PAVLOV I

Excavations 1952-53

ERAUL 66

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PAVLOV I
EXCAVATIONS 1952 - 1953

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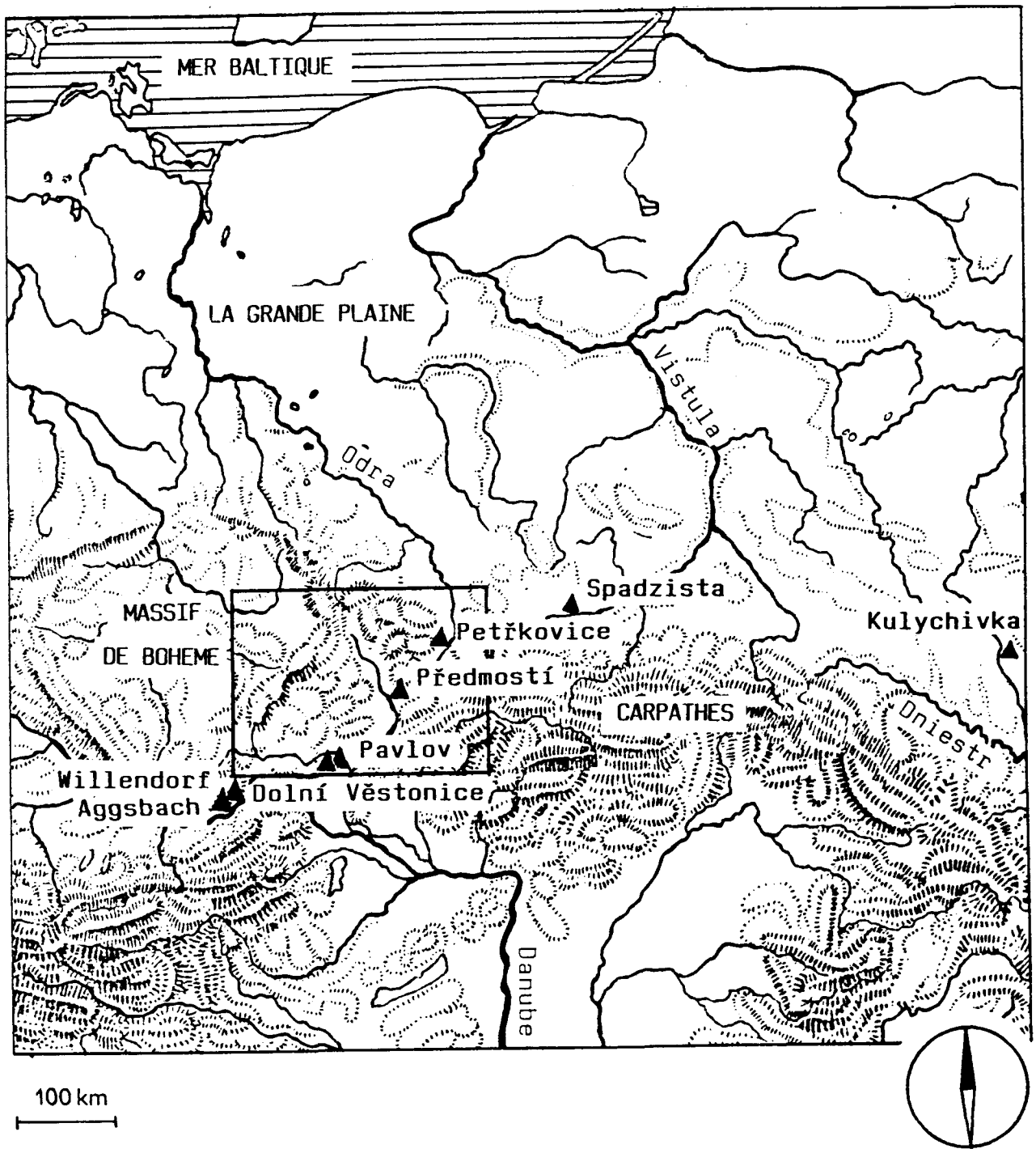

MER BALTIQUE
LA GRANDE PLAINE
Vistula
Odra
MASSIF
DE BOHEME
Spadzista
Petřkovice
Předmostí
Kulychivka
CARPATHES
Dniestr
Pavlov
Willendorf
Aggsbach
Dolní Věstonice
Danube
100 km

CHAPTER I

THE EXCAVATOR'S INTRODUCTION
EINFÜHRUNG DES AUSGRÄBERS

by Bohuslav Klíma

Abstract

The site of Pavlov I remained unknown until the last excavation seasons at Dolní Věstonice I, and the history of research developed in a simple manner. Already the first season 1952, in a surface zone at the eastern margin of the wine-yard, near a crossroad below the village, brought to light surprising results. A deposit of mammoth skulls around a hearth and the related evidence, suggest a tent-like structure. Further excavation (1953) investigated a rich and ashy cultural layer against the slope, bellow the youngest loess cover. The layer was composed of several horizons; the upper ones frequently penetrated the lower ones. This observation suggests repeated stays at the spot.

Previous experience from Dolní Věstonice enabled to develop a specific excavation method. The princip was to unearth larger areas and to separate them by a 1 m² grid of narrow section blocs. The whole content of the cultural layer, rich in microlithic tools and small objects, has been sieved.

Apart from a series of excavation field reports, it was possible to publish several specific finds and assemblages. However a complex presentation of this site, excavated over 21 seasons, with 60.000 inventorized objects and a total of 1.000.000 objects (excluding faunal remains), is still missing. Already the first two excavation seasons show that Pavlov I is closely related to the well-known site of Dolní Věstonice I, it completes the previous evidence, and it is even more rich in archaeological material.

Vorwort des Ausgräbers

Jede wichtige paläolithische Fundstelle hat ihre eigene Geschichte. Je früher sie entdeckt wurde, desto länger und in der Regel auch ereignisvoller hat sich diese gestaltet. Ein gutes Beispiel davon bietet der Mammutjägerrastplatz von Předmostí, dessen Erforschung sogar als ein dramatischer Vorgang anzusehen werden darf (Absolon-Klíma 1977). Besonders aber die Bearbeitung und Auswertung der Ausgrabungsergebnisse einiger Stützpunkte der ältesten Urgeschichte Mährens stoss an manche Schwierigkeiten und diese blieben dann aus verschiedenen Gründen auf dem Tische der Forscher unvollendet und unpubliziert liegen. Hat man die oberflächigen steinernen Denkmäler frühzeitig und vorläufig bekannt gemacht, versuchten mit Vorliebe die eifrigen Sammler auf der Oberfläche der Grundstücke leicht die zugänglichen und erreichbaren Bestandteile der Steinindustrie für sich zu gewinnen. Andermal geschah es sogar durch die Raubgrabungen und die Denkmäler selbst landeten zerstreut in einer Anzahl von Privatsammlungen oder gerieten manchmal in Vergessenheit.

Glücklicherweise blieb die Fundstelle Pavlov I. solcher Entwicklung und einer solchen traurigen Geschichte erspart. Trotzdem der hiesige Pfarrer Josef Mazour schon in der Zeit um die Jahrhundertwende in seiner Pfarre mehrere Knochen und Steingeräte besonders aus dem Hohlwege, der die Kulturschicht der Fundstelle Dolní Věstonice durchgeschnitten und geöffnet hatte, in einer bemerkenswerten Sammlung konzentriert hat (Absolon 1938), blieb für ihn die näher liegende Fundstelle, ebenso wie eine andere (Pavlov II.) bei der östlichen Seite der Ortschaft, unbekannt.

Aber auch die damaligen verantwortlichen Fachleute haben von früheren zufälligen Entdeckungen von Mammutknochen in den Weingärten unterhalb der Burgruine Děvičky nichts erfahren und zwar trotzdem, dass A. Makowsky und A. Rzehak die Fundstellen bei der Nachbarortschaft Milovice und Pouzdřany publiziert haben. Es war erst K.J. Maška, der in seinen Tagebüchern über pleistozäne Tierknochen aus der Umgebung von Věstonice eine Bemerkung verzeichnete. Wahrscheinlich handelte es sich um Mammutüberreste, die der Obrigkeit im Schlosse zu Mikulov vorgelegt und dort auch aufbewahrt wurden. Die Fundstelle blieb merkwürdigerweise ebenfalls einigen eifrigen Sammlern, wie später knapp nach dem ersten Weltkriege es H. Freising und J. Simon waren, ganz unbekannt, trotzdem diese die sämtlichen Oberflächenfunde der Steinindustrie an den ausgedehnten Abhängen der Pollauer Berge aufgefunden und auch einige fast total ausgebeutet haben.

Die Literatur spricht jedoch von einer paläolithischen Mammutjägerstation bei Pollau (Bayer 1924). Einen Anlass dazu gaben die Ergebnisse einer Probegrabung von H. Freising in der Wand des Hohlweges unterhalb der Burgruine, die er in Wien vorgelegt hatte. Sie stammten aber eigentlich aus dem Katastralgebiet Dolní Věstonice und haben die nächsten unmittelbaren Grabungen von K. Absolon hervorgerufen.

Die ersten Oberflächenfunde von Steinartefakten des neu entdeckten Lagerplatzes hat man zu Beginn der neuen Grabungen nach dem zweiten Weltkrieg bei Dolní Věstonice und anlässlich genauer Begehungen der naheliegenden Abhängen gewonnen. Sie kamen unterhalb der Ortschaft im ersten Weingarten bei der Strassenkreuzung in einer durch landwirtschaftlichen Arbeiten zerstörten Kulturschicht zu Tage. Gemeinsam mit ihnen erschienen auch Bruchstücke von

fossilen Knochen, denen die totale Vernichtung drohte. Nach einer näheren Beobachtung war es notwendig noch im Jahre 1952 an dieser Stelle eine Probegrabung durchzuführen (Klíma 1954). Diese hat überraschende Ergebnisse gebracht, die es verlangten zugleich eine grössere Fläche blosszulegen und die weiteren Arbeiten bei Dolní Věstonice vorübergehend zu unterbrechen.

Die im Jahre 1952 untersuchte Fläche von 60 m² in der zum Weingarten angrenzende Parzelle ermöglichte eine schwarzgraue aschige Kulturschicht in einer Mächtigkeit bis 40 cm voll von Tierknochen, Steinindustrie sowie auch von Knochengeräten und Ziergegenständen begleitet zu verfolgen. Die prachtvolle Kulturschicht beherbergte ebenfalls eine richtige dauerhaft genährte Feuerstelle, die, schüsselförmig eingetieft, die Bedeutung eines wahren Feuerherdes annahm. Dieser war von grossen, in einem Bogen nebeneinander aufgestellten Mammutschädeln wie mit einem Wall umrahmt und mit einem weiteren Streifen von dicht übereinander abgeworfenen Knochen des Jagdwildes begleitet. Es bietete sich dabei ein Vergleich mit den bekannten grossräumigen Kjökkenmmödingen von Dolní Věstonice (Klíma 1969), dem aber hier die Mammutknochen in zahlreicherer Vertretung fehlten. Die weiteren Fundumstände gemeinsam mit einigen Pfostenlöchern bezeugten eine Situation, welche für Überreste einer Behausung sprach. Es war vom Anfang der Grabung an ganz klar, dass die Fundstelle mit der Station von Dolní Věstonice eng verwand ist, diese an Erkenntnissen vervollständigt oder sie sogar an Bedeutung der Fundumstände sowie an Fundgut übertreffen wird.

Die Fortsetzung der Erforschung konnte man nicht vermeiden. Sie fand gleich in nächstem Jahre in einem grösseren Ausmasse statt. Man hat die Kulturschicht längs des Weingartens in Richtung dem Dorfe zu verfolgt. Sie war dem Hang gegenüber geneigt und nahm noch an Aussagekraft zu. Sie erreichte an einigen Stellen eine beträchtliche Mächtigkeit bis über 50 cm und zugleich auch einen komplizierteren Aufbau. In solchen Fällen bestand sie aus zwei selbständigen Lagen, die öfters noch feiner gegliedert waren. Einzelne ihre Streifen machten sich hauptsächlich durch den schwarzgrauen aschigen Inhalt, andermal wieder durch den roten Pulverfarbstoff bemerkbar. Solchen Arealen der Grabungsfläche wurde eine erhöhte Aufmerksamkeit gewidmet wobei die flächige Blosslegung durch vertikalen Vorgang kombiniert wurde. Dadurch wurden präzise Beobachtungen ermöglicht, die die feinen stratigraphischen Fundumstände verraten konnten. Einzelne Streifen verliefen keineswegs schieferartig parallel übereinander sondern die oberen durchdrangen öfters die darunter liegenden, wurden aber später selbst von den hängeden Horizonten angegriffen und zerstört.

Besonders die Feuerstellen und ihre aschige Umgebung boten überzeugende Beweise von einer solchen fortschreitenden Siedlungsentwicklung und vom Anwachsen der Kulturschicht. Im Inhalte einzelner ihrer Bestandteile, am eindeutigsten in der typologischen Zusammensetzung der Steinindustrie, konnte man aber keine auffallende Unterschiede beobachten. Es handelte sich ohne Zweifel nur um Destruktionsüberreste von einfachen zeltartigen Behausungen, um Eingriffe, die mit dem Aufbau neuer Überdachungen und ihren Strukturen zusammenhingen, oder um beabsichtigte Umwerfungen der Bodensedimente ausserhalb der Siedlungsobjekte. Solche Fundumstände gaben einen zuverlässigen Beweis von einer andauernden Besiedlung des Lagerplatzes. Man könnte aber diese ebenfalls als Zeugnisse von einer mehrmaligen, nur nach kürzeren Zeitabständen folgende Begehung erklären. Wobei beide Möglichkeiten nicht auszuschliessen sind.

Man fing an die Fundstelle in der ersten Etappe der Nachkriegsforschungen in einer Situation zu verfolgen, in der noch die neuen Grabungsmethoden nicht genau entwickelt waren, die modernen Arbeitsmittel nicht zur Verfügung standen und in der die ausländischen Bestrebungen fast unerreichbar waren. Man hat die hiesigen früheren und bewehrten Erfahrungen in Überlegungen gezogen, in mancher Hinsicht noch neu erweitert und grundsätzlich verfeinert, sodass die Dokumentation der Grabungsarbeiten ein plastisches und wahres Bild über die verfolgte und eigentlich auch vernichtete Kulturschicht darstellen und aufbewahren konnte. Als grundlegender Prinzip galt die Blosslegung einer grösseren Fläche auf einmal und ihre Zerteilung in einzelne Quadratmeter oder Quadranten von 2x2 m, die durch schmale Profilpfeiler abgegrenzt waren und die für selbständige Fundeinheiten gehalten waren. Auf den Wänden dieser Quadranten war es dann möglich den stratigraphischen Aufbau der Kulturschicht und ihre Umwandlungen genau zu beobachten. Es zeigte sich auch bald, dass im Inhalte des Fundgutes ungewöhnlich zahlreich mikrolitische Artefakte vorkommen und man fing deshalb gleich an vollständige Kubatur der Kulturschicht auf Wassersieben zu schwemmen.

Für die komplexe Bearbeitung und Auswertung der Grabungsergebnisse in Pavlov hat man in den letzten Jahren zwar nur stufenweise aber doch wichtige Vorbereitungen getroffen. Es war notwendig die grosse Menge vom Fundreichtum zu inventarisieren, wiederholt konservieren, Rekonstruktionen mancher Gegenstände durchzuführen, ebenso wie die Dokumentation, besonders die zeichnerische, zu vervollständigen und in reine Druckvorlagen zu übertragen. Es ist gelungen das Verzeichnis aller inventarisierten Fundstücke (über 60 000 Exemplare) von dem gesamten Fundgut (ohne Tierknochen fast 1 000 000 Gegenstände) abzuschliessen. Neben laufenden Berichten besonders in alljährlichen Přehled výzkumů AÚ ČSAV Brno, und anderen bei verschiedenen Gelegenheiten veröffentlichten Abhandlungen, übersichtlichen Arbeiten und Erwähnungen war es doch möglich einige Einzelstücke (Klíma 1959, 1963a, 1977, 1988, 1994) und auch ganze Fundeinheiten (Klíma 1955, 1984, 1987, 1989; Vandiver et al. 1990) der Fachwelt zu präsentieren. Eine allseitige und grundlegende Monographie der Fundstelle, die in den Jahren 1952-1974 in 21 Grabungskampagnen erforscht wurde, musste leider, nicht zuletzt wegen Mangel an Publikationsmöglichkeiten, entfernt bleiben. An diesbezüglichen Bestrebungen haben sich auch schon früher mehrere Spezialisten einiger Fachgebiete, wie P. Haesaerts, J. Kovanda, J. Kukla, V. Ložek, R. Musil, E. Opravil, J. Szilvassy, O. Soffer, P. Vandiver, E. Vlček und a., beteiligt.

Die ersten zwei Jahre der Grabungen in Pavlov haben in mancher Hinsicht überraschende Funde und Ergebnisse gegeben. Zugleich, wie es eigentlich auch üblich ist, haben sie jedoch eine Reihe von wichtigen Fragen geöffnet, die nicht nur für die Fundstelle selbst sondern auch für die benachbarten Rastplätze, ja sogar für die allgemeine paläolithische Forschung von grosser Bedeutung sind.

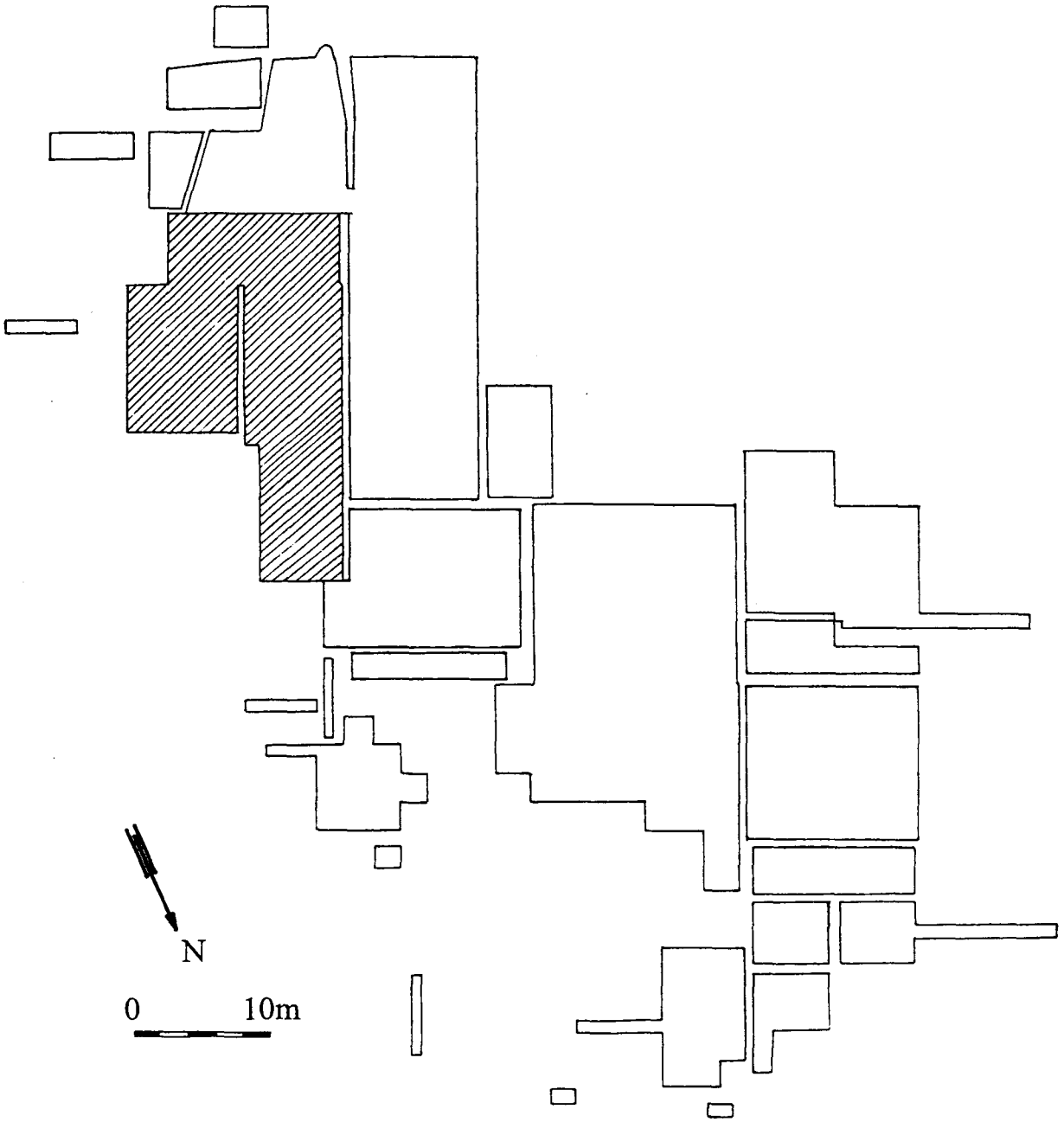


Fig.1. Pavlov I, general excavation plan, showing location of the 1952-1953 area (hatched)
Abb.1. Pavlov I, Gesamtplan der Ausgrabungen und Lokalisation der Flächen von 1952-1953 (schrafiert)

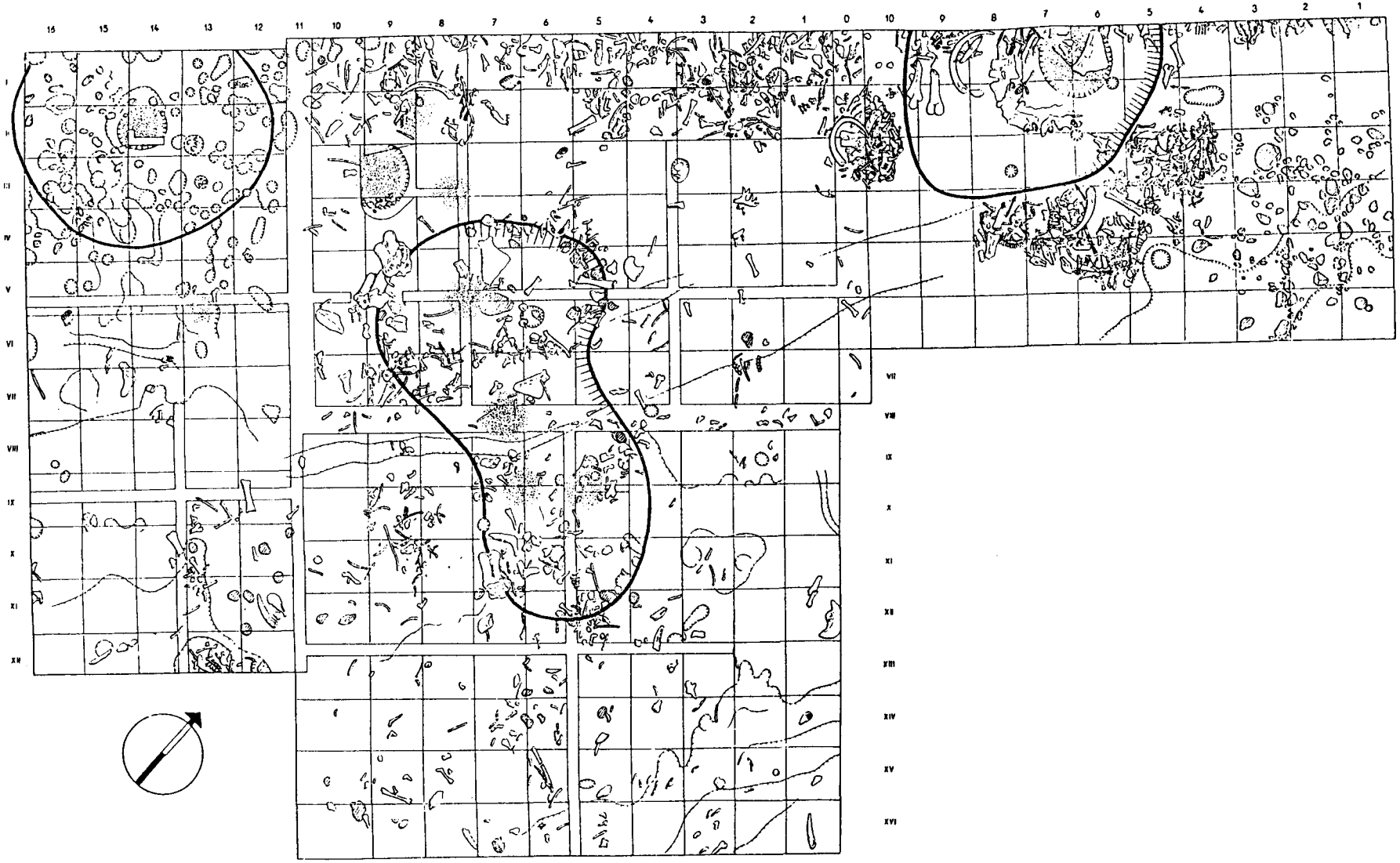


Fig.2. Pavlov I, 1952-1953 excavation area showing location of hearths, objects and depressions
Abb.2. Pavlov I, Grabungsflächen 1952-1953 mit Lokalisation der Feuerstellen, Objekten und Vertiefungen

Fig.3. The Pavlovské Hills from the NE, over the Dyje river (above); southern part of the 1952 excavation area (below)
Abb.3. Die Pavlovské Gebirge von N-O, über die Thaya Fluss (oben); südliche Teil der Ausgrabung 1952 (unten)

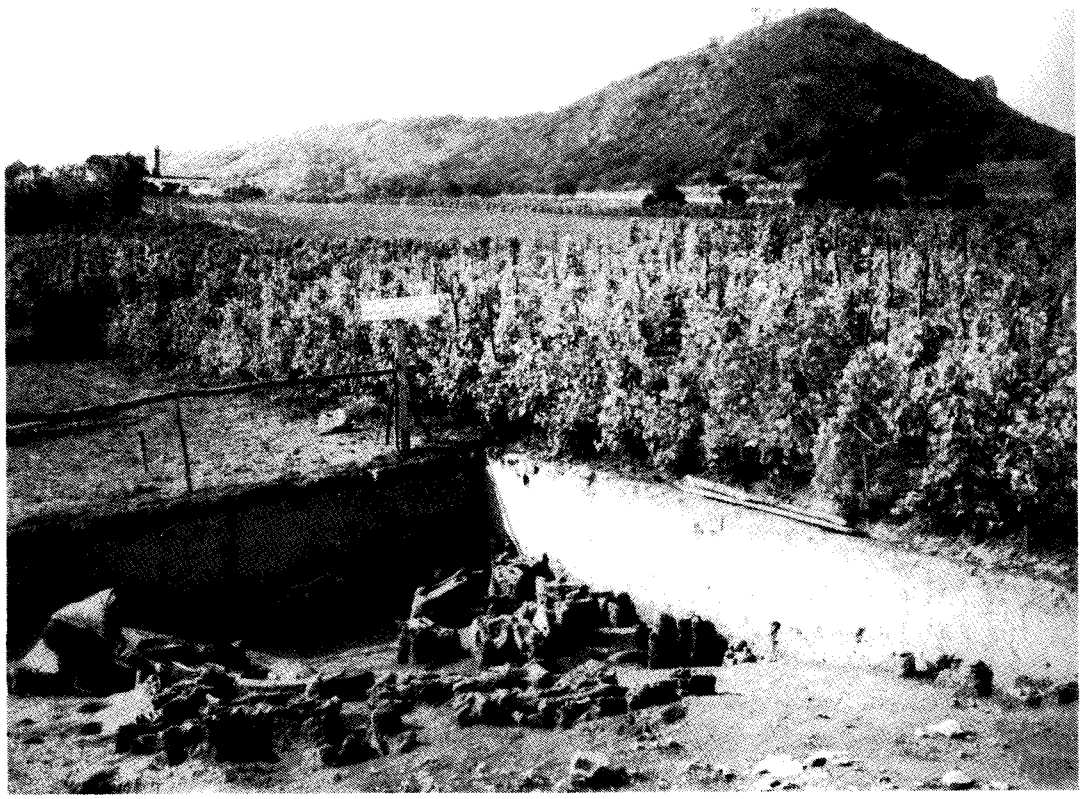


Fig.4. Pavlov I, excavation 1952. Group of animal bones at the southern margin (above), and a complete wolf skeleton at the eastern margin of the area (below)
Abb.4. Pavlov I, Ausgrabung 1952. Gruppe der Tierknochen am südlichen Rand (oben) und ein komplettes Wolfskeleton am östlichen Rand der Grabungsfläche (unten)

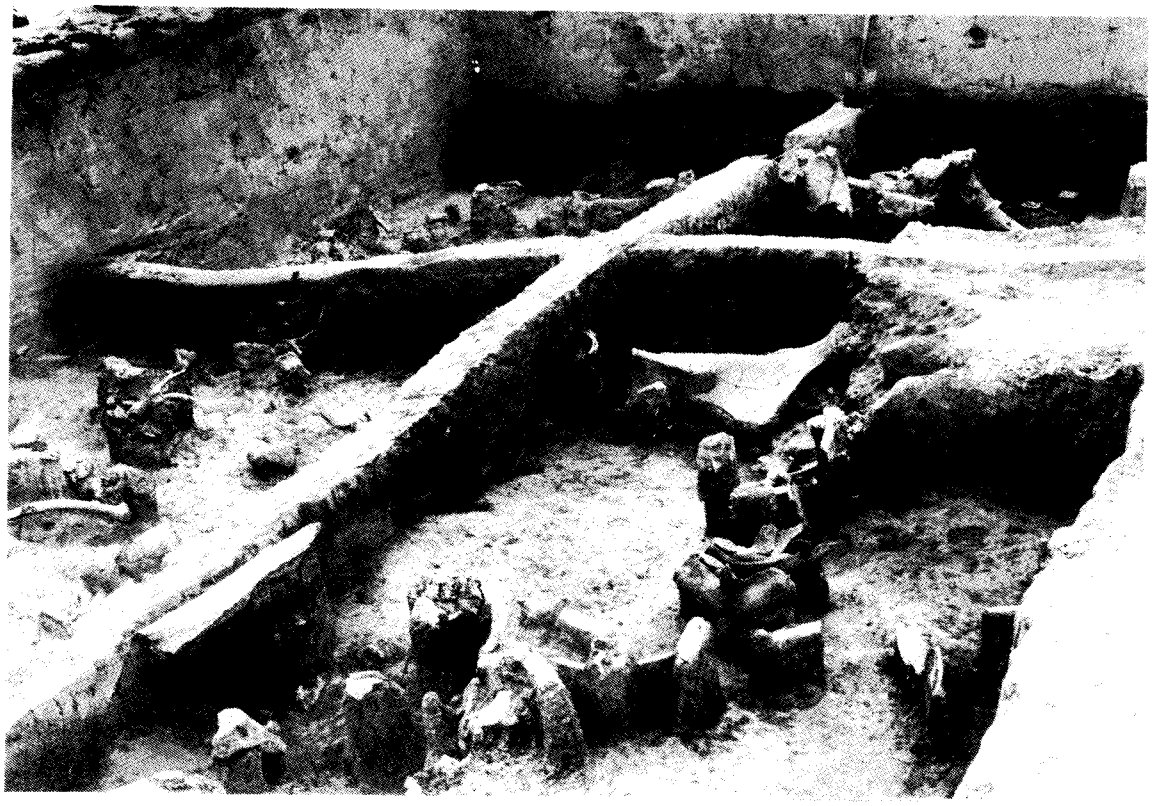


Fig.5. Pavlov I, excavation 1953. Mammoth bones outlining the central feature (No. 3, above), and western part of the trench A (below)
Abb.5. Pavlov I, Ausgrabung 1953. Mammutknochen an der Kante des Zentralobjektes (No. 3, oben) und die westliche Teil der Fläche A (unten)

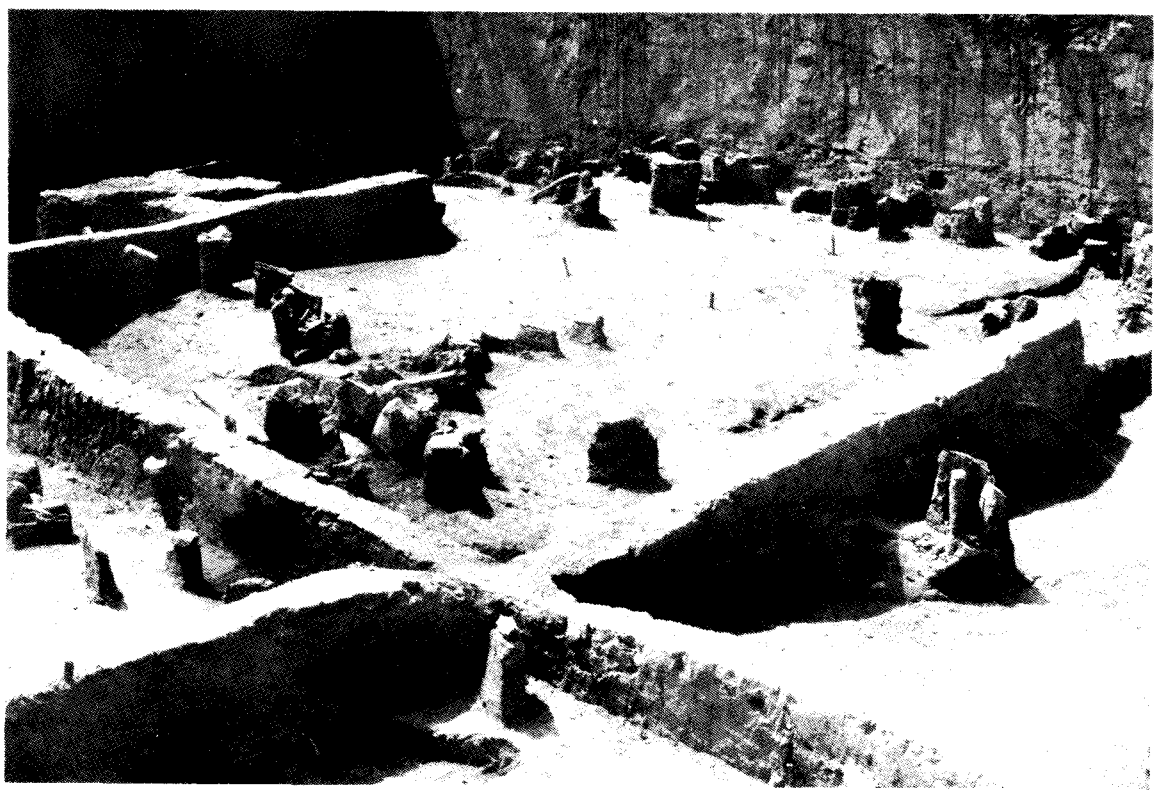


Fig.6. Lower jaw of a young mammoth at the margin of the central feature (above) and a group of the mammoth ribs (below)
Abb.6. Unterkiefer eines jungen Mammuts an der Kante des zentralen Objektes (oben) und eine Gruppe der Mammutrippen (unten)

Fig.7. Kettle-shaped holes at the base of the cultural layer, western part of the area
Abb.7. Kesselförmige Grubchen an der Basis der Kulturschicht, westliche Teil der Grabungsfläche

CHAPTER II
THE LITHICS

by Antonín Přichystal, Petr Škrdla, Jiří Svoboda and Silvia Tomášková

1. Geochemical analysis of the lithic raw materials

Antonín Přichystal

Siliceous rocks represent the most important raw material for chipped artifacts throughout the Stone age. This conclusion concerns the Upper Paleolithic site of Pavlov as well. Siliceous rocks, as regards their petrographical definition, are nondetrital siliceous sediments originating by chemical, biochemical or diagenetic precipitation of silica (SiO_2). They are composed of its various mineral modifications, especially of microcrystalline quartz, chalcedony and opal. An addition of detrital component or another cement material must be less then 10%. Siliceous rocks form nodules or layers in usually marine calcareous sediments (chalk, limestone, calcareous marls and sandstones) and they comprise all varieties of chert including flint, radiolarite, spongolite, lydite and phthanite. Freshwater limnic siliceous rocks exist as well. The sources of SiO_2 may be both biological (siliceous skeletal elements) or chemical (post-volcanic thermal springs).

Archaeologists usually determine the siliceous rocks macroscopically, using their many-years experience. Such a determination is admittedly rather subjective and it is understood as a preliminary result only. Several methods help to determine the raw materials more precisely:

a) study of texture including basic determination of micro-fossils under a stereoscopic microscope using water as an immersion liquid;

b) investigation of mineral composition, i.e. determination of SiO_2 mineral modifications in thin sections by means of a polarisation microscope or by means of an X-ray diffractograph;

c) special study of separated microfossils;

d) determination of physico-chemical qualities (microhardness, porosity, loss by ignition);

e) investigations of trace elements.

Each of the mentioned methods has its limitation. The best way is a combination of various methods.

At the first step, author of this contribution distinguished the various kind of siliceous rocks chipped in Pavlov under a stereoscopic microscope using water as an immersion liquid. Further, trace elements were investigated. Chemical determination of major element has no sense because of very high abundance of silica (usually about 98-99%). Geochemical study of trace elements on the other hand has been successful in determinating the various sources of volcanic glass obsidian. Compared to the obsidians, the siliceous rocks are less homogenous and show a large dispersion of trace elements. Moreover, there is an absolute lack of data from comparable geological sources (e.g. in Czech Republic, occurrences of trace elements have been studied in Proterozoic phthanites only - Dubanská et al. 1977).

Several previous papers are dealing with trace elements in siliceous rocks artifacts of Central Europe. Přichystal (1975) used for this purpose the optical spectral analysis. Results of more exact neutron activation analysis and X-ray spectral method were introduced by Lech et al. (1976). Takacz-Biro (1986) published data on trace elements in the hydrothermal and limnic siliceous rocks in Hungary. Pawlikowski (1987) applied this method to raw materials from the Paleolithic site Krakow - Spadzista street. A detailed geochemical characterization of erratic siliceous rocks

from glacial sediments of Upper Silesia has been given by Kozlowski - Pawlikowski (1989). A relatively extensive collection of trace elements data is published in a paper of Přichystal (1991) in connection with his study of chipped artifacts from the Neolithic site at Bylany (Bohemia).

The selection of analysed trace elements represents a serious problem. Dubanská et al. (1977) emphasised the importance of biogenous metals such as V and Cu for their ability to form organic complex compounds. Mg and Fe reflect character of primary carbonate sediments in which the siliceous sediments originated. The study of siliceous raw materials from the Neolithic site of Bylany is based on Ba, Cu and Sr as elements giving good informations when occurrences in various siliceous rocks are compared. In fact, we are looking for the most useful combination of trace elements depending moreover on the used analytical method.

In this paper, 14 elements have been determined in 10 artifacts from Pavlov and in 8 comparable siliceous rocks from primary geological sources or from other Paleolithic sites. The occurrences of Mg and Fe are given in weight %, the abundances of Zn, Ba, Cr, V, Cu, Nb, Ni, Co, La, Y, Ce and Pb are in ppm (parts per million i.e. 0.0001%). The trace elements were determined in the chemical laboratory of Unigeo Corporation in Brno. Their team led by ing. E. Stuchlíková used for determination the X-ray spectral analysis (data in ppm) and the atomic absorption spectrometry (data in %). The results are summarized in Tab. 1. On basis of the study under a stereoscopic microscope, the raw materials are divided in three groups:

a) radiolarites (numbers 1 - 5);

b) siliceous rocks of the Krakow-Czestochowa Jurassic (n. 6 - 10);

c) erratic siliceous rocks from glacial sediments and similar siliceous rocks (n. 11 -17).

One comparative sample of Volhynian flint (n. 18) from the Paleolithic site of Kulychivka, west Ukraine, has been analysed as well.

1.1. Radiolarites

Radiolarites are distinguishable from the other siliceous rocks at the first sight due to high Mg abundance (fivefold higher on the average) and Fe value (twofold higher on the average - see Tab. 2 for statistical calculations). Vanadium and barium are further important trace elements. Values of these four elements expressed by the mean and the standard deviation differ significantly and do not coincide (neither partly) with occurrences of these elements in the other siliceous rocks. Presence of radiolarites in the collection of chipped artifacts in Pavlov lies beyond doubt. Due to the lack of comparative data from primary geological sources (Vienna - Mauer and miocene gravels of south Moravia) their provenience cannot be determined in the moment. However, a good correspondence in trace elements can be observed between the samples from Pavlov and from the geological source in the Bílé Karpaty Mountains (the Vlára pass).

1.2. Siliceous rocks of the Krakow-Czestochowa Jurassic

Study under the stereoscopic microscope revealed raw material with qualities (i.e. character of microfossils, occurrence of red pigment in the siliceous mass) comparable to raw materials of the Krakow-Czestochova Jurassic. Compared to erratic siliceous rocks, the whole group of Jurassic raw materials has a smaller

dispersion of analysed elements. The values of Fe are relatively stabile (0.43 - 0.59%), Cr and Ni show a very small dispersion. As concerns the other trace elements, V, Nb and Y lie under the limit of detection in the both groups, the values of La and Ce overlap, Rb shows a similar picture but higher values rather in the group of Jurassic siliceous rocks. The most interesting data represent the abundances of Ba and Cu. On the average, barium is higher in the group of erratic siliceous rocks, while values of Cu are higher in the group of the Jurassic raw materials. Unfortunately, Ba and Cu values partly overlap in the both groups.

1.3. Erratic siliceous rocks from glacial sediments and similar siliceous rocks

Compared to the group of Jurassic raw materials, the values of analysed trace elements are more unsteadily. The artifact Pavlov 7, with trace elements values different from the rest of the group, poses a serious problem. The values of Zn and Cu lie closer to that of the Volhynian flint from the Paleolithic site of Kulychivka. The values of magnesium and ferrum in the both samples are nearly identical as well. The artifact from the Aurignacian site of Slatinice represents another rather different sample because of higher value of Cu. Neither the study under the stereoscopic microscope revealed a natural source of this material.

There is no doubt about a large representation of erratic siliceous rocks among raw materials of chipped artifacts in Pavlov. However, the sample with trace element composition better comparable to the Volhynian flint suggest that we cannot exclude presence of this raw material at Pavlov.

1.4. Conclusion

Geochemical study of trace elements in the Pavlov lithic industry showed the presence of radiolarites that are similar to comparative samples from the Vlára region. The provenience in this area, however, cannot be proved at the moment without analysing other possible sources. A comparison of the composition of trace elements in the silicite artifacts of the Krakow-Czestochowa Jurassic, found at the sites of Pavlov I and Bylany (East Bohemia, Neolithic), with samples directly from this source (Wierzchowie, Zwierzyniec), demonstrates that the material has a higher content of Cu and a lower content of Ba. The silicites from glacial sediments, similar macroscopically, have a different content of these two elements. This initial result however is only of a preliminary significance, since the number of samples is not representative, and the same laboratory may reveal quite varying results in different tests. Furthermore, the sample no. 7 at Pavlov shows a similar trace element composition as the sample from Kulychivka. Therefore, even the Volhynian raw material should be considered as a possible source in the Gravettian of South Moravia.

Tab.1. Content of selected 14 elements in 10 artifacts from Pavlov I and 8 other comparative locations (Rr - red radiolarite, Rg - green radiolarite, KCJ - siliceous rock of Krakow-Czestochowa Jurassic, SGS - siliceous rock of glacial sediments, VF - Volhynian flint)

No.	Raw mat.	Locality	Mg %	Fe %	Zn ppm	Ba ppm	Cr ppm	V ppm	Cu ppm	Nb ppm	Ni ppm	Co ppm	La ppm	Y ppm	Ce ppm	Rb ppm
1	Rr	Pavlov 1	0.13	1.43	94	130	27	5	284	5	26	5	48	5	10	10
2	Rr	Vlára	0.21	0.97	103	116	32	17	324	5	16	8	48	<5	10	21
3	Rr	Pieniny	0.13	0.80	72	51	30	9	350	5	20	6	33	6	12	29
4	Rg	Pavlov 2	0.17	0.80	235	248	30	18	482	6	18	6	41	5	11	25
5	Rg	Vlára	0.12	0.69	37	260	28	9	222	8	20	5	35	5	13	24
6	KCJ	Pavlov 3	0.05	0.51	23	15	21	<5	72	5	13	3	46	<5	6	12
7	KCJ	Pavlov 4	0.02	0.59	77	22	25	<5	230	<5	12	5	44	<5	20	26
8	KCJ	Pavlov 5	0.03	0.43	50	<10	26	<5	166	<5	11	5	48	<5	5	16
9	KCJ	Wierzch.	0.02	0.45	77	<10	25	<5	263	<5	14	6	38	5	11	16
10	KCJ	Zwierz.	0.02	0.55	47	21	27	<5	150	<5	18	6	46	<5	5	21
11	SGS	Pavlov 6	0.03	0.52	39	15	25	<5	187	8	16	5	41	<5	18	17
12	?	Pavlov 7	0.03	0.56	196	16	12	<5	612	<5	16	6	44	<5	20	10
13	SGS	Pavlov 8	0.07	0.23	12	20	14	<5	39	5	12	5	48	<5	5	10
14	SGS	Pavlov 9	0.02	0.47	40	34	44	<5	128	<5	16	5	44	<5	10	10
15	SGS	Pavlov 10	0.02	0.31	32	10	25	<5	207	<5	14	5	40	<5	6	11
16	?	Slatinice	0.04	0.59	33	14	30	<5	474	<5	14	7	33	<5	5	20
17	SGS	Petřkovice	0.03	0.41	55	45	25	<5	181	<5	12	5	34	<5	11	12
18	VF	Kulychivka	0.03	0.55	260	12	36	<5	890	5	17	5	48	<5	10	22

Tab.2. Statistics for the studied sample (μ - arithmetic mean value, σ (n-1) - standard deviation)

Raw material	samples	μ Mg %	σ (n-1)	μ Fe %	σ (n-1)	μ V ppm	σ (n-1)	μ Ba ppm	σ (n-1)
Radiolarites	5	0.152	±0.038	0.938	±0.293	12	±5.6	161	±90
Other siliceous rocks	13	0.032	±0.015	0.475	±0.109	<5	-	<18.5	±10.5

Raw material	samples	μ Ba ppm	σ (n-1)	μ Cu ppm	σ (n-1)
Siliceous rocks of Krakow-Czestochowa Jurassic	5	<15.2	±6.3	176	±74
Siliceous rocks of glacial sediments	5	24.8	±14.4	148	±68

2. Technological qualities of the individual materials

Petr Škrdla

Various Paleolithic populations selected the raw materials for lithic production differently. In order to approach possible motivations of this selection, qualities of several rocks (coarseness, cutting ability) were analysed in detail.

The following materials were compared: radiolarite, flint (siliceous rocks of the glacial sediments and of the Krakow-Czestochowa Jurasic), Moravian cherts (the Krumlovský les-type and the Stránská skála-type), obsidian, quartz, quartzite, and rock crystal.

Coarseness measurements: Coarseness (standard deviation of the surface, maximum height of irregularity) is measured in order to consider the quality of the cutting edge, and indirectly the inner structure of the rock. In quartz and quartzite, the surface irregularities reach values in the order of mm. In other materials, the standard arithmetic deviation of the surface ranges between 1.5 - 3.5 micrometers. Maximum height of irregularity is 20 micrometers (chert of the Stránská skála type), minimum is 8 micrometers (radiolarite).

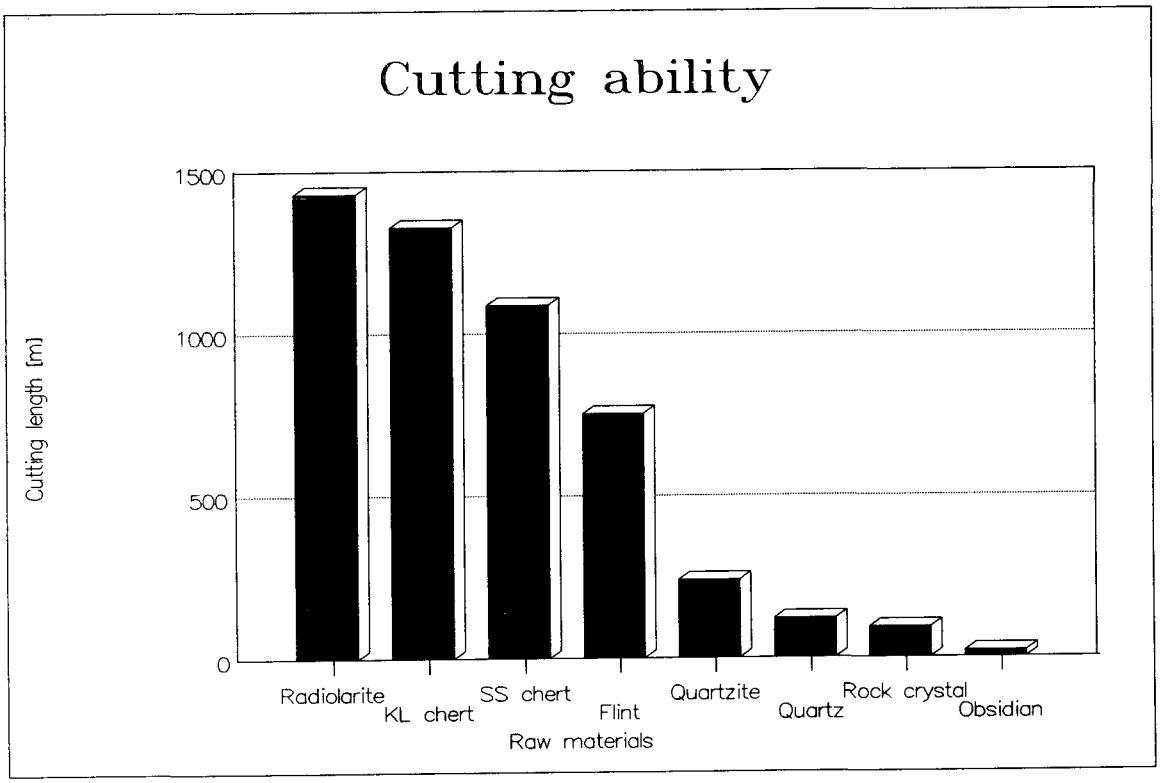
Cutting ability: Cutting ability of the same materials was tested using modern industrial norms (ISO 3685). Segments, made according to norm ISO SNUN 120408, were hafted in a tool post according to the norm ISO CSRNR. Testing was carried out under constant values of cutting edge geometry, feed and depth of cut (0.254 mm and 2.5 mm), cutting speed (300 m/min), and with the same worked material (oak wood). The high cutting speed was used with respect to the capacity of the laboratory. This speed is considerably higher than the manual speed used in prehistory but it enables relative comparison of the various materials.

We measured the duration of the cutting until the breakage of the cutting edge or loss of cutting abilities. Mean values of the achieved results are summarized in Tab.3. The samples may be separated into two groups:

1. siliceous rocks (radiolarite, flint, Moravian cherts)
2. other materials (obsidian, quartz, quartzite, rock crystal).

Quartz, rock crystal, and obsidian broke in a few seconds, while the quartzite resisted until complete abrasion (rounding) of the cutting edge. High quality of radiolarite was observed in the group of siliceous rocks. Flints, on the other hand, showed lower quality than the Moravian cherts. Siliceous rocks (with the exception of the Stránská skála chert) were damaged only by a small chipping from the cutting edge without limiting the cutting ability. This in fact may represent the self-resharpening effect observed on tools as utilization retouch. Stránská skála chert edge was continuously worn out. Differences observed in the siliceous rocks may have been influenced by the geological age of the sediments, i.e., recrystallization from softer chalcedony to harder quartz.

Tab.3. Mean values of the cutting lenghts of examined raw materials



3. Raw materials and technology

Jiří Svoboda

The lithic material excavated in 1952 amounts to 13.530 artifacts. Since we have no record of the artifact spatial distribution, this assemblage was used for a more general pilot study of raw material economy, technology and typology (Svoboda 1994).

The lithic material recovered in 1953 includes 39.144 artifacts (Fig.2). From this total, 5.379 pieces were assigned a catalogue number and their location was marked (Figs. 4-5).

Apart from the siliceous materials, the assemblage includes more heavy and coarse flakes, and fragments of limestone, sandstone, amphibolite, and quartz (Klíma 1984). These raw materials amount to 62 pieces in the 1952 excavation, and 632 pieces (288 inventorized and 344 non-inventorized) in the 1953 excavation (Fig. 3).

The siliceous material recovered from the Pavlov I site during the 1952 excavation were identified in terms of their origin as 96.2% imported from the northern flint sources (glacial sediments and Krakow-Czestochowa Jurassic) and 3.2% from radiolarite outcrops. The rest of the material was collected in the vicinity of the site, either from the local outcrops (limestone of Tertiary and Jurassic age at 0.3%), or from the Dyje river gravels (quartz pebbles at 0.1%, and redeposited Moravian cherts at 0.1%). Spongolite was the most important type of the recovered Moravian cherts.

The quantitative relationships within the 1953 assemblage are similar.

However in other parts of the site (ongoing analysis of the 1957 area) the percentage of radiolarite increased drammatically.

Tab.4. Representation of raw materials in the assemblage of 1952

1952	n	%
Flint	13015	96.2
Radiolarite	430	3.2
Moravian cherts (mainly Cretaceous)	20	0.1
Quartz	17	0.1
Quartz with muscovite	3	-
Limestone (Jurassic, Tertiary)	35	0.3
Sandstone	3	-
Amphibolite	4	-
Others	3	-
Total	13530	

The presence of the two main raw materials, flint and radiolarite, poses a question about the economy of their use (Tab.5). This question was studied on the basis of the 1952 collection.

Table 5. Composition of the lithic industry

Pavlov I/1952	flint		radiolarite	
	n	%	n	%
Pre-cores and cores	46	1.3	1	0.6
Non-retouched flakes	646	17.8	37	20.9
Non-retouched blades	2235	61.8	98	55.4
Partly retouched blades	129	3.6	8	4.5
Retouched blades	560	15.5	33	18.6
Total	3616		177	

The flint artifacts were identified as follows: 1.3% of the assemblage is cores, 79.6% non-retouched blanks, 3.6% partly retouched pieces, and 15.5% retouched tools (small chips and fragments were not quantified).

The radiolarite component of the collection was identified in the following fashion: 0.6% as cores and 76.3% as non-retouched pieces, slightly lower than in the flint category. The partly retouched (4.5%) and retouched pieces (18.6%), on the other hand, are somewhat higher in the radiolarite category.

The pattern of flint use, with higher proportion of cores and lower proportion of tools, resembles the pattern identified in exploitation areas, where the proportion of cores is higher and that of tools lower (Svoboda 1983). The pattern of radiolarite use seems more exhaustive. In the analysed sample of 47 cores (1952 season) only 1 is radiolarite (Fig. 18: 7) and 43 pieces are made of flint. In addition there are 3 other cores from local chert pebbles.

Table 6. Core Analysis

Pavlov I/1952	Flint	Radiolarite	Chert	Total
Precore	1	0	0	1
Upper Pal. type	9	1	0	10
Prismatic	1	0	0	1
Cubical	0	0	1	1
Pyramidal	3	0	0	3
Microcore (< 3 cm)	7	0	0	7
Change of orientation	2	0	0	2
Core rejuvenation	5	0	0	5
Residuals	15	0	0	15
Frag/undetermined	0	0	2	2
Total	43	1	3	47

There is only one core preform and 15 reduced cores but 7 re-worked cores and 15 core residuals. This indicates an emphasis on intensive use of the core material that differs significantly from the lithic exploitation areas. Microcores smaller than 3 cm, suited for microblade production, are relatively numerous (Fig. 18: 3-4).

The technology used at Pavlov I was intended to produce blades from specialized long and narrow cores of Upper Palaeolithic type. The original forms with ridges along the dorsal, frontal and basal edges are rarely preserved but there are numerous forms in various stages of reduction and rejuvenation (Fig. 18 : 7). Furthermore, there are cores of prismatic (Fig 18 : 7), cubical (Fig. 18 : 6), and pyramidal (Fig. 18 : 2) shapes.

The sequence of core reduction begins with cortical flakes and blades and continues from preparation and other non-cortical flakes to rejuvenation flakes. We observed that the number of cortical and partly cortical flakes is higher in flint (3% and 15.1% respectively) than in radiolarite (1.5% and 1.5%). In lithic exploitation areas the percentage of cortical flakes is even higher and that of rejuvenation flake lower.

The proportion of blades relative to flakes is 77.4% in the flint assemblage and 72% in the radiolarite assemblage. These numbers fit well into the usual interval of blade indices at other Pavlovian sites (65% - 80%). The proportion of microblades (width less than 1cm) in the blade assemblage (40.4% in flint and 35.9% in radiolarite

Table 7. Flake Analysis

Pavlov I/1952	Flint	Radiolarite	Total
Cortical	66	2	68
Non-cortical	253	25	278
Non-cortical with rest of cortex	141	1	142
Non-cortical crest flakes	19	1	20
Non-cortical edge flakes	17	0	17
Non-cortical from flaking platform	114	7	121
Non-cortical from frontal face	32	1	33
Partially retouched	38	3	41
Total	680	40	720

Table 8. Blade Analysis

Pavlov I/1952	Flint	Radiolarite	Total
Cortical	19	0	19
Non-cortical	864	46	910
Non-cortical with rest of cortext	232	1	233
Microblades	820	36	856
Microblades with rest of cortext	62	0	62
Pointed blades	38	2	40
Pointed microblades	36	1	37
Crest blades	139	12	151
Rejuvenation blades	25	0	25
Partially ret blades	69	5	74
Partially ret microblades	22	0	22
Total	2326	103	2429

Burin spalls	269	9	278
Fragments and chips	9134	244	9378

assemblage) is, on the other hand, approximately double than the mean values from Dolní Věstonice II (Svoboda 1991a). These microblades, together with the typical microcores, clearly express the small-dimensional character of a large part of the Pavlov I industry.

The proportion of retouched tools (15-19%) is considerably higher than in some assemblages of Dolní Věstonice II, such as units 2 and 3 of the western slope, where the tools comprise only 4-5%.

Generally, the intensity of raw material use was higher at Pavlov I as compared to Dolní Věstonice II. In frame of the Pavlov sample, the radiolarite seems to have been processed slightly more economically than the flints.

Table 9. Dynamics of flake and blade production

Pavlov I/1952	Flint		Radiolarite	
	n	%	n	%
Cortical flakes and blades	85	3.0	2	1.5
Partly cortical	435	15.1	2	1.5
Non-cortical	2011	69.9	110	81.5
Preparation	175	6.1	13	9.6
Rejuvenation	171	5.9	8	5.9
Total	2877		135	

4. Refitting

Petr Škrdla

Refitting at Pavlov I (1953 area) was limited to one raw material, radiolarite, due to the large amount of the total material. The advantage of this raw material is that it does not patinate and that it shows a variety of colour hues, facilitating reassemblage. The results from Pavlov I were then compared to the western slope of Dolní Věstonice II .

The intersite comparison is based on the index Ic, defined as the relation of the number of joined pieces to the total number of artifacts. The second index In relates the number of refittings to the number of joined pieces. When the In increases and the Ic decreases, these two indices can be interpreted as the intensity of transport of products from the site. Tab.10 demonstrates the essential difference between Pavlov I and Dolní Věstonice II, units 1-3.

Tab.10. Comparison of the refitting indices Ic, In

	Pavlov I, 1953 exc.	DV-II, units 1, 2, 3	DV-II, unit 4
Ic (%)	2.9	14.8	5.6
In (%)	44.4	35.6	41.7

At Pavlov I (1953 area), the index Ic is extremely low. The artifacts rarely fit together and certain colour varieties are represented by a single or a few artifacts only. It was possible to refit a core with a short blade and two flakes from platform rejuvenation. In addition, there are several refittings of broken blades (Fig. 16:1,4). One of them (Fig.16:1) shows traces of utilization and it is possible that the breakage was a result of use. This blade was originally retouched to a point, but the use continued after the breakage. The character of the breakage was tested by experimental breaking, and the lift of the break suggests an oriented use of force. Another complex refitting shows an Aurignacoid endscraper, composed of three parts (Fig.16:3). A burin was created by removal of the scraping end, and an additional burin was made on the distal end of the tool. A breakage with surrounding traces of impact was observed in the middle section of the artifact.

It is difficult to reconstruct the spatial distribution of the refitted pieces from Pavlov since about two thirds of the analyzed radiolarites were not recorded by their location in squares. In the single case when the location is known, the distance between the individual pieces is 10 meters. It links sectors 2 and 3 (Fig.16).

Preliminary results of radiolarite refitting from the 1957 area show higher values of the index Ic.

For comparative purposes, I mention results of refitting from Dolní Věstonice II - the western slope. The refitting of the artifacts was much more complex, especially in the units 1, 2, 3. The core on Fig.17 was composed of flakes from the preparation stage, and of a few blades. These blades, however, are either broken or transformed into a tool (burin). A few more flakes and blade fragments were made on the same material but could not be refitted. The inner part of the refitting and the core residual were not found. Another core from the same site shows an opposite problem. This is a core residual with several conjoining flakes and blades. Preparation flakes, most probably from this particular core, were found as well but could not be refitted. In both cases, however, blades from the middle stage of the core reduction are lacking. It was only possible to refit a few sequences of blades or flakes (2 to 5 pieces), and several broken blades.

The spatial distribution of this refitting is relatively large (up to 15 m). The linkage between the various settlement units accords with the assumption based on C 14 chronology and typology that the settlement units 2 and 3 were contemporaneous, while unit 1 is of different age (Svoboda 1991a).

The unit 4, located at the western slope but separated from the units 1-3, yielded less complex refittings and most of them were breakages (Svoboda, Škrdla and Jarošová in press).

The comparison of Pavlov I (1953 area) and DV II suggests that the intensity of transport of objects from the site was higher at Pavlov I.

5. Use-wear analysis and its spatial interpretation

Silvia Tomášková

5.1. Introduction

The study presented here deals with the lithic collections from the site Pavlov I, recovered in two excavation seasons, 1952 and 1953. I examined 569 pieces (4.2% of the total 13,530) from the 1952 excavation, and 4,082 pieces (10.4% of the total .39,144) from the 1953 excavation. In addition, I chose a random sample of 400 unidentified pieces - debitage - (1.02%) from the 1953 collection for comparative purposes.

In order to understand better the contemporaneity of the uncovered features, the history of occupation, and activities that might have taken place at the site at a microscale, I combined information from a map of general lithic distribution (Fig. 2) and maps of faunal remains (Chapter VI) with the results of the use-wear analysis. Due to the fact that work at the site continued after 1952-53, and that lithic collections recovered in subsequent excavations remain to be analyzed, the results presented here are interpreted only in outline, keeping in mind that the adjacent area might have contained additional features and artifacts that could alter the overall picture. The interpretations offered here should be taken as only tentative as none of the large

amount of recovered artifacts - shells, clay, drilled teeth, pendants - were included in the analysis. These may add significantly to the details of the living situations of the prehistoric inhabitants of the area. Moreover, throughout the study, I kept in mind the effect of postdepositional forces that had an effect on the wear, condition of the stone surface, and the spatial distribution of the artifacts.

Model presented here deals with only one aspect of the prehistoric occupation - the possibility of structures sheltering the recovered hearths, their orientation and their relationships at the site as a whole. Results of the microwear study were discussed with this model in mind, not excluding other aspects of the prehistoric occupation of the area. Further detailed analysis and interpretation of the use-wear study, currently under way, will address other issues related to the topic.

5.2. Methodology

Each piece, once measured and described, was examined under magnification of 75x and 200x, using a binocular microscope Meopta with an external light source. Prior to the observations, I carried out a series of experiments in order to determine the type of damage caused by different worked materials (following e.g. Brink 1978, Keeley 1980, Knutsson 1988, Moss 1983). A set of standard materials - plant, meat, hide, antler, bone, wood, and shell - were subjected to cutting, sawing, and scraping. In addition, I carried out similar experiments with the processed materials frozen for several days, in order to determine the extent of difference in edge damage due to water loss.

Damage observed under the medium magnification used (75 - 200x) could be best described in the following terms:

1. polish - varying intensity, appearance, and extent, most common in woodworking
2. rounding - consistent loss of a sharp edge, varying appearance depending on the worked material
3. striation - appearance of scratches and grooves, pronounced with dry and frozen materials
4. microflaking - various forms of crushing, nibbling, step and hinge fractures, common in bone work.

The soft material had to be worked for at least 15 minutes in order to show any microscopic effect (under medium magnification) on the stone used, underlining the necessity of approaching the category of "unused" lithics cautiously. The spatial interpretation of "empty spots" - areas with unused lithics - may hide "invisible" activities of a short duration. The differential formation of edge damage may also influence the interpretation of the types of activities that were carried out at the site, giving undue importance to processing of harder materials, e.g. bones, antler etc. (for discussion see e.g. Bamforth et al. 1990, Levi-Sala 1986).

Results obtained in the experimental study enabled a broad separation of the worked materials into four groups:

1. dry, coarse, hard material - e.g. shell, frozen, dry meat and hide
2. soft resistant material - e.g. wood, tough roots
3. soft material - e.g. plant, fresh hide, fat
4. fresh tough material - e.g. bone, antler, meat.

Interpretation of the observed traces of use-wear on the lithic material followed this categorization. The activities that may have taken place at the site, as well as the proposed division of labor were all suggested on the basis of the above described assumptions.

5.3. Analysis of use-wear, Pavlov I, 1952-53

The starting point of the interpretation was the extent of the overall use of raw material at the site, as expressed by the categorization of stone pieces with observable traces of use-wear and those without (raw numbers and %). The surface of several pieces was heavily affected by post-depositional changes (weathering, damage in the process of labelling), and evidence of use could not be evaluated. These were eliminated from the statistics (category -indeterminate- in Tab. 11). Lithic pieces cracked by fire were included in the spatial analysis, but not in the use-wear study.

Tab. 11. Results of the use-wear analysis in the three examined samples

year	total	ind.	%	no.	+	%	-	%	fire
1952	569	56	9.84	513	228	44.44	285	55.55	23
1953	4082	325	7.96	3757	1583	42.14	2174	57.87	53
debitage	400	36	9	364	163	44.78	201	55.22	8
total	5051	417	8.26	4634	1974	42.6	2660	57.4	84

Key:
1. total = all the lithic pieces examined from each collection in numbers
2. ind = indeterminate, number of pieces where use-wear could not be evaluated due to postdepositional damage
3. % = percentage of indeterminate pieces from the total
4. no. = number of pieces evaluated in terms of presence or absence of use-wear
5. + = presence of use-wear in numbers
6. % = percentage from the evaluated collection
7. - = absence of use-wear in numbers
8. % = percentage from the evaluated collection
9. fire = fire-cracked pieces, use indeterminate

Out of the total of 4,634 analyzed pieces, 1,974 (42.6%) showed clear, observable signs of use-wear. The rate of use was steady in the three separate samples analyzed, with only a minor decline (-2%) in the 1953 collection. This proportion of used pieces at Pavlov I (42-44%) was higher than that of an analyzed sample from the Dolní Věstonice II -western slope site, where only 2.47% of the collection showed any traces of wear (Tomášková 1991). One plausible interpretation of the difference between the two sites is that Pavlov represents a longer and/or more permanent occupation, or series of occupations, than Dolní Věstonice II -western slope. This claim is supported by the wealth of Pavlov I lithic accumulation (39,144

pcs), as well as the large number of associated artifacts and eleven possible hearths present at the site.

Shortage of raw material did not seem to have been a problem at Pavlov I, as a large number of lithics (57.4%) showed no sign of use, only a very small number of the used pieces were worn out, and the intensity of wear was largely moderate with only a few cases of heavy use. This pattern is very similar to that observed at Dolní Věstonice II - western slope. On the other hand, a larger number of formal tools at Dolní Věstonice II (57.1%) than at Pavlov I (1952-53) showed signs of heavy use, possibly a consequence of a shorter duration of occupation at Dolní Věstonice II, when an additional labor invested in more tools was not desired, and/or of a lower number of occupants at Dolní Věstonice II.

5.4. Spatial analysis

Detailed spatial analysis was possible in the case of the 1953 collection, as this excavation was carried out in a systematic fashion using a 1 meter grid, and each analyzed piece thus had a known location within the site. Judging from the excavation plans, some squares did not contain any artifacts, e.g. row 11/VIII-XVI, row 0/VIII-XVI, rows XIII-XVI/12-16 (Klíma 1955). Dr. B. Klíma, when selecting lithics from the total recovered material (39,144 pcs.) that were subsequently catalogued and numbered, did not include some squares in this process, e.g. 5/III-V; 11/III-IV; II/12-13. In order to reduce this bias, for the spatial analysis I used the general lithic distribution map, where all recovered lithic pieces were recorded (Fig. 2). Density of stone artifacts in individual squares was evaluated in comparison with the density of lithic pieces at the site as a whole. In the 272 square meter area with 39,144 recovered lithic pieces, the average density per square was 167.28 stone artifacts.

The 1952 collection and the debitage chosen from the 1953 collection could not be included in the spatial analysis as the location of individual stones was not known. These were only used as control studies for the general raw material economy.

The analysis presented here starts with row 0, next to the 1952 excavation, and moves with ascending row numbers to row 16, from right to left on the site map (see general site map). The hearths were numbered from 1 to 11 (Fig.1), in rows 0 to 16: 1(0/II-III), 2(2/I-II), 3(5/IX-X), 4(6-7/IX-X), 5(7/VIII), 6(7-8/V-VI), 7(7-8/III-IV), 8(8-9/II), 9(9/III), 10(13/V-VI), 11(14-15/II). Contemporaneity between recovered features is neither excluded nor assumed, due to the complexity of each individual site segment. Activities were then interpreted in terms of their proposed relationships to each hearth and its vicinity. An attempt was made to suggest the possibility of structures sheltering the hearths, as well as potential interpretations of their orientation and relationship to other possible structures at the site. A plausible need of protection from eastern winds was taken into account when considering the possibility of structures surrounding the hearths. I assumed that a wall of a structure would result in an accumulation of material against it, while the space behind the wall would have a much lower density of artifacts. Open space in the vicinity of a hearth, relatively free of artifact accumulation, was suggested as a possible entrance to a shelter. Distribution of other associated materials, and faunal remains was used as an additional supporting evidence.

5.5. Hearths 1 and 2

Rows 0-4 of the site were adjacent to the 1952 excavation and contained two hearths in the northern corner (1:0/II-III, 2:2/I). These were about 1.5m apart, and were only partly excavated in the 1953 season. Two separate cultural layers were identified but their relationship has never been specified. For this reason, they present a problem in the interpretation of the two features. The larger hearth 1, centered in 0/II-III, was surrounded by a high concentration of lithics (average lithic density per square = 331.25), while the smaller one, centered in 2/I, was not (average lithic density per square = 85.75) (see Tab.12). The higher proportion of used artefacts runs in a semicircle on the southern side of the two features in an East-West direction (4/I-III, 3/III, 2/IV, 1/IV, 0/III) (see Tab. 13). Since the available information pertains only to a portion of the possible larger feature of which the two hearths could have been a part, it is difficult to determine whether the higher concentration corresponds to a wall of a structure against which these may have accumulated.

Tab. 12. General lithic distribution

highlighted areas with high lithic density

4	3	2	1	0	row
72	65	76	75	**160**	I
210	82	120	**155**	**450**	II
85	110	83	**200**	**520**	III
48	94	119	**173**	**160**	IV
25	44	43	77	53	V

Hearth 1: 0/II-III, hearth 2: 2/I-II

Tab. 13. Lithics with use-wear traces

highlighted areas with high use-wear numbers

4	3	2	1	0	row
11	3	2	3	6	I
15	8	10	0	x	II
14	**17**	0	1	**25**	III
0	1	**16**	**15**	1	IV
x	1	4	3	2	V

From microwear traces it would appear that the lithics nearest to the larger hearth 1 were used on soft materials, while further away from it harder materials were processed. Faunal remains including reindeer, rabbit, and a polar fox were accumulated in two places to the south and the north of this segment of the site. Since the available data relates only to the southern and western edges of the feature, complicated by the two cultural layers, I refrain from suggesting the existence of any possible structure, or its orientation.

The middle section of the site, area between rows 4 and 11, was the most complicated, with 7 possible hearths (see Fig. 2). These provide grounds for a number of interpretations, depending on assumptions about contemporaneity, and relationships between the features.

5.6. Hearths 3 and 4

Hearths 3 and 4 were located in the lower part of the site and centered in 5/IX-X and 6-7/IX-X, about 1m apart. They were surrounded by a high concentration of lithics, running in a semicircle from the NW to the NE (average lithic density per square at hearth 3 = 238.5; at hearth 4 = 200.5 pieces), with significantly lower numbers to the north (average lithic density per square = 65.75 and 87.5 respectively), and south (average lithic density per square = 66.25) of the possible feature (see Tab. 14). Animal remains, primarily wolf and fox, were on the other hand heavily concentrated in two places, to the north and the south of the hearths (chapter VI). Fire damaged stone artifacts were scattered throughout the southern part of this area (rows 6-10/IX-XII). Lithics showing evidence of use were concentrated in an area of about 1.5 m to the north of both hearths.

Tab. 14. General lithic distribution

highlighted areas with high lithic density

8	7	6	5	4	row
235	142	90	95	33	VII
220	150	40	125	10	VIII
270	**210**	**230**	**250**	**300**	IX
150	190	**172**	**270**	134	X
120	85	**255**	**870**	90	XI

Hearth 3: 5/IX-X, hearth 4: 6-7/IX-X

Tab. 15. Lithics with use-wear traces

highlighted areas with high use-wear numbers

8	7	6	5	4	row
6	3	5	2	7	VII
23	5	4	**16**	1	VIII
10	**15**	**18**	5	2	IX
8	**12**	**8**	2	0	X
2	3	**12**	**16**	2	XI

The interpretation depends on assumptions related to the division of space, and to past attitudes toward refuse; whether it was discarded outside a shelter or inside. One possible scenario is a structure sheltering the hearths from the north, and open to the south, where refuse would be discarded. The larger concentration of animal bones and particularly the scatter of burnt stone tools (10 pieces) in the southern area could support this hypothesis, presuming that burnt items would be carried out of a shelter rather than into its inner space. The higher concentration of lithics in the northern area could represent an accumulation against a wall of a shelter, as the area immediately behind had a distinctly lower density of stone artifacts (average lithic density per square = 61.42).

The artifacts nearest to the hearths were used on soft materials (plants, fresh hide scraping), and fresh tougher materials (bone, meat). There appears to be some internal division of activities between the two hearths. The right one (hearth 3:5/IX-X) was surrounded by lithics displaying indications of soft material processing, while the left one (hearth 4:6-7/IX-X) had a slightly higher number of pieces used on fresh

tough materials. Harder materials and wood appear to have been worked in the southern area, corresponding to the front of a possible structure.

5.7. Hearths 5 and 6

The middle section of the site, area between rows 6 - 10, and VI - VII, contained two separate cultural layers, with two hearths on either side of the area - 5: 7/VIII and 6: 7-8/V-VI. This opens a number of possibilities as to the contemporaneity and relationship between the two features, as well as to the surrounding features. One possibility is that each was a separate, singular occupation event. In such a case, determination of the relationship of the lithics to each hearth would be impossible.

Hearth 5, only about 1m away to the west of the above discussed features, may have been related to them. It was separated by a soil depression which may have moved, moving it closer to the other features. The hearth borders on the area in which two separate cultural layers were excavated, and could have been a part of either - the upper or the lower layer, as this was not clearly indicated in the excavation plans. Considering that the high density of lithics runs between the two hearths (3,4) and the third one (5), I would be inclined to interpret them as separate features, not excluding the possibility of contemporaneity.

Hearth 5 was surrounded by a high concentration of lithics from the south (average lithic density per square = 245), and a more open space to the north (average lithic density per square = 87.5) (see Tab. 16). Stone tools that showed any traces of use-wear correspond to this distribution as well (see Tab. 17). The wear traces provided a picture of mixed activities around the hearth, with a higher concentration of soft material processing on the northern side. A high concentration of wolf remains, mixed with some reindeer was on the southern side of the feature,and burnt lithic pieces were scattered on the northern side. Thus if this hearth were a self-contained unit conforming to the scenario outlined for hearths 3 and 4, I would suggest a shelter wall from the southern side, open to the north.

