Lustred flint blades in the epipalaeolithic and neolithic of the near east

Healey, Elizabeth Anne

ABSTRACT

LUSTRED FLINT BLADES IN THE EPIPALAEOLITHIC
AND NEOLITHIC OF THE NEAR EAST

Elizabeth Healey

This thesis is primarily concerned with identifying the change in form and methods of hafting and the evidence for the use of lustred flint blades (sickles) in the Epipalaeolithic and Neolithic of the Near East (Israel, Jordan, Syria, Lebanon, Anatolia, Iraq and W.Iran) between c 10,000 and 5000 bc, though subsequent developments are also summarized.

Chapter I summarizes the history of research and outlines the issues involved. Chapter II is concerned with the environmental and cultural background against which lustred blades are evaluated.

Evidence for function is dealt with in Chapter III. Various sources provide information, including contemporary (though rather late) written and iconographic sources, ethnographic parallels, experimental replication and functional analysis of the blades. Chapter IV summarizes the quite considerable body of evidence for hafting and over 70 hafts are described in detail in Appendix II.

Chapters V and VI concentrate on the change of form of lustred blades. The methodology of the analysis of the blades is outlined at the beginning of Chapter V and a sample of lustred blades from Jericho is used as a case study. In Chapter VI lustred blades from a number of sites in different environments are considered in detail and discussed against the cultural background outlined in Chapter II, together with contemporary evidence for hafting and function. Chapter VII is a summary of the results and concludes that lustred blades, when considered in a wider context, have a potential importance for the reconstruction of past economies.

The Appendices contain a list of the relevant C14 dates, a catalogue of hafts, details of the attributes examined and the type list, as well as a description of lustred blades from selected sites.

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Elizabeth Anne Healey

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DECLARATION

None of the material contained in this thesis has previously been submitted by me for a degree in this or any other university .

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I owe a great deal to my supervisor, Dr Anthony Harding. He not only encouraged me to embark on the research, but has been supportive throughout and provided just the right amount of pressure as well as shouldering some of the burden of museum duties whilst I was, sometimes literally clutching at straws. To him I am especially grateful.

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Finally, as life returns to normal, I dedicate this work to my husband, Dr John Healey and our children, Kevin and Frances.

CHAPTER I

HISTORY OF RESEARCH AND THE ISSUES INVOLVED

1 Introduction

Lustred flints are, as their name suggests, characterised by a band of gloss or lustre which is clearly visible to the naked eye, along one or both edges of a blade. This lustre has usually been thought to have been caused by harvesting cereals. Hence they have frequently been called sickles. Lustred blades begin to occur regularly, but in varying proportions, in tool kits in the Near East from about 10,500 bc (the late Epipalaeolithic) and continue in use into the Iron Age. The presence of lustred blades in tool kits has been considered as an indicator of the harvesting of cereal crops. This equation is used to support other, mainly circumstantial, evidence that wild cereals were being exploited as early as the eleventh millennium. However, there are two major difficulties: firstly cereals, particularly non-domesticated varieties, do not need to be harvested with tools and secondly recent research into the nature and cause of the lustre has demonstrated that it can be caused by cutting a variety of silica-rich plants, not only cereals but also reeds, Stipa, etc. Hence it appears that lustred pieces and cereal harvesting need not be equated.

2 History of Research

Precisely what causes the lustre has been a topic of discussion and research for nearly a hundred years but has not yet been resolved (see

Chapter III). Less attention has been paid to complete sickles and individual tools.

The history of the study of lustred flints (as of other artefacts) reflects contemporary fashion in archaeological thought. As methods of investigation enable more detailed and precise information to be obtained and analysed, so the perception of the information potential of artefactual study changes and criteria of a new order are considered significant.

Initially, interest in lustred blades was focussed on the cause and nature of the lustre as much as on the change of form of the tool or its date. Large curved lustred pieces (similar in shape to metal sickles) were identified as sickles by Evans (1872; 1897, 358). The identification by Munro (1859) of a wooden haft from Italy with lustred flint inserts as a saw, but by Spurrell as a sickle (1892, 53), began the debate about the cause of the lustre and prompted Spurrell to attempt to reproduce the gloss experimentally. Because he was successful in reproducing it when cutting ripe straw, he concluded that the presence of lustre proved that these artefacts were used to cut corn (Spurrell 1892, 53). This equation was contested by Munro (1892, 175) especially for the Scandinavian examples. Vayson, somewhat later, also disagreed with the view that the cause of lustre was the straw. From his own experiments he believed it was caused by hard use, but that the gloss could not be used to determine precise function (1919, 406).

Spurrell also described in detail the construction of the hafts of Egyptian sickles and the illustrations in tombs and experimented with their use.

Interest in typology of complete sickles also continued: Carthaillac in 1892 (in a communication to the Academy of Sciences) had discussed the similarity of Petrie's sickles found in Egyptian tombs to others in Europe and in 1919 Vayson reported the find of a virtually complete hafted sickle at Solferino in Northen Italy. Vayson described the sickle in some detail including the type of insert, the hafting method and its suggested method of use and made a comparative study of the type and distribution of lustred blades and complete artefacts in Europe and N. Africa. In 1932 Clark made a similar study of British lustred pieces (Clark 1932). These remained the general works until updated by Camps-Fabrer and Courtin in 1981. There were of course more localised works such as that of Burian and Friedmann (1979, but not available to me) and decriptions of lustred blades from sites (for example Lechevallier 1980 and Valla 1978 for material in Pakistan and Susa and Mortensen 1970, 1971, Beidha, Tell Shimshara etc.) Mortensen also used them as an example of an index of cultural change (1972).

New interest in the beginning of agriculture had been aroused by Curwen's paper describing the botanical remains from Mediterranean Palestine (1927) (cf Peake 1928) and in 1930 Curwen reviewed Vayson's 1919 paper. He discussed the extent and nature of lustre and attempted by his own experimental work on polish formation to establish that the polish was due to silica in the material being worked. He demonstrated that the cutting of bone produced no lustre because it had no silica, but that the cutting of silica-rich plants <u>did</u> produce lustre and that furthermore, straw produced a broad and diffuse band of lustre, whereas the sawing of wood caused a narrow band of lustre which was quite different. He concluded from these results that he could distinguish sickle blades from other lustred blades. He also raised the question of whether different types of flint might become lustred at different rates (Curwen 1930,186). It is clear that the presence of lustred blades was being gradually equated with the growing of corn. Neuville, in a 1934 paper (not available to me but summarised by Curwen 1935), prompted by the discovery by Garrod of the lustred blades and sculpted hafts in Natufian levels in the caves at Mt. Carmel, suggested that agriculture must have begun in Palestine very much earlier than elsewhere. This was also confirmed by the botanical remains (Curwen 1927; 1938, 29). Neuville used the opportunity to discuss the typology of sickles in Palestine but had also questioned Curwen's interpretation of the gloss from the cutting of corn, believing rather that it resulted from generalised hard use. He repeated the experiments, found that he could wipe away the lustre and thought that it was caused by friction rather than by silica. Curwen in turn repeated his experiments mechanically and more rigorously and established that his corn gloss could not be washed off and that it was different in appearance from the gloss caused by sawing wood. He also noted that different types of flint took gloss differentially (Curwen 1935, 65). Curwen added (see 1938, 31 fn. 6) that similar gloss could be achieved by cutting grasses and other siliceous material. By now the equation of gloss and cereal crops was firmly entrenched.

The discussion shifted in 1943 to the efficiency of various types of harvesting tools, when Steensberg harvested crops using different types of sickle (1943). His categories were harvesting knives (straight sickles), angular sickles and balanced sickles (a form in which the blade is bent back from the line of the handle, see Fig.IV:1). Childe (1951,40) modified the angular category to include a tangential type, although this had little significance for the flint sickles, which, apart from the Egyptian examples, were all angular.

A major landmark in functional studies was the translation of Semenov's Prehistoric Technology first published in Russian in 1957. Though this is not concerned with Near Eastern sickles the methodolgy was to prove to be vital for future developments. In this work he not only identified gloss and described the micro-structure of the wear traces but also related this to hafting methods and tested the efficiency of some of the forms (Semenov 1964, 113-122).

Interest in hafting revived when M.-C. Cauvin (1973) reconstructed the mounting method of the lustred blades from Aswad (Balikh) on the basis of the distribution of lustre and bitumen and, subsequently, briefly but comprehensively summarised the range of types of lustred blade found in the Near East and discussed their hafting and function (M.-C. Cauvin 1983, and see Chapter III). Helmer also replicated sickles from her recontructed hafts and tried them out to demonstrate the relative efficiency of each type (1983). Fujii published two papers in 1981 and 1983 in which he examined hafting methods of sickle flints on the basis of a theoretical model.

In the meantime Korobkova (1978; 1981) studied sickles in Central Asia and also made and used copies of them to test their efficiency. Her results and those of Helmer are further discussed in Chapter V.

More recently most of the studies of lustred blades have been concerned with establishing function (Anderson 1980; Anderson-Gerfaud 1982; 1983a 1985b; Masson _et al_ 1981; Cauvin 1981c; Unger-Hamilton 1983; 1985a and b; Meeks _et al_ 1982) and except for a few specific case studies (for example Anderson-Gerfaud's work on the phytoliths on the obsidian backed blades from Cafer Höyük) have tried to distinguish between the polishes and other features produced by different plants with a view to establishing what species of plant the earliest lustred blades were used to cut, whether they were used to cut cereals and whether the cereals were cultivated or not (see especially Unger-Hamilton 1985a and b). It would appear from Unger-Hamilton's and Anderson-Gerfaud's work that there has been a significant breakthrough here, although much of the work is still at an experimental stage and only a few archaeological specimens have been examined. This is discussed further in Chapter III.

3 The Issues Involved

Much of the research on lustred blades has been _ad hoc_ and concerned with investigating specific details, especially function, often with little attention to their wider context. However, several different questions seem to have become confused in the obsession with identifying function in an attempt to ascertain whether or not lustred blades were used for cereal harvesting at all in the Epipalaeolithic and whether they were used to harvest cultivated cereals in the Neolithic.

Difficulties arise with micro-wear studies because although such analysis can provide specific identification, not all micro-wear analysts agree with each other about what can and cannot be seen in microwear analysis and whether polishes are in fact distinguishable from each other (Anderson-Gerfaud 1983; Unger-Hamilton 1985a and b). Recently the whole basis of the discipline has been called into question (Moss 1987; Moss 1988; Newcomer _et al_ 1987). Also, the process is time-consuming and expensive and, moreover, some artefacts are unsuitable for this sort of analysis, so that coverage tends to be thin and uneven (see Chapter III). Other methods of examining and quantifying functional attributes, outlined in Chapter V, though not as precise, can be done in the course of standard lithic analysis and can provide functional models which can be tested by targeted micro-wear analysis (see Chapter VI).

Analysis of the composition of tool kits in the Epipalaeolithic and Neolithic, though not specifically concerned with lustred blades has demonstrated that it varies according to environment (Henry 1977*; Olszewski 1986; 1988; Rollefson 1986). Caution must be used in the interpretation of the significance of lustred blades in tool kits because it is by no means certain that they were used for harvesting cereals, but even assuming that they were, their absence or low number does not necessarily indicate the absence of cereal exploitation (_pace_ Olszewski 1986) as wild cereals can be harvested by other means (Chapter III). It may, however, be possible to suggest patterns of covariation with other artefact types and ultimately with the type of cereals or other plants available (Chapter VI).

Typological studies suggest that lustred blades, like arrowheads, seem to be sensitive to change and may be usable as cultural markers (Bar Yosef 1981a, 559). Lustred blades first appear regularly when hunter-gatherering economies are beginning to have a more sedentary aspect and, it is generally presumed, to exploit intensively the more widely available wild cereals, eventually leading to neolithization and the domestication of cereals. They change their form during this developmental period and only become standardized, according to J. Cauvin, when cereals are fully domesticated (J. Cauvin 1983, 270). They seem to continue in use as a specialised tool class throughout the Bronze and Iron Ages, when flint was only used for a limited number of artefacts.

Typological studies are concerned only with the finished artefact and may provide some indication of cultural stability and change (Mortensen 1972). Much more precise definitions of change can be made if the technological attributes are also considered both in terms of production method (Rollefson and Abu Ghaneima 1983) and in terms of retouch type, hafting method and function.

To this end I have examined a sample of lustred blades from Jericho using a series of qualitative and quantitative factors/attributes relating to technological, hafting, functional and stylistic features (Chapter V and Appendix III). The data gathered from this exercise were sorted using programmes from the SPSS statistical package to see if the apparent groupings amongst the lustred blades were distinguishable. A similar quantitative approach to the lustred flints from other sites was virtually ruled out because of the inadequacy of the size and range of the samples available for study and the incomplete publication of much of the data. I have, however, summarized the evidence that is available in Chapter VI and Appendix VI. I have also been able to take into account evidence for methods of hafting as in some cases either blades mounted in hafts survive or, as at Aswad (Balikh), there are clear indications of how the blades were inserted into the haft (M.-C. Cauvin 1973 and Chapter IV). To a more limited extent it has been possible to consider functional attributes especially where micro-wear analysis has been undertaken, but even without this, the quantification of other functional attributes (see Chapter V) suggests certain groupings which may be testable in the future.

Perlès has recently voiced a growing feeling amongst lithic analysts that both the functional and the typological approaches to the analysis of lithic artefacts are too extreme and may obscure other factors. She suggests that if we wish to analyse cultural and functional patterning it is necessary to distinguish the one from the other and to consider lithics as part of the whole techno-economic system of a particular group and not to treat them in isolation (Perlès 1988, 447-9).

With this in mind I have discussed, in Chapter VI, the results of the analyses in terms of other aspects of the lithic industries (technology and composition) as well as considering, where information is available, other factors of environment and culture summarized in Chapter II.

CHAPTER II

CHRONOLOGY, CLIMATE AND CULTURAL CHANGE

1 Introduction

Lustred flints begin to occur in significant numbers from the late Epipalaeolithic and continue to be found until the Iron Age. In chronological terms this is c. 10,500 bc until 1200 bc, the time when an economy based on hunting and gathering begins to be replaced by one increasingly dependent on farming and a settled way of life leading ultimately to urbanization. Towards the end of the period metal (copper, bronze and [later] iron) replaces flint and stone as the basic raw material for tools, though flint is still used for a limited range of tools including sickles. This Chapter falls into two parts. In the first part the chronological basis for the period is outlined, followed by a brief review of the theories on the origin of agriculture and a summary of the environmental background. In the second part the cultural background is considered.

2 Chronology and Cultural Change

The main cultural divisions, each with its own regional variations, were originally based on the stratigraphy of multi-period sites and subsequently delineated by radiometric dating, though the C14 dates do not always allow for such neat parcelling; also new understanding of socio-economic changes suggests that the developments are much more complex than initially envisaged and that the compartmentalization of each stage is not as straightforward as once thought. In Table II:1 the traditional terminology is set alongside the phasing or periodization of Aurenche et al 1981 and Moore 1983 for the Levant and Hole et al 1969, Oates 1973 and Smith and Young 1973 for Mesopotamia. Where possible, I have used the periodization of Aurenche et al as this allows the smallest subdivisions, but in several instances it is only possible to assign material to a more general period: hence the use of the terms Period 3-4 or Period 5-6. The relative chronological position of the main sites discussed in this study is shown in Table II:2.

The absolute chronology is difficult to establish as not all sites have C14 dates and not all of the C14 dates are equally reliable. There are particular problems with Near Eastern and desertic environments and contamination of samples with bitumen, a substance extensively used in the Near East, can cause anomalies (Henry and Servello 1974; Evin 1981; Weinstein 1988). The interpretation of C14 dates over a wide geographic area and a long time span has often proved problematic (Ottaway 1973). However, the increasing use of accelerator dating is enabling many more precise dates to be obtained and can also be used to verify the chronological association of plant remains (Harris 1986). The C14 dates are listed in Appendix I and summarized in Fig.II:1. For comparative purposes they are given in years bc (i.e. uncalibrated), using the 5568 half life, although C14 years BP are generally preferred (Evin 1981). They have also been subjected to basic histogram analysis (Figs. II:2-5) in which the Y-axis represents the probability scale for dates occuring within a

	LEVANT		MESOPOTAMIA		
	Aurenche *et al* 1981	Moore 1985	Smith & Young 1983	Oates 1973	Hole *et al* 1969
1000					
2000		BRONZE AGE	BRONZE AGE	BRONZE AGE	
3000			CHALCOLITHIC		
4000	9	DEVELOPED NEOLITHIC	CHALCOLITHIC		Bayat
	8	4	CHALCOLITHIC		Mehmeh
	7	4	LATER NEOLITHIC	Phase 3 Hassuna Samarran Ubaid	Kazineh
5000	6	3	LATER NEOLITHIC	Phase 3 Hassuna Samarran Ubaid	Sabz
	5	3	LATER NEOLITHIC	Phase 3 Hassuna Samarran Ubaid	Mohammed Jaffar
6000	4	ARCHAIC NEOLITHIC 2	LATER NEOLITHIC	Phase 2	Ali Kosh
7000	3	ARCHAIC NEOLITHIC 2	LATER NEOLITHIC / EARLY NEOLITHIC	Phase 2 / Phase 1	Bus Mordeh
8000	2	ARCHAIC NEOLITHIC 1	EARLY NEOLITHIC	Phase 1	
9000	1	EPIPALAEOLITHIC	ZARZIAN		
10,000	0	EPIPALAEOLITHIC	ZARZIAN		

TABLE II:1

MAIN CULTURAL PERIODS

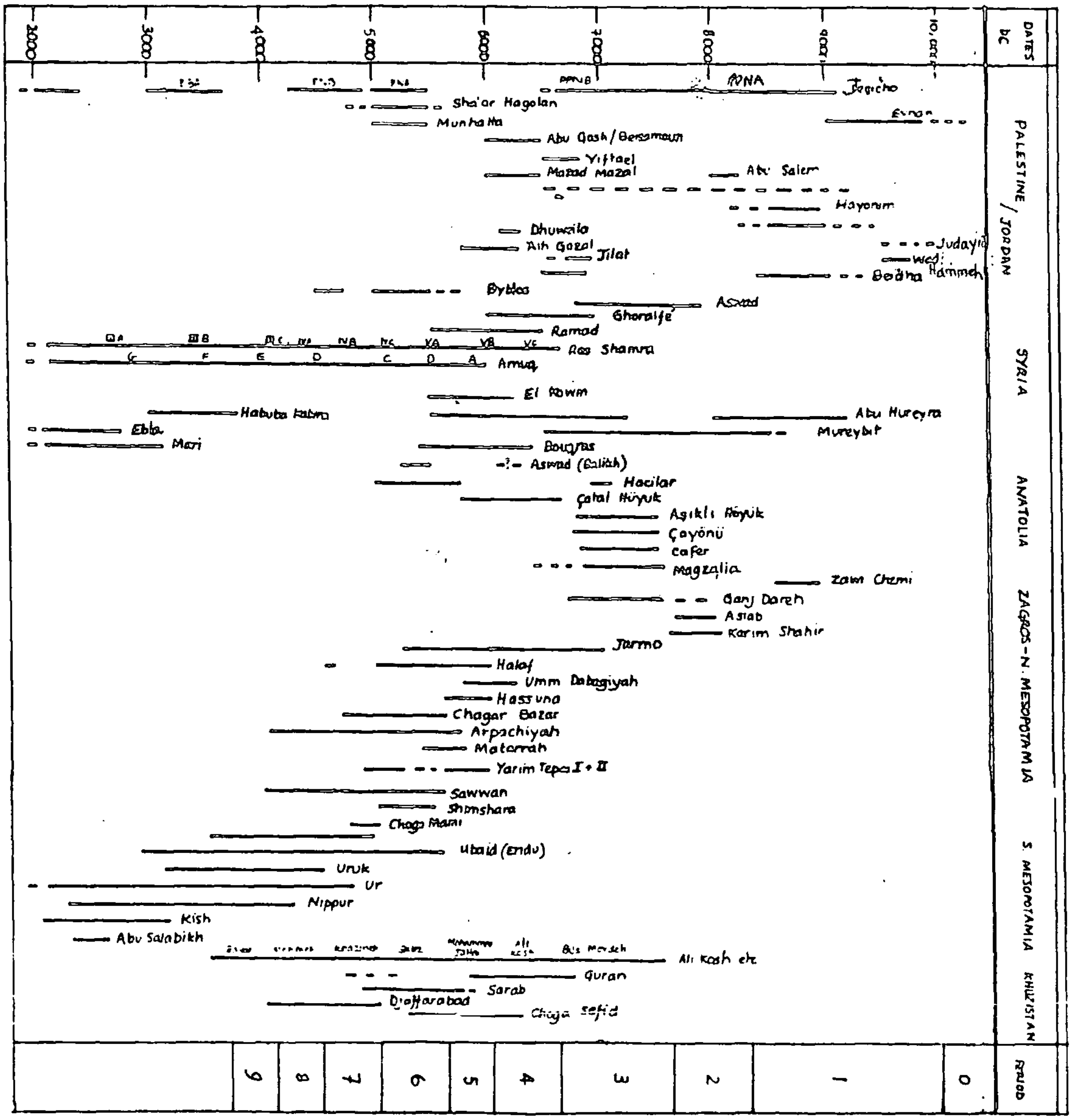


TABLE II:2

CHRONOLOGY OF MAIN SITES

certain 50 year interval in a given distribution of C14 dates at ± 2σ, though it cannot be interpreted quantitatively (Geyh 1980, 695-6; Shennan 1982, 53-63).

3 The Beginnings of Agriculture

The period of particular interest is the 5000 or so years from the Epipalaeolithic to the Neolithic when food production is established. The recognition of early farming communities has largely depended on changes in material culture, including the presence of lustred blades, which has allowed for quantitative comparisons between sites and regions. However, it is becoming increasingly apparent that major changes in technology and economy must be considered against a wider background (Redman 1978; Moore 1985, 48-9) and are related to, and perhaps stimulated by, increases in population. Social factors can no longer be considered in isolation (Boserup 1965; 1981; Binford 1968; Smith and Young 1983; Hole 1984), though for a variety of reasons not all areas are equally or simultaneously receptive to these changes (Boserup 1981, 34).

The introduction of agriculture had an important effect on the development of societies and created the economic basis and social milieu from which states could emerge (Redman 1978, 89). However, of greater relevance to this study is when, how and where agriculture began. Redman offers a working definition of agriculture as "neither a complete technological invention nor a single-valued discrete entity; rather it is a series of new relationships formed between people, land, plants and animals. It is a transition to an ecosystem fundamentally different from any that existed before, and it entails new structural relationships between participants". Not all definitions and theories are as broadly based (see recent summaries by, for example, Wright 1971; Flannery 1969; 1973; Moore 1982; 1985; Redman 1978; Reed 1977).

Thus, in the summary of the development from hunting and gathering to farming which follows, the factors considered include a consideration of the environment, the availablity of resources and the evidence for their use as well as changes in settlement pattern, architecture, technology and cultural contacts.

4 Environment

The success of agriculture depends as much on environment (climate, soil type and fertility, vegetation and topography) as on population and technology and these factors will be briefly outlined following the descriptions of Fisher (1978), Beaumont et al (1976) and Zohary (1973). The area has a wide range of structures, climates and soils. It includes Palestine (Israel and Jordan), Syria and Lebanon, Anatolia, Iraq and western Iran (Fig II:6). The major environmental regions have been reconstructed from palynological investigation of present day data on climate, soil types and vegetation, as well as topography, though there are many localized variations (Butzer 1975; Bintliff and Van Zeist 1982; Bottema and Van Zeist 1981; Hadidi 1985)).