Tab. 16. General lithic distribution

highlighted areas with high lithic density

10	9	8	7	6	5	row
570	**270**	**220**	**254**	113	45	V
315	**250**	**445**	130	**240**	94	VI
125	**320**	**235**	142	90	95	VII
120	**260**	**220**	150	40	125	VIII
260	**230**	**270**	**210**	**230**	**250**	IX

Hearth 5 : 7/VIII, hearth 6: 7-8/V-VI

Tab. 17. Lithics with use-wear traces

highlighted areas with high use-wear numbers

10	9	8	7	6	5	row
15	8	**14**	3	**11**	x	V
22	**18**	**25**	9	**26**	7	VI
3	**25**	6	3	5	2	VII
5	**15**	**23**	5	4	**16**	VIII
4	**16**	10	**15**	**18**	5	IX

If relationships between this hearth and the other uncovered features are allowed, a number of interpretation become possible. Hearth 5 could have been related to hearths 1 and 2 in the northern corner of the site, facing them, and separated from them by about 7m of open space with lithic scatters and faunal remains. This interpretation is the least supportable, mainly due to the incomplete information about hearths 1 and 2. In addition the situation is complicated by the presence of the two separate cultural layers with unspecified relationship in both areas.

Another possible relationship could be suggested between hearth 5 and hearth 6, situated about 1.5-2m to the west. If these were both a part of the same cultural layer, then they were surrounded by a dense concentration of lithics in a semicircle, running in a North-South direction, west of the two features (average lithic density per square = 312.5) (see Tab. 16). This semicircle is also the location of the highest concentration of used stone tools. Each hearth had the highest concentration of used tools right next to it on the southern and southwestern side. The next highest concentration of used artifacts appears in the area slightly away from the hearths in the space between them. The space to the south and the southwest, in addition to displaying a high lithic concentration, also contained a high concentration of animal bones, particularly wolf, rabbit, polar fox, and some reindeer. The area to the north of the two features had a much lower concentration of artifacts, used and unused, (average lithic density per square = 129.75) but a higher proportion of burnt pieces (7 pieces).

If the burnt stone tools were related to these two features, then two possible structure orientations could be suggested. One interpretation would assume that the hearths formed one line in a structure facing north, with the heaviest accumulation of artifacts in the back of the shelter behind the hearths. Another structure option would be along an eastern orientation, with the wall of the structure in the northwestern region. This would place one hearth in the back of the structure and one in the front, while most activities would have taken place along the southern wall. This interpretation would have an additional support in the semicircular depression recorded in the excavation plans, that has the West-East orientation, and could have been part of the structure. This was also the direction in which the river valley lay; thus the northeastern orientation of the opening would offer a view of it. The structure would have been at least 5m wide and 4m long and appears to have been larger than the other structures here suggested.

The use-wear study showed some differentiation in activities around the two hearths. A high proportion of hard materials appear to have been processed in the area around hearth 6, while hearth 5 could have been an area with mixed activities. Pending further analysis, a suggestion could be made for a more permanent settlement with seasonal activities taking place over a year at different times at the two hearths. Then the difference in worked materials would not necessarily be interpreted as a division of labor, but rather represent differentiation of seasonal activities.

5.8. Hearths 7, 8,9

These three features, approximately 2m to the west of the above discussed hearth 6, form a triangular configuration. Hearth 9 was the largest, about 1.5m in diameter, while the other two smaller hearths were about the same size - 1m in

diameter. As with the above discussed features, the contemporaneity of these features can be either assumed or excluded, with alternate interpretations following from this premise.

The area had a large concentration of lithics along the southwest at hearths 8 and 9 (average lithic density per square = 303), and southeast at hearth 7 (average lithic density per square = 250) This concentration forms a semicircle with a significantly lower count of lithics to the north and northeast (average lithic density per square = 147.6) (see Tab. 18). A higher density of used stone tools appears around hearths 8 and 9, but a much lower density around hearth 7 (see Tab. 19). This corresponds with the lower concentration of faunal remains in this area relative to the other parts of the site. Reindeer, wolf, and a few horse and mammoth bones were found accumulated around, and in, hearths 8 and 9. Hearth 7, on the other hand, was not associated with any bones (Chapter VI). In addition, the area around hearths 7, 8 and 9 had a lower number of burnt lithics than the previously discussed spatial arrangements.

Tab. 18. General lithic distribution

highlighted areas with high lithic density

10	9	8	7	6	5	row
235	220	410	154	144	116	I
165	180	182	145	195	105	II
360	80	270	170	122	262	III
320	256	80	140	160	59	IV
570	270	220	254	113	45	V

Tab. 19. Lithics with use-wear traces

highlighted areas with high use-wear numbers

10	9	8	7	6	5	row
11	17	24	14	12	6	I
7	9	8	1	9	5	II
8	15	3	4	1	x	III
20	7	5	9	x	x	IV
15	8	14	3	11	x	V

Hearth 7: 7-8/III-IV, hearth 8: 8-9/II, hearth 9: 9/III

Hearth no. 7 was surrounded by tools that showed traces of soft material processing, and wood working. The two western hearths, 8 and 9, on the other hand, had an evenly balanced mix of scattered stone tools that seemed to have been used in varied activities: bone and meat processing, woodworking, and hard, coarse material working. This distribution could be interpreted in several ways. If the three features were contemporaneous, then a spatial division of labor in the areas surrounding the hearths might be suggested. The two western hearths would have been used for similar activities, while the area to the east was used almost exclusively for processing soft material - possibly plants and/or fresh hide.

Another possibility would be a seasonal occupation, where the different activities could be interpreted in terms of seasonality. In such a scenario the two hearths (8 and 9) could have been used at one time for similar activities, and the smaller hearth 7 during another season, likely a warmer time when only fresh material

was processed. If the hearths were surrounded by any shelter, based on the lithic distribution I would suggest a similar orientation as in the previous case (hearths 5 and 6): a structure from the northwest to the south, with open eastern or northeastern side.

5.9. Hearths 10 and 11

These two features were located in the western corner of the site, about 3m apart. Each was surrounded by a dense lithic concentration that ran from the northwest to the northeast (average lithic density per square at hearth 10 = 325 and at hearth 11 = 710) (see Tab. 20). The greatest number of stone artifacts having traces of use was located in the space between the two hearths, on the northern side (see Tab. 21). Hearth 11, on the western edge, was also surrounded by a large number of used lithics. This corresponds with the heavy distribution of animal bones in this part of the site. A high concentration of reindeer, wolf, polar fox, and rabbit remains was found in and around this feature, and, to a lesser degree, around hearth 10 as well.

Use-wear study suggests some differences in activities near the two features. While stone tools around hearth 11 appear to have been used primarily for soft material processing, and to a lesser degree for fresh tough materials, while those found around hearth 10 were used on a variety of materials. A few burnt lithic pieces (5) were found in the space between the two features, on the southern side.

Tab. 20. General lithic distribution

highlighted areas with high lithic density

16	15	14	13	12	row
140	**270**	**170**	**720**	**240**	I
450	160	**1450**	**190**	**360**	II
180	**200**	**300**	**170**	**460**	III
140	110	137	**250**	**290**	IV
90	110	**200**	156	**380**	V
210	80	130	**235**	**270**	VI
170	150	100	130	**265**	VII
500	60	61	85	**175**	VIII

Hearth 10: 13/V-VI, hearth 11: 14-15/II

Tab. 21. Lithics with use-wear traces

highlighted areas with high use-wear numbers

16	15	14	13	12	row
8	5	10	**18**	**12**	I
26	7	**30**	x	x	II
14	6	**14**	**30**	**18**	III
7	19	**14**	**14**	**23**	IV
8	8	8	10	6	V
4	10	8	**12**	**14**	VI
9	**16**	**11**	10	6	VII
10	3	9	2	3	VIII

As in the previously discussed cases, several scenarios are plausible. The two features could each represent a singular occupational event with no relationship Table between them. Hearth 11 was surrounded by the highest concentration of lithics in

22. Numbers of analyzed artifacts in the individual squares.

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
I	13	17	18	35	36	16	29	27	60	23	27	23	32	11	13	19	15
II	45	12	67	x	x	21	17	22	20	9	30	17	33	11	15	5	x
III	23	17	32	65	38	x	50	40	30	16	5	x	31	23	4	5	75
IV	14	47	28	34	60	x	52	30	23	23	x	x	3	3	31	19	3
V	14	22	20	31	34	24	62	29	33	16	36	x	x	4	6	6	4
VI	5	24	24	35	35	10	45	39	68	19	63	14	15	7	1	7	7
VII	9	44	29	17	30	9	9	34	32	24	9	8	28	6	3	4	6
VIII	22	6	18	11	8	x	15	23	36	10	6	30	2	x	5	3	x
IX	10	x	13	22	12	x	21	27	38	23	32	20	15	18	x	x	x
X	x	39	14	21	16	x	12	1	23	26	15	15	2	14	7	x	x
XI	32	10	18	31	21	x	11	15	8	7	15	41	9	x	38	45	x
XII	11	7	10	10	19	x	21	13	3	x	13	31	21	9	5	6	x
XIII	x	x	x	x	x	x	3	7	10	2	x	33	5	5	8	26	x
XIV	x	x	x	x	x	x	6	10	7	2	14	17	3	29	7	13	x
XV	x	x	x	x	x	x	1	6	5	2	10	9	4	10	3	14	x
XVI	x	x	x	x	x	x	2	4	1	3	3	11	7	6	15	3	x

the whole site, with its northern side displaying the greatest density of all (in square 14/II alone 1450 lithic pieces were recovered, and in square 13/I 720 pieces). However, the 1953 excavation ended only 1m away from the hearth in this direction, which constrains interpretive possibilities.

The animal bones had a differential distribution by species. Reindeer bones were evenly scattered around, while wolf remains were concentrated in the northeast, and rabbit remains in the east and the southeast. Each accumulation could have been a result of a separate occupational event, with the feature repeatedly used over time. On the basis of the even lithic and faunal distribution in a 2m circle around the hearth, and the lack of a concentration of burnt stone tools in any one direction, I would suggest that the feature could have been used without any structure around it.

Hearth 10, a smaller one than the above, was associated with a dense lithic scatter right next to it, particularly on its western and the eastern sides. The accumulation was evenly distributed further away from the feature, in a circle about 1 m away from it. Again this feature could have been a result of separate occupational events. On the other hand, in contrast to the nearest hearth (11), the stone tools showed traces of all materials processed in a balanced ratio. Therefore if any relationship existed between the two, a division of activities or seasonal occupations could be proposed. If the two were used contemporaneously, the evidence available at the moment does not suggest a presence of a structure.

Tab. 23. Numbers of artifacts with traces of use-wear in the individual squares.

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
I	8	5	10	18	12	2	11	17	24	14	12	6	11	3	2	3	6
II	26	7	30	x	x	5	7	9	8	1	9	5	15	8	10	0	x
III	4	6	14	30	18	x	8	15	3	4	1	x	14	17	0	1	25
IV	7	19	14	14	23	x	20	7	5	9	x	x	0	1	16	15	1
V	8	8	8	10	6	4	15	8	14	3	11	x	x	1	4	3	2
VI	4	10	8	12	14	1	22	18	25	9	26	7	6	1	0	3	2
VII	9	16	11	10	6	3	3	25	6	3	5	2	7	2	1	2	4
VIII	10	3	9	2	3	x	5	15	23	5	4	16	1	x	4	3	x
IX	7	x	6	6	7	x	4	16	10	15	18	5	2	7	x	x	x
X	x	17	12	8	7	x	2	0	8	12	8	2	0	6	5	x	x
XI	15	6	7	10	8	x	6	12	2	3	12	16	2	x	13	24	x
XII	6	0	4	5	1	x	11	3	0	x	7	8	14	6	1	3	x
XIII	x	x	x	x	x	x	0	3	2	1	x	9	3	2	2	4	x
XIV	x	x	x	x	x	x	1	3	4	0	7	3	1	10	1	3	x
XV	x	x	x	x	x	x	0	1	0	0	2	0	2	1	1	3	x
XVI	x	x	x	x	x	x	0	0	0	0	0	0	2	1	0	0	x

5.10. Conclusion

The distribution of artifacts that showed traces of wear seem to correspond with the lithic distribution map. The heaviest concentration of stone artifacts, used as well as unused, appears to have been in the vicinity of the hearths. All of the features could be interpreted on the basis of the microwear study as intensively or repeatedly occupied.

Differences between the hearths may be observed in terms of the spatial location of the activities in which the stone artifacts could have been used. In case of hearths 1 and 2, both used and unused lithics were found scattered in a semicircle on the southern side. Hearths 3, 4, 5, and 6 were recorded as surrounded by lithics from most sides, yet lithics that showed any traces of use-wear appear to have been concentrated on the southern and eastern sides of the hearths. The three hearths 7, 8, and 9 which could be suggested as a part of one feature were surrounded by a high concentration of stone artifacts. The pieces that were observed as having traces of use were located in this case to the west an south of the possible feature. Hearths 10 and 11, with the highest density of lithics, seem to have been surrounded by activities, as artifacts that showed traces of use appear to have been found in all directions, with the eastern side dominating (see Tab. 21). If the high density of stone artifacts and faunal remains could be interpreted as one of several possible indicators of long-term or repeated occupation, then the spatial concentration of artifacts with clear signs of use at the hearths could be proposed as an additional line of support that would strengthen

the claim. Repeated activities at a side of a hearth would not be inconsistent with the evidence that this study has shown.

Some differences between the features might be suggested in terms of the processed materials for which the stone tools could have been used. Overall, on the basis of the use-wear study, it may be proposed that a variety of activities could have occured at the site as a whole. Hard, possibly dry, frozen, as well as soft, fresh, and tough materials could have been processed here. Yet, it appears that the area around hearths 10 and 11 served more for soft and fresh material working. The evidence gathered from the material located near the other hearths seems to show a balanced mix of activities associated with them. This would further support the suggestion of possible structures protecting some of the hearths that could have been occupied at times when frozen, or dry materials had to be worked. On the other hand, hearths 10 and 11 could possibly have been frequented at warmer times when no structure was needed or desired.

Preliminary lithic analysis of the large and complex site Pavlov I, excavated in two seasons 1952 and 1953,can support a view of a settlement where multiple activities occured over time. From the above discussed evidence, I would propose an occupation that would not be inconsistent with the presence of a structure, and possibly as many as four at one time with several working hearths.

6. Spatial distribution and typology

Jiri Svoboda

This study deals with a segment of the area - the 1953 excavations (with reference to the 1952 excavations) located in the SE part of the site. Spatial analysis of such an area may be based on the location of hearths (Binford 1983, Stapert 1990), artifact density maps and refittings (Cziesla 1990), or outlines of features (Klíma 1955).

B.Klíma (1955) based his spatial description on the location of hearths, depressions, and alignments of larger objects. He suggested one sheltered feature in the 1952 area, and two in the 1953 area. S.Tomášková (this volume) based herself of the network of 11 hearths in the 1953 area and grouped them in four clusters.

Our analysis is based on the square meter grid artifact density maps (Figs. 2-4). These maps show a diagonally located, oval accumulation, extending downslope, from the west to the east of the 1953 area, and following the northern margins of the central feature distinguished by B.Klíma (hearths 3 to 6 by S.Tomášková). The areas of the highest density (peaks) are concentrated especially to the west and, less markedly, to the south of the feature , where its outline is not clearly visible. The artifacts disappear to the north where the outline of the feature is sharp. This observation accords with the margin of a depression recorded here during the excavation.

A separate concentration, in the northern corner of the excavation, is connected with feature 1 of the 1952 area (hearth 1).

The spatial division of the 1953 excavation area (Fig.1) takes location of the central feature as its starting point. The artifact cluster related to this feature corresponds to our sectors 1 (hearths 5, 6, 7, and 9) and 2 (hearths 3 and 4). The outlying area surrounding the feature was divided into 6 further sectors, covering around 30 square meters each (the smallest is sector 8 at 15 square meters, the largest

is sector 7 at 39 square meters). In creating the boundaries between sectors an effort was made to keep visible patterns of lithic concentrations in respective sectors (cf. Figs. 2 and 4). Sector 3 includes the hearths 10-11, sector 7 the hearths 1-2, and sector 8 the hearth 8.

The adjacent 1952 excavation area was considered separately (see Svoboda 1994), since the artifact location according to squares was not recorded. Finally, there is an assemblage from the upper layer that was superimposed over the main horizon in the northern part of the 1953 excavation, which is also not included in the sectors (Fig.5).

Densities of endscrapers (Fig.6) and burins (Fig.7) correspond roughly to the general artifact density map. Both categories have peaks in sectors 1,2, and 3 but they are not located in identical places. The concentration of endscrapers in these three places is sharper while burins show a more regular distribution throughout the area. In both categories, however, the concentration in sector 3 is the highest.

Density of backed implements (Fig.8) forms an accumulation more axial in shape, extended from the west to the east, with three marked peaks in sectors 1, 2, and 3. Location of the peaks within the sectors differs from that of endscrapers and burins. Distinctive point-types and microliths are concentrated in sector 3 followed by sector 1.

The discussion of the depositional history should take into account possible effects of natural processes. The final artifact distribution is probably affected by slope movements as can be observed from the downslope orientation of the artifact clusters presented in the general distribution map. This tendency is even more obvious on the backed implements map (Fig.8) since the light microliths seem more mobile. This pattern may have influenced the differential picture of the distribution of backed microliths and its suggested interpretations (retooling areas near the hearths, Cziesla 1990, p.82 with ref.).

The density maps do not prove that the central feature would be a homogenous unit. Rather, the western part of the feature (sector 1) is connected with the outside concentration in sector 3 in a single activity area with six hearths, a number of small holes, and two fragments of mammoth skulls. The eastern part (sector 2) of the feature has a smaller number of artifacts which, except for the burins, are concentrated at the eastern margin.

6.1. Typological comparison of individual sectors

As shown in Fig. 10, the representation of the endscrapers is relatively standard in all compared assemblages, with the mean value around 9% (8.9%). The two exceptions are sector 8 with scarcer representation (3.9%), and the upper level (1953) with higher representation (14.3%) of the endscrapers. The proportion of burins is comparable as well and the mean value lies around 30% (30.8%). A higher share is noted in sector 8 (39%) and in the upper level (41.7%), a smaller share is in sector 6 (24.4%) and in the 1952 excavation (24.1%). A similarity in the inner typological compositions of the endscraper and burin groups is observed.

Backed artifacts, on the other hand, vary to a high degree in proportions: sector 2 and the 1952 excavation show extremely high frequencies (42.6% and 39.4% respectively) while sector 8 and the upper layer are extremely low in frequency (10.4% and 7.1%). Generally a larger part of the backed implements (about 60%) is

composed of simple backed microblades; where this percentage decreases, we observe an inverse increase of retouched microblades.

The non-backed microliths constitute approximately 10% of the recovered material. A marked increase is observed in sectors 3 and 8 (19.8% and 19.5%), a decrease in sector 2 (4.3%). Each sector has a different percentage representation of various types of microliths.

The group covering all the other types reaches surprisingly standard percentages (17.0%) while its inner typological composition is variable in individual sectors. We observed an increase of retouched blades in sector 7 (42.9%), an increase of points in sectors 4, 7, 8 (20.8%, 17.9%, 17.6%), and decrease of notches and denticulates in sectors 6, 7, 8 (6.7%, 3.6%, 0%).

The group identified as combinations again conforms to standard percentages (3.0%), with inner structure always dominated by the combination endscraper/burin.

This comparison does not prove that the boundaries observed horizontally (the sectors 7 and partly 8, separated from the main artifact clusters) and vertically (the upper layer) would be reflected in typological differences.

6.2. Typological analysis

6.2.1. Endscrapers

More than 83% of endscrapers are made on raw blades and flakes (Fig. 19: 1, Fig. 22: 1-2, 5, 12, Fig. 25: 17, Fig. 26: 3, 11, 14, 17, 18, Fig. 30: 6, Fig. 36: 15, 17), rarely on retouched blades and flakes (5%) (Fig. 19: 2-3, Fig. 22: 6, 9, Fig. 26: 6, 9, 12, Fig. 33: 11, 13). Special shapes are thumb (2%) (Fig. 35: 2), nosed (3%) and thick (5%) endscrapers. The last two mentioned types (Fig. 19: 4-5, Fig. 22: 14, Fig. 25: 18-19, Fig. 26: 7, Fig. 33: 7) resemble "Aurignacoid" elements. Double endscrapers are very rare (Fig. 22: 10, Fig. 26: 1-2).

Tomášková shows that the working edges of endscrapers have continual traces of wear.

Tab. 24. Endscrapers

	Pavlov I										D.Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
blade endscraper	18	4	11	26	8	0	4	3	2	11	2	2	3	5
atyp. blade endscraper	12	3	3	5	4	1	3	6	0	8	1	1	0	0
flake endscraper	10	3	0	1	1	0	0	2	1	4	0	0	0	0
es. on retouched blade	2	2	0	3	0	0	2	0	0	0	0	0	0	0
unguiform	1	0	0	0	1	0	0	1	0	0	0	0	1	0
nosed	2	2	0	1	0	0	0	0	0	0	0	0	0	0
thick	3	1	2	3	0	0	1	0	0	0	0	0	0	0
double	0	1	0	2	0	0	0	0	0	1	0	1	0	0

key:
52 = excavations 1952, 1-8 = excavations 1953, sectors 1-8, up = excavations 1953, upper layer, 1-3 = settlement units 1-3, LP = settlement unit LP/1-4.

Tab. 25. Burins

	Pavlov I										D.Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
burin on broken blade	61	16	19	44	20	5	3	16	9	25	3	3	6	4
convexe truncation	8	1	5	4	2	0	3	0	0	2	0	0	1	1
concave truncation	9	14	2	19	3	0	1	6	5	6	4	3	1	0
straight truncation	14	8	2	21	5	0	3	4	1	6	0	0	1	0
truncated double	1	0	0	0	2	0	0	1	0	0	0	1	2	0
dihedral symetrical	13	7	2	9	2	2	3	3	3	7	1	0	2	3
dihedral asymetrical	16	8	5	19	9	2	2	6	3	7	1	1	3	0
dihedral double	2	0	0	0	1	0	1	0	1	2	0	1	1	0
transverse	7	2	3	8	1	0	1	1	0	2	0	2	0	4
flat burin	2	2	3	5	2	1	0	2	0	3	0	0	0	0
burin on pointed blade	0	1	0	2	1	0	0	0	1	0	0	0	0	2
polyedric	1	3	3	2	1	0	0	1	2	1	0	0	2	0
combined	9	11	2	16	6	1	4	6	5	9	5	2	1	0

6.2.2. Burins

Burins at Pavlov I may be separated into three main groups in relatively balanced quantities: burins on broken blades (33%) (Fig. 20: 1, 7, 8, Fig. 25: 25, Fig. 27: 9, Fig. 30: 9-10, Fig. 32: 15), truncated burins (25%) and dihedral burins (21%). Truncations are straight (Fig. 23: 4, 7, Fig. 30: 1, 3, 4, Fig. 34: 10, 19, Fig.36: 21), and concave (Fig. 20: 4, Fig. 23: 2, 3, Fig. 27: 8, 13, 17, Fig. 33: 17, Fig. 36: 22), less frequently convex in shape (Fig. 23: 8, Fig. 25: 21, Fig. 27: 10, Fig. 30: 8, Fig. 33: 22). Dihedral burins are asymetrical (Fig. 20: 2, Fig. 25: 26, Fig. 27: 15, Fig. 32: 17, Fig. 36: 20), or less often symetrical (Fig. 20: 9, Fig. 25: 22, Fig. 27: 14, Fig. 30: 5, 14, 10, Fig. 32: 16, 18, Fig. 33: 21, 23, Fig.36: 23).

Other types, such as transverse burins (Fig. 20: 5, Fig. 25: 16), flat (Fig. 32: 3), and burins on pointed blade form about 8% of the total assemblage. Burins on pointed blade are site-specific types at Pavlov (Fig. 23: 9, Fig. 27: 7, Fig. 31: 24). The polyhedric burins (2%) could be considered morphologically as another "Aurignacoid" element but the scars lack the fine microlithic character typical for Aurignacian (Fig. 23: 5, Fig. 24: 24, 25, Fig. 34: 11). Burins of various types are frequently (11%) combined on the same artifact (Fig. 19: 9, Fig. 20: 3, Fig. 23: 1, 10, Fig. 27: 11, Fig. 30: 2, Fig. 32: 18-20, Fig.33: 16, Fig. 34: 3, 14).

6.2.3. Backed Implements

A typologically significant, even if rare (4%) type of backed tool is the La Gravette point. It is generally longer than 3 cm and broader than 0.7 cm, and the back is either curved or straight (Fig. 21: 15-20, Fig. 24: 13-16, Fig. 25: 1-4, Fig. 28: 39-41, Fig. 32: 8-10, Fig.36: 9).

The majority of the backed implements, however, is composed of microliths, no broader than 1 cm. Simple backed microblades represent about 65% of the backed tool assemblage (Fig. 21: 27, 33-34, Fig. 24: 9-10, Fig. 25: 8-12, Fig. 28: 45-47, Fig. 31: 8-9, Fig.36: 11). Some of them (17%) are marginally retouched from the dorsal

(Fig. 21: 29, Fig. 24: 17-18, Fig. 25: 14, Fig. 28: 44, 48, Fig. 31: 8-9, Fig.36: 11) or less frequently the ventral face (Fig. 21: 28, 32, Fig. 31: 11, Fig. 33: 10, Fig.35: 8).

The retouch, however, is not always continuous, but sometimes limited to the basal part of the blades (Fig. 21: 30, Fig. 24: 11, Fig. 36: 7). A number of the backed microblades are pointed, forming a more numerous (6%) but atypical, microlithic analogy to the La Gravette points (Fig.21: 21, 35, Fig. 25: 6, Fig. 28: 38, Fig. 33: 3).

Tab. 26. Backed Implements

	Pavlov I										D.Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
La Gravette point	6	4	4	3	0	3	0	0	0	1	0	0	1	0
backed blade	0	0	0	1	0	0	0	0	0	0	0	0	1	0
backed microblade	149	46	53	50	16	2	15	24	5	6	28	11	9	0
backed microblade ret.	22	9	4	8	6	0	3	3	2	3	0	0	0	0
backed microblade vent. ret.	14	3	2	7	3	1	1	2	0	1	0	0	0	0
backed microblade pointed	17	5	2	3	0	0	3	1	1	1	5	0	3	0
backed microblade truncated	3	0	1	0	0	0	0	1	0	0	0	0	0	0
microblade with gibbosity	5	1	1	2	1	0	2	0	0	0	0	0	1	0
backed microsaw	18	0	2	1	0	1	3	0	0	0	6	3	0	0
bilat. backed microblade	0	2	0	0	2	0	0	0	0	0	0	0	0	0

Further modifications of the backed microblades, represented by 8% in total, are truncations (Fig. 19: 11-12, Fig. 21: 31, Fig. 25: 7), a marked gibbosity at the lower part of the back (Fig. 21: 22-26, Fig. 25: 13, Fig. 31: 16), denticulation along the cutting edge (microsaws, Fig. 21: 38-42, Fig. 25: 5, Fig. 28: 31, Fig. 33: 5), and bilateral backing (Fig. 24: 12, Fig. 31: 12, 15). Backed blades broader than 1 cm are extremly rare at Pavlov (Fig. 28: 49).

As shown by Tomášková, the backed edges were usually used for hafting.

6.2.4. Non-backed Microliths

This is a very varied and stylistically significant group. The most typical and numerous shape at Pavlov I is the crescent (33% of the non-backed microliths). This geometrically standard shape is achieved by a continuous retouch along the margins or by partial retouch at the basal and distal parts (Fig. 21: 1-12, Fig. 24: 1-8, Fig. 28: 1-18, Fig. 31: 1, 5-7, 10, Fig. 33: 1-2, 8, Fig. 34: 1, 3-5, Fig.35: 7, 9). Crescents appear in all sectors in percentages ranging between 15-50%.

The second most numerous microlithic shape is the trapezoid (5%) made on microblades by opposed oblique truncation at the basal and distal edges (Fig. 25: 15, Fig. 28: 19-23, 29, Fig. 31: 4, Fig. 33: 4, Fig. 34: 2, Fig. 35: 10, Fig. 36: 1-2). They are more frequent in sectors 8 and 2, absent in sector 1, and in the upper layer.

The triangle microliths, representing 4% of the total assemblage, were obtained by oblique truncation at the base, usually completed by further retouch along the margins (Fig. 21: 14, Fig. 28: 24-28, Fig. 31: 2-3, Fig.36: 3-6). They are present in the upper layer of the site, and in sectors 3 and 4 but absent elsewhere.

The size of all recovered microliths is the same (1.5 - 3.3 cm in length and 0.5 - 0.9 cm in width). A fine marginal retouch is another common characteristic. Morphologically the three discussed shapes of microliths are clearly defined.

However the trapezoid and the triangle seem to be derived from the crescents as shown by several intermediary shapes.

Two types of hafting were basica lly used, with projecting either one complete extremity, or only the short convexe side. It seems that the way of hafting has been selected without regard to morphology of the microlith.

Another culturally significant group consists of the fine points of the Font-Yves or Krems type (4%) (Fig. 20: 10, Fig. 28: 33-34, 36-37, Fig. 34: 7), showing traces of both haft and use. Further types of non-backed microliths (28%) are represented by microblades with marginal retouch (Fig. 21: 13), truncation (Fig. 19: 10, Fig. 24: 20, 23, Fig. 34: 6), or with denticulation (Fig. 28: 32, Fig. 35: 11).

Tab. 27. Other Microliths

	Pavlov I										D.Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
microblade retouched	10	4	1	10	4	0	0	1	2	0	0	0	0	0
microblade truncated	4	4	0	18	3	0	0	5	2	4	0	2	1	0
shouldered mb. term.	8	1	0	5	0	0	1	2	1	0	1	1	1	0
shouldered mb. basal	19	3	3	7	4	1	4	2	2	5	3	1	1	0
shouldered point	0	0	1	1	1	0	0	1	0	0	1	0	0	0
Font Yves point	1	1	0	6	0	0	2	1	0	1	0	0	0	0
crescent	25	14	1	31	5	0	3	4	4	6	0	0	0	0
trapezoid	0	0	1	6	1	0	1	1	3	0	0	0	0	0
triangle	1	0	0	5	2	0	0	0	0	4	0	0	0	0
microdenticulate	4	0	0	1	0	0	0	0	1	0	0	0	0	0

Finally there are the shouldered artifacts (26%) most probably byproducts of the backed microblades production. It is important to note that we recovered the proximal parts of the shouldered blades (Fig. 21: 36-37, 43, 46-48, Fig. 25: 20, Fig. 28: 42-43, Fig. 31: 18, Fig. 33: 15, Fig. 36: 12) more frequently than the distal ones (Fig. 21: 44-45), and the pointed segments are the most rare (Fig. 28: 30, Fig. 31: 19). Some of the proximal ends resemble borers in morphology and were evidently used in this fashion. The pointed extremities, on the other hand, resemble the later shouldered Kostienki points (Fig. 34: 9).

6.2.5. Other Points

Two pointed shapes, non-backed and not microliths, seem to be morphologically important. One category is that of the simple pointed blade with marginal retouch on the dorsal face, representing a larger variety of the Krems points (Fig. 20: 12-13, Fig. 25: 23, Fig. 28: 35, Fig. 31: 21-22, Fig. 33: 14, Fig. 34: 12-13, Fig. 35: 13, Fig. 36: 8, 13). In addition there are pointed blades retouched ventrally (Fig. 20: 11, Fig. 24: 22, Fig. 29: 3, Fig. 31: 17, Fig. 34: 8). This type is rarely complete and usually only the ends with traces of hafting were recovered (Fig. 24: 26-27, Fig. 29: 1-2, 4, Fig. 31: 23, Fig. 35: 6, Fig. 36: 14) showing marginal or flat retouch.

In addition to the two categories described above, there is a simple basal (hafted) segment of an implement with flat retouch, most probably a leaf-point (Fig. 35: 12).

6.2.6. Retouched and Truncated Blades

Relatively few of the blades possess retouch, unilateral or bilateral (Fig. 25: 24, Fig. 29: 12). The observed retouch is simple and marginal. The thick and scalariform retouch is almost absent. Truncations on blade extremities are more frequently oblique and straight (Fig. 19: 13-14, Fig. 23: 6, Fig. 27: 1-3, Fig. 31: 25, Fig. 32: 5-6, 12-14) than concave or convexe.

6.2.7. Splittered Pieces and Chisels

This group is formed by pieces of approximately quadrangular or trapezoid shape with uni- or bilaterally splittered edges (Fig. 32: 4-7, Fig. 33: 16). Furthermore, there are chisels made on regular blades with one splittered extremity. Some of these are comparable to the Kostienki knives depending on the type of splittering (Fig. 22: 15-16, Fig. 25: 27, Fig. 29: 5, 6-9, 13, Fig. 34: 15, 18, Fig. 35: 15, Fig. 36: 19). They show traces of both haft and use.

6.2.8. Other Tools

Only notches (Fig. 29: 11) gain higher frequencies among the remaining tools while the other types (denticulates, Fig. 32: 1-2, Fig. 35: 5; becs, borers Fig. 27: 5-6, Fig. 31: 20, 26, Fig. 35: 4, Fig. 36: 10; raclettes) are rare. The rarity of sidescrapers is important (Fig. 22: 11).

Tab. 28. Other Tools

	Pavlov I										D.Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
ret. blade, unilat.	7	6	2	13	1	1	4	6	2	5	0	0	2	5
ret. blade, bilat.	6	3	5	11	2	0	0	6	0	2	0	0	1	3
pointed ret. blade	2	0	1	1	2	0	1	4	1	2	0	1	0	4
point, ventrally ret.	1	4	0	4	3	0	0	1	1	1	0	0	0	0
leaf-point	0	0	0	0	0	0	0	0	1	0	0	0	0	0
blade with conc. trunc.	3	1	0	2	1	0	0	0	0	1	0	0	1	0
blade with straight trunc.	0	2	0	3	0	2	2	2	1	0	0	0	1	0
blade with oblique trunc.	7	2	0	3	3	1	0	0	0	2	0	0	2	0
blade with convex trunc.	0	0	1	0	1	0	1	0	0	0	0	0	0	0
notch	13	6	5	16	3	3	1	0	0	5	0	2	6	0
denticulate	6	3	1	0	2	0	0	1	0	2	0	0	0	0
side-scraper	4	2	0	5	0	0	0	0	1	2	0	0	0	2
bec	4	0	2	4	0	0	1	1	1	2	0	0	1	2
borer	1	1	2	5	2	0	0	1	0	1	3	0	0	1
chisel	12	2	1	10	0	0	0	5	6	6	0	0	0	2
splittered piece	13	5	3	1	3	1	4	1	3	2	1	1	1	0
raclette	1	2	1	4	1	0	1	0	0	0	0	0	0	0
hammerstone	0	1	0	3	0	1	0	0	0	0	0	0	0	0

6.2.9. Combinations

Combination tools appear mostly on opposite ends of the artifacts. Sometimes, the opposite tool-type in fact is used for hafting. Endscrapers are usually combined with burins 52%) (Fig. 19: 7, 8, Fig. 22: 4, 8, Fig. 26: 4, 5, 15, 16, Fig. 30: 11-13, Fig. 32: 11, Fig. 36: 16,18) and splittered edges (8%) (Fig. 19: 6, Fig. 22: 13, Fig. 26: 13, Fig. 33: 12). Combinations of endscrapers with truncations (3%) (Fig. 22: 3, Fig. 26: 10) and denticulates (2%) (Fig. 30: 7) are rare. The same associations mentioned with endscrapers are observed in burins as well: 21% are combined with splittered edges (Fig. 20: 6, Fig. 22: 7, Fig. 24: 28), 3% with truncations (Fig. 23: 11, Fig. 27: 12, Fig. 35: 1), and 2% with denticulates. One burin is combined with a retouched pointed blade at the opposite end (Fig. 20: 14).

Tab. 29. Combinations

	Pavlov I										D. Věstonice II			
	52	1	2	3	4	5	6	7	8	up	1	2	3	LP
endscraper/burin	8	3	0	7	3	1	1	0	3	6	1	0	3	2
endscraper/splitt. edge	1	1	0	2	0	0	1	0	0	0	0	0	0	0
endscraper/truncation	0	1	0	1	0	0	0	0	0	0	0	0	0	0
endscraper/denticulate	0	0	0	0	1	0	0	0	0	0	0	0	0	0
burin/splitt edge	6	2	0	2	2	0	0	0	1	0	0	0	0	0
burin/denticulate	0	0	0	1	0	0	0	0	0	0	0	0	0	0
burin/truncation	1	1	0	2	0	0	0	2	0	3	0	0	0	0
burin/point	1	0	0	0	0	0	0	0	0	0	0	0	0	0

6.3. Comparisons

6.3.1. Lithic industry from Pavlov I, excavations 1952-1953

The analyzed samples of the 1952-1953 excavations at Pavlov do not represent the total richess of shapes and forms of the assemblage. Some typical shapes of points, and the typical ventroterminal retouche of microliths (Klíma 1957, fig. 77, Klíma 1959, fig. 144) are missing in these samples. Analysis of further parts of the site and comparisons with the 1952-1953 area are foreseen. The aim is to show how far such differences may have a chronological or other meaning.

B. Klíma (1963c) suggested that the settled area at Pavlov I may be separated in two, chronologically not contemporaneous, parts. With the results of the 1952-1953 area in hand, the main task of future studies is to analyse an area from the other part. Most suitable is the 1957 area, clearly differing by a higher share of radiolarite.

By the dominance (double or even a higher proportion) of burins over endscrapers, the analyzed samples correspond to other Gravettian assemblages of the Austrian-Moravian-Silesian territory. The percentage of microlithic backed implements and other microliths in the Pavlov I sample, on the other hand, reaches the highest values hitherto recorded. Some microliths, fairly standard in size and shape, are rare or absent elsewhere: the crescents, trapezoids, and triangles.

Another stylistic feature of the Pavlov I sample is a lack of lateral, steep or scalariform retouches along margins of the blades and flakes.

Points with ventroterminal retouches, recalling the Jerzmanowice type, are present throughout the assemblage, while the shouldered points of the Kostienki type,

in their typical form, are absent. All typological elements that could be called Aurignacoid are rare in the studied sample. The leaf-points are represented by a single, atypical implement.

Table 30. Change of typological indices, Pavlov I and Dolní Věstonice II

Unit	Pavlov I/52		Pavlov 53		DV II/1		DV II/2+3		DV II/LP
	n	%	n	%	n	%	n	%	n
Endscrapers	48	8.1	137	9.2	3	4.5	8	8.2	5
Burins	143	24.1	501	33.5	14	21.2	33	33.7	14
Backed implements	235	39.9	327	21.9	39	59.1	28	28.6	-
Other microliths	66	11.1	208	13.9	5	7.6	7	7.1	-
Retouched blades	13	2.2	69	4.6	-	-	3	3.1	8
Pointed blades	4	0.7	26	1.7	-	-	1	1.0	4
Side-scrapers	4	0.7	10	0.7	-	-	-	-	2
Total tools	593		1494		66		98		40

6.3.2. Willendorf II

At Willendorf II, a continuous loess deposit dated to 30.000 - 20.000 B.P., enabled excavators to separate five stratigraphic layers (5-9), stylistically assigned to the Gravettian. Lithic materials from Willendorf, stored at the Museum of Natural History in Vienna, and published by F. Felgenhauer (1959), were quantified in terms of typological relationships by A. Broglio and G. Laplace (1966), and by M.Otte (1981, 1991). Even though the statistical results of these authors are not identical, a basic evolutionary pattern emerges from their data (Tab. 31).

Table 31. Development of significant typological indices in the stratigraphy of Willendorf (in %), after Otte 1981.

Layer	5	6	7	8	9
Endscrapers	17.8	11.8	6.3	9.4	9.9
Burins	21.5	19.7	6.3	8.2	20.5
Backed implements	8.9	6.6	4.4	6.9	23.7
Other microliths	14.9	-	-	1.7	0.2
Retouched blades	10.4	25.0	21.5	24.5	15.5
Pointed blades	5.9	3.9	33.5	24.5	7.9
Side-scrapers	-	-	1.9	2.1	0.6

The numbers of endscrapers, burins and backed implements reach their maxima in the lower and upper parts of the sequence (layer 5 and 9). There is an increase of retouched blades in the middle part of the sequence, reaching maximum in layer 8, a very marked increase of pointed blades, with maximum in layer 7, and a smaller increase of sidescrapers in both these layers. Some of the retouch style is elaborate, including artifacts with steep retouch (see Felgenhauer 1959, figs. 33,35).

The typologically significant shouldered points of the Kostienki-type appear in the layer 9 and an even larger collection of them was collected in the nearby Willendorf I site. Such points, together with the famous female figurine of Willendorf II, have analogies in the Don valley.

On the basis of the data by Zirkl (1959, tab.1), and my own analysis it should be added that a parallel change occurs in the raw materials, with flint dominating at the base and top of the sequence (layer 5 and 9), and radiolarite in the middle (layers 6-8). With respect to both typology and raw materials, we suggest separation of the Willendorf sequence into three chronological units.

6.3.3. Dolní Věstonice I

Dolní Věstonice I is an extended and complex settlement accumulation (Absolon 1938, 1945, Klíma 1963b, 1981). It was separated into lower, middle, upper and uppermost parts by Klíma, who suggested on the basis of stratigraphy that the lower location is the earliest.

In order to obtain more C-14 dates for various parts of the site, a series of trenches along the site were excavated in 1990 (Svoboda 1991a, 14). The dates confirm the earlier age of the lower location (29.000 - 27.000 B.P.) compared to the other areas (about 25.000 B.P.).

A higher proportion of the Moravian cherts (16%) appeared in the lower location, while in the middle and upper locations the foreign materials (flint and radiolarite) almost totally dominate. Typologically the lower location differs by the presence of a few Aurignacoid tool types (2.5%).

Two assemblages from the middle location were quantified by A. Bohmers and published in the context of other data by B. Klíma (1981). B. Klíma (1963b) described in detail typology of two settlement units in the upper and uppermost locations, and the related mammoth bone deposit. Generally, burins retain a standard representation between 30-40%. The share of the endscrapers is lower (12-18%), and Aurignacoid types are absent. Backed microliths are relatively frequent (8-26 %), with microsaws (5-7 %) representing the site-specific form.

6.3.4. Dolní Věstonice II

Due to the intensive recent research, Dolní Věstonice II has the largest (and most variable) series of C-14 dates from the various locations and settlement units. In order to retain some consistency, we decided to evaluate the Groningen data only.

The earliest part of the site is the lower location (the bricketery), dated to 29.000 - 28.000 B.P. (Klíma et al. 1962). The industry of unit A (Klíma 1987b), higher on the northern slope, has the highest share of Moravian cherts and certain archaic features, e.g. Aurignacian endscrapers or sidescrapers. The nearby unit B has a standard Gravettian industry with burins, pointed blades and microblades. The industry of unit C is microlithic. Unit LP/1-4 (Svoboda 1990), still higher on the northern slope, differs by the absence of backed microliths, and by a higher proportion of retouched blades and pointed blades whose style resembles the middle part of the Willendorf sequence.

At the western slope of this site (Svoboda 1991a) the C-14 datings, spatial relationships and refittings (Škrdla, this volume) suggest that the settlement units 2 and 3 may be contemporaneous (c. 27.000 B.P.), and unit 1 slightly more recent (c.

25.500 B.P.) While the number of retouched tools is not always sufficient for quantitative presentation (Tab.30), the proportionate numbers nevertheless reflect typological similarity between units 2 and 3, both characterized by the dominance of burins and backed implements. In unit 1, the number and variability of backed implements, mostly microlithic, increased markedly.

6.3.5. Předmostí

At Předmostí, the Gravettian forms the most important, dense and extended occupation stage (Absolon-Klíma 1977, Klíma 1990a, Svoboda et al. in press). The two C-14 dates place it between 26.000 and 27.000 B.P. As is the case at Dolní Věstonice, the Předmostí site may be in fact a horizontal cluster of separate settlement units, extended over fairly large areas.

One of the characteristic typological patterns at Předmostí is the continual lateral, steep and even scalariform retouch along the edges of artifacts. This is observed on blades, pointed blades and sidescrapers (Absolon-Klíma 1977, tab. 8-10, 14, 18, 36, 41). Microliths are very rare, which may be the result of the absence of sediment floating during the earlier excavations. The retouch, together with a few Aurignacoid types, led various researchers to suspect an Aurignacian intrusion. On the basis of recent analyses, the "Předmostí style" may be compared to the middle part of the Willendorf sequence.

Furthermore, the Předmostí materials include at least one shouldered point (Valoch 1986, fig.1:25) and a series of less morphologically standard points. This culturally significant tool type correlates a part of this assemblage to the upper part of the Willendorf sequence (layer 9), Petřkovice, Spadzista, and sites in the Váh valley, all dated between 24.000 - 20.000 B.P. It is probable that some of the leaf-points of Předmostí, originally classified as a Szeletian element, date in fact to this Upper Gravettian period, which represents a new stage of their production.

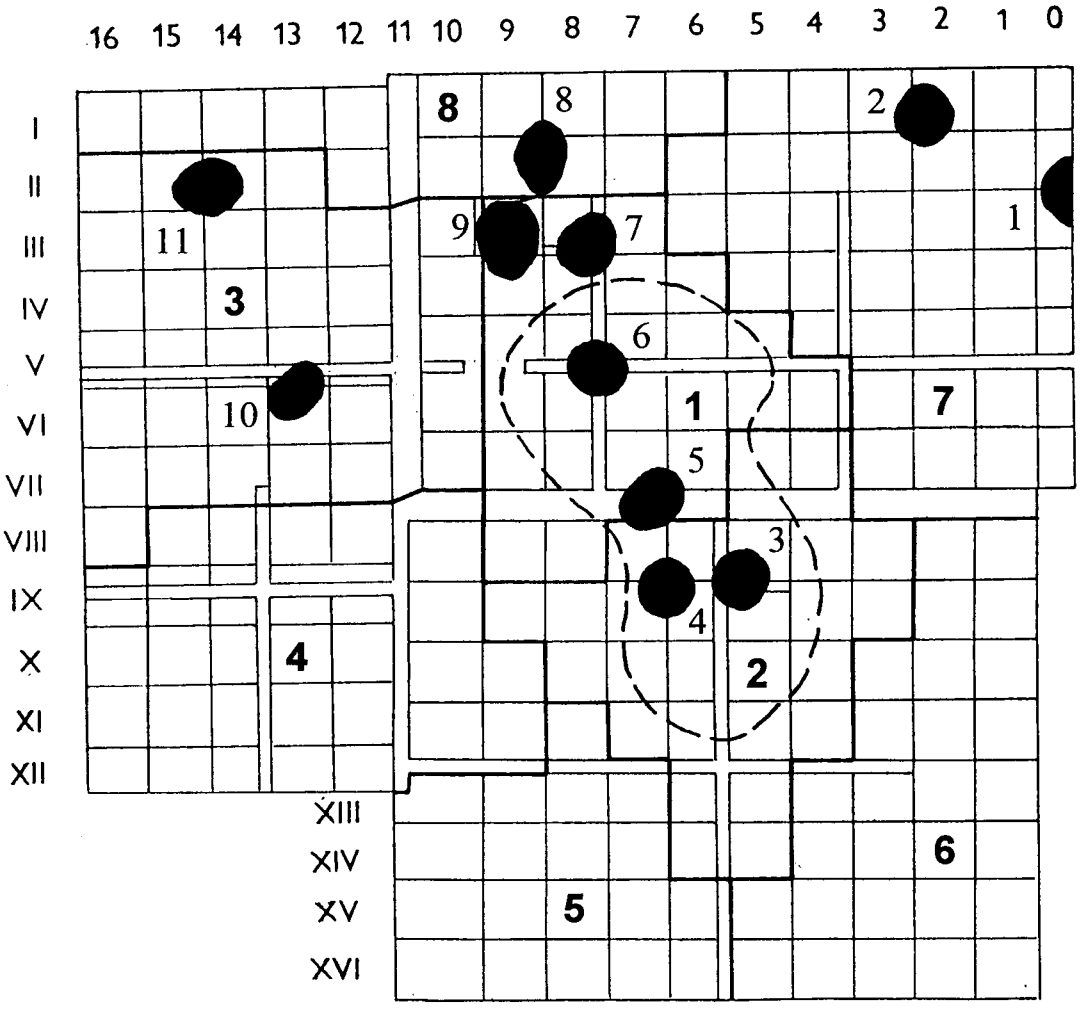


Fig.1. Excavation plan of the 1953 area showing division into the sectors (1-8) and numeration of the hearths (1-11)

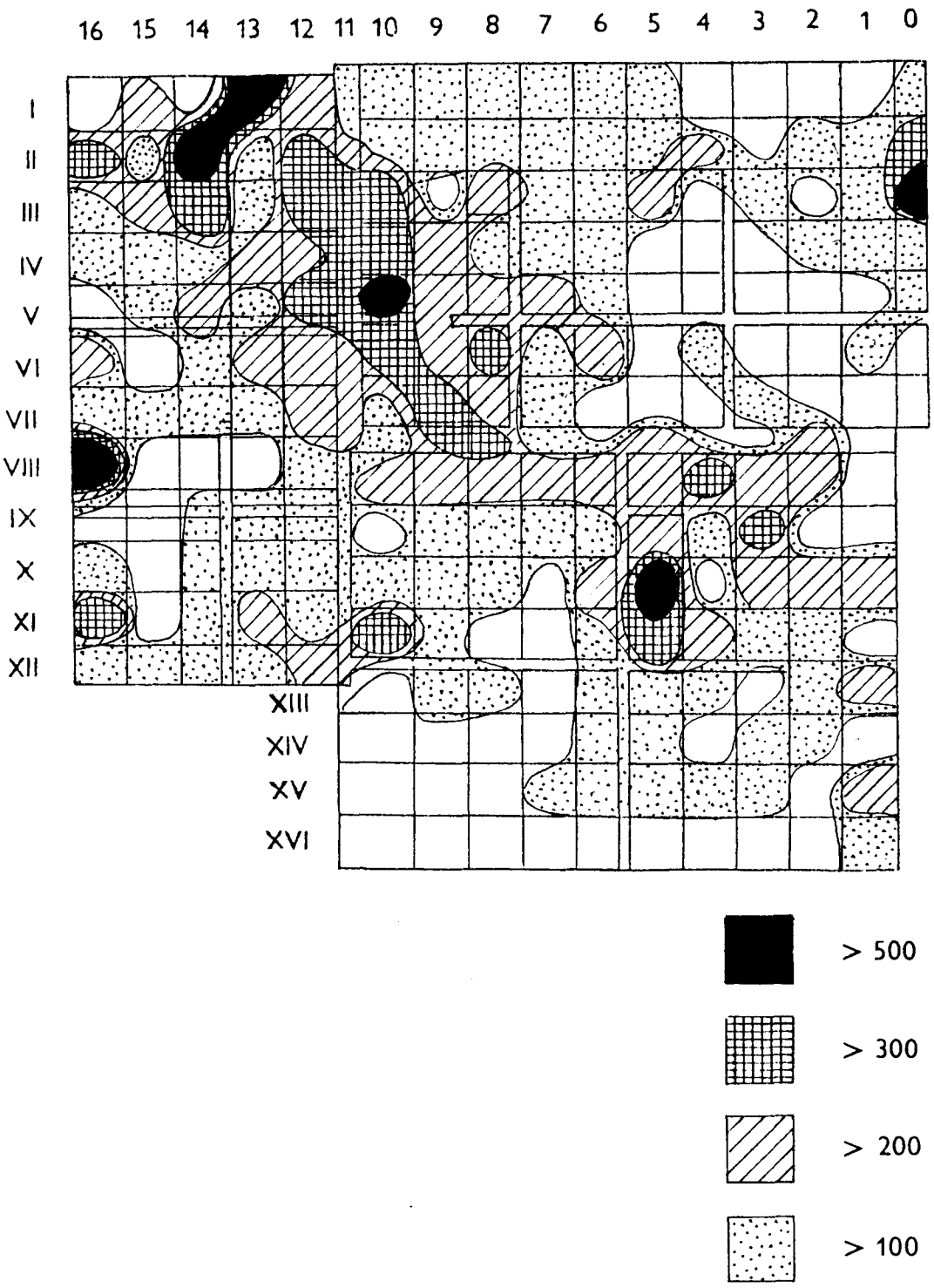


Fig.2. Total density map of siliceous artifacts

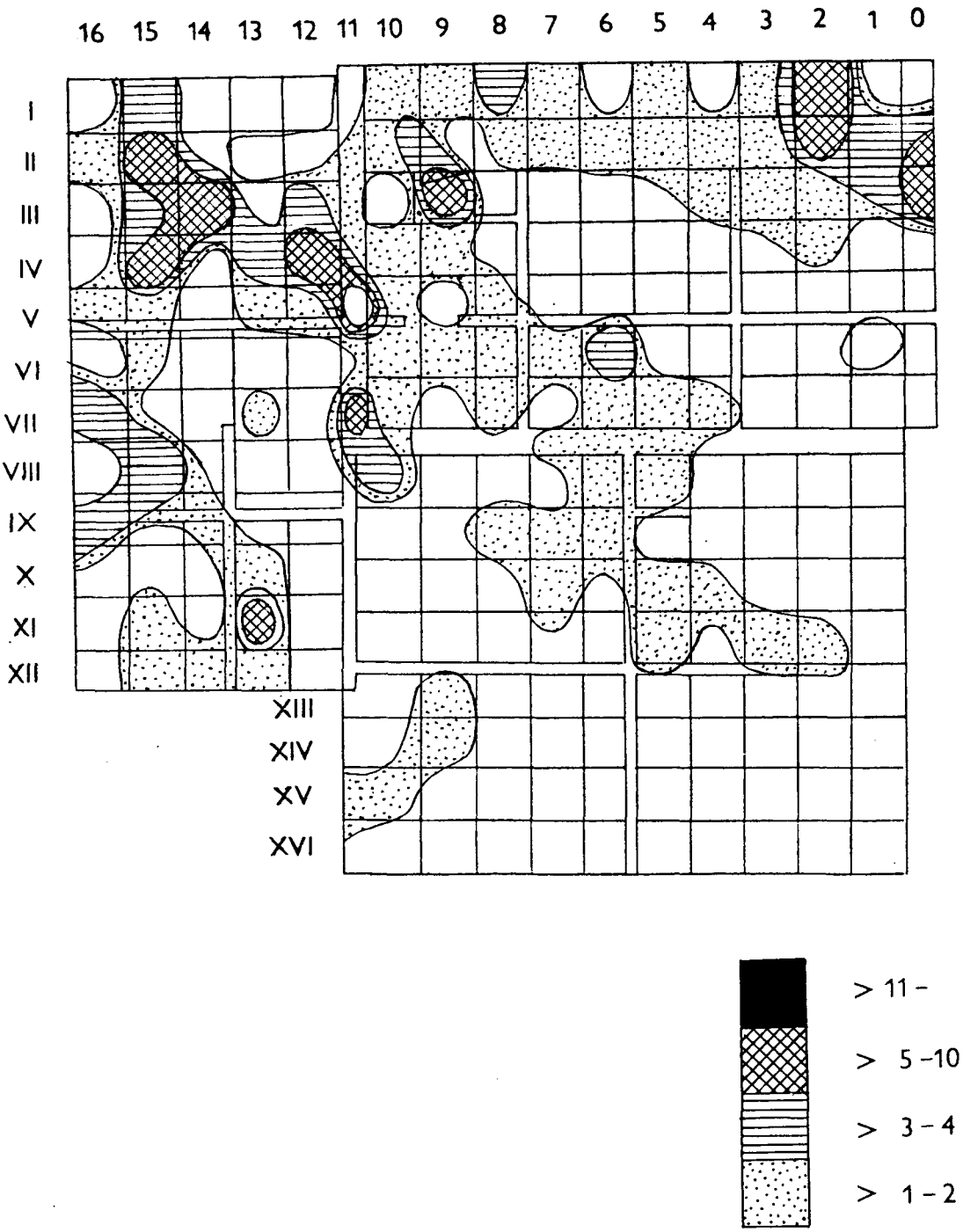


Fig.3. Density of non-siliceous artifacts

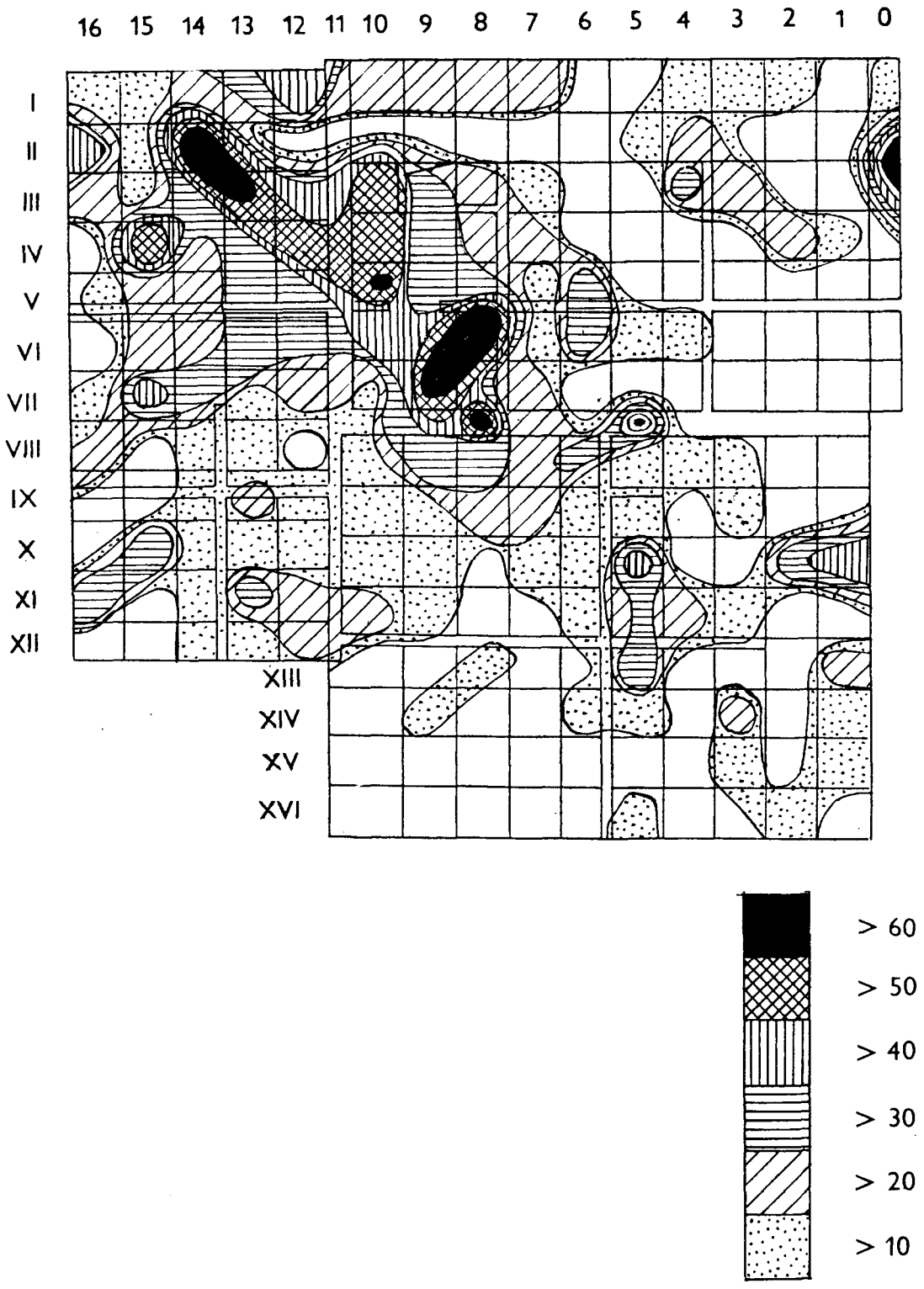


Fig.4. Density of the inventorized siliceous artifacts - lower horizon

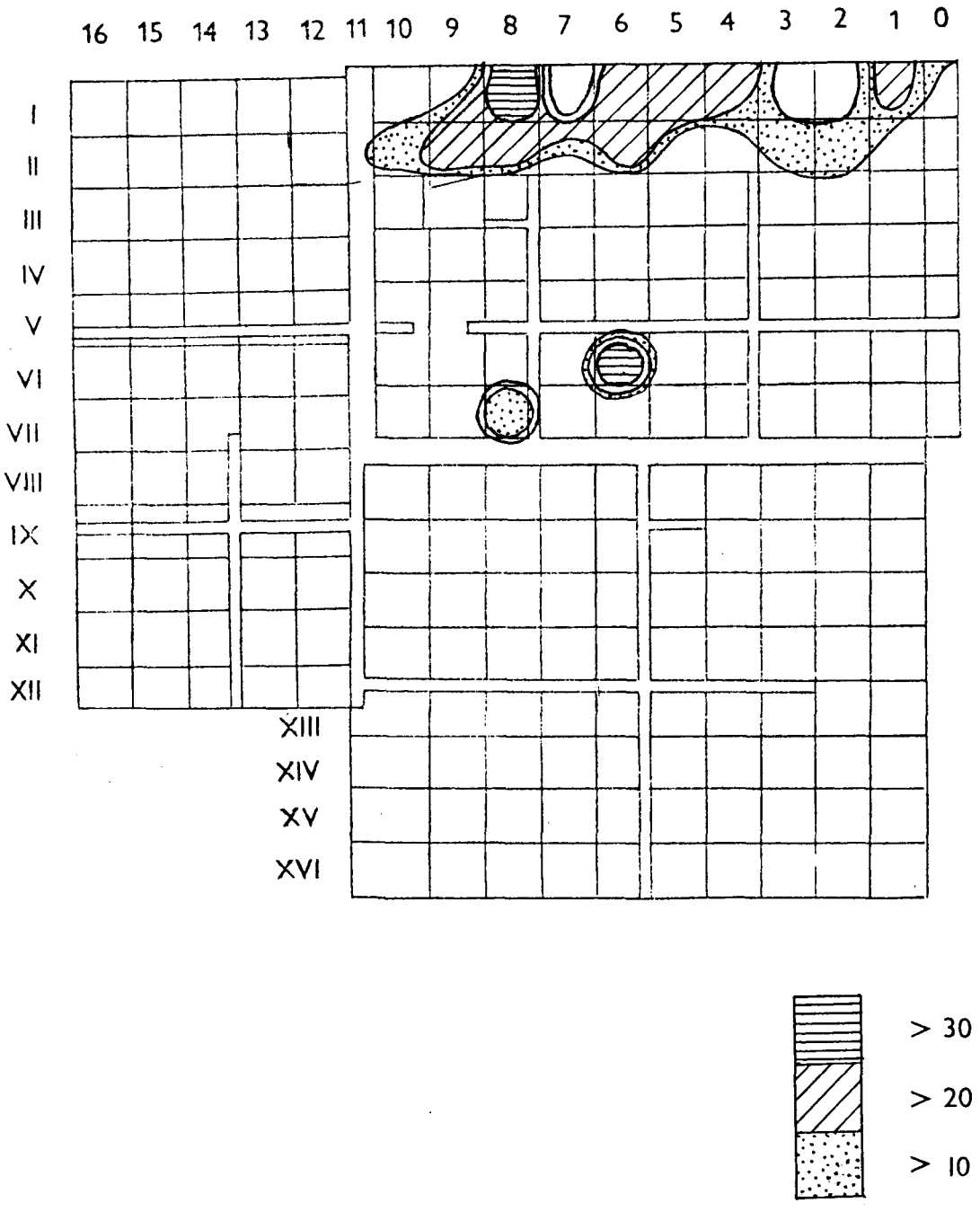


Fig.5. Density of the inventorized siliceous artifacts - upper horizon

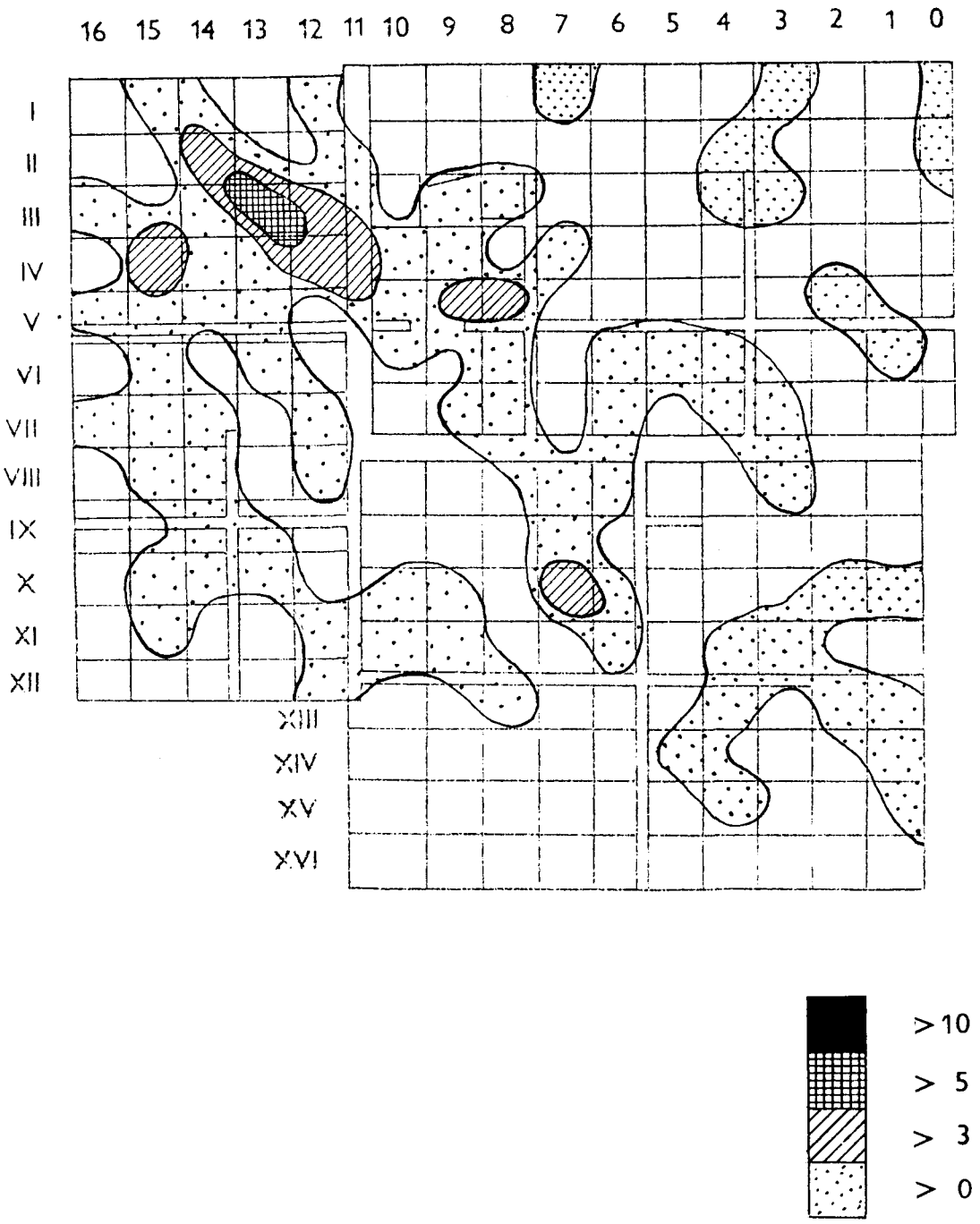


Fig.6. Spatial distribution of the endscrapers and their combinations

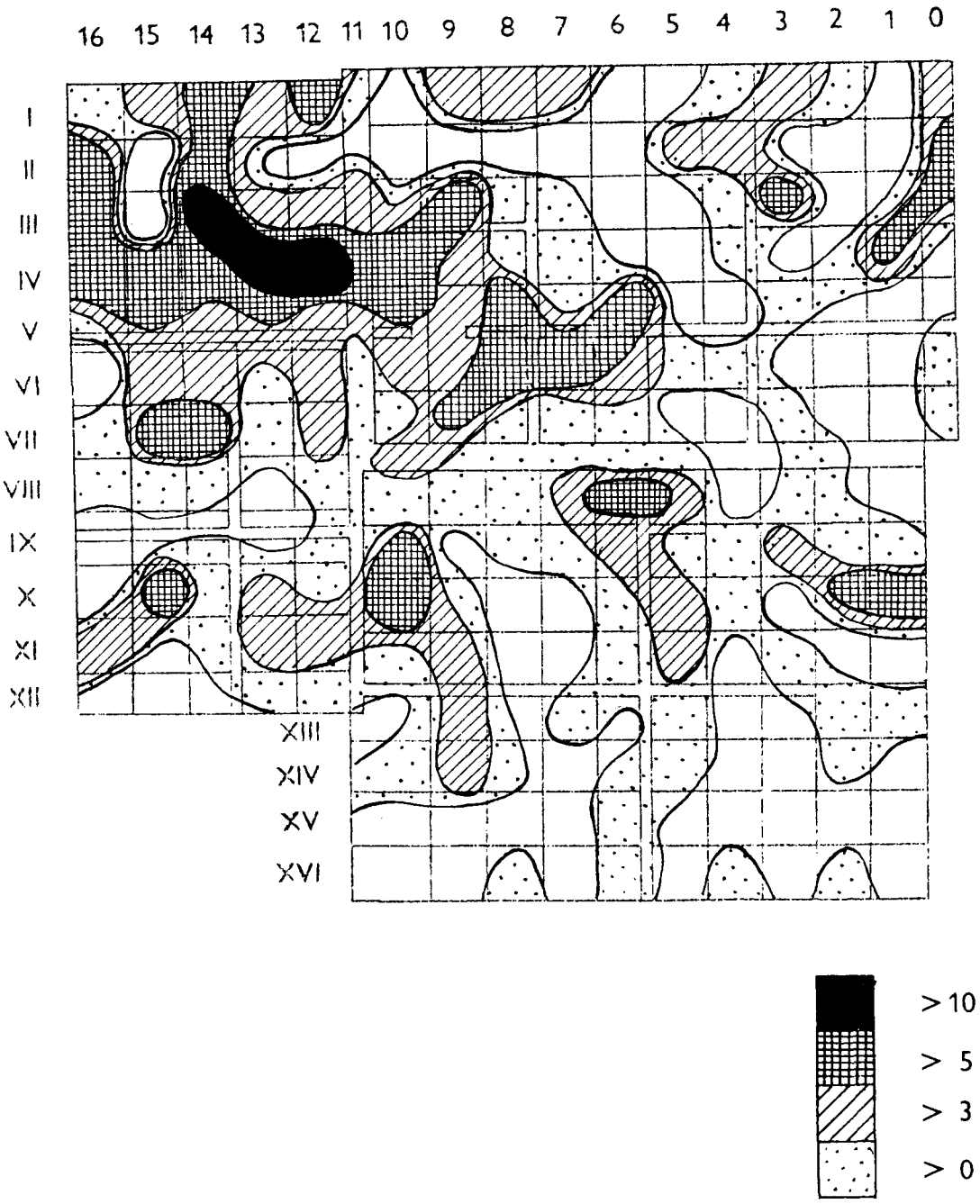


Fig.7. Spatial distribution of the burins, including their combinations

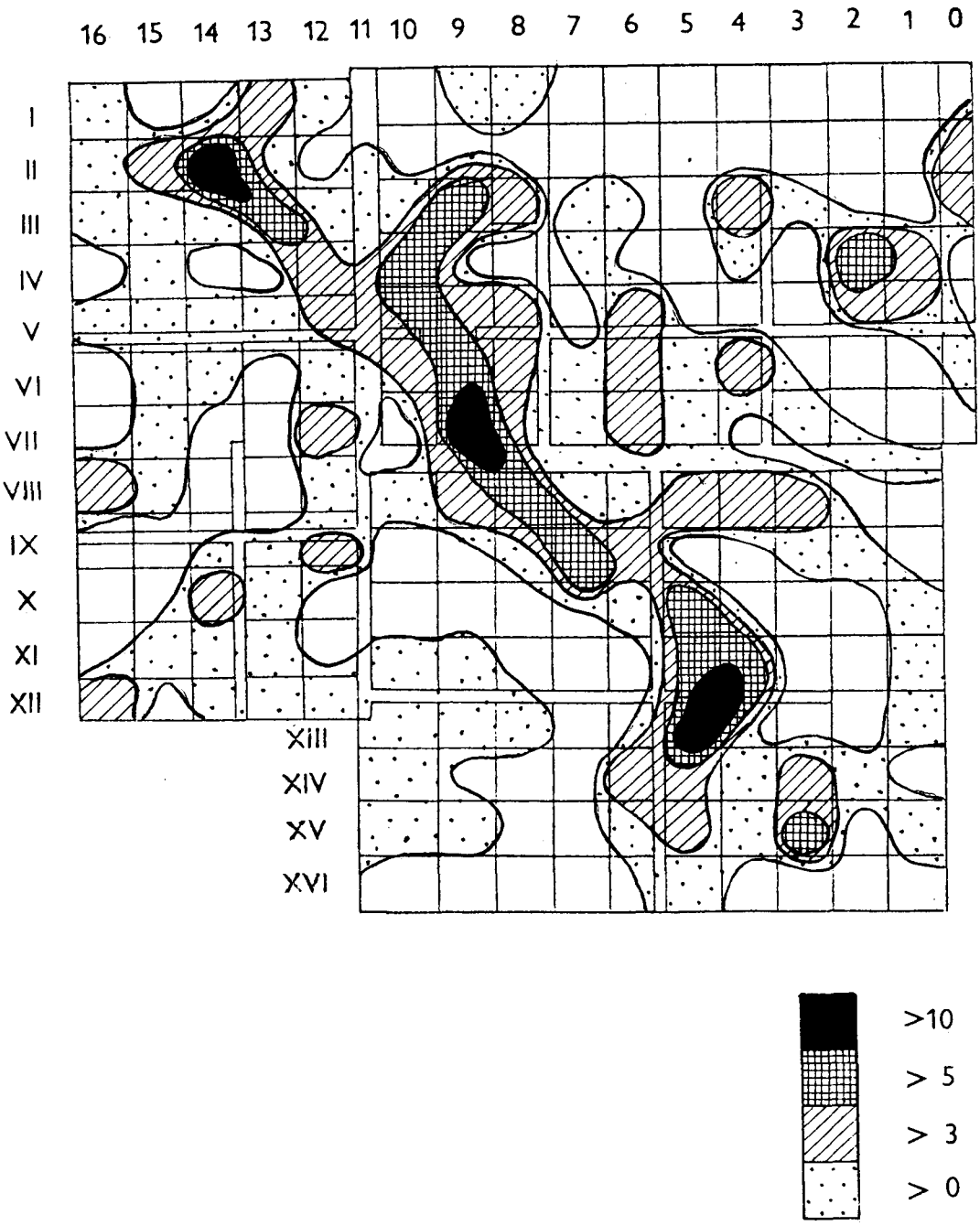


Fig.8. Spatial distribution of the backed implements (except the La Gravette points)

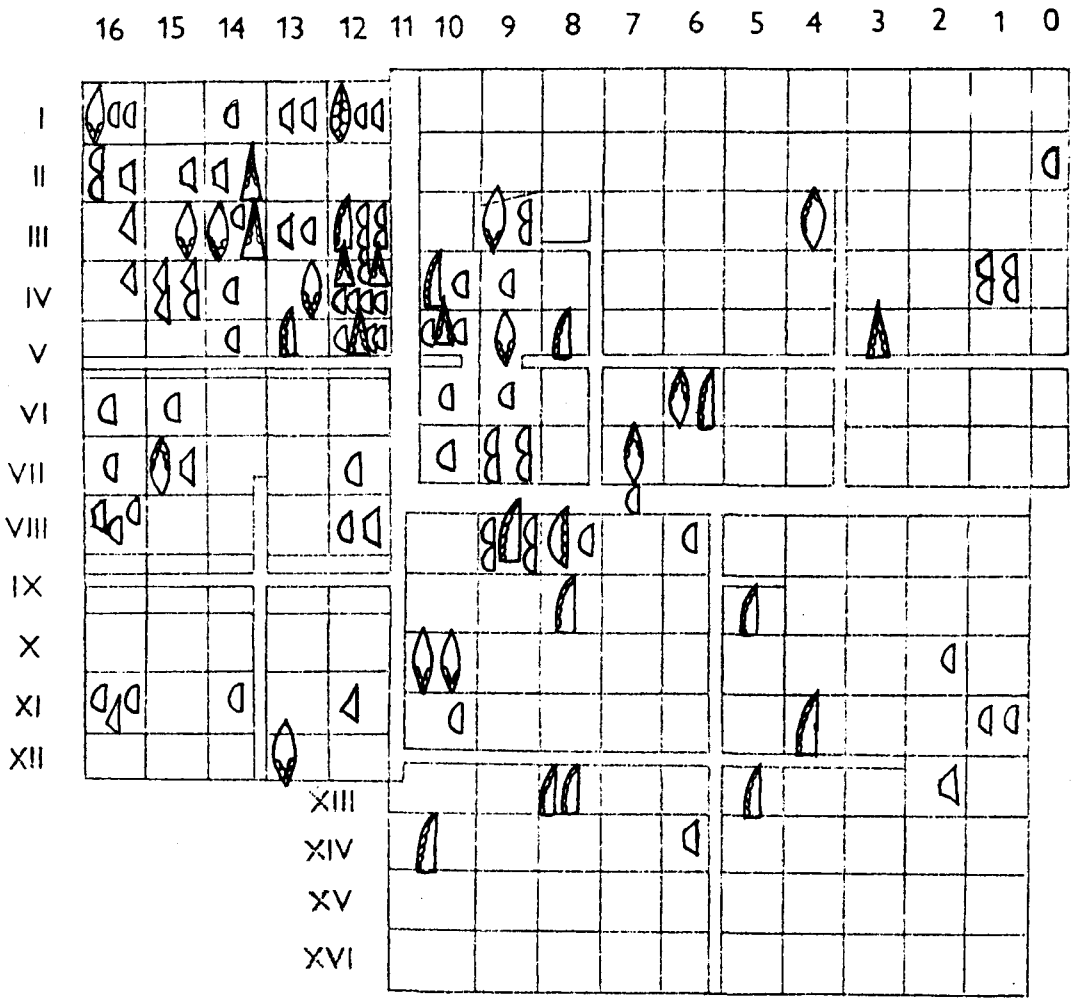


Fig.9. Spatial distribution of distinctive points and microliths (La Gravette points, crescents, trapezoids, triangles, Font-Yves points, ventrally retouched points, a leaf-point)

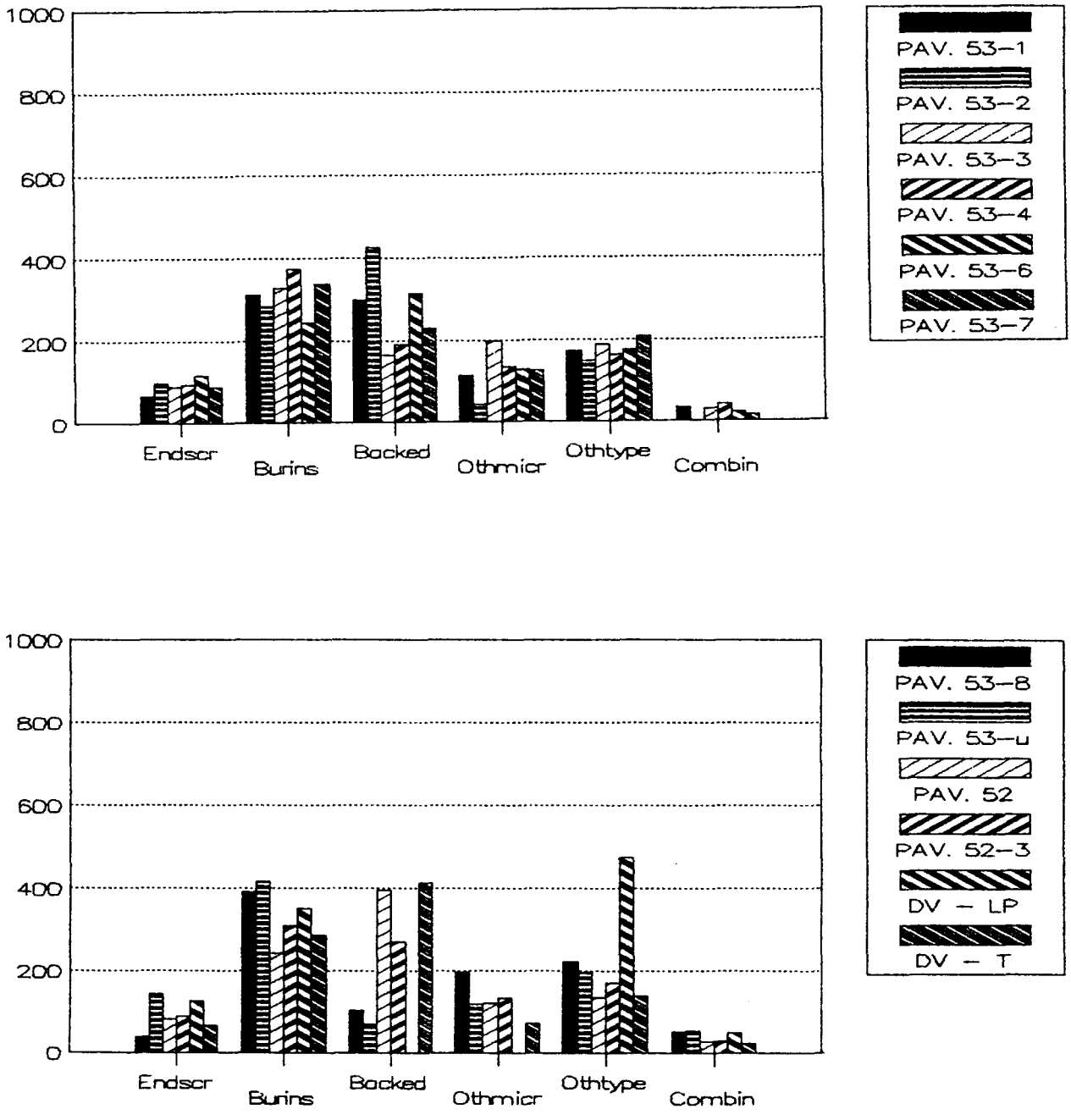


Fig.10. Percentual representation of the major typological groups (endscrapers, burins, backed implements, other microliths, other types, combinations) in the various sectors and assemblages

(excavations 1953 - sectors 1-8, u - upper layer, excavations 1952, Dolní Věstonice - unit LP, Dolní Věstonice - western slope - total)

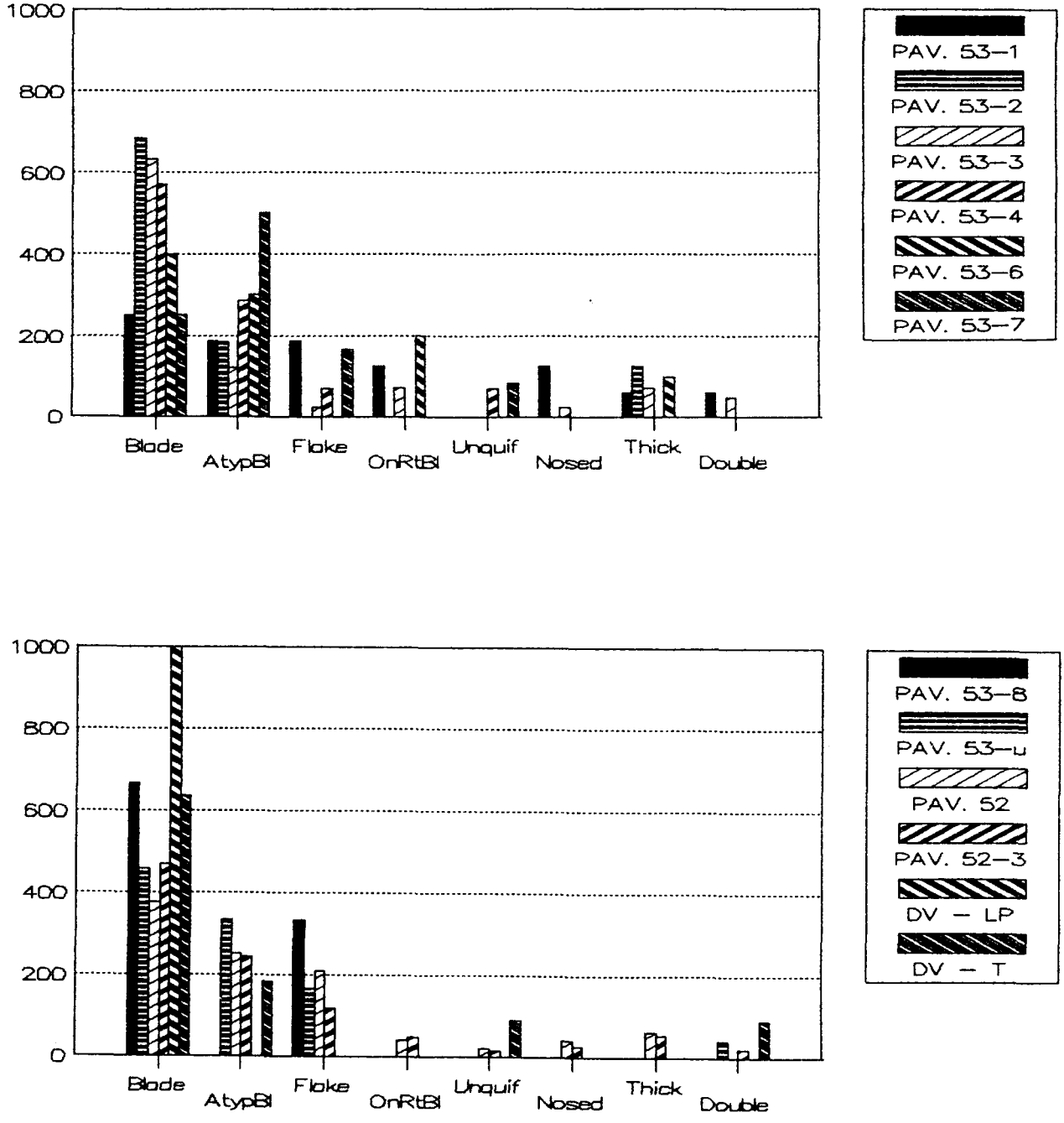


Fig.11. Endscrapers, percentual representation of the individual types (blade endscrapers, atypical blade endscrapers, flake endscrapers, on ret. blade, unguiform, nosed, thick, double) in the various assemblages

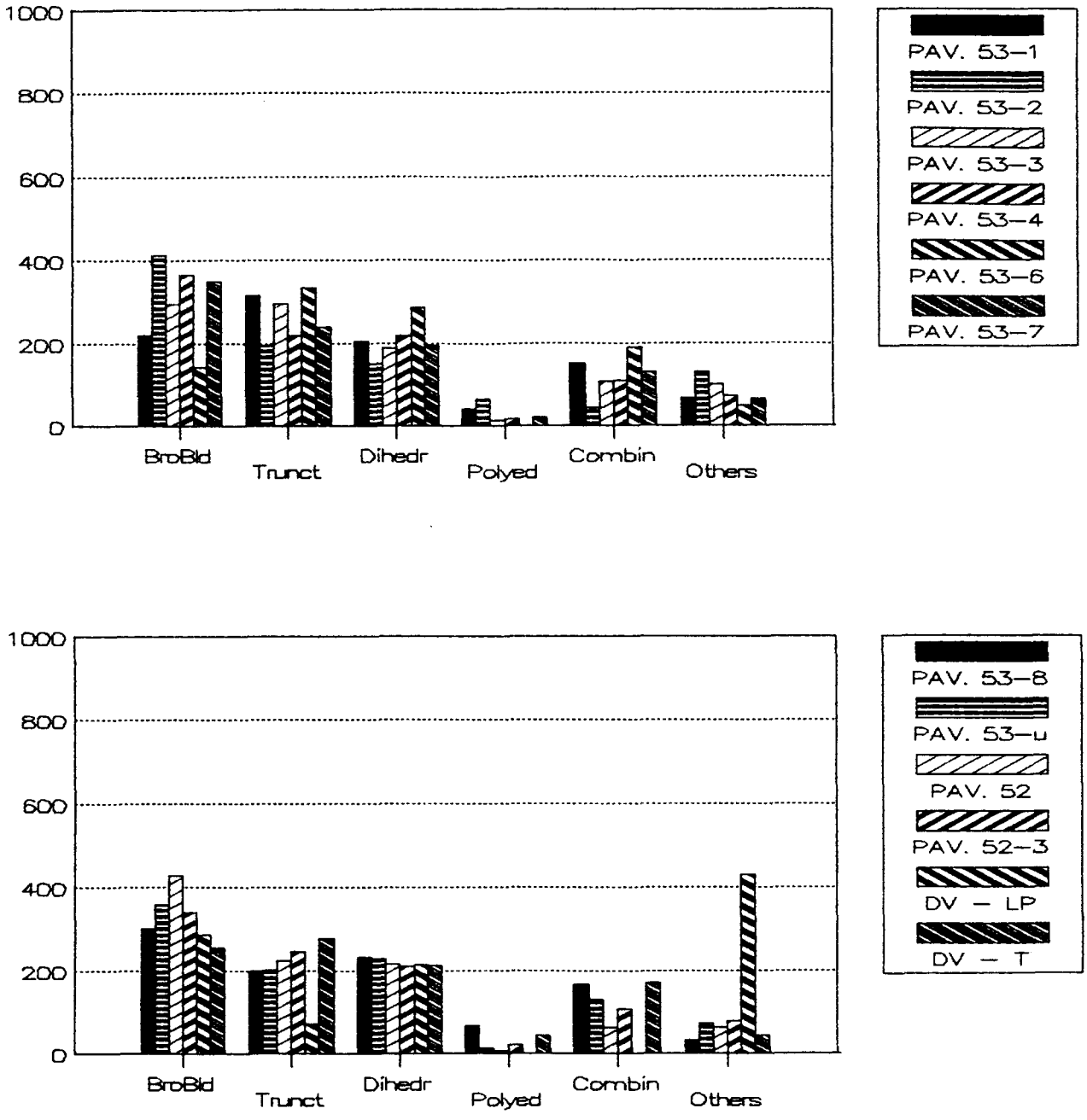


Fig.12. Burins, percentual representation of the individual types (on broken blade, truncated, dihedral, polyedric, combined) in the various assemblages

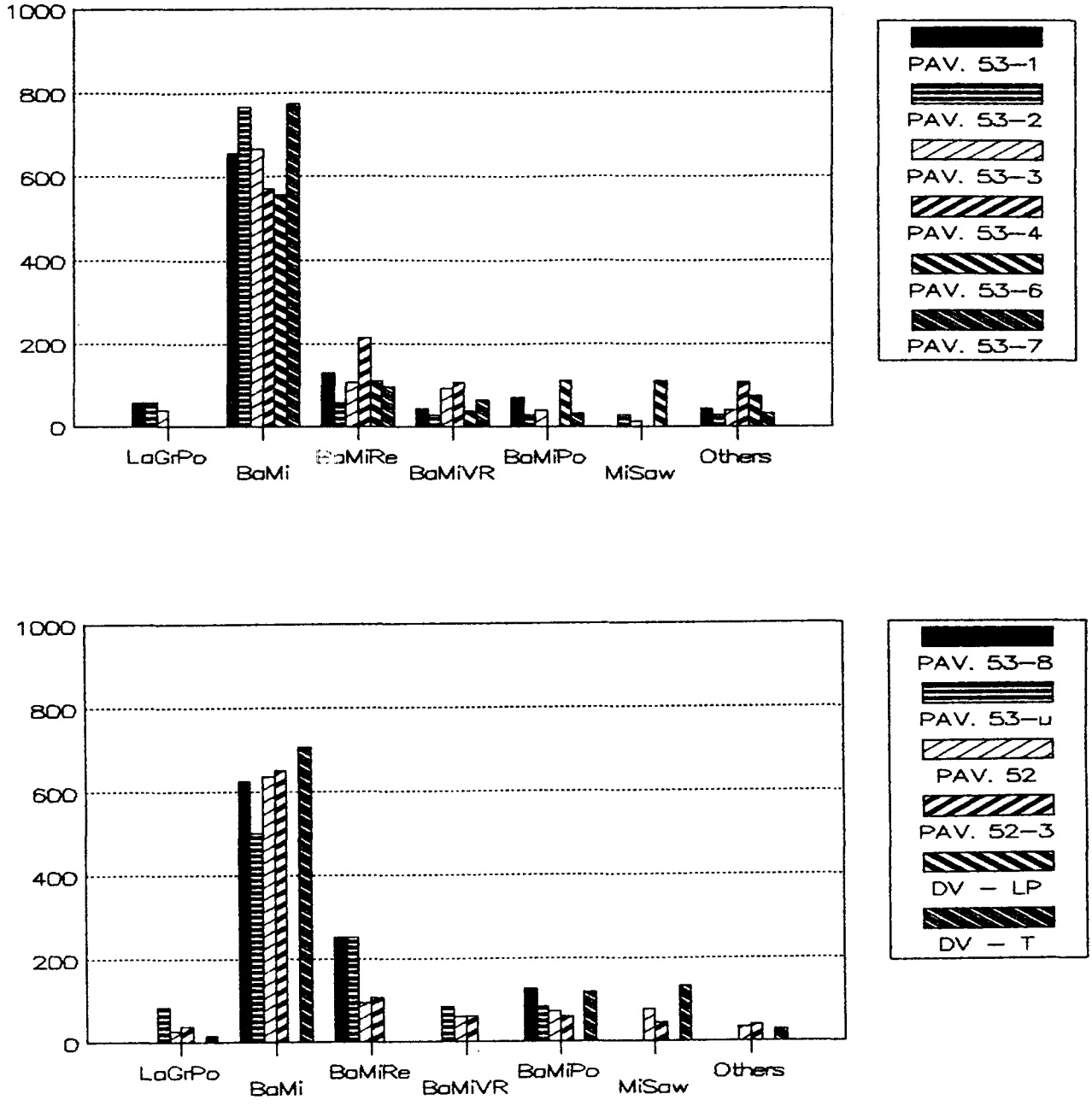


Fig.13. Backed implements, percentual representation of the individual types (La Gravette points, backed microblades, ret. backed microblades, ventrally ret. backed microblades, pointed backed microblades, microsaws) in the various assemblages

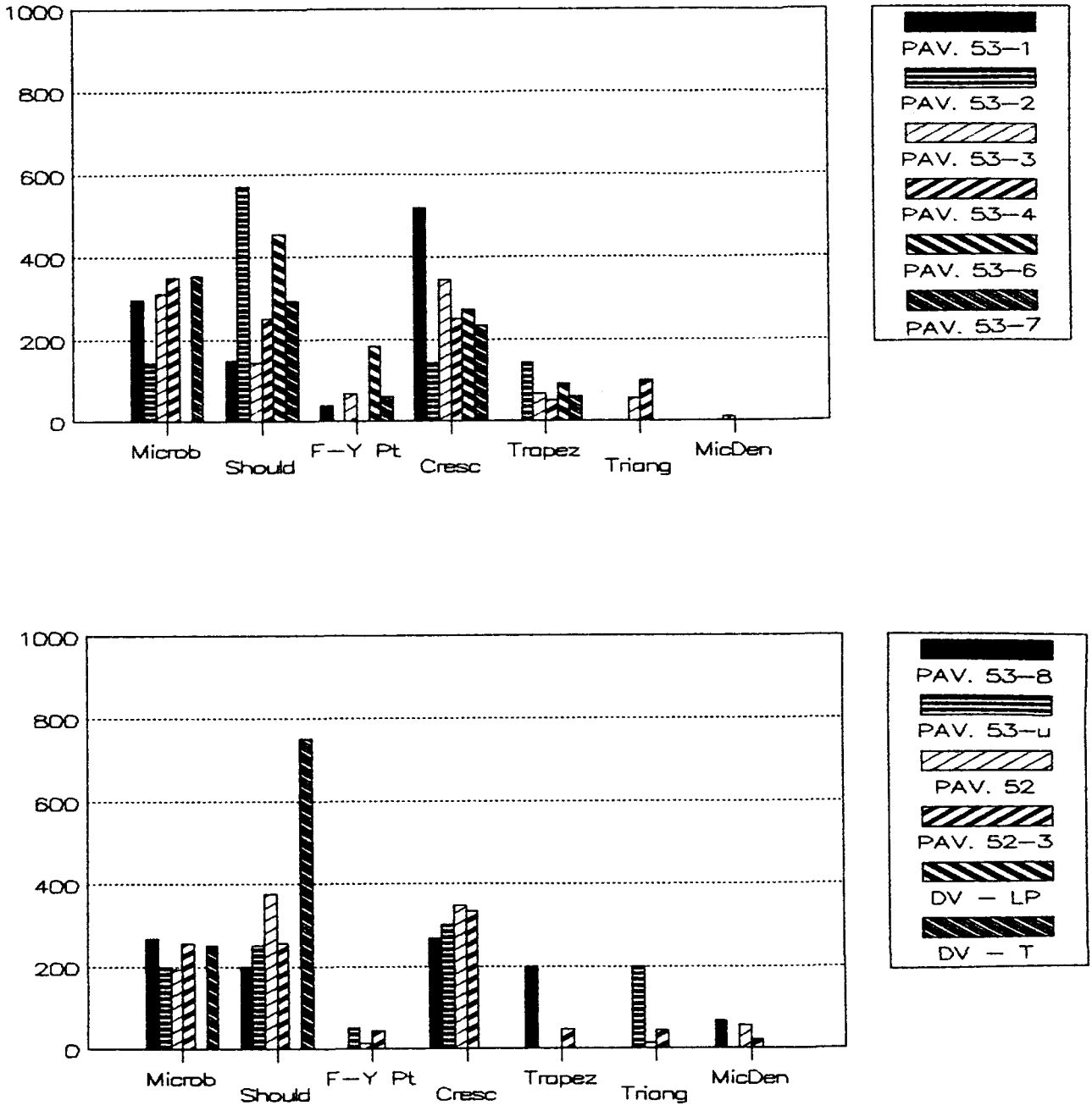


Fig.14. Other microliths, percentual representation of the individual types (ret. microblades, shouldered microblades, Font-Yves points, crescents, trapezoids, triangles, microdenticulates) in the various assemblages

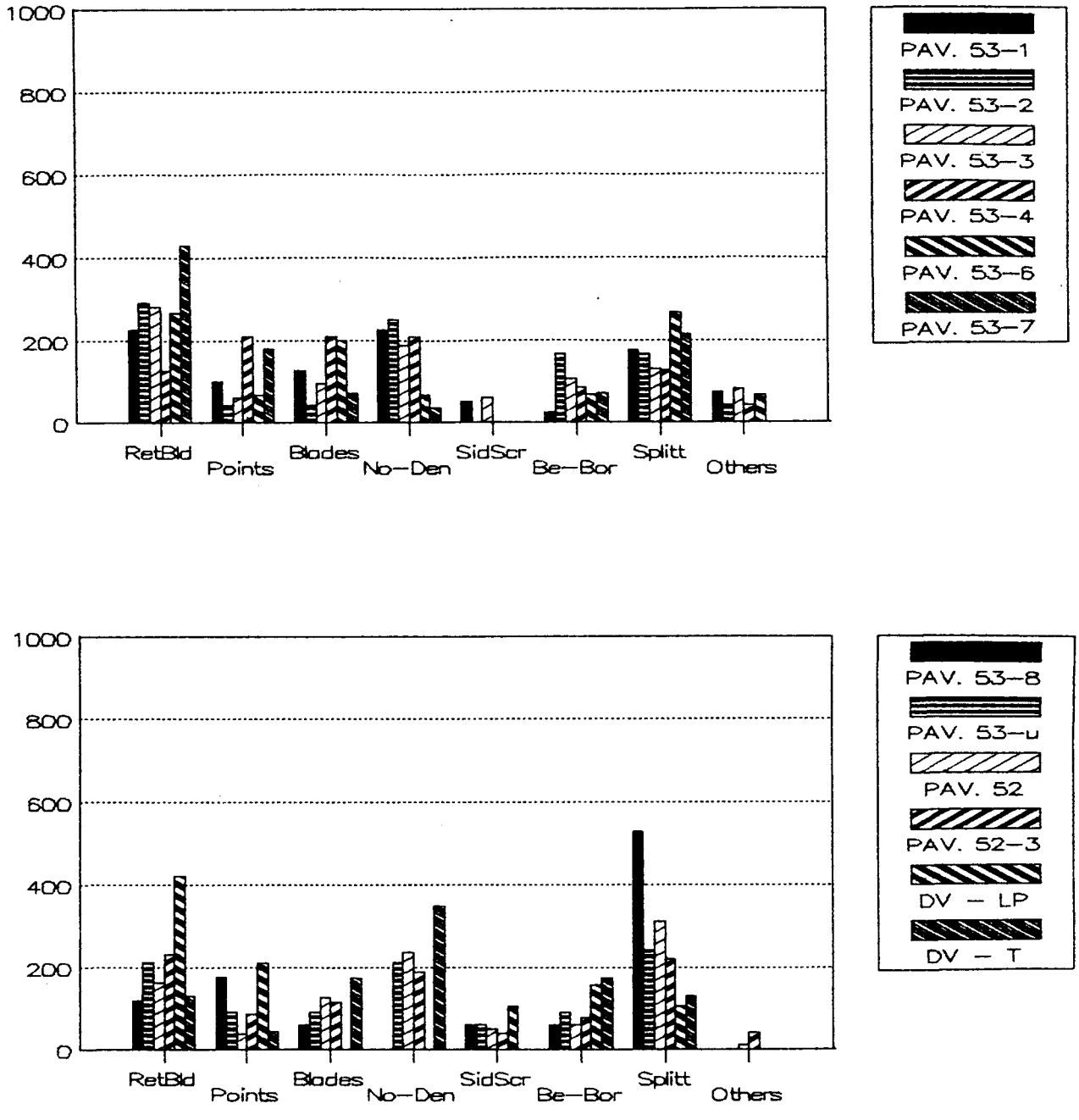


Fig.15. Other tools, percentual representation of the individual types (ret. blades, points, truncated blades, notches and denticulates, sidescrapers, becs and borers, splittered pieces and chissels) in the various assemblages

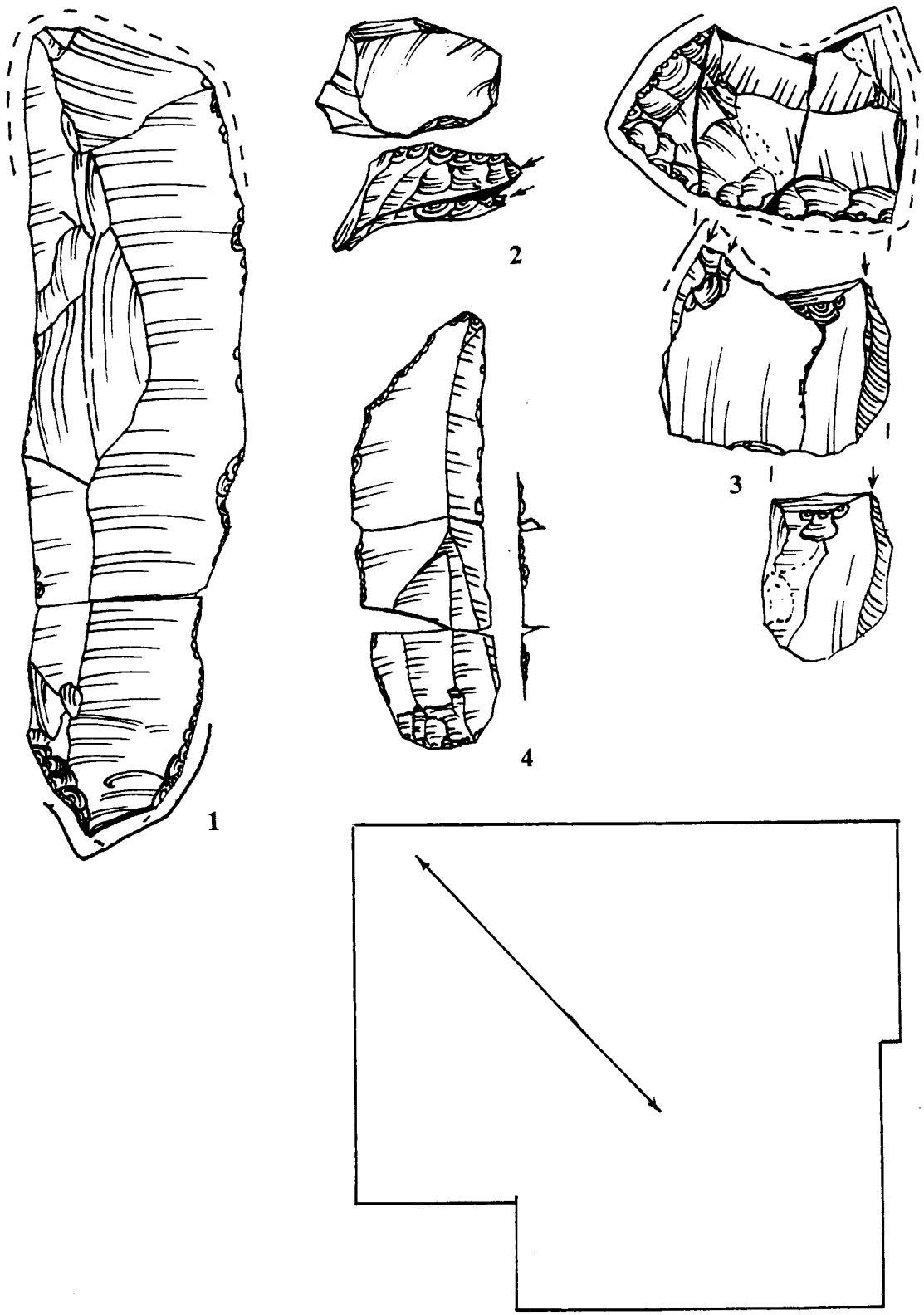


Fig.16. Pavlov I, 1953, refitted artifacts and location of one of the refittings. Full line - traces of use, interrupted line - traces of haft

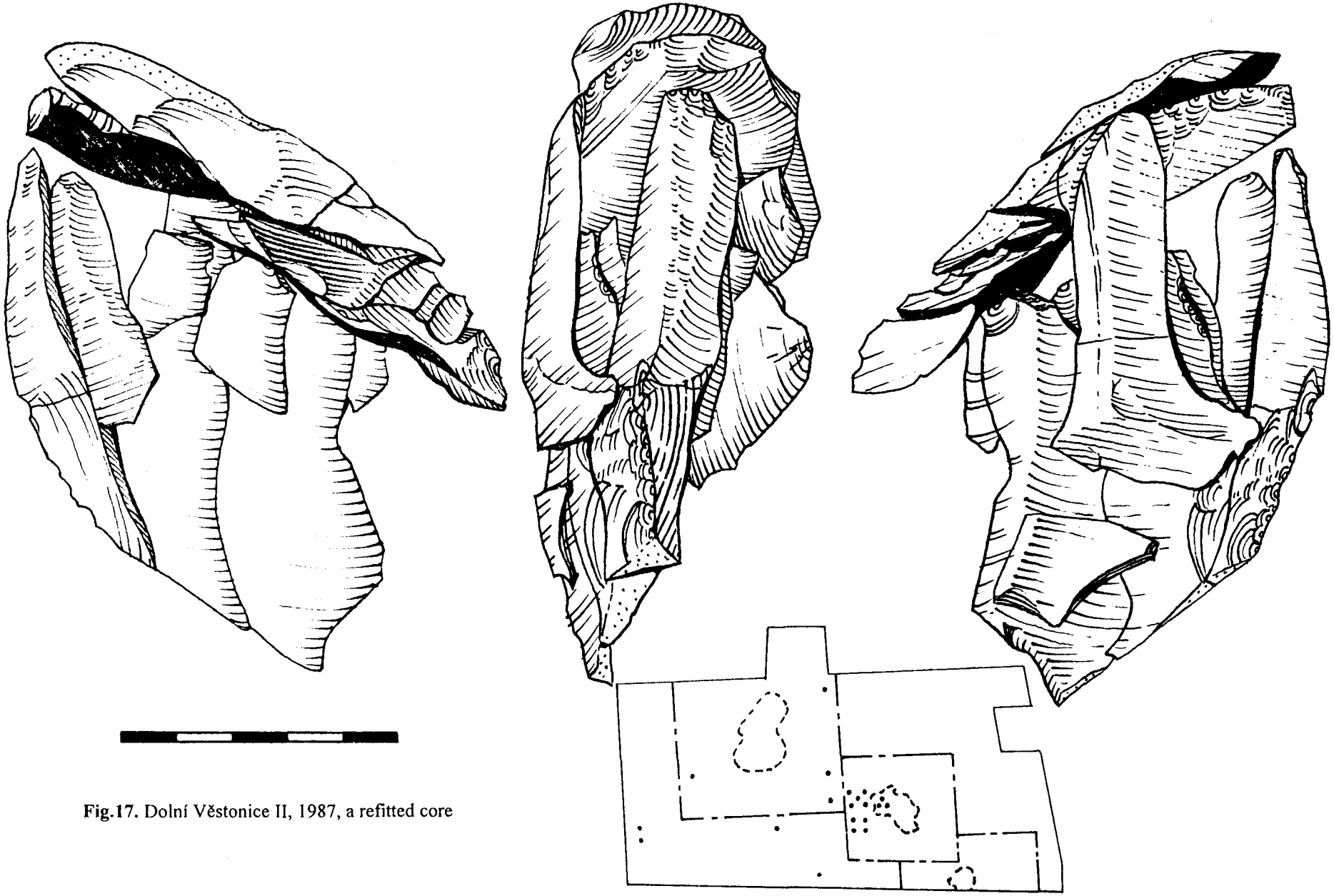


Fig.17. Dolní Věstonice II, 1987, a refitted core

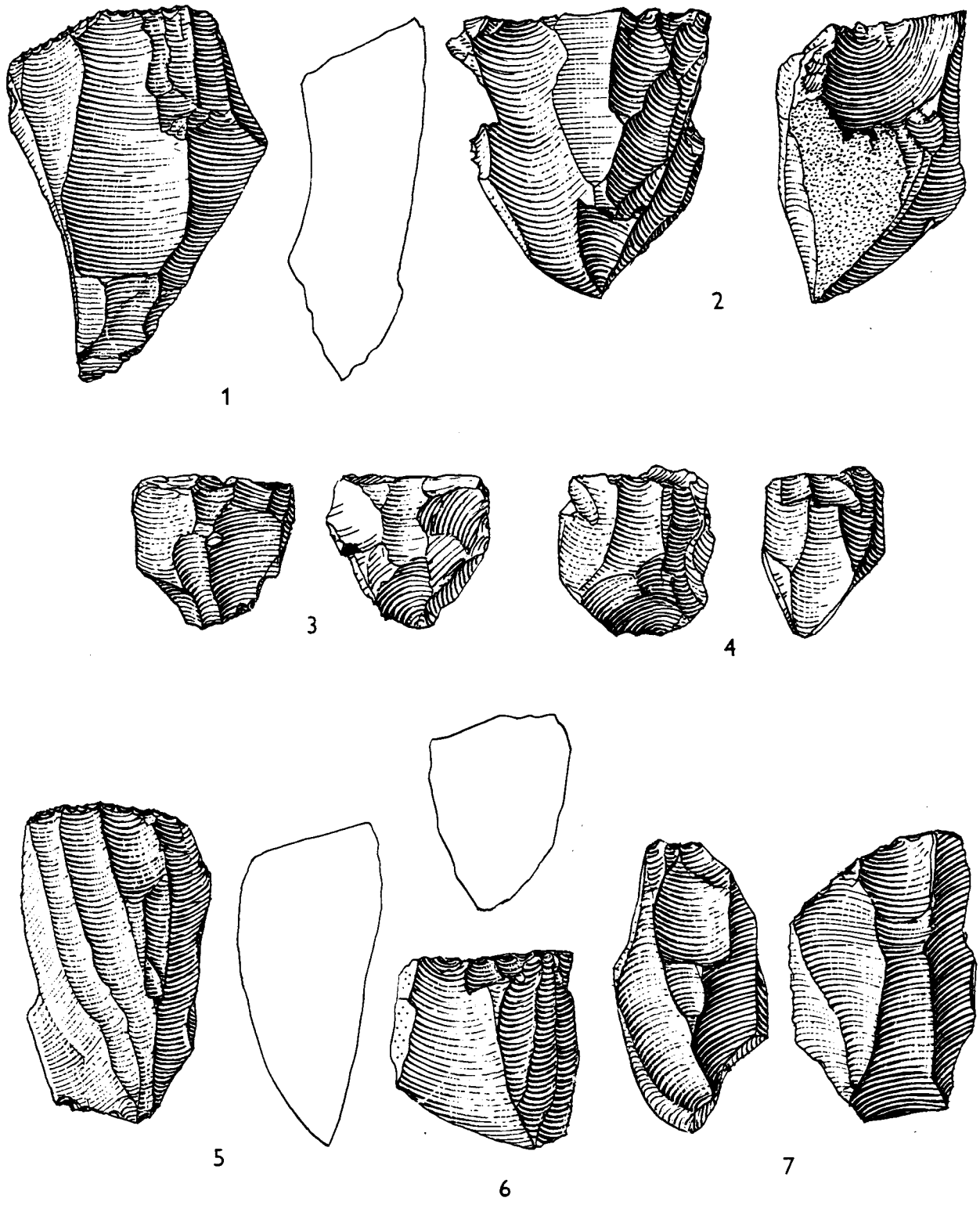


Fig.18. Pavlov I, excavations 1952. Selection of cores

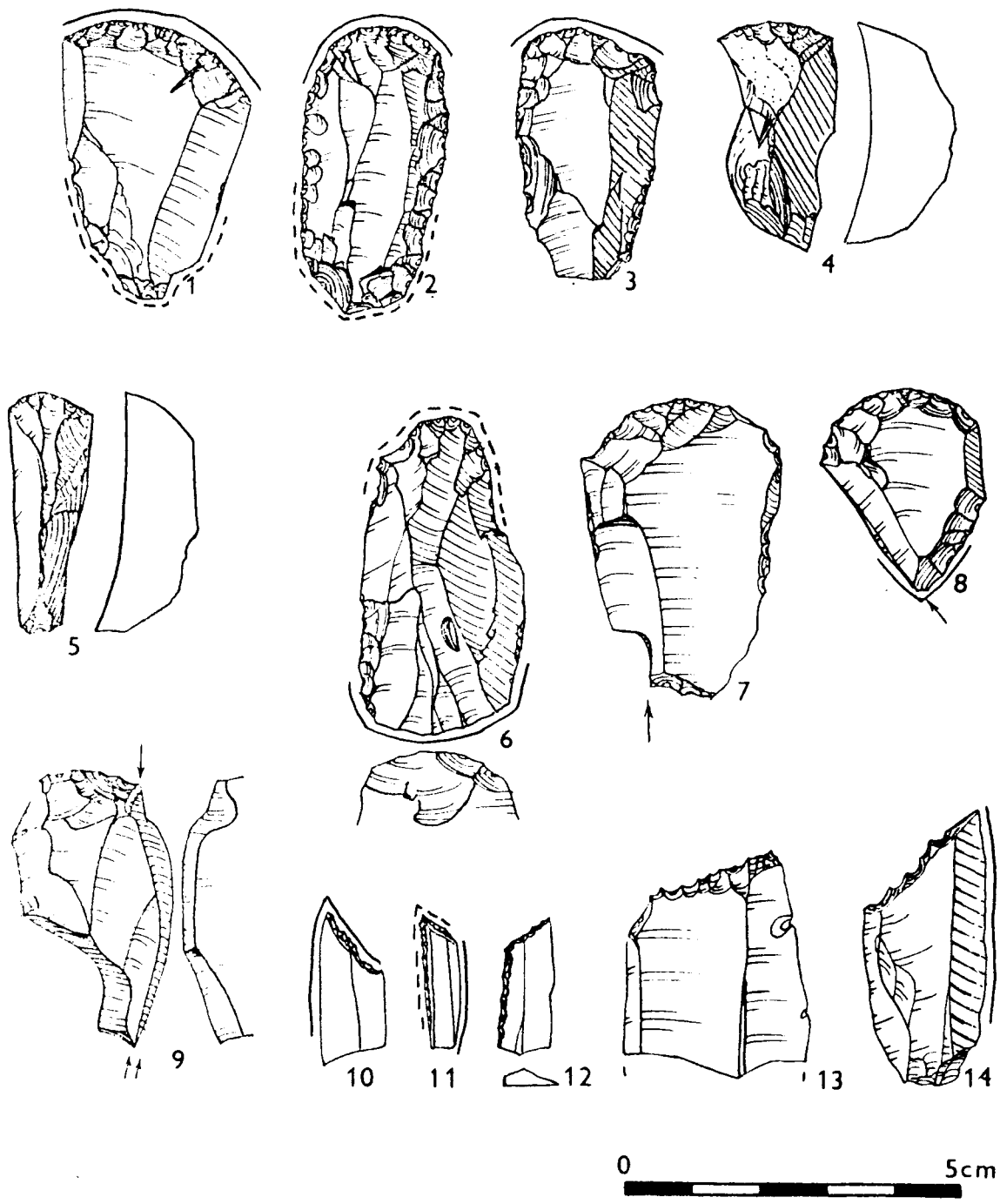


Fig.19. Pavlov I, excavations 1952. Full line - traces of use, interrupted line - traces of haft

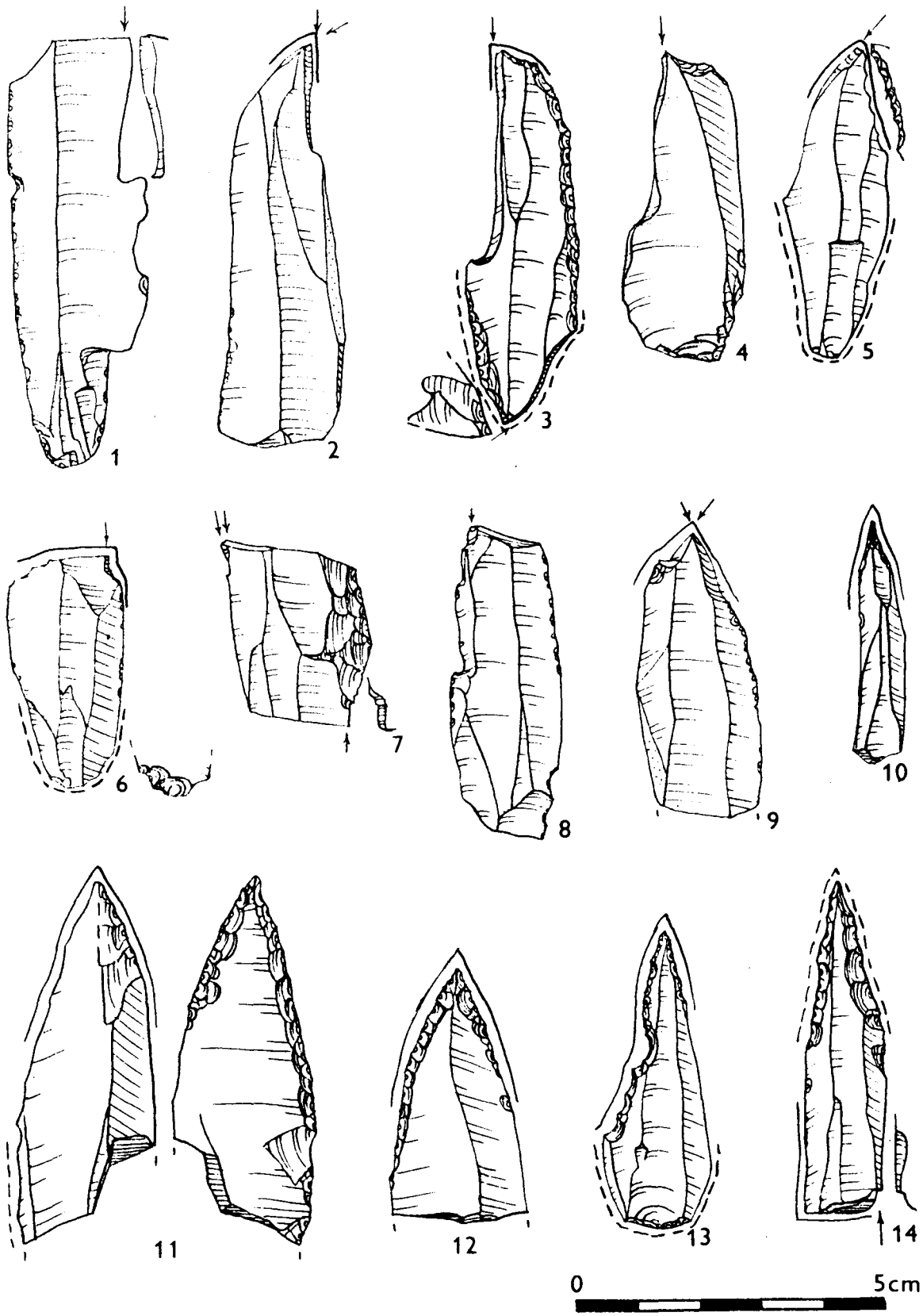


Fig.20. Pavlov I, excavations 1952. Full line - traces of use, interrupted line - traces of haft

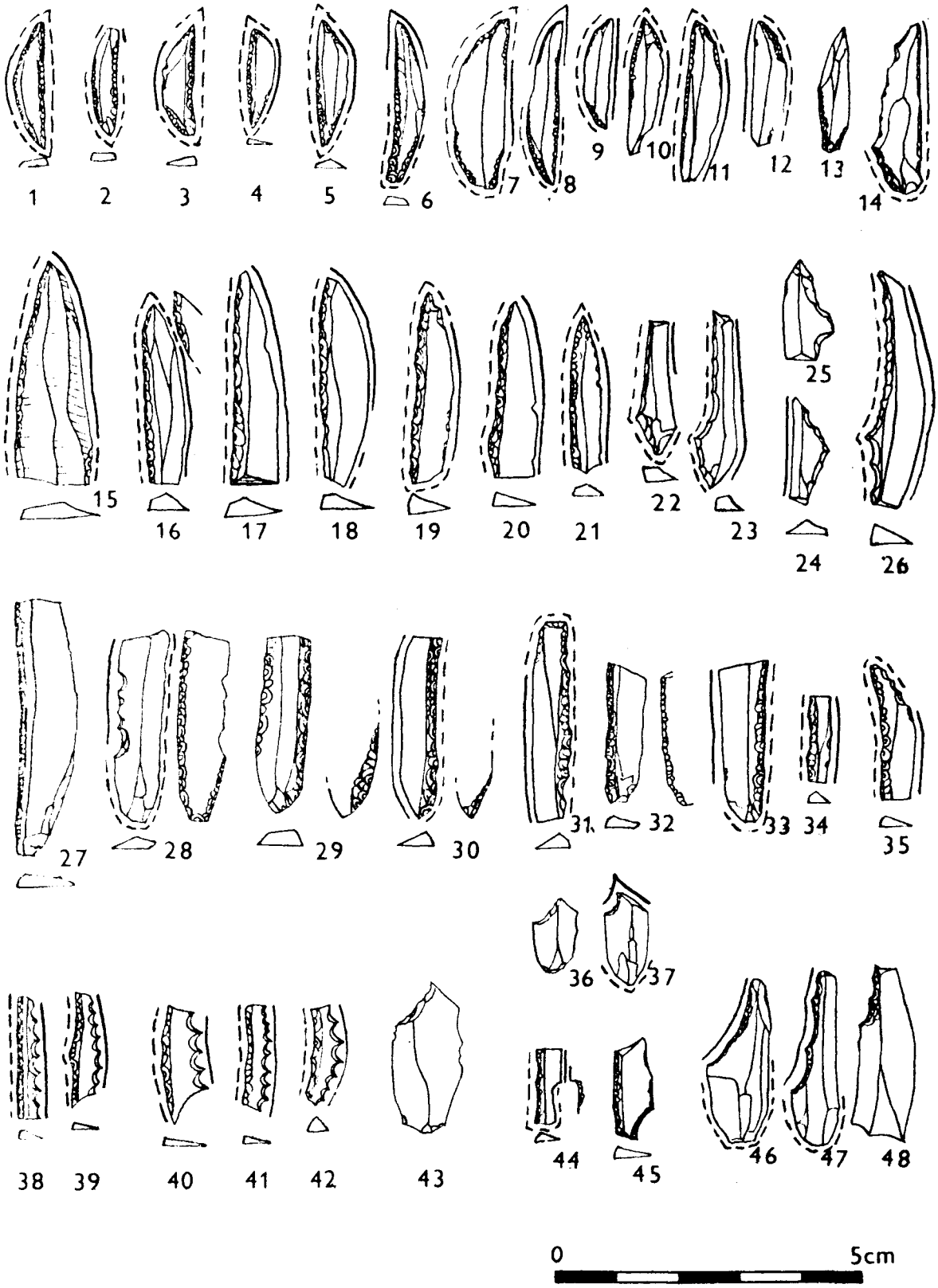


Fig.21. Pavlov I, excavations 1952. Full line - traces of use, interrupted line - traces of haft

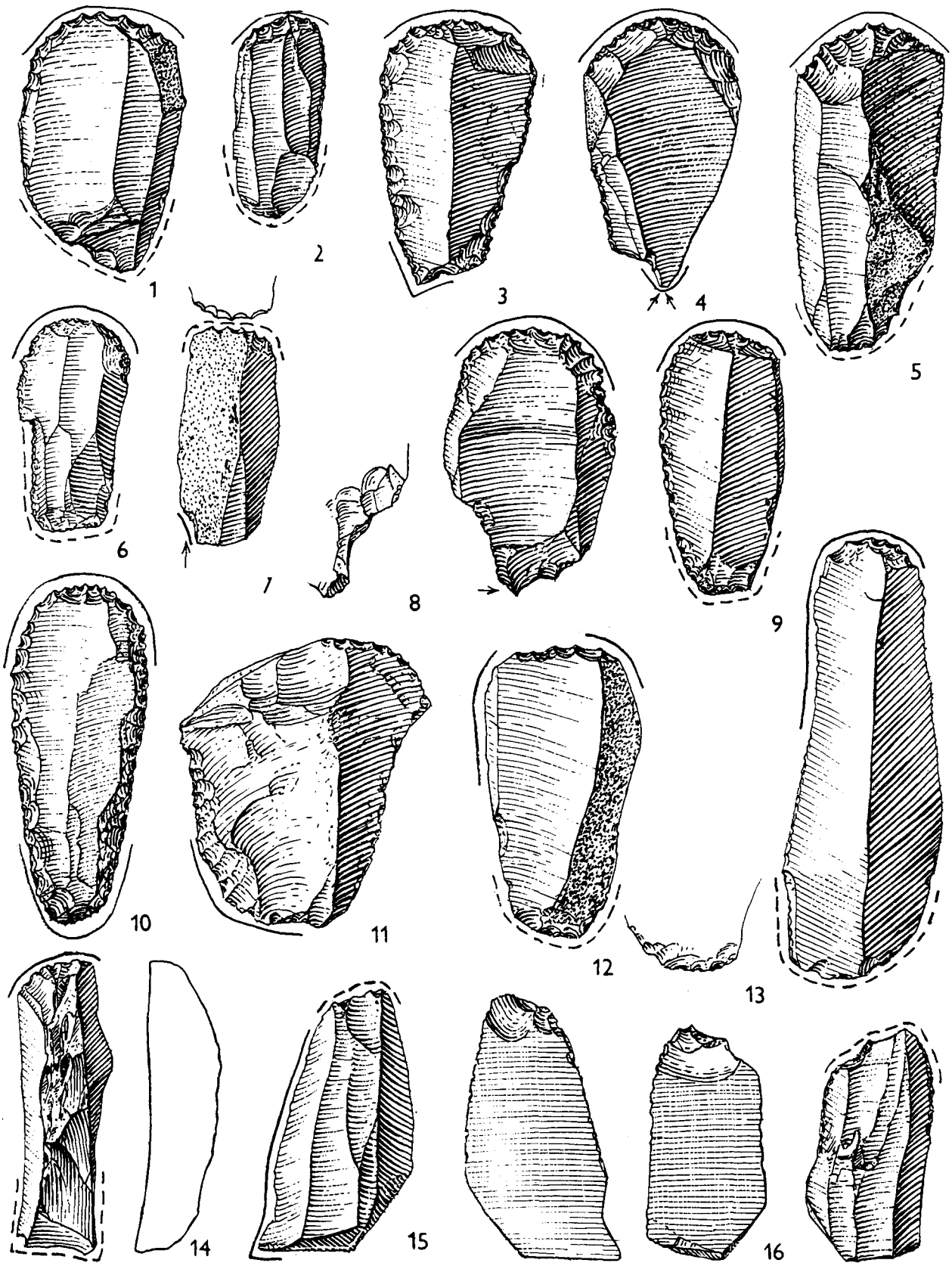


Fig.22. Excavations 1953, sector 1. Full line - traces of use, interrupted line - traces of haft

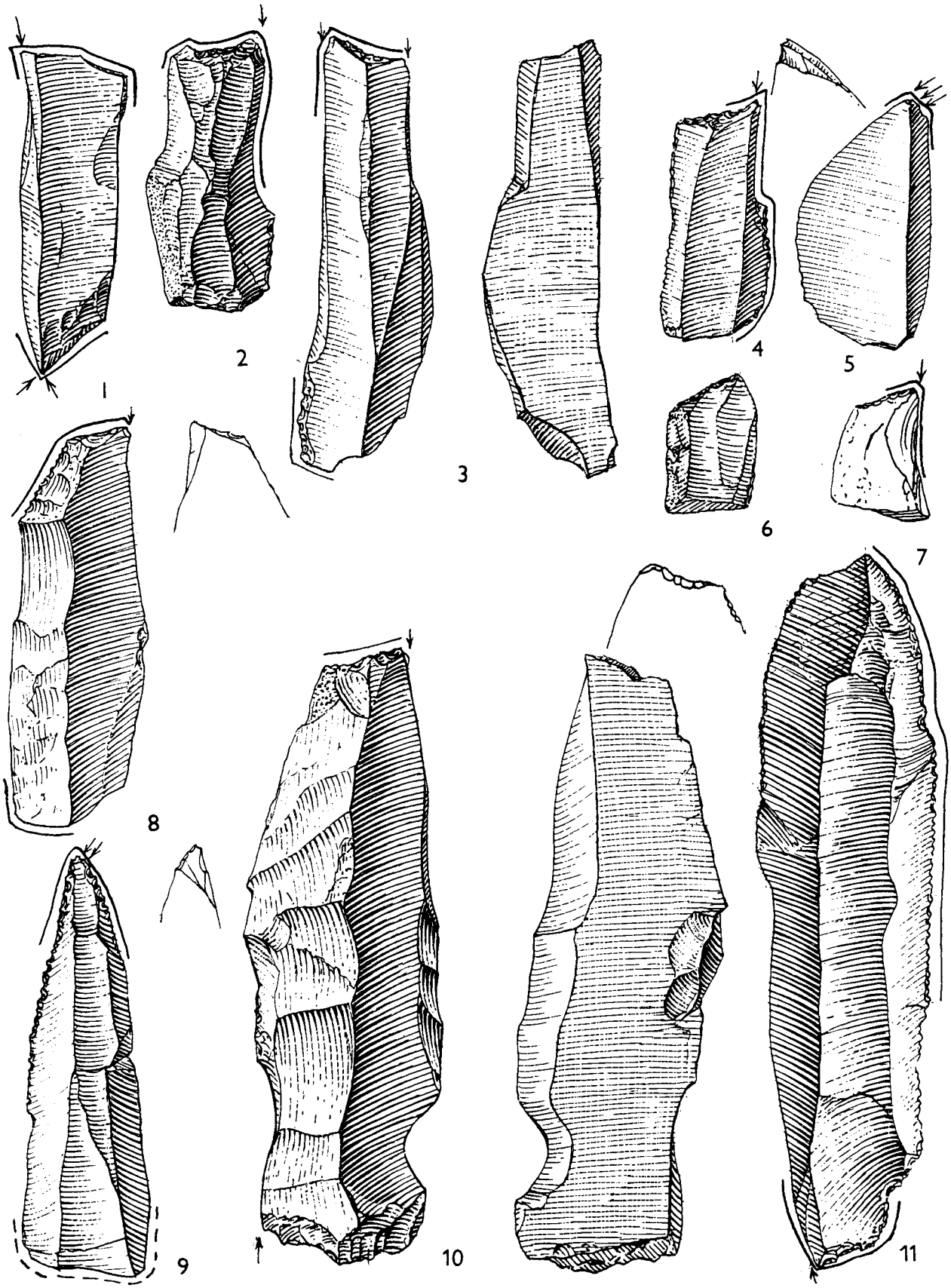


Fig.23. Excavations 1953, sector 1. Full line - traces of use, interrupted line - traces of haft

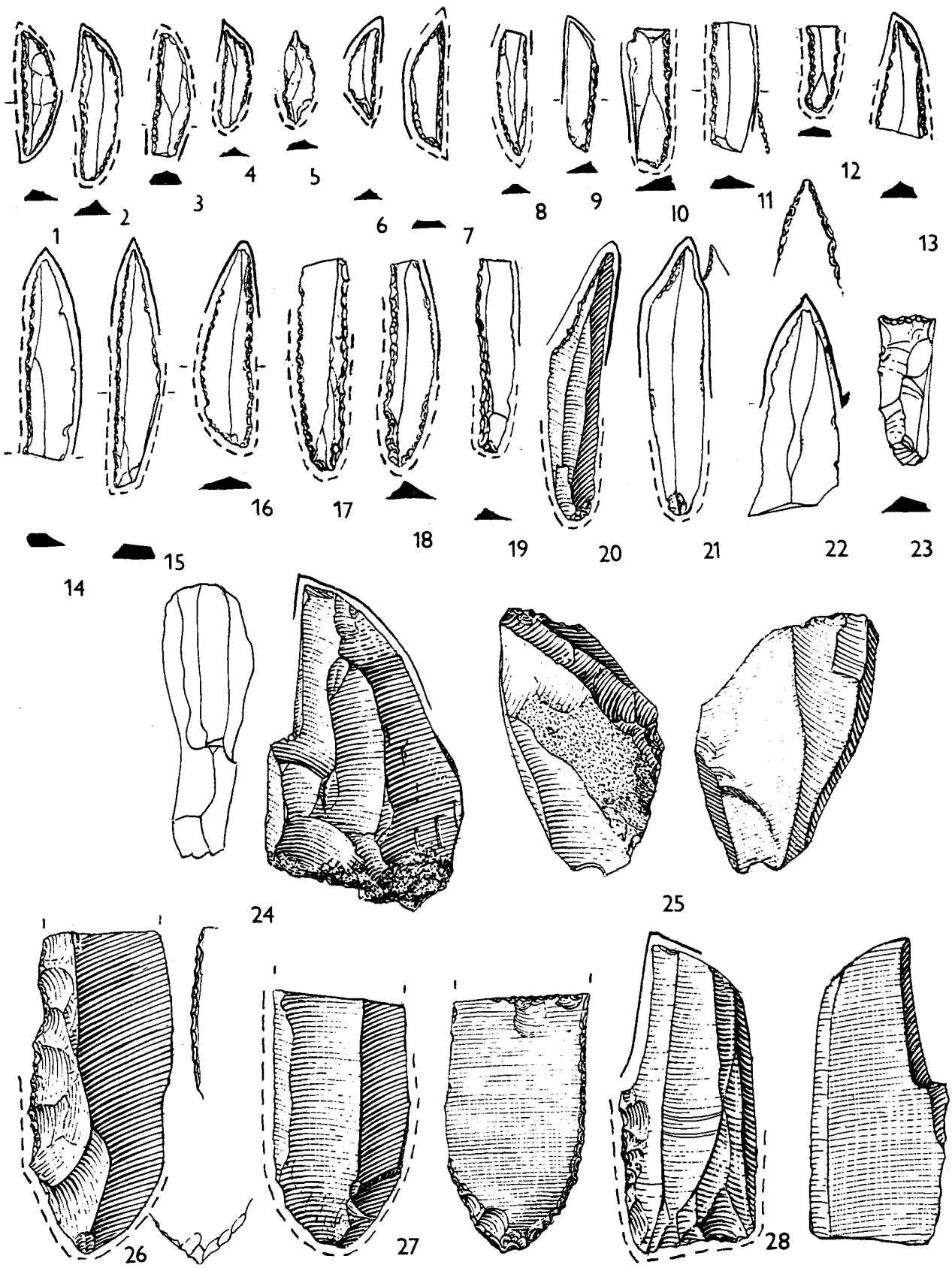


Fig.24. Excavations 1953, sector 1. Full line - traces of use, interrupted line - traces of haft

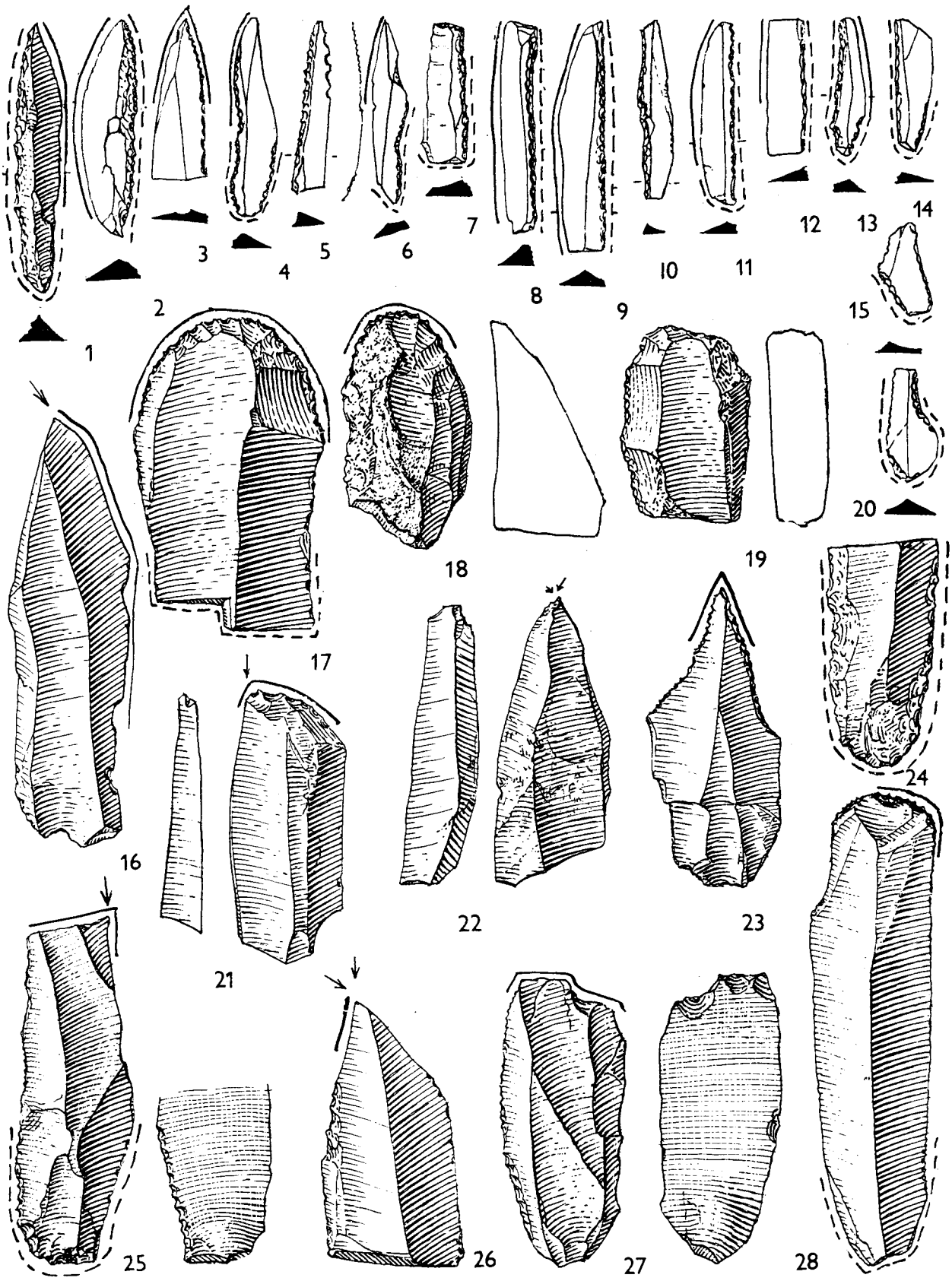


Fig.25. Excavations 1953, sector 2. Full line - traces of use, interrupted line - traces of haft

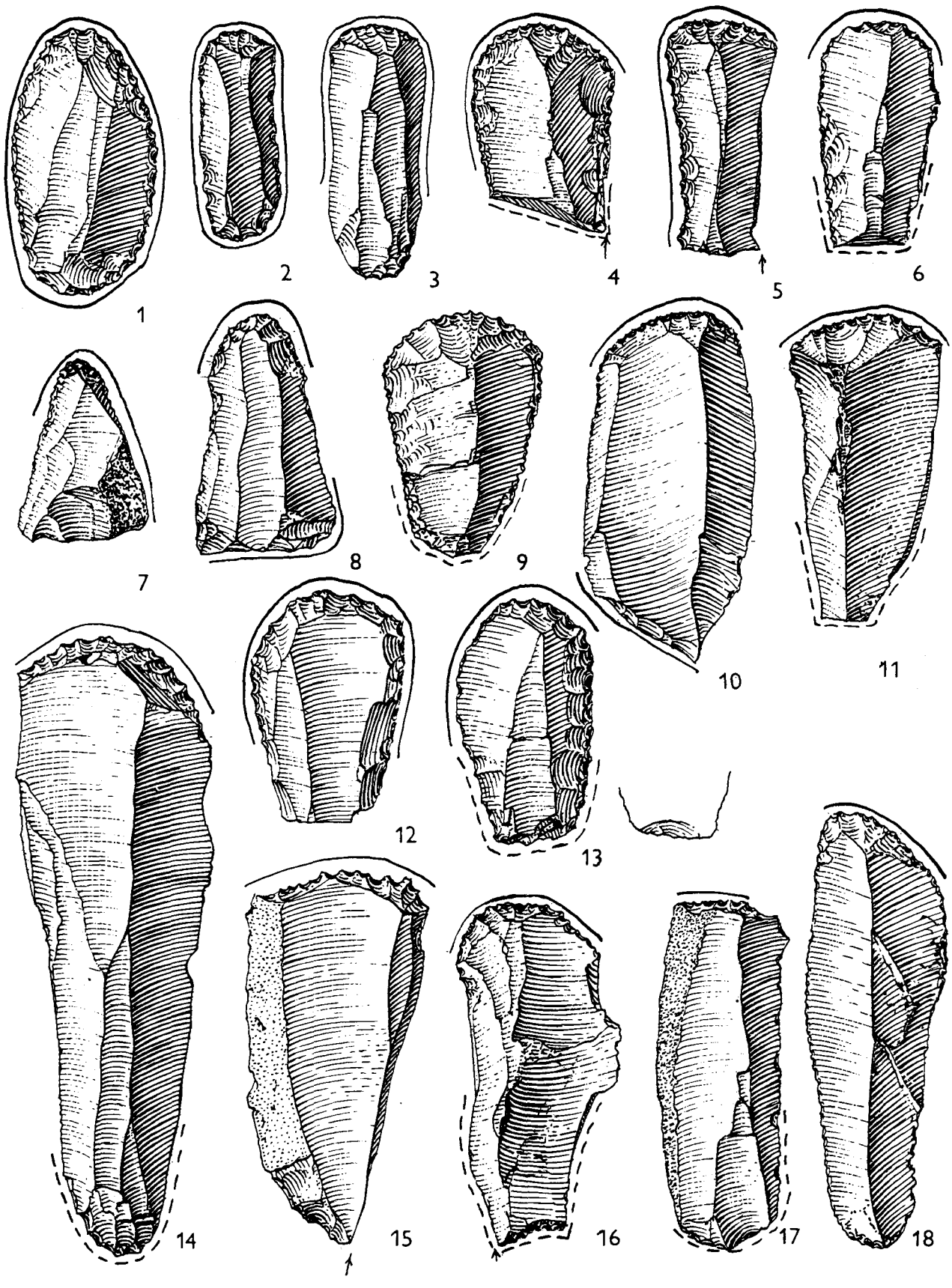


Fig.26. Excavations 1953, sector 3. Full line - traces of use, interrupted line - traces of haft

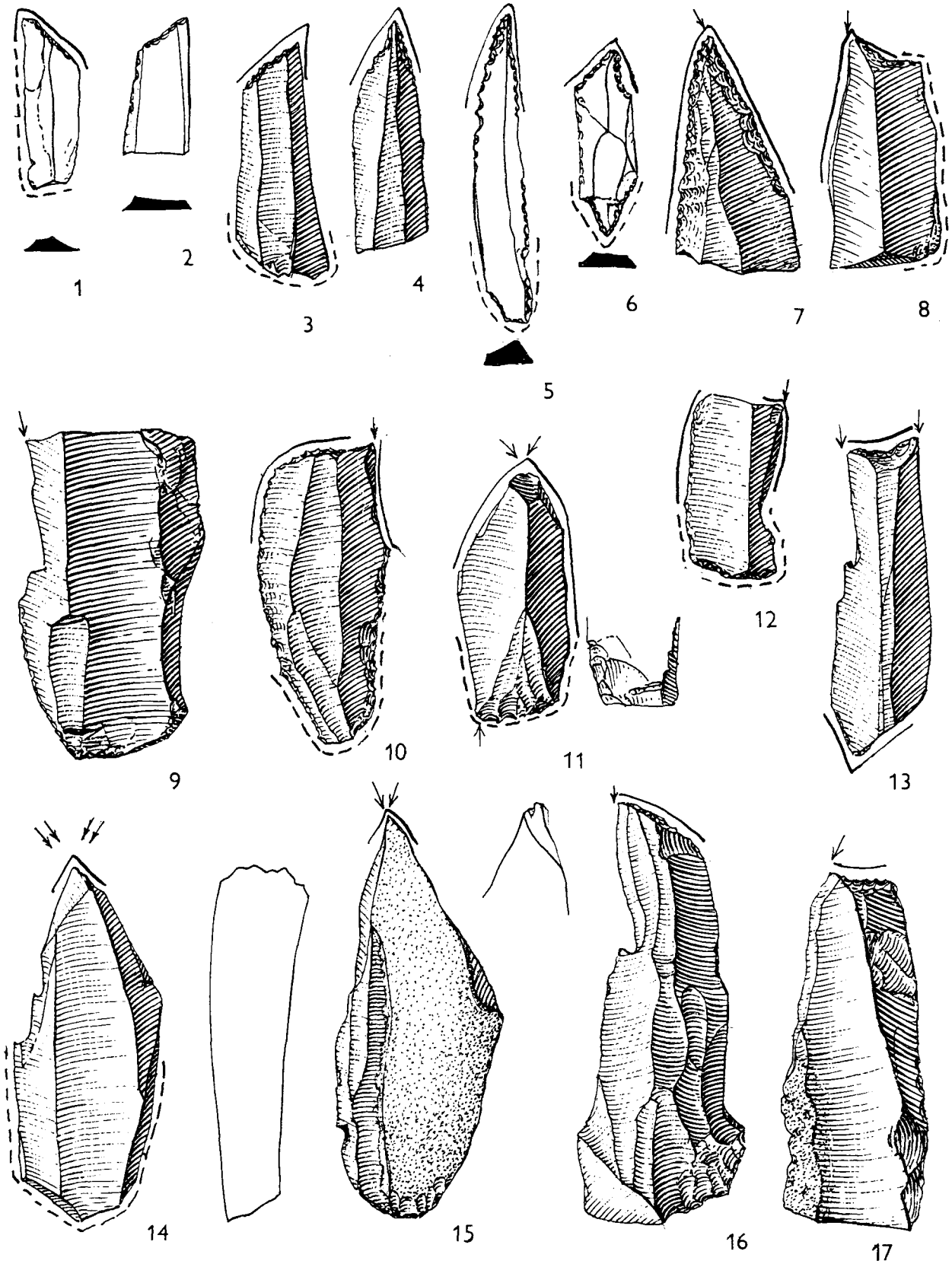


Fig.27. Excavations 1953, sector 3. Full line - traces of use, interrupted line - traces of haft

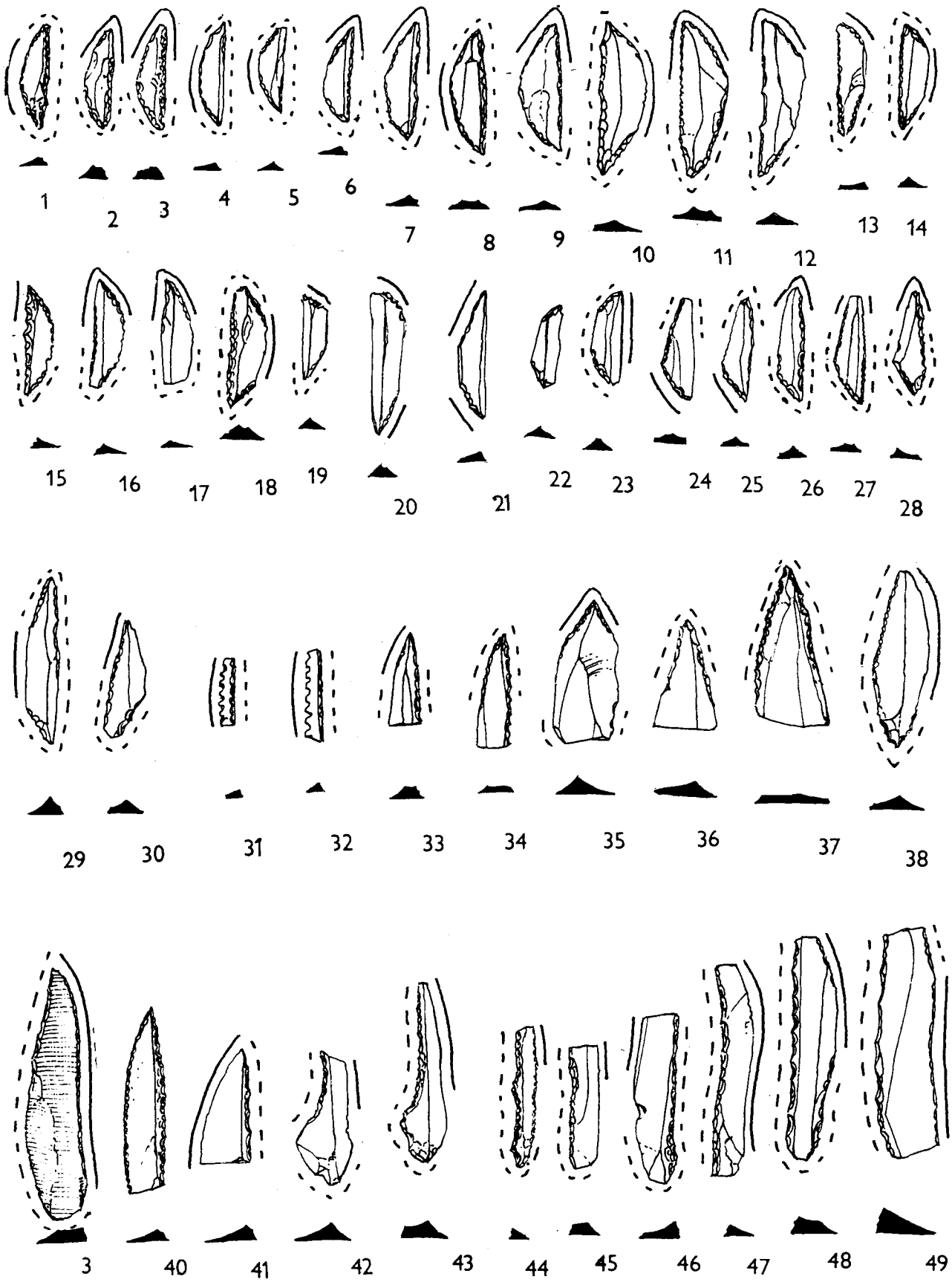


Fig.28. Excavations 1953, sector 3. Full line - traces of use, interrupted line - traces of haft