4.1 Topography

Topographically the area is very varied and includes a wide range of environmental conditions and vegetation zones (Figs II:7-11). The area of particular interest for this study is bounded by natural barriers: the Mediterranean in the west and the Taurus and Zagros mountains in the north and east and desert in the south. The main topographic areas (Fig.II:7) are the Sinai and Negev deserts, the coastal plain (which would have been up to 15 km wider before a rise in sea level c 8000 bc [Moore 1978, 20-21] and which is bounded by two parallel mountain ranges running from north to south - the Jebel Ansariye and the Lebanon and Anti Lebanon mountains), the Jordan rift valley, the trans-Jordan plateau and the Syrian desert, as well as the foothills and mountains of the Taurus and Zagros, the Anatolian plateau and Mesopotamia and the lowland river valleys of the Tigris and the Euphrates, the Seyhan and Ceyhan and to a lesser extent the Aksu. The main land forms therefore include upland zones with steep rock outcrops, alluvial fans on the edge of upland zones, alluvial plains and salt lakes and deserts.

4.2 Geology

Geologically (Fig II:8) the area has predominantly calcareous rocks, mainly limestone, in which flint and cherts occur and which are found especially in the Levant and southern Iran, but also sandstone and basalt (used for querns). There are also many other volcanic rocks (for example obsidian) which were exploited.

4.3 Soils

Soil of reasonable quality and with some moisture is a necessary prerequisite for agriculture. Soil formation is mainly dependent on topography, environment and parent materials, but is constantly modified by erosion, climate, vegetation and human activity. Soils in the Near East are very varied and at least 30 types have been distinguished (Zohary 1973, 39). They form two basic groups, pedalfers and pedocals. Pedalfers are soils in which the moisture moves downwards through the soil so that the soluble products of weathering are carried through the soils into the rivers. Pedocals, on the other hand, are found in arid climates where the weathering products accumulate in the upper layers of the soil and as the water evaporates form salt, gypsum and calcium carbonate layers (Beaumont et al 1978, 33). Soils are generally classified according to their morphological characteristics and land capability (FAO/UNESCO; Fisher 1978, 78: Beaumont et al 1978, 34). In the Near East the soils which are most important, either because they cover a large area or because they are productive, include Red and Grey desert soils, Reddish Prairie, Reddish Chestnut and Reddish Brown soils, Terra Rossa and Rendzinas, Chestnut and Brown soils and Alluvial soils (Fig.II:9).

Desert soils are red and grey and cover an extensive area of the Middle East. They have a low humic content with a poorly developed soil profile and have a coarse texture. There are often salt efflorescences forming crusty layers or calcrete. They are not of agricultural significance.

Chestnut and Brown soils have a well developed A horizon which grades into B and shows a sharp demarcation with the C horizon. It is highly calcareous and tends to form a crust. These soils are generally found in areas between arid zones and grassland soils and are marginal for dry farming but they can be highly productive under irrigation (a good example being the Konya Basin). Brown Forest soils occur in the upland regions often with podzolic soils (Zohary 1973, 20)

Reddish Prairie and Reddish Chestnut and Reddish Brown soils are found in the area of the "Fertile Crescent". They develop from limestone weathering in grassland conditions. They are a transitional type between pedalfers and pedosols and can be agriculturally productive.

Terra rossa develops on hard pure crystalline limestones under a Mediterranean climatic regime and is found over a large area of Palestine, Syria and southern Turkey. It is a distinctive red colour and clayey and thus holds moisture well, though it is subject to erosion; it has a high Ph. Rendzinas have a dark grey or black surface layer and are found on marly limestone and are highly calcareous. They are found in similar or drier areas to the Terra Rossa but are more widespread. These soils are very fertile.

Alluvial soils are the most fertile though they do not have a well developed profile as they are added to annually and if the drainage is poor can become saline. They are found in lowland major river valleys and specifically those of the Tigris and Euphrates, the Nile and the Aksu and Seyhan-Ceyhan, as well as in alluvial fans and wadis.

4.4 Climate

Climate and especially temperature and rainfall are not thought to have changed much since c. 8000 bc (Oates and Oates 1976, 20; Hopkins 1985, 106-7; Frick 1985, 99-112) so that present day climatic conditions and the little palynological information that is available provide a reasonable indication of Neolithic climate (Fig II:10), though there are other palynological data which show that the Pleistocene climate was cooler. Climate, and in particular rainfall, affects vegetation and the zones are largely defined on the basis of rainfall or rain factor (total annual rainfall ÷ mean temperature in rainy season [Fisher 1978, 80]). A minimum annual rainfall of 200 mm is considered to be the limit for dry farming, and it is important that this rain should fall in the autumn and spring. The 200 mm limit should be taken as a rule of thumb rather than an absolute measurement as rainfall fluctuates from year to year, a fact which in marginal areas must have made dry farming a hazardous business. Others prefer to estimate the extent of the dry farming zone using annual cyles of rainfall over a number of years or in a more sophisticated way using standard deviations in the annual amount of rain (Frick 1985, 102-112). Beaumont et al (1978, 71) suggest that a mean annual rainfall of 240 mm with an intervariability of 37 % should be considered the normal minimum.

4.5 Vegetation

Vegetation zones (Fig.II:11) are determined by precipitation, topography, soil type and temperature and it can be seen from the maps (Figs II:7-11) that they largely complement each other. The main zones are forest (xeric and mesic), steppe, desert steppe, desert and alpine. Vegetation can be very localized, but in very general terms in the late Pleistocene (18,000 - 13,000 bc) the climate was cooler than today and more arid; forests were restricted to the Levant, the coast of Turkey and the Zagros in areas with high rainfall; inland areas were steppic. Sea levels were about 100 m lower (Besançon 1981, 51, Table 1; Moore 1985, 9). In the Levant information on climatic change comes from pollen cores (Lake Huleh), sediment analysis, geomorphology and faunal remains; this has been conveniently summarized by Henry (1981, 425-47). In brief there is a gradual inrease in temperature after about 13,000 bc; forests in the Levant began to spread from about 12000 bc according to the Lake Huleh pollen diagram. Other evidence from the Petra area of Jordan indicates a moist phase there in the 10th millennium though it became drier in the late Natufian from c. 9000 bc and wetter again from 8300 bc (Gebel and Starck 1985, 112; Leroi Gourhan 1981a; 1981b, 107-8) and similarly in the Levant (Sanlaville 1981, 159-60; Golberg and Bar Yosef 1982, 403). In Syria forest began to spread from about 9000 bc (Bottema and van Zeist 1982) but in Anatolia forest expansion was later, in the 8th millennium (Bottema and van Zeist 1982), and even later further to the east (van Zeist and Woldring 1978) which was dry and steppic until the 5th millennium. The Zagros continued its Pleistocene climate until c. 8500 bc when pistachios and oaks increased, but it remained steppe-like until c. 4000 bc when precipitation and temperature reached modern levels (Oates 1973, 147). The delay of forest expansion in this area was due in part to the slow increase in precipitation but also because the refuges of trees were some distance away. Although the area could have been inhabited all the year round from the early Holocene, optimum conditions did not exist until much later than in the Levant (Moore 1985, 11). Mesopotamia has produced no evidence but is presumed to have remained steppe-like (Moore 1985, 11).

After the initial expansion of forests there is a deterioration in climate and the forests retreat again. In the Levant and in other marginal areas at sites like Hayonim Terrace, Wadi Judaiyid, Mureybit, Abu Salem and Rosh Horesha there is evidence of increasing dryness. After 8000 bc it is difficult to separate natural and human changes (Sanlaville 1981, 159-60). During the sixth millennium the whole of Palestine was uninhabited probably for this reason and the Damascus basin and areas of the Euphrates, for example Abu Hureyra, were abandoned because the environment became unsuitable for growing crops, at least in part because of the increasing aridity.

5 The Use and Availability of Cereals

It must be assumed for the moment that lustred blades were used to harvest cereals (this is further discussed in Chapter III). It is necessary therefore to establish the nature and availability of the cereals before further discussion. Cereals are attractive as a food source because their large grains provide a concentrated source of carbohydrates and they may be stored until required (Renfrew 1973, 30; Kislev 1984, 61). The stalks could also have been used for bedding, animal fodder, thatching, etc.

5.1 The Archaeological Evidence

Cereal remains from Epipalaeolithic and Neolithic sites are summarized in Table II:3 and see Fig. II:12 .

Plants are thought to have been exploited intensively in the Epipalaeolithic (Hole 1984; Flannery 1983; Moore 1982), though most of

	T. boeticum	T. dicoccides	H. spontaneum	Rye	Pulses	Stipa	Scirpus	Reed	Other	T. monococcum	T. dicoccum	T. aestivum/durum	H. distichum	H. vulgare	Secale	Pulses	Other
PERIOD 1*																	
Abu Hureyra	x̲	x	(x)	(x)?	x	x	x	x	x					?			
Mureybit	x̲		(x)		(x)		x		x								
Wadi Hammeh			x		x	x			gramineae								
Rosh Horesha	cereal pollen																
PERIOD 2																	
Nahal Oren											x?					x	x
Jericho										x	x		x			x	x
Aswad IA			(x)				x		x		x̲		?			(x)	
Mureybit II	(x)		x				x		x								
III	x		x̲				x	x	x								
IVa	(x)		(x)				x		x								
Zawi Chemi	increase in cereal pollen																

+ Nahal Oren now discredited (Legge 1986)

x present
x̲ frequent
(x) rare

TABLE II:3
Plant Remains from Epipalaeolithic and Neolithic Sites in the Study Area

	WILD									DOMESTICATED							
	T. boeticum	T. dicoccides	H. spontaneum	Rye	Pulses	Stipa	Scirpus	Reed	Other	T. monococcum	T. dicoccum	T. aestivum/durum	H. distichum	H. vulgare	Secale	Pulses	Other
PERIODS 3-4																	
Nahal Oren					x						x		x				
Jericho										$\underline{x}$	$\underline{x}$		$\underline{x}$	x		$\underline{x}$	(flax)
Yiftahel									x							x	
Beidha			x						oats		x	x	x	x?			x
'Ain Ghazal					x					x	x	x	x			x	x
Jilat											x						
A 231								x			x			x			
Aswad II			x?					x		(x)	$\underline{x}$	$\underline{x}$	$\underline{x}$	(x)		x	
Ghoraifé I			x								x		x				
II			x							x	x	(x)	x	x		x	
Ramad I	x?		x		x			x	linseed	(x)	$\underline{x}$	(x)	(x)			x	x
Ras Shamra											x		x			x	
Mureybit 4	x			x?													
Abu Hureyra	(x)	(x)	(x)	(x)		x	x	x	oats	(x)	$\underline{x}$		x	$\underline{x}$		x	
Hacilar	$\underline{x}$		$\underline{x}$		x			x	x		$\underline{x}$			(x)		x	
Çayönü	(x)	(x)	(x)	(x)				x	flax		$\underline{x}$					$\underline{x}$	x
Can Hassan III	(x)								x	(x)	$\underline{x}$	$\underline{x}$	$\underline{x}$	(x)	(x)	(x)	
Jarmo	x	$\underline{x}$	x							x	$\underline{x}$		$\underline{x}$			(x)	
Ganj Dareh			$\underline{x}$		x		x		wild grasses ✓				$\underline{x}$			x ?	
Ali Kosh B.M.	(x)			x					oats	(x)	$\underline{x}$		x	x			
A.K.	(x)			x					oats	x	$\underline{x}$		x	x		(x)	
PERIODS 5-6																	
Çatal Hüyük									x	$\underline{x}$	(x)		$\underline{x}$			$\underline{x}$	
Erbarba	x								x	$\underline{x}$	$\underline{x}$	$\underline{x}$	$\underline{x}$	$\underline{x}$		$\underline{x}$	?spelt
Hacilar	$\underline{x}$								x	$\underline{x}$	(x)	(x)	(x)	$\underline{x}$		(x)	
Umm Dabagiyah										x	x	x		x		x	
Yarim Tepe I											(x)	(x)	(x)	x			?spelt
Arpachiyah										x	x		x			x	
Choga Mami	(x)								oats	(x)	$\underline{x}$	$\underline{x}$	(x)	$\underline{x}$		$\underline{x}$	
Ali Kosh M.J.			x			x			oats		x	x				x	
Tepe Sabz					x			x	x	x	x	x	x			x	linseed
Tell es Sawwan									x	(x)	$\underline{x}$	(x)	$\underline{x}$	$\underline{x}$			(flax)

TABLE II:3
Plant Remains from Neolithic Sites in the Study Area

the evidence is circumstantial, such as pounding tools (mortars, cup holes and pestles) (Bar Yosef 1981, 389). The Natufians had, in addition, grinding stones and sickles (Hole 1984, 52) as well as storage facilities, (for example at Eynan). The strontium/calcium levels in human bones has suggested an increase in the use of plant food in the diet during Natufian times (Schoeninger 1981), though Sillen found it was less marked and declined in the later Natufian remains (1984). Dental attrition and the presence of human commensuals such as mice and sparrows are also considered to indicate the use of plants (Hole 1984, 52).

Plant remains from these sites are absent except at Wadi Hammeh (Potts and College 1985,190f) (those from Nahal Oren have been shown to be intrusive by AMS dating), though later in the Natufian einkorn, barley, rye and lentils are present at Mureybit (van Zeist and Caparie 1968,; van Zeist and Bakker-Herres 1984) and wild-type einkorn at Abu Hureyra (Hillman 1975,72)

Slightly later, however, by Aurenche et al's Period 2 (c 8000 bc; see Table II:1) there is evidence from Jericho (Hopf 1983), Nahal Oren (Noy et al 1975) and Aswad 1A (van Zeist and Bakker-Herres 1979) for domesticated emmer, two-rowed hulled barley (brittle at Aswad) and pulses. By Period 3 wild barley is cultivated at Beidha and domesticated emmer (Helbaek 1966). Emmer is also cultivated in Anatolia at Hacilar and einkorn and wild emmer at Çayönü, though barley was extremely rare despite the fact that it is situated in the area of wild barley (van Zeist 1972, 9-10). At Abu Hureyra emmer and barley (wild and domestic forms) were grown and possibly rye

(Hillman 1975, 73). Naked wheat (*triticum durum*) was found in the later aceramic levels at Can Hassan III as was rye (Hillman 1978, 1980).

In the Zagros the first use of plants is documented at Ganj Dareh E when wild barley was exploited. At Ali Kosh barley was cultivated from the beginning but wild einkorn was gathered (van Zeist *et al* 1984). Animals seem to have been domesticated concurrently.

5.2 The Availability of Wild Cereals

At the same time as forests expanded, wild grasses and cereals, some of which were eventually domesticated, also expanded from their Pleistocene refuges and were available over a much wider area. The main species of interest to this study are einkorn, emmer and barley. Pulses (peas, lentils, bitter vetch and chick peas) were also extensively exploited and at some sites are the dominant type of plant food (Zohary and Hopf 1988, 83) though their harvesting would have been by hand and would leave no trace. Pulses do not require such fertile soils as cereals (Frick 1985, 100).

Although it is difficult to reconstruct their precise distribution because it is not certain that the present day distribution corresponds to that of c. 8000 bc (cf Renfrew 1973, 44), it is nevertheless useful, when considering the crops which might have been available, to look at their presumed distribution (Figs II:13 a-c) though not all the potentially available crops seem to have been exploited (van Zeist 1972, 10).

All the species are common in their areas of primary habitat and can build massive stands in areas with much winter rain. Wild einkorn (<u>triticum boeticum</u>) has a relatively wide distribution mainly in the 'Fertile Crescent' and south eastern Anatolia and northern Iraq but not in Palestine. It is a component of open oak park forest and steppes and spreads as a weed to man made habitats. It prefers basaltic soils, marls and limestones and can survive on poor soils where other wheats fail. It tolerates a wide range of climates from the warm summers of the Euphrates basin to the high colder plateaux of Anatolia.

Wild emmer (<u>triticum dicoccoides</u>) has a more restricted distribution in Palestine, Southern Syria and Transjordan and is concentrated in the upper Jordan valley. It is found in basaltic soils and in limestone areas but is virtually absent on marls and chalks. It has a range of habitats in oak park forests and semi-steppe regions and is found at a variety of altitudes (and thus has differential ripening). It usually builds mixed stands with wild barley and oats.

Barley, <u>hordeum spontaneum</u>, has a wider distribution than the wild wheats and is found from the east Mediterranean and western Asia to Turkmenistan and Afghanistan, though its primary area is the Fertile crescent. it prefers well drained fertile soils, but is tolerant of saline and alkaline conditions. It does not form dense stands and is mainly found in oak park forests and, unlike wheats, it is found in wadi bottoms in deserts. However, it does not tolerate extreme cold and is not found on the Anatolian Plateau.

Rye is only rarely found in archaeological deposits. It is distributed in east Anatolia and Transcaucasia and may have invaded as a weed of wheat (Hillman 1978). Flax also seems to have been cultivated in the Levant from c 6000 bc or before and wild forms are found in the Epipalaeolithic levels at Mureybit (Hillman 1975, 72) and in the early aceramic Neolithic (Zohary and Hopf 1988, 208).

5.3 Morphological features of wild and domesticated cereals

The main difference between domestic and wild cereals is one of seed dispersal. The grains are found at the top of the stem or culm and form a dense spike. The morphology is shown in Fig. II:14. The spike consists of a central axis or rachis which in turn is made up of sections (nodes and internodes), each of which bears a spikelet. Each spikelet consists of a pair of glumes which enclose florets. The second and subsequent floret are joined to the primary floret by a short axis or rachilla. Each floret is composed of a lemma and palea which enclose the grain. Wild cereals fracture at the node spontaneously when ripe (hence the term brittle used by Zohary and Hopf 1988) thus propagating themselves (but making harvesting difficult), whereas in domesticated forms the spikelets do not fall apart (as the nodes and internodes have fused) but have to be to broken up by threshing after the spike has been cut from the stalk. Because of this they depend on man to plant them for their survival. A further and subsequent difference is in the glume which in the wild form has to be broken apart by parching and pounding (hulled wheat), whereas in some of the domesticated forms (naked wheat, triticum durum and aestivum) the grain can be freed by threshing.

The length of time domestication took is uncertain as no site has produced a continuous sequence of wild and domesticated forms. At Mureybit which has the longest record of the period in question the cereals remain wild. At Abu Hureyra there is a break in occupation between the Epipalaeolithic and Neolithic levels and when the site is re-occupied domesticated cereals are used. At other sites, such as Aswad IA cereals are domesticated types from the beginning. Kislev however, considers that the process must have been completed by the end of the PPNA (Kislev 1984, 63).

The use of sickles was important in the process of domestication (Hillman 1978,167); Harlan found that their use (on wild crops) increased the efficiency of the harvest (Harlan 1967) and helped to reduce the loss when harvesting brittle, shattering crops (Kislev 1984, 62) and would be essential to cut plants with tough rachises.

6 Overview

We have seen that the range of environments and other resources that were available varied through time and by region, perhaps accounting to some extent for the imbalance of cultivation in some areas. It is now necessary to consider what Frick has described as the translation 'of ecological potential into socio-political change' (1985, 100). At the beginning of the period of study environmental changes greatly influenced human settlement patterns. Gradually, however, especially in marginal areas, man became able to manipulate his environment to the extent that his activities exacerbated environmental decline for example at Abu Hureyra (Moore 1982a; 1985, 53). Eventually, after successfully cultivating crops in suitable conditions man was able to control (by irrigation) regions environmentally unsuited to rain fed agriculture (Helback 1972).

The rest of this chapter is a resumé of cultural and economic change as far as they can be identified in order that the lustred blades may be considered in as wide a context as possible.

7 The Late Epipalaeolithic (10,000 - 8300 bc)

The term Epipalaeolithic is used of terminal Pleistocene cultural developments (adoption of a microlithic technology and composite tools as well as different patterns of subsistence) between the Aurignacian and the Neolithic (Hours 1974; Bar Yosef 1975), though not everyone would agree with this nomenclature (Gilead 1983, 51; 1984, 227). The last quarter is distinguished from the preceding part by the presence of lunates in the tool kit which are regarded as a 'fossil directeur' and it is from this time that lustred blades begin to occur regularly and this is the period with which we are concerned. It was described as Mesolithic (following European terminology) by Garrod (1932) and Neuville (1934) because they saw it as a stage in the sequence of development from Palaeolithic to Neolithic. Others see it as a transitional phase and prefer the terms Epipalaeolithic and Proto-neolithic (Braidwood and Howe 1960, 4 fn 1; Perrot 1968, 383) because the European concept of Mesolithic is one of cultural adaptation but still at a hunter-gathering stage and is not applicable to the situation in the Near East where there are signs of incipient cultivation (Braidwood 1958, 1428; Bar Yosef 1977, 290*; Henry 1983, 151-4). Moore has described the period as an intermediate stage which was not distinct from the Neolithic and which coincided with the final cold phase of the Pleistocene and its immediate aftermath, so that its environmental setting was different from the preceeding and succeeding stages. Initially he described it as Mesolithic (1975; 1978) but later uses the term Epipalaeolithic (1985, 12f).

In the Levant industries of this period are termed Natufian after the discovery of Shubkah in the Wadi en Natuf by Garrod (1942, 1). However, the term cannot be used throughout the Near East for sites of this period as there are different areas have basic differences in technology and compositon of tool kits (see for example M-C Cauvin 1981a; Olszweski 1986; 1988 and section 8.4) and the general term Epipalaeolithic is preferred here.

8 Period 1 (10,000 - 8300 bc)

8.1 Chronology

The late Epipalaeolithic is dated between 10,000 bc and 8300 bc and was subdivided into an earlier and a later phase initially by Garrod 1932 and Neuville 1934 on the basis of the change in relative proportions of Helwan and abrupt retouch on lunates and a decrease in their length through time (Olszewski 1986, 181), and subsequently on the basis of a micro-burin index (Bar Yosef 1975, 370; Bar Yosef and Valla 1979; Henry 1974; 1981, 423-4; 1983, 137). The dividing line falls at about 9000 bc though the two phases have not been found in clear stratigraphic succession (M.-C. Cauvin 1981a, 440).

It has already been mentioned that the late Epipaleolithic period is dated between 10,500 and 8300 bc (Henry 1982, 437; M.-C. Cauvin 1977, 17); Moore prefers a shorter range 10,000-8500 bc (1985, 12) and Bar Yosef (1983,13, Table 1) suggests that the limits are 10,300-8500 bc. The boundaries are established by the earlier Kebaran dates and later aceramic Neolithic dates on multi-period sites, as well as from C14 dates of the Natufian sites themselves, though only ten sites have reasonably acceptable dates (Olszewski 1986, 151). The dates are listed in Appendix I and plotted in histogram form in Fig. II:2. In fact, at 2σ less than a third fall within the date brackets suggested and the end of the period is not as clear as once thought (cf Perrot 1983, 118).

8.2 Site Location and Type

The main sites which form the basis of this discussion are shown in Fig.II:15a & b. Environmental conditions at this time are particularly crucial in determining locations and types of settlement and this ultimately determined or at least influenced the future development of agriculture. The increasing warmth and rainfall c 10,000 bc meant that cereals expanded from the Pleistocene refuges in the Rift Valley and on the Mediterranean coast, and colonized the hill zones in much the same way as forests (Harlan and Zohary 1966). In the Levant practically all of the earlier Natufian sites were concentrated in the Mediterranean vegetational zone and the Jordan valley. They tend to be located at topographic and environmental boundaries between wooded slopes and level open areas near water - the areas of the natural habitat of wild cereals and often on terra rossa. However, later as the climate becomes drier and cooler, the settlements are also found on areas of higher ground, perhaps to compensate for the increasing aridity (Henry et al 1981); in environmentally marginal areas which the pollen remains suggest were climatically more favourable than they are today, sites such as Rosh Zin, Rosh Horesha in the Negev, Hayonim and Beidha, the Azraq Basin and beyond in Jordan were located near water (Betts 1986, 86). Northwards in the Euphrates area of Syria sites are in steppe regions but in a riverine or oasis environment, for example at Mureybit, Abu Hureyra, Dibsi Faraj and El Kowm (Henry et al 1981, 46, 83). At Mureybit at least, the climate seems to have improved from when the site was first occupied to warmer and more humid conditions c. 8000 bc (Leroi Gourhan 1974). These climatic changes did not take place until even later further north and east so that the evidence for contemporary activity in Anatolia is sparse and ambiguous (Beldibi, Belbasi, Baradiz and Maçun Çay [Bostançi 1959; 1962; 1965; Esin and Benedict 1963 and see the discussion in Olszewski 1986, 61-62]) probably because there were few inland areas available for settlement (the Konya plain only became dry after c 6500 bc [Erol 1976; 1981 and Erinc 1980]). Cohen suggests that the first settlements in southern central Turkey were in causal relationship to a general ecological change which came at the end of the last Ice Age (Cohen 1970, 136).

The Natufian sites fall into three size categories and tend to be larger than the earlier Kebaran sites and to have a greater density of artefacts. They range from c.500 sq m to over 2000 sq m (Eynan and Rosh Horesha) and comprise base-camps (sites with fixed features), satellite (seasonal) camps (Henry 1983, 138) and cave sites (Bar Yosef 1983, 24). The base camps include Hayonim Terrace, Eynan, Kebara, El

Wad and Nahal Oren and are considered to be permanent because they include a high concentration of finds, paved areas, storage pits (plaster lined at Eynan [Valla 1975, 60]), successive building levels (three at Eynan) and human commensuals as well as fixed features such as bed-rock mortars (Henry 1983,140), hearths and graves (Bar Yosef 1983, 25). Seasonal sites include Rakefet Cave, Abu Ushba and Sefunim which differ from the larger, more permanent settlements in that they often have either flimsy structures or none, and no graves, and heavy tools are absent.

Houses are partly subterranean, circular or curved, between 2 and 9 m in diameter and single-roomed. They are built of unmodified stones (Beidha, Nahal Oren, Hayonim Cave, Mureybit, Abu Hureyra, Zawi Chemi) with post holes at Eynan for roof supports (Bar Yosef 1983, 14). There is slight evidence for the use of lime at Eynan and Hayonim (Aurenche 1981, 507; Bar Yosef 1983, 15). In the earlier part of the period they are organized in a linear arrangement or on terraces (Eynan) (Valla, 1981, 418), but later are clustered. A particularly diagnostic feature of the sites are the hearths and pits or bin-like, so-called storage, structures (which are plastered at Eynan) though the use of the latter has not been confirmed (Bar Yosef 1983, 15). The sites in the Negev have similar but much less substantial structures (Bar Yosef 1983, 15) but at Khallat 'Anaza and Taibé no certain structures were identifiable (Betts 1986, 74-75).

8.3 Burial practices

The dead are buried in cemeteries or under the floor; the graves are either pits which are rarely lined with limestone slabs; some graves were marked with (worn out) mortars. Single and collective burials are known and the position of the body varies. Grave goods include shell necklaces and art objects though the evidence is too ambiguous to draw conclusions about social hierarchies (Bar Yosef 1983, 15-16; Garrod 1957; Wright 1978).

8.4 Material Culture

The material culture used to be considered to have an overall uniformity throughout the area, with some localized variations due partly to environment and partly to economy. However, detailed analytical studies of various technological and typological aspects of lithic industries from these areas suggest there are significant differences (Henry 1977*; Olszewski 1986; 1988). Natufian complexes are distinguished from other Epipalaeolithic groups by their lithic industries and the presence of elaborate ground stone tools, worked bone (for example at El Wad, Kebara and Nahal Oren [Stordeur 1981]) and by ornaments as well as by settlement type and burial customs.

The lithic industries of the Levant and North Syria have been studied in some detail (Henry 1977*; 1981; Bar Yosef 1981, Olszewski 1986; 1988; Calley 1986). They are characterized by the presence of lunates and the use of the microburin technique; the variation in the presence of these form the basis of the chronological division of the period. There is a general typological similarity pervading all Epipalaeolithic industries in the Levant, Syria and Jordan, considered by some to indicate that they belong to the same tradition, but the apparent similarity could simply be due to similar functions (Perlès 1988, 408) and needs further investigation. Analysis of the technology indicates a marked difference between the industries in Central and Southern Levant and those from North Syria (Olszewski 1988, 136). In the Levant cores are single platform bladelet cores (and not multi-platform as recorded by Henry 1981, 422), and blade tools were preferred (Olszewski 1988, 132) though multi-platform cores were used in both regions to produce flakes (Olszewski 1986, 107; 1988, 132). At Mureybit, although bladelets were produced, there appears to have been no systematic shaping of cores (Calley 1986, 16) and pyramidal cores are absent (Olszewski 1986, 150). Flake cores predominate and the blanks from them were used for most tools.

The overall quantity of tools varies from site to site as well as the proportion of the tool classes (Bar Yosef 1983, 26, Table 6). A number of regional groupings have been defined by the variation in the proportion of tool types which show a high statistical correlation with environment (Henry 1977*; 1981, 423; Olszewski 1986; 1988). In steppic regions sites have a higher proportion of borers, perforators, notches and denticulates relative to other sites. In the Mediterranean forest area there are two groups defined by the proportions of geometric to non-geometric microliths, open sites having a greater proportion of non-geometric forms whereas rock shelter sites have a larger proportion of geometric forms. Scrapers and burins (but see Bar Yosef 1983, 18) do not seem to vary from region to region but do have specific activity *loci* within sites. Lustred blades (a new tool class) are relatively common in the Mediterranean zone but decline in numbers in the drier south and are rare in marginal areas on the Euphrates (see Chapter VI). Large tools also show a difference between the two areas; in north Syria there are gouges, axes and blunted implements but in the Levantine tool-kits massive scrapers, notches, denticulates and picks are typical.

Ground stone tools are different in north Syria and the Levant (Olszewski 1986, 149) and are less common in southern Levant and the Negev. There are rubbers and querns in north Syria (i.e. types associated with grain processing), but in the south these are rare and the equipment includes mortars (portable and bed rock), pestles, cup marks, bowls, large goblet shaped basins, deep stone-pipe mortars and grinding stones.

The bone industry includes a wide variety of tools, including harpoons, slotted hafts for reaping knives and sickle blades, barbed and other points and hooks (? for fishing), as well as pendants and art objects. It has been discussed by Stordeur (1981).

There are also carved bone or limestone figurines and sculpted heads on sickle hafts as well as abstract or geometric designs on bone and stone objects.

8.5 Economy

The economy is assumed to have been based on hunting and intensive gathering of plants, especially cereals and in the case of El Wad and Abu Hureyra there may have been cultivation of cereals (see Unger-Hamilton 1985a and b; Hillman 1975, 72 and Chapter III:) Some of the settlements must have been seasonal especially in marginal areas, but others were year-round. Bar Yosef (1983, 27) suggests from the number and distribution of the base camps in the well surveyed Mount

Carmel region (Kebara and El Wad and later Nahal Oren) and the seasonal camps such as Rakefat, Abu Ushba and Sefunim and some of the open air sites, that the inhabitants must have lived below the carrying capacity of the land.

Faunal remains, usually with a single species dominant (gazelle at Nahal Oren, El Wad and Hayonim, goat at Beidha), suggest that selective hunting was practised. A few sheep and goats were present at Abu Hureyra and at sites in Palestine, though not at El Wad, Nahal Oren or Kebara (Legge and Rowley-Conwy 1986, 24,31). Fishing is evidenced by fish remains and fishing equipment from Hayonim Cave, Nahal Oren, El Wad, Kebara, Eynan and Mureybit.

Most of the evidence for use of plants is indirect and difficult to quantify because plant remains are poorly preserved in terra rossa, clays and colluvial deposits (Bar Yosef 1980b, 125; 1983, 24) on which a large proportion of the sites are located. However, plant remains,including cereals, survive at Mureybit (van Zeist and Casparie 1968; van Zeist and Bakker-Heeres 1984) and Abu Hureyra (Hillman 1975) and include brittle einkorn, barley, lentils, pistachios and grass and herb seeds, as well as rye and wild flax (Abu Hureyra only). The grain found in Natufian levels at Nahal Oren and Eynan has been shown by AMS dating to be intrusive and not to be contemporary with the levels from which they were recovered. This acts as a warning on the apparent association of occasional seeds as they have been shown to be stratigraphically mobile without leaving any trace in the soil profile (Legge 1986). An increase in gramineae pollen was noted at Wadi Judayid J2 (Henry 1982), but no species were distinguishable.

Despite pollen analysis at Eynan no gramineae pollen was recorded, though it has been suggested that this is an accident of dispersal rather than a real absence (Valla 1975, 41; 1981, 418-9; van Zeist and Bakker Heeres 1984). Similarly the absence of any evidence from sites in present day desertic conditions may simply reflect the shallow nature of the deposits and the poor preservation of pollen and organic materials in such circumstances (Betts 1986, 32).

Indirect evidence comes from presumed food processing equipment (ground stone equipment and lustred blades) as well as site location and dietary evidence from human remains. The equation of grinding stones with cereal preparation is by no means established though wear analysis has shown that mullers were used to pound cereals at Mureybit and Abu Hureyra (Nierlé 1982, 199). However, other pestles from El Wad, Erq el Ahmar, Hayonim and Eynan have red ochre or lime on them (Bar Yosef 1983, 15; Valla 1975, 95). Typology also varies from region to region; in the forest zone at Eynan, El Wad and Hayonim there are stone pipe mortars which Moore has suggested are more likely to have been used to crush nuts or acorns rather than to pound cereals (Moore 1978, 81; 1983, 96), though they are absent from sites in the steppe regions. Querns and rubbers on the other hand are found in the steppe regions at Abu Hureyra and Mureybit where there is other evidence for the uses of cereals. We have already noted that lustred blades are rarer in some regions than others. They are for example rare at Abu Hureyra and Mureybit but common at El Wad where microwear analysis suggests that they were used to cut cultivated cereals (Unger-Hamilton 1985 a and b and see Chapter III) although site catchment analysis indicates that the Mt Carmel region is not a particularly good area for growing cereals (Vita Finzi and Higgs 1970). The implications of this variation are discussed in Chapter VI:2.

Other evidence for cereals in the diet comes from dental attrition which suggests that ground plant foods were an important part of the Natufian diet (Henry 1983, 132 with reference to Smith 1972, 37) and from the comparison of the strontium and calcium ratios in human bones. Results of analysis of individuals from Kebara, El Wad, Hayonim Cave and Eynan and Nahal Oren suggests that there was an increase in plant foods in the diet in the early Natufian but that these reduced later, and do not pick up again until Period 2 (Sillen 1984; 1986) though this needs to be tested over a wider area as other factors could affect the Sr/Ca ratios.

8.6 Contacts

Shells from the Red Sea occur at sites in the Negev, but the origin of the dentalium shells are less certain. The obsidian from Natufian levels at Eynan suggests contact with Anatolia, though there is no evidence for contemporary activity there.The greenstone or phosphorite at El Wad, Eynan and Fazael IV is probably of Trans-Jordanian or Syrian origin. There is however, as yet no systematic analysis of exchange networks (Bar Yosef 1983, 23).

9 The Neolithic

9.1 Definition

The Neolithic is traditionally distinguished from the Epipalaeolithic by an economy based on subsistence farming and stock breeding rather than on hunting and gathering. There is a marked increase in population and a change in settlement pattern and duration. There are also corresponding changes in material culture, for example the appearance of arrowheads, an increase in the sickle blades and later the use of pottery (Hours 1982; Moore 1985, 2). The established terminology is somewhat cumbersome and self contradictory; in western Europe the term Neolithic implies the use of pottery and ground stone tools as well as a farming economy, but in the Near East there is a farming economy long before the use of pottery and hence the inconsistency. However, the terms aceramic and pre-pottery Neolithic have become enshrined in the literature and it seems best to keep them as labels. One of the major problems in defining the Neolithic has been to pinpoint the beginning of such development because once the changes are visible in the archaeological record the Neolithic has already developed (Clark 1980). Moore (1982b) sees the initial shift happening somewhere about 8000 bc, though believes the foundations were laid much earlier. Perrot prefers to see neolithization beginning with the domestication of plants (Perrot 1983, 116-7).

9.2 Chronology

In the Near East the Neolithic is subdivided into several periods or stages using radiometric dates to confirm changes in material culture and economy. There is a major division between the aceramic and the pottery Neolithic at c.6000 bc and within each of these stages there are earlier and later periods. The main subdivisions are those of Aurenche et al (1981), Moore (1982a and 1985), Bar Yosef 1981, Weinstein (1984) and Crowfoot Payne (1978) for the Levant, and Oates (1973) and Smith and Young (1983) for Mesopotamia and Hole et al 1969 for the Khuzistan area (see Table II:1). The C14 dates on which these subdivisions are based are discussed in the appropriate sections.

There are also geographically based cultural differences; for example, on a general level the Levant is culturally different from Mesopotamia and within this division there are some variations (eg Moore's Euphrates and West Syrian groups (1981) which become more easily identifiable once pottery is in general use later in the Neolithic. These variations serve to demonstrate how regionally idiosyncratic the Neolithic was (Moore 1982, 32).

10 Period 2 (8300 - 7600 bc)

1 Chronology

The dates for Period 2 are given in Appendix I and plotted to 2σ in Fig.II:3. Aurenche et al (1981) have suggested that in the Levant their Period 2 has two sub-phases, Period 2A between 8300 and 8000 bc and Period 2B between 8000 and 7600 bc, though the C14 dates do not show this differentiation. Also, unless there is clear stratigraphic division, they are very difficult to differentiate on the basis of the tool kit and technology (Crowfoot Payne 1976, 1983). At the end of the period sites seem to overlap with the beginning of Period 3. The Mesopotamian sequence is established by dates from Zawi

Chemi, those from Ganj Dareh being internally inconsistent. The dates from sites in the Zagros region overlap with the end of the Epipalaeolithic in the Levant but continue into the Neolithic and, as they are considered to be of Proto-Neolithic rather than of Epipalaeolithic tradition (Solecki and Solecki 1983, 123; Jaguttis Emden 1981, 267), they are considered with the Neolithic sites.

The earliest part of the period (Aurenche et al, 1981, Period 2A) is perhaps best seen as a transitional stage between the Epipalaeolithic and Neolithic whilst there is an adjustment to the new way of life (Moore 1982, 229). It has three facies in the Levant, defined on the basis of the tool kit, namely the Harifian, the Khiamian and the Proto-neolithic levels of Jericho (Bar Yosef 1975; 1981b; Cauvin and Cauvin 1983, 46-7). In the Zagros region it is typified by the Zawian complex (Solecki and Solecki 1983). Later, in Period 2B, economic and social changes are also apparent. There is evidence for occupation in northern Mesopotamia from Qirmez Dere, a site in the Jebel Sinjar which is currently under excavation and from another on the left bank of the Tigris at Nemrit (Watkins in a lecture, December 1987, and see Iraq 1987; cf Oates 1982, 359). Both these site are on the Levant - Zagros divide and it is hoped that future excavation and analysis will provide much more information about the relationships between the two areas. Occupation in the Zagros shows little change from Period 1.

10.2 Site Location and House Types

The distribution of the main sites is shown in Figs.16a and b. Settlements are found in the desert and in environmentally better land where they tend to occur on low ground with good access to agricultural land (Moore 1982b, 229; Oates 1973, 150) though they are unknown in the desert regions of Jordan (Betts 1986, 97). The location of Aswad in the Damascus basin in an area with less than 200 mm of rainfall per annum (making rainfed agriculture difficult) was probably enhanced by its situation on a lake edge and the use of surface water for agriculture (de Contenson 1985, 10). In the central western Zagros region sites are located on slopes above narrow, intermontane river valleys at ecotones (Smith and Young 1983, 147) and though occupation was protracted it was probably impermanent (Howe 1983, 130). The sites of Period 2B can be large (4 ha at Mureybit). Jericho was surrounded by a large wall with a tower and though its purpose may have been for protection against flooding (Goldberg and Bar Yosef 1982, 403) rather than defensive (Kenyon 1957), its construction must have entailed a good deal of organization such as is not usually found until later. The Zagros villages tend to be smaller than those further west.

Houses throughout Period 2 are still round though occassional rectangular structures occur towards the end of the period. The main difference from the Epipalaeolithic is that they are built above ground in a variety of materials (stone at Abu Salem, clay and stone at Mureybit, rush-tempered 'hog backed' bricks at Jericho and Aswad, though no structures remain there). The houses have common walls at Mureybit and Nahal Oren, where the terraces are steep and they are densely placed at Netiv Hagdud, Gilgal, Jericho and Abu Madi. Rubbish pits and bedrock mortars were found at Abu Salem. Walls at Aswad were of lime and at Mureybit are plastered and painted with geometric designs (J.Cauvin 1977, 28-30; 1979; Aurenche 1981, 507). In the Zagros settlements are in villages (Zawi Chemi) with round stone walled structures and in shelters (Solecki and Solecki 1983, 129). In Khuzistan there isno evidence of structures at Karim Shahir (Howe 1983, 138) nor in the earliest level of Ganj Dareh, but by level D structures are of made of mud brick and are rectangular in shape (Smith and Young 1983, 148)

10.3 Burial Practices

Burials were between the houses at Mureybit and the skulls were detached from the body and buried separately, perhaps pre-figuring the skull cult of PPNB Jericho. At Ganj Dareh the skulls seem to have been deformed during the life of the person (Lambert 1979, 52). Burials at Shanidar were in a cemetery with collective burial and show some similarity with the Natufian burials (Solecki and Solecki 1983, 129).

10.4 Material Culture

Tool kits are different from the Natufian ones but still in a similar tradition, producing small blades, often of non-standard form (Calley 1986, 201; Crowfoot Payne 1983, 631). The only uncontaminated industry of Period 2A date is from Salabiyah IX (Bar Yosef 1980a,193) but generally it is difficult to distinguish Period 2A and 2B industries on technological and typological grounds, especially when they are from sites which are difficult to interpret stratigraphically, though some trends can be identified. For example, towards the end of the period, at Aswad IA and Mureybit III, the use of naviform cores begins to appear, enabling long straight blades to be struck (Calley 1986, 203), though this technique is not used in Palestine until Period 3. Microliths still form a significant proportion of the earlier tool kit (40% in the Negev and 20 % in Palestine). The industries are chiefly distinguished by the appearance of small notched points, probably arrowheads, the variation in form of which suggests a range of provincial industries (Henry 1983, 151). The Harif points of the Negev have a localised and mutually exclusive distribution to the Khiamian points which are much more widespread. Towards the end of Period 2B tanged points with flat retouch on the base (Helwan and Byblos points) which are more typical of Period 3 assemblages, begin to appear at Mureybit. Arrowheads are very rare at Jericho. Burins are present in different proportions in tool kits. There are, for example, few at Aswad IA but more at Mureybit (M-C Cauvin in de Contenson et al 1979, 157). There are bifacial tranchet tools at Jericho from Proto-neolithic and PPNA levels (Crowfoot Payne 1983, 631) but not at Aswad or Mureybit, though there are flaked erminettes and picks at Mureybit (M-C Cauvin 1978, 29-40, 51-54) and chipped axes at Zawi Chemi (Solecki 1981, 64-5) and Karim Shahir and ground ones at M'lefaat (Howe 1983, 131). The industries in the Zagros are more microlithic based than those in the Levant, have few lustred blades and a predominance of multi-purpose tools. They seem to derive from the Zarzian and to continue into Period 3 (Solecki 1981,25; Howe 1983, 129).

Ground stone equipment is ubiquitous and includes cup holes and bedrock mortars (Abu Salem), cup holes and querns (but not mortars) at Gilgal (Noy 1979) and pestles, which take on a new form towards the end of the period (Bar Yosef 1981b, 562). A large number of ground stone tools, especialy mullers querns and abraders were found at Zawi Chemi (Solecki 1981, 28). At Karim Shahir (though not at Zawi) ground stone bracelets and rings, similar to those of a later date found at Jarmo, were recovered (Howe 1983, 127).

The bone industry is simple and includes points, knives, spatulas and beads. There are some enigmatic toothed objects at Mureybit (Stordeur-Yedid 1974, 442)

Anthropomorphic figurines of terra cotta were found at Mureybit (J.Cauvin 1974, 200) and at Salabiya IX and Gilgal (Bar Yosef 1980, 193f) and in the Zagros sites (Howe 1983, 128) and ground stone figurines at Karim Shahir (Howe 1983, 7). Clay containers were found at Mureybit (J Cauvin 1974, 200) and at Ganj Dareh E (Smith 1968).

10.5 Economy

The new tool forms which appear in Period 2A (heavy tools and arrowheads) form the basis for the interpretation of the economy of Period 2. The differing environmental situations of the various sites make it unlikely that they all supported the same economy. The Negev sites seem to have been seasonally occupied and still based on hunting and gathering, exploiting the wild cereals on the hills. In the more permanent settlements cereals are thought to have been intensively exploited. At Jericho (Hopf 1983) and at Aswad (van Zeist and Bakker-Heeres 1979) and possibly Gilgal they are domesticated, except for barley. At Mureybit wild cereals were exploited though evidence is scarce until Phase 3, when, coinciding with a warming up of the climate, there is a marked increase in cereal remains (van Zeist and Bakker-Heeres 1979). No threshing remains were recovered at Mureybit implying that crops had been harvested and collected some distance from the site though no firm conclusions can be drawn at present (van Zeist and Bakker-Heeres 1984, 196).

Gazelle and cervids were hunted (Ducos and Helmer 1981, 525) and recent finds of sheep in Palestine (Jericho) and the Negev suggest that sheep were more widespread than once thought (Braidwood and Howe 1960, 1; Legge and Rowley-Conwy 1986, 3).

In the Zagros the economy seems to have been less oriented towards cereal exploitation, though some lustred blades (of uncertain function) are present and a few cereals were recovered at Ganj Dareh (van Zeist et al 1984) and there is increase in cereal pollen at Zawi (Leroi-Gourhan in Solecki 1981). There was also a proliferation of grinding stones at Ganj Dareh and Zawi (Smith and Young 1983, 148; Solecki 1981), all of which suggest some use of plant food, though at Asiab and Ganj Dareh there is a greater emphasis on sheep herding (Moore 1985, 42-3).

10.6 Contacts

Contacts were similar to those of the Natufian, but as the use of obsidian becomes more widespread there is more contact with with Anatolia, mainly the Çiflik area, but also a few pieces from Nemrut Dag in eastern Anatolia from Aswad (de Contenson 1985, 10). Contemporary sites in Anatolia have not yet be found.

10.7 Summary

Throughout Period 2, as in the Epipalaeolithic, Syria is culturally distinct from the Levant with a different tool kit and a more agriculturally advanced economy (de Contensen 1985, 12). In the Levant there are two economies, one in desertic regions and one in more fertile areas. The Zagros also develops separately, with its economy much more based on exploitation of animals and with a different tool kit.

By the end of Period 2, there is a change in emphasis of settlement and economy: some sites (eg Jericho) seem to be no longer occupied for a time, whereas others, particularly the newly developed site of Aswad, and also the somewhat precocious Mureybit, prefigure Period 3 developments both in economy (at Mureybit, though there is more evidence for increased cultivation of cereals, they remained of wild type) and in material culture (naviform cores, arrowhead types, sickle blade types, etc).