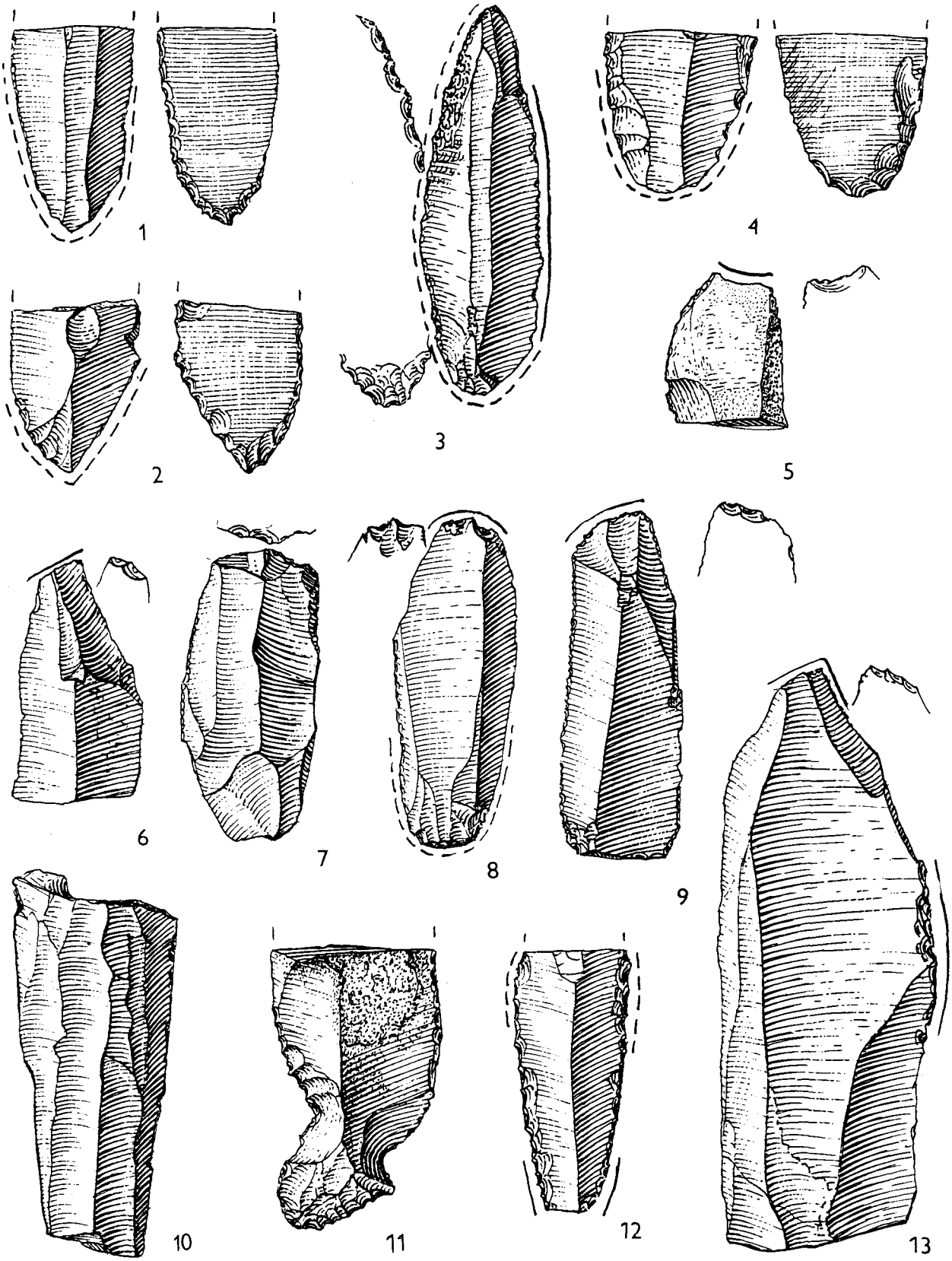


Fig.29. Excavations 1953, sector 3. Full line - traces of use, interrupted line - traces of haft

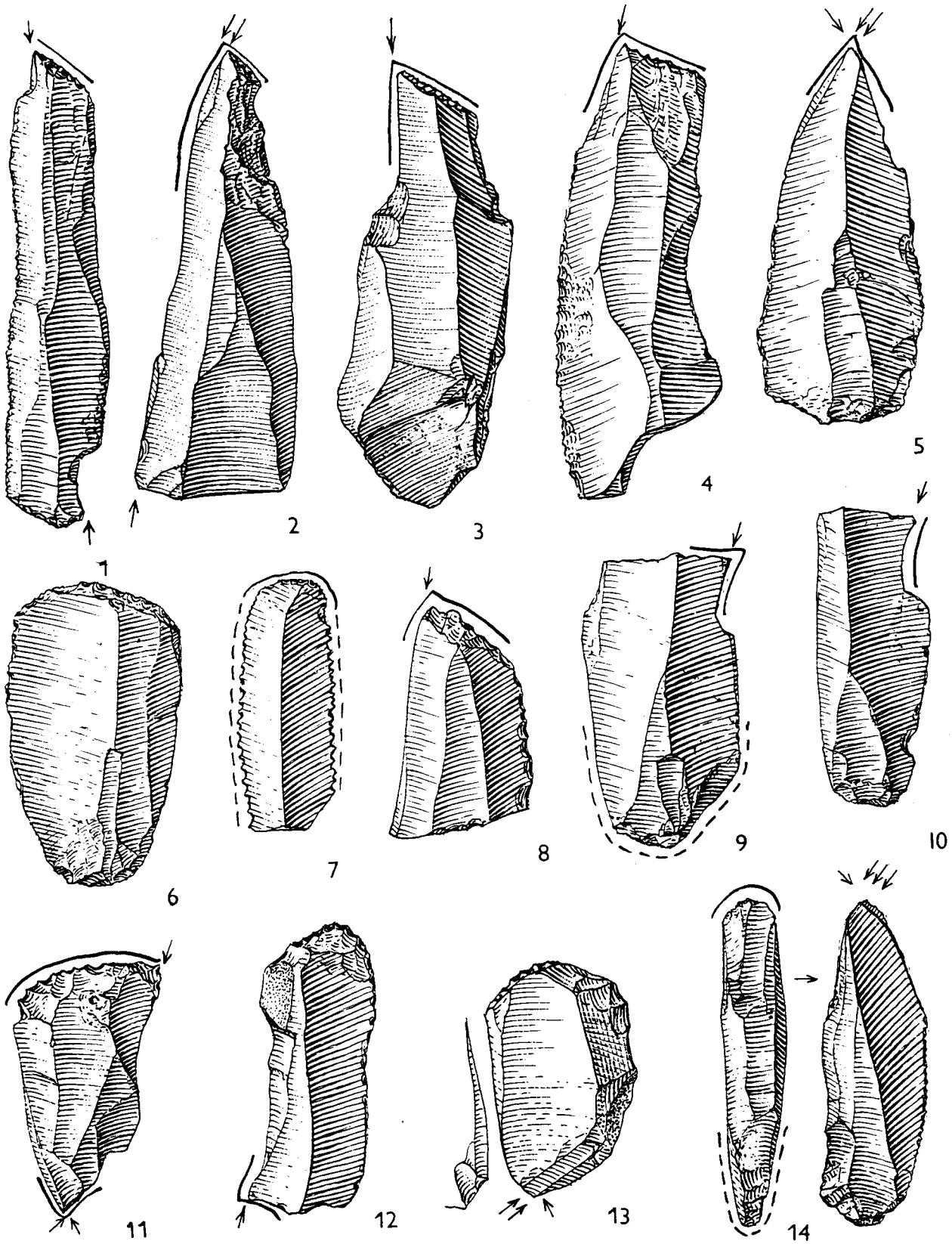


Fig.30. Excavations 1953, sector 4. Full line - traces of use, interrupted line - traces of haft

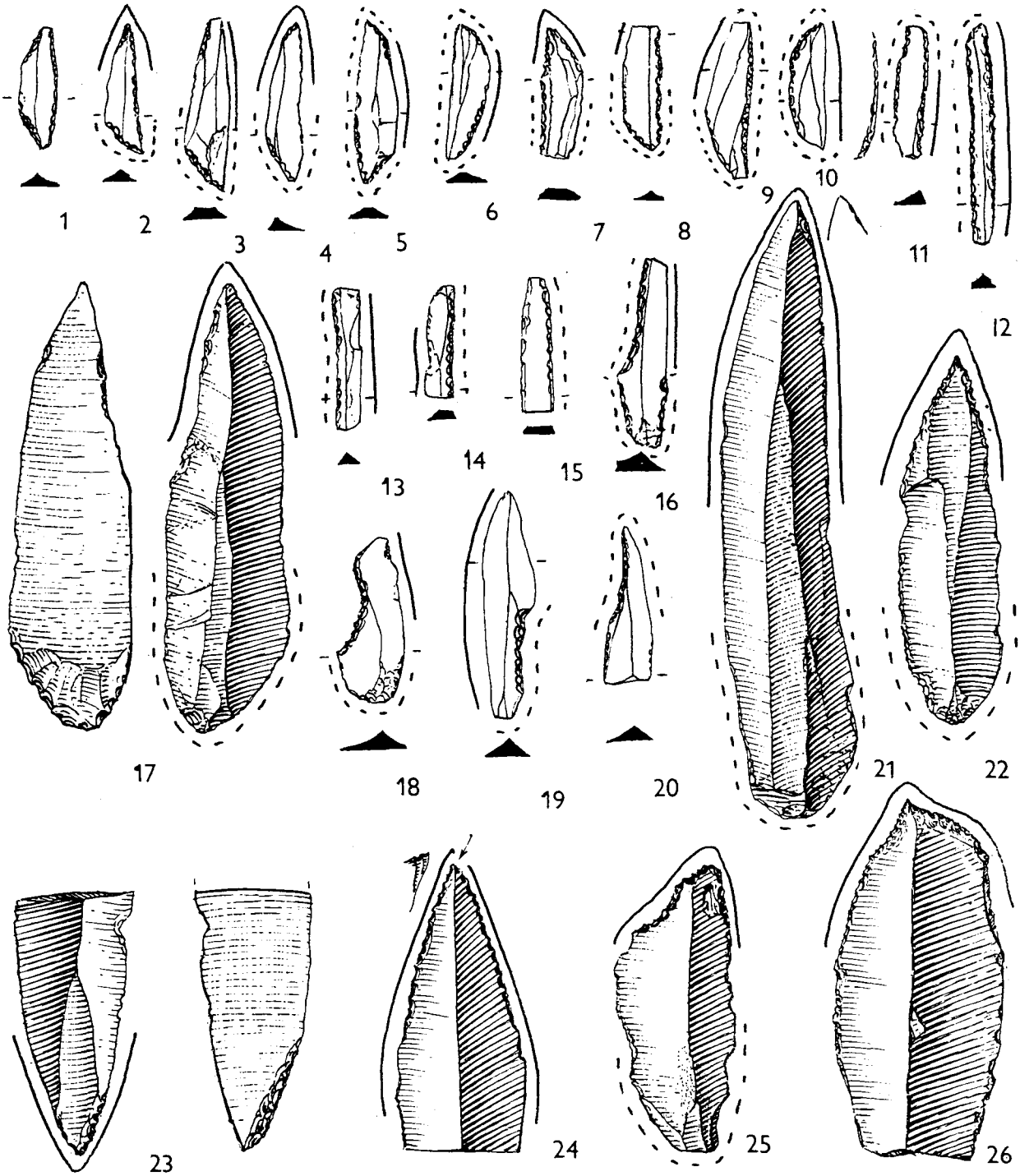


Fig.31. Excavations 1953, sector 4. Full line - traces of use, interrupted line - traces of haft

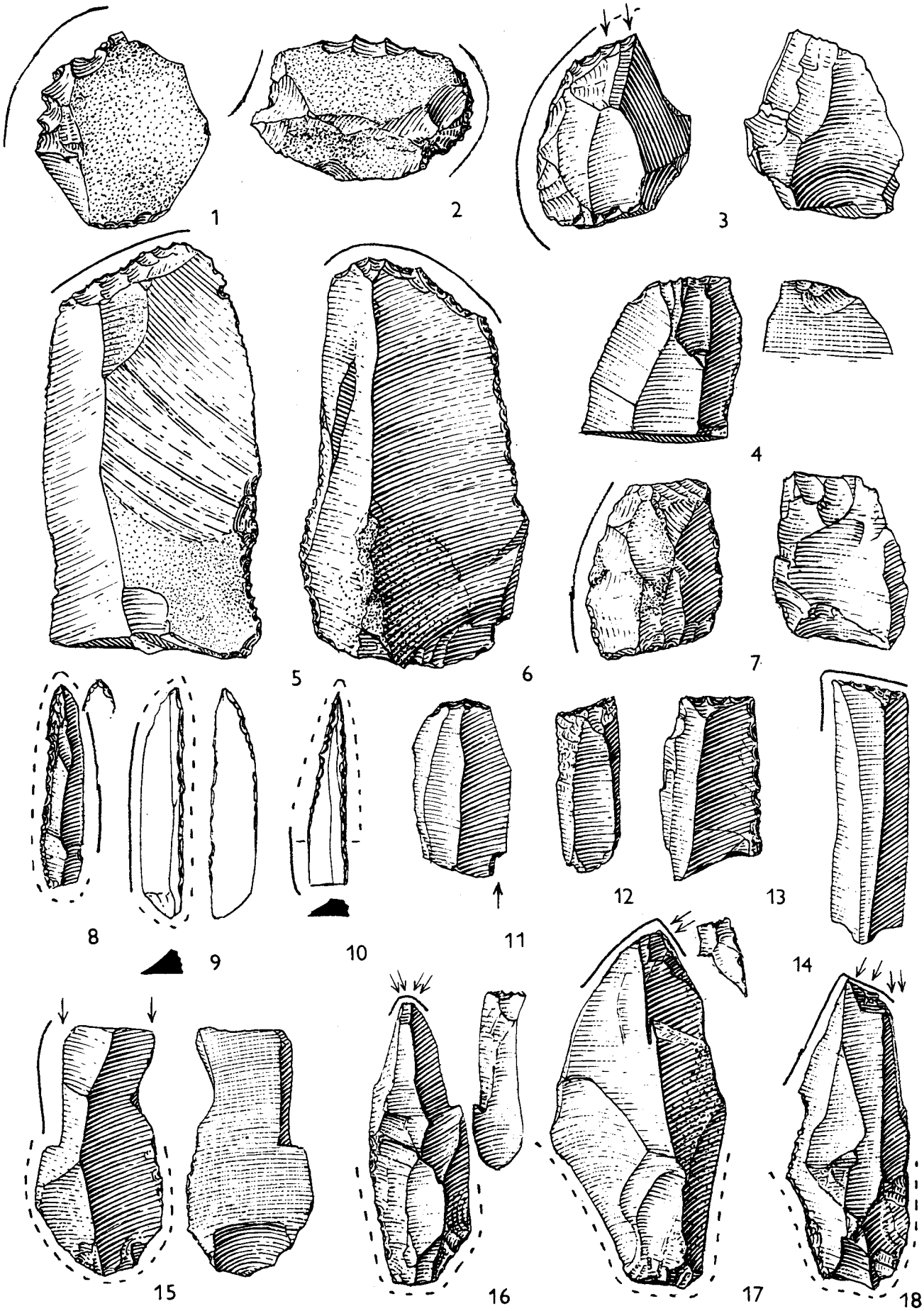


Fig.32. Excavations 1953, 1-7: sector 4; 8-18: sector 5

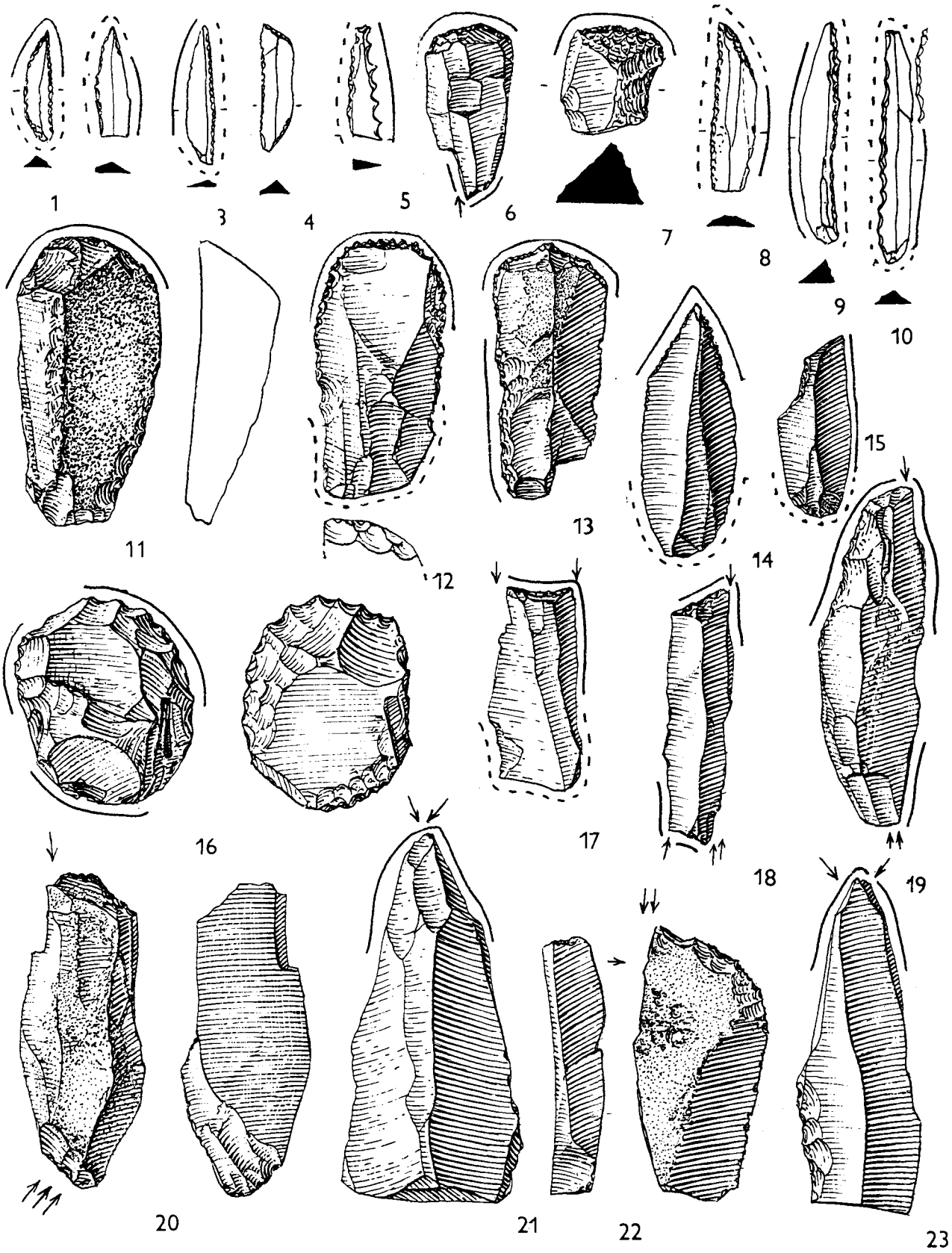


Fig.33. Excavations 1953, sector 6. Full line - traces of use, interrupted line - traces of haft

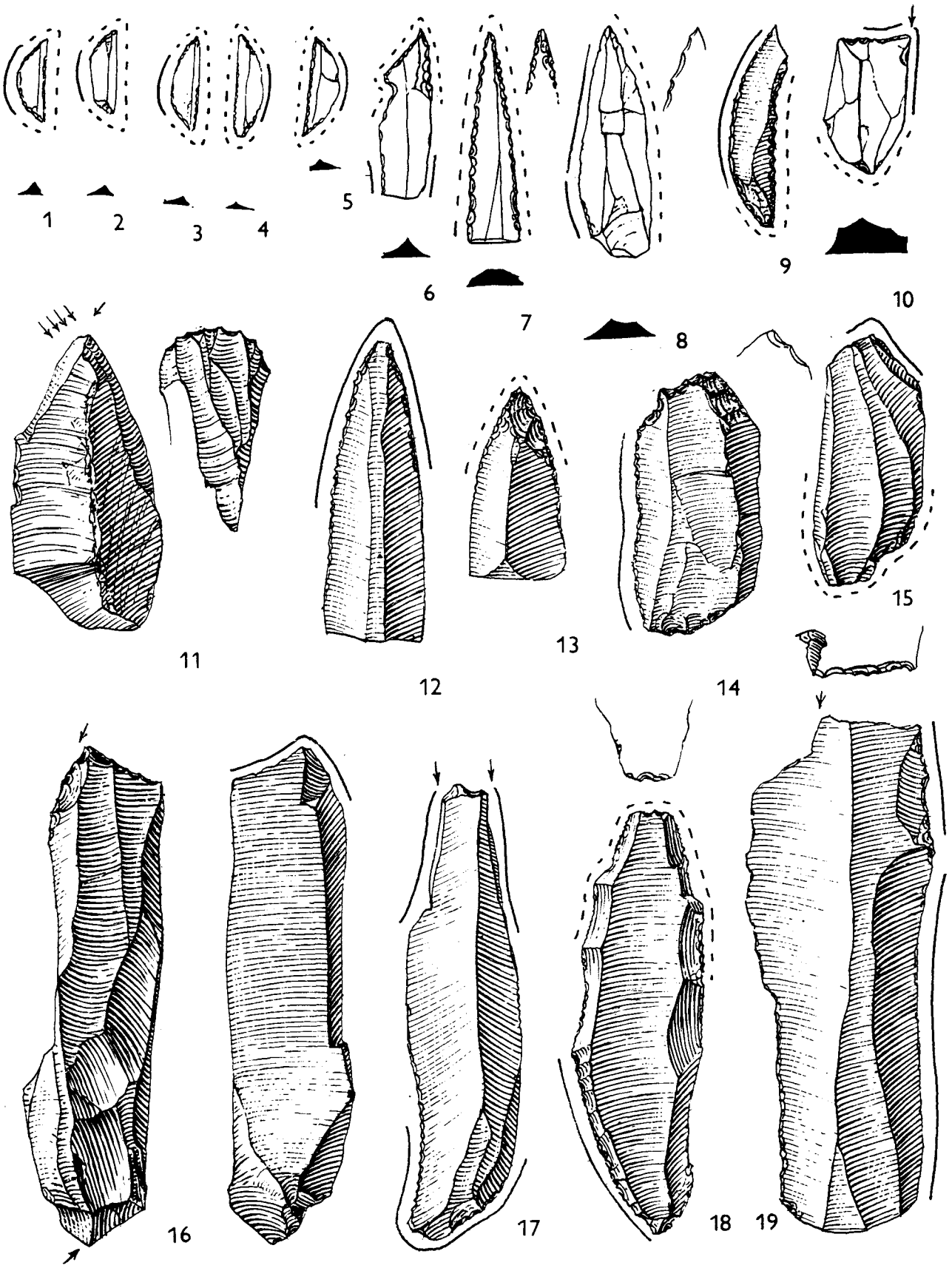


Fig.34. Excavations 1953, sector 7. Full line - traces of use, interrupted line - traces of haft

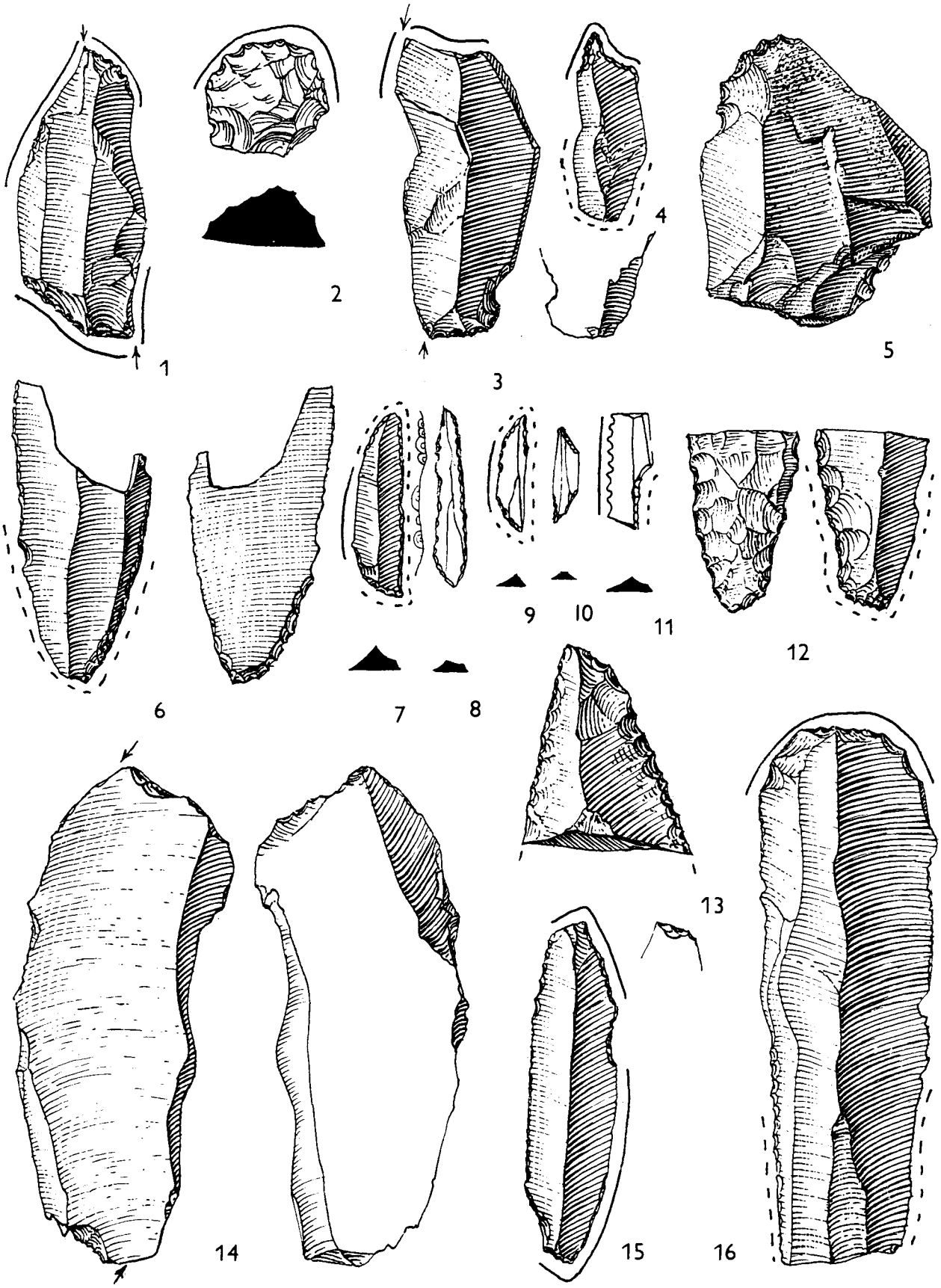


Fig.35. Excavations 1953, 1-5: sector 7; 6-16: sector 8

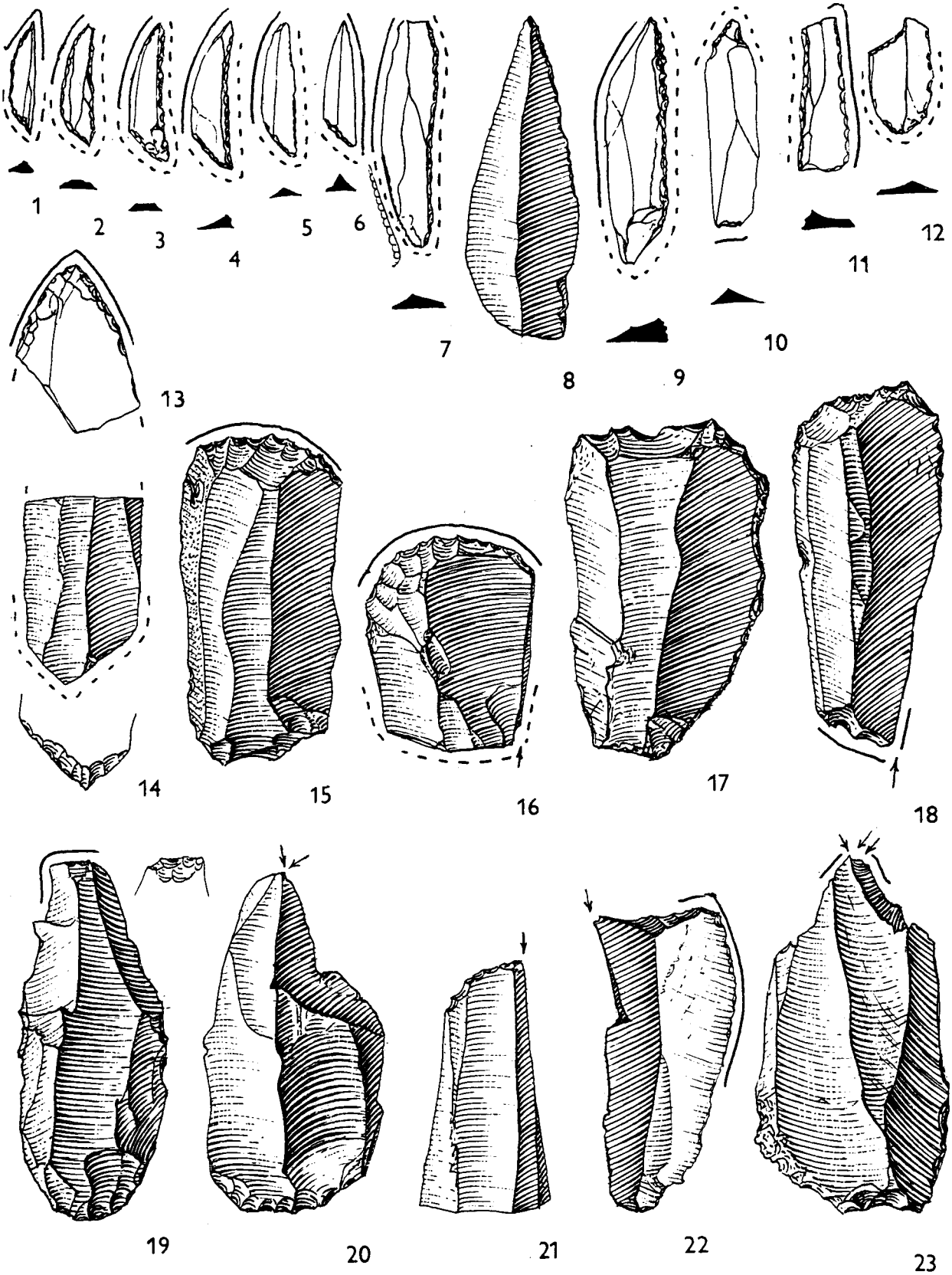


Fig.36. Excavations 1953, the "upper layer". Full line - traces of use, interrupted line - traces of haft

CHAPTER III

THE BONE INDUSTRY, DECORATIVE OBJECTS AND ART
DIE KNOCHENINDUSTRIE, ZIER- UND KUNSTGEGENSTÄNDE

by Bohuslav Klíma

Abstract

The bone industry from Pavlov I is composed of finished and unfinished artifacts of various animal bones, antler and ivory. Not only for their number and good state of preservation, but especially for the richess of forms and types, these artifacts are decisive for defining a group of mammoth-hunters sites in the Central Europe as Pavlovian. Additionary characteristic is being supplied by the decorative objects and the art, carved most frequently of ivory: the elaborate head-bands, relieph pendants, and further anthropomorph and zoomorph carvings. They prove a high degree of mastery in working this noble and precious material. Some of the tools yield evidence of the applied technological procedures: i.e., the mode of antler chipping differs from that described from the Magdalenian.

The tools were mostly found scattered around the hearths. Among the exceptions are a concentration of antler tools, which, however, does not represent a workshop area, and several concentrations of pendants, obviously the remains of colliers.

The description presented here is preliminary. The objects are worth of a more detailed comparative and synthetical study, based on the total material of the site. Until now, such a comparison exists for the antler industry (Klíma 1987a). The type-list created for the first two seasons is valid for the total assemblage as well. It aims to incorporate almost completely the variability of types and forms. There are 419 objects, 273 of which belong to the bone industry.

Die Knochenindustrie, Zier- und Kunstgegenstände

Im Fundgut beider ersten Grabungsjahre der jungpaläolithischen Siedlung Pavlov I. nahmen die Geräte aus Knochen, Elfenbein und Rengeweih eine besondere Stelle ein. Schon ihre Anzahl allein, aber besonderes ihr Typenspektrum, haben ein gutes Zeugnis davon gegeben, dass ausgerechnet diese Reihen von Fundstücken ein bedeutendes Charakteristikum der Fundstelle sind und, wie es sich später zeigte, für die ganze Gruppe der Mammutjägerrastplätze in weitem Umkreise Mitteleuropa eine representative Einheit darstellen. Sie haben dazu viel beigebracht, dass eine selbständige Kulturgruppe des Ostgravettien an Hand dieser Fundstelle erkannt und nach ihr als "Pavlovien" benannt wurde (Klíma 1959).

Gleich die zwei ersten Erforschungskampagne haben zwar eine gute Übersicht über den typologischen Inhalt der Knochenindustrie und der Ziergegenstände angeboten, trotzdem wäre es aber vorzeitig diese genauer zu untersuchen oder sogar zu analysieren. Sie sind, im Vergleich zu der Steinindustrie, in der manche Unterschiede in einzelnen Siedlungsobjekten und Arealen zu ersehen und die dem Arbeitsbedarf nach auch sein müssen, mehr einheitlich und weichen eher nur in unbedeutenden Variationen voneinander ab. Deshalb werden sie zuerst nur übersichtlich betrachtet aber zugleich durch ein vollständiges Verzeichnis mit zahlreichen Abbildungen begleitet und wie durch einen Katalog vorgestellt. Dieser entbehrt nur wenige Wiedergaben einiger Gegenstände, die seit dem Jahre 1991 als Exponate der Ausstellung "Mensch und Mammut" vorübergehend unzugänglich sind. Ungezeichnet blieben auch wenige Knochen mit unbeachtlichen Spuren von Bearbeitung. Es sind besonders Bruchstücke von Mammutrippen, die manchmal teilweise flächig abgeglättet sind. Einzelne Serien beider Gruppen von diesen Denkmälern verlangen eine selbständige und grundsätzliche Bearbeitung aller ihrer Fundstücke um eine wahre Aussage über ihre Position und Bedeutung im gesamten Fundgut der Siedlung zu gewähren. Für einen Muster solcher Aufgaben darf vielleicht schon die durchgeführte Auswertung der Geweihgeräte gelten (Klíma 1987a).

Die Bezeichnung Knochenindustrie, manchmal unrichtig auch "Beinindustrie", im Fundgut der paläolithischen Lagerplätze wurde in der Fachliteratur schon öfters ihrem Inhalt nach diskutiert. Ganz genau betrachtet gehören zu ihr eigentlich nur Geräte aus Knochen. Unter diesem Ausdruck sind aber auch jene Arbeitsmittel eingeschlossen, die aus Zähnen und Geweih hergestellt wurden. Richtiger wäre deshalb diese Serien als Industrie aus organischen Materialen zu bezeichnen, denn noch andere Körperbestandteile der erlegten Tiere haben den urgeschichtlichen Jägergemeinschaften als Rohstoffe zur Verfertigung verschiedener nutzbaren Arbeits- und Lebensbedürfnisse gedient. Unter dieser Bezeichnung würde man aber auch die Rohstoffe der Pflanzenwelt verstehen können. Dies besonders das Holz, denn andere in Frage kommende Gewebe von Pflanzen (ausser Pollen) aus der so weit entfernter Zeit konnten sich natürlich nicht erhalten. Eher nur ausnahmsweise stehen dem Studium des Paläolithikums nicht nur Bruchstücke von Holzkohle und Asche zur Verfügung, sondern auch seltene, unter günstigen Lagerungsumständen erhaltene Holzstücke und Holzgeräte, die uns berechtigen über Holzindustrie zu sprechen (Klíma 1990b).

Die zeichnerische Wiedergabe der Knochengeräte beachtet die typologische Beschreibung und unterlegt dabei den allgemeinen, auch für die Steinindustrie geltenden Gesetzen. Nach diesen Richtlinien ist schon die Orientation der Gegenstände wichtig, wobei ihre Längsachse senkrecht zu besetzen ist und der eigentliche Arbeitsteil als terminales Ende nach oben zielen soll. Dadurch unterscheidet sich dieser Vorgang von vereinzelten Gewohnheiten, die bei der Beschreibung und Abbildung der Artefakte späterer urgeschichtlichen Perioden öfters beachtet werden. Im Falle länglich gespaltener Knochen wird die Oberfläche der festen Kompakta als dorsale und die innere mit Überresten von Spongiosa als ventrale Seite angesehen und dementsprechend auch wiedergegeben.

Als Grundrohstoffe für Herstellung von Knochenindustrie dienten fast alle verwendbare Knochen der gejagten Tiergattungen. In der Regel waren es die langen Knochen von Extremitäten. Ihre feste Kompakta wurde vorwiegend zu Spänen abgespaltet und dann weiter zu verschiedenen Zwecken, mit Vorliebe in spitzige Form, zugerichtet. Ähnliche Verwendung haben auch die Rippen, hauptsählich die Mammutrippen, gefunden. Die Metapodia, Ulna, Fibel, Tibia und auch Os penis eigneten sich durch ihre schmale und spitzige Form als Pfriemen, Ahlen, kleine Stecher und Dolche zum Gebrauch. Kürzere Walze von Röhreknochen und Geweihstangen haben wieder als Griffe und Schäftungen für Steingeräte Gebrauch gefunden. Man hat eine passende Benützung auch den feinen Vogel- und Kleintierknochen zugeteilt.

Sehr selten haben irgend einem Arbeitsprozess auch die Tierzähne, in der Regel nur die Eckzähne, gedient. Versorgt mit einem Loch gehörten sie eher schon seit dem Paläolithikum dem Schmuck an. Eine besondere Rolle spielten aber als Rohstoffmaterialen die Stosszähne. Verschiedene ihre Teile, wie längliche Späne, flache Abschläge oder Splitter dienten hauptsächlich zur Verfertigung von sonderbaren Artefakten, vor allem Speerspitzen, Haarspangen, Haarnadeln und auch von anderen Zier- und Kunstgegenständen. Alle Erzeugnisse aus Elfenbein der ganzen Kulturgruppe bezeugen eine Meisterstufe der Bearbeitung des kostbaren und geschätzten Rohstoffes. Eine ganz besondere Stelle im Fundgut der Fundstelle nehmen aus diesem Matèrial hergestellten Kunstdarbietungen an, die in der Form von flachen Reliefplastiken durchgeführt wurden. Sie sind gemeinsam mit den gravierten Haarspangen als ein wichtiges Charakteristikum der Fundstelle Pavlov I und des Pavlovien anzusehen.

Die Fundumstände aller Bestandteile der Knochenindustrie sowie der Zier- und Kunstgegenstände sind am einfachsten aus der Abb. 1 (Fig.1). sichtbar. Man darf ganz allgemein sagen, dass sich die Denkmäler beider Gruppen vorwiegend in der unmittelbaren Nähe von Feuerstellen und zwar frei zerstreut in deren Umkreise befanden. Das betrifft insbesondere diejenigen Feuerstellen im Inneren der abgegrenzten Siedlungsobjekte, die offensichtlich eine längere Zeit die Wärme ausgestrahlt haben und die die Bedeutung von dauerhafteren zentralen Feuerherden übernommen haben. Eher bloss vereinzelt verfolgten Artefakte der behandelten Gruppen auch die äussere Begrenzung der Behausungen. In der freien Fläche der Siedlung erschienen sie dann nur ausnahmsweise. Die eigene Lage oder eine gewisse Kummulation der Knochenartefakte liess deshalb manchmal auch an die genauere Form der Siedlungsobjekte schliessen.

Eine Aufmerksamkeit dürfen nur einige auffallende Konzentrationen von Ziergegenständen erwecken, die aber ihre Begründung in ihrem öfteren Vorkommen

in zusammengesetzten Halsketten und Stirnbändern oder ähnlichen Komplexen haben. Erfolglos bliebe ebenfalls selbständige Aufzeichnung der genauen Position einzelner Kategorien der Knochenindustrie. Eine Ausnahme bilden nur die stupfen Stecher aus Rengeweih im östlichen Halbkreise des vierten Objektes, in dem auch drei Teile von Geweihhacken aufgehoben wurden. Man kann diese Tatsache jedoch nicht als einen Beweis für die Existenz eines Ateliers betrachten. Es ist auch nicht gelungen in der untersuchten Fläche zahlreichere Begleitsprodukte der Geräteherstellung in insofern bedeutenden Konzentrationen festzustellen, die es erlaubten an solche besondere Arbeitsplätze zu denken. Davon geben auch kein zuverlässiges Zeugnis einige kleinere Anhäufungen von Knochen, von denen die meisten absichtlich gebrochen oder in Trümmer gänzlich zerlegt wurden. Diese tragen zwar öfters Spuren von einer solchen Behandlung und dies besonders in Form von kleinen Schlagnarben, sind aber nicht als Abfall oder sogar als Begleitstücke der zielbewusster Knochenbearbeitung anzusehen. Ähnliche Zusammensetzungen von abgeworfenen Tierknochen sind auch nicht geräumig und dicht. Sie können deshalb keineswegs die grossen Mammutknochenanhäufungen ersetzen, die unter Bezeichnung "Kjökkenmöddinge" für die Siedlung Dolní Věstonice I. ganz typisch sind und die im ganzen Raume der Fundstelle Pavlov I. fehlen.

Das Vorkommen aller Bestandteile der Knochenindustrie sowie der Zier- und Kunstgegenstände hängt direkt mit der Verbreitung und mit dem Charakter der wahren Kulturschicht zusammen. Je mächtiger und fundvoller sie als Ergebnis eines längeren oder wiederholten Aufenthaltes erschien, desto mehr an diesen Erzeugnissen konnte man in ihrem Inhalte erwarten. Die Siedlung wurde eigentlich, wie es sich später zeigte, in ihrer Randzone mit auslaufender Kulturschicht und mit zerstreuten Denkmälern angeschnitten, was sich für die nächste Erforschung als sehr günstig erwies.

Selbst die Form sowie auch die Oberfläche der Knochengeräte verrät mannigfaltiges Verfahren der Herstellung von Halbfabrikaten und von deren Zurichtung. Dazu gehören besonders feine Schnittspuren, tiefere Rillen, kurze Einkerbungen, die öfters regelmässig geordnet sind und die in solchem Falle auch eine bestimmte Bedeutung haben können, weiter auch Schlagnarben, flächige Vertiefungen von abgehauten Abschlägen und Absplissen, in wahrem Sinne des Wortes ebenfalls verschiedenerartig geschnittene und zerbrochene oder auch teilweise abgeglättete Knochenfragmente. Man findet desgleichen Spuren, die einer Art von Sägen, Feilen, Reiben und Schaben beweisen. Alle diese Zeugnisse der Berührung sind gewöhnlich auf der Oberfläche des festen Knochengewebes (Kompakta) gut sichtbar, denn sie liessen sich nicht einmal durch kräftige Verwitterungsprozesse vertuscheln. Seltener kann man aber auch Bearbeitung des inneren Gewebes (Spongiosa) von grossen Mammutknochen in selbständigen Formen beobachten.

Manchmal lassen sich jedoch Beweise der allgemeinen Knochenbearbeitung von deren Abnützung während eines Arbeitsprozesses nich zuverlässig unterscheiden. Das betrifft auch die zahlreichen Abschläge und Bruchstücke, die durch ein absichtliches Vorhaben aber auch durch ganz einfaches Zerbrechen oder sogar durch totale Zertrümmerung entstanden sind und die trotzdem noch als Arbeitsmittel, wenigstens für einen momentanen Gebrauch, die Benützung fanden. Alle diese Knochenfragmente kann man dennoch bei der Beschreibung der Knochenindustrie nicht berücksichtigen. Umgekehrt lassen sich einige von ihnen nicht einfach übersehen.

Mit der Technologie der Herrichtung von Knochengeräten hängt auch die Art ihrer Arbeitsweise sowie ihre Benützung und eigentliche Funktion zusammen. Diese ist für manche Gerätetypen eindeutig zu erkennen, für andere Einzelstücke und sogar auch für ganze Gattungen ist sie aber manchmal schwer zu beurteilen und weiss wahre Überlegungen hervorzurufen. Dies schon deshalb, weil die allgemeine Methodologie der Knochenindustrie nicht genug durchgearbeitet ist. Man entbehrt haupsächlich eine einheitliche Klassifikation, Grundlagen für die Beschreibung und Bezeichnung einzelner Geräteformen und Gruppen, wie eine solche für die Steinindustrie im Gebrauch und gültig ist. Die, unter Anregung von H. Camps-Fabrer und durch die UISPP gegründete Kommission für Nomenklatur der Knochenindustrie will diese mangelhaften Voraussetzungen im folgenden Ablauf der Urgeschichtsforschung erfüllen (Camps-Fabrer 1974). Die bisherigen Bestrebungen in dieser Hinsicht sind eher übersichtlich und allgemein verfasst (Feustel 1973, Semenov 1983). Sollten die Anstrengungen der Kommission erfolgreich sein, müssen sie sich nicht nur mit ethnographischen Parallelen, sondern auch mit Experimenten und mit dem traseologischen Studium befassen. Dieses verlangt jedoch mikroskopische Untersuchungen der verwitterten Oberfläche der Knochenkompakta, auf der die feinsten Kratzer- und Schnittspuren nicht einfach zu verfolgen sind und öfters die Knochenstruktur, besonders für die parallel mit der Längsachse der Knochen laufenden Gewebefanden gehalten werden können.

Die einfachen Schnittspuren sind überwiegend bei Zerteilung der erlegten Tiere entstanden und dürfen deshalb nicht zu der Knochenindustrie gehalten werden. Anders muss man aber offensichtlich Knochen mit sonderbaren Schlagnarben beurteilen, die durch absichtliche Zerlegung der Knochen entstanden sind und deren Behandlung zur Gewinnung von geeignetem Rohstoff oder direkt von Halbfabrikanten zielte. Manche solche Arbeitsergebnisse in Form von Abschlägen und Spänen konnten sogar schon allein verschiedenen Zwecken als unvollendete Geräte und als zweckmässige Hilfsmittel dienen.

Die Nomenklatur der Knochenindustrie übernimmt begreiflicherweise die französischen Erfahrungen und Bezeichnisse. Die übliche typologische Beschreibung geht in erster Reihe aus der vorausgesetzter Funktion der Artefakte heraus. Lässt sich diese nicht eindeutig erkennen und beurteilen, stützt sie sich auf die Form, die dem Rohstoff absichtlich verliehen wurde. Nur ausnahmsweise empfehlt es sich ganz besonderen Artefakten die Bezeichnung der Fundstelle noch zuzufügen und zwar nur dann, wenn es sich um Abweichungen vom üblichen und in der Funktion ganz klaren Vorbild handelt.

Die Knochenindustrie ist in einer einheitlichen Betrachtung gemeinsam mit den Zier- und Kunstgegenständen absichtlich behandelt. Es wäre in manchen Fällen nicht möglich diese beide Kategorien voneinander zu trennen, denn beide sind eng verbunden. Die ausgesprochenen Geräte sind öfters mit eingravierten Verzierungen versehen, die sogar auch eine Art von wahren Produkten der bildenden Kunst einnehmen. Umgekehrt aber auch eindeutige Zier- und Kunstgegenstände haben durch ihre besondere Form oder als kultische Bedürfnisse eine allgemeinere, ja manchmal auch richtige praktische Verwendung gefunden und tragen Spuren von einer solchen Betätigung.

Für den einfachsten Beweis von einer absichtlichen Berührung von Knochen gelten scharfe Schnittspuren auf ihrer Oberfläche. Sie kommen eher nur selten und vereinzelt vor. In der Regel wiederholen sie sich als parallel verlaufende Linien, die

die Längsachse der Knochen verfolgen (Abb. 5:1-2; 7:7). Ihre mehrmalige Wiederholung gibt ein Zeugnis von dem mühsamen Schneiden des widerstandfähigen Fleischgewebes mit einem schlichten Feuersteinmesser (Abb. 5:7-8). Am besten zeigt sich diese Tatsache im Bereich der härteren Muskulatur und besonders nahe dem Knochengelenk (Abb. 6). Mehrere Knochen mit einfachen Schnittspuren beinhaltet die osteologische Sammlung, die als eine selbständige Einheit dem paläontologischen Studium übergegeben wurde (Kapitel VI).

Durch eine mehrmalige Führung der scharfen Messerkante konnten auch tiefere Rillen entstehen (Abb. 8:1-2). Manchmal bilden die Schnittlinien verschiede zusammengesetzte Bündel (Abb. 8:4). Dem öfteren überqueren sich die Schnittspuren wie geritzte Striche und zeichnen dann sogar ganz bunte regelmässige und geometrische Formen auf, die absichtliche Gravierungen ähneln (Abb. 8:3, 9-11). Zu diesen gesellen sich als ein Übergang zu wahren sinnvollen gravierten Bildern dicht nebeneinander parallel laufende Einkerbungen (Abb. 5:2).

Neben lang gezogenen Ritzlinien kommen auch kurze eingeschnittene Abszisse vor (Abb. 7:3-5), die schon als Schlagnarben gedeutet werden können. Eindeutige Nachweise von einer solchen Behandlung erscheinen besonders auf Bruchstücken von festen und grossen Knochen (Abb. 2:16; 5:1). Als Ergebnis absichtlicher Zerspaltung, zum Unterschied von einer einfachen Zerschlagung und Zertrümmerung von Knochen, sind verschiedene Formen der festen Kompakta grösserer Knochen entstanden. Auf diesen lassen sich am meisten kleinere aber auch grössere flache Narben verfolgen.

Manche davon zeugen von einer fortgesetzten Bearbeitung einzelner Bruchteile. Andermal übernehmen solche Bedeutung teilweise an der Kante oder in der Fläche abgeglättete Knochen. Eine totale Abglättung, die sich fast als Polieren erweist, verfolgt selten kleine Knochensplitter, deren Urpsrung aber als rätselhaft erscheint. Ihr Aufsehen erinnert Knochen, die öfters in Höhlensedimenten auftauchen oder kleine scheibenförmige flache Gerölle, die, wie es schon J. Matiegka (1934, 1938) vorausgesetzt hat, im Munde getragen worden waren (Abb. 34:1-3).

Bei der Zerspaltung von Knochen entstand eine beträchtliche Anzahl von kleinen Kompaktafragmente in mannigfaltigen Formen, die sich nicht nur zu Halbfabrikaten, sondern auch zu wahren Geräten zureichen liessen, besonders wenn diese noch öfters Spuren vom folgenden Spalten, Abhauen oder von einer anderen Zurichtung aufweisen. Aus der Kompakta von festen Knochen wurden Absplisse und regelrechte Späne abgehaut, die sich in einer absichtlichen Gestalltung wiederholen und die als Grundformen für weitere Anpassung geplant wurden. Dazu eigneten sich besonders die Mammut-, Nashorn- und Pferdeknochen. Sie nehmen öfters die Form von spitzigen oder noch näher zugespitzten langen Spänen an (Abb. 1). Manchmal erreichen sie durch ihre weitere Bearbeitung Aussehen von steinernen Sticheln (Abb. 10:4), knebel- (Abb. 0:3-5), meissel- und keilartigen Geräten (Abb. 10:1-2). Manche davon landaten ebenfalls im osteologischen Material, das für ein näheres paläontologisches Studium zugeteilt wurde (Musil 1959).

Eine besondere Aufmerksamkeit jedoch verdienen die Rippen, deren längliche und schmale Gestaltung sich für die Herrichtung von speziellen Gerätetypen eignete. Einfach zugespitzt (Abb. 2:14; 13:5, 8-10; 14:4) konnten diese sogar als Lanzenspitzen Gebrauch finden. Überwiegend wurden die Rippen nahe dem distalen Ende quer abgebrochen und abgerundet. Dadurch ist eine flach ausklingende Kante entstanden, die verschiedene Arbeits- und Abnützungspuren trägt. Nach diesen kann

man kleinere und ausreichend abgeglättete Stücke (Abb. 11:4-9; 13:1-4) für Glätter oder jene Arbeitsmittel halten, die sich bei ihrer Betätigung im weichen Milieu, wie Fleisch oder Fell, bewegten. Die breiteren und mit eingeritzten Rillen in Längsrichtung begleiteten Stücke dürfen für Wühlstöcke gehalten werden (Abb. 2:15; 11:1-3; 12:1-2; 13:3, 6; 14:1-3, 5). Sie sind für das ganze Gebiet des Ostgravettien charakteristisch. Ihre Bedeutung hebt öfters auch die geritzte Gravierung hervor. Diese wird sogar auch in regelmässigen Mustern durchgeführt. Ein solches einzigartiges Stück ist eine Mammutrippe, die auf einer Seite mit feinen Querstrichen und auf der anderen mit tief eingraviertem Kasettenmuster versorgt ist (Abb. 12:3). Ein weiteres nur im Fragment erhaltenes Exemplar (Abb. 13:7) bestätigt das Gesetz der Duplizität.

Grössere Teile von breiten und massiven Rippen dienten zur Verfertigung von schaufelförmigen Geräten. In der Regel wurden die Rippen länglich zerspaltet und ihre feste Kompakta im verbreiteten Abschnitt flach in die Form einer Schaufel zugerichtet und vollkommen abgeglättet (Abb. 15-18). Die schmale und dickere Hälfte stellte einen Griff dar. Es wird vorausgesetzt, dass sich die Schaufeln für die Erdarbeiten sowie auch für die Schlachtung eigneten. Für eine solche Annahme spricht der fragmentarische Erhaltungszustand dieser Typenreihe. Alle Teile solcher Geräte waren ohne Zweifel einer mühsamen und kraftvollen Arbeit ausgesetzt, die zu ihrem Zerbrechen in der Querrichtung führte. Es sind öfters aber auch nur Kanten abgesplittert worden (Abb. 17:6-8). Ein solches Beispiel ist mit ganz regelmässig eingesetzten Einkerbungen ausgestattet und schaut wie gezähnt aus (Abb. 18:6).

Die schaufelähnliche Form wiederholt sich in verschiedenen Dimensionen. Die grössten davon erreichen mächtige Späne von Schenkelknochen, die nicht terminal, sondern an den Kanten von zusammenhängenden Schlagnarben begleitet sind. Diese bezeugen nicht nur die technologische Vorgangsweise der Bearbeitung, sondern auch die Arbeitsfolgerung als schwere Keule. Ein einziges Stück dieser Art kam im Jahre 1953 in einer selbständigen Versuchsonde westlich der Siedlungsfläche zutage. Es gehört eigentlich nicht zu der behandelten Fundeinheit und ist deshalb nicht abgebildet.

Kleine und spitzige Knochen führten zur Herrichtung von einer grösseren Anzahl von feiner Pfriemen und groberen Stecher. Für die erste Reihe eigneten sich hauptsächlich die Ulna, Fibel und Metapodia kleiner Wirbeltiere wie Hase, Fuchs und Wolf (Abb. 19:1-3; 20:1-6); für die zweite dieselben Knochen von Rentier und Pferd (Abb. 2:11-13; 19:9-13, 15; 20:7-10). Öfters wurden ebenfalls verschiedene spitzige Knochensplitter (Abb. 2:11-13; 19:9; 20:11-13) und seltener sogar auch os penis (Abb. 19:16-17; 2:5) zum Gebrauch ausgesucht.

Die zarteren Knochen konnten begreiflich leicht abbrechen, wurden in dem Fall manchmal wieder jedoch zugespitzt und benützt. Dieser Vorgang wiederholte sich als keine Seltenheit sogar mehrmals und liess endlich kurze und stumpfe Gebilde entstehen, die bei weiterer Betätigung total abgeglänzt wurden (Abb. 19:10, 13-14; 21:10). Manchmal wurden die abgebrochenen spitzigen sowie die walzförmigen mittleren Teile als mannigfaltig verwendbare Stäbchen für nützlich gefunden und zu einem entsprechenden Zweck benützt (Abb. 2:1-10; 19:4-8). Die Bedeutung dieser Gerätegattung liegt nahe. In den kalten klimatischen Umständen war es notwendig die körperliche Temperatur sowie auch einen begrenzten Lebensraum in einer zeltartigen Überdachung zu schützen. Für ihren Aufbau brauchte man unbedingt Pfriemen in Funktion von Ahlen und Nadeln sowie auch feste Stecher im Sinne von Locheisen. In der Regel tragen nur die Stecher neben einfachen Schnittspuren (Abb. 20:12) noch

flächig begrenzte Gravierung, die meistens aus kurzen parallel laufenden Striche besteht (Abb. 21:1-10). Die flachen Stecher könnte man ebenfalls für Dolche halten (Abb. 20:12).

Die Fingerknochen von Rentier und Wolf wurden in einigen Beispielen mit Loch versorgt und sind dadurch zu einfachen Signalpfeifen geworden (Abb. 2:17; 34:5-6), die in dieser Form erst später im Magdalénien üblich sind. Im Pavlovien gehören sie also zu den progresiven Zügen der materiellen Kultur ebenso wie eine andere Art einen Ton durch Zuflut der Luft gebenden Knochen. Dazu eigneten sich am besten die hohlen Knochen von Hase. Nach einem glatten Querbruch, zu dem die tiefen Schnittrillen geholfen haben, sind sie für Querflöten und für die ältesten Musikinstrumente gehalten (Abb. 2:18, Absolon 1937).

Das ganze Fundreichtum an Geweihgeräten aus der Siedlung Pavlov I. wurde zwar schon in einer selbständigen Abhandlung veröffetlicht (Klíma 1987a), aber für den Gesamteindruck der Fundeinheit aus beiden behandelten Grabungsjahre ist es notwendig auch diese Artefakte übersichtlich hier wiederholt zu präsentieren. Sie stammen alle aus dem Jahre 1953, nachdem die erste Grabung keine solche Stücke lieferte.

Zur Anwendung eigneten sich nach dem Abbrechen aller Sprossen selbst die Hauptstangen und zwar ihre walzförmigen Stangenstücke allein. Sie wurden aber gewöhnlich in längliche Späne zur weiteren Bearbeitung zerlegt. Als Ergebnis einer solchen Betätigung darf eine Reihe von kleinen stumpfen Spitzen gelten, die aus länglichen Abschlägen geformt wurden. Keinesfalls waren es aber die langen Späne, die zur Magdalenienzeit durch tiefe, mit Steinsticheln parallel geritzte Rillen aus dem Geweih ausgeschnitten wurden. Durch dieses technologischen Merkmal unterscheidet sich die Geweihindustrie des Pavlovien von der des Magdalénien. Die Herrstellungs- und Bearbeitungstechniken bestanden aus Hacken, Anschleifen, Zuschlagen und besonders in der charakteristischen Zerspaltung, deren Spuren als seichte Einkerbungen am Rande der Bruchflächen deutlich zu erkennen sind (Abb. 22:7-8; 25:3;26:1). Diese sind durch das Einschlagen der harten Steinmeissel und mächtigeren Keile an zwei gegenüberliegenden Stellen in das Geweih entstanden. Die spitzigen Endstücke der abgetrennten Sprosse verraten nicht nur durch Abglättung des Gipfels, die auf einem natürlichen Wege entstanden konnte, sondern durch Schnittspuren und Einkerbungen, dass sie gelegentlich zum Stechen oder Bohren und als pfriemenartige Geräte verwendet wurden (Abb. 22:2, 9). Auch die flachen Stangenschaufeln wurden nicht nutzlos abgeworfen. Das regelmässig geformte Stück (Abb. 22:1) lag angebrannt inmitten von einer Aschenstätte und seine Funktion als Feuerhacken liegt deshalb nahe.

Die Ritz- und Schnittspuren begleiten manche Bruchstücke und Abschläge von Geweihstangen. Sie lassen aber nichts davon wissen, durch welche Tätigkeit sie entstanden sind. Es gibt abgerundete und geglättete Teile (Abb. 22:8; 24:3-8), spitzige Bruchstücke (Abb. 22: 3-4), Fragmente mit meisselartig zugeschlagener Arbeitskante (Abb. 22:5) und stichelartig zugespitze Abschläge (Abb. 22:3-4), die als Glätter, Meissel, Spaltstücke oder Retuscheure Anwendung finden konnten.

Zum eindeutigen Charakteristikum der Siedlung in Pavlov gehören die hackenartigen Hiebwerkzeuge, bei denen eine Basissprosse, in der Regel die Eissprosse, nicht gänzlich abgetrennt ist und die als "Lyngby Beile" bekannt sind (Abb. 23:1). Sie sind ohne Ausnahme im Typus der quer zugeschliffenen Arbeitskante als Hacke geformt und sind für Geräte zu den Erdarbeiten anzusehen. Zerbrochene

Stücke (Abb. 22:2-3) und abgeschlagene Sprossen oder deren Absplisse (Abb. 23:4-6) bezeugen eine beträchliche Anzahl, in der diese merkwürdigen Hacken hier plötzlich erschienen. Wurde die Sprosse nicht bis zur Basis abgehaut, konnte ein hammerartiges Werkzeug entstehen (Abb. 22:3). Walzenförmige, an beiden Seiten intensiv bearbeitete Geweihstücke sind als Geräte anzusehen, die sich wieder zum Reiben, Zermalen und zum Hammern eigneten (Abb. 26:2-3).

Teilweise länglich geteilte Stangen, deren vollständige Basis als Griff diente und das obere Ende zugespitzt oder abgerundet aber öfters abgebrochen wurde (Abb. 25), hat man ursprünglich für Stecher (Klíma 1989) oder eine stechartige Handwaffe im Sinne eines mächtigen Dolches erklärt. Später zeigte sich, dass ihnen eher die Bedeutung eines Wühlstockes oder Pickles angehören könnte. Endgültige Erklärung ihrer Funktion brachte aber erst die letzte Grabung (1993) in Grubgraben (Brandtner 1990, Montet-White 1991), wo sechs dieser vollständigen Artefakte in die Tiefe von 35 cm in den Boden eingeschlagen wurden. Ihre näheren Fundverhältnisse, die einen Bogen bildeten, zeugten davon, dass sie richtige Zeltnägel waren, die für die Verankerung der Überdachungskontruktion einer runden Behausung sorgten.

Die folgenden zwei Gegenstände sind keine echte Geräte, denn die Fassungen, Griffe oder Schäfte nur als ergänzende Bestandteile der Knochenindustrie anzusehen sind (Abb. 22:2; 26:4). Für diese Zwecke eignete sich das Geweih vollkommen. Manche Geweihstücke sind durch Gravierungen verziert. Ihre Art ist immer dieselbe: entweder parallel laufende kurze und feine Einschnitte oder mit Vorliebe in diesem Rohstoff leicht durchführbare tiefere und breitere Einkerbungen, die nebeneinander in Querrichtung längliche Reihen bilden (Abb. 23:2-3; 24:3; 26:1).

Die Erforschung der materiellen Kultur urgeschichtlicher Jägergemeinschaften widmete bisher der Verwendung von Mammutelfenbein nur eine beschränkte, seiner Bedeutung nicht entsprechende Aufmerksamkeit. Die Ursache lag teilweise auch im Mangel an Möglichkeiten ein umfangreiches und gut erhaltenes Fundmaterial solcher Art zu studieren. Diese Tatsache bestätigten schliesslich die Ergebnisse eines internationalen Symposion, das im Jahre 1992 vom Centre universitaire européen pour les biens culturelles in Ravello (Italien) veranstalltet wurde. Leider war es nicht möglich bei dieser Gelegenheit alle Erfahrungen und Ergebnisse vorzulegen, die das zahlreiche Fundmaterial aus Pavlov bietet. Durch seine massenhafte Vertretung, Mannigfaltigkeit an Formen und Art der Bearbeitung stellt das Mammutelfenbein ein weiteres Charakteristikum der Fundstelle dar. Schon deshalb verdient es, nach dem Vorbild vom Geweih eine selbständige zusammenfassende Abhandlung, die auch die technologische Seite auf Grund der Experimente betrachten muss.

Trotz mancher Unterschiede verhält sich das Mammutelfenbein im Prozess der Behandlung ähnlich wie die feste Kompakta von grossen Mammutknochen. Es ist in diesem Sinne selbstverständlich, dass sich aus diesem edlen Rohstoff auch dieselben Geräteformen und Halbfabrikate wiederholen. Als Grundformen für eine Zurichtung dienten die walzförmigen Bruchstücke von quer geteilten Stosszähnen (Abb. 28:1), von denen dann grössere Splitter und besonders längliche Späne abgehaut wurden. Sie kommen zahlreich in Fragmenten vor (Abb. 3:1-3) und erreichen öfters knebel- und meisselartige Form (Abb. 3:5-7; 28:4, 6). Auffallend wirken die spitzigen und manchmal noch zugespitzten langen Späne (Abb. 3:4; 27:1-3). Durch den Arbeitsprozess sind natürlich kleinere Abschläge entstanden, die in der Regel ebenfalls länglich gestalltet wurden (Abb. 3:9-10; 31:2, 6-8). Breite und flache Formen bilden aber keine Ausnahme (Abb. 3:8).

Für Halbfabrikate und Bruchstücke von wahren Geräten sind davon diejenigen zu bezeichnen, die Abglättung aufweisen und geritzte Linien oder sogar echte Gravierungen tragen (Abb. 3:3,11; 28:5-7; 31:1-2, 7-8, 10). Eine vollkommenere Abglättung verrät einen laufenden Übergang zu eindeutigeren Glättern (Abb. 28:2, 4; 31:11, 15-16). Die flachen, regelmässigen und mit Andeutung von Gravierung, konnten als Halbfabrikate oder Bruchstücke von Haarspangen (Abb. 28:3; 31:4-5, 9, 11), andermal als kleine Löffel (Abb. 31:13, 14) angesehen werden.

Zu den typischen und auch zahlreichen Gegenständen der Fundstellen von Pavlovien gehören die zylindrischen Spitzen. In Pavlov selbst hat man sie in verschiedenen Dimensionen aus schmalen Spänen von Mammutelfenbein geschnitten und meistens einwandfrei ausgeglättet. Es gibt kleine aber auch ganz grosse Stücke, die eine Länge von über 50 cm erreichten. Leider sind sie in der Regel aber nur in Bruchstücken erhalten geblieben (Abb. 4:1-2; 29:1-7; 30:1-20). Sehr selten kommen flache Fragmente vor, die entweder in der ganzen Länge flachen Vertretern dieser Gerätegruppe oder solchen Spitzen angehören konnten, die nur teilweise abgeflacht wurden (Abb. 4:7; 30:14-15). Die besten Beispiele solcher Exemplare sind Einzelstücke, die ausgerechnet im oberen Teile abgeflacht sind und zugleich auch einen verbreiteten harpunenartigen Gipfel aufweisen (Abb. 30:17-18). Als Ausnahme dürfen diejenigen gelten, die mit einer Längsrille im Sinne der Blutrinne (Abb. 4:9; 30:16) oder mit zerklüfteter Basis (Abb. 30:19-20) versorgt wurden. Für unvollendete Exemplare von Spitzen darf man vielleicht schmale kantige und nur teilweise abgeglättete kleine Stäbchen halten (Abb. 30:1-7).

Walzenförmige und an beiden Seiten intensiv bearbeitete Teile von Stosszähnen sind, ganz ähnlich wie dieselben Formen von Geweihstangen, als Reiber, Pochstücke oder Schlägel anzusehen. In der vorgeführten Kollektion sind sie nur mit einem zarten Beispiel vertreten (Abb. 28:8). Die feinsten schmalen zylinderförmigen Elfenbeinstäbchen sind nur in Trümmern (Abb. 30:8-12) erhalten geblieben. Es ist schwer zu entscheiden ob diesen zarten Gegenständen eine Bedeutung von einfachen Nadeln im Sinne von Pfriemen zugeschrieben werden darf. Der edle Rohstoff spräche eher für Schmuckstücke, am ehesten für Haarnadeln.

Das Beispiel von eben angeführten Haarnadeln ist ein guter Beweis eines fliessenden Überganges von nutzbaren Geräten zu den Ziergegenständen, die mit Vorliebe aus Mammutelfenbein hergestellt wurden. Zu solchen gehört der mächtige Armring (Abb. 33:30), der in diesem Falle nur in einem Bogenfragment vorgestellt werden kann. Als rätselhalfte Gegenstände muss man die flachen und total abgeglätteten Plätchen halten, die eine merkwürdige schildartige Form aufweisen (Abb. 4:15-16; 33:28-29). Sie wiederholen sich öfters in dieser Durchführung und lassen keinen Zweifel davon wissen, dass sie keine ausgesprochene Gebrauchsartikel darstellen und dass ihnen im Gegenteil eine besondere, vielleicht eine symbolische Bedeutung zugeschrieben wurde. Ist ihre untere Kante tief und breit eingekerbt entsteht ein mondsichelförmiges Gebilde, das den wahren Anhängern ähnelt (Abb. 33:24-25). Dies verraten eindeutig Beispiele, die nicht mit einer Einkerbung sondern mit einem vollen Loch versorgt wurden (Abb. 33:26-27). Das Loch ist in beiden abgebildeten Fällen teilweise abgebrochen und deshalb nicht vollständig, jedoch überzeugend genug.

Bewunderungswert sind ebenfalls die ringförmigen Anhänger. Das grössere Stück überrascht durch seine vollkommene Form (Abb. 33:31), die Kollektion von sieben folgenden Exemplare wieder durch ihre Zertlichkeit (Abb. 33:32). Diese

befanden sich alle gemeinsam in einem vertieften Grübchen und verraten also durch ihre Fundverhältnisse, dass sie nicht separat als Anhänger sondern höchstwahrscheinlich als eine Einheit im Sinne einer Halskette getragen wurden. Ebenfalls, am Hals durch ein Gewebe horizontal aufgehängt, übernahm der ovale, mit zwei Löchern und Gravierung versorgter Anhänger die Rolle eines prachtvollen Schmuckes (Abb. 32:13).

Die Siedlung Pavlov I. zeichnet sich vor allem durch die bewunderungsvollen Haarspangen aus (Abb. 32:1). Es sind in der Regel ganz flache Plättchen von Mammutelfenbein überwiegend von ovaler, eliptischer oder länglicher Form. Sie sind an beiden Enden abgerundet und dort auch mit einem Loch versorgt. Wegen der Zertlichkeit sind diese merkwürdigen Schmuckstücke, den Fundumständen im Grabe von Malta nach (Gerasimov 1935), für Stirnbände und Diademe gehalten, leider überwiegend nur in Fragmenten vorhanden (Abb. 4:17; 32:2-12). Die meisten sind mit Gravierungen versorgt. Diese bestehen entweder aus fein oder tief und breit durchgeführten Rillen in üblichen schraffierten Mustern. Die bogenartigen und gekreuzten davon erreichen sogar auch bewunderungsvolle Regelmässigkeit (Abb. 32:17).

Für Verzierung der Bekleidung darf man die verdoppelten tropfenartigen Perlen halten (Abb. 4:18-19; 33:23). Trotzdem diese merkwürdigerweise im Fundgut der Fundstelle von Dolní Věstonice gänzlich fehlen, gehören sie mit vereinzelten Parallelen weit weg im östlichen sowie auch im westlichen Teile von Europa zu den typischen Ziergegenständen des gravettoiden Kulturkomplexes.

Die hohe Meisterstufe der Schnitzerei im Elfenbein sowie auch beträchliche Ausdruckskraft verrät ein, aus einem papierdünnen Elfenbeinspan geschnitzter Anhänger (Abb. 33:33) und eine Reliefplastik (Abb. 33:34). Das erste Stück wäre es möglich wegen des gegliederten Umrisses für eine anthropomorphe Darstellung halten (Klíma 1989), das zweite ist eine klare zoomorphe Wiedergabe. Sie stellt eine stilisierte Eule dar, ist für Ansicht von beiden Seiten konzipiert und vertrit in der Kollektion Fundstücke der wahren Kunst. In diesem Sinne ist auch ein kegelförmiges Bruchstück einer grösseren vollkommen modelierten Frauenplastik aus Elfenbein anzusehen, das als ein Brust zu deuten ist (Abb. 4:14). Seine Oberfläche ist mit kurzen Einschnitten bedeckt, von denen sich zwei in der Mitte des Fragmentes kreuzen und damit eine Brustwarze kennzeichnen.

Eine einzige vollständige anthropomorphe Wiedergabe stellt eine kleine dreidimensionale Schnitzerei im Elfenbein dar (Abb. 34:17). Sie ist weitgehend stilisiert und aus drei Hauptteilen der menschlichen Gestalt aufgebaut, die durch Einschnürungen getrennt sind: der obere Teil ohne Absonderung des Kopfes, der mittlere mit dem Bauch und Gesäss und der untere nur in der Vorderansicht länglich geteilte Gliedmassenstumpf. In der Brustpartie weist die Plastik Beschädigungen auf. Trotzdem sind an deren Basis eine Reihe von kleinen Einschnitten sichtbar. Flache und hängende Brüste können eindeutig erkannt werden, ebenfalls der aufgewölbte Bauch und die mächtigen Hüften. Die äusseren Geschlächtsorgane sind durch eine kleine Furche angedeutet. Die Plastik darf man als "Venus von Pavlov" bezeichnen.

Für echte Ziergegenstände sind die durchlochten Tierzähne (Abb. 4:26-28; 33:1-9) und Molluskengehäuse zu halten (Abb. 4:21-30; 33:10-22) und die in der Regel zu Halsketten zusammengestellt wurden. Die erste Serie stellen überwiegend Fuchs- und Wolfeckzähne dar. Die zweite Reihe besteht aus verschiedenen Konchyliengattungen, die alle in tertiären Meeressedimenten in Südmähren

aufzufinden sind. Das Loch in der zarten Gehäusewand wurde entweder durchgestochen, durchgebohrt oder durchsägt. Zu diesen gesellen sich vereinzelt noch Anhänger aus Knochen. Als ein Beispiel darf Bruchstück eines kleinen Röhreknochen dienen (Abb. 4:20), das von röhreförmigen Molluskengehäuse (Dentalium badensee Partsch.) fast nicht zu erkennen ist. Für zweites Beispiel darf ein Phalanx von Wolf dienen (Abb. 34:4), dessen unglaublich enge Durchbohrung in der Querrichtung durch das Gelenk gezogen wurde. In der behandelten Sammlung fehlen steinerne Anhänger, die fast ausschliesslich, wie es die nächsten Grabungsjahre bewiesen haben, aus Kulmschiefergerölle zugerichtet wurden.