11 Periods 3 & 4 (7600 - 6000 bc)

11.1 Chronology and Main Sites

The next fifteen hundred or more years is the time during which agriculture became established and in material culture there is a change in certain tool forms and the sporadic use of pottery. There is a great increase in the number of sites and the range of areas occupied (Hours 1982; Moore 1983). The characteristic features of each period are outlined below. For the Levantine and Anatolian sites the period is generally divided in two, though some would divide it into three (for example Bar Yosef 1981b, 564-65). The first part, Period 3, is dated between c 7600 and 6600 bc and the second, Period 4, between 6600 and 6000 bc. However, if key types are not present it is not always possible to allocate a particular site to an early of later context. The distribution of the C14 dates support the twofold division (see Fig. II:4 and Appendix I) but several sites (for example Ramad and Bouqras) seem to overlap into Period 5. In Mesopotamia the period coincides with the transition from the Early Neolithic to the Later Neolithic (Table II:1). At Ali Kosh the Bus Mordeh and Ali Kosh phases are roughly the equivalent of Periods 3 and 4 in the Levant.

11.3 Settlement Location and Type of Site

The distribution of the main sites of relevance to this discussion are shown in Figs.17a and b. More permament settlements are generally located in areas of good agricultural potential in river valleys or near good water supplies (for example the Damascus basin) and there is now occupation in Anatolia on the plains and beside rivers and at the edge of the Zagros foothills (Magzalia) and in the Zagros sites are still in the narrow, high- sided valleys rather than the more open valleys (Smith and Young 1983, 147). Ali Kosh may have been transhumant (Hole et al 1969, 345). In the arid regions sites are somewhat ephemeral and seasonally occupied.

Houses are rectangular and multi-roomed. Construction materials seem to be whatever is available locally. In Anatolia and Palestine the walls are lime plastered (sol enduit), kilns for manufacturing lime plaster being found at various sites (Garfinkel 1987), and may be stained with red ochre. In Syria they are still of clay. At Ali Kosh houses were built of mud brick 'slabs' and different from preceding periods. The village was initially small but by the Ali Kosh phase had become larger (Hole et al 1969, 342, 347). At Jarmo floors were covered with reed mats. Several types of house were noted at Çayönü which seem to develop from one another, though still all within Period 3. The earliest form is the grill plan type, followed by the cell plan and the large single roomed structure (Çambel 1981, 535). Model houses of clay were also found, providing some information on structure (Redman 1983, 193). Spatial differentiation of activities is apparent for example at Yiftahel where there were storage structures (Garfinkel 1987, 193) and at Çayönü the shape and the finds from the cell plan structures suggest that each was used for a particular purpose (Redman 1983, 192-6). By Period 4 there is some development in the planning and layout of the settlements (Moore 1981, 450), with houses aligned along roads at Bouqras, Ramad and Ali Kosh.

Some settlements are larger than in the preceding period, for example Aswad II is much larger than Aswad I (de Contenson 1985); 'Ain Ghazal covers 12 ha (i.e. three times larger than PPNB Jericho) (Rollefson 1984, 5), Abu Hureyra 11.5 ha (Moore 1985, 19), Ras Shamra 9 ha and Çatal Hüyük 13 ha. There are also smaller villages like Bouqras of c 4 ha, Ramad I of 2 ha and the sites in the Zagros and Khuzistan.

11.4 Burial Practices

The dead are still buried within the settlement often under floors of houses in all regions. Skulls were detached and plastered or separately treated at Mureybit, Ramad, Çayönü, Jericho, Beisamoun and at 'Ain Ghazal where they were found with a group of statues and busts (Rollefson 1983). There are few grave goods.

11.5 Material Culture

The material culture of Period 3 and 4 is broadly similar. The main innovation in Period 4 is the making of pottery, though pottery has been claimed from as early as Period 2, at Mureybit Phase III (J Cauvin 1974) and at Ganj Dareh (Smith 1968; Smith and Crepeau 1983) and the use of clay for figurines is also attested before this. In Period 4 pottery is sporadically made and used at Ramad II, Bouqras, Aswad (Balikh) and Çatal Hüyük XIII-X. White ware (vaisselle blanche) is found in northern Syria and Lebanon (Balfet et al 1969; Frierman 1971) and at 'Ain Gazhal in Jordan (Rollefson 1983, 37).

Lithic industries are based on blade production; some Levantine industries have highly distinctive naviform cores, already known in the Period 2 levels at Mureybit and Aswad (M.-C. Cauvin 1978; 1979, 159); in Period 4 they are found at Bouqras (Roodenberg 1986b) and Hayaz (Hours and Copeland 1983, 77). A decline in their use towards the end of Period 4 was noted at Ramad (de Contenson 1985, 18). Method of blade production at other sites is less well known and has only been studied in detail at 'Ain Gazhal (Rollefson and Abu Ghaneima 1983). Blade production at Ali Kosh was rather different, being based on single-platform bullet cores (Hole et al 1969). There is a variety of arrowhead types including Byblos points, Amuq points and oval and winged types with pressure flaking (M-C Cauvin 1974c) though multiple rather than single pieces were used at Ali Kosh and Jarmo (Hole et al 1969, 76-7; Hole 1983). Sickle blades increase in number and a new form (enlarged head type) in obsidian but not in flint is found at some sites in Anatolia (Cafer, Çayönü, and Sakce Gözü) and further east at Magzaliya. A new type of sickle blade of geometric shape and with bifacial flat retouch is present at Ramad and Ghoraifé in Period 4 but is not found elsewhere in the Levant until Period 7. The coarsely toothed variety, much more frequent in later periods, is also found at Ramad. There are also a high number of retouched blades (outils a posteriori) (Bar Yosef 1981b, 564). Axes in Palestine continue the earlier tranchet form. There are flaked and ground stone axes at Aswad, Ghoraifé, Mureybit and Abu Hureyra and a specilaized form made on levallois type cores in the Beisamoun area (Le Brun 1970). No axes were recovered at Ali Kosh, but large pounders and choppers are present.

Obsidian is present at most sites though in small amounts, but in the 'supply zone' it is used on a large scale (100% at Asikli). In the 'contact zone' the amount of obsidian used increases through time (Renfrew et al 1966, table 13; 1968) and the source of supply seems to change through time (Moore 1985, 38) and from site to site (Garfinkel 1987, 212).

Copper, found at Ergani near Çayönü, was used there and hammered into pins, hooks and beads (Braidwood and Braidwood 1982, 11); a copper pendant from Ramad I (Period 4) was from the same source and other copper objects have been found at Ali Kosh and Shanidar (France-Lanord and de Contenson 1973, 115). Malachite was commonly used at Beidha (Kirkbride 1966, 53) and greenstone (unprovenanced) at Yiftahel (Garfinkel 1987, 212).

Ground stone equipment shows some change from Period 2 and as well as axes there are more querns (trough type in Palestine) and less pestles. At Ali Kosh pestles and mortars were found for the first time as well as saddle querns.

Bone tools increase in number and seems to go hand in hand with a similar increase in animal bone remains which is recorded at many sites. Forms include the usual pins and awls and at Aswad many of the bone tools had perforations (de Contenson 1985, 14). At Ganj Dareh there are notched shoulder blades which microwear analysis suggests were used to remove grains from stalks (Stordeur and Anderson Gerfaud 1985).

Beads and pendants were made of stone, bones and shells. Figurines of lightly baked clay are commonly found at Ramad, Aswad, Jericho and Munhatta 6-3 (Perrot 1968, Pl III,3); at Beidha and on the Euphrates they are of female goddesses like the ones from Çayönü together with a more slender type; at Ali Kosh there are a number of animal figurines.

11.6 Economy

As in previous periods two economies are identifiable, one based on cereal cultivation and the other on hunting, which correspond to permament and seasonal sites or the Mediterranean and Desertic Societies of Garfinkel (1987, 199). In Period 3 there is still a differential rate of the domestication and use of cereals. Sites which have plant remains surviving (Table II:3) show a mixture of wild and domesticated types. Mureybit had virtually all wild cereals (van Zeist and Bakker-Heeres 1984), Abu Hureyra a mixture of wild and domesticated forms (Hillman 1975), Aswad has fully domesticated emmer, einkorn and barley as well as pulses and perhaps shows rotation of crops (Leroi-Gourhan in de Contenson et al 1979, 171, 174); at Çayönü the remains contained a few wild types as well as domesticated wheats, though barley, which would have been available locally was not grown or gathered (van Zeist et al 1984, 223). At Hacilar cereals were fully domesticated (Helbaek in Mellaart 1970). Yiftahel produced no evidence of cereals but broad beans and lentil were plentiful and at 'Ain Ghazal there seems to be a similar emphasis on pulses rather than cereals. At Ganj Dareh barley (the only cereal recovered) and pulses were exploited on a small scale. Emmer wheat, barley and pulses were recovered at Ali Kosh, in both the Bus Mordeh and Ali Kosh phases, with an increase in production of cereals during the Ali Kosh phase, again suggesting some kind of selective process (van Zeist et al 1984, 223). Smith and Young (1983, 147-48) have suggested that the location of these sites in steep, narrow, upland valleys rather than the broader valleys may have been a deliberate attempt to control the resources in a managable situation before moving to the wider valleys. Goats were domesticated at Ali Kosh but gazelle. onager and wild cattle were hunted. In Palestine there is increasing evidence for herding sheep, for example at Jericho (Legge and Rowley Conwy 1986) and by the end of Period 4 animals were domesticated at Ramad (de Contenson 1985, 22) and at Ali Kosh (Hole et al 1969, 347).

Some sites in areas too dry to support agriculture have evidence for the use of grain. At Mazad Mazzal it is presumed to have been imported; grinding stones were found on the site but no lustred blades (Taute 1981). At 'Ain Abu Nekheileh (Kirkbride 1978) and Jilat

7 (Garrard et al 1987, 16 Table 8 & 24) the situation appears to be similar though Betts (1986, 157) suggests that basic agriculture may have been practised there. At Bouqras the economy is based on hunting and though grinding stones and sickle blades are present there is no evidence for cereal cultivation, though wild barley may have grown on the nearby steppe (Oates 1973, 160) and irrigation might have been used.

In the remoter regions occupation seems to have been seasonal. For instance in the Sinai region there were summer camps in the hills where cereals may have been collected (silos were found at Ujrat el Mehed) and specialized winter camps at lower altitudes (Wadi Tbeik) (Bar Yosef 1981c; Tchernov and Bar Yosef 1982). There are also specialized winter hunting camps in the Negev (Nahal Divshon and Nahal Issaron). In the El Kown region there are permament villages such as El Kowm and a series of smaller camps in the surrounding area, though little is yet known of their relationships (J. Cauvin 1982). In the Palmyra region camp sites seem to be associated with flint extraction.

A similar pattern probably pertained in the Zagros where Guran was occupied only in the summer. The absence of other sites prevents discussion.

Betts, in her discussion of the possible relationships between the two economies, has suggested that despite the marked contrast between the temporary desert sites and the permanent village settlements there is a common material culture pervading all Period 3-4 sites in the Levant which she believes demonstrates connections between them, though it is not possible at present to see how they interacted (1986, 195ff).

11.7 Contacts and Relationships

Contacts are wide-ranging and can be seen to have been on two levels, one relatively local for utilitarian needs and a more distant one for rare goods. The utilitarian pieces from Ras Shamra, Abu Hureyra, and Bouqras include basalt and limestone for querns, rubbers etc and gypsum, probably obtained locally, as well as bitumen. Wider contacts are shown at the Euphrates sites by the presence of steatite from the Zagros at Abu Hureyra, other stones (jadeite, agate and serpentine) from the Taurus and obsidian from Anatolia. At Ramad I native copper from Ergani, near Çayönü in Anatolia, and later haematite were present. Copper from Ergani was also found at Ali Kosh. The distribution of obsidian also demonstrates the wide range of contacts at this time. For example at Beidha some obsidian from the Van area was recovered (Mortensen 1971, 115). The pattern seems to have been complex and preferences for sources changed through time (Moore 1985, 33). Contacts between the Euphrates and the north would have been relatively easy through the river valleys, but there is also contact to the south and west with cowrie shells from the Mediterranean and turquoise and malachite from Sinai (Moore 1985,21); Mediterranean shells were also found at Çayönü. Other connections between Jordan and the Euphrates and Anatolia are suggested by the distribution of human and animal figurines (Rollefson 1983, 37). Sea shells, possibly from the Persian gulf were recovered at Ali Kosh and turquoise from near the border with Afghanistan (Hole et al 1969, 350)

11.8 Overview of Periods 3 and 4

There is a general cultural similarity throughout the western part of the study area atthis time, as typified by arrowhead typology and rectilinear architecture, but there is also variation from one area to another. Hours and Copeland have suggested that within the cultural context a number of provinces can be distinguished (see map Fig.II:18). These include one in Palestine with Jericho points and tranchet axes continuing PPNA traditions and distinct from northern Syria and Anatolia. Another would be in Syria, with flaked and polished stone axes (Aswad, Ghoraifé, Mureybit and Abu Hureyra); northen Syria and Anatolia are also linked by the limited use of pottery and white ware. There is a third in the Djezerieh and Upper Tigris area which extends eastwards to Magzaliya and Jarmo and which is linked to Anatolia by the use of a distinctive form of obsidian sickle blade with an 'enlarged head' (see Appendix IV), as well as scrapers with pointed bases, inversely flaked arrowheads (not Jarmo) and a small number of microliths. Hours and Copeland see the Euphrates valley area as an entrepot (1983, 78). In the Deh Luran area Ali Kosh has connections (shown by the copper) with the Çayönü area of Anatolia, but obsidian is little used and there are no obsidian sickles of the enlarged head type. The area seems to be little affected by developments in the west.

Subsequent developments in Period 5 show the crystallization of distinct cultural entities.

12 Periods 5 and 6, 6000 - 5000 bc

12.1 Introduction and Chronology

Although there is continuity of occupation and material culture in some sites from the preceding period (for example at Abu Hureyra, Bouqras, Ras Shamra, Ramad, and Labweh and in the Zagros and Khuzistan) there is also the beginnings of a major adjustment in the settlement pattern (Hours 1982), culminating in changes to the socio-economic structures brought about by irrigation which ultimately (in Period 6) marks the end of the Neolithic (Moore 1982, 49; 1985, 49). In terms of material culture one of the distinctive features of this part of the Neolithic is the universal manufacture and use of pottery, which had been made sporadically earlier in Iran (Smith 1968), Anatolia and north and central Syria (Mellaart 1972, 279; J Cauvin 1974, 199-205; Hours and Copeland 1983, 78; Moore 1985, 50). Flint and obsidian continue to provide raw material for edged tools, though the range of types is considerably reduced and industries tend to be documented in less detail than in earlier periods. Copper also is sporadically used.

Period 5 is dated to between 6000 - 5500 bc though there is some overlap with preceding and succeeding stages. It is the beginning of Moore's Developed Neolithic 3 (Moore 1985, 49 ff) and the Later Neolithic in the Zagros (Smith and Young 1983). Chronology is established by dates from sites with aceramic and ceramic phases such as Abu Hureyra, Bouqras II and Ramad II-III and other sites. Period 6 begins c. 5500 bc and continues until c.5000bc (see Appendix I and Fig. II:5).

12.2 Environment

The beginning of the period coincides with a marked deterioration in climate in the Levant (de Contenson 1985, 18), for although it was warmer, rainfall diminished and in consequence forest zones contracted and were replaced by steppe. The desert in its turn tended to encroach on the steppe (Moore 1978, 69-70; 1983, 99, Fig. 7). There is, however, a moister phase in lowland Mesopotamia at this time (Oates 1982, 370). The increasing dessication made many areas which had previously been farmed, unsuitable for reliable rain-fed agriculture. The Damascus basin for example, where agriculture had depended on surface water from the lakes, was abandoned, though Ramad, which is in a wetter area at the foot of Mount Hermon, continued in use for the next few hundred years. New areas were settled, probably as a direct consequence of the climatic change (compare maps Figs.II: 17 a and b and Figs.II:19 a and b). The evidence from Abu Hureyra encapsulates what seems to have been happening over a wide area, particularly in marginal zones. The plant record suggests that part of the deterioration in the environment may have been due to or exacerbated by anthropogenic factors, in particular the over-exploitation of natural resources by grazing and food collection. This situation may have triggered the need to cultivate crops and raise stock (Hillman 1975). However, in this particular area, farming was short-lived because as the climate deteriorated further the land became unsuitable for farming and the site was abandoned. Major redistribution in settlement patterns have been documented in the Levant (Moore 1985, 49) with movement into forest zones (Moore 1982, 25) but other areas show less disruption. Also, new regions, especially those with potentially good arable land and nearby surface water, were inhabited for the first time.

A number of regional groups can be identified, partly geographically and bio-climatically but also on the basis of differences in ceramic styles (the groups usually being named after the site at which they were first identified). Some of these groups overlap chronologically and in their spatial distributions, while others are of different dates. Initially there appears to have been little contact between the groups but later none is mutually exclusive and each has widespread contacts (Fig.II:20; Hours and Copeland 1983).

12.3 Sites, House Types and Material Culture

The distribution of the main sites is shown in Figs.II:19a and b. The material culture is summarised by region below:

(1) Syro-Cilicia: Houses are loosely organized (in contrast to those in Anatolia). Pottery is regularly manufactured and is typically a dark lustred ware (DFBW); white ware, first found in Period 4, continues in use. Lithic industries are best documented at Byblos and the Amuq. There is a new form of tanged arrowhead and lustred blades are coarsely denticulated, like those found at Ramad II at the end of Period 4; they were probably used for cutting reeds rather than cereals. Agriculture seems to decline in importance and domesticated animals play an important role at Ramad for which the increasing dryness may be partly responsible (de Contenson 1985, 24).

(2) Jordan: Most of the sites, especially in the Black desert are small specialized 'burin sites', for example Jebel Naja and Wadi Dhobai B (Waechter et al 1938, now known as Jilat (Betts 1986, 207)).

(3) Palestine: Palestine, which had been abandoned at the end of PPNB remained, on present evidence, unoccupied virtually throughout Period 5, though towards the end there is occupation at Sha'ar Hagolan (Stekelis 1972) (broadly contemporary with Byblos (néo. ancien) (Moore 1973). Period 6 sites include Hammadiyeh (Kaplan 1965) and Megiddo (Loud 1949). Jericho remained unoccupied until the end of the Period. There is little evidence for agriculture.

(4) Anatolia: There is expansion of settlement on the Konya Plain and Anatolian plateau (Figs.II:19a & b), where cattle are herded and crops cultivated. Houses are tightly organized in contrast to other areas, perhaps because of the cold winters. A light lustred pottery is used. The lithic industries are not well known; arrowheads are tanged with flat pressure flaking. Obsidian was used extensively and copper and lead smelted at Çatal Hüyük. Burials are now in cemeteries.

(5) Mesopotamia: There is a different cultural milieu from the Levant (Hours and Copeland 1983, 81-2; Watson 1983, 242). Though the climate was moister here, two agriculturally marginal regions are recognizable, namely the Khabour and Djezireh (Oates 1982, 366f). In the Khabour the pottery is dark and lustred but different from the DFBW of Syro-Cilicia; preceding Halaf proper, painted pottery begins to appear at Chagar Bazar. Lithics are well documented at Bouqras and Aswad (Balikh) and the Khabour valley (Copeland 1979). The Halafian, dated

between c. 5500 bc and 4500 bc developed in the area of the upper Khabour but by 5000 bc had spread across much of the study area (Watson 1983).

The Djezireh area of the north Mesopotamian plain is steppic and agriculturally marginal; the earliest evidence of occupation is at Magzaliyah (see above) but most of the sites are farming villages (Oates 1973), attributable to an early phase of the Hassuna culture (Oates 1982, 367) though it is likely that future investigations may produce earlier material. The settlement pattern has been described as a 'radiating cultural system', whereby there are a number of villages in the northern foothills of the Zagros and a series of non-permament and sometimes specialized camp sites on the plains, though their precise relationship is not known (Mortensen 1983, 216f). Permament villages include Tell Sotto, Yarim Tepe I and Tell Shimshara. On the plain the sites consist of a series of non-permament settlements for example at Umm Dabagiyah, Telul eth Thalathat XV-XVI, Hassuna 1a, Matarrah and Gird Ali Argha. All the settlements, except Umm Dabagiyah, are in areas where dry farming is possible and though a few sickles and grindstones are present, there are few details of the economy (Mortensen 1983, 217).

Kirkbride suggested Umm Dabagiyah was a trading post on the basis of the predominance of onager amongst the faunal remains, which she believes indicated a hunting economy (Kirkbride 1974) and which Mortensen considers is reflected in the lithic tool kit (Mortensen 1983, 217-8). However, the evidence of agriculture and domestic animals suggests a farming economy (Oates 1982, 367-68).

Samarran Sites: These are situated well outside the 200 mm isohyte. The main sites are Choga Mami, where there is evidence for irrigation, Tell es Sawwan,Baghouz, Matarrah and Tepe Sabz. Irrigation agriculture was practised as is clear at Choga Mami (Helbaek 1972).

(6) Khuzistan: The contemporary cultural phase in this area is termed Mohammed Jaffar (Hole et al 1969, 333). Settlements now also occur in the broader alluviated valleys (Smith and Young 1983, 148). The main sites are Ali Kosh, Tepe Guran 3 and Tepe Sarab. Houses were built of cobbles with mud floors and rush mats. All sites have pottery and baskets, some of which are decorated, and there are numerous clay figures. Stone tools are characterized by microliths, sickle blades now modified to fit the haft (see Chapter VI:5) and piercers and scrapers. Contacts seem to be wide-ranging, as in Period 3-4, with obsidian from Anatolia, shells from the Persian Gulf and turquoise from north east Iran. Farming practice is similar to the preceding periods but had begun to reduce the number of trees and to alter the landscape. The main cereals were emmer and hulled barleys. There is a considerable variety of ground stone equipment (Hole et al 1969, 351f).

12.4 Overview

By the end of Period 5 cereal cultivation, 'brought to perfection' (Aurenche et al 1981, 577) at the end of the aceramic Neolithic (Period 4), was securely established, though only in dry farming areas and stock breeding was regularly practised throughout most areas of the Near East including the newly occupied northern Mesopotamian plain. Only southern Mesopotamia was uninhabited (Oates and Oates

1976, 76). The new settlements in northern Mesopotamia, even though somewhat poorly documented at present, are considered to be the prelude to the rapid spread of agriculture and permament villages of Hassunan, Samarran and Halaf type (Mortensen 1983, 218) in areas beyond the limits of rain fed agriculture.

13 Later Developments

13.1 Introduction

The previous sections have been concerned with the general cultural milieu in which the exploitation and ultimately the cultivation of cereals took place. This was the time when, despite doubts about their function (see Chapter III), lustred blades appeared regularly in the tool kit, though according to Cauvin they only became standardized in form when farming was established (J. Cauvin 1983, 270; but see Chapter VI). They continue to occur, presumably used as sickles, though some may have been used for cutting reeds (see Chapter III) well after the introduction of metal tools and after techniques and organization of cultivation had undergone considerable development (Hopkins 1985, 227).

Although a full discussion of these later periods is beyond the scope of this study, subsequent agricultural developments include the expansion of farming to areas outside those where rain-fed agriculture could be practised. There is also the building up of systematic trade patterns and a generally more productive economy marking a development beyond the Neolithic.

13.2 Ubaid and subsequent cultures

By Ubaid times (fifth millennium, see Oates 1983) agriculture was established in the marshy areas of S.E. Iraq at Eridu and Ubaid cultural influence ultimately spread to north Syria, Iran and Iraq (Oates 1973, 172-3) and the Khazineh phase in Khuzistan. With the widespread use of irrigation in south eastern Iraq a need for socio-political organization developed, exemplified in the trend to urbanism (Redman 1978, 266), and with it came the development of proto-literate societies (Oates 1972, 303) leading to the Sumerian civilization which was rather different to contemporary developments in northern Mesopotamia.