Neben einfachen Schnittspuren darf man freie geritzte Linien und kurze, breite und tiefere Einkerbungen zu den absichtlichen Gravierungen zählen. Eindeutige Bedeutung von Verzierung ist regelmässigen Systemen von geritzten Striche zuzuschreiben. In diesem Sinne wiederholen sich überwiegend hintereinander parallel in Längsreihe angeordnete Formen. Diese bilden seltener kompliziertere Motive und geometrische Muster, die offensichtlich eine tiefere symbolische Bedeutung haben konnten (Abb. 32:5-6, 14-17). Eine wahre geritzte Zeichnung, die den Rahmen einer Verzierung eindeutig überschreitet, erscheint im Fundinventar der Mammutjägerrastplätze nur als eine Ausnahme. In der behandelten Kollektion ist jedoch ein solches Beispiel vertreten (Abb. 32:18). Inmitten von einigen geradelinigen Striche verläuft auf einem Elfenbeinspan einmal breit und dann wieder kürzer hoch gebogene Linie, die die charakteristische Rücken- und Kopfkonture wie eine Mammutsilhuette darstellt. Einen Vergleich bietet auch nur als eine Seltenheit in der Nachbarschaft liegende Fundstelle Dolní Věstonice (Klíma 1981, Abb. 51:5).

Zu weiteren Eigentümlichkeiten im Fundgut der Fundstelle Pavlov I sind die Gegenstände aus weichen Kalksteinschiefern zu zählen. Weniger als 10 mm dick kommen sie in kleineren Bruchstücken aber auch in grösseren Platten vor. Die grösste davon erreicht in einer unregelmässigen ovalen Form die Länge von 27 cm und ist vom roten Pulverfarbstoff bedeckt. Kleinere Plättchen weisen überwiegend feine Struktur des Mergelsteines von ockerweissen Farbe auf und sind öfters zu länglichem flachen Gebilde geschnitten. Sie kommen ebenfalls schmale, abgeglättete und mit geritzten Striche versorgte Stäbchen und Scheiben vor (Abb. 34:10). Eine andere absichtliche Form wurde zwei Stäbchen verliehen. Eindeutig wirkt die schmalere, die in die Reihe stark stilisierter anthropomorpher Figuren gehört (Abb. 34:12). Ihre Vorderseite ist von feinen Schnittspuren in Querrichtung bedeckt. Mit dem nach hinten erweiterten Kopf und besonders mit dem dachförmig aufgewölbten Hinterteil erinnert sie deutlich die bekannten Plastiken und gravierten Darstellungen aus Gönnersdorf, La Gare de Couze, Nebra, Avdeevo, Pekárna und anderen Fundstellen. Diese Wiedergaben sind als Typus Petersfels bezeichnet worden und bilden ein Charakteristikum des jüngsten Paläolithikums. Die zweite Schnitzerei wirkt zwar grob (Abb. 34:11), ist aber nach demselben Vorbild modelliert.

Zu den merkwürdigsten Entdeckungen der Siedlung bei Pavlov zählen kleine Klümpchen aus gebranntem Lehm, die nach Beispiel von Dolní Věstonice als Beweise der ältesten Keramik und als wichtige Charakteristika des Pavlovien anzusehen sind. Sie kommen zwar überwiegend in unregelmässigen und abgerundeten Formen vor (Abb. 35:3, 20), jedoch ihre beträchtliche Anzahl weist Spuren vom Knetten oder Modellierung (Abb. 35:4-5) und sogar auch Abdrücke von Fingern (Abb. 35:6-7, 18-19) auf. Andermal sind auf ihrer Oberfläche wieder Narben und Schrammen von tiefen eingestochenen festen Stäbchen (Abb. 35:16-17) oder Einkerbungen sichtbar,

die durch harte Gegenstände verursacht wurden (Abb. 35:12). Manche stellen Fragmente von wahren Plastiken dar (Abb. 35:2, 8-13). Am deutlichsten davon wirken abgebrochene Beinchen von Tierdarstellungen (Abb. 4:31-32; 34:16; 35:23-32). Seltener kann man Bruchstücke oder ganze Teile von erkenntlichen Tierarten vorfinden. Neben einfachen Abkürzungen der bildenden Kunst, die man nur für Köpfchen kleiner Tiere erklären darf (Abb. 34:15; 35:1) sind auch zwei vollkommene Plastiken vertreten. Die erste stellt einen Nashornkopf dar (Abb. 34:13), der mit einem halsartigen Ausläufer für Festhalten versorgt ist, die zweite ist eine Wiedergabe eines abgerundeten Bärenkörpers, dem der Kopf abgetrennt und selbst mit zwei magischen Stichwunden versorgt wurde (Abb. 34:14). Solche Stiche darf man ebenfalls auf einigen weiteren Fragmenten beobachten (Abb. 35:16-17). Durch Vergleiche ist es möglich einige Fragmente sogar für abgerundete Teile von anthropomorphen Statuetten zu deuten. Das erste Stück ähnelt dem Kopf der bekannten Venus von Dolní Věstonice (Abb. 35:2), die zwei folgenden erinnern wieder an die halbkugeligen Teile von Frauenfiguren (Abb. 35:14-15). Die Lehmklümpchen wurden neuerlich genauer untersucht und haben durch physikalische und chemische Analysen überraschende Erkenntnisse über die älteste keramische Erzeugung und ihr technologisches Verfahren gebracht (Vandiver et al. 1990, Kapitel IV).

Eine entsprechende Aufmerksamkeit wurde bei der Erforschung der Kulturschicht auch dem Farbstoff gewidmet. Er kam frei zerstreut, andermal linsen- und zungenartig konzentriert vor oder hat öfters einzelnen Horizonten der Kulturschicht rötliche Farbe verliehen. Durch seine auffallende Anwesenheit verriet er gewöhnlich einen reicheren und bedeutenderen Inhalt des verfolgten Milieu sowie dauerhaftere Aufenthalts- und Arbeitsplätze. Im festen Zustand wiederholten sich kleinere aber auch grobere Klümpchen, die selten die Länge von 7 cm erreichten. Sie weisen gewöhnlich feine und nur seltener auch sandige Struktur auf. Manche harte davon sind auf der Oberfläche abgeschliffen, die weicheren lassen sich leicht verreiben. Eine Eisenkonkretion in Form einer Knolle weist wieder zerspaltene Kruste auf und weckt dadurch eine Hypothese über den möglichen Urpsrung des Rohstoffes aus den heimischen Mergelschichten des Tertiärs.

Aus demselben Milieu stammt ein Haifischzahn. Man darf diesen als eine wahre Rarität bezeichnen. Er gibt ein gutes Zeugnis von der Aufmerksamkeit, die die paläolithischen Jäger und Sammler der Naturprodukte in dem unmittelbaren Lebensraum gewidmet haben.

Eine weit entfernte Herkunft ist dem metallsilbergrauen Haematit anzuvertrauen. Dieser blattförmiger Farbstoff erscheint öfters auch in grösseren Bruchstücken als der Roteisensenstein. Bei der Aufzählung von besonderen Mineralien darf man auch drei kleine Klümpchen von Galenit (PbS) nicht vergessen. Alle sind auf der Oberfläche stark verwittert, die Bruchnarbe weist jedoch die charakteristische metallische Struktur und silberne Farbe auf. Ihr Vorkommen hing vielleicht mit der Anzündung des Feuers zusammen.

Die zwei ersten Grabungsjahre in Pavlov haben zwar eine grosse Anzahl an Gegenständen beider Gruppen des Fundgutes sowie auch an Erkenntnisse mancher anderer Art geliefert und angeboten, sie sollten in dieser Hinsicht aber noch erfolgreichere Arbeitskampagne kommen. Die Anzahl einzelner Gattungen von Artefakten war für die Zusammenstellung des Verzeichnisses zugleich insofern ausreichend, dass dieses für eine Typenliste der ganzen Sammlung gelten darf.

Verschiedene, nur wenig bedeutende Abweichungen des Typenreichtums wird es in folgenden Untersuchungen der Fundstelle dennoch geben, die wichtigeren davon wurden schon nun jedoch berücksichtigt.

Übersicht der Knochenindustrie, Zier- und besonderer Gegenstände

Gattung	1952	1953
I. Erzeugnisse und Geräte aus:		
1. Knochen		
- Knochen mit Schnittspuren	-	27
- Knochen mit Schlagnarben	1	2
- teilweise abgeglättete Knochen	-	2
- kleine Splitter gänzlich abgeglättet	-	3
- kleinere Kompaktaspäne grosser Mammutknochen:		
- flache	-	3
- kantige	-	2
- Späne und Splitter von grossen Mammutknochen:		
- spitzige und zugespitzte	2	2
- stichelförmige	-	1
- meisselartige	-	2
- knebelförmige	-	1
- Rippen, überwiegend von Mammut:		
- zugespitze	1	4
- terminal abgerundete, Glätter	-	14
- Wühlstöcke	1	9
- mit regelmässiger Gravierung	-	2
- Löffel und Schaufeln:		
- schmale aus Rippen	-	7
- breite aus Kompakta grosser Mammutknochen	-	19
- mit regelmässiger Gravierung	-	1
- Keulen	-	1
- Pfriemen:		
- schmale und lange (Ulna und Metapodia kleiner Wirbeltiere)	10	12
- kurze und stumpfe, mehrmals zugerichtete	-	5
- besondere Formen (os penis)	1	2
- Stecher:		
- zugespitze Ulna und Metapondia grosser Tiere	2	12
- mit regelmässiger Gravierung	-	4
- Dolche, dolchartige flache Stecher	1	2
- Pfeifen:		
- Phalange von Rentier oder Wolf	1	2
- Querflöten aus hohlen Knochen	1	1
2. Geweih		
- Teile und Bruchstücke von Geweihstangen	1	2
- kleine Splitter und Späne mit Schnittspuren	-	1
- Fragmente mit geritzter Verzierung	-	3
- abgerundete Bruchstücke, Glätter	-	6
- zugespitze Späne, Bruchstücke von Stechern	-	6
- grosse Stecher, Zeltnägel	-	1
- Spitzen	-	1
- Beile und Hacken, auch Fragmente	-	6

- Hämmer und Schlägel	-	2
- Halter und Griffe	-	2
- Spaltstücke	-	2
3. Elfenbein		
- walzförmige Teile von Stosszähnen	-	1
- spitzige, knebel- und meisselartige Splitter und Späne	3	6
- kleine Abschläge und Späne	3	7
- flache Bruchstücke als Halbfabrikate, auch graviert	1	4
- Glätter	1	2
- Löffel und Schaufeln	-	2
- Speerspitzen:		
- zylinderförmige mit konischer Basis	2	17
- flache	2	-
- im unteren Teile zylindrische, im oberen flache	1	2
- mit verbreitetem flachen Gipfel	-	2
- mit Längsrille (Blutrinne)	-	1
- mit zerklüfteter Basis	-	2
- Stäbchen:		
- schmale und kantige	-	7
- zylinderförmige in Fragmenten	1	7
- Reiber, Pochstücke und Schlägel	-	1
Knochenindustrie zusammen	38	235

Gattung	1952	1953
II. Zier-, Kunst-, und besondere Gegenstäde		
1. Elfenbein		
- feine zylindrische Stäbchen, Haarnadeln	1	5
- Armringe	-	1
- schildartige Plättchen	2	2
- Harrspangen, in der Regel graviert	1	13
- Anhänger:		
- einmal durchlocht	-	1
- mit zwei Löchern	-	1
- mondsichelartige	-	2
- ringförmige	-	8
- verdoppelte Perlen	2	9
- Reliefplastiken und Statuetten	1	1
2. Anhänger		
- durchlochte Tierzähne und Knochen	4	98
- Molluskengehäuse:		
- Dentalium	25	81
- Vermetus	-	2
- Pirenella	3	24
- Terebralia	1	5
- Cardium	-	10
- Turitella	-	2
- Melanopsis	-	3

- andere Konchylien (Conus, Natica, Pecten, Cerithium)	1	9
- Stein, in der Regel Kulmschiefergerölle	-	3
3. Gravierungen		
- freie Linien und Einkerbungen	-	2
- regelmässige Systeme und geometrische Muster	-	1
- zoomorphe und anthropomorphe Darstellungen	-	1
4. Kalkschiefer		
- Stäbchen und geschnittene Schieferplättchen	2	7
- kleine Stäbchen und Rondelle, geglättet und graviert	-	1
- zoomorphe und anthropomorphe Darstellungen	-	2
Zier- und Kunstgegenstände zusammen	43	292
5. gebrannter Lehm		
- Klümpchen, unregelmässige und abgerundete Formen	76	897
- modellierte Klümpchen, geknettete Stücke	14	640
- abgebrochene Beinchen verschiedener Figuren	3	14
- Tierplastiken und ihre Fragmente	3	9
- anthropomorphe Statuetten und ihre Bruchstücke	-	2
gebrannter Lehm zusammen	96	1562
6. Farbstoff		
- Rötel, auch grössere und geschliffene Stücke (2,27 kg Gewicht)	64	965
- Haematit (0,65 kg Gewicht)	12	54
Farbstoff zusammen	76	1019

Verzeichnis der abgebildeten Gegenstände
I. Grabungsjahr 1952
(Der Inv.Nr. sind noch zwei letzte Ziffer des Grabungsjahres beizusetzen)

Taf.	Abb.	Inv. Nr.	Gegenstand
1	1	1236	spitziger Span aus Mammutknochen
	2	1246	schmaler zugespitzter Mammutknochenspan
2	1	1220	
	2	1229	
	3	1227	
	4	1223	abgebrochene Spitzen - Pfriemen
	5	1226	aus zylindrischen Knochen
	6	1230	- (os penis)
	7	1224	
	8	1205	
	9	1222	Pfriemenbruchstück mit länglicher Rinne
	10	1233	
	11	1206	Pfriemen aus Kante eines Knochengerätes
	12	1210	Knochenstecher (metapondium, Equus sp.)
	13	1109	Stecher (ulna)
	14	1235	zugespitze Mammutrippe
	15	1207	Endstücke eines Wühlstockes, Mammutrippe
	16	1284	Kompaktaspan mit Schlagnarben und Abglättung
	17	1201	Signalpfeife (phalanx, Rangifer)
	18	1972	Querflöte (humerus, Lepus sp.)
3	1	1211	
	2	1240	zugespitzte Elfenbeinspäne
	3	1238	
	4	1277	- (mit Schnittspuren)
	5	1285	
	6	1242	Elfenbeinabspliss
	7	1243	
	8	1244	flacher Elfenbeinabschlag
	9	1234	kleiner ausgeglätteter Elfenbeinabschlag
	10	1216	ausgeglättete Kante eines Knochengerätes
	11	1239	Glätter aus Mammutelfenbein
	12	1241	geschnittenes Knochenbruchstück
4	1	1220	
	2	1218	
	3	221	
	4	1219	
	5	1225	Bruchstücke zylindrischer Spitzen aus
	6	1217	Mammutelfenbein
	7	1215	
	8	1214	

	9 10 11 12	1283 1213 1212 1282	
	13	1231	abgebrochener Gipfel einer flachen Spitze oder Löffels aus Mammutelfenbein
	14	1200	halbkugelige Elfenbeinschnitzerei mit Gravierung, abgebrochene Brust einer Frauenstattuette
	15 16	1232 1205	schildförmiges Elfenbeinplättchen
	17	1203	Bruchstück einer Haarspange mit Gravierung Mammutelfenbein
	18 19	1193 1192	verdoppelter perlenartiger Anhänger, Mammutelfenbein
	20	1572	Fragment eines kleinen Röhreknochen, geglättet, wie Dentalium
	21	1140	Pirenella picta, Loch abgebrochen
	22		Pirenella picta mit Loch
	23		Pirenella sp. mit Loch
	24	159	Terebralia bidentata Defr., Loch abgebrochen
	25	1197	Fragment einer gezähnten Konchylie
	26 27	1281 1043	gelochter Eckzahn (Vulpes sp.)
	28	1194	Eckzahn (Vulpes sp.) mit abgekratzter Fläche für Durchbohrung
	29 30	154 1191	Dentalium badensee Partsch.
	31	162	abgebrochenes Beinchen einer Tierstatuette aus gebranntem Lehm
	32	163	modelliertes Klümpchen, gebrannter Lehm

II. Grabungsjahr 1953

Taf.	Abb.	Inv. Nr.	Gegenstand	Fund-platz
5	1	287	Knochenbruchstück mit Schnittspuren und Schlagnarben	
	2	1984	Knochen eines Schwanes mit Schnittspuren	
	3 4	1986 995	Mammutrippe mit Schnittspuren	
6	1 2 3 4	991 1977 4824 1969	– (femur, Vulpes sp.) Knochenbruchstücke mit Schnittspuren	
	5 6	4840 4830	Epiphyse mit Schnittspuren	14/III 13/V

	7	4836		14/III
	8	5963	Metapodia mit Schnittspuren	10/VI
	9	1982	(Rangifer sp.)	V/8
	10	2021		15/I
	11	1988		V/6
7	1	1987	- (humerus, Lepus sp.)	V/6
	2	5959		16/V
	3	1005		I/8
	4			
	5	1012		VII
	6	5955	Knochenbruchstücke mit Schnittspuren	15/III
	7	2170	- quer abgebrochener femur, Flöte	13/5
	8	8011		16/III
	9	1983		V/8
	10	2004		16/VII
	11	19		VI/6
	12	4829		7/XI
	13	1999		16/VII
	14	1971	- (femur, Lepus sp.)	III/1
8	1	978		VII/9
	2	1975		III/10
	3	2003	Rippenfragmente mit Schnittspuren	16/VII
	4	789		
	5	4825		5/XII
	6	1981		V/8
	7	6029		
	8	6034	flache Knochenfragmente mit Schnittspuren	
	9	992		IV/9
	10	2032		12/II
	11	2059		18/VI
	12	4847		13/V
	13	4846		14/VI
9	1	6043	Schulterblatt mit Schnittspuren (scapula, Rangifer sp.)	
10	1	2118		10/IV
	2	516	Absplisse und Späne mit Schnittspuren	IV/7
	3	2055		15/V
	4			
	5	974		VII/6
11	1		abgeglättete schmale Rippe	
	2		abgeglättete Mammutrippe	
	3	2108	mächtiger Wühlstock, Mammutrippe	14/IV
	4	2117		16/V
	5		typischer Wühlstock, Mammutrippe	
	6			
	7	509	Wühlstock mit scharf geglätteter Kante	V/6
	8	517	Wühlstock, schmale Rippe	IV/8
	9	2103	terminal zugespitze Rippe	13/III

12	1	2178	Mammutrippe mit Schnittspuren und Gravierung	13/I
	2	2129		12/VIII
	3	2018	Mammutrippe mit kasettenartiger Gravierung	14/I
13	1	2092	Bruchstücke terminal abgerundeter Mammutrippen	12/III
	2	6035		
	3	6025		
	4	286		
	5	5958		16/V
	6	2018		14/I
	7	2098	terminal abgerundete gravierte Rippe	15/III
	8	2086	zugespitzte Rippen	12/II
	9	6041		
	10	6042		
	11	6028	flach abgeglätteter Knochenabschlag	
14	1	2100	terminal abgerundete Rippen	13/III
	2	514		IV/7
	3	1970		III/1
	4	2076		12/I
	5	962	zugespitzte Rippe	VI/6
15	1	508	terminaler Teil einer Schaufel	V/6
	2	1980	Bruchstück einer Schaufel	V/8
	3	2174	mittlere Teile von breiten Schaufeln	9/XI
	4	2177		16/XI
	5	2172		3/XII
16	1	5961	terminale Teile breiter Schaufeln	16/V
	2	2056		15/V
	3	2119	Mittelteil breiter Schaufel	12/VI
	4	2050	terminale Teile von schmalen Schaufeln	15/IV
	5	2150		13/VII
	6	2077	Bruchstücke von Schaufeln	12/I
	7	1976		III/10
17	1	1168	terminale Teile breiter Schaufeln	X
	2	2037		13/II
	3	970	abgebrochene Schaufelgriffe	IV/9
	4	977		VII/6
	5	4942	Handgriff schmaler Schaufel, graviert	13/IV
	6	1952	Bruchstücke von Schaufelkanten	
	7	2045		14/II
	8	813		V/7
18	1	2035	mittlere Teile von Schaufelartigen Geräten	12/II
	2	2046		14/II
	3	2058		18/VI
	4	2049		15/IV
	5	1994		16/VI
	6	353	gezähnte Löffelkante	
19	1	2122		13/VII

	2	2048	lange Pfriemen	14/IV
	3	2123		13/VII
	4	1950		
	5	2180		
	6	2181	Bruchstücke feiner Pfriemen	
	7	8		
	8			
	9	2068	Pfriemenfragment	13/IV
	10	503		VI/3
	11	5953		
	12	515	stumpfe Pfriemen	IV/7
	13	4841		13/VII
	14	2124		12/V
	15	2167	gerader Pfriemen	9/X
	16	2182	gebogene Pfriemen (os penis)	
	17	4843		13/IV
20	1	1011		I/8
	2	999		I/1
	3	2114	Pfriemen aus kleinen Vorderhandknochen	12/V
	4	994	(ulna, Vulpes sp.)	II/5
	5	979		VII/8
	6	596		
	7	5956		
	8	4837		14/III
	9	4833	Stecher, massive Pfriemen (metapodia, Equus sp.)	7/IX
	10	2176		9/XIII
	11	1951		
	12	2099	flacher Dolch, graviert	15/III
	13	2173	langer Pfriemen aus Knochenspan	10/XI
21	1	5923		15/XI
	2	504		VI/5
	3	510		V/8
	4	5957		8/XV
	5	2053	massive Pfriemen- Stecher (ulna)	13/V
	6	5922		8/XI
	7	2173		10/XI
	8	1989		II/5
	9	4839		14/III
	10	990		IV/9
22	1	1990	Schaufelsprosse als Feuerhacke	IV/2
	2		Endstück einer Geweihsprosse	
	3	2169	Spaltstück aus einer Geweihstange	7/I
	4	2023	zu beiden Enden zugespitztes Geweihstück	13/I
	5	966	Spaltstück mit Schlagspuren	VI/9
	6	5948	graviertes Schädelbruchstück mit Geweihnarbe	13/III
	7	4875	abgerundete spitzige Geweihspäne	
	8	2075		12/I

	9	6044	Halter, ausgehöhltes Endstück einer Geweihsprosse	
23	1	1020	Geweihhacke	V/9
	2	2089	abgebrochene Beilspitze, graviert	13/II
	3	2110	abgenützte Beilspitze aus Geweih	14/IV
	4	2	abgebrochene Sprossen von Geweihhacken	I/2
	5	997		II/2
	6	2007		16/IV
24	1	968	Geweihfragmente mit geritzter Verzierung	6/VI
	2	6040		
	3	2033		12/II
	4		Glätter aus Geweih	
	5	1998		16/VII
	6	3699		
	7	2002		16/VII
	8	2087		12/II
	9	2028		13/I
25	1	5960	spitzige Geweihspäne	16/V
	2	6019		14/I
	3	2001		16/VII
	4	2006		16/IV
	5	2025		12/V
	6	2026		12/V
26	1	2022	gravierter Geweihstecher, beide Endstücke abgebrochen	13/I
	2	1974	Geweihhammer	II/2
	3	2014		14/I
	4	2234	Geweihstange mit Schaftloch, Griff	12/II
27	1	6018	spitzige Stosszahnspäne	
	2	2112		14/IV
	3			
28	1	998	Stosszahngipfel mit Schnittspuren	II/2
	2	5969	abgebrochene Stosszahnspäne	6/XIV
	3	4844		12/III
	4	2051		15/IV
	5	1002		I/3
	6	2017		14/I
	7	1010	flacher Elfenbeinabspliss mit regelmässiger Gravierung	I/8
	8	2057	Reiber, zylindrisches Stosszahnstück	18/VI
29	1	2005	zylinderförmige Speerspitzen mit konischer Basis	16/IV
	2	959		IV/7
	3	2117		16/V
	4	11		I/6
	5	2016		14/I
	6	14		VI/9
	7	1015		VI
	8	5950		
	9	6017		

	10	5966		
	11	6038		
	12	5951		
	13	5952		
	14	5967		
	15	6018		
	16	6031		
	17	6030		
30	1	5962		16/VII
	2	971		IV/10
	3	6019		
	4	983	Elfenbeinstäbchen	VI/8
	5	282		
	6	984		VI/8
		985		
	7	15		VII/6
	8	1955		
	9	1022		II/2
	10	1054	Fragmente von Haarnadeln aus Mammutelfenbein	
	11	507		V/5
	12	2113		14/IV
	13	1017	Basis einer Haarnadel oder Spitze	VII
	14	960	zylindrische Speerspitzen mit flachem oberen Teile	VII/8
	15	5964		10/VI
	16	4848	Gipfel einer Speerspitze mit Längsrille	13/V
	17	521	Spitzen mit verbreitetem Gipfel aus Mammutelfenbein	IV/8
	18	961		III/5
	19	5945	Elfenbeinspitzen mit zerklüfteter Basis	
	20	2095		14/III
31	1	6026		
	2	6027	flache Elfenbeinsplitter mit Einschnitten	
	3	2143	- (Spitze)	12/II
	4	9		VII/7
	5	5968		7/X
	6	6032	geglättete Elfenbeinscheibchen und Plättchen	
	7	19	als Halbfabrikaten für Haarspangen	6/IV
	8	6020		
	9	4832		7/XI
	10	505	Elfenbein in Absplissen	VI/7
	11	2021		15/I
	12	2106	knebelförmiger Abspliss	16/IV
	13	2024	Halbfabrikat eines Löffels	13/I
	14	973	Löffelchen aus Mammutelfenbein	IV/10
	15	2111	Glätter aus Mammutelfenbein	14/IV
	16	2120		14/VI
32	1		Haarspange, graviert	
	2	6125		

	3	6024		
	4	6033		
	5	1015		VII
	6	6022		
	7	5970	Fragmente von Haarspangen aus Mammutelfenbein	5/XIV
	8			
	9			
	10	2141		5/IX
	11	2142		5/IX
	12			
	13	2169	ovaloider Anhänger mit zwei Löchern	7/I
	14	2232	Elfenbeinbruchstücke mit reicher Verzierung	
	15	2455		
	16	1016	Elfeinbeinplättchen mit regelmässiger Verzierung	VII
	17		schmale Haarspange mit bogenförmiger Gravierung	
	18		Elfenbeinspan mit geritzter Zeichnung eines Mammuts im Netz von Schnittlinien	
33	1	5782		
	2	3186	- (Canis lupus L.)	
	3	5976		
	4	5972		
	5	5979	durchlochte Tierzähne	
	6	5974	- (Vulpes sp.)	
	7	3097		
	8	5973		
	9	5975		
	10	1318	- Dentalium badensee P.	VI/6
	11		- Vermetus arenarius	
	12	1760	- Dentalium badensee P.	II/V
	13	1369	- Vermetus arenarius	IV/8
	14	5935	- Dentalium badensee P.	12/XII
	15	1317	- Dentalium badensee P.	VII/9
	16	1604	durchlochte Molluskengehäuse als Anhänger	I/3
	17		- Melanopsis sp.	
	18	5945	- Pirenella picta	12/XII
	19		- Cardium sp.	
	20	3738	- Melanopsis impressa K.	14/IX
	21	4850	- Terebralia bidentata D.	10/XIII
	22	385	- Turitella turris B.	II/7
	23	2165	verdoppelte perlenartige Anhänger aus Mammutelfenbein (9 Stück)	12/II
	24		mondsichelförmige Anhänger aus Mammutelfenbein	
	25			
	26		Anhängerbruchstück mit einem Loch aus Mammutelfenbein	
	27		Anhängerbruchstück mit zwei Löchern aus Mammuttelfenbein	

	28 29	8053	flache schildartige Elfenbeinplättchen	
	30	6039	Fragment eines Armringes aus Elfenbein	
	31		ringförmiger Anhänger aus Elfenbein	
	32		Halskette aus Fingerringen (7 Stück) aus Mammutelfenbein	
	33		flacher Anhänger aus Mammutelfenbein	
	34		zoomorpher Anhänger (Eule), Reliefplastik aus Mammutelfenbein	
34	1 2 3		kleine Knochenplättchen auf der ganzen Oberfläche abgeglättet	
	4	2145	Fingerknochen (phalanx, Canis lupus) quer durchbohrt	12/IV
	5 6	2145 1969	Pfeife, durchbohrter Fingerknochen (phalanx, Rentier)	12/IV III/1
	7 8		Bruchstücke von Schiefergerölle	
	9		Fragment einer Geröllscheibe mit Gravierung, Kulmschiefer	
	10	2178	verzierte Scheibe aus weichem Kalkschiefer	16/XI
	11	996	prismatisches Stäbchen aus Kalkschiefer, geschnitten in Form einer Frauenstatuette	II/4
	12	17	stilisierte Frauenstatuette, geschnitten aus weichem Kalksteinschiefer	IV/10
	13	520	Nasshornköpfchen, gebrannter Lehm	IV/8
	14		Leibchen eines Bärenfigürchen ohne Kopf und mit Stichwunden, gebrannter Lehm	
	15	3554	Kopf einer Tierplastik, gebrannter Lehm	
	16	3532	abgebrochenes Beinchen einer Tierplastik, gebrannter Lehm	
	17		Frauenstatuette geschnitten im Mammutelfenbein	
35	1		Tierköpfchen, gebrannter Lehm	
	2		Kegelförmiges Bruchstück einer Statuette	
	3		modelliertes Klümpchen, gebrannter Lehm	
	4		flaches Klümpchen mit Halbrelief	
	5		abgebrochenes Beinchen einer Tierplastik	
	6 7		Klümpchen mit vertieftem Fingerabdruck	
	8 9 10 11 12 13	 2064 6008 5870	- mit Beinansatz Bruchstücke von Tierplastiken - mit Beinansatz - mit Beinansatz - mit Beinansatz - flach abgebrochen	 12/III 14/I
	14 15	6014 2063	kugelförmige Bruchstücke von Tierplastiken, Lehm	16/VI

	16 17	 5870	Klümpchen mit Durchstechung	
	18 19	5874	Klümpchen mit vertieftem Fingerabdruck	
	20	1003	Klümpchen in Form eines Prisma	
	21	1019	flächig modelliertes Klümpchen	
	22	2027	flächig modelliertes Klümpchen mit Einschnitt	
	23 24 25 26 27 28 29 30 31 32	2138 5879 5103 5880 5881 2134 6010 6013 6015	abgebrochene Beinchen von Tierfiguren aus gebranntem Lehm	

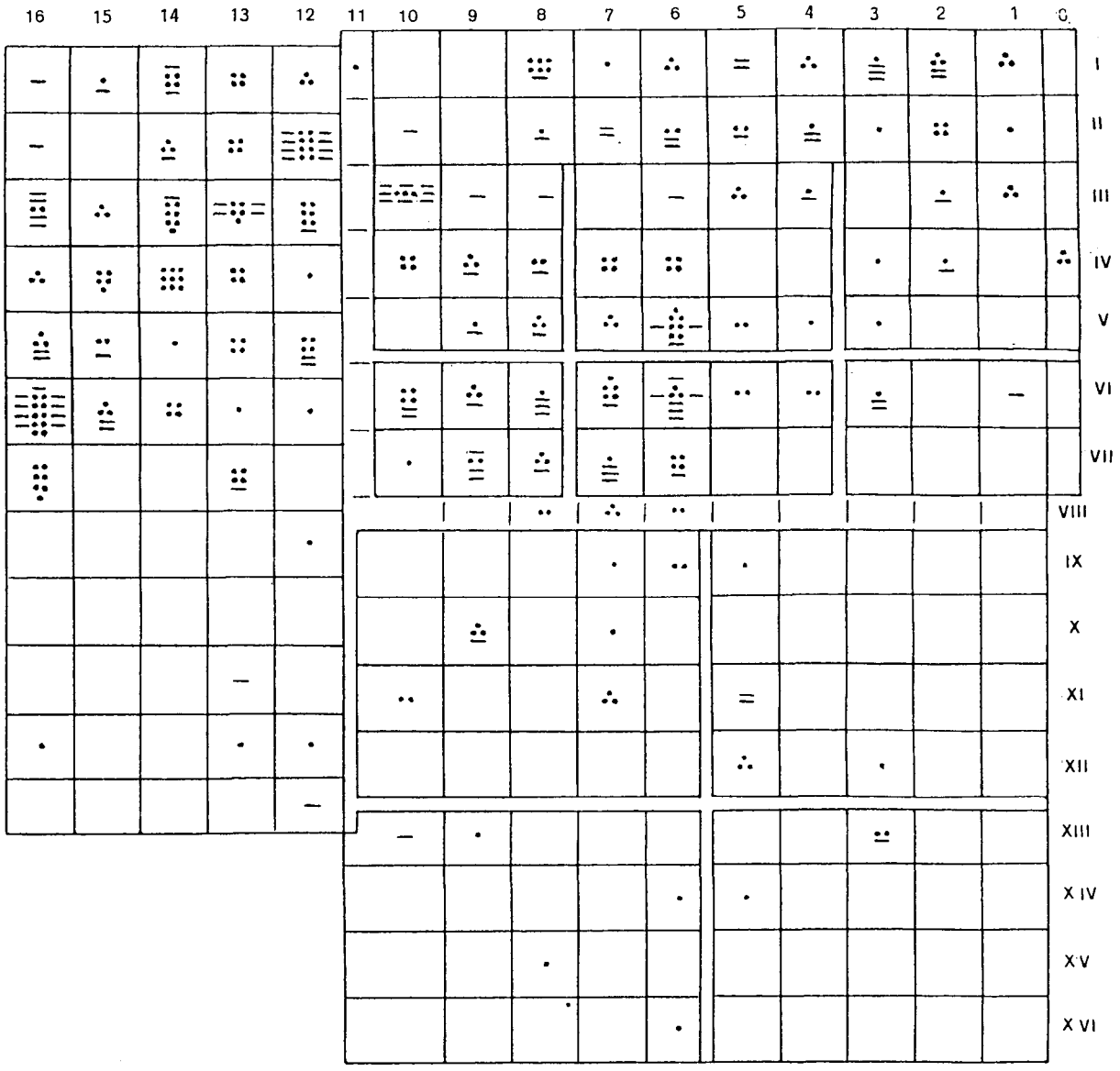
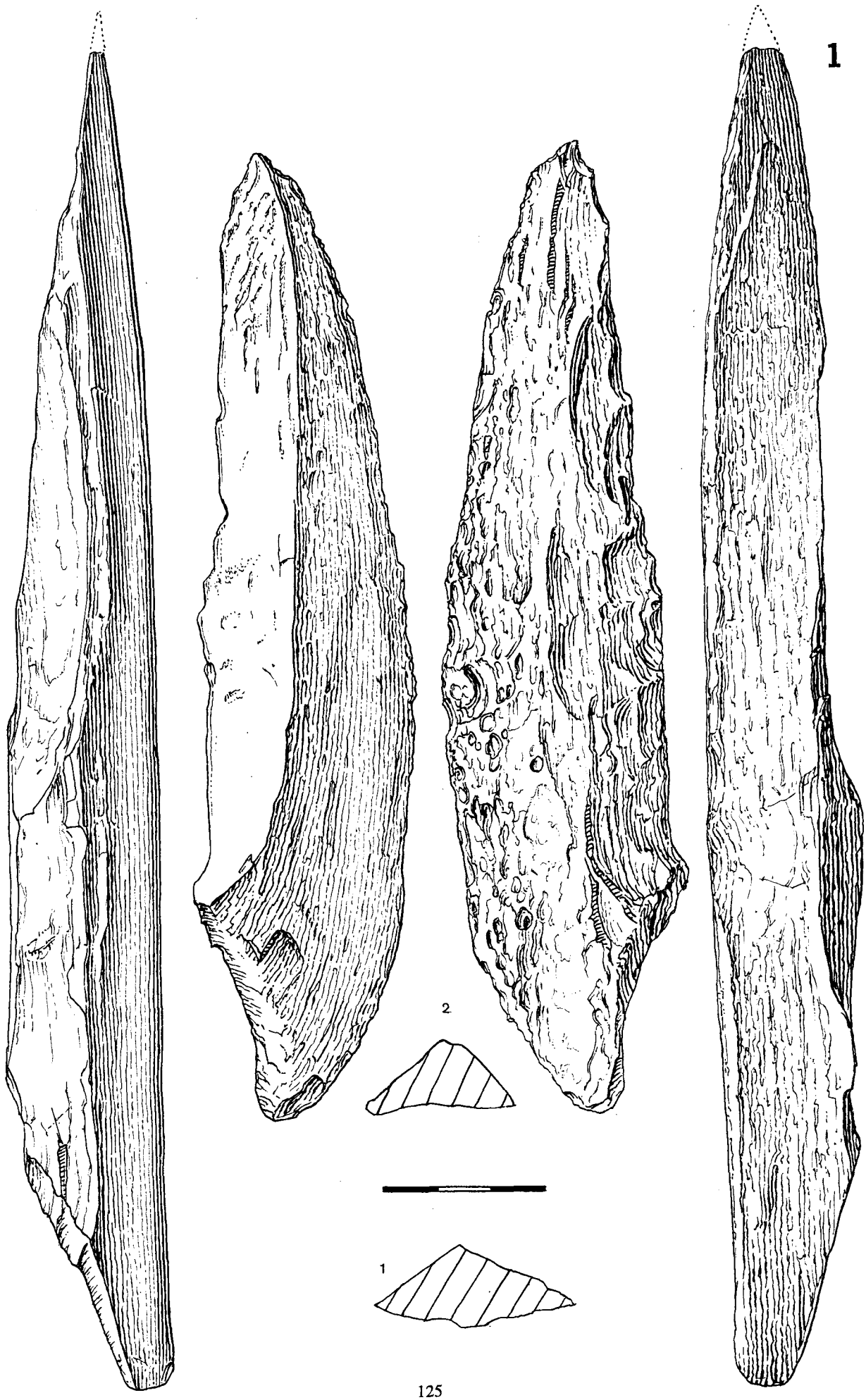


Fig.1. Excavations 1953, distribution of bone industry (short lines), decorative and specific objects (points)
Abb.1. Grabungsfläche 1953. Zerstreuung der Knochenindustrie (kurze Striche) und der Zier- und besonderer Fundgegenstände (Punkte)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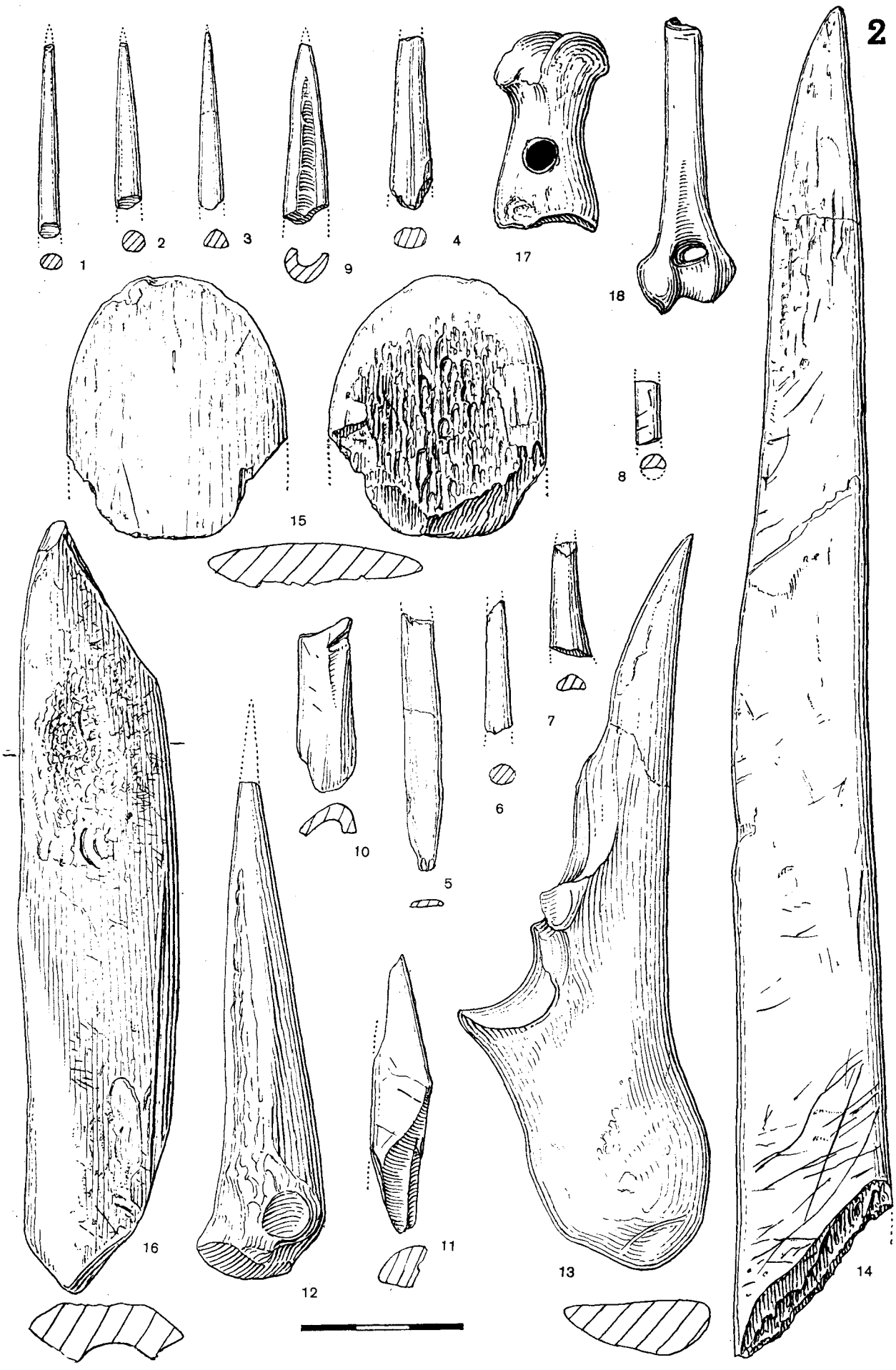
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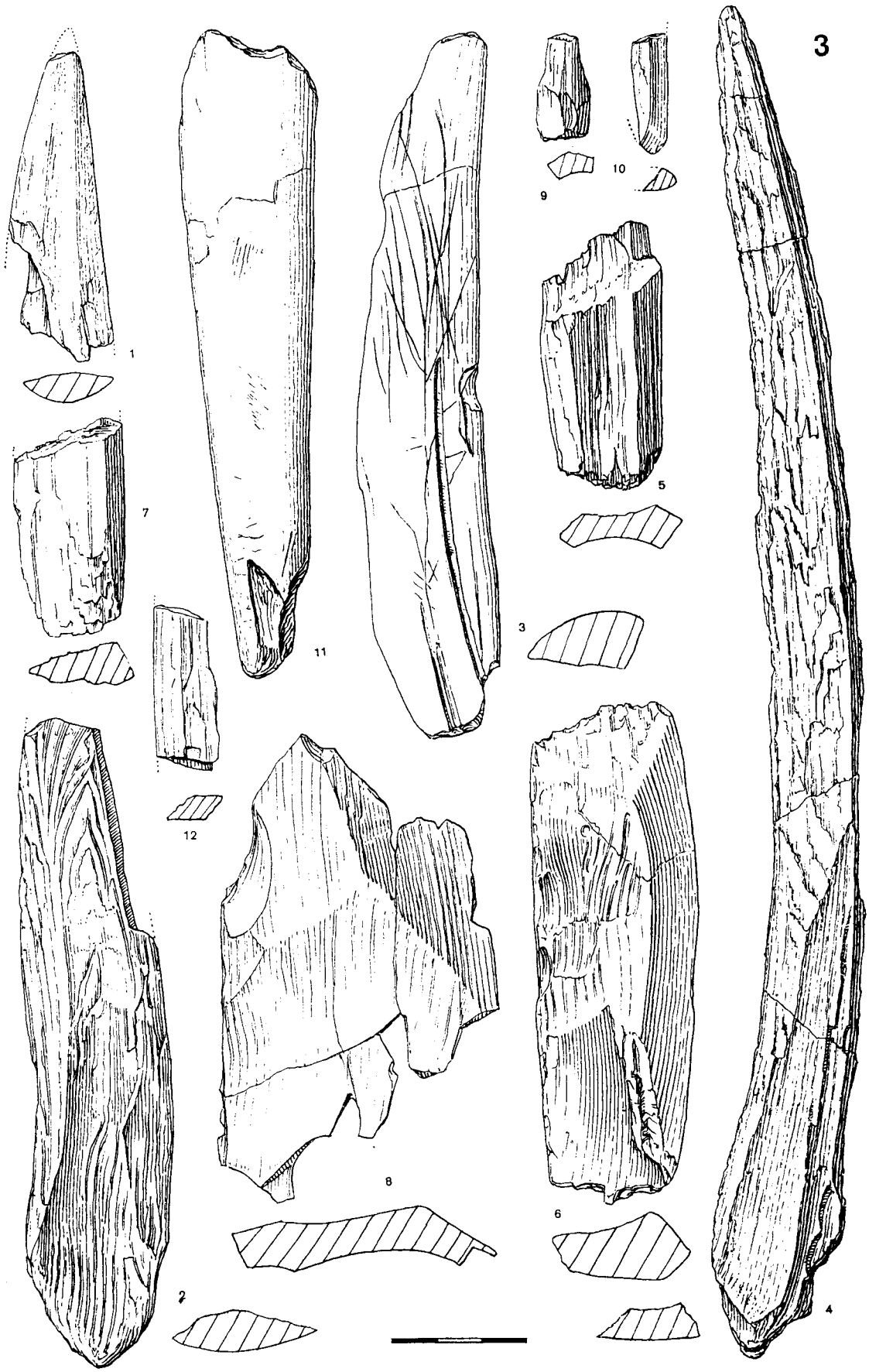
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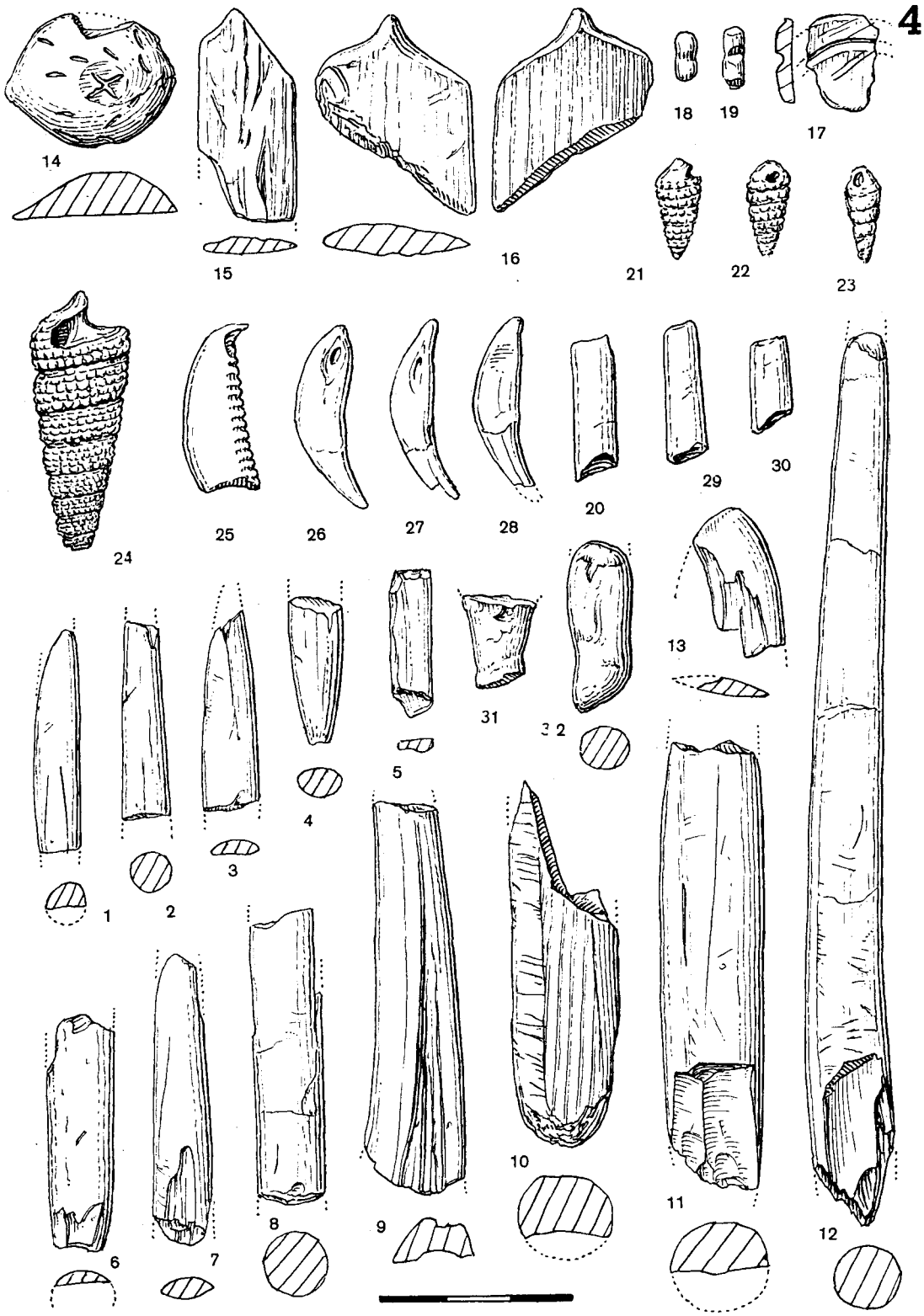
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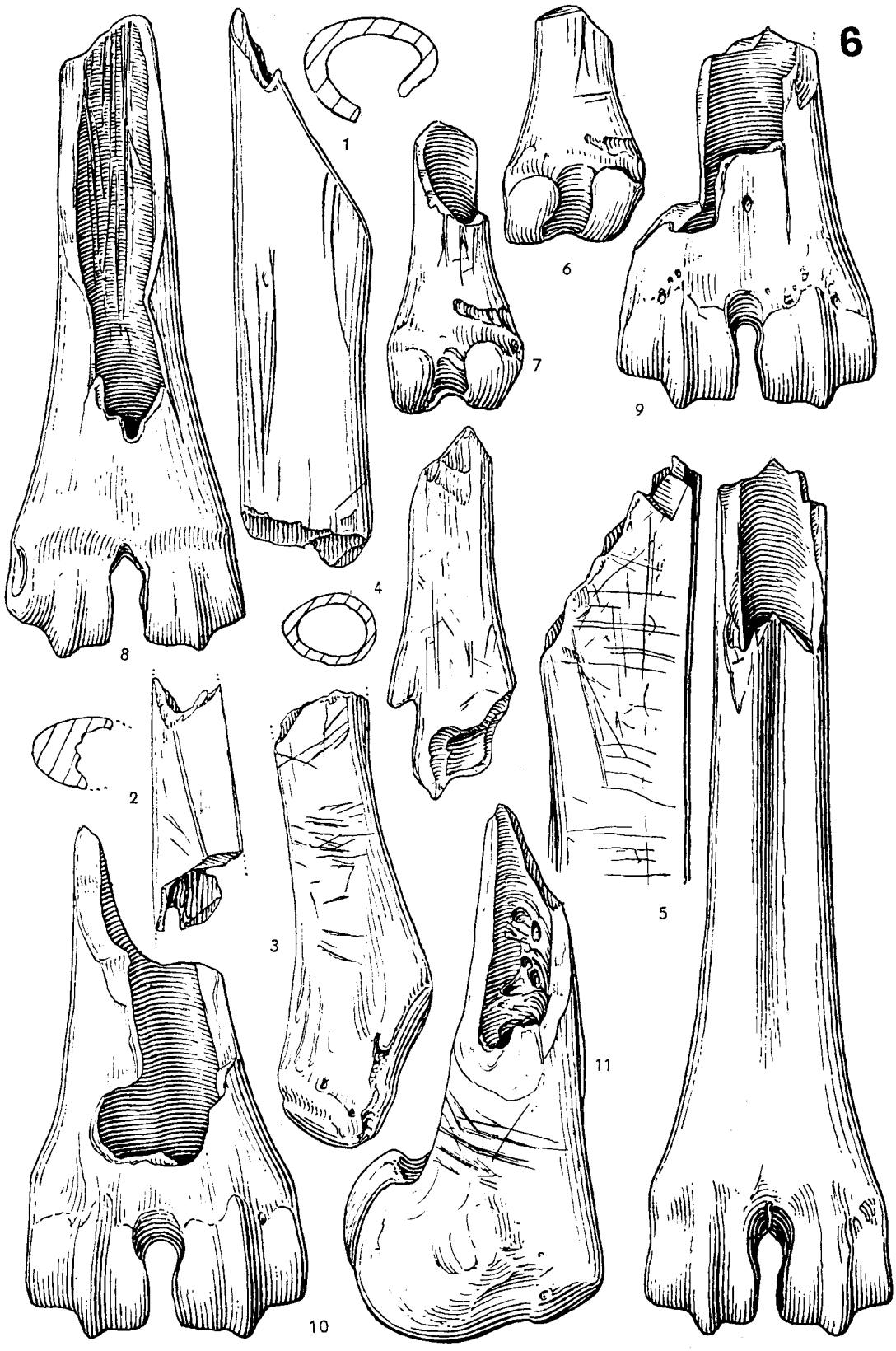
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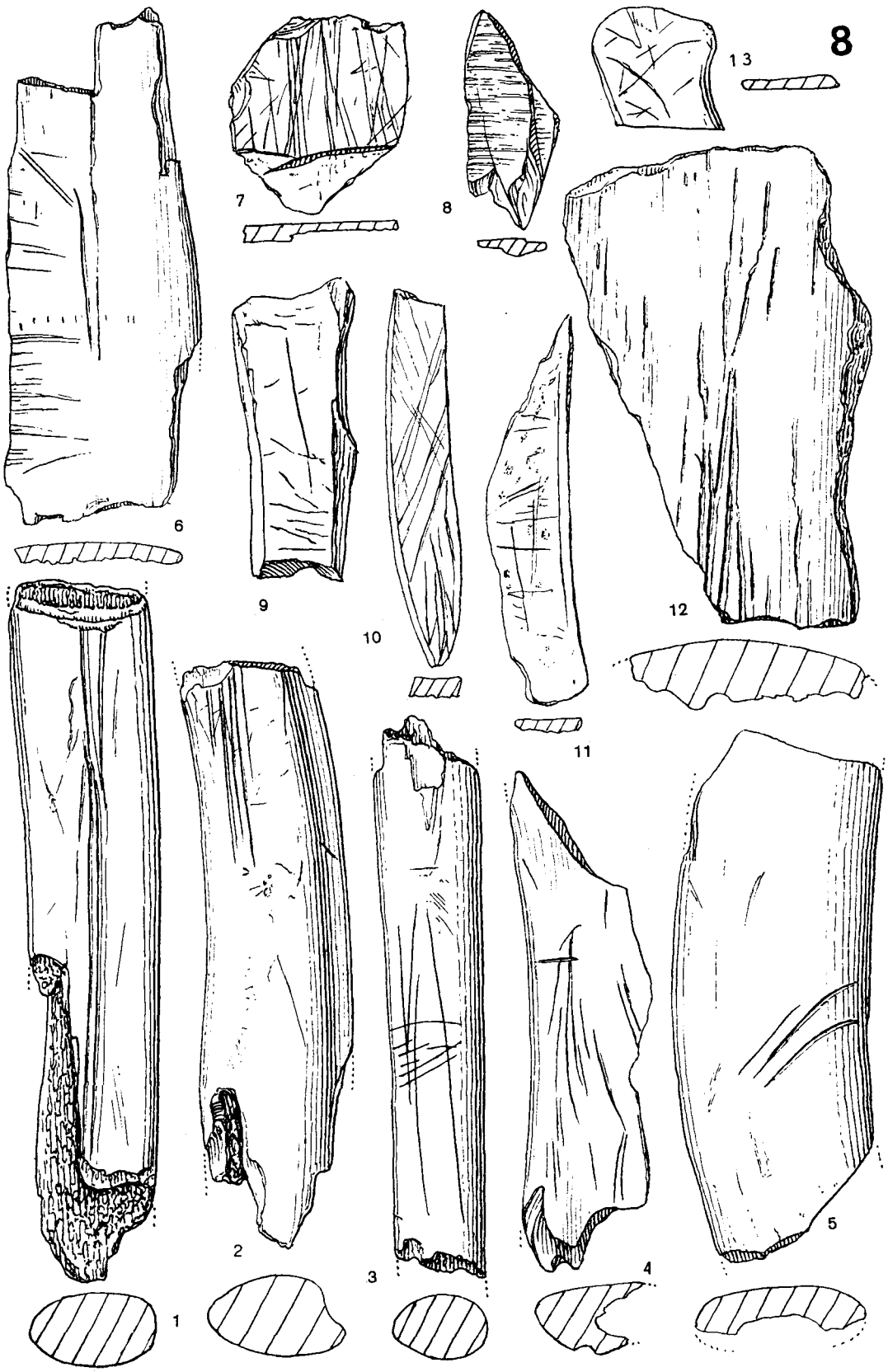
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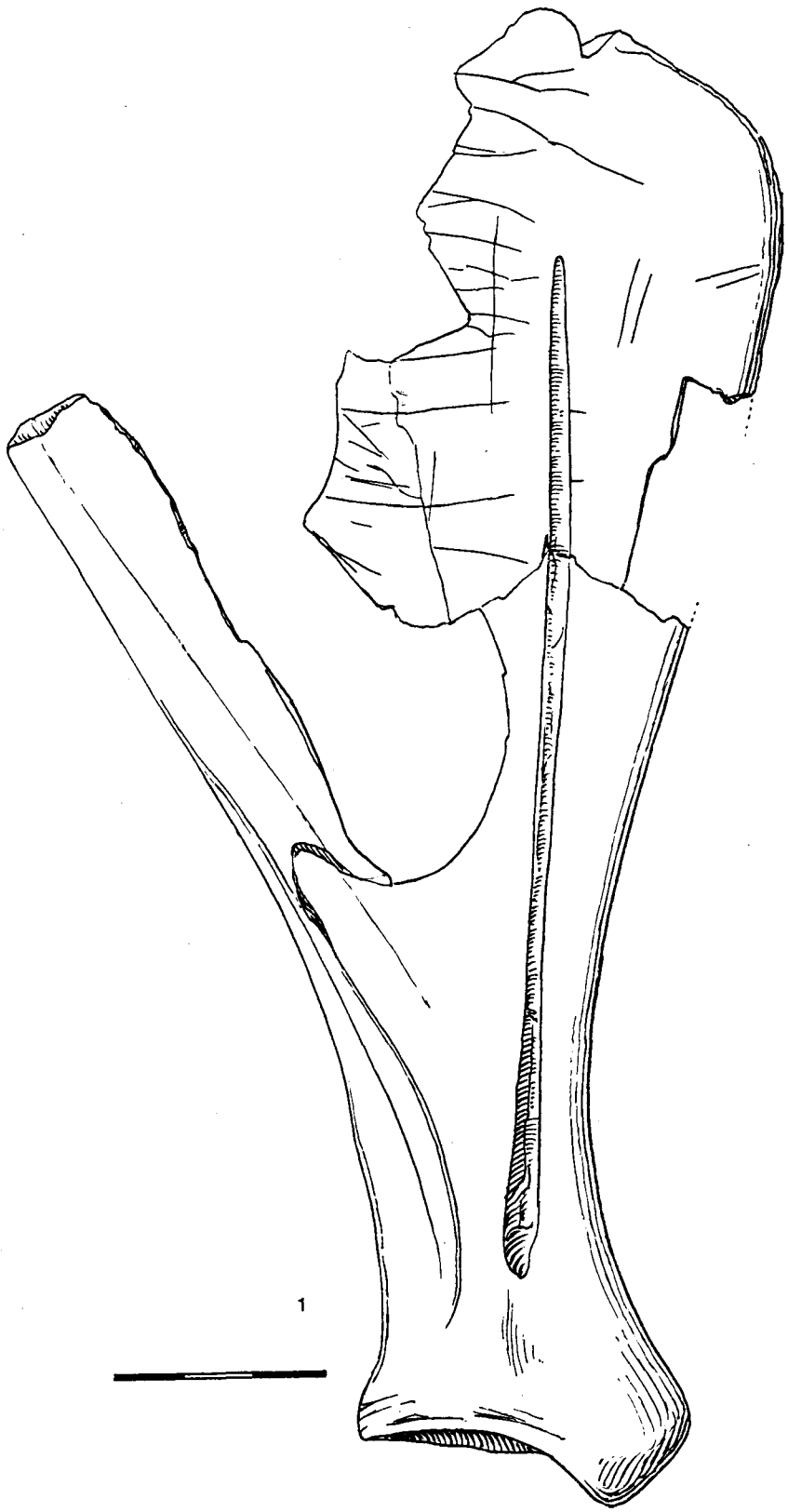
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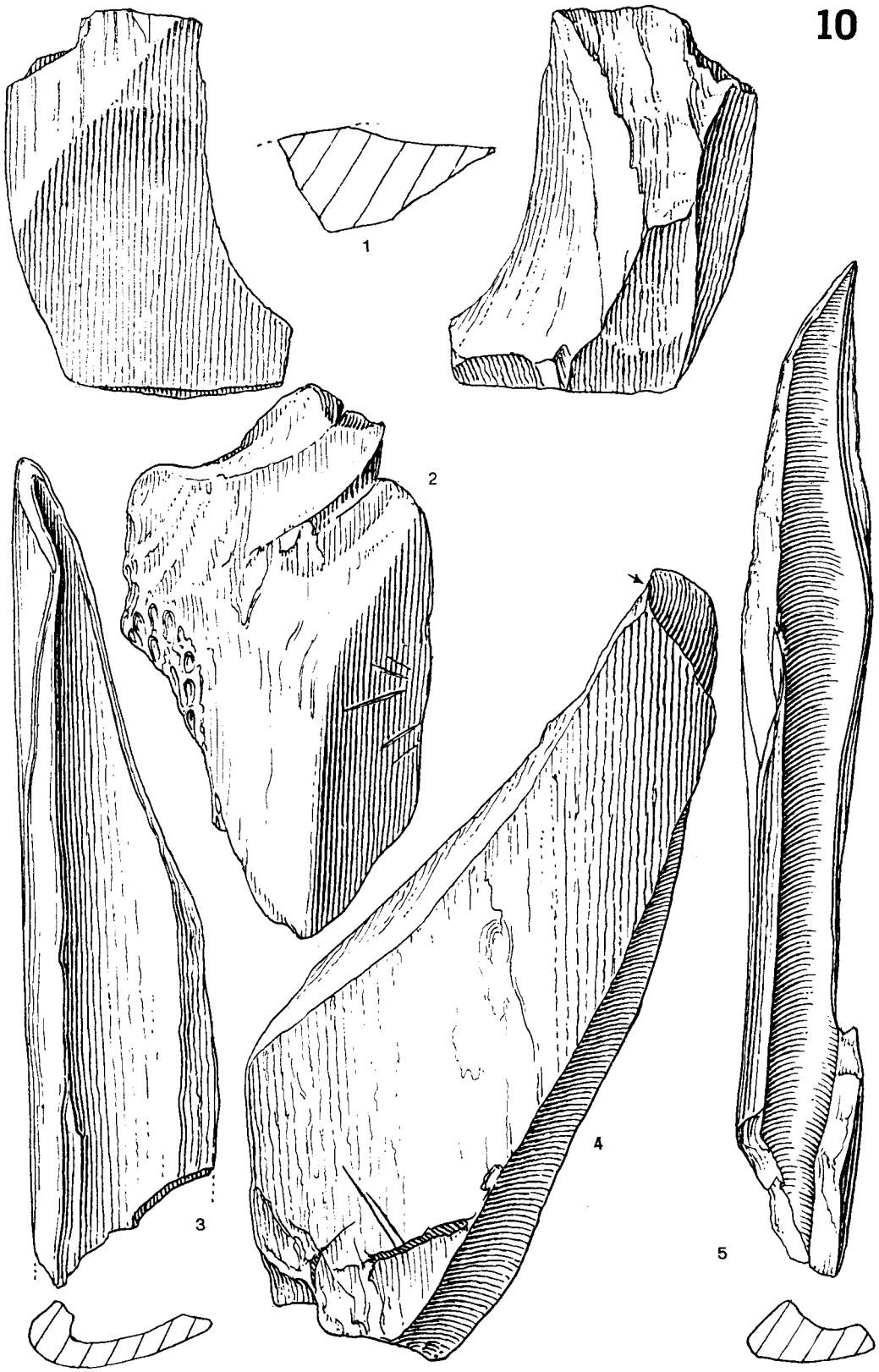
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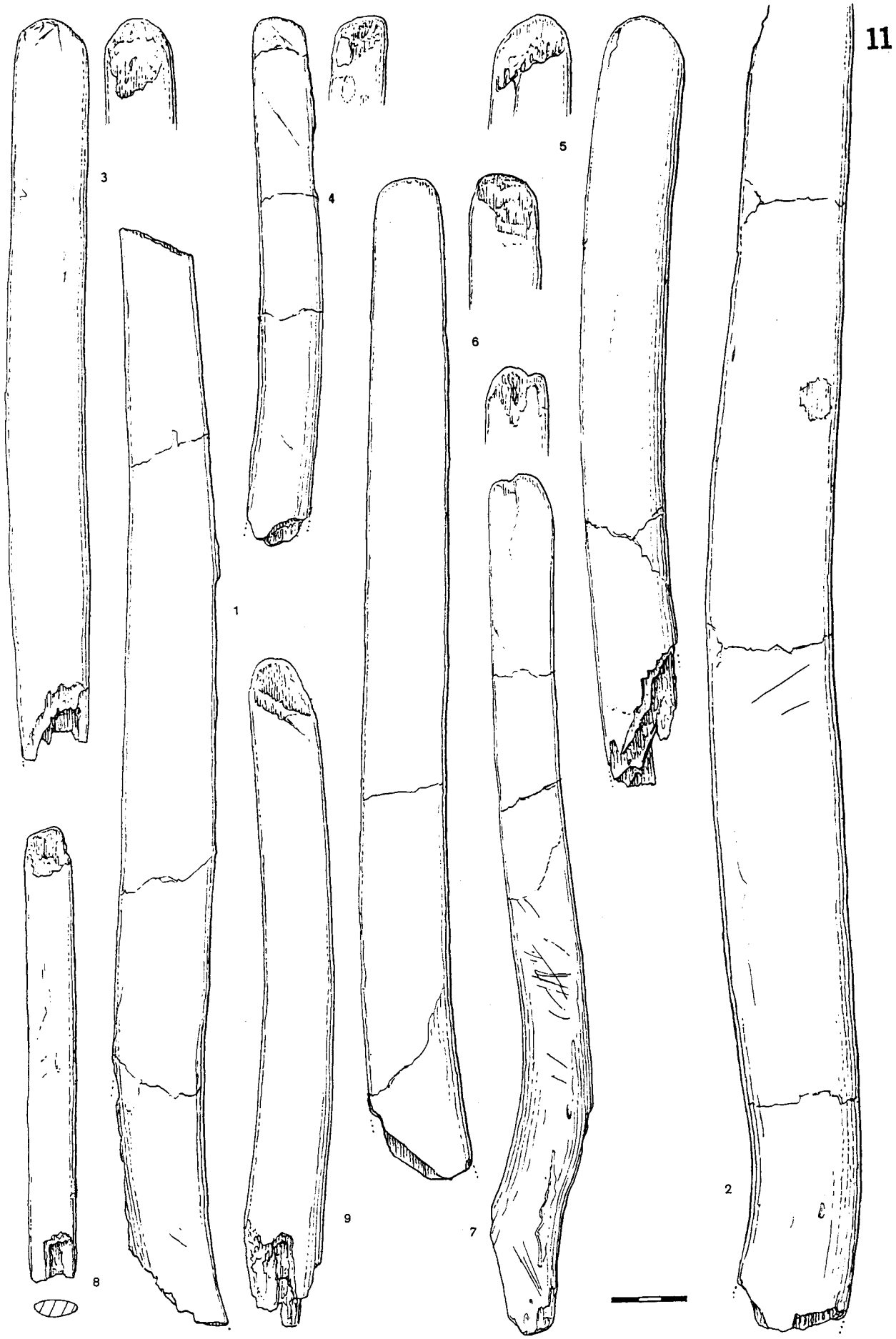
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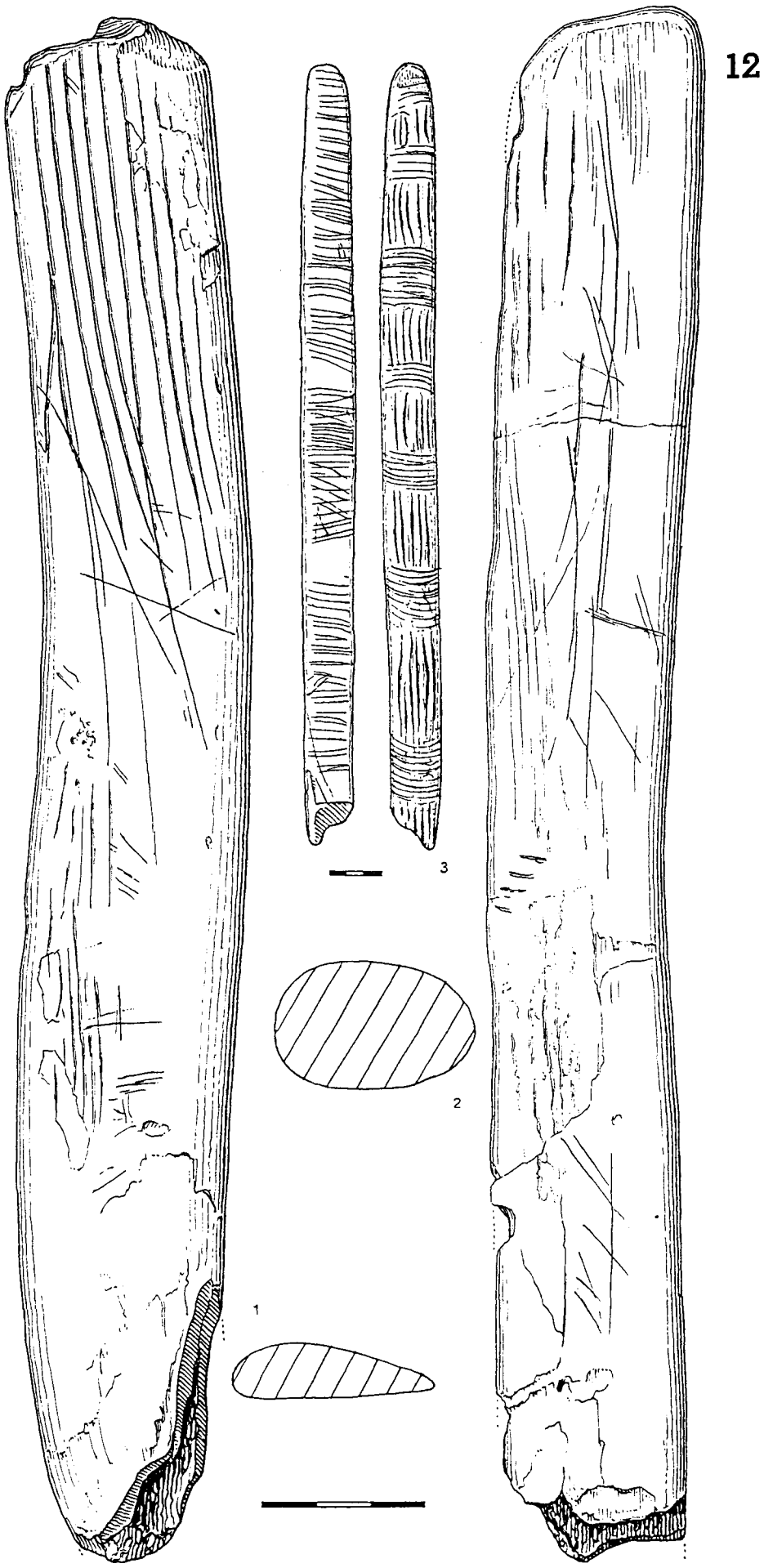
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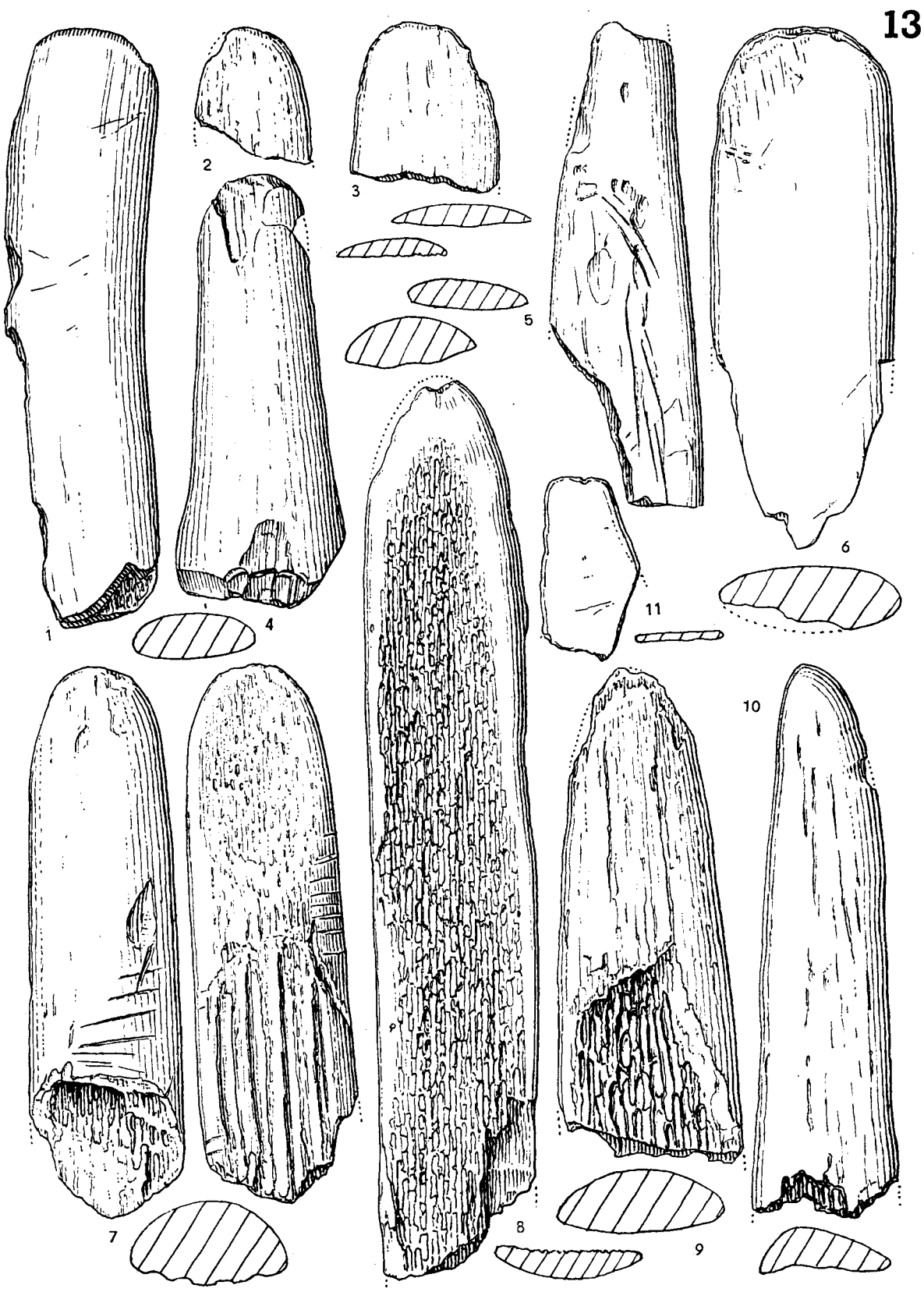
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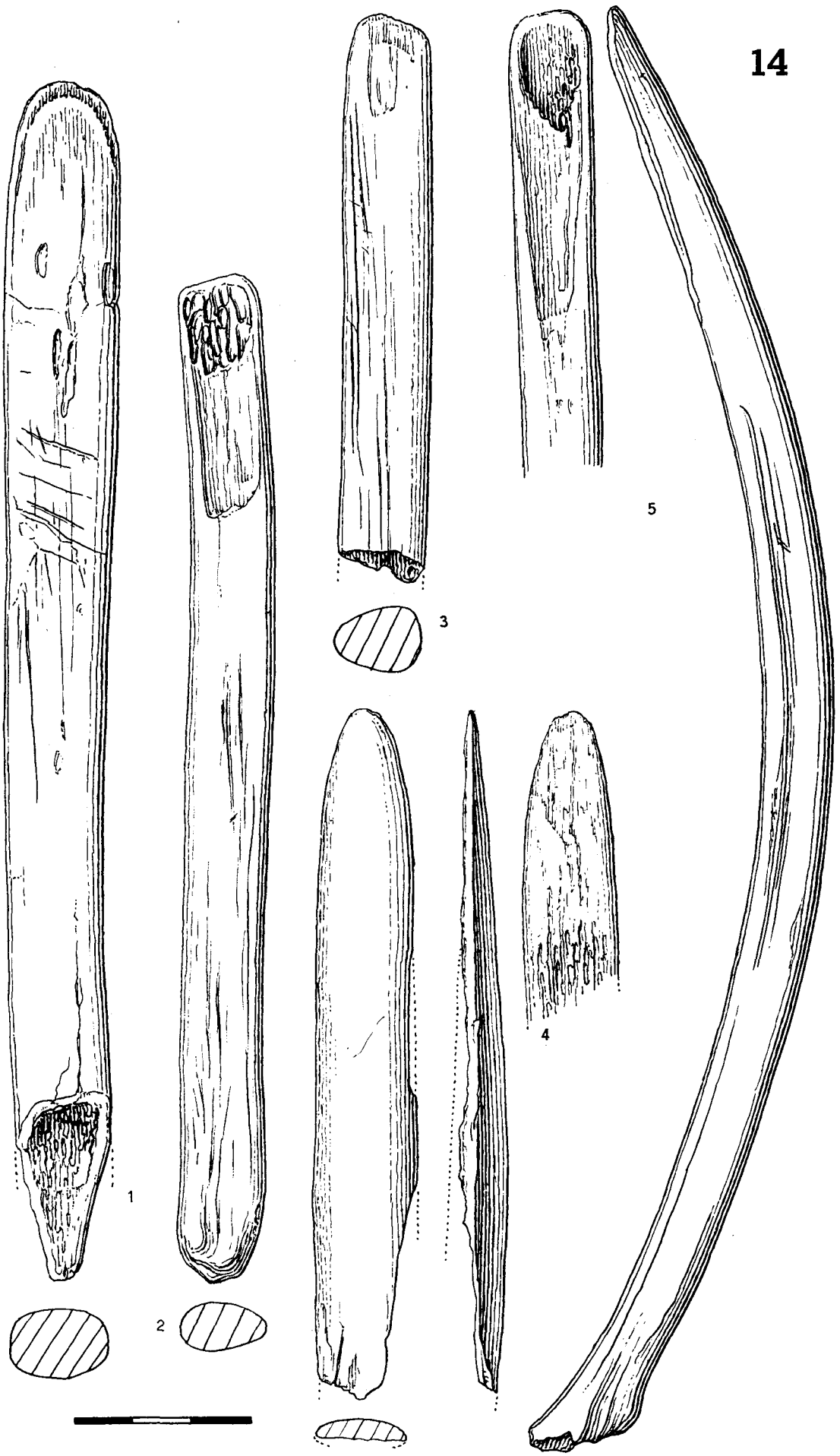
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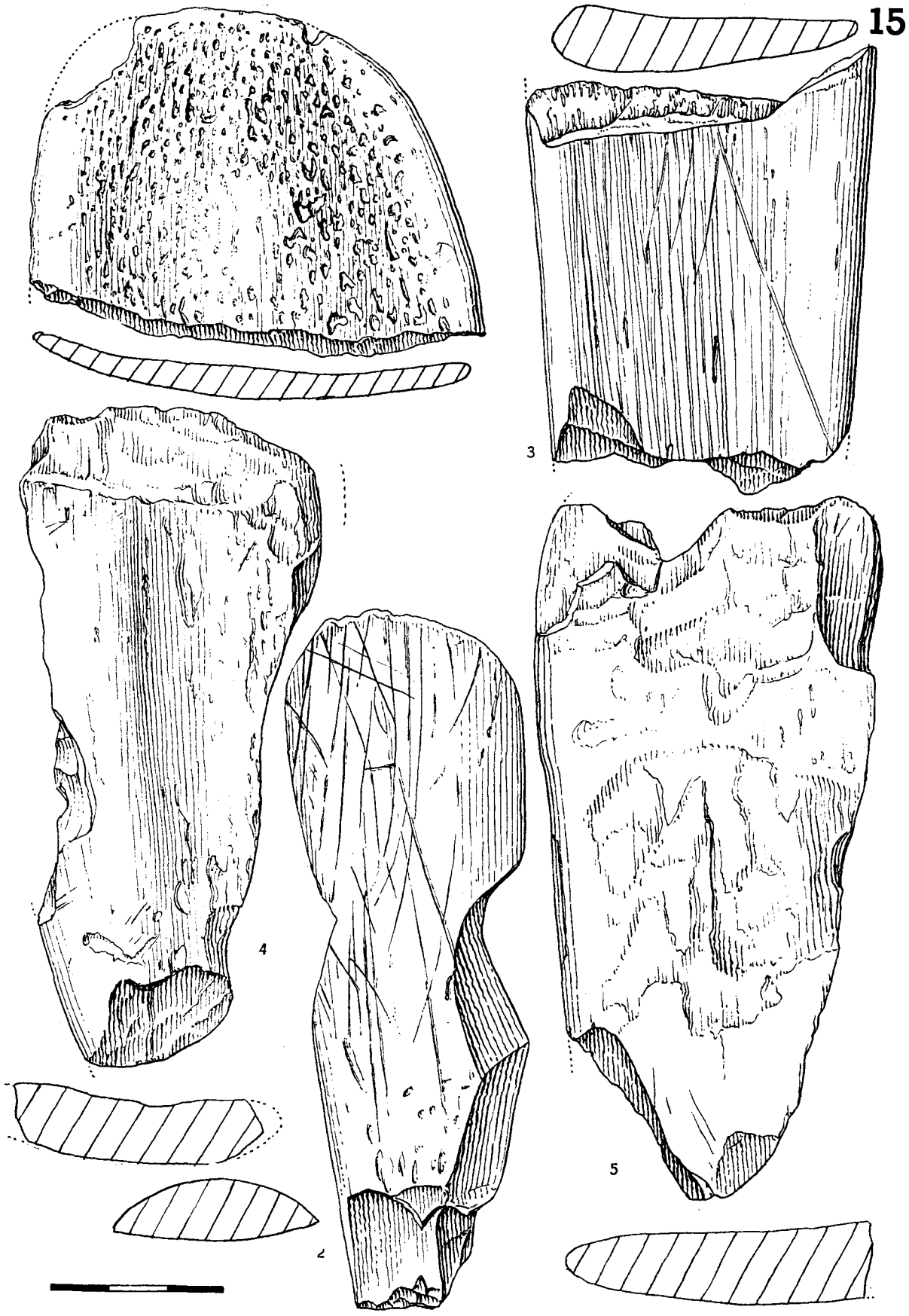
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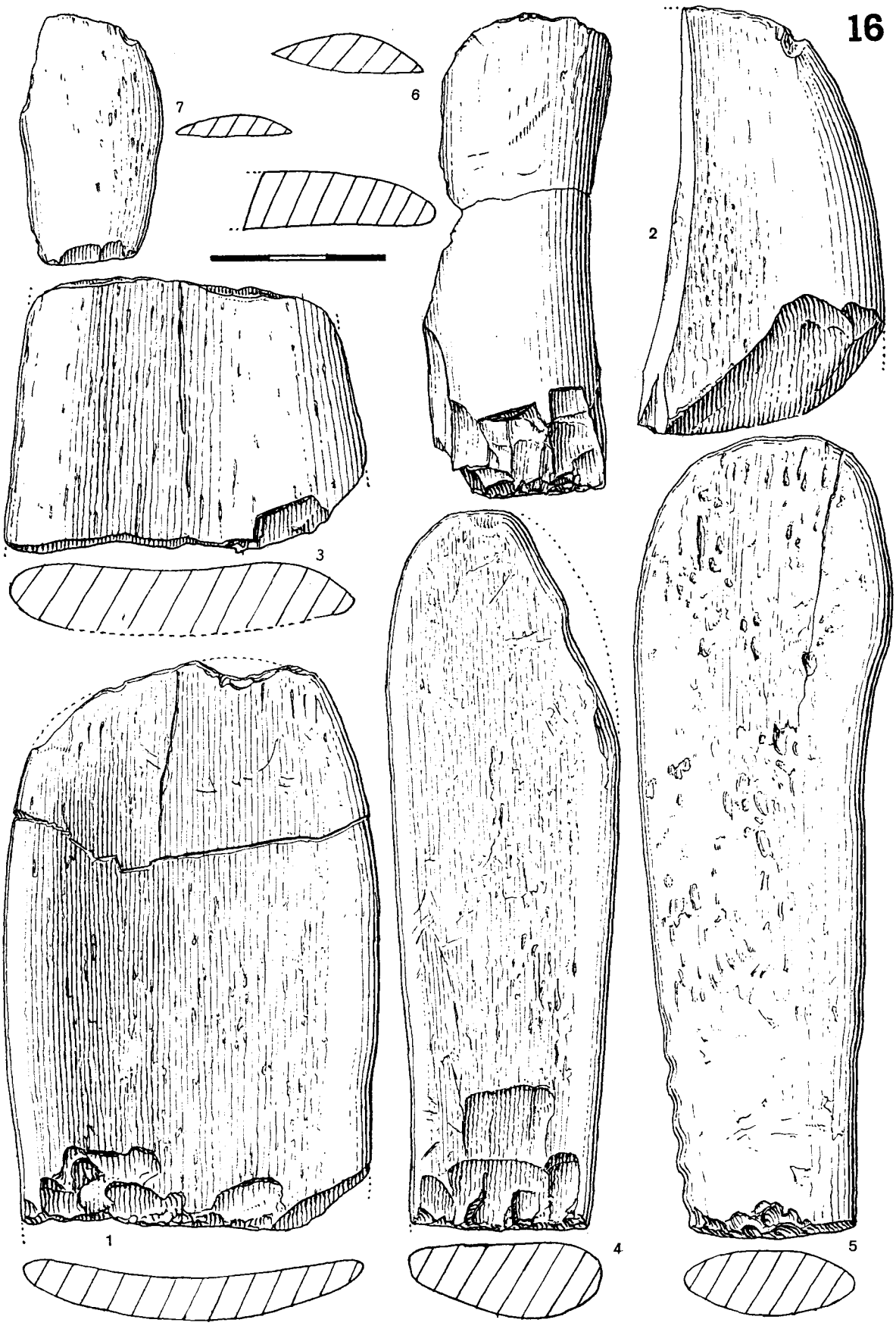
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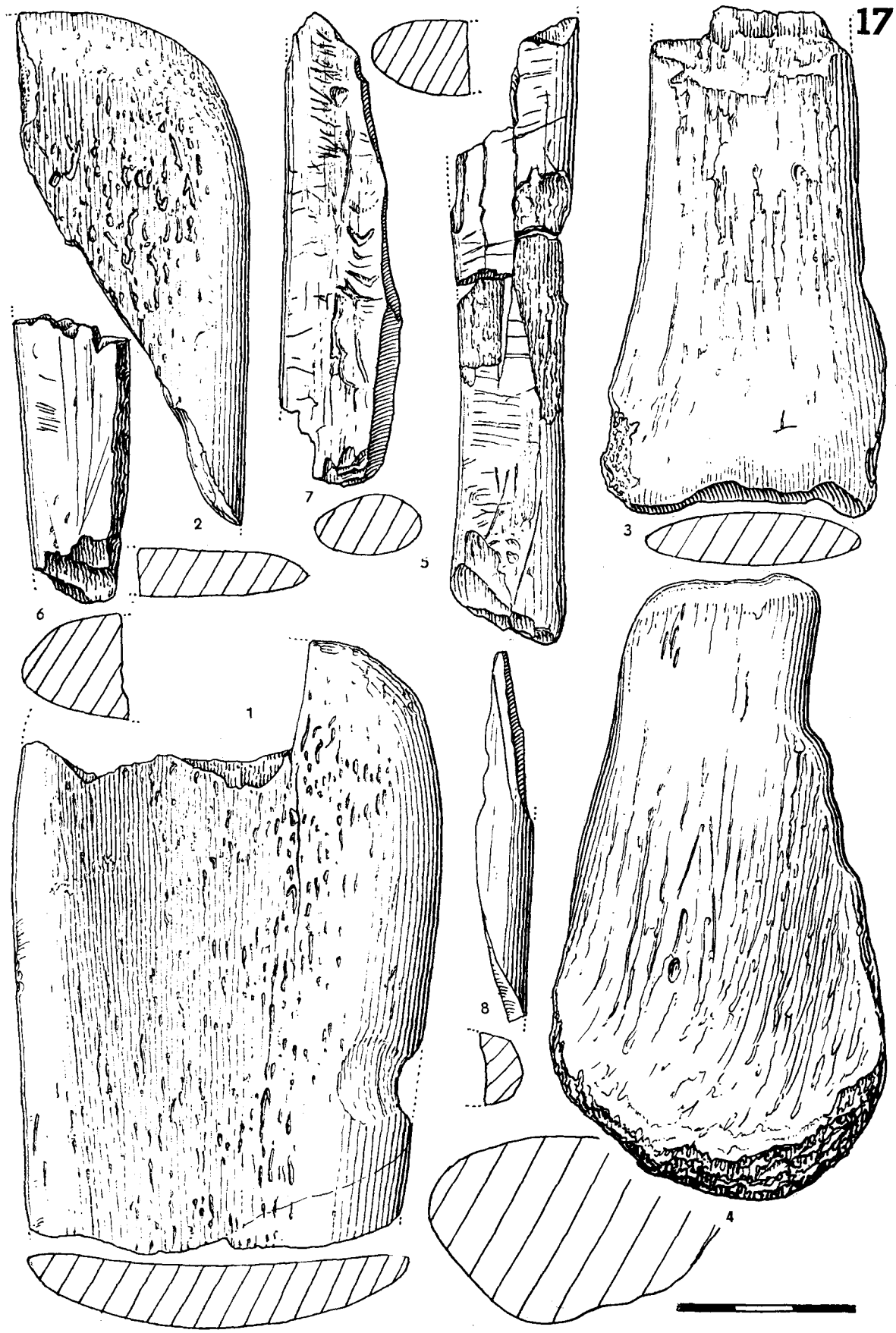
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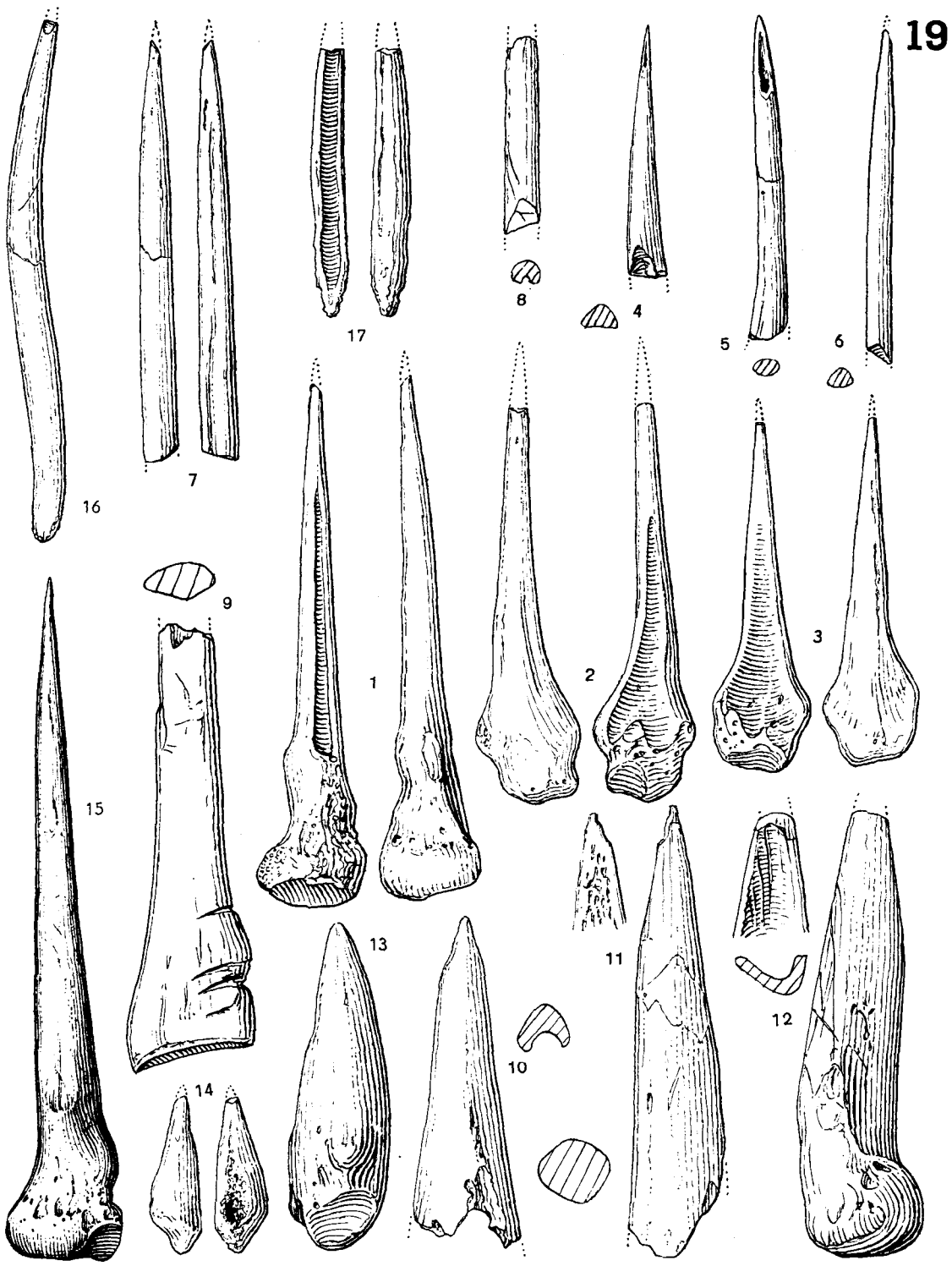
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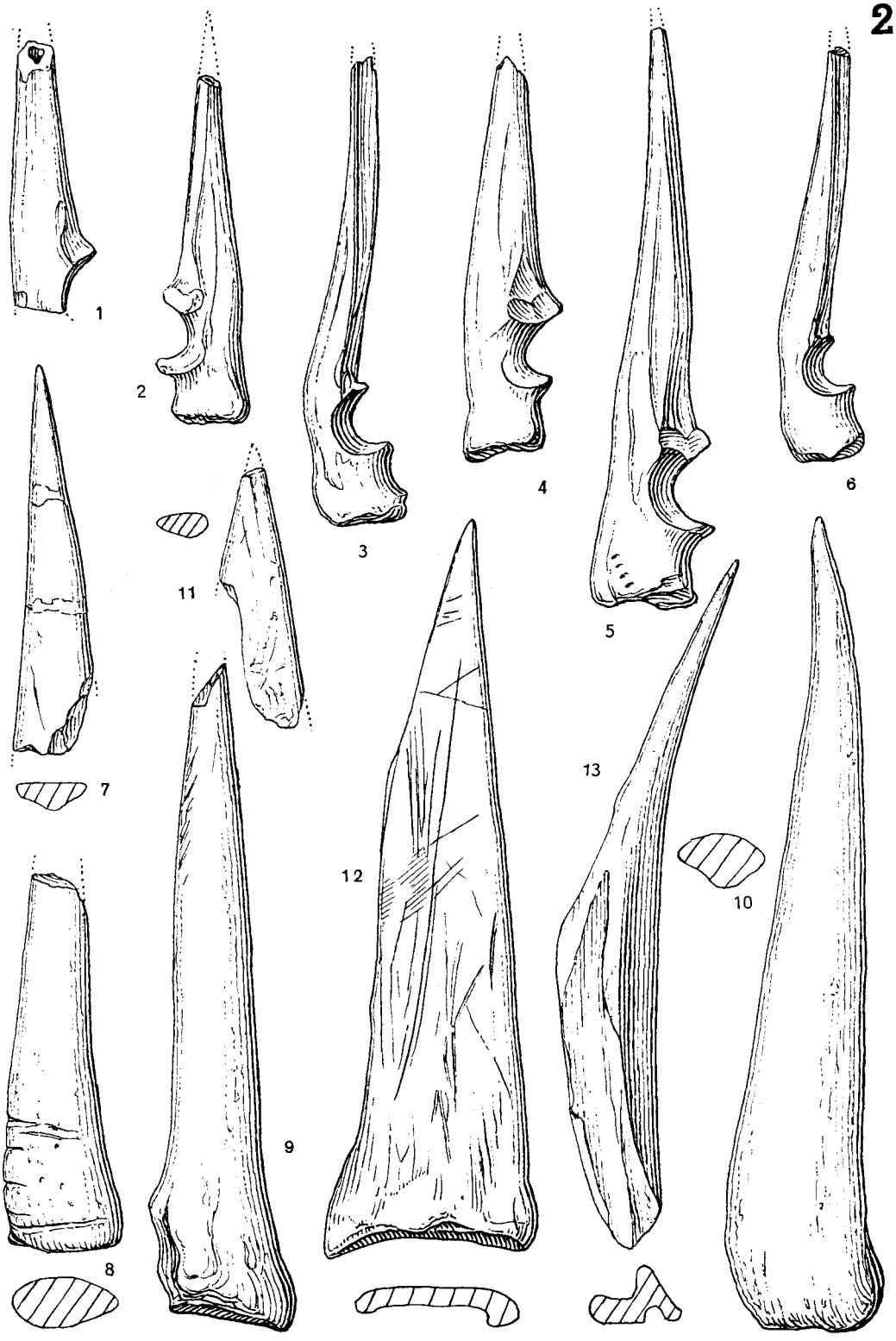
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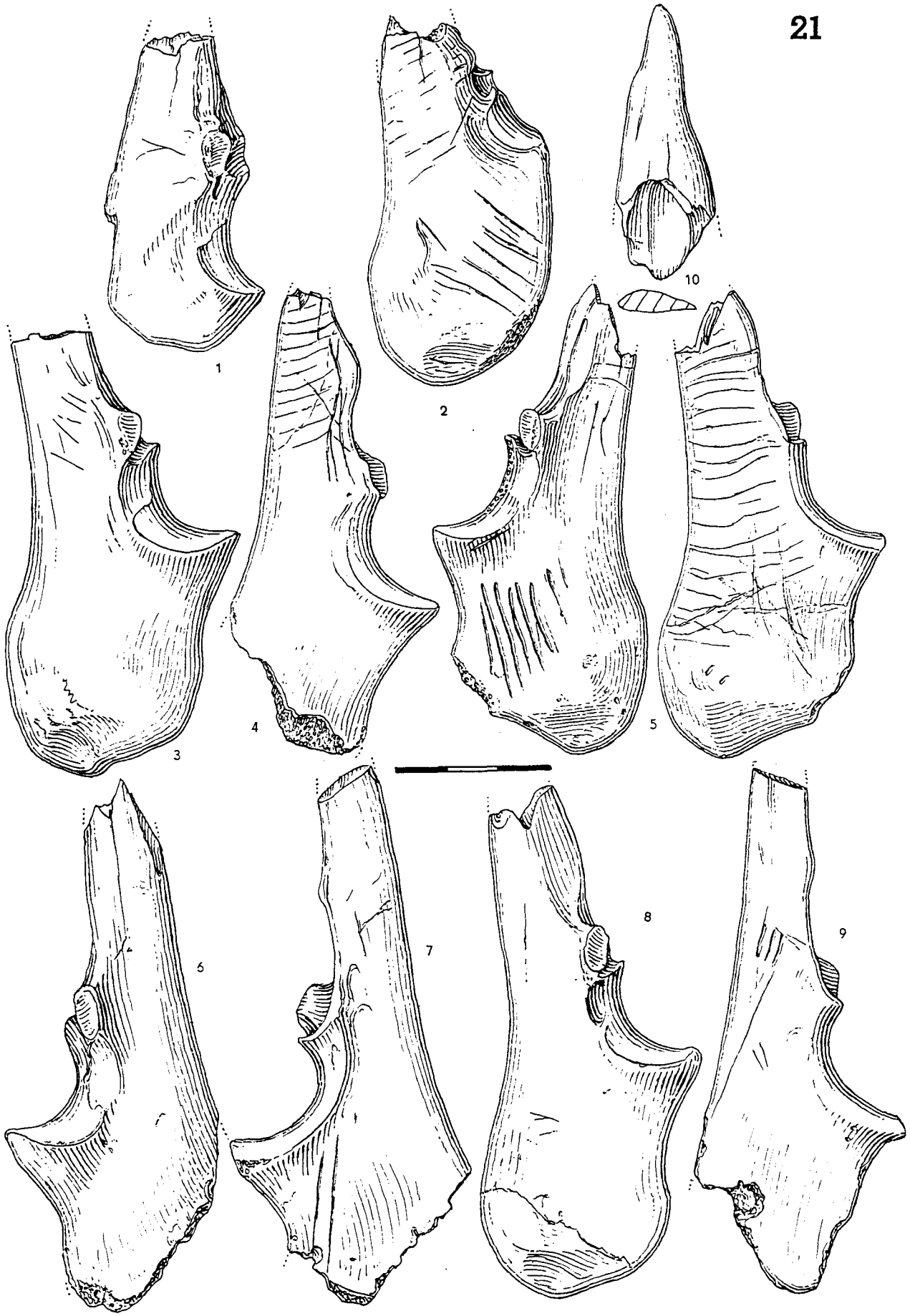
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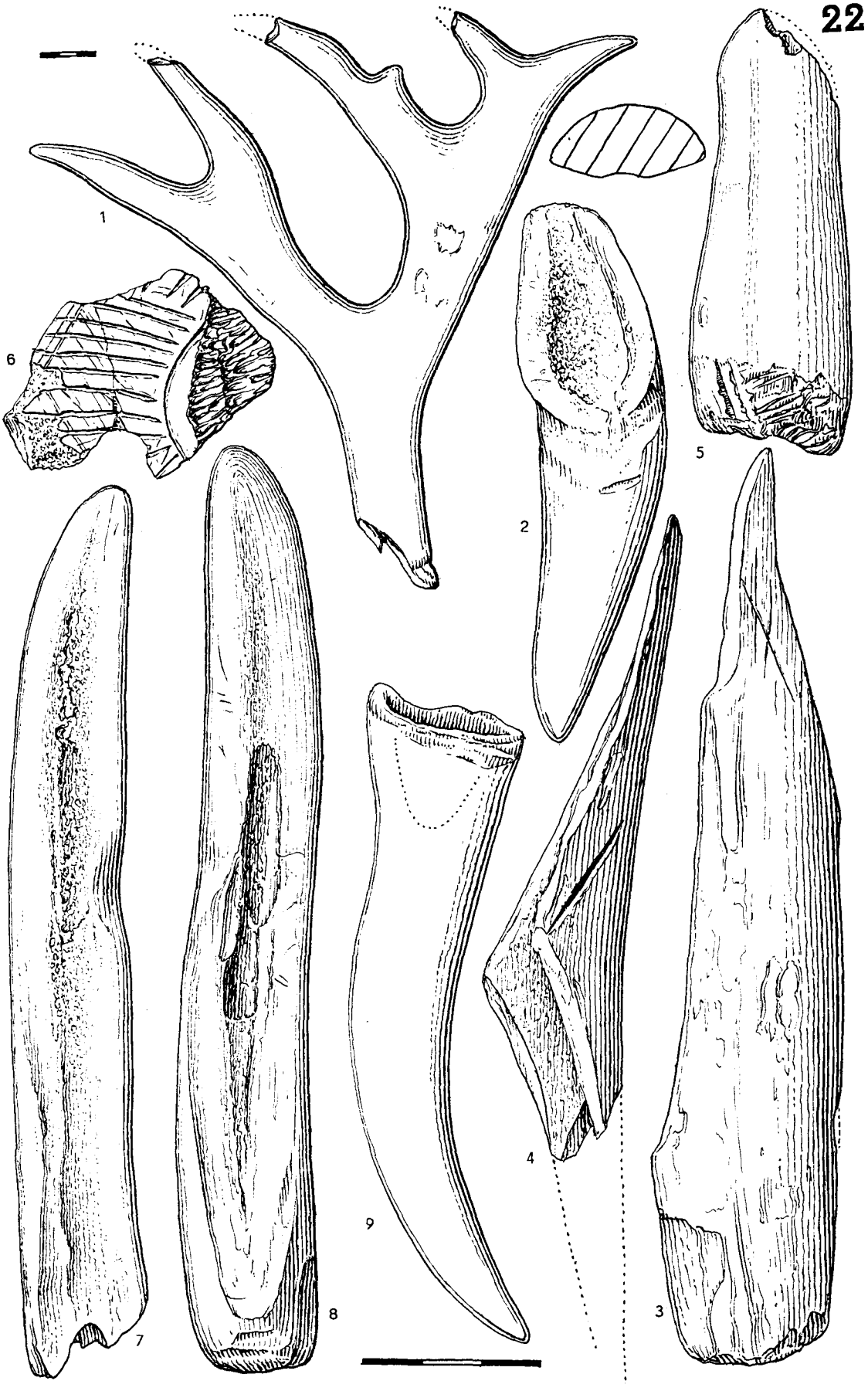
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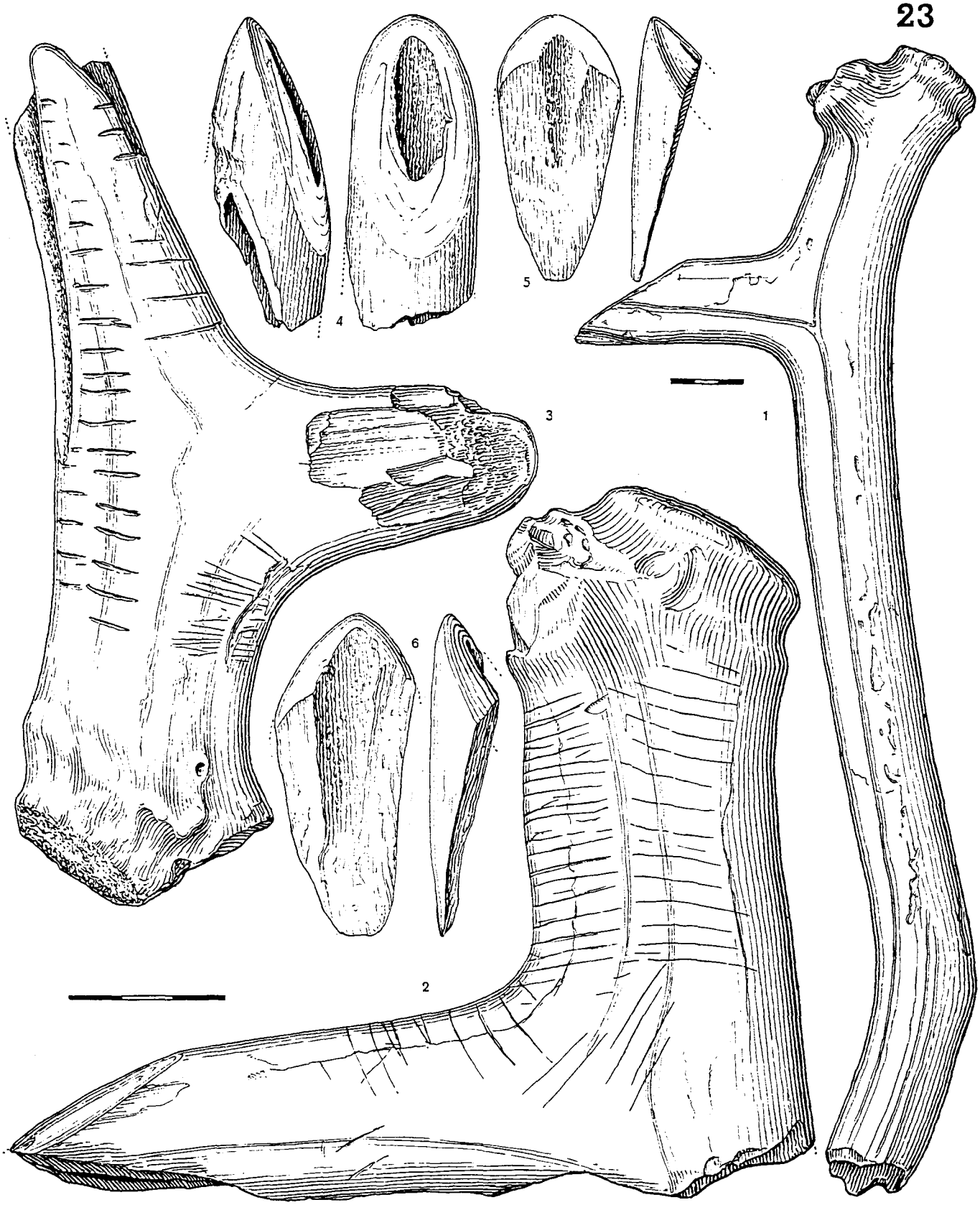
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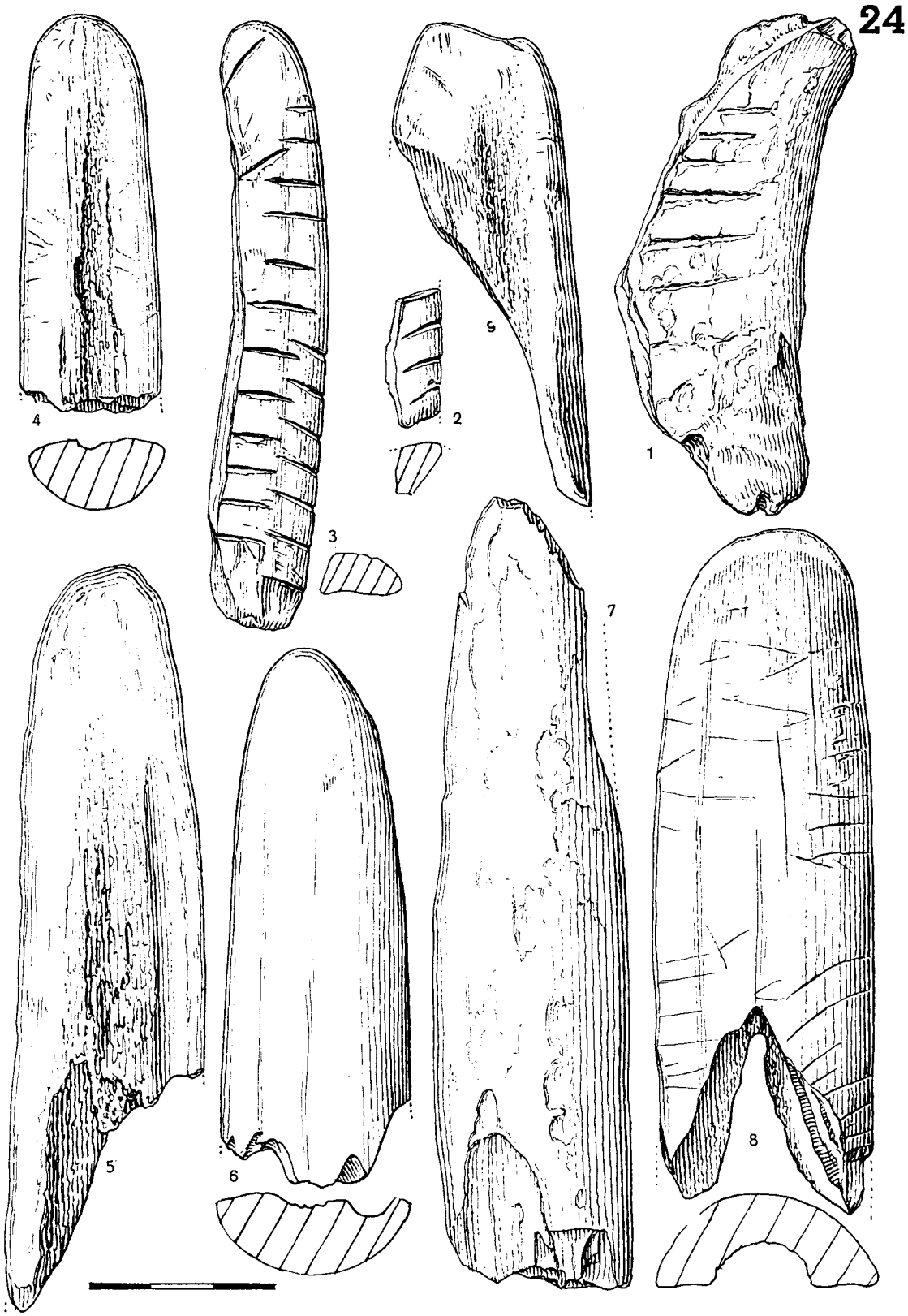
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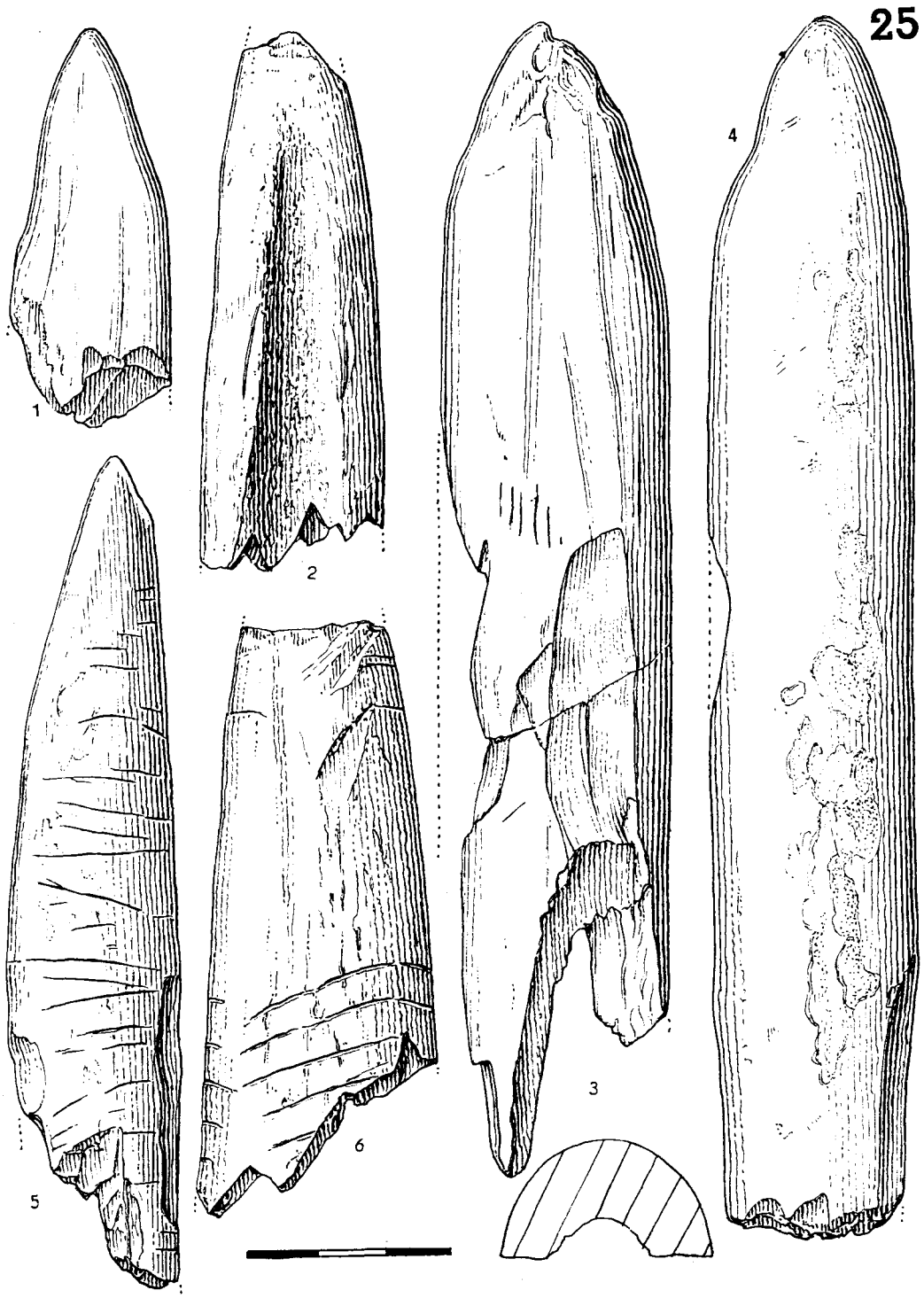
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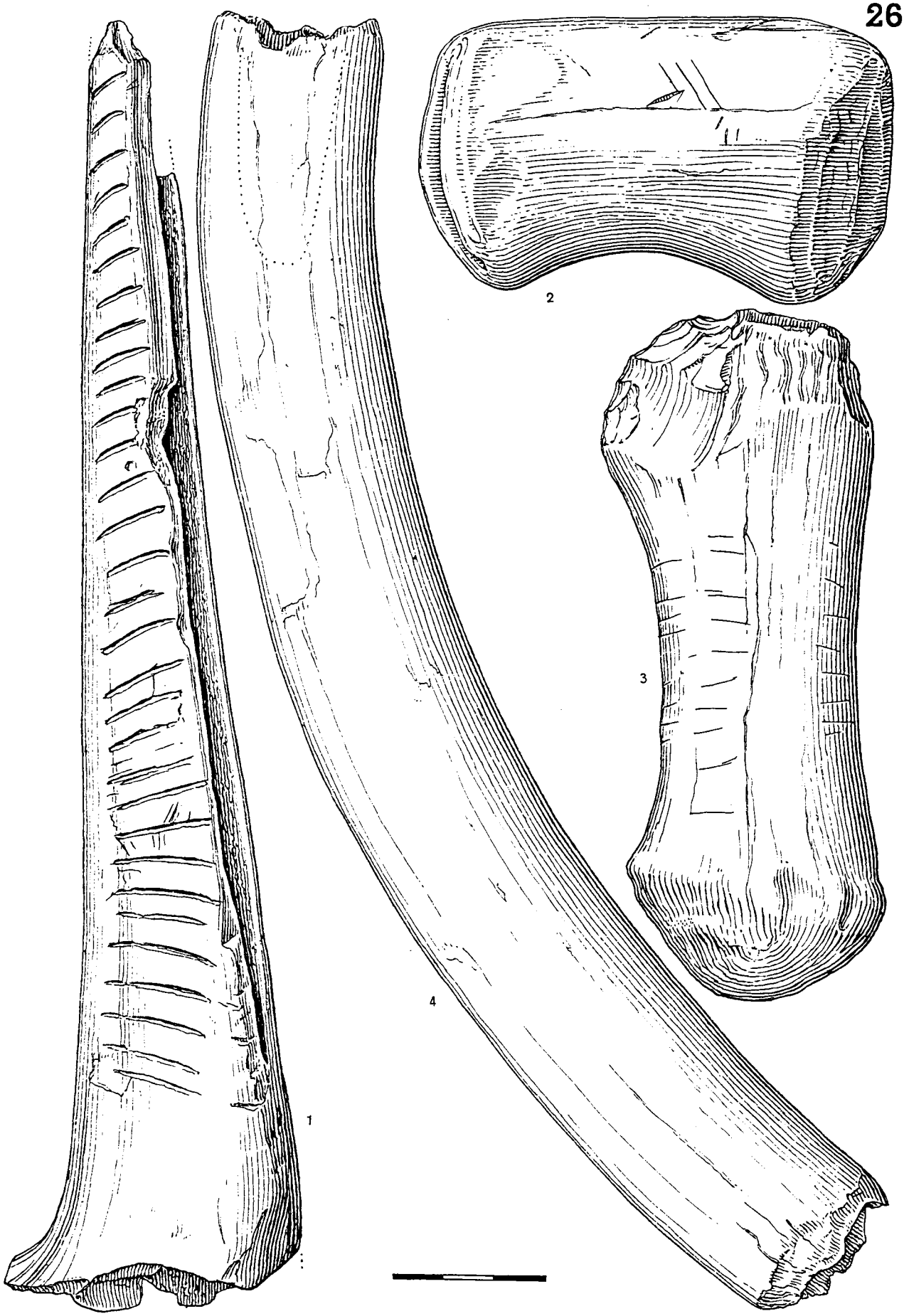
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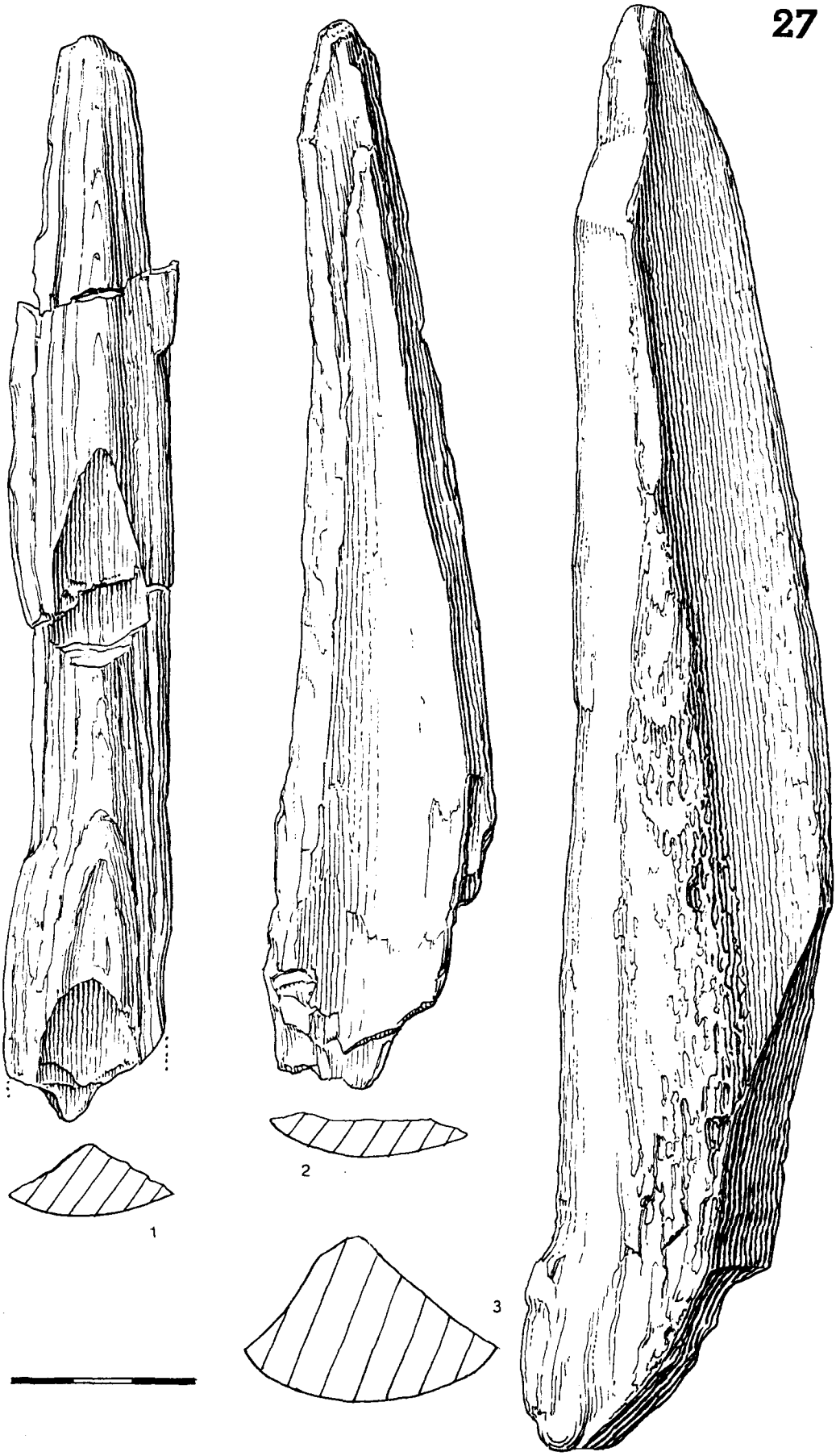
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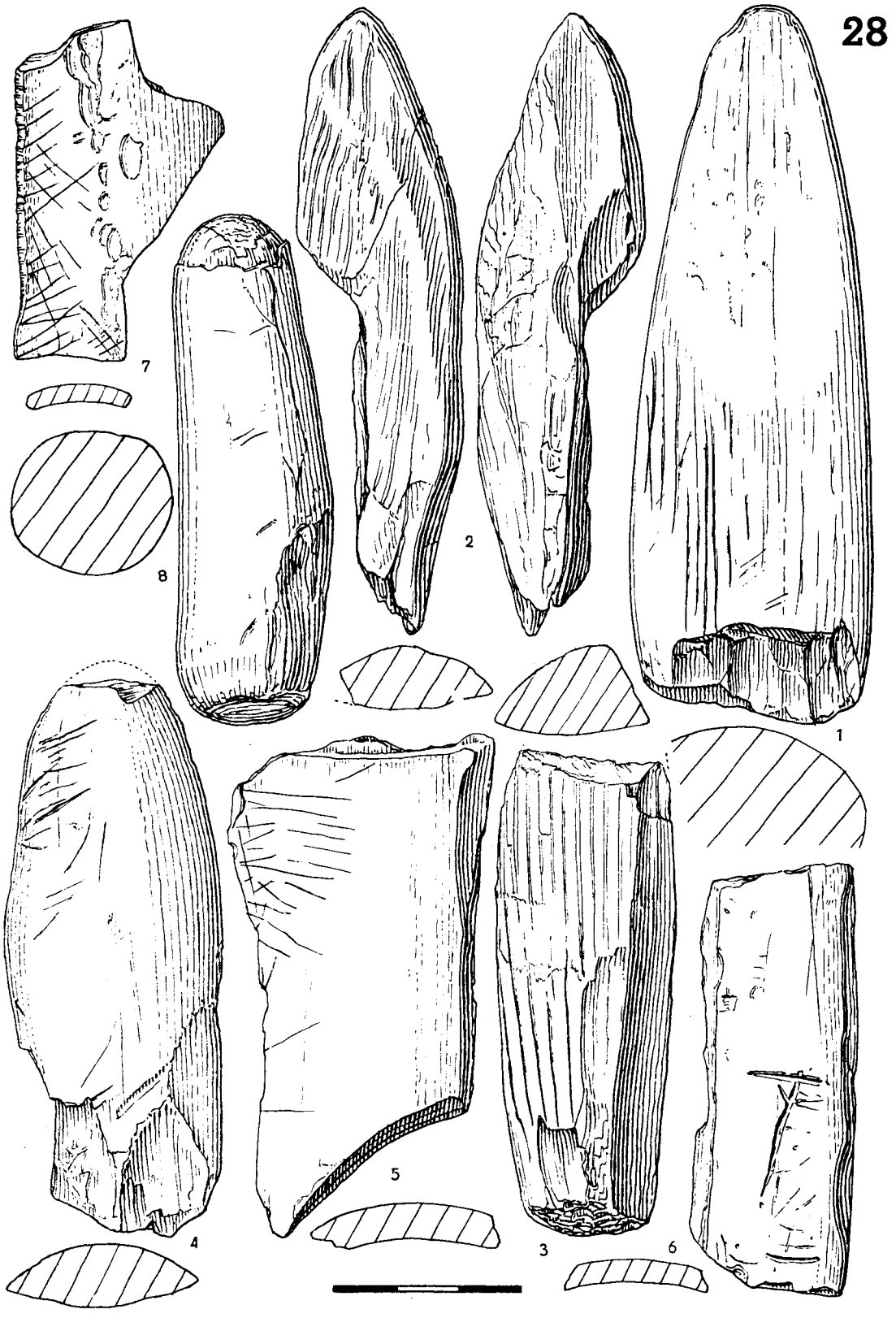
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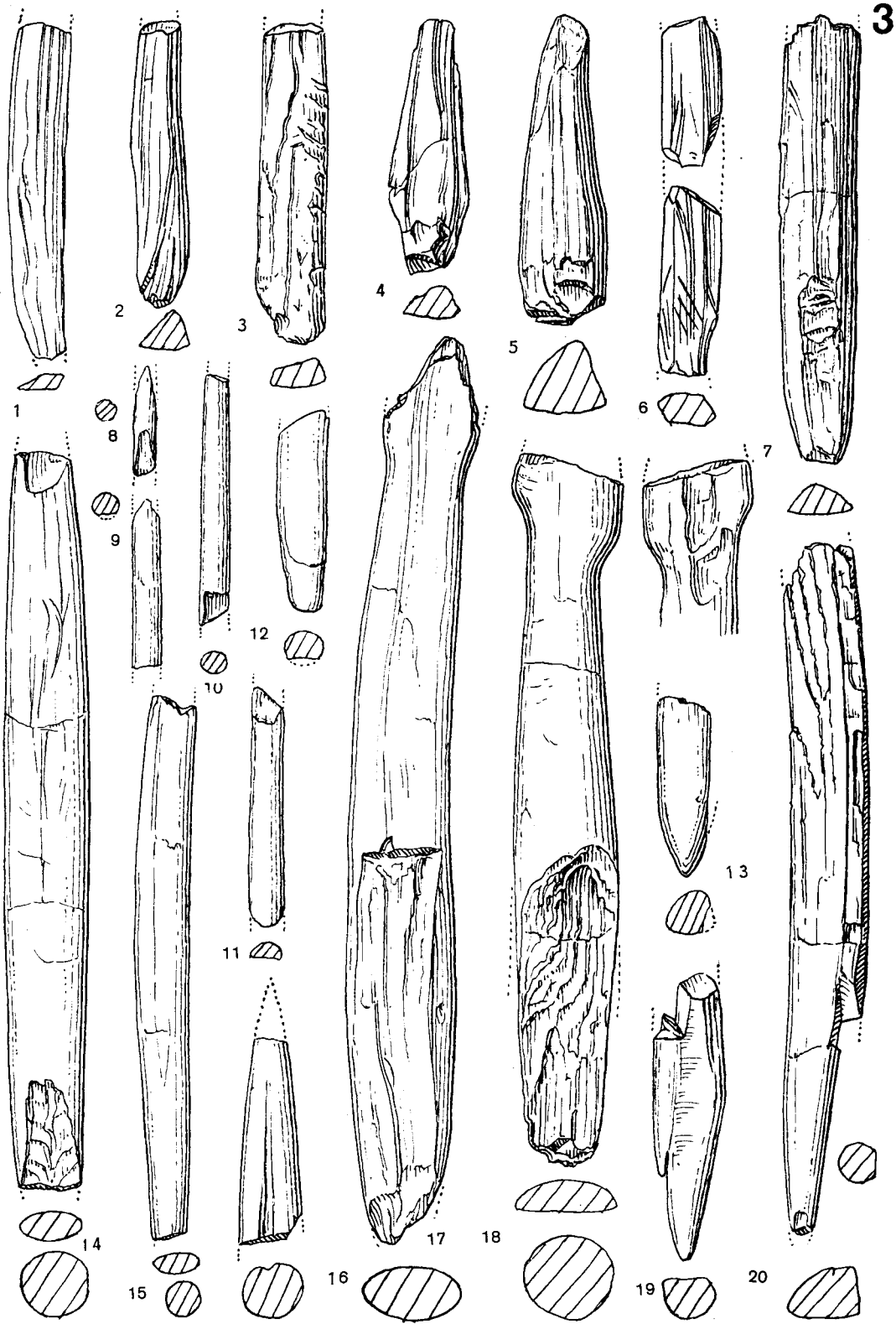
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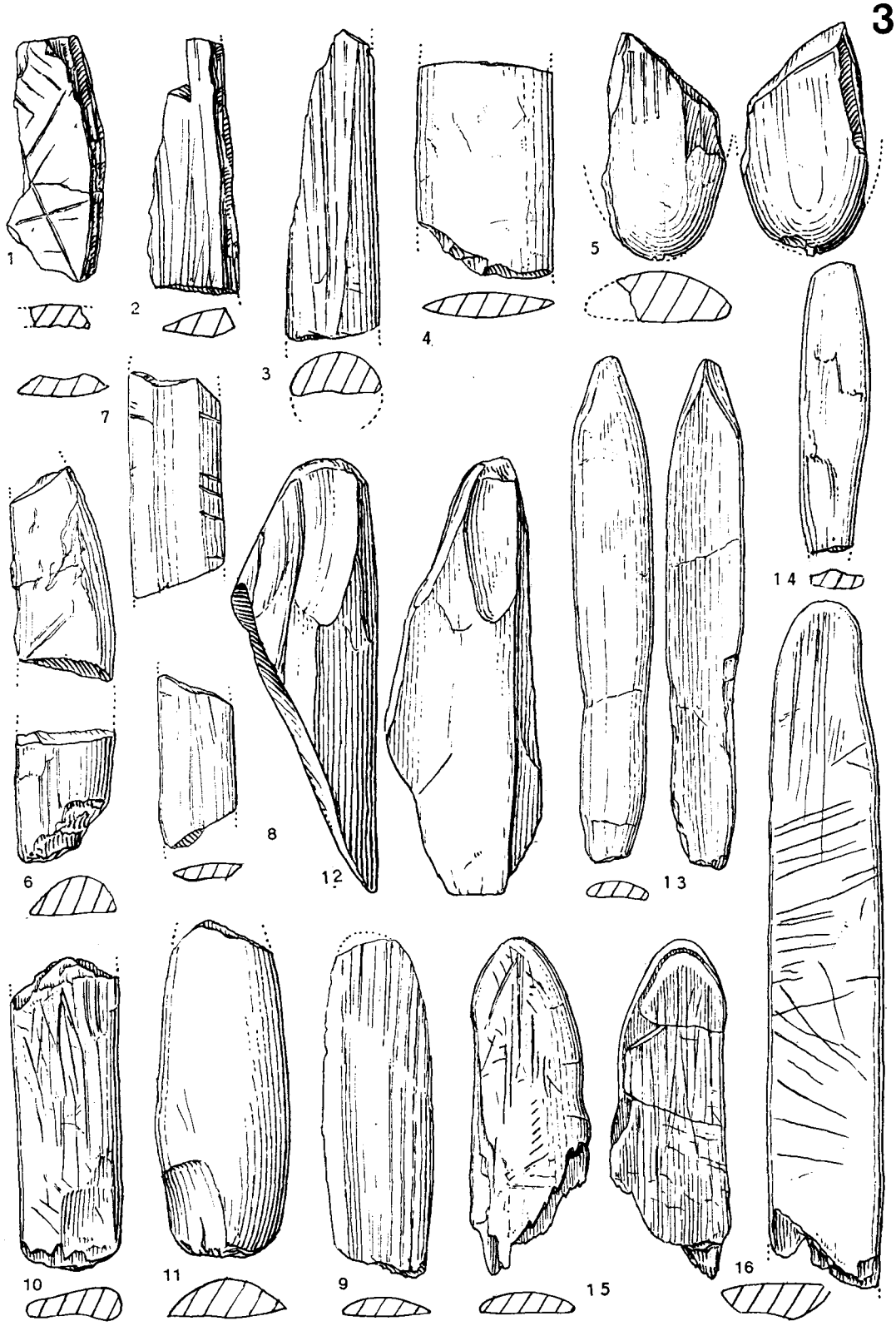
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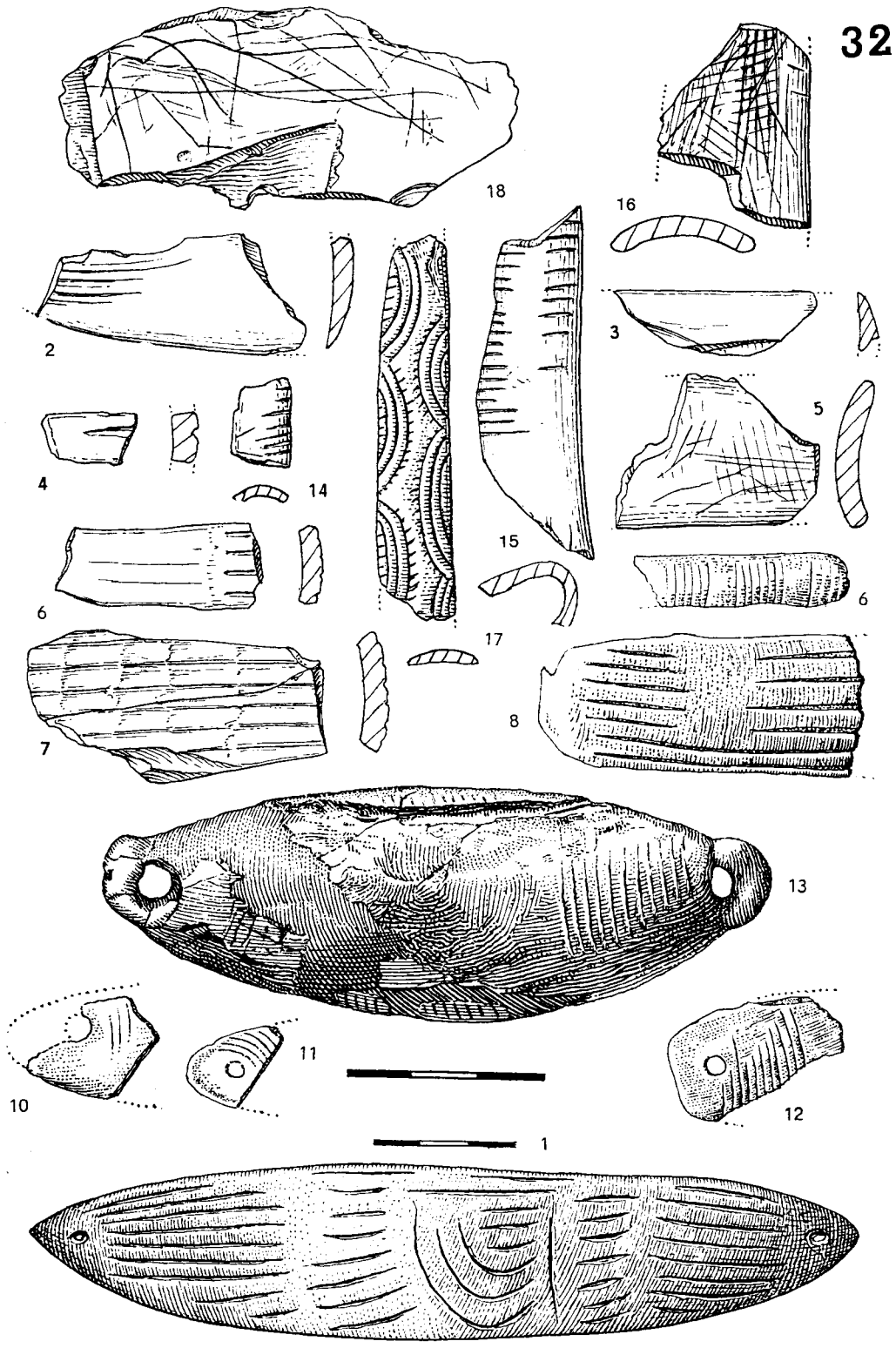
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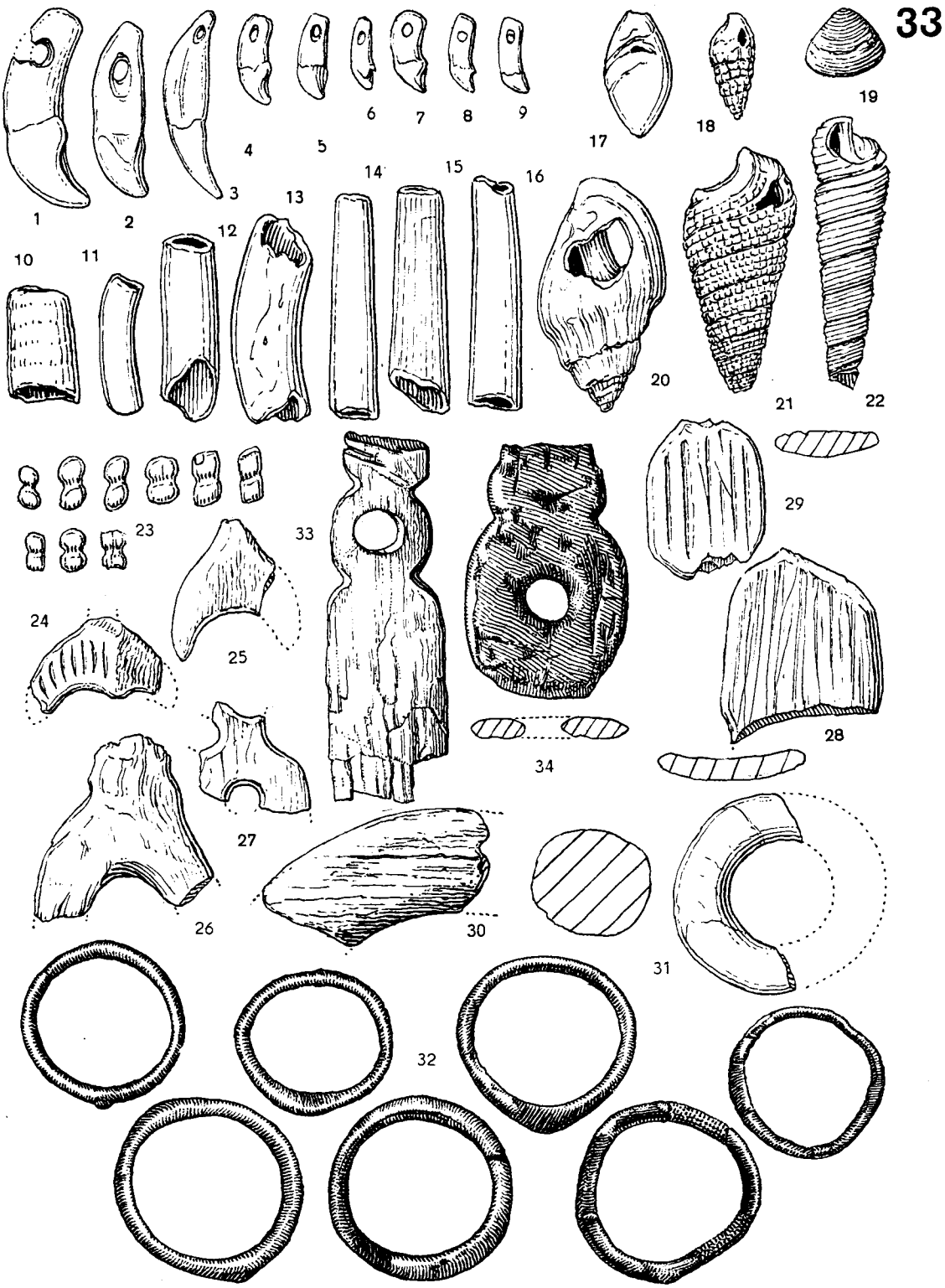
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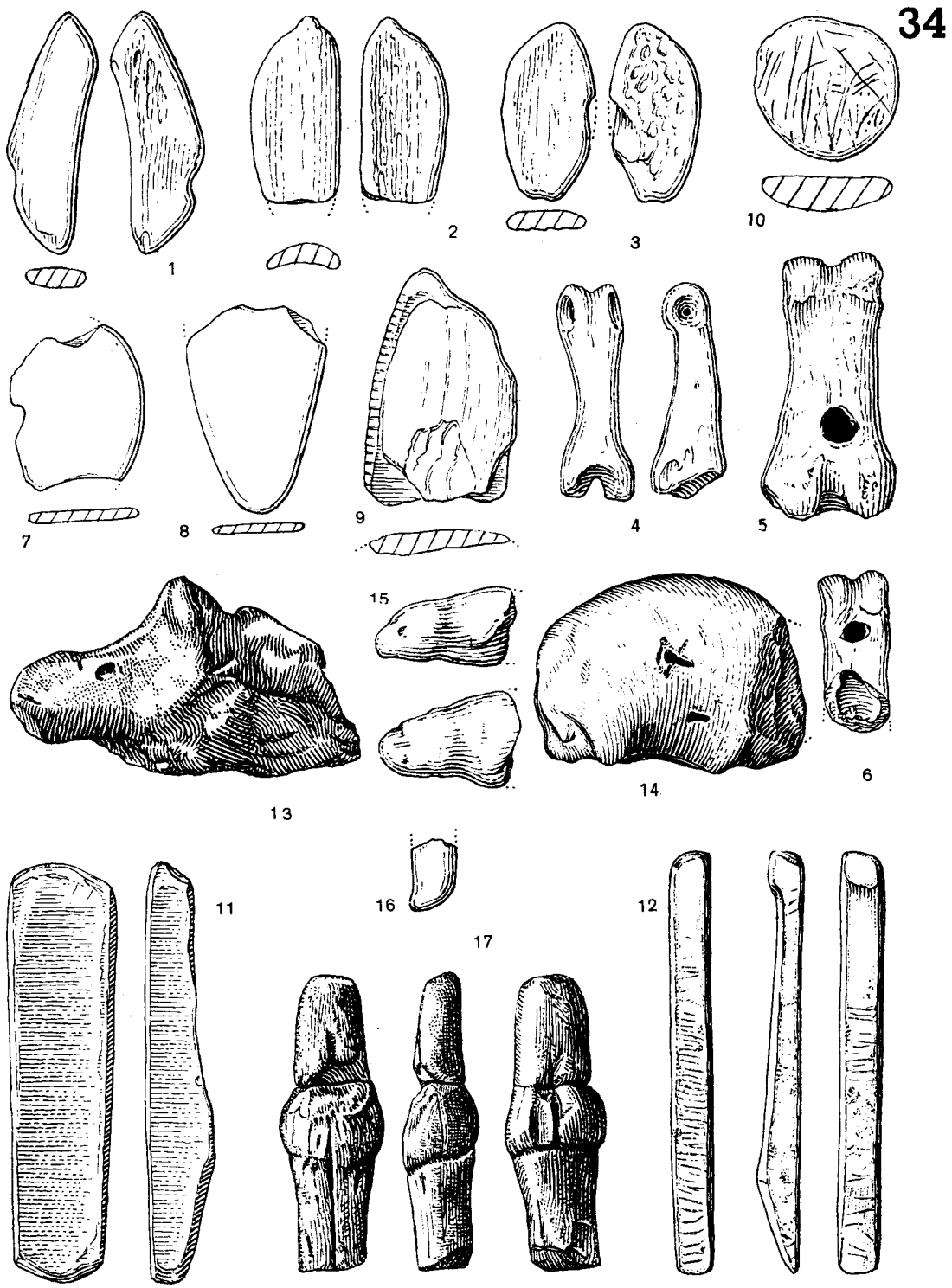
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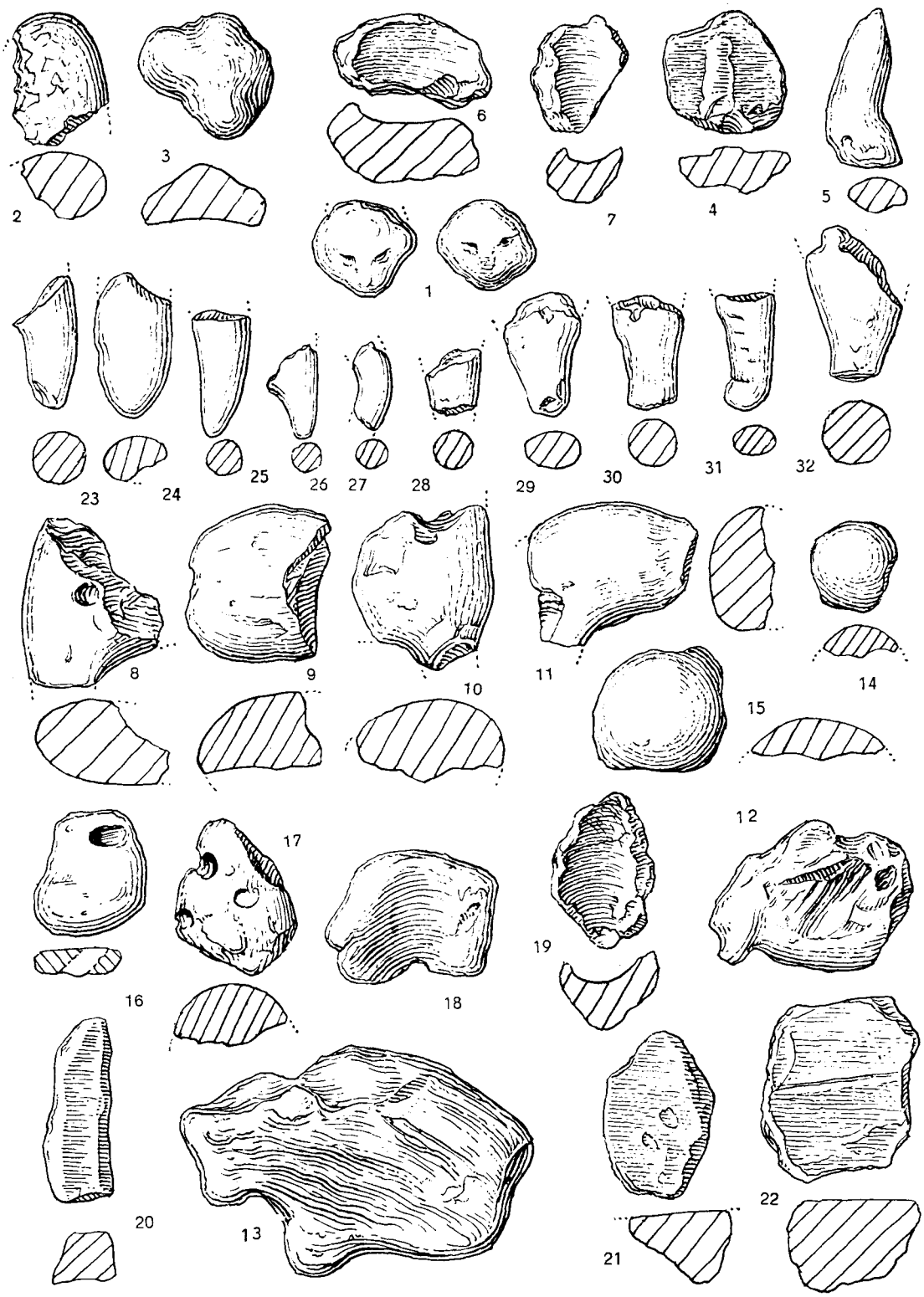

CHAPTER IV
THE CERAMICS

by Olga Soffer and Pamela Vandiver

1. Introduction

Our study of the ceramic inventory excavated at Pavlov I during the 1952-53 field seasons focused on establishing what categories of objects were present as well as how they were made. The examined collection of 1,332 objects was subjected to an in-depth technological and typological analyses. Thirty nonfigurative Pavlov I ceramic samples as well as four samples of loess from the site and one recovered near a hearth at the site were subjected to the same series of laboratory analyses we had used in our study of the Dolní Věstonice I ceramics to characterize structure, composition, range of variability, and firing temperatures (for a detailed description see Vandiver et. al. 1990).

The typological study sub-divided the inventory into the following five analytic categories:

I. Not worked or smoothed

II. Worked or smoothed:

A. Non-figurative

B. Figurative:

(1) anthropomorphic

(2) zoomorphic

(3) anthropomorphic or zoomorphic

The objects in each category were counted, measured, weighed, and classified by color as yellow to tan, gray, or black. Shaped pieces were examined to determine what methods were used to fashion them. Figurative pieces were examined for the following traits:

a. silhouette: natural; distorted - how

b. depiction : natural; stylized -how

c. body position : at rest; in motion - what kind

d. decorative elements: absence; presence: nature and location

e. damage: where, what kind

2. The Ceramic Technology

2.1. The Samples

Microscopic examination showed that one of the 30 supposed ceramic samples was weathered, stained and cracked tooth enamel and dentin. The other samples made of inorganic materials were sorted by color and hardness into three groups. One was yellow and soft (Mohs hardness of about 1 1/2 to 2). The second was gray to dark tan or black in color and slightly harder. The color tended to be splotchy, as if smudged or fire smoked. The third group was tan to brown or orange and harder (Mohs 2-3 1/2). The color tended to be layered from the exterior to the interior with tan, brown or gray on the exterior and orange on the inside.