The Uruk city states and their colonies show a further development and a differently organised economic system (Weiss 1986, Sürenhagen 1986, 10) and by the Bronze Age there is another transformation in settlement patterns with the establishment of cities in all areas. Examples of sites which have produced flint sickles are mentioned in Chapter VI and shown on map Fig.II:21.

14 Summary

This chapter has attempted to decribe the background to the development of farming economies from the first tentative harvestings of wild cereals to the establishment of agriculture by Period 5 and ended with a cursory glance at the development of the highly organized agricultural systems of the city states. This provides some sort of context within which lustred blades can be evaluated. They occur throughout the time in question and, in the past, have been used as an indicator of agriculture, despite their sometimes enigmatic role.

At each period (at least up to Period 5 and probably later) two parallel economies have been identifiable, one agriculturally based and the other predominantly concerned with hunting, each in its own environmental niche. Present evidence does not allow an interpretation of their relationship to each other (if any). Lustred blades are virtually absent from the hunting tool kits, and in consequence the hunting camps do not figure in much detail in this study.

Conditions of agricultural growth are complex and not determined by a single factor (Hopkins 1985, 23-26) and it seems incontravertible that increases in population, changes in technology and other aspects of material culture as well as economic development go together, though how they are related is more problematic. Only by more specifically targeted excavation and multi-disciplinary analysis of a range of sites can the questions begin to be answered. For the moment we can only say that population and settlement show a marked but irregular increase through time (Hours 1982 and see Fig.II:22), an increase which appears to be contemporary with other major socio-economic changes outlined in this Chapter and perhaps changes in climate. The first increase in settlement density is in the last stage of the aceramic Neolithic (Periods 3-4) and it is at this point that lustred blades become more standardized and show a considerable increase in numbers. The second is c. 5000 bc with Halaf expansion (Hours 1982, 429) and settlement in southern Mesopotamia with irrigation agriculture. Cauvin and Cauvin have also noted that although sites do not increase in number they do increase in size in Period 2B (1983, 48).

Changes in material culture (or specific aspects of it) as well as variation in settlement patterns and economic growth can also reflect these differences, though the evidence is often rather tenuous (but see Hodder 1987). Although it is dangerous to base interpretation on one facet of the evidence, detailed analysis must begin somewhere and new levels of interpretation of lithic industries suggest that they may have a wider relevance (see for example discussion of Greek material by Perlés 1988). More specifically, although artefactual studies per se are out of fashion, lustred blades seem to fulfil many of the criteria now asked of lithic material and to have a specific role to play in the documentation of the exploitation of cereals, in that the variations can be considered beside changes in other data relating to the development of agriculture (plant remains, ground stone, human remains etc., summarized in Chapter VI). In addition there is data on function (Chapter III) and hafting (Chapter IV) as well as technological and stylistic change (Chapters V and VI).

CHAPTER III

FUNCTION

1 Introduction

Lithic artefacts, typologically termed "sickles" and "sickle-blades", have been traditionally distinguished by a functional attribute - the presence of gloss or lustre which is visible to the naked eye and sometimes described as a 'high optical gloss' (Meeks et al 1982). However, although the function of the tool is implicit in the term sickle-blade (i.e. that it was used to harvest cereals) this in fact need not necessarily be the case, since exactly what they were used to cut is a matter of some discussion, as will be outlined below; it seems unlikely that all lustred blades had a similar function.

The regular appearance of lustred blades in Epipalaeolithic tool kits (before the domestication of cereals) has aroused much interest. Although it cannot be precisely documented, their first appearance seems to coincide with an improvement in climatic conditions which would have allowed grasses and in particular cereals to expand their natural distribution and thus be more widely available for exploitation (see Chapter II). The exploitation of cereals is documented with greater or lesser degrees of certainty from a number of sources: from distribution of settlements (Bar Yosef 1983; Henry 1983; Moore 1985), from the plant remains themselves (which indicate that they were not domesticated before 8000 bc [see references in

Zohary and Hopf 1988]) and from equipment traditionally associated with food processing, such as mortars, pestles, grinding stones and querns as well as lustred blades themselves which are presumed to have been used for cutting cereals.

The main stumbling blocks to the equation of lustred blades with cereal harvesting (particularly for the Epipalaeolithic) are a) that wild grasses and cereals can be harvested without recourse to stone tools (see below) and b) that the cutting of plants other than cereals can cause macroscopically visible lustre (Unger-Hamilton 1985a). The use of coarsely denticulated blades to cut cereals has also been questioned because they have proved to be unsatisfactory in experimental work (Sauer 1958; J. Cauvin 1968, 72).

It is important, therefore, to examine ways in which function can be identified before interpreting the significance of lustred blades.

2 Sources of information

There are a number of indicators of the function of lustred pieces, which include textual information and illustrations, parallels from ethnographic data and experimental replication, as well as plant remains and the lustre on the blades.

2.1 Contemporary Sources

(i) Textual references and illustrations, although later than the main period with which this thesis is concerned, do provide some useful information and are still contemporary with the use of flint sickles.

One of the earliest written pieces of evidence concerning agriculture is of Bronze Age date and comes from the so called Sumerian Farmers' Almanac, a document somewhat similar to Virgil's Georgics, (Butz 1980-83, 479). There is LBA evidence , for example from the Ugaritic texts from Ras Shamra (Healey 1983) while later (c 900 BC) information comes from the Gezer Calender and allusions to agricultural practices in the Old Testament, for example in the Book of Ruth, but there is little specific detail (Healey 1984; Borowski 1987,56).

(ii) Other contemporary information comes from a cylinder seal of 4th millennium date which shows a harvesting scene (Collon 1987, no 722, Louvre AO 27210 and see Fig III.1) and later gnostic gems show similar activites.

(iii) From Egypt there is a funerary papyrus of Mutemuia and tomb paintings with harvesting scenes (e.g. Chenet 1931, 173; Childe 1951) which although later in date clearly show the use of flint sickles. and contemporary examples ~~Sickles~~ have also been found in tombs (see Figs III.1 and 2) .

(iv) The sickle shape also seems to take on a symbolic meaning (Healey 1983) and is sometimes depicted with gods or kings as a weapon (Fig.III.3). For example a statue of Ashurnasipal shows him with what Chenet considers to be a sickle with flint inserts on the outer curve of the haft (Chenet 1931, 475; 1939,50). The gods Shamash and Marduk carry sickle-like symbols and in Hittite art, for example on a relief at Yazlilikaya, soldier-like deities carry 'sickle swords' (with the cutting edge on the outside of the haft) (Macqueen 1986,59, 125 Pl.114-5, 121). There are other allusions to sickle-weapons in biblical literature and in Greek mythology we may note the sickle of Kronos (Chenet 1931, 475; Barb 1972).

2.2 Ethnographic Data

Ethnographic data can be particularly useful despite some problems with interpretation (see Watson 1980). Harvesting with hand held sickles is still practised in some areas and apart from the substitution of metal sickles for flint ones the process has probably changed little since prehistoric times.

Information is largely drawn from data compiled earlier this century especially by Dalman (1928) and Maurizio (1927) and more recently Turkowski (1971), Sweet (1960) and Lerche (1971), but there are also passing observations from field workers in other disciplines (eg Schaeffer 1930 in Chenet 1931, 76; 1939, 50; Lloyd and Safar 1945, Pl XXI; Hillman 1973a,b and c & 1981).

2.3 Experimental Replication

Replication of ancient harvesting techniques have been tried since the 1890's (Spurrell 1892), not only in attempts to reproduce the gloss on the blades but also to test the efficiency of stone sickles (Steensberg 1943; Korobkova 1978; Anderson-Gerfaud, 1983; Helmer 1983; Unger-Hamilton 1985).

2.4 Palaeobotanical data

Plant remains, both of weeds and the part of the plant remaining can also provide some clue to the harvesting processes involved (Hillman 1981), though they are rare for the earlier periods.

2.5 Functional Analysis of Lustred Blades

More specific identification of function of individual artefacts has been made possible by microwear analysis and this technique (pioneered by Semenov and first published in Russian in 1957, and in English in 1964) has been applied to lustred blades in particular by Witthoft (1969), Kamminga (1979), Masson _et al_ (1981), Meeks _et al_ (1982), Anderson (1980) Anderson-Gerfaud (1982; 1983)and Unger-Hamilton (1985a and b). Although there are still many unresolved problems it is a very important step in the interpretation of the function of individual artefacts.

Used together these sources of information can provide details not only about what the lustred blades were used for, but also how they were used and the length of time each blade lasted as well. They can also allow reconstruction of contemporary harvesting methods and will be drawn on in the following discussion.

3 Harvesting Methods

Cereal crops can be harvested in a variety of ways, some of which do not require the use of sickles at all. The most usually encountered in the Near East are summarized below.

3.1 Without sickles

The seeds of wild cereals and grasses are dispersed by shattering and can be easily and successfully harvested without sickles by beating the seeds into baskets or drawing a hand through the stems (Steensberg 1943, 122-126,127; Sauer 1958,188; ~~Bohrer 1972~~, 145; Harlan 1967, 197; Kraybill 1979, 520; Reed 1977, 543, 546; Cauvin in Helmer 1983,195, fn.4). Maurizio points to the inefficiency of this method because much grain is lost (Maurizio 1927,136). Wild grains are nearly always harvested by beating even by peoples who use sickles to cut domesticated crops (Unger-Hamilton 1985a, 235), though in certain circumstances wild cereals are also cut (Harlan 1967, Maurizio 1927,136), for example for a special recipe which requires green wheat (Dalman 1928,349-50). Wild cereals can also be cut more easily in moist conditions when the seeds would not disperse so easily (Unger-Hamilton 1985a, 235). Harvesting whilst the crop was green might also have been used as a way to stop the birds eating the crop, though the grain would not be fully formed.

Cultivated crops may also be harvested by beating or plucking. Hillman has observed this on small plots and in particular for the second picking of grain in Turkey (1981,151-3) and it is clear from Old Testament literature that gleaning was done by hand (Is 17:55; Ruth 2:2) and is still practised today (Lerche and Steensberg 1980). The method has also been reproduced experimentally (Harlan 1967; Reynolds 1980; Anderson-Gerfaud 1983,86) though Harlan preferred to use a sickle because, as others have commented, hands quickly become sore from hand-stripping.

Crops can also be harvested by uprooting, as is recorded throughout the Near East. Spurrell (1892) believed that this was the earliest method of harvesting and Steensberg suggested that it was necessary because of the short stiff stems of ancient crops (1943, 122-3). It has been recorded in Palestine by Dalman (1928,2,551; Borowski 1987,43 and references therein), in Syria (van Zeist and Bakker Heeres 1979,166) and in Jordan at Beidha (Kirkbride 1985, 123). In Iran Sweet records that barley was uprooted, whereas wheat was cut (Tell Toqan, Sweet 1960) and Lerche (1968-71, 34) notes that cereals were uprooted in unirrigated fields in the mountains in Iran. In some areas of Turkey emmer is harvested in this way by children too young to use a sickle (Hillman 1981,148). Uprooting may be assisted by using blunt, curved sickles (Dalman 1928, 20-21; Hillman 1981, 149). It also appears to have been the method of recovering the straw in Egypt in the New Kingdom (Tomb of Renni) after the grain had been harvested (Steensberg 1943, 125). In archaeological remains uprooting can be determined by the presence of a high proportion of seeds of twining weeds and a low proportion of other weeds and a larger than usual proportion of culm bases amongst the grain (Hillman 1981).

3.2 With Sickles

The harvesting of crops by hand-cutting today usually requires more than one person and there is no reason to suppose that the situation was different in prehistoric times. The textual evidence and the illustrations suggest that a team of workers was involved. The Sumerian Farmers' Almanac shows that harvesting was a complex and systematic procedure requiring a team of three men, one to hold the stalks and to cut them, one to tie them into bundles and one to stack them (Butz 1980-83, 479); representations of harvesting scenes in Egyptian tomb paintings and elsewhere also show teams of people cutting crops tying them into sheaves and transporting them (see Figs. III:3). Old Testament allusions indicate similar organization involving a foreman and a team of reapers (Enc Judaica, 378; Borowski 1987,59). Team work was also observed in Iran (Lerche 1980), though different tactics were adopted for harvesting dispersed crops on poor soil and those in irrigated fields (Lerche 1968-71, 34 & 37-38). Photographs of modern villagers harvesting suggest that they advanced in rows across a field (Lloyd and Safar 1945, Pl XXI)

Modern ethnographic observations show that some reapers wear cane gloves or finger protectors on their left hand (Schaeffer in Chenet 1931, 76, Fig 4) which both protects the left hand and, if they have an extension, enables more tillers to be grasped (Lerche 1968-71, 38; Meurers-Balke & Loennecken 1984, 27-42). These gloves are not shown in the contemporary illustrations but there are two examples from Assur (Meurers-Balke & Loennecken 1984, 35).

The height at which the cereals are cut varies and depends on what the straw is required for (cf Steensberg 1943, 125-6). Grain and straw are often harvested separately (Is 17:5, Job 24:24 and Steensberg citing paintings in the Tomb of Menna at Thebes and another at Mediyan as evidence [1943, 99 & 125]). Other Egyptian paintings show the corn being cut close to the head or at knee height (cf Clark 1955,110). In present day Palestine the stalks are cut high up leaving 20 - 30 cm of stubble for the animals but the crop is cut close to the ground in Syria and Iran (Sweet 1971). Low reaping can sometimes be determined from the type of weed seeds present amongst the grain (Hillman 1981, 151). On lustred blades the presence of many striations presumed to have been caused by particles of earth suggets that crops were cut near to the ground (Korobkova 1978; Unger-Hamilton 1985a).

4 Methods of Cutting and Sickle Type

Experimental replication demonstrates that cereals can be cut by cutting or sawing (with the blade held at 90° to the stem of the plant (Unger-Hamilton 1983a, 245) or by reaping (i.e. a uni-directional semi-circular movement drawing the sickle up towards the reaper [Steensberg 1943, 12; Lerche 1971; Helmer 1983,193]). The Egyptian portrayals show both methods in use (Helmer 1983, 193). The tomb paintings from Mereruku and Urarna (Fig. III.1) suggest that the grain was held taut and upright with the sickle drawn towards the reaper; similarly in Old Testament descriptions the sickle is held in one hand and a bunch of stalks in the other (cf Ruth 2:16; Is. 17:5; Ps. 129:7; Joel 4:14). Reaping, sensu stricto, seems to require a particular type of sickle which was fairly heavy and has the body of the haft set at 90° or less to the handle (Childe's angular type and cf those from Kahun and Solferino, Figs.IV:1; Helmer 1983, 193). In Iran (Kermanshah province) a balanced sickle (Childe 1951 and see Chapter IV:2) with a curved blade 50 cm long, mounted in a ram's horn at right angles to a short wooden handle, more like a short-handled scythe, was used for harvesting where the sweep of the sickle was not impeded by thorny seeds (Lerche and Steensberg 1980). This was used only for wheat (Lerche 1968-71, 34). Vayson's suggested reconstruction of the Solferino sickle suggests that it may have been of similar type and size (Vayson 1919, 406) as does Lloyd and Safar's reconstruction of bottom left the sickle from Hassuna (1945, Fig 37 and see Fig.IV:1 D). On the other hand where there are many impurities in the crop it tends to be harvested with an 'unbalanced' curved knife with a serrated edge and often by women and old men. A similar knife is used for harvesting barley and other crops (Lerche and Steensberg 1980,70; Lerche 1968-71, 37).

The pattern of striations on lustred blades can also provide some clue as to the way in which the sickle was used. Those parallel to the edge of the blade suggest that the tool was used in a cutting rather than a reaping action. Similarly the extent and distribution of the gloss and the angle of the lustred edge suggest how the sickle was used. By analogy with experimental sickles, blades with low edge angles (about 30°) were probably used in a unidirectional cutting or reaping motion drawing the tool up towards the user. Blades with higher edge angles were used in a cutting or sawing motion to cut more resistant plant material. This produced a more invasive gloss, as did the cutting of thicker stemmed plants (Anderson-Gerfaud 1983,92).

The distribution of the gloss (cf Fujii 1983) can be used to determine which way up the sickle was held; Crowfoot Payne has suggested that the uppermost face would get the most friction (1983,686) and claims because of the more extensive gloss on the ventral face (see Fig.VI:35) that the Early Dynastic Mesopotamian sickles were held with the ventral face of the flint blade uppermost (1980). The inverse denticulation on the edges of some blades would have caused further spalling in use, thus automatically re-sharpening the blade (Crowfoot

Payne 1983, 686). Anderson-Gerfaud on the other hand, found that the ones she has examined (from earlier contexts) seem to have been used with the dorsal surface inclined more towards the surface of the plant than the ventral (Anderson-Gerfaud 1983a, 92).

Complete sickles (see Chapter IV) seem to be for right-handed use and all the complete Egyptian sickles are for right handed use, although some illustrations show them held in the left hand, but this is presumed to be artistic license (Steensberg 1943)

5 Efficiency

Experimental work, although not conclusive, provides some measure of efficiency of the various types of sickle discussed in Chapter IV. Ethnographic observations suggest that size and type of sickle as well as the density of the crop affect the amount of grain that can be harvested in a day (Lerche 1968-71,34).

Harlan found that he could harvest more wild grain in an hour with a flint sickle than by hand-stripping despite the fact that he lost very ripe heads and harvested immature ones (Harlan 1967, 197) and on the basis of his harvest he calculated that a family could harvest more than enough wild grain for a year in three weeks. He also found that a flint sickle reconstructed with prehistoric blades cut almost as well as a steel sickle.

Measures of efficiency are based on the amount cut, either in acreage or in the number of stems cut in a given time (Steensberg

1943,23,Table 1; Korobkova 1978,47; Unger-Hamilton 1985a), though others give no details and 'success rate' seems to be a matter of personal preference (Helmer 1983). Because experimental harvesting of crops with replica sickles has been tried out for a variety of reasons, results are not strictly comparable. Nevertheless a few general points can be made.

Helmer's experimental work using sickles replicated from M.-C. Cauvin's reconstructions (1983 and see Chapter IV) was based on the premise that the type of haft, the angle of the body of the sickle (cf Childe 1951) and the way in which the blades were inserted as well as the retouch on the cutting edge are determinants of how the sickle was used. He demonstrated that reaping requires a large sickle with the body of the haft set at 90° or less to the handle and that all the other types were used for cutting. For sickles with blades set parallel to haft, retouch on the cutting edge seemed to be more important than the shape of the edge or whether it was comprised of a single blade or several blades. He suggested that the ideal length is about 8 cm. The efficiency of sickles with obliquely hafted blades, on the other hand, depends on the number of blades (Helmer 1983,193).

Korobkova found that a single blade with a slightly concave denticulated edge set in a curved haft (a type not recorded in the study area) was most efficient, followed by a curved sickle with contiguous blades set parallel to the curve of the haft, and by a straight haft with denticulated inserts (Korobkova 1978, 47). She suggests that it is the insert type which changes rather than the body of the haft (1978, 41 & 52). Nevertheless, Unger-Hamilton (1985a) and Steensberg (1943) preferred a straight sickle for cutting cereals and Unger-Hamilton a curved type for 'reaping' reeds, bulrushes and stipa. She also found that she could best cut non-cereals with a single, unhafted blade (1985a, 249). Meeks et al (1982), using a straight reaping knife to cut through grass, found that a bunch of grass containing about 90 stalks required two or three cuts. Steensberg using an unhafted blade cut through a handful of straw in 8 cuts (1943, 18-19).

A finely denticulated edge appears to be the most efficient (Unger-Hamilton 1985a, 249 and Helmer 1983) and it may be noted in passing that modern sickles by definition have a finely denticulated edge which is the feature which distinguishes them from reaping hooks (Oxford English Dictionary). Unger-Hamilton found that an unretouched edge was sharpest but it wore out too quickly (1985a, 249); Helmer found unretouched edges satisfactory for cutting green but not ripe barley (1983, 193).

Coarsely denticulated blades have been found to be unsuitable for cutting corn as the stalks tend to slip between the teeth making friction uneven (Steensberg 1943, 26). Cauvin (1968) found that tended to damage the stalks of cereals. However they were found to be good for cutting reeds (Sauer 1958; J.Cauvin 1968; Helmer 1983, 195). Unger-Hamilton found that when she tried to cut cereals using a sickle with this type of blade, the culms got caught in the denticulations and tended to pull out the blades. and she experienced similar problems with blades hafted obliquely (1985a, 251).

Inferences about the length of time a blade may have been used were made by Korobkova from her experimental harvesting. She found that some blades ceased to be useful after about 20 to 24 hours of cutting corn although the most efficient type probably lasted two seasons (Korobkova 1978, 52). A similar conclusion was reached by Unger-Hamilton (1985a). Other ways of estimating length of use have been suggested by Meeks et al (1982, 335-6) who measured the amount the cutting edge had been reduced by projecting the sides of the blade to form an apex (following the method used by Semenov and Shchelinski 1971) and comparing it with a control sample which had been used experimentally. Although rounding of the cutting edge was noted early on it did not appear to impare the blade's efficiency and they estimate that a blade would only become unusable after about 60 hours of cutting grass. It is not known whether flint type or heat treatment of flint affects the life of the tool although both factors affect the formation of gloss.

6 Plant Remains

Although theoretically it should be possible to ascertain what harvesting methods had been used by comparing primary and waste 'fractions' (Helbaek in Mellaart 1970; Hillman 1981), the actual plant remains are generally too fragmentary or damaged to enable such reconstructions.

Modern excavation techniques ensure that any surviving plant remains would be recovered, but because of soil conditions they are not always preserved (Bar Yosef 1983). Also Legge has shown that small quantities of grain are stratigraphically mobile and should be interpreted with caution (1986).

On a microscopic level, plant opals found in soils and possibly on tool edges may provide additional information (Fujiwara et al 1985, 156-7 and see below) although this method has not been extensively applied in the Near East except at Shiqmim (Levy 1987).

Pollen analysis can also provide some corroborative evidence particularly relating to environment and the likelihood of cereals growing locally.

Knowledge of the plant remains from sites (or their potential availability) is important in interpreting the micro-polishes on blades (Unger-Hamilton 1985a, 233f and see below).

7 Functional Analysis of Lustred Blades

Whilst the data described above provide a general background, the lustred blades themselves provide specific information about how they were used and, in some instances at least, what they were used for. There are three main ways of arriving at this information, typological analysis, macroscopic edge-wear analysis and microwear analysis. The first two are less precise than microwear analysis but each method is an aspect of a wider whole. The two latter are discussed below and typological analysis and the interpretation of the results are discussed in Chapters V and VI.

7.1 Macroscopic edge wear analysis

This involves an examination of edge characteristics such as thickness, angle (Wilmsen 1968) and patterns of edge chipping at relatively low magnification (Tringham et al 1974). Though edge damage was originally not considered to be use-specific an extension of this method to include micro-flaking suggests that it is possible to determine the type of material worked (Roy 1983; Akoshima 1987). Aspects of lustre configuration, edge angle, etc. are considered in Chapter V and VI.

7.2 Microwear analysis

Microwear analysis is a technique whereby microscopic traces of wear can be observed. It has enabled the precise function of some tools to be identified. It involves not only the recognition of micro-polishes but also striations, micro flaking, edge damage, etc (Moss 1983, Ch 6; 1987). The main work has concentrated on polishes and striations.

Polish or gloss has been defined as "any change in the luster (sic) of a lithic implement's surface which is attributable to contact against a foreign substance" (Del Bene 1980, 36) and which cannot be removed with (weak) acids, bases or solvents (Vaughan 1981, 132; Moss 1987, 475). It is a visual phenonemon, characterized by its appearance under incident light at magnifications of 100x to 300x. Other features including striations and residues are better observed using a scanning electron microsope (hereafter SEM) at much higher magnification (Moss 1987).