The four samples of loess were provided as control samples and were used to establish a baseline of untreated, unworked and unfired samples during the characterization of composition, microstructure and firing reactions. Three of the samples were easily powdered and yellow. The fourth sample was orange in color and somewhat hard to crush.

2.2. Analyses and Results

To determine whether the proposed ceramic samples were durable examples of well-fired ceramic, a subsample of 50 to 80 mg. was placed in a beaker of boiling water, and a durability test was conducted. Fifteen of the 29 samples dissolved when placed in the boiling water, indicating they are not durable examples of well-fired clay. They may have rehydroxlated during burial, or they may never have been fired. The remaining fourteen samples proved durable during 3 hours of continuous boiling, and after standing in water for a further 24 hours. When dry their original color and Mohs hardness returned. All of the yellow subsamples dissolved when placed in boiling water; whereas, all of the orange subsamples remained unaltered after this test. Thus, the orange color is an indication of the upper limit of firing temperature. In comparison with the Dolní Věstonice I assemblage of ceramic fragments, those from Pavlov are less durable. Twenty-nine of 30 samples tested from Dolní Věstonice excavations remained hard and durable after undergoing the same test. As will be discussed later, such variation in properties indicates that there are differences between the two ceramic assemblages.

In order to determine whether the reason for the lack of strength of half of the ceramic fragments is related to composition or firing, a subsample of 25-50 mg. was subjected to a 2 N solution of hydrochloric acid. The tooth fragment dissolved slowly. The 15 nondurable samples and 4 of the gray to black splotchy samples in the second group fizzed rapidly, indicating the probable presence of calcium carbonate. In each case not all of the sample dissolved, indicating the presence of noncarbonate minerals. In each case, the residue upon drying was stained yellow, presumably due to the presence of iron oxide and/or hydroxide, both of which are somewhat soluble in HCl acid. From this test, our conclusion is that the reason for the lack of durability is that unsuitable, earthy materials probably high in calcium carbonate were chosen as a raw material for modeling of lumps and figurines.

In order to confirm that calcium carbonate was present and to test how much calcium carbonate made the raw material unsuitable, both spectrographic and diffraction methods were used. Another 50 mg subsample was taken from two of the yellow and two of the gray splotchy samples. These were mounted for examination with a scanning electron microscope, along with pressed pellets of well milled mixtures of reagent grade powders consisting of 25 wt% $CaCo_3$-75% SiO_2 and a 50-50 mixture. These three artificial mixtures were used as standards to compare the composition of the four unknowns. Using energy dispersive x-ray analysis in a scanning electron microscope at 200x magnification and counting for 180 seconds, the four samples were shown to one quarter to one half calcium carbonate. X-ray diffraction of the four unknowns confirmed that calcium carbonate was present, in addition to quartz and an illitic type of clay and a minor amount of mica. Other very minor peaks were present, but were not identified. Thus, we conclude that several of the fragments which appear to be clay-based ceramics were mixtures of calcium carbonate, clay and quartz.

To test whether any of the high lime clays could have formed a durable ceramic, refiring experiments were conducted, but they were unsuccessful. When the four subsamples of calcium carbonate, clay and quartz are fired in an oxidizing atmosphere to 600°C for 20 minutes after having been wetted and formed and dried, they form somewhat hard and durable ceramic if about 25% $CaCO_3$ is present, but

they powder when 50% or more $CaCO_3$ is present. In the 50% $CaCO_3$ sample not enough of the clay is present to sinter to a hard body if so much powdered limestone is present. When refired to 800°C, all four samples form powder, as the $CaCO_3$ has formed CaO. The 25% $CaCO_3$ "deadburns", or does not recarbonate and harden. The 50% or more $CaCO_3$ forms the hydroxide when water is added and then recarbonates in air. Essentially, it hardens to about 2 Mohs in a mechanism similar to the formation of an impure lime plaster. None of these lime-containing samples, when refired, forms a durable, hard clay-based ceramic. All of them dissolve when subjected to boiling water.

The ten fragments of durable orange, brown and dark gray ceramic were tested by scanning electron microscopy and found to have the sintered structures commonly found in fired ceramics. The close packing of particles indicates that the body was wetted prior to forming. The amount of calcium oxide in these ceramics is less than 20%. Their compositions are similar to and lie within the range of compositions found in the ceramics from Dolní Věstonice I.

We have microprobe data for the Dolní Věstonice I ceramics, but not for the ones from Pavlov. However, our conclusion of quantitative compositional similarity is based on similarity in the energy-dispersive x-ray spectra. The semi-quantitative analysis of the spectra for the Dolní Věstonice I and Pavlov I ceramics were taken and compared with instrumental standards using the same measurements of background and in the same analysis session. The Faraday cup was monitored for beam current drift, thus insuring constancy of instrumental parameters. Our conclusion is that 10 successful ceramic fragments from Pavlov I have a similar microstructure and bulk composition to those from Dolní Věstonice I.

Differential thermal analysis was used to determine the extent of firing. The firing standards developed for the Dolní Věstonice I ceramics were applied to those from Pavlov I. The use of the same standards was justified because of the similarities of composition, microstructure and properties. The Dolní Věstonice ceramics were fired from 600°C to 800°C. DTA curves for the 10ceramic samples and one hearth sample were superimposed onto the curves from the Dolní Věstonice study, as were curves for the three unfired loess samples and unfired yellow lump samples. The unfired samples have a large, endothermic decomposition curve in the range of 620° to 820°C. This curve is a composite of the decomposition reactions for calcium carbonate, muscovite mica, illite and chlorite (clinochlore), as demonstrated in a previous publication (Vandiver et al. 1990:50). The size of the curve increases as secondary calcium carbonate accumulates in the sample during burial and as fired clays weather and rehydroxylate to their initial state. Therefore, these curves only provide a minimum firing temperature. The standards to which they are compared were fired to 100°C increments from 500° to 900°C for 15 to 20 minutes and then they were run in the DTA. The extent of unreacted materials is measured by the size of the curve. The assumption was made that the composition of decomposing minerals and the burial conditions for all the samples tested was approximately the same. In reality, however, this was not always the case as certain parts of the sites lay considerably downslope the Pavlov Hills and closer to the river. If the amount of lime increased above that of the standard or if the burial conditions proved more acidic, a lower firing temperature would be reported. The hearth sample and 3 of the eight ceramic samples were fired to 800°C, as the endothermic curve is very small and

virtually no unreacted material is present. The other 7 samples were fired to 600° or 700°C, because a small curve is present indicating some unreacted material is present.

2.3. Interpretations

Earthy material consisting of micaceous illitic clay, quartz and powdered limestone was used in a wetted state to form small, rounded lumps and figurines. Surfaces were smoothed, intentional shaping of the fragments took place, and pieces were preformed and added to one another. Some of the raw material was high in powdered limestone. Some of this material was not fired, and some was smudged or smoked in a fire to a temperature probably below about 600°C. No lime plaster microstructures were found which would indicate the presence of a lime plaster technology. In addition, the compositions were too high in clay to form strong or durable lime plasters. Some of the raw material was low in powdered limestone and high in clay, and was suitable for use as a fired ceramic. Of fourteen samples having an appropriate composition, 10 were fired to between 600° and 800°C and were found to be stable, durable and hard clay-based ceramics. Four were not. In addition, one sample from near a hearth was fired to about 800°C.

The variability of composition imposed limits on the ceramic technology practiced at Pavlov I. To test whether the earthy materials would have formed reasonable clay-based ceramics required empirical testing, as the raw materials had a similar appearance and texture. However, the presence of fired ceramics indicates that a successful technology was practiced at Pavlov. A firing temperature of 800°C was found in both a fragment of hearth and three ceramics fragments. A lower temperature of 600° to 700°C was found in seven other ceramic fragments. Thus, a range of firing temperatures is found in the ceramics which is consistent with firings using a bonfire, hearth or banked, walled kiln.

The evidence for thermal shock is negative among the 29 non-figurative pieces examined. Evidence for thermal shock, however, was found among the figurative pieces. We have previously presented an in depth argument why we interpreted some examples of fragmentation found in the Dolní Věstonice I assemblage as resulting from thermal shock (Vandiver et al. 1990). We augment that argument here by pointing out that the parts of several figurines from Dolní Věstonice I cannot be refitted together, even though the external shape is continuous and the internal faceted fracture surfaces mirror one another. In other cases cracks have opened in the pieces. These cracks and fracture surfaces at first appear to be the result of shrinkage. When tested, however, the ceramic body had 0 to 0.5% linear shrinkage because there were many coarse rock fragments, measuring 10 - 300 microns in maximum diameter and thus falling outside the range of clay-sized particles, which minimized shrinkage. The observed near-zero shrinkage discounts the shrinkage process as the cause of the lack of refit and cracking. The second possible main cause of such cracking is shrinkage in firing. The measured firing shrinkage, however, is also near zero. Our test results have shown that the observed pattern of fracture, cracking and warping can be produced by what would be considered "unceramic" practices (i.e. practices contrary to the production of a whole object) - namely, by placing unfired ceramic pieces with a gradient in water content into a thermal gradient in the fire. Doing so causes the ceramic to thermal shock or explode. We further noted that these ceramics were very porous - about 20%-40% vol. - a feature which would have made them dry evenly.

We have argued that to achieve such gradients in water content and temperature as we observed in the Dolní Věstonice I assemblage required intentional human intervention in what would be considered natural patterns of physical processes in the drying and firing of ceramics. Finally, observations under the scanning electron microscope of the fracture surfaces and the internal surfaces of cracks showed many thermal shocked, exploded grains, which reinforced our conclusions that thermal shock had occurred.

3. The Inventory

The Pavlov ceramics inventory, consisting of both fired and unfired pieces, is composed of small sized pieces the largest of which does not exceed 5.49 cm in length and 24 grams in weight.

Table 1. Clay Pieces from Pavlov I - 1952-1953 Excavations

N= 1,332 pieces

Unworked pieces:	N = 200	15% of inventory
- black	- N = 47 (23.5%)	
- gray	- N = 143 (71.5%)	
- yellow to tan	- N = 10 (5.0%)	
Worked:	N = 1,132	85% of inventory
- black	- N = 134 (11.8%)	
- gray	- N = 971 (85.9%)	
- yellow to tan	- N = 26 (2.3%)	

3.1. The Unworked Fragments

As Table 1 indicates, some 15% of the pieces consist of angular fragments which show no traces of workmanship. The pieces range in size from small (mean weight of 0.7 grams, N = 123), to medium (mean weight 3.5 gr., N = 68) to large (mean weight 5.8 gr., N=9) with small sized pieces predominating. These fragments shade from black to tan and the distribution of their colors is comparable to that found among the worked or shaped pieces.

3.2. The Worked Pieces

The majority of the pieces are worked and contain at least one side that bears traces of smoothing and shaping and often joints where the adding of one piece to another had occurred. These traces, like those observed in the Dolní Věstonice I assemblage , indicate that the pieces were worked in an additive fashion.

As shown above, morphological analyses indicate that their surfaces were worked and that bits of preformed clay body parts were added to one another. Optical microscopy showed that platelets of mica were aligned parallel to the curved ceramic surfaces, thus indicating forming into somewhat spherical lumps. In some cases, a thin layer of clay body measuring 3 to 4 mm. was smeared or pressed over the surface of a lump of clay, increasing its size from, for instance, 9 to 15 mm. However, these surface layers are not evenly applied, but are probably the result of rolling and

pressing the lump and adding some material, then rolling and pressing the lump again. Xeroradiography confirms the presence of internal joints as well as occasional surface layers.

As at Dolní Věstonice I, there is little evidence that modeled pieces were smoothed with tools, wiped, or scraped. Convex surfaces were usually not reworked while many concave surfaces show traces of impression with other small implements which were used to incise details of bodies and faces.

Table 2. Worked Clay Objects

N = 1,132 pc.

Non-figurative	N = 1,101	97 % of worked pieces
- black	- N = 116 (10.5%)	
- gray	- N = 962 (87.4%)	
- yellow to tan	- N = 23 (2.1%)	
Figurative:	N = 31	3 % of worked pieces
- black	- N = 18 (58.1%)	
- gray	- N = 10 (32.3%)	
- yellow to tan	- N = 3 (9.6%)	

3.2.1. Non-figurative ceramics

Table 2 shows that the Pavlov I inventory, like that at Dolní Věstonice I, primarily consists of non-figurative objects which here make up 97% of the pieces with traces of shaping. The majority of these pieces are gray in color - this contrasts with the predominance of black pieces in the figurative inventory.

Table 3 presents the composition of the non-figurative Pavlov I assemblage and shows that, as at Dolní Věstonice I, the irregularly shaped small (4-10 mm) gray pellets constitute most of the non-figurative pieces.

Table 3. The non-figurative inventory

	N	mean weight	total weight
A. Pellets	948	0.6 gr.	610.60 gr.
- black	- N = 87 (9.0%)		
- gray	- N = 851 (90.0%)		
- yellow to tan	- N = 10 (1.0%)		
B. Flat fragments	123	1.76 gr.	214.35 gr.
- black	- N = 22 (18.0%)		
- gray	- N = 94 (76.0%)		
- yellow to tan	- N = 7 (6.0%)		
C. Slablike fragments with flat/convexo/concave profiles	30	3.6 gr.	107.67 gr.
- black	- N = 7 (23.0%)		
- gray	- N = 17 (57%)		
- yellow to tan	- N = 6 (20 %)		

The pellets show smoothing on more than two of their surfaces while the flat fragments primarily exhibit smoothing on just one surface. Some objects in both categories show evidence of being impressed with small-sized tools. A few bear impressions of partial fingerprints and/or palm prints.

Slablike fragments making up the third category of non-figurative worked objects feature slight bowing on one surface. Like the flat fragments they are crude and poorly worked, small in size and thin,ranging in thickness from 0.6-1.5 cm, with most measuring 1.0 cm or less. The slightly concave sides of the slablike fragments often bear predominantly linear impression which cover the entire interior surface of the fragments. The continuous nature of these impressions suggest that they resulted either from the wetted loess being smeared on the outside of some sort of larger sized objects and/or that larger sized objects were placed on wet loess. At least some of these impressions may be from small linear vegetal elements such as sticks, grasses, or pine needles. While the impressions on fragments excavated in the 1952-1953 field seasons were not distinct enough for identification, four of those excavated during the 1954 season bear distinct negative impressions of fabric (either textile or basketry, J. Adovasio, personal communication 1993).

The possible use of loess, which when wet would have been somewhat plastic, as a bonding agent has been previously suggested by Klíma (1955) who reported excavating a semi-circular windscreen adjacent to a hearth of dwelling #1 at Pavlov I that was made of mammoth bones held together by silty clay. Adovasio's identification of fabric impressions on the Pavlov I pieces suggests that wetted loess may have also been used as an outside coating on baskets or bags. These two observations strongly suggest a wider use of clay at Pavlov I that documented for Dolní Věstonice I, where we reported ceramic technology primarily used for the making and firing of animal and female figurines (Vandiver et al. 1990).

3.2.2. Figurative ceramics

The figurative pieces, because of their highly fragmented nature, were more difficult to classify into discrete unambiguous categories. Our prior research on the Dolní Věstonice I ceramics had shown that the Pavlov culture-bearers modeled figurative clay pieces by an additive process of sticking bits and pieces of the preformed wetted loess together. This observation held true for the Pavlov I inventory

Table 4. The Composition of the Figurative Pieces

Anthropomorphic	1	3 % of figurative pieces
- black	- N = 1 (100%)	
Zoomorphic	2	6 % of figurative pieces
- gray	-N = 2 (100%)	
Anthropomorphic or zoomorphic	28	91 % of figurative pieces
- black	- N = 17 (60.7%)	
- gray	- N = 8 (28.6%)	
- yellow to tan	- N = 3 (10.7%)	

as well, resulting in a figurative assemblage where, as Table 4 shows, the majority of the fragments (91%) consisted of body parts which could not be clearly classified as depicting anthropomorphic or zoomorphic mammalian taxa. It is important to note that a considerably greater percentage of these figurative pieces were gray or black in color, indicating that they were fired ceramics, than observed among the non-figurative inventory. This observation suggests that intentional firing in hearths or kilns was predominantly used in the production of figurative pieces while the ceramic technology used for non-figurative purposes was not as closely associated with pyrotechnology.

a. anthropomorphic or zoomorphic pieces

These pieces were small in size and quite fragmented. Since similar modeling techniques were used to fashion somewhat medio-laterally flattened small triangular clay cones used to model both ears and legs on the figurines, three pieces were classified as add-on ears and/or leg cones. Two of these were yellow to tan in color, one was black. None exhibited evidence of thermal shock.

The second category consisted of leg cones with or without feet. These ranged from fairly static, straight and massive in contour, accentuated by a certain degree of medio-lateral flattening, to slightly elongated bowed leg forms exhibiting a degree of dynamic stylization. All of these, like the remainder of the figurative category, exhibited degrees of stylization seen in the emphasis on the silhouette over natural three-dimensional contours and a simplification of detailing to essential diagnostic features at the expense of realism.

All of these 15 pieces exhibited diagonal crotch fractures or breaks, probably the result of thermal shocking of imperfectly dried or partially rewetted clay pieces upon firing. Thus, for example, 4 of the seven leg cones without modeled feet are black in color and show evidence of thermal shock fractures. The same holds true for 3 of the 5 black leg cones where the foot had been originally modeled but had subsequently broken off. Thermal shock type fractures were also observed on 2 gray leg cones initially fashioned without feet. The pieces with feet in some cases had modeled flat feet which presumably made the bodies they were originally attached to able to stand flat while in others the feet were just suggested by diagonal extensions that would not have encouraged a flat placement of the figurines on the ground. The fourth category consisted of 10 body-part fragments with 7 black and three gray in color. Five (71%) of these seven fragments bore signs of having been thermally shocked. The fragments were too small and indistinct for assignment to specific body parts. One fragment in the shape of a tear drop with one flattened side may have depicted a female breast.

b. zoomorphic fragments

Two large fragments could be identified to specific animal species. The first, a gray torso of a bear measured 2.86 cm in length, 1.64 cm in width, 0.90 cm in thickness, and weighed 24.0 grams (see chapter III for illustrations). This heavy and massive but symmetrical middle and rear portion of the body, vertically broken behind the neck, featured foreshortened legs which allowed the body to stand flat on the ground. The same minimalist stylization is repeated on the animal's posterior where

the tail is just faintly suggested. The bear's torso contains four intentional holes produced by a sharp object being stuck into the wet clay body. Two large holes measuring some 0.40 cm in depth are located on the ventral side of the animal - one in the area of the right foot and the other between the forelegs. The animal's right flank contains two triangular holes measuring 9 x 2.5 x 4 mm in size and about 0.40 cm in depth. The second piece represents a stylized head of a rhinoceros measuring 5.26 cm in length, 2.67 cm in width, and 1.78 cm in thickness and weighing 13.5 grams. This head, gray in color, was originally fashioned as a head and not attached to a body. It is symmetrical in contour, accenting the cylindrical shape of the head, and shows a considerable degree of stylization which accents the silhouette of the head at the expense of such naturalistic details as horns and mouth. The animal's eyes are indicated by small punched in holes. The neck section wedges off into a slightly flaring triangular contour evocative of the occipital crests found on the napes of rhinoceros necks and was produces by squeezing wet clay between fingers.

c. the anthropomorphic fragment

The sole anthropomorphic figurine fragment in the inventory is a very small black rectangular leg with foot that measures 1.90 cm in length, 0.69 cm in width, 0.47 cm in thickness, and weight 0.7 grams. The piece has a tall and slender contour which features slight elongation. The anterior-posterior flattening evident in the piece which gives it a somewhat square silhouette was produced after the figurine was fashioned but before it was fired. The top of the leg has a horizontal crotch break indicating that the fragment was joined to a body and probably broke away from it during firing. The bottom part features a suggestion of a foot - but its somewhat diagonal form indicates that the figurine could not "stand" flat on the ground.

4. Some General Conclusions

In this study we report on our analyses of just a small segment of the ceramic objects recovered at Pavlov I. Because we deal with only those materials recovered during the 1952-1953 excavations, the ensuing conclusions are tentative and preliminary in nature. While in need of future corroboration, they do indicate some interesting differences compared to materials from Dolní Věstonice I. These differences, however, occur against a background of considerable continuity.

The technological analysis of the Pavlov I ceramic inventory indicates that a much higher proportion of these pieces were unfired when compared to the samples examined from Dolní Věstonice I. Since local loess was used at both sites to make the ceramic objects, part of the explanation for this difference can be found in the composition of the loess itself - namely, the Pavlov loess was much less suitable to the firing of ceramics.

The presence of large numbers of pellets at both sites, many of which at Pavlov I were not fired, remains enigmatic, but suggests the use of clay for purposes other than the fashioning and firing of figurines. The unfired and low fired slablike flat pieces with impressions on their slightly concave sides strengthens this suggestion and argues for wider use of clay than observed at Dolní Věstonice I. The considerably higher ratio of unfired pieces in the Pavlov I non-figurative inventory, together with Klíma's (1955) observation of the use of clay in the construction of a bone fire screen,

tentatively indicate that ceramic pyrotechnology may have been used just for the production of figurines while unfired clay had a wide utilitarian use.

The figurative pieces at Pavlov I show that a much higher percentage were fired than do the non-figurative ones. In addition, it is these fired fragments which exhibit evidence of thermal shock fractures. These data are in good accord with those from Dolní Věstonice I where we reported intentional thermal shocking of the animal and female figurines during the firing process (Vandiver et al. 1990). Since, as we reported previously, thermal shocking of figurines made of local loess would have required considerable extra effort, and given that the overwhelming majority of the figurines at both sites are fragmented, we suggest that intentional thermal shocking may have been practiced at Pavlov I as well.

Although the figurative ceramic inventory excavated at Pavlov I in the 1952 and 1953 field seasons is fragmented and small, it exhibits certain features characteristic for the Pavlov culture. These include the small size of the figurines, their aggregate nature, and stylization which accents the most evocative body parts of the depicted animals. Detailing is minimal and accomplished by a few deftly placed indentations made by small tools and fingernails. In some cases, as with the rhinoceros head or with footless leg fragments, only parts of the body were modeled and fired. The distortions observed on some body fragments suggest that the pieces were thrown down while still wet, while the intentional punctures observed on the body of the bear recovered during the 1953 field season suggest additional manipulation of the figurines prior to firing.

Finally, some possible differences can also be observed in the spatial distribution of the ceramic fragments at Pavlov I and Dolní Věstonice I. While at both sites this inventory is strongly associated with hearths and kilns, at Dolní Věstonice I the kilns with the majority of the fragments are somewhat separated spatially from the residential part of the site. At Pavlov I, on the other hand, data from some 290 m^2 excavated in 1952-1953, which uncovered residential features together with hearths and ceramic fragments, suggest a more widespread use of ceramic technology by the residents of the site. Given the limited size of the area excavated, this interpretation necessarily remains a tentative one and one in need of corroboration with evidence from other parts of the site.

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Tab.5. Results of testing loess and ceramic samples from Pavlov

Number	Color	Hardness	Dura-bility	Acid Test	Elemental Composition	Fired in °C or Unfired
RED, BROWN, GREY OR BLACK COLOR OR MOTTLED, AT FIRST SEEMING TO BE FIRED						
1	Brown	Medium	+	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti	800
2	Red	Hard	+	Fe Residue	Si, Al, Ca, Fe, K: Mg, Ti, Na	800
3	Yellow-Brown	Soft	-			
	Brown Mottled	Medium	+		Si, Al, Ca, Fe, K: Mg, Ti	UF
4	Yellow-Brown	Soft	-	Fizzed	Si, Ca, Al, K, Fe: Mg, Ti	UF
5	Red	Hard	+	Fe Residue	Si, Al, Ca, Fe, K: Mg, Ti	800
6	Grey Interior	Medium	+	Fe Residue	Si, Al, Fe, K, Ca: Ti, Mg, P	6-700
	Brown Exterior	Medium	+			
7	Yellow-Brown	Soft	+	Fe Residue	Si, Al, Ca, Fe, K: Mg, Ti	600
8	White, Yellow, Coarse	Soft	+		Si, Al, K, Fe, Ca: Ti, Mg	UF
9	Bright Yellow-Orange, Probably a Pigment	Hard	+	Fe Residue	Fe, S, Si: K, Al, Ca, Na, P	UF
10	Yellow-Brown	Soft	+	Fizzed	Si, Al, Ca, Fe, K: Ti, Mg, Na	600
11	Brown	Medium	+	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti	6-700
12	Brown	Soft	-	Fizzed	Si, Al, Fe, Ca, K: Mg, Ti, Na	UF
13	Grey Interior Mottled Black & Yellow Exterior	Hard	+		Si, Al, Fe, K, Ca: Mg, Ti, P	6-700
14	Grey	Soft	+		Si, Al, Ca, Fe, K: Ti, Mg	6-700
YELLOW APPEARANCE, SEEMING AT FIRST TO BE UNFIRED						
15	Yellow	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Ti, Mg, Na	UF
16	Yellow & White Mottled	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti, Na	UF
	Shell	Medium	+	Fizzed	Ca: Si, Al, Fe	UF
17	Yellow & White Mottled	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti, Na, P	UF
18	Yellow	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Ti, Mg	UF
19	Yellow	Soft	-	Fizzed	Si, Ca, Al, Fe, K: Mg, Ti, Na, P	UF
20	Yellow	Soft	-	Fizzed	Si, Ca, Al, K, Fe: Mg, Ti	UF
21	Yellow	Soft	-	Fizzed	Si, Ca, Al, Fe, K: Mg, P	UF
	and White	Medium	+	Fizzed	Ca, Si, Al, Fe, K: Mg, Ti, Na, P	UF
22	Yellow & White	Soft	-	Fizzed	Si, Al, Ca, K, Fe: Mg, Ti, Na	UF
23	Yellow & White	Soft	-	Fizzed	Si, Al, Ca, K, Fe: Mg, Ti, Na	UF
24	Yellow & White	Soft	-	Fizzed	Si, Al, K=Fe: Mg, Ti, Mn	UF
25	Yellow & White	Soft	-	Fizzed	Si, Al, Ca, K, Fe: Mg, Ti, Na	UF
26	Yellow	Soft	-	Fizzed	Si, Al, Ca, K, Fe: Mg, Ti	UF
27	Yellow-Light Brown	Hard	+	Fe Residue	Si, Al, Ca, Fe, K: Mg, Ti, P	6-700
28	Yellow-Light Brown	Soft	-	Fizzed & Fe Residue	Si, Al=Ca, Fe, K: Mg, Ti	UF
29	Yellow-Brown	Soft	-	Fizzed & Fe Residue	Ca, Si, Fe, Al, Mg, S, K: Ti, Na	UF
30	Tooth, Orange & Brown	Medium	+	Fizzed & Fe Residue	Ca, P: Fe, Si, Al, Mg	UF
EXCAVATED LOESS STANDARDS, BELIEVEDTO HAVE BEEN UNFIRED						
A	Yellow	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti, S	UF
B	Yellow Powder	Soft	-	Fizzed	Si, Al, Fe, Ca, K: Mg, Ti, Na	UF
	Yellow Lump	Soft	-	Fizzed	Si, Al, Fe, Ca, K: Mg, Ti, Na	UF
C	Yellow	Soft	-	Fizzed	Si, Al, Ca, Fe, K: Mg, Ti, Na	UF
D	Orange & Some Grey-Brown Sample from Hearth	Medium	+	Fizzed & Fe Residue	Si, Al, Fe, Ca, K: Mg, Ti, Na	800

Notes to table 5: The Samples were classified using an optical microscope in order to determine whether they appeared fired or unfired. Then the tests were carried out to add further evidence to the initial characterization. The initial classification was incorrect where compositional mixing rather than firing variability occurred, and where unexpected compositions were found.

X-ray diffraction was carried out on samples 1, 2, 3, 4, 5, 15, and A, B, C and D. The results show quartz, calcite, illite, mica, and minor felsdpar as calcian albite (JCPDS 41-1486) and anorthite (JCPDS 41-1486). Mohs hardness was measured as soft (1½-2), medium (2-3) and hard (2-3⅓). Acid test included 2N solution of HCl; "Fizzed" means sample gave off CO2, and iron-containing residue is indicated by "Fe Residue". Samples were boiled to determine durability; "+" indicates sample was durable, and "-" indicates sample dissolved. Elemental composition was taken by energy dispersive x-ray attachment on JEOL 840-II scanning electron microscope by counting for 180 seconds at 200x. Limit of detection is 0.5%, and no elements lighter than Na can be detected with this system (Tracor-Northern). Peaks appear in descending order of peak intensity. The ":" is placed to separate peaks which are less than 10% of the maximum peak intensity. The firing temperature was judged by comparison with samples of loess fired to known 100 °C increments of temperature, using a differential thermal analyzer (Perkin-Elmer DTA-1700).

CHAPTER V
THE VEGETATION

by Emanuel Opravil

The large-scale archaeological fieldwork along the northern slopes of the Pavlovské Hills repeatedly yielded finds of charcoal. Since an assumption of wood transport from the south is not probable, these finds represent unique evidence of a forest within the settled area. All samples are dominated by the conifers, while the number of accompaniing deciduous trees is minimal. In comparison with the actual Holocene trees in the same altitudes, however, they show a much denser structure of more narrow tree-rings, suggesting unfavourable climatic conditions. Intervals between the rings lie usually below 1 mm, and rarely overpass 1-2 mm.

The limiting factors of growth in the Gravettian of south Moravia, first of all, the cold climate and low precipitation ratio. The curvature of rings visible in some larger pieces from the triple burial at Dolní Věstonice II suggests, on the other hand, that even in the unfavourable conditions some of the trunks reached 10 or more cm in diameter.

The first analysis of a small charcoal collection from Dolní Věstonice I was presented by J.Slavíková-Veselá in 1948 (Klíma 1963b, Slavíková-Veselá 1950). This author determined pine and spruce as the main species, accompanied by a lower share of willow. Since the number charcoal increased during further excavations, V.Nečesaný (1951) soon presented a more extended analysis. With respect, most probably, to a high fragility of the matter, Nečesaný analysed 500 pieces as a total, without indicating the amount of individual species. Apart from spruce and pine, he noted larch, fir, juniper and elm. With respect to deciduous trees such as the elm and the birch, estimated palynologically by Puchmajerová (1946), he a scribed the forest to the taiga-type. In 1951, a smaller charcoal collection was determined by V.Vodičková-Kneblová (in Klíma 1963b): apart from scots pine she estimated mountain pine and stone pine, spruce, and a surprising find of a beech charcoal. In 1961-1963 I received a smaller charcoal collection from Pavlov I. Further charcoal finds were supplied from excavations at Dolní Věstonice II during the 80'ties. Larger pieces of wood were concentrated especially around the triple burial. results of analyses from the both sites are summarized in the Tab.1. One of the hearths at DV II (unit 1), dated to 26 390 ± 270 B.P., has recently been analyzed in London, and larch, juniper and yew were determined (Mason and Hather 1993).

Since the early 90'ties, the charcoal analyses are being completed by modern results of the pollen analyses (Svobodová 1991a, b). The pollen analyses, reconstructing paleovegetation of larger landscapes, may well complete the anthracotomic data, since the spectra from loess are clearly dominated by anemophilous trees. The charcoal, on the other hand, is of local origin.

All collected data show that the most important trees at the foot of Pavlovské Hills during Gravettian were spruce, fir and pine. The variing quantity of these species may be due to local conditions and, as suggested by Svobodová (1991a, b) on basis of the pollen data, to climatic oscillations. The pollen spectra, naturally, are more diversified not only within the arboreal pollen group, but also in the non-arboreal group, not represented in the macroremains. The pollen analyses confirm all trees, as found in the charcoal, and supply additional evidence on certain deciduous trees. In the pine pollen, the species could not be determined more precisely and even in

charcoal this is possible only in larger fragments. The absence of fir pollen, determined anthracotomically in certain samples from the loess, is striking. We may expect a lower ability of this species to preserve in the loessic sediments. This is supported also by the analyses of Frenzel (1964), who determined single cases at Stillfried.

The pollen analyses by Svobodová (1991a, b) from Dolní Věstonice II, together with a similar pollen spectrum from Bulhary (Rybníčková and Rybníček 1991) support a character of the landscape as suggested by Frenzel (1964): mostly deforested areas, in protected areas passing into a forest-steppe. Some authors search for analogies in the actual transitory zone between taiga and tundra, others in the subalpine zone of the Alps. The singular occurrence of submontane and montane species such as yew and beech, however, warns how difficult it is to lock for analogous society composed by submontaneous, montaneous to subalpine species today. This may be explained with the help of the past ecotypes adapted to cooler and drier climate. The accessible data do not even allow to reconstruct the appearance of such forests. We generally assume gallery forest following the rivers, but no tree trunks of a comparable age were hitherto discovered in the fluvial sediments of Dyje and Morava. This bias is due to elevation of the actual water level on the one side, and to lack of systematic control over the industrial gravel and sand exploitation on the other side. Neither in the loess is preservation of tree trunks probable, and a reconstruction the tree and branch diameter is only possible through curvatures of fragments not larger than several cm. Certain data are available in the sample from the triple burial.

In this sample, I analysed fragments of smaller branches, and larger fragments of charcoal in the shape of various ring sections. In the small branches the wood is preserved completely and the diameter is measurable, while in fragments it only could be reconstructed from curvature of the rings. In selected fragments, the following diameters are estimated (all in millimetres):

Picea/Larix	6, 30, 35-40, 50, 100-110, 200, 300-400
Picea excelsa	5, 6, 7, 8, 9, 10, 20-25, 35, 100, 160-180
Larix decidua	100-120, 140
Abies alba	20, 25
Pinus silvestris	8.5, 50, 180-200

In fragments of larger trunks, the following intervals between the tree rings were measured (all in mm):

Picea/Larix	0.25-0.40; 0.5-1.25
Picea excelsa	0.75-1.0; 1.0-1.25
Abies alba	2.0
Pinus silvestris	0.75-1.0

The above data suggest that the hearths around the triple burial were fed rather by branches or smaller trunks. The surrounding forest, presumably, was composed by trees (with character of stake trunk), only rarely reaching 40 cm in diameter. The wood matter was dense and thus resistant. Wood exploitation, with the given technical equipment, was a difficult task for the past hunters. However, the forest obviously suffered from the migrating mammoths, and wood from this damages was probably available.

The dominance of conifers suggests that the landscape was not a subarctic steppe, but in lower altitudes we may reconstruct a cold forest-steppe, in protected

places accompanied by more pretenduous deciduous trees. Their wood is comparable to recent species of Central Europe. We cannot however exclude presence of their cold-adapted and more continental ecotypes, comparable to very relative Siberian species. Since microscopic features in wood obtained from extreme conditions are not as well developed as in wood from optimal localities, determination into species becomes difficult. We may, for example, observe a reduction in number of the dots on radial walls of rays, limited by the trancheid breadth, etc. Finer structures such as the epithelial cells in resin channels are hardly preserved either.

In branches from the triple burial we observed in several cases the complete diameter, or fragments with the complete last ring. All cases show development of the late summer wood, but not a single case where the cells of a new spring wood would follow. This means that the development was interrupted during the winter.

Species	Pavlov I	Dolní Věstonice I			Dolní Věstonice II				
	1961, 1962, 1963	Slavíková-Veselá 1950	Kneblová-Vodičková 1963	Nečesaný 1951	the triple burial	lower part of the site	upper part of the site	mammoth bone deposit	Mason et Hather 1993
Abies alba	242	.	.	+	1	.	40	1	.
cf. *Abies*	1	.	.	.	1	.	1	.	.
Larix decidua	.	.	12	+	1	.	.	.	+
cf. *Larix*	.	.	.	.	1	.	.	.	.
Picea excelsa	100	6-29%	17	.	12	.	1	.	.
cf. *Picea*	1	.	.	.	1	.	.	.	.
Picea/Larix	7	.	.	.	10	.	.	.	.
Pinus sylvestris	15	77-94%	35	.	3	108	.	.	.
Pinus cembra	1	.	29	.	.	.	.	.	.
Pinus mugo	5	.	18	.	.	.	.	.	.
Pinus sp.	19	.	.	.	.	.	.	.	.
cf. *Pinus*	8	.	.	+	.	.	.	.	.
Juniperus communis	.	.	.	+	.	.	.	.	+
Taxus baccata	.	.	.	.	.	.	.	.	+
cf. *Ulmus*	.	.	.	+	.	.	.	.	.
Salix sp.	.	3%	.	.	.	.	.	.	.
Fagus sylvatica	.	.	1	.	.	.		.	.

Tab.1. Review of charcoal finds from the Gravettian from Pavlov and Dolní Věstonice

CHAPTER VI
THE FAUNA

by Rudolf Musil

Hunting game of the culture layer of Pavlov

1. Introduction

The processed osteological material comes from the culture layer of Pavlov, from the investigations of B. Klíma in the years 1952 and 1953. It was evaluated by two publications (Musil 1955, 1959) to which I therefore refer. In this paper I thus do not deal with the systematic procession of the fauna and the morphometry of bones and I process the material from another point of view. In this I start on one hand from papers published earlier, on the other hand from a new study of this osteological material.

2. The vertebrate species found

Most of the species found belong to hunted animals. That means that they represent only a smaller part of the whole animal association living in the surroundings. The found species can be evaluated quantitatively, but even this fact does in no case reflect accurately their relative representation in the then association. Their selection is purely utilitarian from the point of view of the then people. Only in systematically hunted animals can their quantity be evaluated from that viewpoint. In no case does it concern animals hunted at random.

The determined animals belong to the following species:

Aves: *Corvus corax* Linné, 1750; *Lyrurus tetrix* (Linné, 1758); ? *Alectoris* sp.; *Lagopus* sp.; *Phasianinae* gen. et sp. indet.; *Cygnus* sp.

Lagomorpha: *Lepus* sp.

Rodentia: *Citellus* sp.; *Cricetus cricetus* (Linné, 1758).

Carnivora: *Felis silvestris* Schreber, 1777; *Panthera leo* (Linné, 1758); *Lynx lynx* (Linné, 1758); *Canis lupus* (Linné, 1758); *Vulpes vulpes* (Linné, 1758); *Alopex lagopus* (Linné, 1758); *Vulpes* sp. or *Alopex* sp.; *Gulo gulo* (Linné, 1758); *Ursus arctos* Linné, 1758; *Ursus* cf. *spelaeus* Rosnm., 1793; *Ursus* sp.

Proboscidea: *Mammonteus primigenius* (Blumenbach, 1799).

Perissodactyla: *Equus germanicus* Nehring.

Artiodactyla: *Cervus elaphus* Linné, 1758; *Rangifer tarandus* (Linné, 1758); *Bos* sp. or *Bison* sp.

From the systematic point of view Carnivora prevail greatly. From the nutrition point of view it is above all Proboscidea, Perissodactyla and Artiodactyla. The found bones of small rodents belong to animals living in the proximity of man.

The list of species found does not say anything about their amount. The calculated amount of individuals is the minimum value, they could not have been fewer, but a higher number cannot be excluded. If we take the studied area as a whole, we get the following pattern from the quantity of the individual species:

(1) Very amply represented group (10 - 18 % of the total amount):

Lepus sp. (18.5 %), *Alopex lagopus* (16.9 %), *Canis lupus* (12.5 %), *Vulpes vulpes* (10.7 %), *Vulpes* sp. or *Alopex* sp. (2.0 %), *Rangifer tarandus* (10.1 %).

(2) Medium represented group (4 - 8 % of the whole amount):

Aves (8.3 %), *Mammonteus primigenius* (7.5 %), *Equus germanicus* (4.6 %), *Gulo gulo* (4.4 %).

(3) Sporadically represented group (0.2 - 0.7 % of the whole amount):

Ursus arctos (0.7 %), *Ursus* cf. *spelaeus* (0.2 %), *Ursus* sp. (0.7 %), *Panthera leo* (0.5 %), *Felis silvestris* (0.5 %), *Bos* sp. or *Bison* sp. (0.2 %), *Cervus elaphus* (0.2 %), *Lynx lynx* (0.2 %).

From the above it follows that big animals important from the viewpoint of nutrition are found above all in the second group, only reindeer is in the first group. In view of the fact that for the reason of safeguarding the nutrition the priority of their hunting must be assumed, the list indicates the fact that their number in the neighbouring landscape was not high already at that time. In that case they would be found in group 1. On the other hand, small animals occurred amply, prevailingly hares, foxes and wolves. The above deduction cannot be related to finds of birds, in that case it is rather the difficulty of hunting them.

The finds of bones and the finds of the individual species are not regularly deposited in the layer. They are concentrated prevailingly around the fires and settlement objects, further from them they become scarce. Therefore I divided the whole area into 11 parts. In the last part belonging as a whole to the 1952 investigation all osteological material was not unearthed by square metres, so that it is taken as one unit.

In the above area B. Klíma distinguished four settlement objects (in parts 1, 5, 6 and 11), only in part 6 the object is as a whole. All other objects are only outskirts of the found settlement objects.

The most important is thus part 6 with settlement object III. Looking at its ground elevation we find that the countersink is evident in its right half. Inside the settlement object osteological material is almost not found, only in the upper left part it is possible to see the concentration of bones. It is not excluded that it might have also been due to the delimited borderline of the settlement object. Of interest is the accumulation of bones near the object. It is found above all in front of its left part, which signals evidently the then entrance into the object and its complete closure on the right hand side.

Immensely interesting is not only the distribution of all bones, but also that of individual species. It is not accidental. In the upper left half mostly bones of hares, wolves, foxes and reindeer are found as well as small bones of a mammoth.

The second place of concentration is the lower left half in front of the settlement object. There, however, only bones of wolves, foxes and to a lesser extent also reindeer are found. Hares are missing altogether.

Quite exceptional is the concentration behind the settlement object, i.e. in its right lower part. It concerns wolves only.

The above three places of the concentration of osteological material near settlement object III are not accidental, but are certainly linked with intentional activity of the man who stayed in that object.

In part 1 there was settlement object IV. The distribution of osteological material is quite chaotic, mostly not exhibiting any concentration, and it is also found inside the object. It thus behaves quite differently from what it was in object III. It can be either due to the fact that the distribution of bones on that area occurred only after the destruction of the settlement object or its delimitation was only subjective. The former

alternative is more probable.

Settlement object II in part 5 does not exhibit any excessive concentration of bones. Only in its right part bones of the hare, wolf, reindeer and mammoth were found in greater amount. Due to the fact that only a small part of the object was uncovered its evaluation is not possible.

In settlement object I in part 11 osteological material was not collected according to individual square metres.

From the above a certain intention and/or some working organisation of the then people follows. In the opposite case osteological material would have been distributed chaotically.

All that indicates a certain work organisation of the then people and - which I consider the most important - that it was only within a small group dwelling in the settlement object. It follows from the fact that even that small unit formed to a certain extent an independent community.

3. Comparison with temporally close localities

To be able to draw further conclusions, we cannot study this locality isolated, but only as part of a certain unit. That means to mention also localities preceding in time as well as younger localities. Such localities are, unfortunately, not very numerous. It is Předmostí, Kůlna, Milovice and Willendorf.

Isotopic dating of locality Pavlov rendered the following data: 25 020 ± 150 BP. and 26 730 ± 250 BP. These data approach very much those from the loess base at Dolní Věstonice: 25 820 ± 170 BP. and 26 430 ± 190 BP. From the soil denoted as W 2/3 the data are 29 940 ± 300 BP. and 31 700 ± 1 000 BP. All these data were found from small pieces of coal. From humus the datum is substantially lower, i.e. 20 270 ± 210 BP. Also Předmostí yielded similar data: 26 320 ± 240 BP. and 26 870 ± 250 BP. A younger layer 6b from locality Kůlna (Gravettian): 22 990 ± 150 BP. and 21 630 ± 150 BP, and the upper culture layer from Milovice are dated to 22 100 ± 1 100 BP. The lower Aurignacian layer of the same locality which has not a large amount of osteological finds, gave the date 25 200 ± 950 BP.

From Austrian localities I use for comparison locality Willendorf II (culture layer 5 - 9) and Willendorf I. The Gravettien of that locality should correspond in time roughly to the age of Dolní Věstonice. Layer 5 of Willendorf II is of age of 30 000 + 900 -800 BP. (carbon) and 23 830 ± 190 BP. (humus). Layer 8 of Willendorf II is of the age of 25 800 ± 800 BP.

3.1. Předmostí

Předmostí was no doubt one of the largest, if not the largest of all Paleolithic stations of that time. Numerous investigations of the most varied specialists yielded a great amount of paleontological material. Unfortunately, it has never been processed systematically, so that our information must be drawn from individual partial papers.

Much information is found in a summary overview published by B. Klíma (1990a). Without quoting individual authors he drew information from, let us try here to reconstruct the then association of vertebrates and the distribution of osteological material. A list of species found will, however, be given later in a summary way.

Maška: Mammoth bones were scattered quite haphazardly, but they were also grouped according to the individual bones or parts of bones. Besides, some parts of

bodies were found in the anatomical order, such as part of a mammoth leg. This did not only concern mammoths, but also other species (part of a horse backbone). Mammoth bones were split, some of them also burned in fires.

Kříž: Fires were mostly fed almost exclusively with mammoth bones, but the ash layers originated only from burned wood. Bones of mammoths were also found in the overlying layers of the culture layer: "mammoths moved there long after the fires had become extinct". He also discovered an almost complete skeleton of a young mammoth.

Knies: In one place there were 18 mammoths of different ages, most of the bones were split. He mentions 16 tusks, 89 molars, 16 scapulae, 12 humeri, 14 ulnae, two radii, 18 tibiae. Besides mammoth bones also those of wolves, foxes and wolverines were present.

In my paper on mammoths from Předmostí (Musil 1958, 1968) I also mention some important information from earlier papers. In the culture layer there were not only whole parts of mammoth skeletons, but also those of wolves, horses, foxes and wolverines. Besides there also appeared heaps of sorted individual mammoth bones: pelvic bones, scapulae, molars, fragmental crania. In that way also individual parts of long bones were sorted, such as prox. epiphyses of femora or tibiae of mammoths.

To get an idea of the immense quantity of osteological material Kříž's paper (1896) is the best illustration. From a small section of the culture layer he gives the following numbers of the individual mammoth bones:

complete or almost complete skulls	6
maxillae	6
mandibulae	12
free molars	850
molar fragments	220
whole tusks	32
major tusk fragments	26
scapulae	86
carpal and ankle bones	340
phalanges	225
pelvices	29
rib fragments	5 076
diaphyses of long bones	600

Locality Předmostí was exceptional not only by the amount of osteological material, but also by sorting individual bones or their parts into units. This way is unknown in any other locality mentioned here.

The most detailed list of species and its quantitative evaluation is found in the paper by Pokorný (1951). The names of species were adapted according to present-day viewpoints and the species were ordered according to their quantity (see Table 1).

The overall number of bones, besides mammoths, is 9 585 pieces. The total number of individuals (mammoths are taken as 1 000 individuals) makes 1 388 individuals. As for the species *Alopex lagopus*, it is evident that also the species *Vulpes vulpes* is included there which at that time currently occurred at those places. In the species *Ursus spelaeus* it is probable that it will be the species *Ursus arctos* (Musil 1964). Finds of birds are not included in the list. From earlier literature it is, however, known that from Předmostí the following species are mentioned: *Corvus corax*, *Lagopus lagopus* and without a more detailed determination further 13 taxa.

From the mammals *Rupicapra rupicapra* is missing which occurred there rarely. The percentages of bones and individuals have been counted on the basis of the data mentioned.

Tab.1. Absolute and percentual representation of the individual species at Předmostí.

	No.of bones	%	No.of individuals	%
M. primigenius	unknown	-	>1000	72.05
Canis lupus	4 143	43.22	103	7.42
Alopex lagopus	2 250	23.47	96	6.92
Lepus timidus	860	8.97	79	5.62
Lepus europaeus	52	0.54	8	0.58
Rangifer tarandus	890	9.28	36	2.59
Gulo gulo	581	6.06	12	0.86
Equus germanicus	194	2.02	5	0.36
Ursus arctos	233	2.43	8	0.58
Ursus spelaeus	82	0.85	2	0.14
Coelodonta antiquitatis	5	0.05	1	0.07
Megaloceros giganteus	13	0.13	1	0.07
Alces alces	13	0.13	2	0.14
Castor fiber	4	0.04	2	0.14
Crocuta spelaea	4	0.04	1	0.07
Panthera spelaea	1	0.01	1	0.07
Panthera pardus	1	0.01	1	0.07
Bison priscus	25	0.25	2	0.14
Bos primigenius	9	0.09	1	0.07
Meles meles	23	0.24	2	0.14
Capreolus capreolus	2	0.02	1	0.07
Capra ibex	2	0.02	1	0.07
Ovibos moschatus	4	0.04	1	0.07
Lemmus lemmus	12	0.12	3	0.22
D. torquatus	16	0.17	4	0.29
Talpa europaea	25	0.26	2	0.14

Unfortunately, the publication does not mention and I do not know either from what size of area the above values come. Despite this drawback the table expresses certain information. The main hunted animal is no doubt the mammoth (72 %), all other species are far behind it in numbers. On the basis of these data it can be stated that the then people were fully specialised in this animal. The hunting of the other species, both from the point of view of their number and from the point of view of the amount of food obtained, was quite negligible and it was a mere addition. Besides mammoths also wolves, foxes, hares and reindeer were intentionally hunted.

All other species indicate only occasional hunting. It is interesting above all with horses in which it must be assumed that they lived there in large herds and from the viewpoint of the size of their bodies their hunting need not have been negligible. The

lack of their finds must necessarily be linked up with the technique of hunting, with the fact that the hunting of these highly mobile animals was very difficult to impossible for the people of that time.

Surprising is at the same time also the lack of bones of Felidae.

From the paleontological and stratigraphical aspects the presence of bears is interesting. In my papers on bears from this locality (Musil 1964) I could state that all finds I had available belong to the brown bear.A whole number of morphological characters and, after all, the metrics were very similar and in detail sometimes the same as in the cave bears, but still it was not that species. A whole number of signs on the bears' teeth has not species validity, but they are only phenotypical signs. The finds were, however, not identical with the present species *Ursus arctos* and they rather agreed with finds of arctoid bears from the Last Glacial which is denoted as *Ursus arctos priscus*. That means that even if some species penetrate in isolated cases from southern Europe as far as this area, it does not yet concern the brown bear living at that time in the Mediterranean region.

Conclusion: The chief hunted animal was the mammoth. As complementary animals can be mentioned reindeer, hares, foxes and wolves. All other animals were hunted more or less accidentally. The bones were splintered. In isolated cases individual parts of skeletons were found in anatomical order, which does not hold for mammoths only. Bones of mammoths or their parts were often sorted into separated heaps, evidently as starting material for further procession. This way of sorting osteological material is characteristic of Předmostí.

3.2. Dolní Věstonice I

If relatively little is known about Předmostí, still less is known about the fauna of Dolní Věstonice. It is impossible to take as basis written unpublished sources which would process in detail paleontological material or publications. In papers by K. Absolon dating back to pre-war years there are only lists of species found. The only paper that has appeared about paleontological material processed only finds of the time after World War II in an informative way is that of the investigation by B. Klíma of 1947 - 1951 (Musil 1959). That paper has become the basis of this chapter.

From the above investigation there comes material of two settlement objects (I and II), further from the site of a female grave and from a connecting ditch. Like in the preceding localities, osteological material can be divided into three parts according to its amount:

The most frequent and numerous species: *M. primigenius*, *Lepus timidus*, *Alopex lagopus*, *Vulpes vulpes*. Those species amounted to 51 % of all individuals, out of which hares and foxes 17 - 25 %. The mammoth must be considered the most numerous animal.

Numerous species: *Canis lupus* (11 %), *Rangifer tarandus* (11 %).

Medium represented species: *Equus germanicus*, *Gulo gulo*.

Sporadically occurring species: *Ursus* cf. *spelaeus, Panthera spelaea*, *Lynx lynx*, *Bison* or *Bos*.

From the pre-war years K. Absolon also lists the species *Castor fiber*, *Coelodonta antiquitatis*, from among birds *Corvus corax*, *Lagopus lagopus*, Lagopus *mutus*, *Nyctea scandiaca* and *Cygnus cygnus*.

The highest number of species and, at the same time, their greatest amount, was found in settlement object I. They were the following species: *Alopex lagopus*, *Vulpes*

vulpes, *Lepus timidus* (most numerous); *Canis lupus*, *Rangifer tarandus* (numerous); *Lynx lynx*, *Ursus* cf. *spelaeus*, *Panthera spelaea* (isolated). Near the female grave there was similar fauna as in the settlement object.

In settlement object II the following were found: *Canis lupus*, *Rangifer tarandus* (most numerous); *Equus germanicus*, *M. primigenius*, *Lepus timidus*, *Gulo gulo*, *Alopex lagopus* (numerous); *Ursus* cf. *spelaeus*, *Vulpes vulpes* (isolated).

In the dump prevailingly mammoth bones were found.

Summary: The most numerous hunted animal was the mammoth followed by hares and foxes. Numerous are also wolves and reindeer. All other species were hunted only accidentally or hunting them was not intentional. The same situation is repeated as was the case at Předmostí. The only difference is the fact that cumulation of some bones was not discovered.

Another aspect I consider important is the fact that mammoth bones do not occur in high numbers in settlement objects or immediately near them. Dumps of those bones constitute independent separated accumulations. It is not excluded that it may have been like that also at Předmostí and quite certainly at Pavlov.

3.3. Kůlna

Whereas the preceding localities were found in open air, in this case it is a cave in the northern part of the Moravian Karst. Its investigation in the years 1961 - 1976 was carried out by K. Valoch. In layer 6b Gravettian was found and its big fauna was processed by L. Seitl (1988) who mentions split fragments of bones of the following species: *Alces alces*, *Cervus elaphus*, *Equus* sp. (92 % of all species found), further *M. primigenius*, *Rangifer tarandus* (6 %). On the basis of this species composition a moderate climate is considered (Valoch 1988: Interstadial Tursac which in France is considered to be a weakly temperated and wet oscillation). According to Seitl the species composition corresponds to forest to forest-steppe fauna. It is, however, necessary to state that the number of bone fragments was relatively low, about 50 pieces.

3.4. Milovice

The procession of the fauna of the investigation led by M. Oliva has not yet been done, so that detailed basic information is missing. In a preliminary paper by Oliva (1989) the finds of the mammoth, horse, reindeer, wolf and lion are mentioned. In connection with this list he points out high specialisation in mammoth hunting, higher than at Dolní Věstonice and Předmostí. From mammoths there are: scapulae 14 pieces, pelvic bones 13 pieces, femora 7 pieces, humeri 6 pieces, mandibulae 7 pieces, broken skulls 4 pieces.

L. Seitl permitted me to have a look at the list of osteological material that is being made. It is only a part of it, but I think that it represents well the whole. With his consent I give here the quantitative values:

Mammoth bones thus strongly prevail over other species. It is not evident that they would be split to a great extent by the than man, their breaking was only due to natural processes. Another substantially lower quantitative group is that of the horse and the reindeer. As for the horse, according to L. Seitl some parts of extremities were still found in anatomical order. Another group of animals consists of isolated finds of: the fox (probably both species), the wolf and a felida somewhat smaller than the lion. Probably also bear bones were present.

Tab.2.

	No. of bones	%
M. primigenius	6 748	95.25
Equus germanicus	145	2.04
Rangifer tarandus	135	1.90
Alopex lagopus, Vulpes vulpes	7	0.09
Panthera cf. *leo*	12	0.16
Canis lupus	37	0.52
Ursus sp. ?	-	

Conclusion: The locality Milovice differs from all earlier mentioned ones. This difference is most probably not due to a different animal association living in the neighbourhood, but to quite a different function of the station. Its comparison will be possible only after a detailed procession of material, its time relation to the above stations, and after establishing the age of the mammoths hunted.

3.5. Willendorf

The only one near locality abroad that can be compared in time and on the basis of faunistic finds, is Willendorf. It is above all Willendorf II and I, particularly the following culture layers with the following species (Felgenhauer, 1959, I have done the quantitative viewpoint in bones according to published summaries, 1 = the number of bones, 2 = the percentage of the number of bones, 3 = the number of individuals, 4 = the percentage of the number of individuals, see Tab. 3.

The species differences of the individual layers of Willendorf II are not evident, even though they belonged to different time horizons. A marked accumulation can, however, be observed only in layer 9. I give the overall summary of finds from all layers.

The most frequent and numerous species: *Alopex lagopus*, *Vulpes vulpes*, *Capra ibex.*

Medium represented species: *Canis lupus*, M. *primigenius*, *Cervus* sp., *Rangifer* sp.

All other species occur only sporadically.

The fauna of Willendorf I does not differ from that of Willendorf II in the species hunted (the species *D. kirchbergensis* is most probably wrongly determined or it comes from an older horizon), but by the number of finds of the individual species.

The most numerous species: *M. primigenius*, *Capra ibex*, *Cervus* sp., *Rangifer* sp., *Bison priscus, Canis lupus.*

Medium represented species: *Equus* sp., *Lepus* sp.

All other animals were hunted occasionally.

From the above association of hunted animals the following conclusions can be drawn:

(1) The association is influenced by the region in which the locality is situated (e.g. a high number of the species *Capra ibex*).

(2) In the surroundings there also lived species in high numbers we do not meet at Dolní Věstonice, Předmostí and Milovice. They are: *Cervus* sp., *Bison priscus* and

Rangifer sp.

(3) Those species appear in time only after Předmostí and Dolní Věstonice, never immediately before them. It is basically the problem of an ecologically different association. From the faunistic point of view there can be two explanations:

(a) A more favourable climate in the surroundings of Willendorf set in much earlier than in south and central Moravia, which resulted in a change in the animal association.

(b) Radiometric data of the individual localities are not comparable and probably not correct, because the whole association at Willendorf indicates rather a period younger than that of the stations Předmostí, Dolní Věstonice and Milovice. A certain similarity is exhibited mostly by the fauna with layer 6b at Kůlna.

At present I am inclined to accept the second variant, although the evaluation is based of course on layer 9 of Willendorf II, which was the youngest and faunistically the richest, and further from culture layer marked as Willendorf I. It is not excluded that only those layers are younger than Dolní Věstonice and Předmostí.

Tab. 3. The fauna of culture layers of Willendorf II and I. Explanations in the text.

	Willendorf II														Willendorf I			
culture layer	5		6		7		8		9		total							
	1	3	1	3	1	3	1	3	1	3	1	2	3	4	1	2	3	4
Aves	2	1	-	-	-		-	-	-	-	2	0.67	1	1.13	1	0.44	1	2.08
Lepus sp.	3	1	-	-	-	-	1	1	-	-	4	1.35	2	2.27	9	4.00	2	4.16
Panthera spelaea	1	1	1	1	-	-	4	1	-	-	6	2.02	3	3.40	-	-	-	-
Panthera sp.	-	-	-	-	-	-	-	-	3	1	3	1.01	1	1.13	-	-	-	-
Lynx lynx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.44	1	2.08
Canis lupus	1	1	1	1	1	1	1	1	10	2	14	4.72	6	6.81	62	27.55	7	14.58
Vulpes vulpes	2	1	-	-	1	1	-	-	38	9	41	13.85	11	12.50	7	3.11	1	2.08
Vulpes sp.	-	-	-	-	-	-	1	1	-	-	1	0.33	1	1.13	-	-	-	-
Alopex lagopus	-	-	-	-	-	-	-	-	48	25	48	16.21	25	28.40	2	0.88	1	2.08
Gulo gulo	-	-	-	-	-	-	-	-	2	1	2	0.67	1	1.13	-	-	-	-
Ursus cf. *arctos*	-	-	-	-	-	-	-	-	3	1	3	1.01	1	1.13	-	-	-	-
Ursus sp.	1	1	1	1	1	1	-	-	-	-	3	1.01	3	3.40	1	0.44	1	2.08
M. primigenius	2	1	-	-	3	1	1	1	6	2	12	4.05	5	5.68	23	10.22	8	16.66
D. kirchbergensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	2.66	1	2.08
Equus sp.	-	-	-	-	-	-	4	2	9	1	13	4.39	3	3.40	7	3.11	3	6.25
Cervus sp.	2	1	-	-	-	-	2	1	8	2	12	4.05	5	5.68	13	5.77	5	10.71
Rangifer sp.	18	2	4	1	-	-	3	1	15	2	40	13.51	6	6.81	18	8.00	4	8.33
Bison priscus	-	-	-	-	-	-	-	-	2	2	2	0.67	2	2.27	17	7.55	4	8.33
Bison sp.	-	-	-	-	2	1	-	-	-	-	2	0.67	1	1.13	-	-	-	-
Capra ibex	13	2	2	1	-	-	20	3	52	4	87	29.39	10	11.36	57	25.33	8	16.66
Ovicaprinae	-	-	-	-	-	-	-	-	1	1	1	0.33	1	1.13	1	0.44	1	2.08
	45	12	9	5	8	5	37	12	197	53	296		88		225		48	

4. Similarities and differences in fauna

For the analysis of the species diversity of the period from Denekamp oscillation until the first half of the subsequent Stadial there are relatively few localities that would contain a large number of the processed osteological material. Let us first study

the species composition of earlier listed localities, but not from the systematic point of view, but from that of a deliberate and purposefully performed hunting. I would include here the following species:

(a) *M. primigenius*, *R. tarandus*, *Equus germanicus*, *Bos* sp. or *Bison* sp., *Alces alces*, *C. elaphus*, *Lepus timidus*, *Capra ibex*. In the hunting of this group the nutrition viewpoint prevailed.

(b) *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*. The nutrition viewpoint might be chief in an only critical situation, the hunting of those animals was conditioned by other reasons.

(c) Aves. The hunting of birds may have been conditioned by the most varied reasons, starting with the religious ones.

Besides the above species occasionally and evidently haphazardly a number of further animals were hunted, above all of beast of prey. This group of species is of importance only from the point of view of getting acquainted with the whole association of that time, from the point of view of reconstructing the natural environment, but not from the viewpoint of comparing the ecological basis.

The species composition of the first group of animals (a, b, c) is identical with Předmostí, Dolní Věstonice and Pavlov. It is like that because the period of the rise of the culture layer of the above localities is almost time identical and therefore does not exhibit great climatical differences. Somewhat different is the composition of the fauna of the cave Kůlna and of Willendorf, in the latter locality in at least some species no doubt affected by the relief of the surrounding landscape.

What remains is the quantitative evaluation which will show the number of individuals of the individual species and thus to a certain extent their quantity in the surroundings of the locality. This evaluation can be subject to some factors that cannot be completely excluded. They are above all the following circumstances that can be different in the individual localities:

(1) The heterogeneity of the given region for the life of the given species and/or for its migration, the heterogeneity of the landscape relief.

(2) For the study only a certain part of the material of the culture layer was unearthed which need not be exactly representative for the whole locality.

(3) The selection of above all small bones by the sedimentation environment.

(4) The objectivity of the relation of the number of individuals of the individual hunted species to the number of individuals of the individual species living in the surroundings.

The morphology of the landscape will probably play no role with Předmostí, Dolní Věstonice, Milovice and Kůlna. But it will be important with the locality Willendorf. As for point (2), with respect to a great amount of the unearthed material and to the size of the area uncovered those samples must be considered representative. Only Kůlna stands outside this view. Even though some colleagues are of the opinion that the sedimentation environment might play an important part in small bones, due to the fact that small bones are secondarily missing, I am of a contrary opinion. Not in a single studied locality could fossilisation processes on a relatively large area be the same on a relatively large uncovered area and at the same time so adversary that a complete loss of small bones should occur on the whole area. As for point (4), I think that in the case of intentionally hunted species the above relation exists, of course not in animals hunted occasionally.

Let us now try to make a quantitative analysis of the above localities from this

view, first of all Předmostí, Dolní Věstonice and Pavlov. Typical of those localities is a great number of individuals of the following species: *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*, *Rangifer tarandus* and *Lepus timidus*. The mammoth is very numerous only at Předmostí and Dolní Věstonice, at Pavlov it is only in the group of medium numerous animals. That may be due to two factors:

(1) Its number against the somewhat earlier Předmostí and Dolní Věstonice decreased. It is possibly the period of its gradual extinction. This point of view may be confirmed by the presence of young to very young animals, i.e. a substantial reduction of their average age.

(2) The investigation at Pavlov discovered only settlement objects and not mammoth-bone accumulations, as was the case at e.g. Dolní Věstonice. Mammoth bones, due to their size, were always thrown out outside settlement objects to dislocated dumps. If such a dump were found at Pavlov, the number of mammoths would be the same as at Dolní Věstonice.

By mere deduction it is difficult to solve the given problem. Only the established age of the hunted mammoths at Pavlov, which is on the average lower than at further localities, can signal the correctness of the first statement, but it cannot confirm it fully. On the other hand, a great amount of mammoth bones from the locality Milovice which is in time younger than Pavlov, would oppose that statement. But we do not know the average age of mammoths at Milovice. From everything it only follows that settlement objects and dumps of mammoth bones were found at different places, in the case of Pavlov the fact that they have not been discovered so far.

The locality Kůlna behaves quite exceptionally from the point of view of our present knowledge of the fauna of Moravia. Very numerous there are species which in earlier times (i.e. in the period of Předmostí, Dolní Věstonice and Pavlov) were found only isolated: deer, elks and horses. Such faunistic pattern at that time in Moravia is unknown, it is quite unique, and if it is proved at another locality, it must necessarily be counted with another temperature oscillation at that time. It would be climatically more conspicuous than the Denekamp oscillation (= W 2/3). Of interest is, of course, the fact that such a marked oscillation has not been found in any loess investigation where it would have to manifest itself.

An independent chapter is the fauna of Willendorf. Its composition, neglecting the regionally conditioned species, would indicate an age younger than that of Pavlov, maybe time identical with layer 6b (Gravettian) in the cave Kůlna. But that is somewhat opposed by radiometric data. Nevertheless, on the basis of the knowledge of the faunistic association of our territory I would include the localities studied into the following series from the time point of view.

The oldest: Předmostí, Dolní Věstonice

Roughly of the same age or younger: Pavlov (objectively possible only after finding of mammoth-bone accumulation and its evaluation). Milovice (maybe time identical with Pavlov, definitive inclusion only after processing paleontological material).

The youngest: Kůlna 6b, Willendorf I and Willendorf II (layer 9, possibly also some preceding layers).

As far as osteological material and its handling are concerned, I must draw the reader's attention to one more fact. There are minor differences between Předmostí on the one hand and Dolní Věstonice and Pavlov on the other hand. But Milovice differs substantially from all those localities. Those deviations must necessarily be linked up

with the working activity of the then man.

For the sake of clarity I mention the representation of the individual species and their amount at the studied localities in Tab. 4. Quantitative groups hold only for the given locality and their value is not quite the same in the relation of the individual localities.

Tab. 4. Quantitative representation of the individual species at the localities compared (%).
x1 - abundantly represented species
x2 - medium represented species
x3 - sporadically occurring species
x4 - without indication of number

	Předmostí	Dolní Věstonice	Pavlov	Kůlna	Milovice	Willendorf I	Willendorf II
Aves	x4	x4	8.3	-	-	0.44	0.67
Lepus timidus, L. europaeus, Lepus sp.	6.20	x1	18.5	-	-	4.00	1.35
Castor fiber	0.14	x4	-	-	-	-	-
Felis silvestris	-	-	0.5	-	-	-	-
Panthera leo	-	-	0.5	-	0.16	-	-
Lynx lynx	-	x3	0.2	-	-	0.44	-
Panthera spelaea	0.07	x3	-	-	-	-	2.02
Panthera pardus	0.07	-	-	-	-	-	-
Crocuta spelaea	0.07	-	-	-	-	-	-
Canis lupus	7.42	11	12.5	-	0.52	27.55	4.72
Vulpes vulpes	-	x3	10.7	-	⎫0.09	3.11	13.85
Alopex lagopus	6.92	x1	16.9	-	⎭	0.88	16.21
Gulo gulo	0.86	x1	4.4	-	-	-	0.67
Meles meles	0.14	-	-	-	-	-	-
Ursus cf. *spelaeus*	0.14	x3	0.2	-	-	-	-
Ursus arctos priscus	0.58	-	0.7	-	-	0.44	1.01
M. primigenius	72.05	x1	7.5	x3	95.25	10.22	4.05
C. antiquitatis	0.07	x4	-	-	-	-	-
Equus germanicus, Equus sp.	0.36	x1	4.6	x1	2.04	3.11	4.39
Cervus elaphus	-	-	0.2	x1	-	5.77	4.05
Capreolus capreolus	0.07	-	-	-	-	-	-
Alces alces	0.14	-	-	x1	-	-	-
Megaloceros giganteus	0.07	-	-	-	-	-	-
Rupicapra rupicapra	-	-	-	-	-	-	-
Ranfiger tarandus	2.59	11	10.1	x3	1.90	8.00	13.51
Bos or Bison	0.21	x3	0.2	-	-	7.55	1.34
Ovibos moschatus	0.07	-	-	-	-	-	-
Capra ibex	0.07	-	-	-	-	25.33	29.39

5.. Natural environment and biostratigraphic notes

A faunistic association is always in relation to the plant cover reacting much in detail to the climate at that time. Even though in our case it is only hunting game, its

composition is , nevertheless, indicated by the then environment. Despite the relatively great distance of the individual localities (Předmostí - Willendorf) the local climatic changes are not so great to prevail over the climate of that time. Taking this assumption into consideration, all essential changes in the faunistic composition must necessarily have a stratigraphic value.

The localities studied can, according to fauna, be at first sight be divided into two groups. The first includes Předmostí, Dolní Věstonice, and with certain deviations possibly also Pavlov and probably also Milovice. In the surrounding there lived abundant mammoths, reindeer, foxes, wolves and hares. In the association there also occur wolverines and horses, as for the last mentioned species I suppose that it was much more abundant than indicated by the number of hunted animals. In only isolated cases there occur deer, red deer, elks and bovids. From the summary it follows that the landscape could not be a loess steppe covered with only herb vegetation, but at that time species requiring light groves start penetrating into it, at least in the river valleys (Musil 1955, 1959). On the basis of the fauna it cannot be excluded that Pavlov might be younger than Dolní Věstonice and Předmostí.

The second group of localities includes the cave Kůlna (layer 6b) and Willendorf (above all layer 9 from Willendorf II and Willendorf I). Besides mammoths, species occurring only sporadically at the above mentioned localities increase in number. They are deer, elks, reindeer and bovids. The great number of ibex bones at Willendorf is due to the character of the landscape. It is thus a noticeable shift towards species requiring a different landscape, both climatically and from the viewpoint of the plant cover. I think that it must necessarily be younger than the localities of the first group, because their quantitative species composition is the continuation of what could be stated as the beginning with Dolní Věstonice and Pavlov.

In some authors there still prevails the opinion that the period of the end of the Pleistocene, with respect to its cold climate, was very unfavourable for the vertebrates and of course for plants. The loess steppe should have stretched from hilly land up to the lowest valleys and only isolated bushes and dwarfed trees could occur in it. Since it was a periglacial region, permafrost everywhere was automatically assumed.

In animals living at that time it was assumed that they were mostly so strongly adapted to that cold climate that they could not live in another one. Hitherto analyses, however, show that most of the then mammal species are not adapted to markedly warm or markedly cold climate, but rather to continental or oceanic climate. They are mostly eurythermic.

Sometimes, without major considerations, it is assumed that in the Glacials there was a meridian shift of present-day vegetation zones towards the south, without taking into consideration the fact that a number of important factors does not depend on glacial or interglacial time (the length of the day, the intensity of sunshine, etc.), but on geographic latitude. Therefore I believe that a thus conceived automatic shift of vegetation zones is not possible and that the biome typical of our region in the Last Glacial does not exist in present-day Europe (Musil 1988). This is also connected with the shifts of the animal association. A variety of American scientists have found that in North America there is no automatic shift of fauna towards the south in the Glacials, but rather to mingling of species of the individual zones. And that concerns a region where the shift north - south was very easy, not as it is in Europe where there are mountain ranges of the west-east direction.

And one more fact is conspicuous. Comparing the association of the end of the

Last Glacial and the beginning of the Holocene, the Last Glacial is characterised by a much greater species diversity than the Holocene. This incomparably higher species diversity assumes a much more heterogeneous biotope. That means that closed forest units developing in the Holocene were less advantageous for the species diversity and thus also for the number of species than the countryside at the end of the Pleistocene. If there were only a mere loess steppe in question at that time, the number of species would have to be the same, only other species would be concerned. Since this was not the case, it is necessary to admit a greater plant diversity.

This idea is also supported by big herbivores which need a great amount of food. In only a mammoth individual one must count with the amount of 200 kg plant food per day.

From all this it follows that the vegetation of that time was not monotonous, that it was not a mere steppe, but rather a forest-steppe and that it was also covered with small groves, maybe prevailingly in river valleys and at climatically more advantageous places.

An unexpected support for this claim at which I arrived years ago on the basis of fauna, is the paper on the vegetation from the peat-bog at Bulhary situated near Pavlov. This peat-bog is dated to 25 675 + 2 750 - 2 045 BP, i.e. it comes from the same time as the culture layer at Pavlov. It indicates forest vegetation with the species *Pinus silvestris*, *Pinus cembra*, *Larix europaea*, *Picea abies*, *Juniperus communis* together with steppe herbs. These conifera were also accompanied by deciduous trees: *Ulmus*, *Acer*, *Corylus*, *Quercus*, *Tilia* (Rybníčková-Rybníček 1991). Further data are given by Opravil (Chapter V) and Svobodová (199la,b).

From the composition the authors draw the conclusion that the climate had a continental character, was certainly cold, but the presence of the above deciduous trees absolutely excludes extremely cold climate and/or permafrost. It is in accordance with my conclusions following from the fauna, but also with present-day papers dealing with this period in North America.

The above conclusions are thus quite identical with those I obtained by the study of mammals. The countryside must therefore be imagined as a forest-steppe with alternating areas of steppes and forests. Culture layer 6b in the cave Kůlna and a part of Willendorf belong already to a climatically different period which can be only younger than the culture layer of Pavlov.

6. Areal distribution of the osteological material at Pavlov

In the investigations by B. Klíma the osteological material was recovered very carefully and sorted according to the individual square metres. This kind of work permits us to get acquainted with its areal distribution, possible accumulations and all conclusions following from it (see drawings of the areal distribution of bones of the individual species).

The areal distribution of bones of individual species is basically the same. There are places where there is accumulation of bones irrespective of the species, and places where bones are almost completely or completely missing. From that fact it follows that animal bones were not thrown away at will all over the area of the settlement, but they are concentrated to places where the hunted animals were processed. Those places must have been the same for the whole time of settlement, otherwise the above

phenomenon could not occur.

Despite this generally valid observation we are able to recognize in it three somewhat different variants of distribution.

(1) The accumulation of wolf and reindeer bones is quite identical. The two animals whose utilisation was certainly considerably different were processed at identical places. It is interesting that this group also includes finds of mammoth bones, differing partly in area 1. It cannot be assumed that mammoth bodies were processed at the given area, it is not their dump either, as is known e.g. from Dolní Věstonice. Evidently different factors play their role here.

(2) Also foxes and hares follow variant 1 in their distribution. Only at area 11 their accumulation does not correspond by their distribution to variant 1.

(3) This group includes all further species whose amount is too small to permit conclusions. Despite that their distribution at the area does not seem to be contrary to the above variants.

What conclusion follows from it? The hunted animals, irrespective of the species, were always processed in the same place in which also parts of their skeletons remained lying. It is difficult to assume that in this kind of work the area was utilised for a long time. The time of settlement must have been relatively short, which corresponds with my conclusions of earlier studies (Musil 1955, 1959). This kind also assumes a certain organisation of work and induces an idea that it could not be a too numerous group of people.