Experimental work has indicated that micro-polishes from different materials (wood, bone, antler, hide, plants etc) can usually be separated (Cook and Dumont 1987, 54), but although each polish is claimed to be distinctive, there is no generally agreed way of objectively quantifying them (but see Dumont 1982, Grace et al 1987). However, there is now a debate about the validity of the use of blind tests (Keeley and Newcomer 1977) to distinguish polishes (Newcomer et al 1986; Moss 1987) and the matter is unresolved.

Plant polish is different from other polishes in that it is visible to the naked eye and has always been considered to be particularly distinctive; it only seems to occur when siliceous plants are cut (Anderson-Gerfaud 1983,89) and it is possible to differentiate polishes from different species (Unger-Hamilton 1983a, 247), though they do tend to grade into each other (Unger-Hamilton 1985a, 101). The effect of the soil chemistry on the silica in plants and the consequent gloss formation is not known. User variables do not seem to have a significant affect on polish formation (Unger-Hamilton 1983a, 247).

Plant polish has been described as a high optical gloss with a smooth surface having micro-pits in it (Meeks et al 1982) which are sometimes comet-shaped (Semenov 1964; Witthoft 1969). The polish is often described as having a vitreous or a liquid appearance (Masson et al 1981, 45, fn 4 & 5). It begins to form immediately the tool is used and becomes visible to the naked eye after a relatively short time, although the exact length of time depends on the type of plant cut and its moisture content, as well as the flint type and its microstructure (coarse grained flint takes polish more slowly than fine [Curwen 1935; Anderson 1980; Unger-Hamilton 1985a, 98f], flint that has been heat-treated taking polish more slowly [Unger-Hamilton 1985; Homes 1987,95; Bradley and Clayton 1987,89; Anderson-Gerfaud 1983a,90]). The gloss appears to increase in intensity when moisture is present in the material being worked (Anderson-Gerfaud 1983a, 89; Unger-Hamilton 1983a, 247); thus fresh or green plants which contain a high proportion of moisture (Kamminga 1979,151) produce a brighter polish more rapidly than if they are cut once they have dried out (Meeks et al 1982; Unger-Hamilton 1983a, 247; Gysels and Cahen 1982). Anderson-Gerfaud also claims to have observed phytoliths on the edges of tools of flint from Mureybit and Abu Hureyra (1983),obsidian from Cafer Höyük and clay from Tell Oueilli (1982; 1983b), as well as on notched shoulder blades from Ganj Dareh Tepe (Stordeur and Anderson-Gerfaud 1985). Others, however, dispute the likelihood of the survival of phytoliths (Masson et al 1981, Unger-Hamilton 1985, 71ff).

The recognition and identification of polishes and the possiblility of the survival of plant residues depends to some extent on the theory of polish formation. Three main theories, based on specialized knowledge of polish mechanics, appear to be current though they are nor entirely distinct. Since two of the theories are opposed to each other it is necessary to summarize the evidence in order to evaluate the results.

The three main theories are:

i) that it results from attrition or abrasion between the tool edge, the soil and the silica in the plant (Curwen 1935; Curwen 1941, 332;

Diamond 1979; Del Bene 1979), with water from the plant acting as a medium (Masson et al 1981). Masson et al also compare it to natural abrasion and suggest that it is purely mechanical. Witthoft (1967) considers that polish is caused by friction which itself is generated by heat, though others do not think that sufficient heat could be generated.

ii) that it is due to a chemical interaction between the flint surface and the plant stems (Kamminga 1979) occasioned by friction (Meeks et al 1982).

iii) that it is caused by the dissolution of the surface of the flint and the formation of an amorphous silica gel. Surface dissolution is provoked by a combination of localized pressure and friction (and hence heat) together with the acidity in plants, abrasive particles such as dust, micro-chips of flint and phytoliths and causes the formation of amorphous silica gel which could trap residues such as phytoliths (Anderson 1980, 184-5).

It is generally agreed that some chemical exchange of silica does take place, but the main issue seems to be whether this produces an additive layer (such as a chemical deposit on 'glazed' flint (Shackley 1988, 123)) and whether residues could become incorporated in it (Anderson 1980). Masson et al (1981) have pointed out that amorphous silica is very alterable and dissolves easily so that any phytoliths in it would be unlikely to survive. They demonstrated, using X-ray diffraction (a technique better suited to investigating mineralogical features than SEM's), that there is no evidence on the lustred surface for crystalline silica and that it is not possible to identify any superficial change in the flint such as that observed on 'glazed' flint (Shackley 1988, 123). Meeks et al (1982) also come to a similar conclusion. Recent research into the mineralogy of flint has shown that it is made up of three generations of silica, namely a framework of silicified skeletal fragments and quartz lepispheres held together with interstitial cement of structurally disordered water-rich micro-fibrous quartz chalcedony. Recrystallisation of the chalcedony (naturally or deliberately) affects not only the fracture mechanics but also the formation of microwear traces (Bradley and Clayton 1987, 89) and this may account for some of the discrepancies in the observations.

Unaltered flint is more prone to chemical attack because it is composed of more structurally disordered water-rich silica (which can be altered at low temperatures (Anderson 1980, 194); the localized heat build-up in use would therefore allow the formation of silica gels and the subsequent redeposition of recrystallisation products and residual deposits including phytoliths from the material being worked. This could accumulate in the irregular fracture surface of the unaltered flint (Bradley and Clayton 1987, 3). Recrystallised flint (which could result from heating) would be much more resistant to the formation of micro-polishes (Bradley and Clayton 1987, 83).

Present evidence then, suggests that it is likely that phytoliths could be present despite the claim of Masson's et al to the contary; the likelihood of their survival is confirmed by the fact that they have been extracted from other archaeological deposits (Anderson-Gerfaud 1983, 91-2; Fujiwara _et al_ 1985). Masson _et al_ may not have been able to observe them or the silica gel in the pieces they examined because many of the lustred pieces they looked at had been burnt (1981, 47-48).

8.3 Striations

Striations of different degrees have been observed in the polishes. They were considered a possible indicator of cultivation by Korobkova (1978) who noted (using magnifications of 200x) that the striations on modern (experimental) sickle blades used for harvesting seemed to result from the presence of dust and soil particles and to vary in quantity with the continuity of the soil cover (Korobkova 1978); Meeks _et al_ (1982,333) observed a similar phenomenon. They found that the direction and length of the striations and the pattern of wear seem to indicate the way in which the tool was used and they postulated that it may ultimately be possible to distinguish different size and depth of striae caused by the different materials cut (Meeks _et al_ 1982, 322, 332). Unger-Hamilton, who was particularly concerned to establish some criteria which would be indicative of deliberate cultivation rather than of harvesting wild crops (1985b) noted from her experimental work harvesting a number of different plant species in various pedological conditions that striations were absent when plants growing in water were cut, that some were present when plants grew in a grassy cover and that there were many on plants grown in tilled soil, especially if cut near the culm base). This would corroborate Korobkova's theory that striations increase as a result of soil loosened by tillage. Unger-Hamilton hypothesized that if the presence of striations were an indicator that the ground had been tilled, and therefore that plants had been cultivated, their presence could be used as an indicator of cereal cultivation before any morphological change in the plant had taken place. Amongst the archaeological material which she examined she records that four out of twenty-three Epipalaeolithic lustred blades from El Wad and Kebara had striations and she has tentatively suggested that this may indicate cultivation on a small scale (see also report in The Independent 21.7.88). Striations were more frequent on lustred blades from PPNB Jericho and Arjoune where there is evidence of domesticated crops (Unger-Hamilton 1985b, 122). However, tilled and untilled soils may not be the only factors involved and caution is needed in interpreting the striations until further tests have been carried out. Moore has indicated that stands of wild grasses in semi-arid regions of the Zagros or the Levant may have been discontinuous and the root system may not have anchored the soil, so that there may have been soil particles around (footnote in Meeks et al 1982, 333). The theory also presumes that cereals were harvested near the culm base though ethnographic evidence suggests that this is by no means always the case (see above).

8 Summary and Results

The results of microwear identifications of lustred blades from archaeological contexts are summarized in Table III:1 and will be discussed more fully with the other data in Chapter VI. However, a few points and caveats should be mentioned here.

Distinctions between polishes are not always clear-cut (Newcomer <u>et al</u> 1987; Moss 1987) and so absolute identifications are not always possible.

The results suggest that not all lustred blades were used for the same purpose. Although there are a number of different forms of lustred blades no correlation between form and function has been established(Büller 1983) though Unger-Hamilton does see some correlation between the long denticulated blades of PPNB date from Jericho and cereal harvesting but it is not conclusive as this is not their only function (Unger-Hamilton 1985a). Ethnographic data suggest that at least in some instances different types of sickle were usedfor specific purposes though in other instances different sorts of sickle were used in the same field.

Preliminary observations of the different configurations of the lustre suggest that they may be due to cutting different types of plant (Unger-Hamilton 1985a, 251 & Table 2). However, this needs further investigation because other variables such ashafting method can affect lustre configuration (M.-C.Cauvin 1973), as can the different rates of development of lustre and the length of time the blade was used for.

There does seem to be evidence that cereals (and perhaps cultivated ones) were cut with sickles as early as the Epipalaeolithic (El Wad, Mureybit and possibly Abu Hureyra) despite M.-C. Cauvin's claim to the contrary (1983, 76); this possibility is corroborated by the plant remains at Abu Hureyra and Mureybit.

Only a very small number of lustred blades have been examined and all of these are from sites in the Levant and north Syria and they cannot, as yet, be claimed to be representative of lustred blades in general. Indeed, apart from Arjoune only a very small proportion of blades from a single site have been examined.

Microwear analysis does, however, offer a new dimension to the interpretation of lithic artefacts and their wider significance on a site, despite the problems. Unfortunately, microwear analysts require a long period of training and each has to build up his or her own reference collection. The technique is time consuming and requires expensive equipment. A more cautious way forward may therfore, be to assess assemblages for their potential function using other criteria first and then to target microwear analysis to sort out particular problems. In terms of cost and time other macroscopic indicators of function might in most instances prove to provide sufficient information.

SITE & REF	PERIOD	NUMBER	IDENTIFICATION	OTHER ASPECTS
Mureybit Anderson-Gerfaud 1983a	1	6	reeds, rushes phytoliths of cyperaceae einkorn, emmer Borage	 Edge angles 20°-30° Edge angles 40°; gloss less bright
Mureybit Roy 1985	1	37	plant cutting	unmodified flakes
Abu Hureyra Anderson-Gerfaud 1983a	1	2	stipa or triticum phytoliths of grass family	striations
El Wad B2 Unger-Hamilton 1985a	1	5	reed or stipa	
El Wad B1 Unger-Hamilton 1985a	1	6	5 cereal polish 1 reed or stipa	3 with striations denticulated
El Wad Büller 1983	1	4	sickle gloss	
Kebara B Unger-Hamilton 1985a	1	12	5 reed or stipa 6 cereal or grass	denticulated
Kebara Meeks et al 1982	1	6	-	slicing action
'Ain Mallaha Büller 1983	1	2	sickle gloss	
Black Desert 14/7 Moss in Betts 1980	1	1	silica gloss	
Mureybit III Anderson-Gerfaud 1982	2	1	phytoliths of festucoïdes	
Jericho PPNA Unger-Hamilton 1985a	2	19	4 cereal 3 stipa or reed 5 bullrushes 1 grass 1 unclassifiable	striations
Jericho PPNB Unger-Hamilton 1985a	3	33	25 cereals (4 probable) 3 reed or stipa 3 bullrushes 1 grass 1 ?	

SITE & REF	PERIOD	NUMBER	IDENTIFICATION	OTHER ASPECTS
Cafer Höyük Anderson-Gerfaud 1982	3		phytoliths of *festucoïdes*	
El Kown Anderson-Gerfaud 1982	?	1	phytolith of *gramineae*	
Cheik Hassan Anderson-Gerfaud 1982	?	2	phytoliths of *gramineae*	
Jericho PNA Unger-Hamilton 1985a	7		reed or stipa	polish difficult to identify
Fayum Hooks *et al* 1982	6?	1		used for reaping
Arjoune Tr V Unger-Hamilton 1985a	6/7	38	31 sickle gloss 7 stipa	striations unstriated
Arjoune Tr VI	6/7	40	22 sickle gloss 8 burnt or patinated 6 indeterminate 3 reed or stipa 1 wood 2 plant polish	striations no lustre visible to naked eye
Jericho EBA Unger-Hamilton 1985			cereal polish	striations
OTHER				
CLAY SICKLES Tell Oueili Anderson-Gerfaud 1983b	Ubaid		Worn ones with little lustre used to cut cereals Very lustred ones used on rushes and sedges	
Eridu Semenov 1965	Ubaid			
NOTCHED SHOULDER BLADES Ganj Dareh Stordeur & Anderson-Gerfaud 1985		2	stipa and barley phytoliths of *gramineae*	

TABLE III:1 (cont)
Identifications of micro-polishes

CHAPTER IV

HAFTS

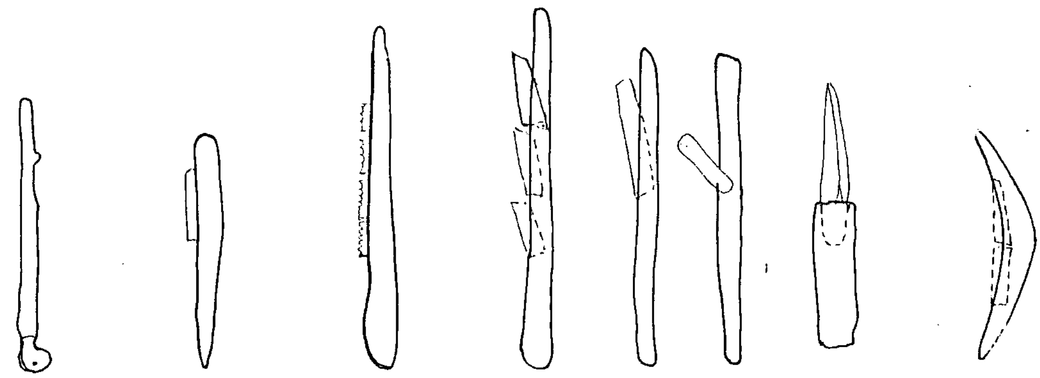
1 Introduction

Over 70 complete or reconstructable sickles and reaping knives are known from prehistoric sites in the Near East and others can be reconstructed on the basis of the distribution of hafting traces (e.g. bitumen) or from the configuration of the gloss. It should also be mentioned here that although hafts have always been considered to belong to sickles, there is in fact very little actual data to confirm this. Only 7 hafts (excluding blades set in bitumen) have blades in them and only one of the blades is lustred.

2 Terminology

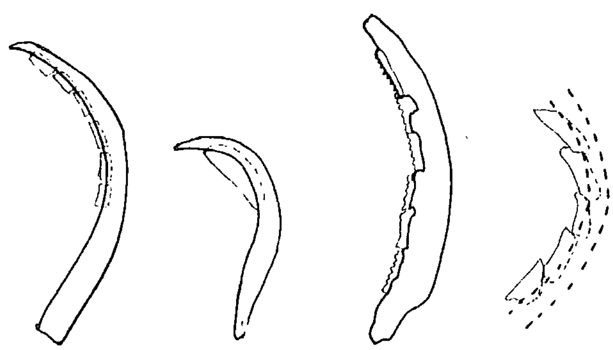
Terminology is somewhat loose, and strictly speaking the term reaping knife should be applied to a straight haft with inserts (Steensberg 1943) whereas the term sickle should be reserved for the curved type. The comparative study of sickle types has a long history and has been carried out for a variety of reasons (see Chapter I). Most studies cover a wider area than that in the present study. These include the work of Korobkova (1978), who reconstructed seven different types of haft for experimental reasons to test the relative efficiency of each type (see Chapter III.6), Camps-Fabrer and Courtin (1982) who dealt with sickles in the Mediterranean area, Fujii (1981, which was not available to me, and 1983) who, working from a theoretical basis, identified 15 methods of hafting, only five or possibly eight of which

I
Straight



Cauvin	1	2	–	3	4 & 5	8	–
Helmer	Ic	Ia	Id	IIc ?	IIa	–	
Fujii	AII_1	AI_1	–	AII_3	AI_2	AI_3	–
Healey	I.1a	I 2	I 3	I 4	I 5	I 7	I 6

II
Curved



Cauvin	6	–	–	7
Helmer	IIIc	–	IIId	IVc/d
Fujii	$B^{ii}II_1$	$B^{ii}I_1$	–	$B^{ii}II_3$
Healey	II 1a/b	I 6	II 2	II 4

TABLE IV:1 CLASSIFICATION OF HAFTS : COMPARISON OF SCHEMES are present in the Near East, M.-C. Cauvin (1983) who describes eight methods of hafting found in the Near East and Helmer (1983) who has isolated four main forms, each with four subdivisions, making a total of sixteen in all, although not all forms are present in the Near East. These classifications are summarized in Table IV:1.

Steensberg (1943, 126, 133 and 209) groups sickles, on the basis of the relationship of the handle to the body, into reaping knives, angular sickles and balanced sickles; Childe (1951, Fig 3) added an intermediate category of tangential sickles and this classification is adhered to by Rees (1979,438-9) (see Fig.IV:1).

3 Parts of a Sickle

Before examining the evidence in detail it is useful to summarize the information relating to the different parts of the sickle, namely the body, the distal end, the handle and the inserts (Fig.IV:2), as well as to look at the variation in size and the range of materials used.

3.1 The body

The body is the part in which the blades (or inserts) are set. Strictly the body can only be defined as such on sickles where there is a marked change in direction by contrast with the handle, but on straight examples the grooved area is taken to be the equivalent of the body. The body is normally flat, convex or plano-convex in cross section. It is constructed either out of a single piece of antler, horn, bone or wood or is composite like the wooden haft from Ghurob and Kahun (Fig.IV:21) and presumably the ones from Mesopotamia (Fig.IV:18).

It is usually grooved to take the inserts. As will be shown below, the length of cutting edge seems to increase with time (see also Fujii 1983, 135). The shape of the groove seems to reflect the type of blade inserted. For example the narrow V-shaped grooves of the Early Natufian hafts is ideal for accommodating the bladelets with Helwan retouch but is quite unsuitable for the abruptly retouched backed blades (Garrod and Bate 1937, 38)

3.2 The distal end

The distal end, when intact, may be long and tapering as are some of the Egyptian ones (Fig.IV:2) (cf the clay sickles [Fig.VI:37]) or even have an extension nailed to it (the European palamarka [Steensberg 1943, 128-9, 135]) which is presumed to be a device to gather the stalks together before cutting them. Others have a swelling or knob (Hacilar) which is perhaps decorative, or are obliquely cut (Hacilar) or left unmodified (Çayönü). Some of the Natufian sickles (for example four from from Kebara, one from El Wad, one from Eynan and a newly discovered one from Wadi Hammeh 27 [Edwards pers. comm.]) have a semi-circular knob on the back just before the distal end (Figs.IV:4 and 7).

3.3 The handle

Evidence for handles is scarce. The complete sickles from Egypt and the Mesopotamian clay sickles (Figs.IV:21 and VI:34) have short handles which are made either from a suitably curved piece of wood (probably deliberately shaped in growth [Petrie 1891,54] or are separately attached, as in the Gurob and Kahun examples. The end of the handle is enlarged to form a grip or a stop (Camps-Fabrer and

Courtin 1981) so that when held the end of the handle slopes downwards (Steensberg 1943, 135). The carved ends of the reaping knives such as those from El Wad and Kebara, which are at right angles to the cutting edge, presumably had a similar function, as well as being decorative.

The antler examples from Çatal Höyük and Hacilar (Fig.IV:11-13) form a continuous curve though the earlier forms from Çayönü and Nahal Hemar have a straighter handle (Fig.IV:11,1 and 2). The sickle from Hassuna has been reconstructed with a longer handle more like a modern short handled scythe (Fig. IV:15) sickle; contemporary examples from Iran have a curved blade, c. 50 cm long, mounted in a ram's horn at right angles to a short wooden handle (Lerche and Steensberg 1980,70). However, the sickles from Khafarjah (Delougaz 1940, 30-32, Fig. 27) which were found in a box would not have had room for additional handles and they may have been similar in shape to the Egyptian ones. Three flat sickles, one from Shanidar, one from El Wad and another from outside the study area at Sialk (Figs.IV:6 and 8), have perforations at their ends rather like hafting devices of some of the tanged copper sickles, but it is more likely that this was for suspension than for attaching a handle (but see Caton Thompson 1937; Garrod 1957, 215 and Valla 1975,101). Modern analogies suggest that the holes may have been for lashing the blade or for holding a thong which was worn round the wrist when the sickle was in use (Steensberg 1943, 133); one of the sickles from Abu Salabikh had a cord curving down to the right hand end of the sickle (Crowfoot Payne 1980,106). Other hafts from Kebara and Tell Shimshara have perforations in a central position (Fig.IV:10,2-4).

3.4 Inserts

The inserts which form the cutting edge of the sickle are blades or, more rarely, flakes of flint, chert or obsidian. Some are elements of composite tools but the larger ones may have been hafted singly. The edges can be unmodified or denticulated with fine or coarse, widely spaced serrations. They are discussed in detail in Chapters V and VI. The inserts were either arranged so that their edges formed a continuous line parallel to the haft or they were set obliquely to form a toothed edge. Fujii (1983, 143, figs. 3 and 5) has pointed out that there are eight possible ways to orientate each blade in its haft (see Fig.IV:3).

Actual information on the orientation of the blades within the haft is rare as only 7 hafts have blades in situ, but there are over 20 more or less complete pieces with substantial portions of bitumen still adhering to them, which have blades in position. Two sets of blades were found as if hafted, though the haft had decayed (Sha'ar Hagolan [Stekelis 1972] and Tell el 'Ajul [Gaza] [Petrie 1932, Pl. xxiii, 50]). Additional data comes from examples from Egypt, Central Asia (Korobkova 1978) and Europe, especially from the Lake dwellings.

At Hacilar the blades are all positioned the same way up to produce a more or less continuous edge (Fig.IV:12; Mellaart 1970, Fig. 177) as they are on the Fayum example, where they are set so that the joints between the blades are in line with the direction of friction (Steensberg 1943, 127). Other examples with continuous edges are from Umm ez Zøuwetina (Fig.IV:6), Nippur, Abu Salabikh (Fig.IV:18) and Sha'ar Hagolan (Fig.IV:9). The latter three have blades with denticulated edges. At Jarmo, however, the blades were placed with the dorsal and ventral faces alternately uppermost (Fig.IV:15), causing an irregular, pseudo-denticulated edge and at Hassuna flakes with convex edges were used, set so that they overlapped each other to form a serrated edge (Lloyd and Safar 1945,269). The Nahal Hemar blades are so irregularly placed (Fig.IV:11) that it is difficult to see how they could have formed a functional edge.

Evidence for obliquely set blades comes from a fragment from Tell es Sawwan (Fig.IV:16,2; El Wailly and Abu Soof 1965, Fig. 78 lower). Otherwise oblique settings are inferred from lustre configuration and traces of adhesive, for example M.-C. Cauvin's reconstruction of the blades from Aswad (Balikh) (Fig.IV:16,1), where the configuration of the lustre and bitumen indicated that the blades must have been set obliquely in a curved haft: their butt ends were retouched in such a way as to accomodate the shoulder of the next insert (M.-C. Cauvin 1973). Outside the area of study blades hafted like this are known from Karanovo (Hrṫstova 1983, Fig.2) and Meghrgarh (Fig. IV:3; Lechevallier 1980, 261, Pl 1, no 2, Fig. 1, nos. 2 & 4).