Let us now study in detail the skeleton material of the individual species and its distribution in the area. From some earlier investigations it is known that e.g. at Předmostí there was a sorting of the individual parts of mammoth skeletons to certain places and I was able to state something similar at some Magdalenian localities in Germany (e.g. Musil 1985). The two areas investigated, of 1952 (area 11) and of 1953 (area 1 - 10) are judged together in this study.

6.1. Foxes

In this case I do not distinguish the two fox species found at Pavlov. The overall amount of determinable bones was 1 063 pieces. All bones of the skeleton were found, mostly fragmentary. We are above all interested in extremity bones, altogether 405. If we do not take into consideration ulnae, 41 pieces, where the distal end is very easily broken off in the natural way, there were only 18 whole long bones, i.e. 4.71 % of long bones (besides ulnae). If we compare the present distal and proximal parts of long bones, a considerable disproportion is evident,there were many more distal parts, 63.18 %, and only 36.81 proximal parts.

From the distribution of the individual fox bones it follows that not even in one case was it possible to state their sorting to certain areas.

6.2. Hares

The total number of determined bones was 644 pieces. Like in foxes, also in this case it is possible to state the presence of all bones of the skeleton, the bones being again mostly fragmentary. There were altogether 42 ulnae, I do not take them into consideration for the above reasons. There were only 3 whole long bones, i.e. 1.11 % of long bones. Distal parts of long bones were altogether 72.18 %, proximal parts only 27.81 %. It is the same phenomenon as in foxes.

As for the distribution of the individual parts of the skeleton, again no

concentration of individual bones to certain areas is perceptible.

6.3. Wolves

The overall number of bones is very high, altogether 1 935 determined pieces. All skeleton bones are represented, mostly again in fragments. There were 57 ulnae, whole long bones 16.24 % The way of preservation is different from the above species and indicates evidently what the hunted animal served to. There were 57.83 % of distal parts of long bones and 41.81 % of proximal parts. Even this confirms the above opinion.

Dividing the finds of long bones of wolves to investigated areas of 1952 and in 1953, we would see that from the 1952 area there are more whole and fragmentary bones than from a much larger area in 1953. But one cannot speak about some intentional sorting of osteological material.

Bones were frequently thrown away still in connection with tendons and in the investigation they were found in anatomical order. Several whole hind legs were unearthed, sometimes also with the distal part of fibula, or part of the whole hind leg or the whole front leg, i.e. the humerus, the radius, the ulna and the paw, sometimes also part of the backbone with vertebrae in anatomical order. Very many bones belonged to young individuals.

One fragment of a mandible deserves attention in which the teeth were ordered in a zigzag way. This feature is considered to be a domestication sign and its more detailed procession should be paid more attention in the future. If it proved correct, it would be the oldest known domestication in the central European region.

As for the areal distribution of individual bones, it corresponds completely to that of the above species. A difference is found in the ratio of distal and proximal parts of long bones, in the presence of a larger number of whole long bones and in a relatively high amount of skeleton parts in anatomical order. From all that it follows unambiguously that the hunting of this animal was carried out for other reasons than for obtaining food.

6.4. Reindeer

The overall number of bones was relatively high, altogether 920. All bones are highly fragmentary, not a single long bone was intact. There were altogether 11 ulnae, 69.87 % of distal ends of long bones and only 30.12 % of proximal ends.

By the analysis of their areal distribution it was impossible to find any intentional concentration of individual parts of the skeleton. It is interesting that not a single tibia or humerus was found, only one femur. Due to the fact that the overall number of bones of this species is very high, they must have served as starting material for making tools. That is, after all, evident in preserved bones, above all in metapodia.

6.5. Horses

There were relatively few hunted animals, the number of bones is altogether 267. The highest number consisted of free teeth, further carpal and tarsal bones. All others served as raw material for making tools. No intentional distribution of individual bones is perceptible.

6.6. Mammoths

The overall number of bones was 661. They were mostly phalanges, rib fragments and molar fragments. Long bones, mere small fragments, were only three. A whole number of bones came from very young animals, from freshly born young animals, and even unborn individuals cannot be excluded.

6.7. Birds

There was a relatively great number of bird bones, altogether 129. Their bones were scattered all over the area.

6.8. Other species

Relatively most frequent were wolverines, fewer lions and fewest bears. By it isolated occurrence also deer belongs here. Bones of carnivores were preserved in a similar way as in wolves, whole long bones and metapodia are found. From that we can judge at the same way of utilisation as in wolves.

A great majority of the found bones was, of course, fragmentary, so that they are either indeterminable or their determination would be very difficult. They are altogether 10 210 fragments, their areal distribution being evident from the graph.

Several facts follow from the analysis of bones:

(1) The hunted animals were always processed in the same places, which assumes a relatively short time of settlement by a small group of people.

(2) Not all animals served as food. This is particularly evident in the beasts of prey. A relatively high number of hunted wolves, evidently for obtaining fur, therefore signals the settlement of the given area in winter months, at a time when the fur was at its best. Putting this assumption together with the amount of the hunted game, also the length of settlement follows from it. The amount of the hunted game probably corresponds to the period of one to two years, or one year with two winters.

(3) The disproportion of distal and proximal parts of long bones cannot be explained otherwise than that the proximal parts served for the production of some tools. The above disproportion is too conspicuous as not to be intentional.

(4) Individual bones of big and small animals (excepting the beasts of prey) evidently served as raw material for further products. But their concentration to certain places where they were processed is not evident, as it is known e.g. from some Magdalenian localities. This reveals a lower degree of labour organisation as compared with the localities of the Magdalenian.

7. Game Hunting

Hunting game constituted the main economic basis of the then people and their existence, the number of people and their cultural level depended fully on the success of hunting. But it did not serve them only for meeting the basic human needs, i.e. as food, but at the same time as the starting raw material for further activity. This of course did not only concern the hard parts of the body that are found, but also the soft parts (such as tendons, fur, etc.) which are, of course missing. I believe that the elaboration of this fact has not yet been paid sufficient attention which was rather oriented at stone tools.

From the study of osteological material certain deductions follow:

(1) Hunting was not concentrated to a certain species or to a certain age. Prevailingly all big herbivores were hunted, but the number of other small game is not negligible.

(2) The objects of hunting were both animals living in herds (such as mammoths, reindeer) and those living individually. That means that the way of hunting them must have been quite different.

(3) Finds of horse bones are relatively small. Despite that I believe that in the landscape of the forest-steppe character they lived in big herds and the fact that the number of hunted animals is so small witnesses rather that the method of their hunting had not yet been mastered by the then people. That is substantially different from the Magdalenian when many a time a complete specialisation sets in of their hunting; of course there was nothing else left for people if they wanted to survive.

(4) Animals were hunted in relatively near surroundings and they were carried to the settlement either whole or, big animals, in parts. The settlements were founded at places advantageous above all for hunting mammoths. Near Dolní Věstonice and Pavlov it is necessary to assume their migration on a relatively narrow territory between the stream of the river Dyje with numerous swamps (see also the peat-bog at Bulhary at the same time) and the steep slopes of the Pavlovské vrchy Hills. At Předmostí, on the other hand, there were effusions of warm waters not freezing even in winter; it was a place very advantageous particularly in the winter season owing to a high daily consumption of water by the mammoth.

(5) In some animals also seasonal annual hunting has to be assumed. Bone accumulation was due to man's activity and natural factors did not participate in it. I am sure that this also concerns Předmostí, when old opinions about a natural disaster appear again. It would be possible to mention a variety of factors contradicting it, but this is not the objective of the present paper.

(6) Individual settlement structures did probably not serve for a long time, it cannot even be excluded that they were only seasonal. On the other hand, it was a permanent place for inhabiting suitable evidently for its important position from the point of view of animal migration. Only with Milovice it is possible to consider a satellite camp.

(7) The high success of the hunting and thus also a high level of the economic basis allowed a relatively great upsurge of the then human community and liberated the possibilities of cultural development at an unpreceded level. One question remains unanswered, viz. why those advantageous places were deserted. Decisive must have been an essential change in their economic basis.

(8) A number of problems would be soluble in the case of a comprehensive procession of the whole set of problems by different branches of science on a broader geographical and temporal scale.

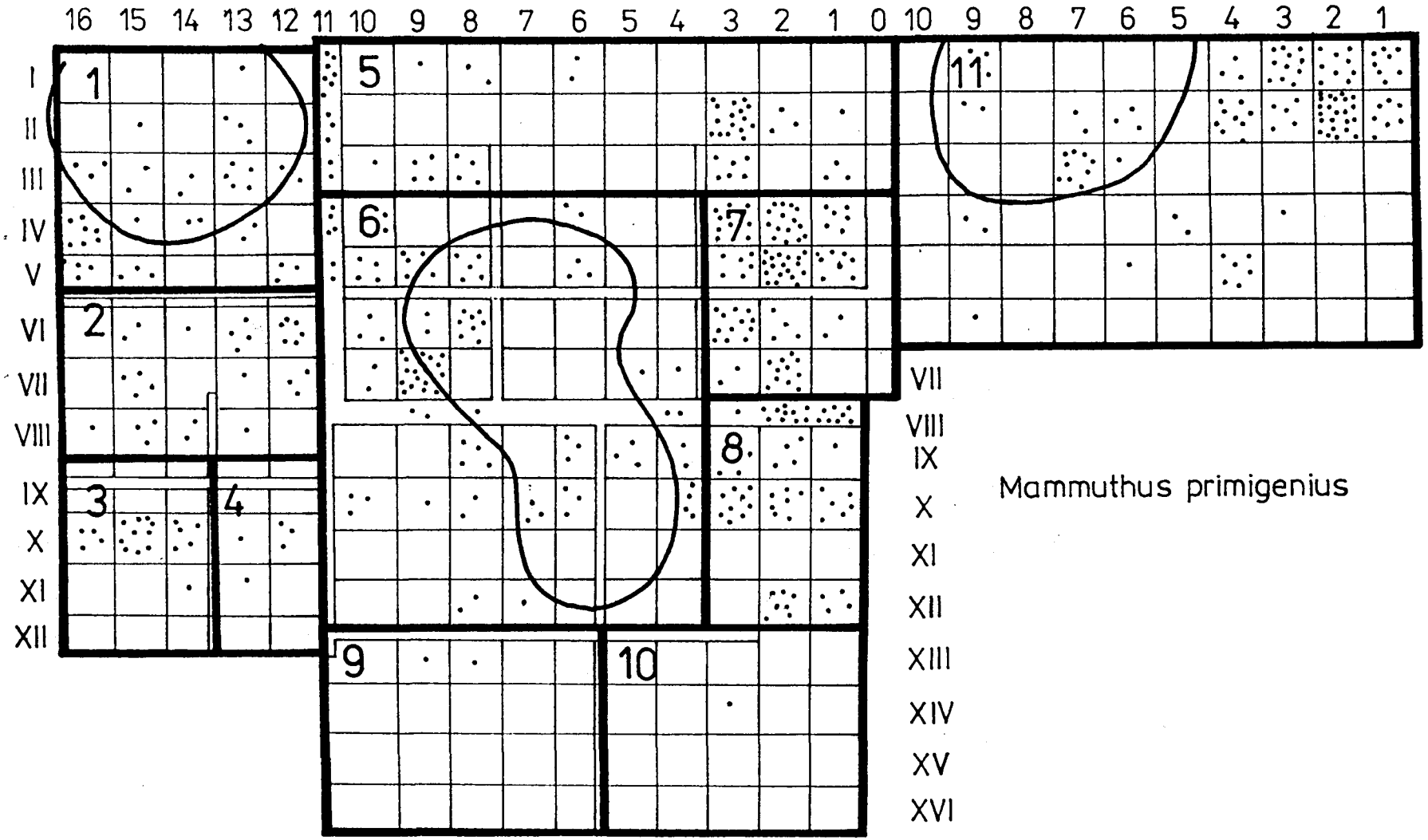

Fig.1. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

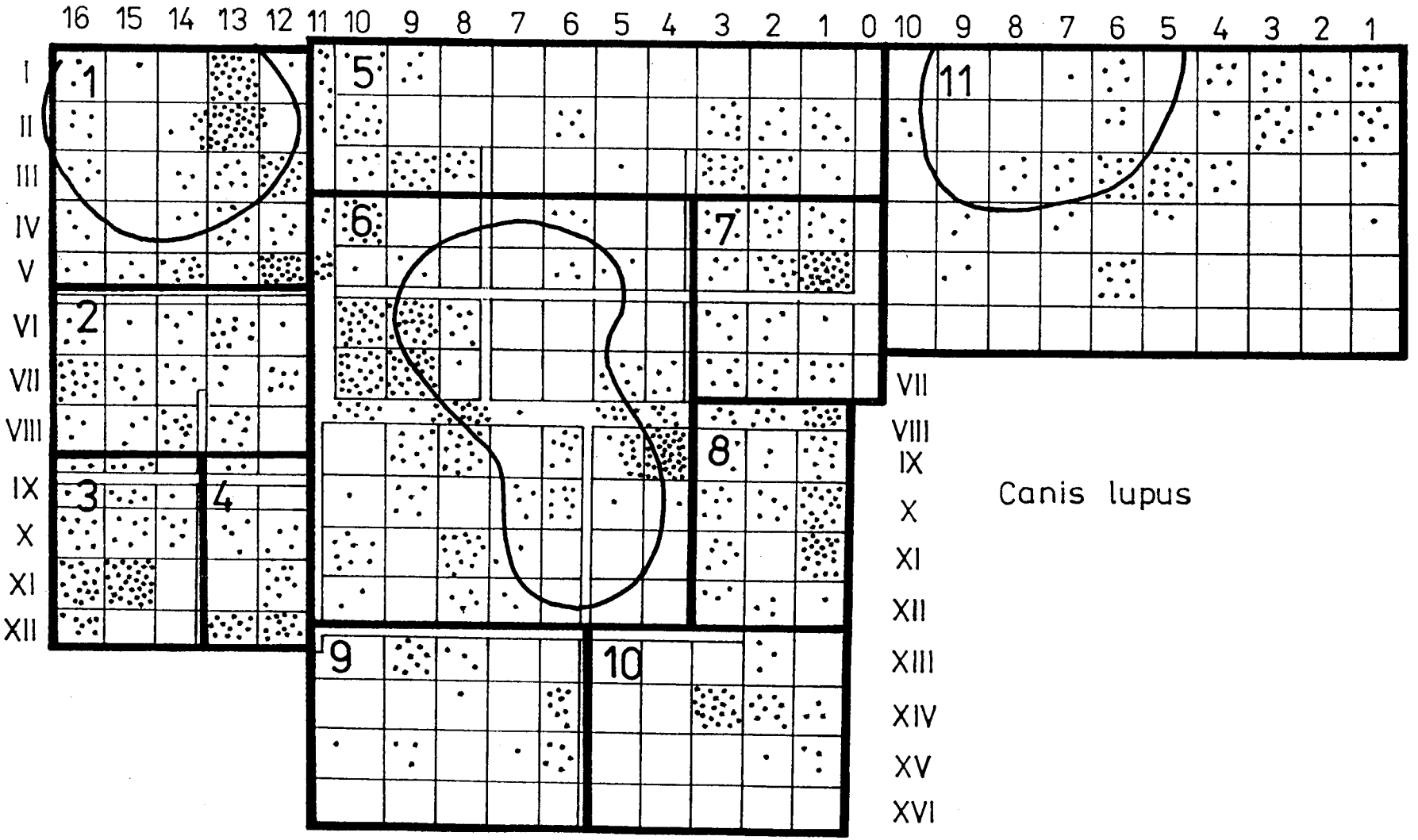

Fig.2. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

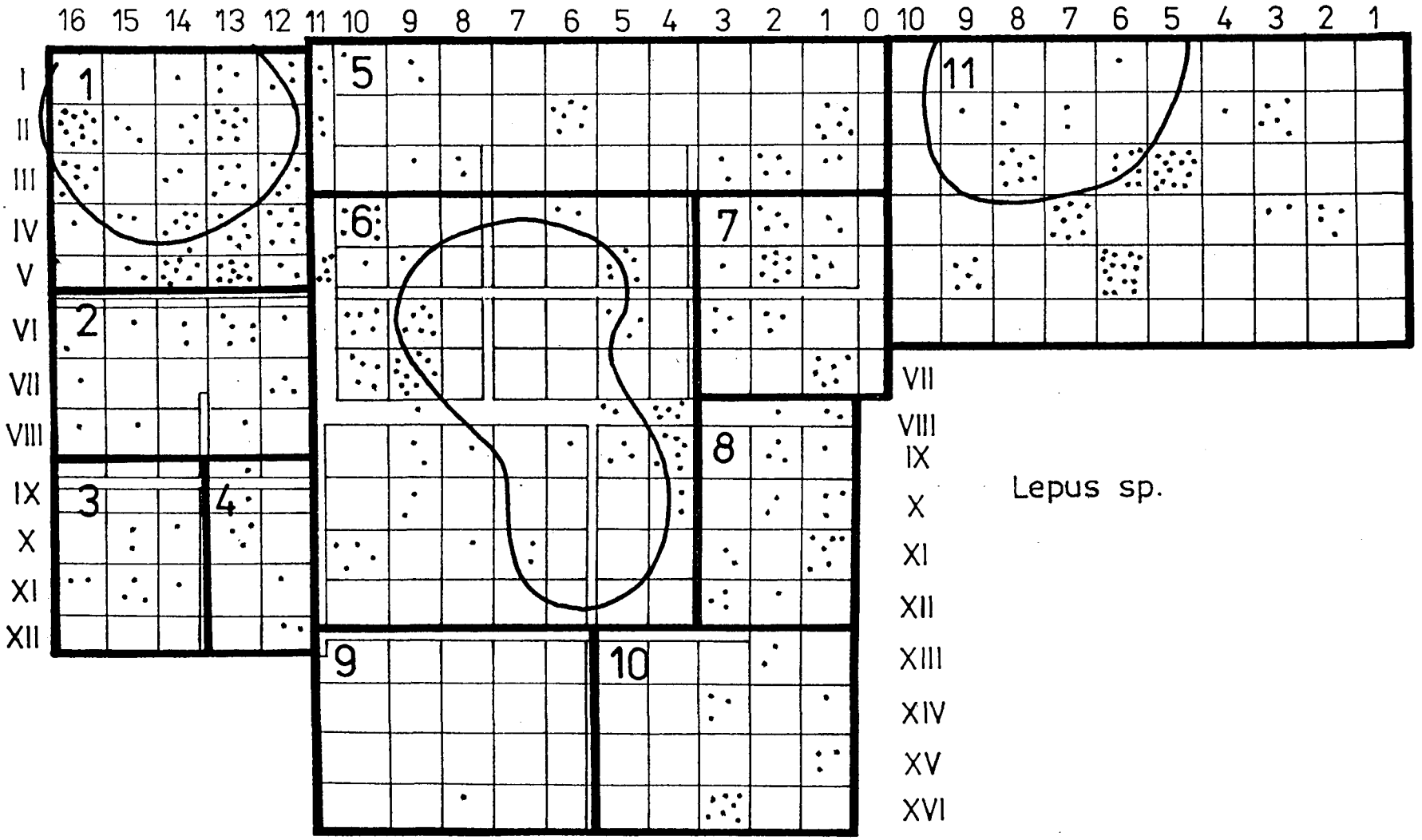

Fig.3. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

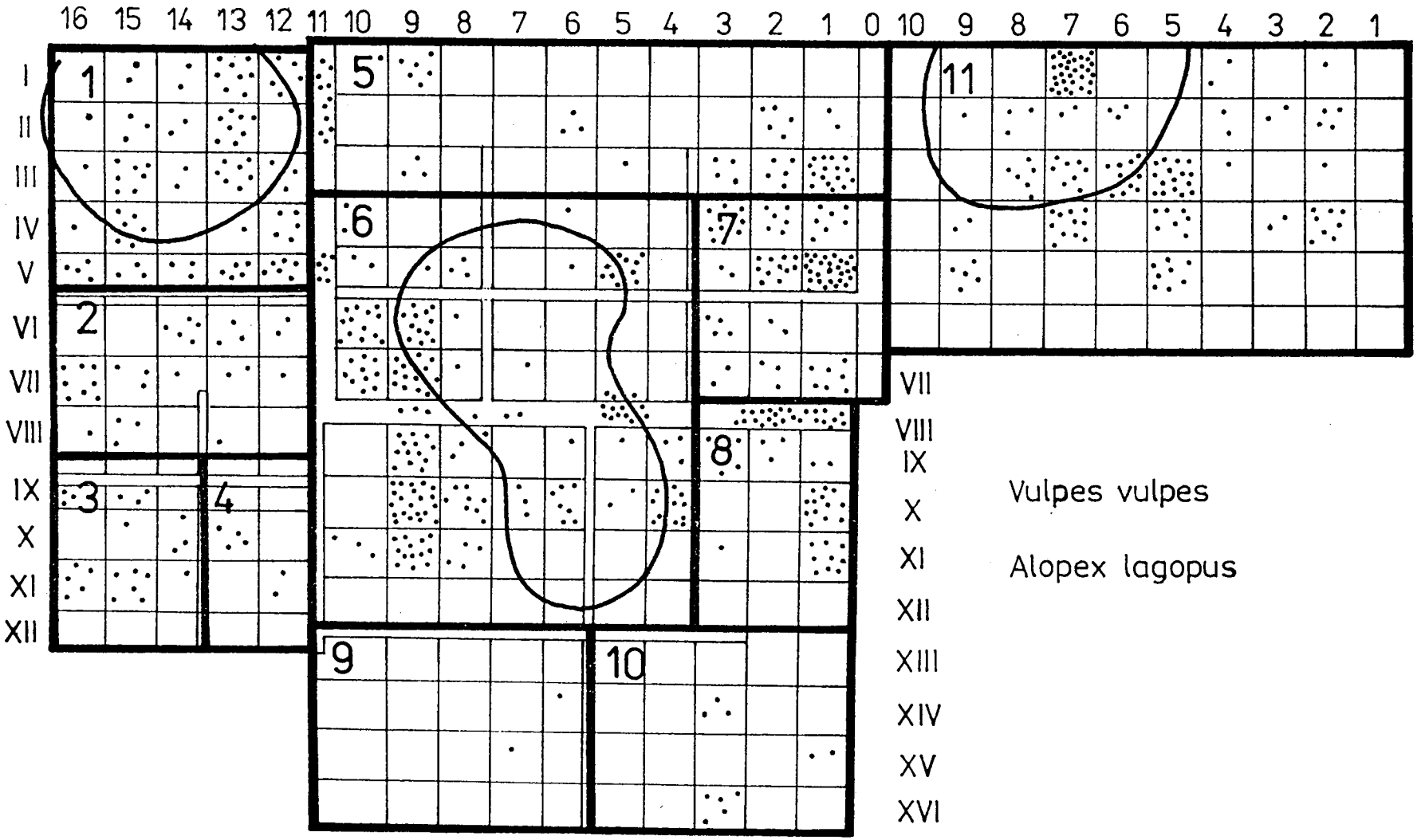

Fig.4. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

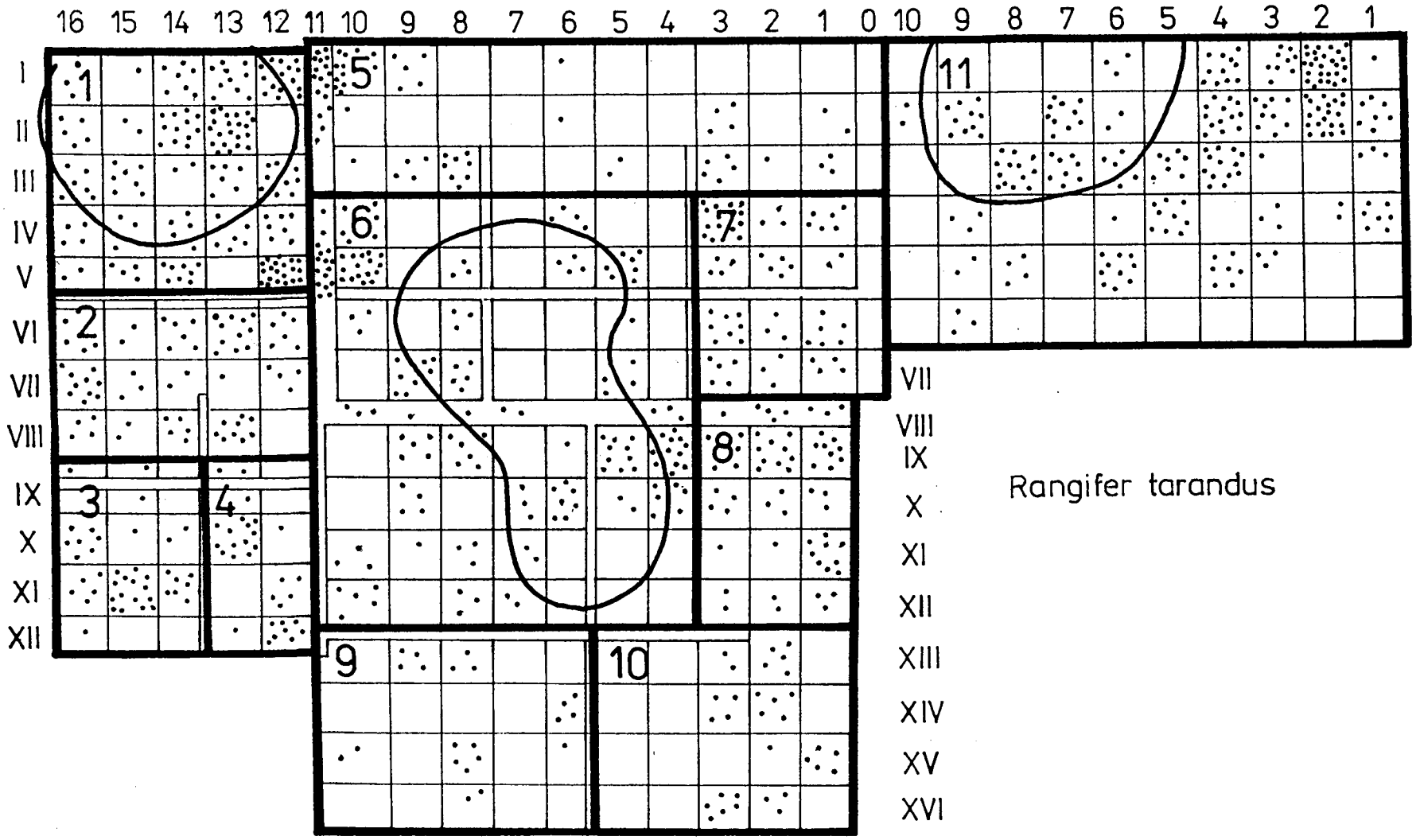

Fig.5. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

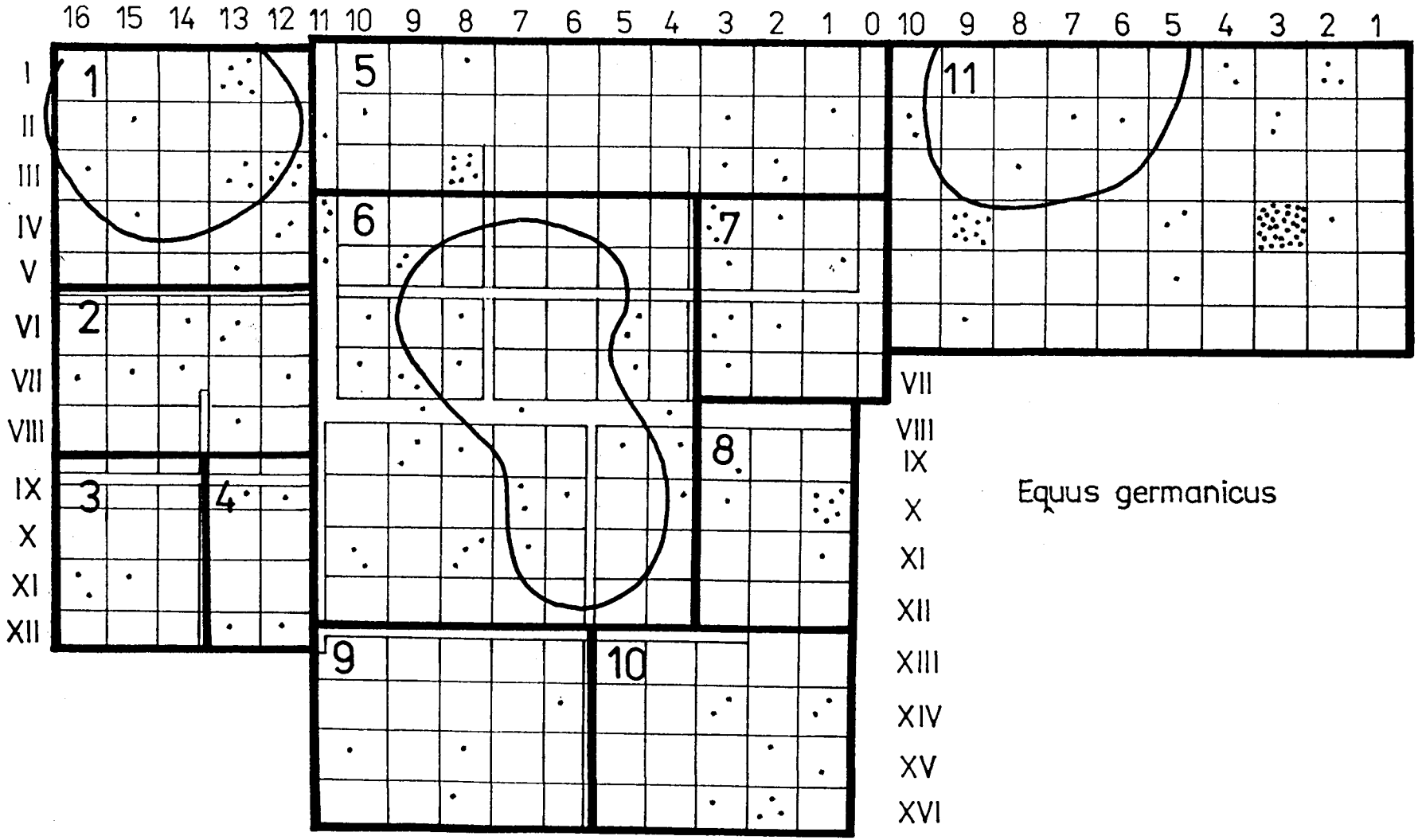

Fig.6. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

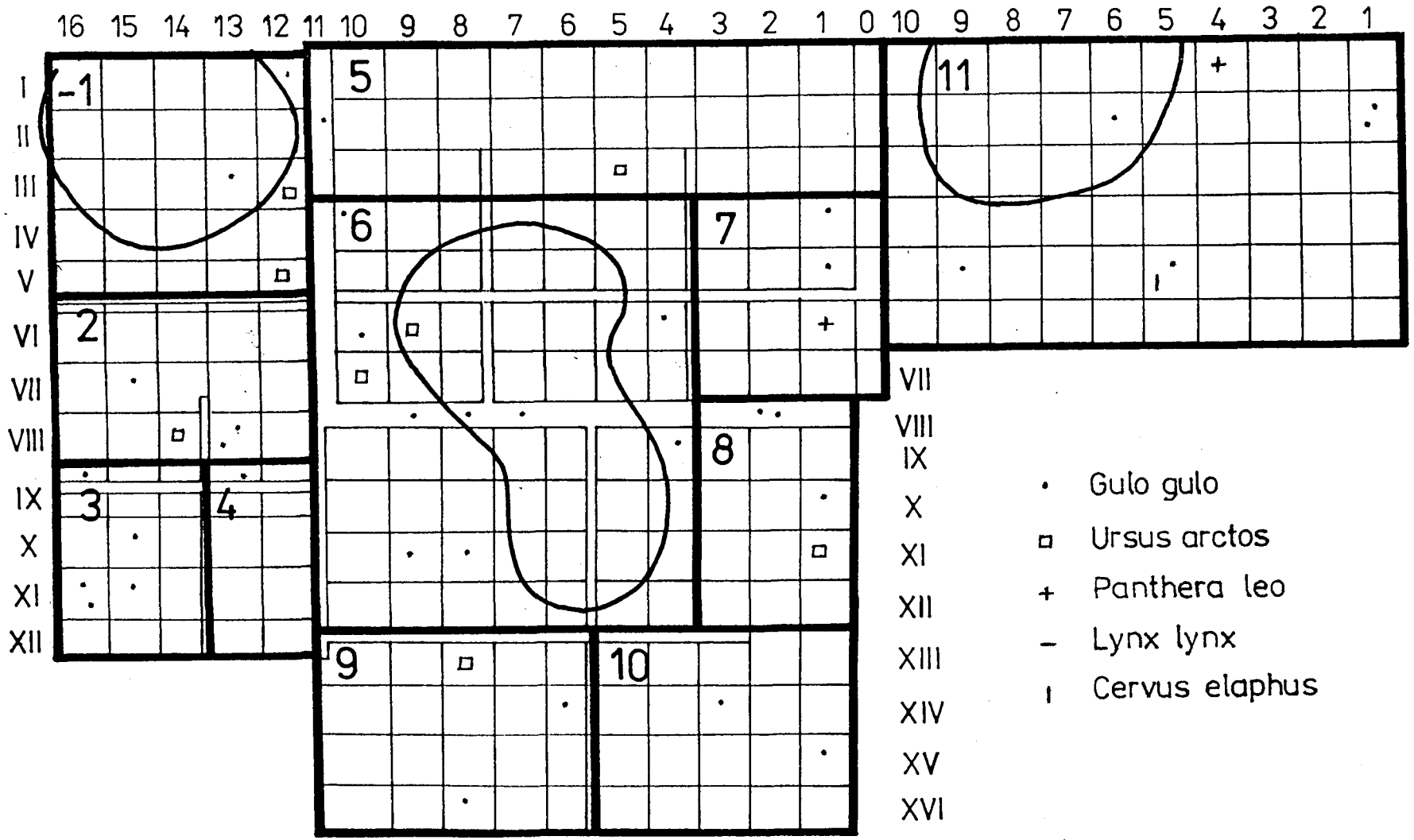

Fig.7. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

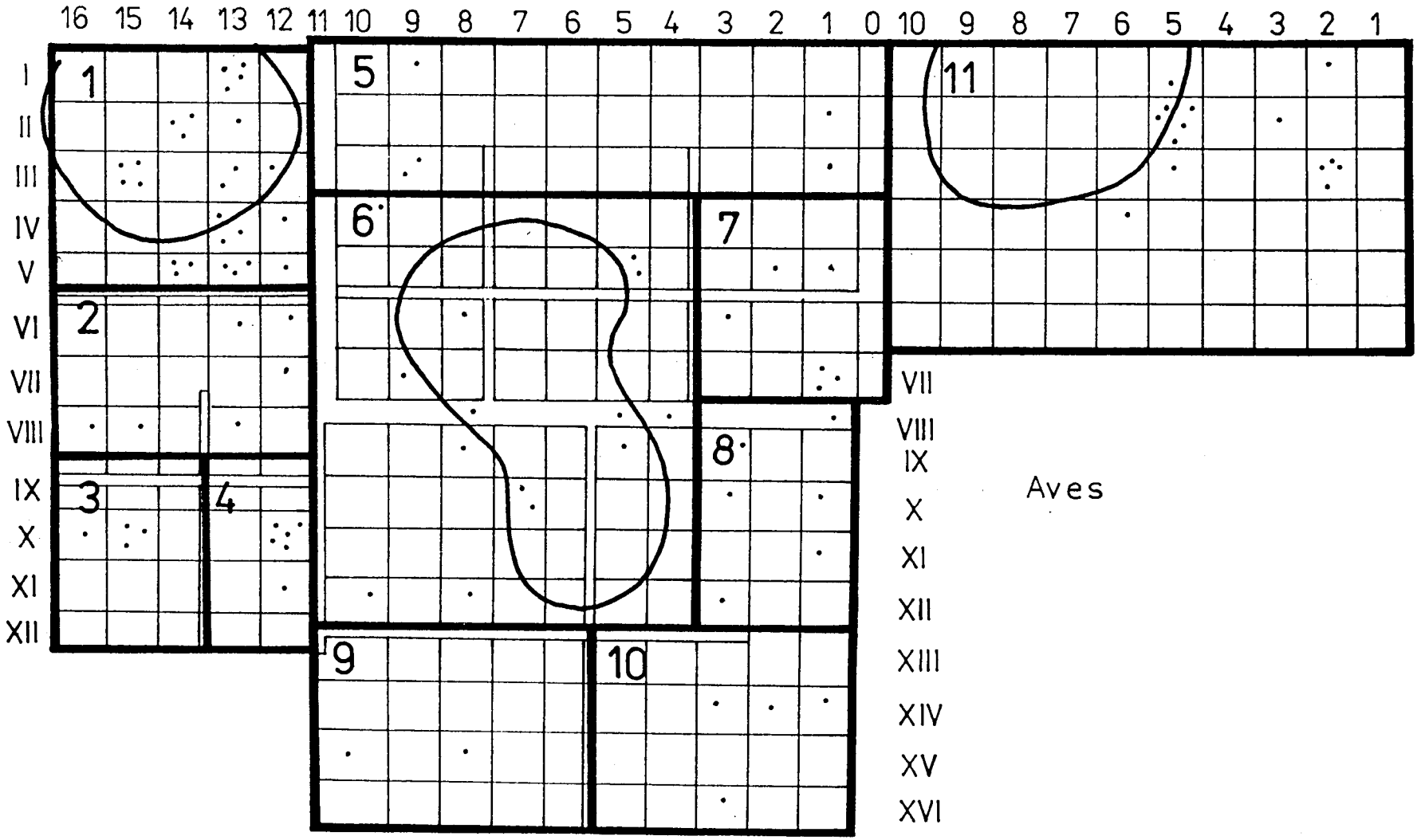

Fig.8. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3

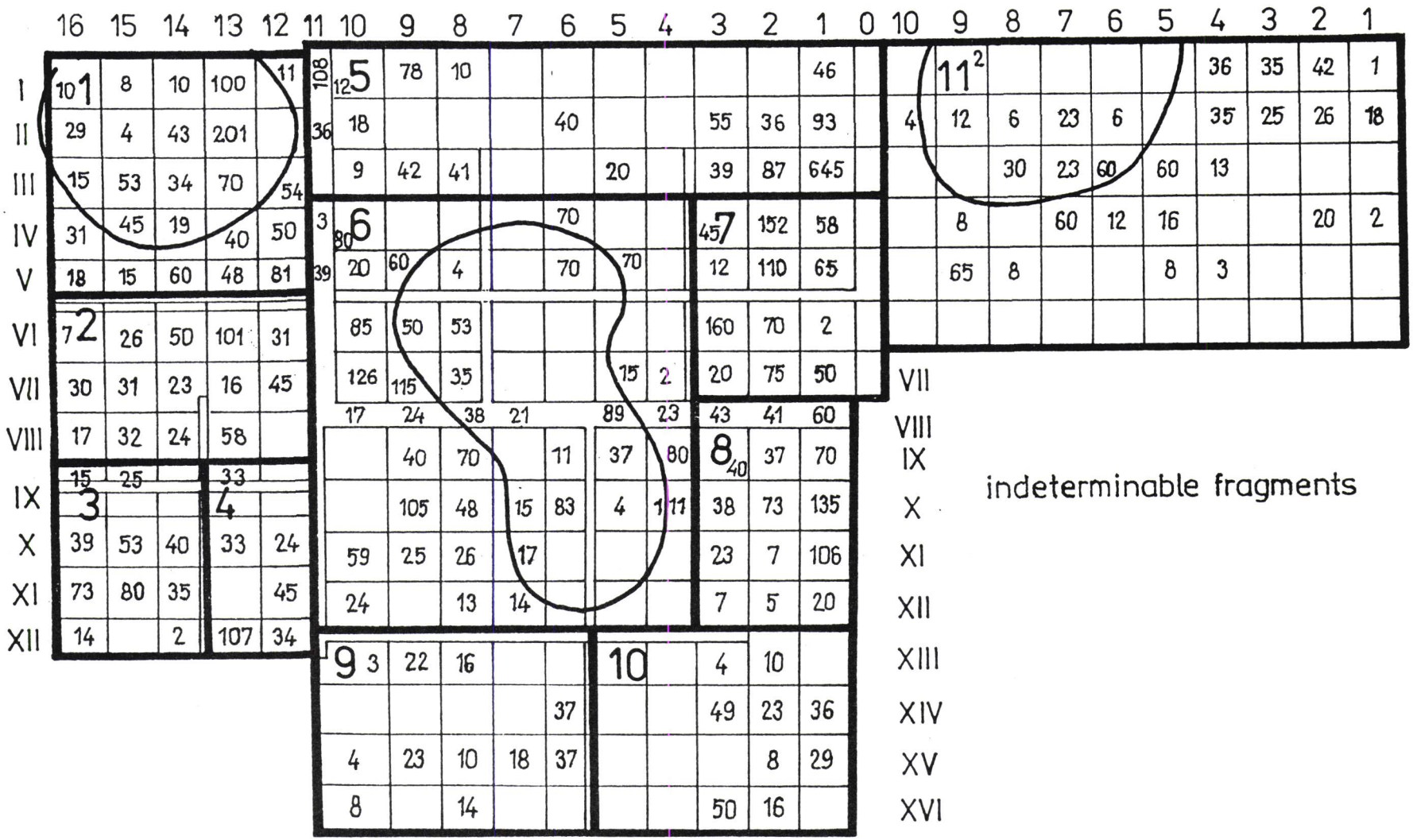

Fig.9. The spacing of bones in the culture layer of Pavlov in the separate square meters. Investigation in the year 1952 (part 11) and 1953 (part 1-10). In the part 6 the central feature 3. The numbers represent the quantity of bones (only interminable) in the square metre

CHAPTER VII
AFTERWORD

by Jiří Svoboda

1. Introduction

The excavations by Bohuslav Klíma at Pavlov I were held in a systematic and complex way. Therefore, it widely enriched our knowledge of the Gravettian (Pavlovian) adaptations. Full exhaustion of the material and data collected by B.Klíma is a long-term task, and it should be realized in collaboration with specialists from various research fields and disciplines.

This afterword aims to recall few ideas arising from evaluation of the first two excavation seasons. They concern especially the Gravettian chronology and adaptations. Given the total number of material from Pavlov I, however, the scope of this summary is limited and it should be understood as preliminary.

Presentation of the Pavlov I site, 1952-1953 area, and the ongoing analysis of the 1957 area, are sponsored by grants from the Grant Agency of the Academy of Sciences of the Czech Republic (project No 090104) and the Grant Agency of the Czech Republic (project No 404/93/2359). Simultaneous fieldwork at Dolní Věstonice and Předmostí is supported by a grant from the L.S.B.Leakey Foundation. I am especially indebted to W.G.Mook and J. van der Plicht for new series of C 14 datings.

2. Location

Several previous archaeological studies stressed the geomorphological character of the Moravian territory (Czudek 1994, Skutil 1955, Svoboda et al. in press). It is considered as a system of narrow passages connecting the plains: in the North, the Moravian Gate with important Aurignacian and Gravettian settlements; in the center, the Vyškov Gate and the Napajedla Gate. In the southern plains opened towards Austria, the isolated chain of the Pavlovské Hills emerges as a marked orientation point. As a whole, the territory forms a natural corridor between the Bohemian Massive and the Carpathians, allowing migrations from the Danube valley in the SW to the North European Plain in the NE. This function is reflected both in the paleontological and archaeological records.

The site Pavlov I makes a member of the chain of sites extending about 2,5 km along the northern foot of the Pavlovské Hills, from Dolní Věstonice II in the west, through Dolní Věstonice I and Pavlov I (located close to each other in the center), to Pavlov II in the east.

3. Stratigraphy, sedimentology and pedology

Stratigraphically, the period concerned here is principally correlated with a soil formation representing the upper member of the soil complex PK I (including Middle Aurignacian and Early Gravettian, with C 14 datings between 32 500 - 29 000 B.P.; Haesaerts 1990, Svoboda 1991a,b), and the deposition of the overlying loess (Upper Aurignacian and Gravettian), until the Last Glacial Maximum (20 000 - 18 000 B.P., Soffer and Gamble, eds., 1990).

At Stránská skála, micromorphological investigation shows that the basal soil ranges typologically between the pararendzines and chernozems. The soil developed within a short time-span, under repeated eolian sedimentation, redeposition and

solifluction. In the subsoil, we observed horizontal movements of stones (formation of sorted circles), both prior to the soil formation (Czudek et al. 1991).

At Dolní Věstonice II, a stratigraphically identical soil has been classified as a weakly developed pararendzine, mixed with relics of earlier chernozem soils. Again it evolved during a short time-span, under cold and relatively dry climate. Following moister oscillations were responsible for its pseudogleyfication. At the nearby site of Milovice, on a different substrate, this soil corresponds to a weakly developed pseudogley (Smolíková 1991).

At Willendorf II, a comparable horizon (layer 5) is represented by lenses of humous sediments (Haesaerts 1990).

The overlying loess cover was studied in detail by Klíma (1958, 1969, Klíma et. al. 1962) at Dolní Věstonice and by P. Haesaerts (1990) at Willendorf. The both authors observed several pseudogley horizons, eolian sand and solifluction layers within the loess. Further excavations at Dolní Věstonice II repeatedly reveal further pseudogley horizons (Smolíková 1991), obviously representing periods of increased humidity rather than increased temperature.

The Gravettian cultural layer (or complex of layers) at Moravian sites developed during a long period of limited loess deposition, between 29 000 - 20 000 B.P. The matter originates from anthropogenic activities, and, as show by Smolíková, the matrix also includes soil particles. Horizontal movements (solifluction) and other deformations of the layer are visible, but archaeological features such as hearths, pits or human skeletons are little or not affected by these deformations. No vertical differentiation within this layer, that would have a chronological meaning, is observed.

At Willendorf II, on the other hand, excavators were able to separate five stratigraphic levels (5-9) within the same time-period. Thus, all efforts in Gravettian chronology should combine the vertical stratigraphy at Willendorf with the spatial analysis at the Moravian sites (Otte 1991, Svoboda 1994).

4. The Gravettian chronology

Chronological subdivisions of the Gravettian in our region (Pavlovian) were suggested by Klíma (1961), Valoch (1961) and Otte (1981, 1991). Bárta (1987) separated an earlier and later Gravettian stages in Slovakia, while Kozlowski and Sobczyk (1987) named the earlier stage Pavlovian and the later Kostenkian. Soffer (1993) and Grigoriev (1993), on the other hand, talk about a Willendorf-Pavlov-Kostenki-Avdeevo unity. Svoboda et al. (1994, 149) repeat the Pavlovian-Kostenkian succession.

The Gravettian culture in the Middle Danube area covers the time span between 30 000 and 20 000 B.P. (Otte 1981, Kozlowski 1986), and it is supposed that the archaeological content of large Moravian sites like Pavlov, Dolní Věstonice, or Předmostí accumulated during parts of this period. Chronological relationships between the various settlement units (Klíma 1963b,c, Svoboda 1991a) were hitherto studied on the basis of stratigraphic observations such as overlapping of slope-slipped loessic blocks (DV I), overlapping of settlement units (unit 1 and 2 at DV II), thickness of the underlying loess separating the cultural layer from the 30 000 years-old soil below (DV I and II), and radiocarbon dating.

The samples for C 14 were measured in the laboratories at Groningen, Prague, Illinois and Lyon. A table of the C 14 datings so far available (Tab. 1) shows that the data from Groningen present usually higher values, a more meaningful developmental pattern, and smaller deviations than data from the other laboratories. Therefore, we based our effort in chronological comparisons on the Groningen data only.

We tried to correlate the C 14 data with the typological evidence emerging from spatial analysis of some sites, and with the environmental data. As a result, it is suggested to separate the Gravettian in two major stages which we may call the Pavlovian and the Willendorfian-Kostenkian. Eventually, the Pavlovian may be subdivided in two substages.

4.1. The Early Pavlovian (30 000 - 27 000 B.P.)

Earliest Gravettian in the Middle Danube territory is documented at Willendorf II (layer 5), Dolní Věstonice I (lower part of the site) and II (lower part of the site and certain locations at the upper part such as units 2 and 3 of the western slope). The industries are dominated by burins, backed implements and endscrapers. Burins are about twice as numerous as endscrapers, number of geometric microliths is usually lower. Rarely, some of the endscrapers may possess high, Aurignacian-like shapes.

Environmental context of this stage, dating to the end of the basal soil formation (e.g. humous lenses in layer 5 at Willendorf II, Heasaerts 1990) and to the beginning of the loess deposition, is little know. Pollen analyses from the basal soils at Stránská skála and Dolní Věstonice II suggest a temperate climate with steppe-like vegetation (Svobodová 1987, 1991a).

4.2. The Evolved Pavlovian (27 000 - 24 000 B.P.)

This chronological stage was observed in layers 6 - 8 at Willendorf II, at Dolní Věstonice I (middle and upper parts of the site), Dolní Věstonice II (certain settlement units), Pavlov I (all hitherto analyzed materials) and Předmostí (larger part of the industry). The rich bone industry documents unity of this stage (Klíma, chapter III). Judging by lithic typology, one may observe separation into two facies each with a particular style. The first one, represented by Willendorf II, Předmostí and Dolní Věstonice II - unit LP/ 1-4, is characterized by elaborate marginal retouch on blades and flakes, by retouched pointed blades, and by some typical sidescrapers. The second facies found at Dolní Věstonice I, II (with the exception of unit LP/ 1-4), and most characteristically at Pavlov I (1952-53), can be differentiated by a rarity or absence of marginal retouch, and by an abundance of microliths such as crescents, trapezoids and triangles, while Dolní Věstonice is rich in denticulated microsaws.

Stylistic differences between the Předmostí style on the one hand, and Dolní Věstonice - Pavlov style on the other, are observed in art as well (Svoboda in press). The Dolní Věstonice - Pavlov style is characterized by slightly curved linear decoration, figural representations of animals and humans in ceramics, and sophisticated but simple abstractions carved in ivory. The Předmostí style includes geometric decorations and a female drawing in the same style.

The landscape was partly covered by wooded areas with conifers and accompaniing decidous trees including few more pretendous species (Rybníčková-Rybníček 1991, Svobodová 1991a,b, Opravil, chapter V). After R. Musil (chapter VI),

the animal composition (mammoths, reindeer, foxes, wolves and hares) fits well into such landscape reconstructions.

4.3. The Willendorfian-Kostenkian (24 000 - 20 000 B.P.)

This Upper Gravettian stage is represented by the sites of Willendorf I, II (layer 9), Předmostí (a hypothetical recent stage) and Petřkovice. Outside the Austrian-Moravian-Silesian territory, the sites of West Slovakia (Moravany, Nitra-Čermáň, Trenčianské Bohuslavice) should be added, as well as Spadzista in Poland, and Molodova, layer 7, in Ukraine. The most important typological feature uniting all these assemblages is the appearence of shouldered points of the Kostenki-type, showing linkage to Eastern Europe typical for the period. Therefore, J.K. Kozlowski and K. Sobczyk (1987) call this stage Kostenkian. Some sites also have leaf-points (Trenčianské Bohuslavice, Předmostí). During a time period which saw development of the Solutrean in West Europe, these implements should no more be considered a Szeletian reminiscence, but rather an expression of a new wave of leaf-point production. Marginal, sometimes steep retouches on the artifacts and the decrease in number of microliths recall the former Předmostí style rather than Dolní Věstonice. In the decoration, G.P.Grigoriev (1993, 55) underlined the presence of small crosses lineary distributed along the ribs of implements, uniting Willendorf II (layer 9), Kostenki (layer I) and Avdeevo.

Finally, some of the sites yielded female figurines (Willendorf, Moravany, Petřkovice). The first two mentioned figurines also have striking analogies in East Europe (Kostenki 1-I, Avdeevo).

In the faunal evidence of this period (Musil, chapter VI), we observed an increase in the number of deer, elks, reindeer and bovids. It appears that such a fauna requires a slightly different landscape. Even if the paleobotanical evidence for this period is still scarce, the situation at Předmostí (samples 6-7, Svobodová in Svoboda et al., in press) suggests a decrease in arboreal pollen (31% - 16%) and an increase in heliophilous plants.

4.4. Late Aurignacian (Epiaurignacian)

Stratigraphic evidence from Moravian sites (Stránská skála, Svoboda 1991b), certain C 14 datings from Lower Austria (Tab.2) and typological chronologies based on surface assemblages (Oliva 1987) suggest that the Aurignacian survived until 20.000 B.P. According to current scenarios, the two populations lived side-by-side, but their behavior was of different manner.

5. The Gravettian adaptations

5.1. Settlement pattern and geography

Since the Early Upper Paleolithic (EUP), the settlement pattern demonstrates an intensive land-use throughout the territory, and creating of network of sites in open landscape. Marginal highlands at 300 - 400 m a.s.l. were preferred, enabling exploitation of a variety of altitudinal zones and environments. At favourable sites we observe superimposed reoccupations (Stránská skála). The loess deposition, however, was limited in such exposed areas and, in consequence, much of the evidence is found on surface.

In the Gravettian, the strategy in selectioning a microregion or a site differs. The Gravettian is usually found in extended sites under loess deposits near river valleys, at 200-300 m a.s.l. These sites are less numerous, and are aranged axially, along the main route connecting the Danube valley and the North European Plain (Willendorf, Pavlov, Dolní Věstonice, Předmostí). The Gravettian/Aurignacian superpositions (Willendorf, Milovice) are rather exceptions.

By the end of Gravettian, a horizon of several sites with artifactual elements reminiscent of East Europe, here called the Willendorfian or Kostenkian, emerges on strategic places along the same passage. The relationships in the cultural inventories, dispersed quickly over a large part of the continent, suggest an increased mobility, probably as an adaptive response to the climatic change.

5.2. Lithic raw material exploitation and use

Decrease in importance of Moravian lithic materials and increase of foreign rocks is a regular trend observed during the interval between Late Middle Paleolithic and the Gravettian (Svoboda 1983, Přichystal 1989, Kozlowski 1987). The Aurignacians still occupied and exploited important local chert sources such as Stránská skála and Krumlovský Les while imports played a role in areas deprived of local supply.

In the Gravettian, this pattern becomes even more systematic. About 60-90% of raw materials originate from the flint outcrops in the Silesian glacial sediments, or in the Krakow-Czestochowa Jurassic of South Poland, and 10-30 % from the radiolarite outcrops, either in the Slovakian/Moravian boundary or in the Austrian Danube valley. It is suggested that this pattern is due to a higher mobility and regularity of the movements along the SW-NE route. Later in the Epigravettian, imports continued to be used, but selection of the sources is less systematic.

We believe that the message reflected in these changing behavioural patterns is important. Geochemical analyses are in course (Přichystal, chapter II) in order to locate the network of lithic imports as precisely as possible. A combined geological-archaeological project is in preparation.

5.3. Subsistence

Unfavourable conditions of bone preservation at most of the EUP (Bohunician, Szeletian, Aurignacian) sites in Moravia caused the actual lack of evidence on hunting during this period. Most of the bones determined belong to horse and mammoth.

On the contrary, a huge amount of faunal material is being excavated at the Gravettian sites. Musil (chapter VI) observed the dominance of reindeer, fox, wolf and hare inside the settlements. The surprising decrease in the importance of horse is, after R. Musil, due to the change of hunting techniques. The variability in mammoth presentation at the various sites seems to be related to changing behavioral strategies. At Předmostí, evaluation of the early reports suggests that mammoth bones were either concentrated or scattered throughout the cultural layer in quantities. At the south Moravian sites, huge deposits of mammoth bones were sorted apart from the settlements (Dolní Věstonice I - Klíma 1969, Dolní Věstonice II - Svoboda 1991a, Milovice - Oliva 1989). A discussion exists wheather these bones accumulated through human hunting activities (Musil, chapter VI), or wheather they represent natural mammoth cemeteries, exploited by man for organic materials (Soffer 1993). A

direct relationship between man and mammoth, in any case, is demonstrated by the terrain situations and by the contemporaneity of the settlements with the adjacent bone deposits. It is equally clear that the mammoth bone deposits disappear by the end of Gravettian. For the Epigravettian, the site of Stránská skála IV brought evidence of horse hunting, more specialized than we may assume for the EUP (Svoboda 1991b).

The question of plant exploitation receives attention as well (Klíma 1955, Kozlowski 1986, 187), especially with the new evidence from recent excavations and with the newly applied methods (Mason and Hather 1993).

Compared to the other Upper Paleolithic cultures in Moravia, the Gravettian model of long-distance raw material transport and of systematic mammoth exploitation, seems the most labour-expensive and the most systematic one. Functioning of this system could have been influenced by activities of other, Aurignacian population, making Moravia and Lower Austria territories characterized by intergroup-competition.

5.4. Art and rituals

Central Europe lacks evidence of parietal art and the related deep-cave rituals. The diversity of mobile art techniques and forms, however, is not less complex than in the West. We assume that ritual behavior took place in open-air sites or in caves opened to day-light, by other means than decorating the walls. Context and subjects of the excavated objects are therefore being analysed in order to approach social actions.

With respect to the context, art objects may be separated in items of short-term and long-term use (Svoboda 1976). Carving sculptures of animals and humans, or items of personal adornment, is time-consuming and the products served their purpose during a longer interval. Larger sculptures were certainly stationary, while the smaller, pierced ones contributed to personal adornment as pendants or carried in a pouch. A. Marshack (1972) confirmed this by observing wear polish on surface of some of the carvings. Such objects contribute to the concept of "self-awareness" of an individual within the society (Marshack 1992, 183). It is only surprising that we do not find such carvings with the ritually buried human skeletons, among the items of personal adornment. The only statue found in a burial, the ivory carving of Brno II (Makowsky 1892), is too large to have been carried around.

Long-term use is expected for decorated bone, antler and ivory tools and weapons as well. An image decorates the object once for ever. Beside its aesthetic meaning, it could have supplied some kind of supernatural power to the implement, strenghtening its functions. In all these categories, the aim is an object *per se* and its magical powers.

The short-term art is observed first in the Gravettian ceramics, and later in the Magdalenian engraved plaques. In both cases, not the object seems to be important, but the moment of its creation and destruction. An experienced artist may produce such objects relatively quickly. The pattern of subsequent destruction is sometimes demonstrated by breakage, deformations (ceramics), and reutilisations (stone plaques). This kind of art clearly represents only the non-perishable relict of a more complex ritual creation.

Baked clay figurines represent one of the most typical phenomena of Gravettian (Pavlovian) sites in Moravia (chapter IV). These figures, sometimes broken, deformed or incised, are found clustered together with a number of unshaped clay pellets around the hearths where they were obviously made. Large collections

were found at Dolní Věstonice I (Absolon 1938, 1945, Klíma 1979, 1981) and Pavlov I (Klíma 1989), while smaller samples originate from Pavlov II, Dolní Věstonice II and Předmostí.

K. Absolon (1938, 1945) and B. Klíma (1963b, 1981) suggested that the ceramic objects served in some kind of ritual, located in "places of mystical hunting cults" (Absolon 1945, 17). The results achieved recently by P. Vandiver et al. (1990) and O. Soffer (chapter IV) have shown how this rituals could have functioned. The raw material was local loess, generally fired to temperatures between 500 - 800°C. These temperatures correspond to the results of analyses from some of the hearths. Some deformations observed in shape of the figurines are due to a thermal shock. Effects of such a rapid temperature change appear repeatedly, showing that this approach was not accidental but intentional.

Another question is how far such presumed ritual suites to the generally accepted hunting magic scenario. Klíma (1979, 1981, Fig. 24) showed a disproportion between quantitative representation of animals depicted in art and those preserved in faunal remains of Dolní Věstonice I. In faunal remains, we have the huge accumulations of mammoth bones along the sites. Whatever disagreement there may be in interpreting them, this animal was of primary importance to human economy. Inside the settlements, the faunal composition differs (Musil, chapter VI).

Among the ceramics found at Dolní Věstonice, the species most frequently represented are bear, lion and other carnivores. Furthermore, there are figurines of females, males and hybrids in the same contexts. Mammoth is much more important in the ceramic sample from Pavlov I; this site, however, lacks the typical mammoth-bone accumulation.

A comparison with species depicted in the "long-term" art shows a similar picture. The few ivory carvings with identifiable subjects show that females (both realistic and stylized) and important or imposing animals (mammoth images from Pavlov I and Předmostí, and a lion from Pavlov I) were among the choiced subjects.

As early as the Aurignacian, J. Hahn (1986, 1992) showed that selection of species depicted in art focuses on strong and imposing animals. Since the "short-term" art appears in the Gravettian, this pattern remains true even if the particular animal may be rare in the osteological context. In the Magdalenian, the dichotomy between economical reality on the one side and subjects of the "short-term" art on the other seems even more pronounced (Svoboda 1976).

Almost all artistic evidence related to rituals, as well as a large part of human burials was discovered in the context of settled areas. The bulk comes from large sites with intensive reoccupations. This stresses the social functions of art and rituals, performed in living places and in places of aggregation.

6. Pavlov I: Analysing segment of a site

The questions arising during spatial analysis of Gravettian sites concern, at the first place, the chronology of various settlement units, hearths and features, and its reflection in artifact typology and faunal composition. The second point concerns a more detailed analysis of a particular settlement unit. In this second case, differences are interpreted rather from the point of view of behavior than of chronology.

Any spatial analysis of South Moravian sites is limited by primary data about location of the objects. It is only since 1990 that position of each piece is being

measured three-dimensionally and computerised (Dolní Věstonice I, III, Předmostí). At Dolní Věstonice I, II and Pavlov I, position of artifacts has mostly been documented by square meters only.

Analysis of spatial data from Dolní Věstonice revealed certain comparative data. At the site I, settlement unit 2, B.Klíma (1963b, fig. 51) recognized a clearly-outlined structure with a central hearth, ceramic fragments, ochre, and a medium artifact density inside. Areas of a higher artifact density, and with shells, occur 3-4 m to the SE from the structure. These areas have several small pits, but no hearths. At the western slope of the site II, three settlement units were distinguished, each with a central hearth and an artifact concentration around (Svoboda 1991a, Figs. 2 and 23) or slightly downslope (unit LP/1-4, Svoboda 1990). The unit 4 was separated from units 1-3 by a sterile zone (Svoboda, Škrdla and Jarošová in press) - here, the position of hearths in relation to the central artifact concentration is clearly peripheral. One of these hearths, instead, was sorrounded by Tertiary shells and ochre. The microliths dominate in the centre; approaching to the periphery, we observed an increase of burins, of larger artifacts, and of radiolarite.

With these comparative data in hand, we approach the evidence from Pavlov I. Within the 1952-53 area we observe a similarity of the individual assemblages both in the horizontal sense (sectors) and vertical sense (the lower and upper layers). On the other hand, the 1957 area, located in the opposite (NW) part of the site and actually under study, shows important differences in raw material (increase of radiolarite) and typology.

In frame of the 1952-53 area, we may assume a contemporaneity on the level of large chronological stages (the Evolved Pavlovian). This however does not prove a contemporaneity on the level of years or seasons. The questions of duration of occupation and of seasonality become important in this context.

6.1. Duration of occupation

All sites at the foot of the Pavlovské Hills were supplied with the same raw materials, possibly in a regular, seasonal rhytm. The economy of lithic production, however, was not exactly the same. The pronounced microlithic character of a large part of the hitherto studied Pavlov I industry, together with the higher proportion of retouched tools (Svoboda, chapter II) and worn artifacts (Tomášková, chapter II), suggests a higher intensity of material use use than at Dolní Věstonice II. Refittings of the radiolarite (Škrdla, chapter II) show that, in contrast to DV II, the artifacts rarely fit together; this observation suggests that the time-period of input and output of material into and from the area was long enough to interrupt relationships among artifacts as emerging from the lithic production. In other areas of the site (preliminary results from the year 1957), however, the Ic index increases. This, together with the other differences, stresses the necessity of an analytical approach to the site.

The presumed dwellings at Pavlov I and DV I are more frequently semi-subterranean (type "C") and sometimes include remains of marginal enclosures (Klíma 1963b,c), while those at DV II are rather light surface structures (type "D", Svoboda 1991a, fig. 26). Pavlov I is the only site in Moravia where a storage pit comparable to the ones know from Eastern Europe has been found (Klíma 1977; cf. Soffer 1989). Furthermore, Pavlov I and DV I have thick ashy deposits, sometimes separated in several microhorizons, with concentrations of fired clay and decorative objects around them (e.g. Klíma 1981, fig. 4); DV II lacks representational art, the

production of fired clay was limited, and the ash deposits were smaller and thinner. It seems reasonable, therefore, that differences between sites like Pavlov I or DV I on the one hand, and Pavlov II or DV II on the other, may be related to duration of the occupations.

Basing himself on the amount of hunted game at Pavlov I (1952-1953 area), R. Musil (chapter VI) estimates the length of occupation to one or two years, or one year with two winters.

6.2. Seasonality

Data on seasonality are still extremely limited and the question calls for more systematic study in the future. R. Musil (chapter VI), on the basis of quantity of animals hunted for furs (wolfs, foxes), suggests a winter occupation. Tomášková (chapter II) seems to support this view by observing traces of work with frozen and dry materials near some of the hearths.

Dolní Věstonice II, a site expected to have a shorter occupation, also has a good proportion of foxes. Furthermore, we have the evidence from tree-rings by Opravil (chapter V), suggesting a winter occupation. Thus the sites of the area, in the present state of knowledge, show differences in duriation of occupation but not in seasonality.

6.3. Spatial structure of the site

Comparison of the distribution maps of lithics (chapter II, figs 2-9), bone industry, art and decorative objects (chapter III, fig.1) and fauna (chapter VI, figs 1-9) reveal a pattern of irregular distribution throughout the area. Several of us (Musil, Tomášková, Svoboda) investigated the relationship of this pattern to the location of hearths and other terrain features. By using various approaches of spatial analysis, the authors arrived to a similar pattern of distribution.

Most of the approaches (Musil, Svoboda) take location of the central feature, as outlined by B.Klíma during the excavation (No. 3), as starting point. The outlines were roughly limited by larger objects (chapter I, fig. 5) and, more clearly, by a depression along the northern margin. The other structures suggested by Klíma (Nos 1 and 2) are more hypothetical, since the outlines are not really visible.

Shape of the central feature - two adjacent circles - suggests that it may have been composed of two circular features, each 4-5 m in diameter. A barrier, probably a wall, existed along the northern margin.

The artifact distribution accords with the shape of the feature, it respects its northern outline, but continues to reach maximal densities at the western vicinity. The faunal distribution does not respect the feature at all, almost all species concentrate to the west of it, and some of them to the south.

The western vicinity of the feature, therefore, is an area of special importance. It includes several hearths and regular kettle-shaped depressions, most probably boiling pits (chapter I, fig. 7). Tomášková (chapter II) analysed the various hearths separately and observed a semicircular patterns of artifact concentrations around some of them. She suggested that some of them may have been protected and some were open. This area also covers the maximal densities of endscrapers and burins, as well as maximal densities of wolf, hare and reindeer remains.

Generally, it seems that the western part of the excavation was a zone of concentrated activities. The pattern of an artifact and ash concentration outside a

feature is similarly visible in cases where the outlines are more clearly defined (Dolní Věstonice I, unit 2, Klíma 1963b, fig. 51, Mezhirich, Pidoplichko 1976, fig. 51, Goncy, Pidoplichko 1969, fig. 14, Dobranichevka, Pidoplichko 1969, fig. 20, Mezin, Pidoplichko 1969, fig. 37, etc.).

If we accept the central feature recognized by B.Klíma at Pavlov I as a dwelling structure, the western zone would represent an adjacent activity area, most probably connected by an entrance.

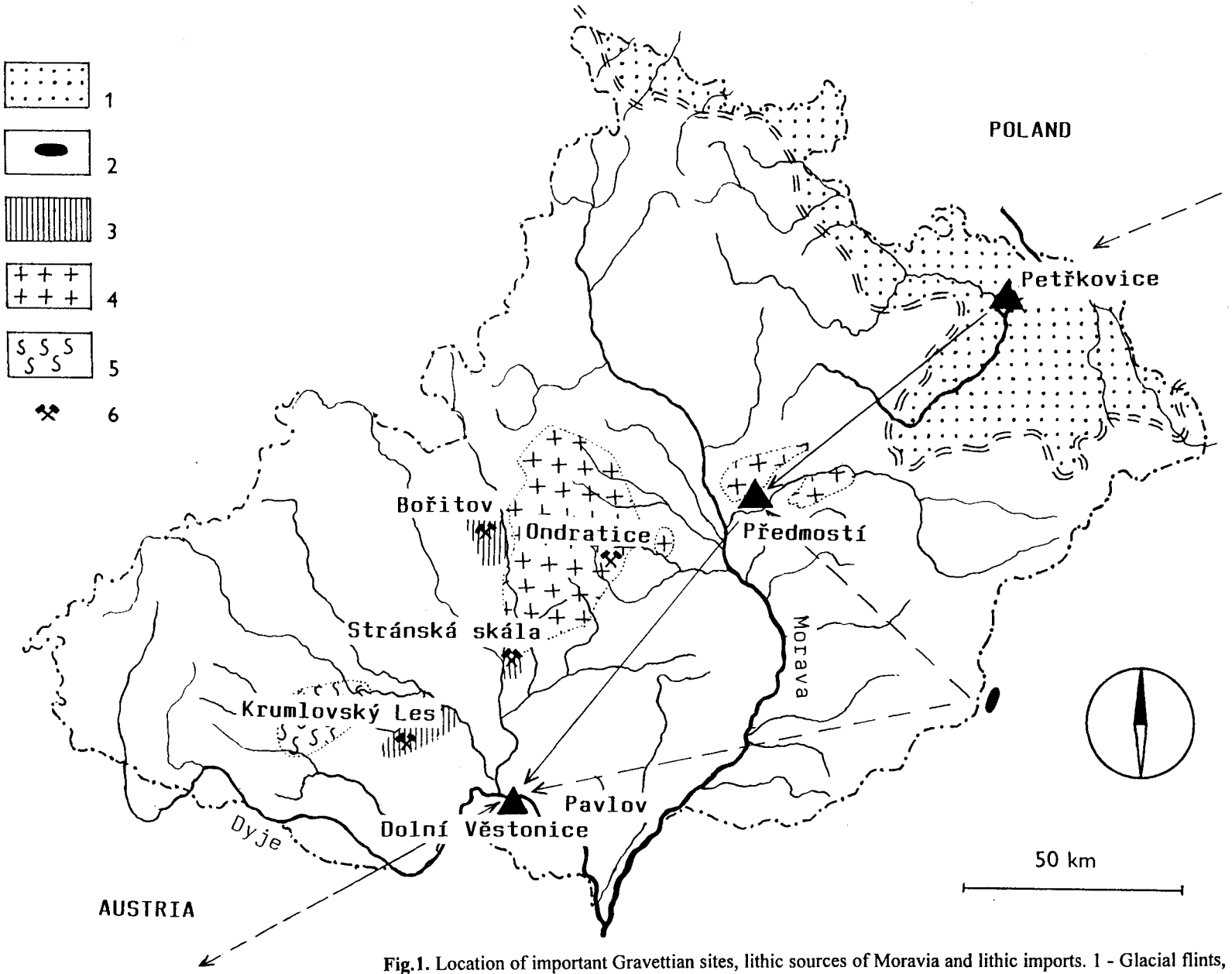

Fig.1. Location of important Gravettian sites, lithic sources of Moravia and lithic imports. 1 - Glacial flints, 2 - radiolarites, 3 - Moravian cherts, 4 - quartzites, 5 - plasma, 6 - Early Upper Paleolithic raw material exploitation

B.P.	Willendorf II	D.Věstonice-I	D.Věstonice-II	Pavlov I 1956	Předmostí	Milovice	Petřkovice	Spadzista C 2	Molodova V
20,000							20,790		
21,000									
22,000	(9)					22,100			
23,000									(7) 23,000
24,000								(III) 24,040	23,700
25,000		middle/upper part	(1. unit) 25,570-25,740	25,020		25,220		24,380	
26,000	(8) 25,800	25,820 25,950		26,620	26,320				
27,000	(7)	lower part 27,250	(2.-3. units) 26,920-27,070 (A-C) 27,660	26,730	26,870			(IV)	
28,000	(6)		lower part 28,300						(9) 28,100
29,000		lower part 29,300	lower part 29,000						(9) 29,650
30,000	(5) 30,500								

Fig.2. Comparative chronological table of the Gravettian

Tab.1. Gravettian datings from Lower Austria and Moravia (after Neugebauer-Maresch 1993, Haesaerts 1990, Svoboda et al. 1994)

GrN 11193	Willendorf II, layer 5	30 500 +900 -800 B.P.
GrN 11194	Willendorf II, layer 5	23 830 ± 190 B.P.
GrN 11191	Willendorf II, layer 8	25 800 ± 800 B.P.
GrN 3011	Krems, Wachtberg	27 400 ± 300 B.P.
GrN 2513	Aggsbach	26 800 ± 200 B.P.
GrN 1354	Aggsbach	25 760 ± 170 B.P.
GrN 18187	Dolní Věstonice I, lower part	29 300 + 750 -690 B.P.
GrN 18188	Dolní Věstonice I, lower part	27 250 + 590 -550 B.P.
GrN 1286	Dolní Věstonice I, middle part	25 820 ± 170 B.P.
GrN 18189	Dolní Věstonice I, upper part	25 950 + 630 -580 B.P.
GrN 2092	Dolní Věstonice II, brickyard	28 300 ± 300 B.P.
GrN 2598	Dolní Věstonice II, brickyard	29 000 ± 200 B.P.
GrN 13962	Dolní Věstonice II, units A-C	27 660 ± 80 B.P.
GrN 14831	Dolní Věstonice II, triple burial	26 640 ± 110 B.P.
GrN 15276	Dolní Věstonice II, burial DV XVI	25 570 ± 280 B.P.
GrN 15277	Dolní Věstonice II, unit 1	25 740 ± 210 B.P.
GrN 15279	Dolní Věstonice II, unit 2	26 920 ± 250 B.P.
GrN 15278	Dolní Věstonice II, unit 3	27 070 ± 300 B.P.
GrN 14830	Dolní Věstonice II, mammoth deposit	26 100 ± 200 B.P.
GrN 1272	Pavlov I, 1956 area	26 620 ± 230 B.P.
GrN 1325	Pavlov I, 1956 area	25 020 ± 150 B.P.
GrN 4812	Pavlov I, 1956 area	26 730 ± 250 B.P.
GrN 6801	Předmostí, cemetery	26 870 ± 250 B.P.
GrN 6852	Předmostí, cemetery	26 320 ± 240 B.P.
GrN 19540	Petřkovice	20 790 ± 270 B.P.
GrN 14824	Milovice	25 220 ± 280 B.P.
GrN 14835	Milovice	22 100 ± 1100 B.P.
H 246-231	Willendorf II, layer 5	32 000 ± 3000 B.P.
H 2218-1537	Langenlois	25 480 ± 880 B.P.
KN 10c	Langenlois	26 960 ± 1200 B.P.
Ly 1303	Dolní Věstonice I, middle part	22 250 ± 570 B.P.
ISGS 1744	Dolní Věstonice II, unit 1	26 390 ± 270 B.P.
ISGS 1899	Dolní Věstonice II, unit 3	22 630 ± 420 B.P.
ISGS 1690	Milovice	22 900 ± 490 B.P.
ISGS 1691	Milovice	21 200 ± 1100 B.P.
CU 715	Dolní Věstonice II, mammoth deposit	22 368 ± 749 B.P.

Tab.2. Late Aurignacian datings from Lower Austria (after Neugebauer-Maresch 1993)

GrN 6660	Langmannersdorf	20 260 ± 200 B.P.
GrN 6659	Langmannersdorf	20 580 ± 170 B.P.
VRI 676	Horn, Raabserstr.	23 210 ± 510 B.P.
VRI 1272	Alberndorf	20 500 ± 1400 B.P.

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