Most blades are placed with the dorsal surface uppermost when the sickle is held in the right hand, but those from Kish and Abu Salabikh have the dorsal face of the flint nearest to the wooden haft. Crowfoot Payne suggests that in reaping these sickles would have been held with the ventral face uppermost and drawn upwards towards the reaper so that the blades would be pressed onto the haft and not dragged away from it. The denticulation on the dorsal face would re-chip in use keeping the edge sharp (Crowfoot Payne 1980,108). The wooden back on the sickle from Nippur does not overlap the flint blades and the blades appear to have been inserted ventral face uppermost. It is and was perhaps a left-handed example. The wider spread of gloss on one face than on the other may also indicate which way up the sickle was used (Crowfoot Payne 1980, 109; Fujii 1983 and see also Chapter III).

All the Egyptian sickles appear to be for right-handed reapers (those shown in use in the left hand in the tomb paintings are probably a reflection of artistic licence (Petrie 1891, 54; Steensberg 1943, 135)). In contrast the clay sickles from Mesopotamia all for left-handed use (Adams and Nissen 1972, 208-9; Fujii 1983, note 18).

4 Dimensions

Very few of the sickles are complete enough to provide reliable estimates of dimensions and a more useful basis of comparison is the length of the cutting edge (curved examples measured as the chord of a circle), as summarized in Fig.IV:22). It seems to account for about a third of the tool. From the information in Fig.IV:22 it can be seen that the curved sickles fall into two size groups, those under 200 mm and those above. Earlier ones are all in the smaller range, the size being partly dictated by the use of antler, but the blades in bitumen from Jarmo do not form a much larger curve and the reconstructed haft from Aswad is of a similar size. Later examples seem to be considerably larger, the complete sickles from Kahun and Hemaka measure 420 mm and 459 mm respectively, the body of the curved ones from Mesopotamia measure c. 250 mm across (Payne 1980,108) and that from Gaza (blades only) c. 345 mm. The straight settings show more variation in size and less correlation with date. They range from as little as 50 mm at Shanidar, to between about 100 amd 120 mm at Wadi Hammeh and upto 175 mm at Kebara and 235 mm for the blades from Sha'ar Hagolan. The example from Fayum has a cutting edge of c 250 mm. The Megiddo ones are estimated to be rather larger at 295 mm and 355 mm. Cauvin's suggested reconstruction of the Byblos blades at 40 - 50 cm seems far too long (J. Cauvin 1968).

5 Materials

Of the surviving hafts catalogued in Appendix III, 44 are of bone, 13 are of antler, 2 are of horn; those set in bitumen are presumed to have had wooden hafts and number well over 20, although it is not always clear whether the fragments are from a single sickle.

5.1 Bone

The earliest hafts were believed to have been provided by the jaw bones of ruminants, the animal's teeth being replaced by flint inserts. The Egyptian hieroglyphic sign 'ma' is also supposed to indicate such sickles (Petrie 1892,31-32; Spurrell 1892,54; Macalister 1912; and see also Barb 1972). In fact only one jaw bone (of a deer) used as a haft has been recovered from Sha'ar Hagolan (Cat.no.6.1, Fig.IV.14; Stekelis 1972, 24, Pl.62 no. 1).

Bone, however, is frequently used as a hafting material and survives well in the archaeological record, though the species from which the haft has been made is rarely identified beyond being described as belonging to a large mammal (Ghirschman 1938, 20) or a ruminant (gazelle or cattle [Valla 1975, 97]). Individual identifications include the hafts from Tell Shimsharra which are of metatarsals of red deer (Fig.IV:10). Long bones were used for the sculptured hafts from El Wad and Kebara, one of which is from an ox; split limb bones or rib bones were used for the flatter hafts from Hayonim and El Wad. The bones are grooved so that the blades may be inserted into them.

The sculpted hafts of Period 1 date are restricted in distribution to the Mount Carmel area, where, quite apart from the unusually large number of sickle hafts, much more worked bone has been found than elsewhere, and Stordeur considers that it might have been a manufacturing centre (Stordeur 1981, 434).

5.2 Antler and Horn

Despite its naturally suitable shape, antler has only been used for hafts at Çayönü, Hacilar and Çatal Hüyük (Figs.IV:11-13). It has been identified as red deer antler. The sites are all of Period 3-4 or 5-6. The horn used at Nahal Hemar (Fig.IV:11,2) is from a gazelle and has been heated to bend it into shape. Like the bone hafts the antler ones have V-shaped grooves in which the blades are set.

5.3 Wood

Wooden hafts have been preserved in their entirety only in the Egyptian tombs, for example at Ghurob, Kahun and Thebes and in the tomb of Hemaka and in a grain basket at Fayum, where the wood was identified as tamarisk (Caton Thompson 1934). Elsewhere wood rarely survives, though impressions have been found on a number of pieces of bitumen, sufficiently detailed in one case (Kish) to indicate a hard wood but not to identify its species (Crowfoot Payne 1980,107). At 'Ain Ghazal fragments of wood were preserved but not identified (Rollefson and Simmons 1984). The dimensions of the sickles reconstructed at Byblos suggest that if we accept Cauvin's estimates, wood must have been used for the haft, as bone would not be long enough. Also it would probably have survived. However, note the reservations expressed in section 4 above. Most of the wooden hafts seem to have been single-piece hafts but the Ghurob and Kahun hafts are made of three pieces of wood pegged together. At Kish, Nippur and Abu Salabikh the bitumen appears to have been extended to form a groove into which the wood was inserted, though at Hassuna the wood was grooved to take the bitumen (Fig.IV:3; Crowfoot Payne 1980).

5.4 Clay

Sickles made of clay (without inserts) are well known in the Ubaid and Uruk periods (Adams and Nissen 1982 and see Chapter III). Clay hafts have also been found at Dfajjarabad (Dollfus 1971, 53-4,Fig. 20,22; M.-C.Cauvin 1983, 63, fn.3 and Lechevallier 1980, 260 fn.2). Some of the Late Bronze Age sickles from Palestine (for example Tell Gemmeh and Beth Shan) have clay-like deposits on them which seem to be part of the haft, but the substance could be the remains of the material used to cement the blades in to the haft such as calcium carbonate mixed with an adhesive (see below).

5.5 Stone

The only stone haft from the study area comes from Tepe Gawra (Fig.IV:5) and there is no evidence for its use as a sickle. Another small stone haft, incised with geometric designs, comes from Sialk (Fig.IV:8).

6 Adhesives

The use of adhesives is attested by traces left on specimens and also by the absence of lustre or wear (Büller 1983, 95 -6; Anderson-Gerfaud 1983a, 92; J. Cauvin 1983, 270). The inserts were fixed in their hafts by two main methods: either they were aligned in a groove and secured by an adhesive (as, for example, the hafts from Hacilar and Fayum) or they were encased in bitumen which either slotted into a groove in the wood (Jarmo, Hassuna, Tell es Sawwan) or was itself grooved to receive the wood as at Kish, Abu Salabikh and Nippur). In the latter instances the bitumen seems to be part of the haft (the equivalent of the groove?) as well as having an adhesive function.

In the Levant, where only traces of bitumen remain on the sickle blades (for example from Jericho (Crowfoot Payne 1983), Arad (Schick in Amiran 1978) and Aswad (M.-C. Cauvin 1973, 103), bitumen seems to have been used more like resin. Whether this is because of differential preservation or because much smaller quantities were used is not known. The sources of bitumen at least for the earlier periods in Mesopotamia were probably local (Marschner et al 1978, 110) and in the Levant bitumen probably came from the Dead Sea (Nissenbaum et al 1984, 161). Bitumen was not used as an adhesive at Nahal Hemar, although it was used for other objects and some flint blades seem to have been used to spread or scrape bitumen (Bar Yosef 1985, 11). None of the Egyptian sickles are glued with bitumen and indeed bitumen is unknown in Egypt (Clark, Phillips and Staley 1974,337). The adhesvie used on the Kahun sickle is decribed as a 'black cement' composed of Nile mud and a sticky substance (Petrie 1891,55).

The adhesive used to hold the blades in place in the Fayum sickle is resin (therebentine) (Clark, Phillips and Staley 1974, 337). Resin was fairly commonly used but is usually mixed with another substance. Experimental work suggests that its composition was largely a matter of personal preference (Moss 1983, 128). Actual archaeological examples include a mixture of resin and powdered limestone (Nahal Hemar) and 44% calcium carbonate with organic matter (Hemaka). The chalky concretions on the El Wad lustred blades (Garrod 1958, 215-6) may be the residue from a similar adhesive mixture (cf also the EBA sickle from Tell Gemmeh). A mixture of resin and beeswax was used at Aswad and Hacilar (Mellaart 1970) and beeswax may have been used on its own at Kahun (Lucas 1962, 2; Clark, Phillips and Staley 1974, 337). Red ochre was noted on a blade from Jericho and at Mergharah and was perhaps used in an adhesive mixture. There is no evidence for the use of animal products for glue (Lucas 1962, 35).

7 Decoration

Decoration ranges from elaborately sculpted three-dimensional carvings to simple incised geometric patterns.

7.1 Sculpted Heads

These carvings are on the handle end of the haft. They occur in Natufian contexts at El Wad, Kebara and perhaps Nahal Oren (the object being described as a figurine by Bar Yosef 1983, 22; Fig.IV:4,4). They depict heads of animals, usually ruminants, either gazelle or deer. Garrod has identified the animal on the El Wad sickle as a deer or a goat (Garrod 1957, 219). Cauvin on the other hand considers it to be a gazelle because that was the animal most hunted by the Natufians (33 % of the animal bone being of gazelle [Davis 1978, quoted by Bar Yosef 1981, 22]). Later examples come from outside the study area at Sialk, where one figure appears to be a caprid, possibly an ibex, and another a hare (Ghirshman 1938, 119). A carved haft from Tepe Gawra (Fig.IV:5) may be a stylized version of an animal head (Tobler 1950, Fig.18). Mellaart claims that one of the sickles from Hacilar has a carving on the non-handle end, possibly of an animal head (Mellaart 1970, 161, Fig. 177.2), though this is not clear from the illustration. A full-length human figure is carved to form the handle of one of the Sialk sickles (Fig.IV:5l;Ghirshman 1938, Pl VII, 18).

The tradition of three dimensional carving is seen in other objects of Natufian date (Stordeur 1981; Bar Yosef 1983, 22), but the juxtaposition of sickle and animal calls for some comment. Bar Yosef suggests that sickles may have been used to harvest grasses for fodder for gazelles or that there was a unique religious relationship between hunting (the basic subsistence source for the Natufians) and harvesting (Bar Yosef 1983, 22; J.Cauvin 1972). But it may also be noted that none of these hafts had lustred blades in them and their is no proof of their use as sickles.

7.2 Geometric patterns

These are incised lines; they range from a pair of lines around the girth of the haft (Shanidar) to zig-zags at Hayonim, Umm ez Zuwetina, Nahal Hemar and Sialk (Figs.IV:5 and 8). There are elaborate patterns on some of the hafts from Hayonim (for example Fig.IV:5,5). The end pair of perforations on the haft from El Wad (Fig.IV:6,4) are outlined by a deeply incised groove.

8 Classification of Hafted Sickles

In the classification used here the hafts are first divided into straight and curved forms, and then sub-divided by the number (single or multiple), orientation (parallel or oblique) and type (plain or denticulated) of insert. Details of the system are given in Appendix II, followed, in Appendix III, by a catalogue of known hafts from the study area. This is numbered by period to allow for the insertion of new finds in the relevant place. In the discussion which follows (though not the catalogue) indirect evidence for hafting such as lustre configuration and traces of haft is considered, as well as evidence from microwear analysis. Some hafts from outside the immediate area of study are also included for comparative purposes though the survey of these is not exhaustive.

I Straight hafts

I.1 Multiple inserts with cutting edge parallel to haft

Only two fragmentary hafts of this type (out of a total of over 30) have blades in place. The surviving hafts are made on split long bones or ribs. Most are incomplete so that more detailed classification is difficult, but two main forms are recognizable, those with carved handles and a flat type, some of which have perforations in the butt end or are decorated.

I.1.a Carved ends (Fig.IV:4 and 5)

Hafts of this type are characterized by the three-dimensionally carved heads on the handle end. They have been found in Period 1 contexts at El Wad (Cat.no.1.1), Kebara (Cat.nos.1.15-18) and Nahal Oren (Cat.no.1.21). Three of these are heads only, which are generally presumed to have come from sickle hafts though it should be noted that the head is in a different plane in relation to the shaft compared with the complete examples. In Period 9 there is a small haft with a carved end, possibly a stylised head,from Tepe Gawra (Cat.no.9.3), which is similar to broadly contemporary ones found outside the immediate area of study at Sialk (Fig.IV:5; Ghirsçhman 1938). The two complete hafts from Kebara have semi-circular knobs or projections on the back of the shaft towards the distal end on the same edge as the head faces, Fig.IV:1 and 2. A similar knob is found on other fragments from Kebara and on two fragment from Wadi Hammeh (Cat.nos.1.32 and 37); on one from Eynan there is a hollow to take a knob (Cat.no.1.23) and there is a slight swelling on another from El Wad (Cat.no 1.2). The protruberance also occurs in a reduced form at El Wad.

The complete sickles from Kebara measure 230 mm and 380 mm in length; the size of the head on the El Wad example suggests that it was of similar size to the larger of the hafts from Kebara. The later haft from Gawra is smaller, measuring only 130 mm and is similar in size to the Sialk ones which vary from c. 180 mm (estimated) to 128 mm. The groove, as far as can be ascertained from the complete hafts, extends from the handle or grip (usually the extent of the carving) to the distal end. The length of cutting edge obviously varies with the size of the haft, and ranges from about 90 mm to about 210 mm on the Natufian ones and is about 90 mm on the hafts from Tepe Gawra and Sialk (Fig.IV:22). It normally seems to be about 2/3rds of the length of the haft. It is V-shaped on the examples from Palestine and Tepe Gawra but more U-shaped on the Sialk ones.

I.1.b Flat hafts with multiple inserts (Fig.IV:6)

This category probably embraces a number of sub-types, but because so many are fragmentary they are are included under the general heading of flat straight hafts. They all date from Period 1 and are found at El Wad (12 examples, Cat.nos.1.2-14), Eynan (2 examples, Cat. nos.1.23 & 24), Nahal Oren (unquantified), Hayonim Cave (4 examples, Cat.nos.1.25-28), Umm Qala'a (1 example, Cat.no.1.30) and Umm ez Zuwetina (1 example, Cat.no.1.29). They have V-shaped grooves reaching from the distal end for about one third of the length of the haft. End fragments which are insufficently complete to show both ends of the groove, have been illustrated as if they are distal fragments, but they could be fragments with the groove extending for the whole length. The grooves are quite shallow and narrow (c. 2mm to 4 mm deep and upto 6 mm wide) by contrast with the Period 5 ones from Hacilar. Two hafts have blades in place, Cat.no.1.5 from El Wad and Cat. no.1. 29 from Umm ez Zuwetina (Fig.IV:6,10 and 11). The blades from El Wad are unretouched and unlustred; at Umm ez Zuwetina there is a single blade which is chipped on its ventral face and has slight lustre on the edge. It also projects beyond the length of the haft.

The main variation seems to be in the form of the distal end. On the narrow forms the end tapers to a rounded point (Cat.nos.1.27 and 1.29, Fig.IV:6,9 and 11) but on the flatter examples it is bevelled (Fig.IV:6,3). The handle on the Eynan (Cat.no.1.24) and Hayonim (Cat.nos.1.25 & 26) examples is wider than the body, but utilizes the natural shape of the bone (Fig.IV:6,1 and 6). Two from Wadi Hammeh have been deliberately carved so that the handle is offset from the body (Cat.nos.1.35 and 36; Fig.IV:7b).

Several hafts are decorated. Two have grooves around the girth (Fig.IV:6,1 and 2) One from Kebara, one from Hayonim and one from Eynan have groups of incised lines not unlike those on the sculpted haft from El Wad (Fig.IV:6,5 and 6; Fig.IV:4,6) and there is a reticulated pattern on one from Hayonim (Cat. no.1.26, Fig.IV:6,5).

I.1.c Fragments with perforations (Fig.IV:6,4)

Two fragments (Cat.nos.1.8 and 9), from El Wad A (though considered to be derived from level B (Garrod and Bate 1937, 38) are broader and flatter than the others. They have one or two pairs of perforations at the presumed handle end which Garrod and Bate (1937, 38) assume was for thongs to bind the haft on to a wooden handle. the groove reaches to the end and it may be that this is the distal rather than the butt end of the haft (cf the fragment from Umm Qala'a (Cat.no.1.30)

I.1.d Double-sided hafts (Fig.IV:8,3)

Double sided hafts are known from Nahal Oren (unquantified), from Wadi Hammeh (Cat.no.1.37) and Hacilar (Cat.no.5.1). Preliminary studies suggest that the one from Wadi Hammeh is made from two pieces of split caprid horn core joined down the mid line. It has 9 out of 10 blades still *in situ*; they all have Helwan retouch and none are lustred. Five appear to have been made from one type of raw material and 5 from a different kind (Edwards pers.comm.)

The double-sided haft from Hacilar II (Period VI) (Cat.no.5.1)= is narrow and double sided and is more like a harpoon, though Mellaart suggests that this is unlikely as it was found near a grain bin (1970, 161).

I.2 Single insert (undenticulated) set parallel to the edge of a straight haft (Fig.IV:8)

Only one example of this type has been recovered within the study area from Shanidar (Cat.no.2.2), but another of later date was recovered from Sialk Fig.IV:8,2). The two hafts are of approximately the same size and shape, though the Sialk one has a longer groove and blade *in situ*. It is decorated with zig-zag grooved lines. The Shanidar example has a perforation in its base. Solecki and Solecki (1968) have suggested that this artefact is a knife rather than a sickle. This form is that used by Harlan to harvest wild wheat in Turkey (Harlan 1967).

I.3 Multiple inserts (with coarse denticulations) set parallel to the haft (Fig.IV:9)

The only complete example of this type is from the Fayum in Egypt; it measures some 515 mm. The groove begins c 130 mm from the handle end and continues for about 250 mm. It orginally had four blades in it (though only three survive). They have oblique ends set so that they follow the direction of friction (Steensberg 1943). The remaining 150 mm or so tapers to a point and is curved to the left, similar to a *palamarka*. The handle has an enlarged end. A set of five rectilinear blades still in their original arrangment but with the haft completely decayed were recovered from Sha'ar Hagolan, (Cat.no.6.2) It measures 230 mm in length. J. Cauvin (1968, 72) suggested that the Byblos (*Néolithique ancien*) blades of similar form were also arranged in a straight wooden haft, though because he estimated the length of the sickle on the ratio of terminal elements to other pieces his suggested 400 to 500 mm cutting edge seems too long by analogy with the Fayum and Sha'ar Hagolan sickles (see Fig.IV:22). A similar form is found in the late Dzaitun culture of East Kazakhstan (Korobkova 1978, 7).

I.4 Obliquely set blades in straight hafts

The evidence for this form in the study area is very slim. Büller (1983) has observed from microwear traces that some backed blades from El Wad (Period 1) were also hafted obliquely. M.-C. Cauvin has reconstructed a haft of blades under 60 mm in length on the basis of the absence of lustre on the butt and the oblique configuration (Fig.IV:3 oblique (a)). The distal ends of the blades were truncated, suggesting a deliberate shortening and standardization for a multiple haft (M.-C. Cauvin 1983, Fig.5,2).

I.5 Single blades hafted obliquely

The classic example of blades hafted thus is from Ergozwil in Switzerland (Wyss 1971). The only direct evidence of this type from the study area is a blade of PPNB date with traces of asphalt from 'Ain Gazal (Cat.no.4.2, [Rollefson and Simmons 1984]). It appears to have been a single bladed sickle, but it is absolutely not clear from the brief description available. M.-C. Cauvin (1983, 74) has suggested that some of the larger blades with retouch on the butt and diagonal lustre (en écharpe) from Mureybit III and Aswad, as well as other contemporary blades in the Levant of Period 4 date, could have been similarly hafted. She also is in no doubt that the backed lustred blade from Beit Tamir was hafted thus. However, other examples of this form have clearly defined areas of lustre indicating a curved haft (see Chapter VI). A lustred blade from Qadan in Nubia and some from the Maghreb have been reconstructed in this manner (Wendorf 1968 II, Fig. 92; J.D. Clark 1955) as has one from Turkmenistan at Yalangach Tepe (Korobkova 1978,Fig.2,3).

I.6 Other hafts with straight edges (Fig.IV:4D)

One haft from Zawi Chemi (Cat.no.2.1) and three from Tell Shimshara (Cat.nos.7.8-10)which do not fit into the above categories must be mentioned here. The one from Zawi Chemi has curved back with a straight, grooved edge. The groove is deeper and wider at the ends than in the middle where it is too shallow to have held blades. A generally similar form made of red deer bone is present at Tell Shimshara. These hafts have slightly curved backs and are raised in the centre and decorated with incised notches. They have V-shaped grooves at each end, measuring in length between 50 and 70 mm (giving a total cutting edge of between 100 and 140 mm in length) and 4 to 5 mm deep. They are perforated at the centre between the two grooved areas.

I.7 Axially hafted blades

There is no direct evidence for this method of hafting but the lustre on some of the large blades from Aswad and Mureybit (see Chapter VI) suggests that they may have been hafted in this way (M.-C. Cauvin 1983, 75).

II Curved hafts

Curved hafts were separated into angular and balanced forms by Steensberg (1943) and Childe (1951) added a tangential type (see Fig. IV:1), though the categorization has little relevance for the description of flint sickles as, with the exception of a few examples from Egypt, all are of angular or tangential form. Both types continued in use in metal form with the balanced type eventually becoming the norm.

II.1 Parallel, undenticulated inserts

These have been subdivided into (a) actual hafts and (b) blades set in bitumen though the actual haft does not survive.

II.1a Hafts (Figs.IV:11-13)

Hafts of this type have been found in Period 3/4 contexts at Çayönü (Cat.nos.3.1 and 2) and at Nahal Hemar (Cat.no.4.1), complete with (unlustred) inserts. The form is common in Period 5/6 contexts at

Hacilar where two have inserts in place (Cat.nos.5.2 and 3) and at Çatal Höyük (Cat.no.5.3). They are basically antler tines grooved on the inside of the curve into which the blades are set. In most of the Hacilar examples the body forms a continuous curve with the handle but those from Nahal Hemar and Çayönü have a bend or kick which separated the body from the handle, making them tangential sickles, The Nahal Hemar example had been deliberately shaped by heating the horn (Bar Yosef 1985). The others appear to be the natural shape of the antler. The inserts in the Anatolian examples are small, bi-truncated blades with unmodified cutting edges. This type of blade is a common find at Çayönü but not at the other sites (see Chapter VI and Appendix VI). The inserts in the Nahal Hemar haft are widely spaced and so irregular that it is difficult to see how it could have functioned. The length of the cutting edge of the examples discussed above (with the exception of the Nahal Hemar sickle for which no dimensions are available) range from about 100 mm to 185 mm (measured as an arc of a circle).

II.1b Unmodified Blades mounted in bitumen (Fig.IV:15 and 17)

These are considered separately because the hafting method is different from those which are inserted directly into the haft. Evidence mostly comes from Iraq where bitumen is abundant. The earliest example is of Period 4 date from Jarmo (Cat.no.4.3) and later ones come from Hassuna (Cat.no.5.13 and 14), Tell es Sawwan (Cat.nos. 6.3 and . 7.2) and in Period 9 two fragments come from Tepe Gawra (Cat.no.9.1 and 2) The blades are set into bitumen which holds them together as a group. The whole is then inserted into a grooved haft which in turn may have had a handle rather like a short-handled scythe (Fig.IV:2b bottom right). The inserts themselves appear to be irregular and sometimes, as at Hassuna, flakes were used. The bitumen now covers most of the insert leaving only a narrow strip exposed. However, the extent of the gloss on the unhafted lustred blades suggests that the bitumen may have spread a little. As far as can be ascertained from reconstructions these sickles are larger than the antler hafts (apart from the Jarmo example), measuring upto 360 mm (see Fig.IV:22).

II.2 Coarsely denticulated blades set in bitumen (Fig.IV:16 and 18)

As well as the sickles described above there are some from Early Dynastic contexts which have coarsely denticulated blades but are also set in bitumen in a curved arrangement. However, the method of hafting was somewhat different as the bitumen was wrapped around wood rather than being inserted into it. The bitumen is also more carefully shaped so that the sickle is 'aerodynamically' more efficient. The bitumen on the ventral face of the blade is domed and on the dorsal flat so that it fills in the area between the flake ridge and the edge (Figs.IV:3 and 18). Imprints of teeth on the far edge of the bitumen suggest that the elements were reversed in the haft when worn out. The inside edge of the bitumen also appears to have been grooved to hold the blade (Crowfoot Payne 1980,109; (Cat.no.ED.7 and see Fig. IV:18,8). Crowfoot Payne has also suggested that they were held with the domed surface uppermost so that the friction of the stalks would re-chip the blade and so automatically resharpen the edge.

II.3 Geometric Inserts (Fig.IV:20)

Though no complete hafts survive in the study area, the Bronze Age trapezoidal and triangular blades have been found in settings at Gerar

(Cat. no.BA.1), ~~and~~ Gaza (BA.2) and Ras Shamra (Cat. no. BA.3). They are somewhat similar to the complete sickles found in Egyptian tombs, though they seem to have more 'tailor-made' inserts and to be larger. This may have been the way the bifacial elements from Period 4 contexts at Ramad and Ghoraifé and Period 7 from Jericho were hafted.

II.4 Obliquely Set Blades in Curved Hafts (Fig.IV:16)

There is a set of blades encased in bitumen from Tell es Sawwan, level IV (Cat.no.7.2) and a fragment from Yarim Tepe 2 (Merpert and Munchaev 1975,112) with the blades obliquely set; a somewhat different version was noted by Fujii (1983), from Pulur with what appear to be triangular blades set with the points uppermost. Outside the study area the form is found at Mehrgarh (Fig.IV:3; Lechevallier 1980), Karanovo and amongst the Omalian sickles (Camps-Faber and Courtin 1983, Fig.9,2). M.-C. Cauvin (1973, Fig.3) was able to reconstruct a sickle from Aswad (Balikh) of Period 7 date (Fig.IV:16b), on the basis of the blades with modified ends and oblique gloss, which unlike those from Mureybit was curved. The blades are also shorter and wider than the earlier pieces considered to have been hafted thus. She has however, apparently used a blade from an earlier context in her reconstruction (compare the third blade from the top with her Fig.2,,8) which according to the caption comes from an earlier level).

II.5 Other Curved Hafts

Apart from the more standardized hafts, there are a few which are idiosyncratic. Sickles were considered to have developed from the use of jaw bone have already been discussed. One such grooved jaw bone was recovered in PWA contexts from Sha'ar Hagolan (Cat.no.6.1) and another from outside the study area at Shomu Tepe (Korobkova 19787, Fig,1,5)

9 Summary

For the earlier part of the period of this study there is little direct evidence that relate the surving hafts to the lustred blades. By Periods 3-4 the correlation seems more or less established though some forms may not have been used to harvest cereals (see Chapter III re the coarsely denticulated blades). The range of hafts and their related inserts outlined in the preceding section demonstrates that in order to interpret the modifications to the blades it is necessary to consider how they were hafted. Efficiency studies (see Chapter III.5) suggest that it is the type of insert and whether or not it is denticulated that is important. Size appears to increase with time and may be correlated with harvesting method (Helmer 1983, 193).

There is no hard and fast chronological or geographic distribution of sickle types but some general trends are apparent (Table IV.2). Straight bone hafts are virtually restricted to Period 1 (Early Natufian) contexts in Palestine. It has always been assumed that they were hafts for sickle blades though the only direct evidence for this is the weakly lustred blades from Umm ez Zuwetina. Garrod pointed out that the V-shaped grooved hafts from El Wad would not accomodate backed blades, but would be ideally suited to the blades with Helwan retouch (many of which have lustred edges there). Büller has recently demonstrated (admittedly on a small sample) that although lunates

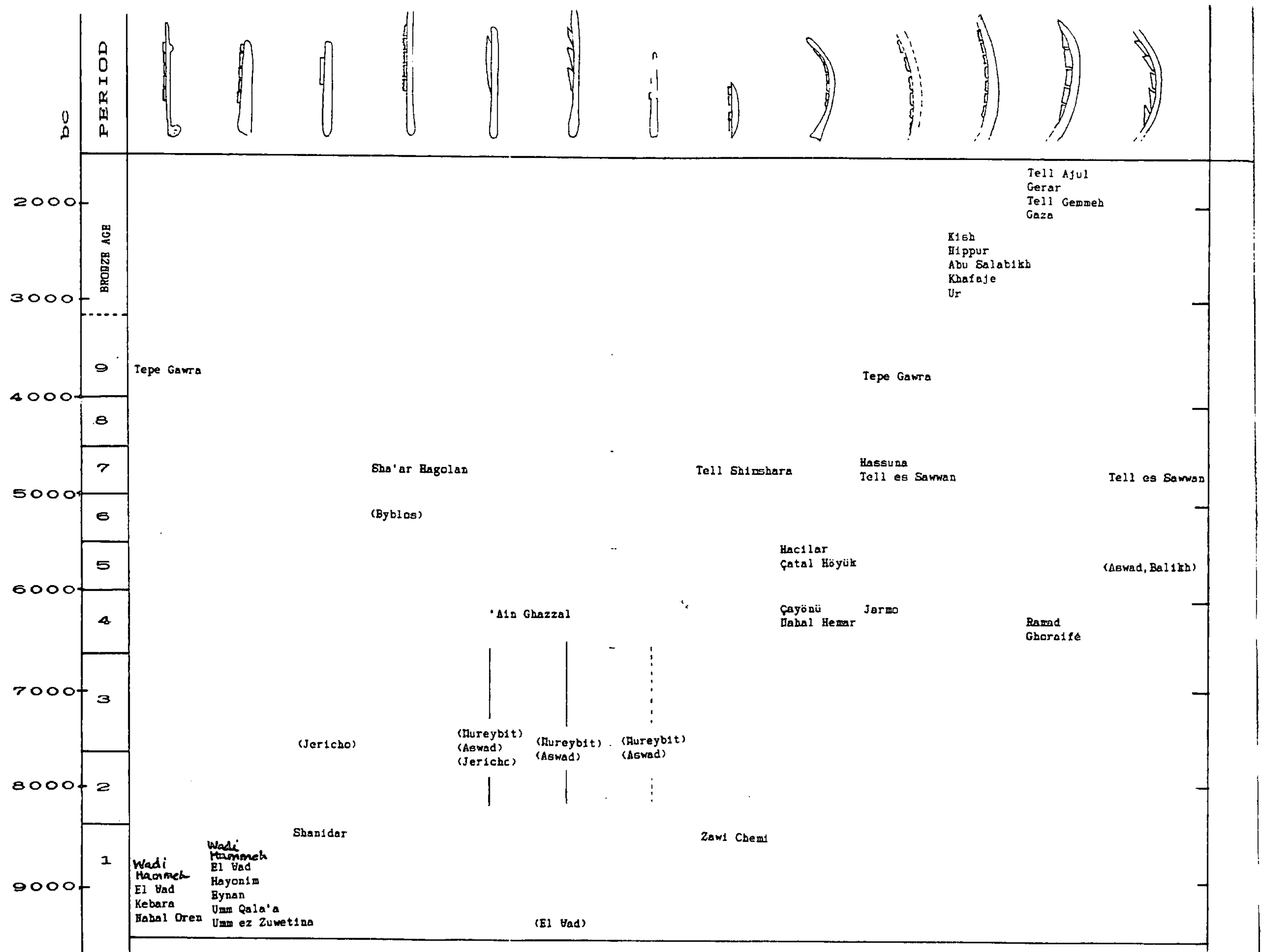


TABLE IV:2 OCCURRENCES OF VARIOUS TYPES OF HAFT with meat polish were hafted in bone, backed blades with plant polish were hafted in wood and set obliquely (1983, 112), further dissociating the hafts with narrow V-shaped grooves from lustred blades. Clearly hafting traces on lustred blades needs to be researched more widely and it would be particularly interesting to subject the two surviving sets of blades in hafts to microwear analysis. It is of interest to note that Korobkova found that the sickle typical of Epipalaeolithic contexts was the least efficient of all that she tried (1978, Table p. 47).

Curved hafts with parallel inserts (usually unmodified bi-truncated blades) first appear in Period 4, towards the end of the aceramic Neolithic, both in Anatolia and Palestine (Çayönü and Nahal Hemar) and continue into Period 5 at Hacilar and Çatal Hüyük. The bifacially worked geometric blades from Ramad and Ghoraifé of this date would also have be set in a curved haft but this is the only evidence in this region until the insert type reappears in PNA contexts (for example at Jericho in Period 7).

Coarsely denticulated blades first occur at Ramad in Period 4 contexts (see Chapter VI), but are most common during Period 5/6 of the Late Neolithic in the Levant and were probably set in a straight haft. It has been suggested that this type was used for cutting reeds rather than cereals (Sauer 1958; Steensberg 1943,21; J.Cauvin 1968; Unger Hamilton 1985a, 250-51). Early Dynastic blades of similar form seem to have been set in curved hafts.

Obliquely set blades occur in some form in all periods. Although there is no precise indication of their function, it was clearly a successful form. Helmer found the efficiency of this type of sickle increased with the number of inserts (1983, 193). Korbokova found it amongst the more efficient forms (1978), but Unger-Hamilton found that the blades tended to pull out when they got caught in the culms (1985a, 250-51).

Single blades obliquely hafted seem to be a PPNA/B phenomenon. They are often heavily worn and present in large numbers (see Chapter VI). Axially hafted blades are much less common than once thought (*pace* Steensberg 1943, Schick 1978) but there are a few probable examples e.g. the PPNA/B blades hafted thus at Aswad (Damascus) and Mureybit.

Preliminary conclusions suggest that there is some sort of correlation between stages of agriculture and the efficiency of a particular type of sickle, though this needs considerably more research especially as Helmer has suggested that the choice of sickle type may be as much a matter of tradition as of efficiency (1983, 193). Certainly there are ethnographic examples of different types of sickle being used to harvest one crop. There is, however, other data which suggests that different tasks required different sickles and that weed-invaded crops on the edge of a field may be harvested with a small knife, whilst the bulk of the field was harvested with a larger sickle (Lerche and Steensberg 1980). If the identification of wear traces on the blades becomes more certain and is used over a wider area, it may be possible to explain the wide range of types which are sometimes found at one site and why one form seems to be preferred to another.

CHAPTER V

THE ANALYSIS OF LUSTRED FLINTS WITH A CASE-STUDY OF JERICHO

PART 1 THE ANALYSIS OF LUSTRED FLINT

1 Introduction

The characteristic which distinguishes lustred blades as a category is a functional one (cf M.-C. Cauvin 1978, 69) but within this category there are a number of different shapes and sizes which may or may not be stylistically or functionally significant but which almost certainly have some chronological or cultural basis. In the next two Chapters I consider the information potential of lustred blades and examine those from Jericho in some detail (this Chapter) and those from other sites (Chapter VI) in as much detail as the published information permits, against the background outlined in Chapter II.

2 Methodology

There have been many different approaches to the analysis and classification of lithic artefacts, including simple typological descriptions used to document cultural change and quantitative approaches, often using type-lists, which have enabled variations in the tool kit to be quantified. More recently, technological studies and functional analyses have been considered important, the latter both at the level of an individual tool (e.g microwear analysis) and in terms of the composition of the tool kit as a whole in relation to its environment. Perlès has argued that stone tools must be analysed as part of the whole techno-economic system of a human group and that it important when investigating reasons for change to discriminate between the factors which are the potential causes of change (1988, 478-9). If the full information potential is to be extracted from stone tools it is important to consider what tools were made from and how they were made, as well as what was made and for what purpose (Perlès 1988,487).

Lustred blades present a special and particularly interesting case for classification because, apart from the crossing of conventional class boundaries, they often exhibit information not visible on other artefacts. For example, there is quite a substantial amount of evidence for hafting, not only from the survival of hafted pieces, but also in traces of adhesive remaining on blades and the configuration of the lustre. These allow hafting methods to be reconstructed and allow us to deduce which modifications were due to the hafting method.

3 Previous Classification

Apart from works relating mainly to hafting and whose prime concern is therefore not with the blades per se (Camps-Fabrer and Courtin 1982; Cauvin 1983 and Fujii 1981; 1983 and see Chapter I) there has been no recent comprehensive analysis of lustred blades from the Near East. Instead work has concentrated on detailed studies of lustred blades from individual sites or areas, for example Lechevallier's work at Mehrgarh in Pakistan (Lechevallier 1980), Valla's description of the lustred pieces from Susiana (Valla 1978),Rosen's work on the Bronze Age sickles in Palestine (1982;

1985), J. Cauvin's report on the Byblos material, Mortensen's on those from Beidha and Choga Mami (1971, 1973) and Crowfoot Payne's on those from the Amuq and Jericho (1960; 1983). These are inevitably somewhat ad hoc and the criteria for classifying lustred blades tends to vary from analyst to analyst; sometimes it is functionally based, but more often it is concerned with the shape of the piece. Sometimes attributes such as truncation and backing cannot be related to edge treatment. It is often general and not always repeatable, making it difficult to compare variations in lustred blades between sites. Because classification has often been at an intuitive level they cannot be subjected to statistical testing.

4 Selection of Variables

In order to use a consistent 'vocabulary' for the description of lustred blades I drew up a basic type list and defined various sets of attributes pertaining to technological, functional and stylistic features of the blade (Appendix IV). This was based on a case study of a sample of the lustred blades from Jericho supplemented by published examples from other sites where necessary. The variables I considered related to raw material, technology, morphology, function and hafting. The reasons for the selection of a particular set of variables are outlined below bearing in mind Redman's comment that the reason for the consideration of a variable may affect its interpretation (1982, 20-22). The actual variables and the resulting classificatory scheme are detailed in Appendix IV.

5 Raw Material

One of the main reasons for considering raw materials is that their nature may affect not only technological features, thus accounting, to some extent, for variation in the form of a piece, but also its performance. There are also implications for functional interpretations because different types of flint become lustred at different rates (cf Unger-Hamilton 1985a and Bradley and Clayton 1987). Also, the heat treatment of flint to improve its flaking quality appears to cause micro-polishes to form more slowly than on unheated pieces (Bradley and Clayton 1987).

A full appreciation of choice raw materials requires a detailed knowledge of their availablity (both geological and economic), type and quality as this may point to social or trade contacts between groups. As this is a specialist study in its own right and beyond the scope of this work, raw materials are only dealt with in general terms as discussed in reports.

6 Technology

The type of blank manufactured will to some extent affect the end product and may itself be partly determined by the choice of raw material and any consideration of the different forms of lustred blades must take this into account. In addition it is important to consider the range of blanks available and what was actually selected. as this can be used to establish patterns of specialization and trade. An extension of Calley's analysis of the technology at Mureybit (1986) applied to other sites may enable the selection of particular types of blades for specific purposes to be demonstrated more precisely. By reconstructing methods of blank and tool production (including tools and by-products) it may be possible to establish whether the entire manufacturing process took place on site or elsewhere (see for example Rosen 1987, 296, Fig.11.1).

7 Dimensions

Dimensions can be used, with other variables, to compare the size of blades selected for sickles with those used for other purposes and also to compare sizes of lustred blades within and between sites, thus providing some measure of standardization, especially if the same raw materials are used, or the blades are 'imported' from a common source (see for example Rosen's work on the Canaanean blades [1983]). However, interpretation of differences and similarities must, of course, take account of differences in raw materials and modifications to the blank. Length, breadth and thickness are the measurements most usually taken. However, as many pieces are fragmentary or it is not certain whether a truncation is deliberate or accidental, it can restrict sample sizes to unacceptably small numbers and I have also used width and thickness as the basis for comparison as they seem to be little affected by breakage. Positions of measurements are shown in Appendix IV.

8 Morphology

The overall shape of a piece is the basis on which classifications and comparisons are usually made. However, shape may alter for a number of different, and sometimes inter-related reasons, including those of style, function and hafting. It is likely, for example that attention (i.e. retouch) to the back and ends will reflect the hafting method (cf Cauvin 1983 and see Chapter IV) though this, in turn, may be functionally or culturally determined as may the type of retouch.

I have recorded modification according to shape, position (ends and back) and the type of retouch or other method of modification.

8.1 Ends

Ends may be left unmodified or adapted to suit a particular hafting method. Two main types of modification are present, the first simply regularizes the basic shape of the blade, but the second is more radical and removes or substantially modifies the ends by truncation or retouch. The shapes produced include straight, oblique, pointed, concave and convex and may be present in combination. The method of shaping varies from truncation to retouch (see Appendix IV for definition of various terms).

8.2 Backs

The back is the side opposite the lustred edge and obviously the term can only be applied to blades with a single lustred edge. Backs need not be modified at all, and when they are it is to a greater of lesser extent, varying from minimal retouch, to reduce or regularize a prominent or irregular part of the back, to a deliberate re-shaping of the contour of the flake, either to straighten it or to make it into a convex or angular shape.

9 Functional Edge

This is the lustred edge which is either left unmodified (though it may be chipped in use) or deliberately denticulated. A number of variables have been considered, some of which are functional, but others seem to be determined by the haft. I recorded the following variables:

a) the shape and regularity of the edge

b) the extent and configuration of the lustre, which presumably reflects the shape of the haft and the method of insertion of the blades (though in most instances less clearly than those from Aswad [M.-C. Cauvin 1973]).

c) the invasiveness and intensity of the lustre which may reflect different materials worked (see Chapter III:3) or the length of time for which the tool was used.

d) the edge angle which again may be an indicator of function. In very general terms those blades with angles under 30° are likely to have been used for cutting, and those over 30° for sawing (Wilmsen 1968; Anderson-Gerfaud 1983).

e) denticulations. Unmodified edges, though very sharp when fresh, have been found to blunt too quickly to be efficient in use, but by denticulating the edge the life of the blade can be prolonged, especially if the denticulations are made on the lower surface of the sickle (usually the ventral face of the blade), in which case the friction from cutting the stalks will chip the edge and automatically resharpen it (Crowfoot Payne 1980).

Sometimes the denticulation is post-lustre, as if an attempt has been made to renew the edge (M.-C. Cauvin 1978, 70-1) but on other pieces seems to be an integral part of the design of the blade.

Three types of denticulation are identifiable: fine, medium (c 2 mm apart) and coarse (c 4 mm apart), though in practice fine and medium were not easily separable. Coarsely denticulated pieces seem to be functionally distinct from the other blades (see Chapter III.5). In addition some blades have no distinctive edge treatment but flat invasive retouch on the functional edge.

10 Other Variables

This includes traces of bitumen or other material still adhering to the blade which result from hafting. This is occasionally present as a clearly demarcated line but is more usually present as an indefinite spotting spread over much of the surface of the blade.

11 Overview

The resulting recording system is detailed in Appendix IV and its accompanying figures. It is unit-based in that it consists of sets of attributes pertaining to particular features which can be independently described and quantified. The main advantages of such a system are that all groups are automatically examined for the same variables and that others can be added as required, thus providing a new dimension to the analysis without destroying the basic work. Also, because every attribute does not need to be present for the system to be usable, it allows in many instances fragmentary pieces to be included in the analysis. For the purposes of this study I have made the treatment of the edge the first division, but other sets of attributes could equally well have been chosen (Appendix IV). Lustred edges have been described as undenticulated (Class I), or as having fine to medium denticulations (Class II), coarse denticulation (Class III), invasively flaked coarse denticulation (Class IV) or flat retouch (Class V). Within each of these categories the blades are described by form (flake, blade, truncated blade. etc., then by shape and the method of modification (type of retouch, truncation, etc.).

The variables of a sample of the lustred blades from Jericho have been coded and the data manipulated and summary counts generated using programmes from SPSS. These results are summarized in Appendix V and discussed in the second half of this Chapter.

Lustred blades from other sites with as wide a range of dates and environmental context as possible were also analysed using the same system in so far as the published data would allow (Chapter VI). The main problems were the incompatibility of systems which in extreme cases masked differences or created the illusion of differences which were not actually there. However, such problems inevitably arise when there is no agreed system and where terminology is not precisely defined. Nevertheless, in most instances the method described above proved to be sufficiently flexible to allow what information was available to be incorporated within the system, though it could not always be quantified. Even if all blades could have be studied at first hand the resulting analysis would still have been limited by the initial recovery and recording on site.

PART 2: A CASE STUDY OF THE LUSTRED BLADES FROM JERICHO

The lustred blades from Jericho were selected for detailed study because there is a long and reasonably well stratified sequence of levels and a sufficiently large number of blades from most contexts allowing quantitative analysis to be a useful tool. Also, the recent publication of the industry meant that the lustred blades could be considered against the background of the whole industry. In addition the material was available for examination.

12 The Site

Jericho has attracted interest for a long period (Kenyon 1957; Bartlett 1982; Bienkowski 1986) and has been excavated several times, the earliest documented excavation being that of Warren in 1867. Between 1908 and 1911 it was dug by Watzinger and Sellin, by Garstang in 1930-36 and by Kenyon in 1952-58.It is the flint from Kenyon's excavations with which we are primarily concerned here. Kenyon excavated in a number of areas (Fig V:1) and hers was the only excavation to reach Natufian levels, though not all levels were reached or were present in each area of Kenyon's excavation, nor can the levels in the different soundings be inter-related (Oates 1987).

The mound of Jericho is situated on rich alluvial soil ajacent to a perennial spring ('Ain es Sultan) with a more or less constant water supply, though it is actually outside the 200 mm rainfall isohyet necessary for rainfed agriculture. The topography of the land would have allowed the water to spread over a wide area forming an oasis (Dorrell 1978, 11). It is also situated in an area with a diversity of types of territory and in summer the oasis may have attracted animals, thus making a unique combination of resources sufficient to support a large population at least until the increasing dessication at the end of the PPNB period. Dorrell has argued that the process of domestication of both plants and animals may have been aided by the natural advantages of Jericho rather than through "revolutionary economic changes" (Dorrell 1978, 14).

Jericho's particular interest from the point of view of the study of lustred blades is that apart from its situation, there is a reasonably good amount of botanical remains and stone equipment as well as a series of chipped stone industries, of which the lustred blades are part, dating from Natufian to the Middle Bronze Age. These have been described by Crowfoot Payne (1983). The quantities and range of types present are summarized by period in Table V:1. Full stratigraphic details can be found in Crowfoot Payne's Tables 1-30.

13 The Lustred Blades

Over 1800 lustred blades were recovered during Kenyon's excavations. They were found in every level. The numbers vary from level to level and there is a certain amount of residual and derived material (see

Level	micr	back	arr	sic	bur	perf	scr	dent	kn	nibb	ret	axes	oth	total
Natufian	12	5		4	2	3	15	2		3	13			59
Proto-Neo				9	95	15	26	1		179	25	13		363
PPNA		18	*9	231	712	202	206	33		2472	253	113	22	4271
PPNB		187	'405	998	913	191	212	111		1046	268	59	272	4662
PNA			8	52		7	5		39			3		114
PNB				11										11
PU				9		1	9			1	†5			24
EB				181		5	33			8	†9			236
PU/EB				2		1					†1			4
EB-MB				9		1								10
MB				61										61

*= 2 Proto-arrowheads

†= Canaanean blades

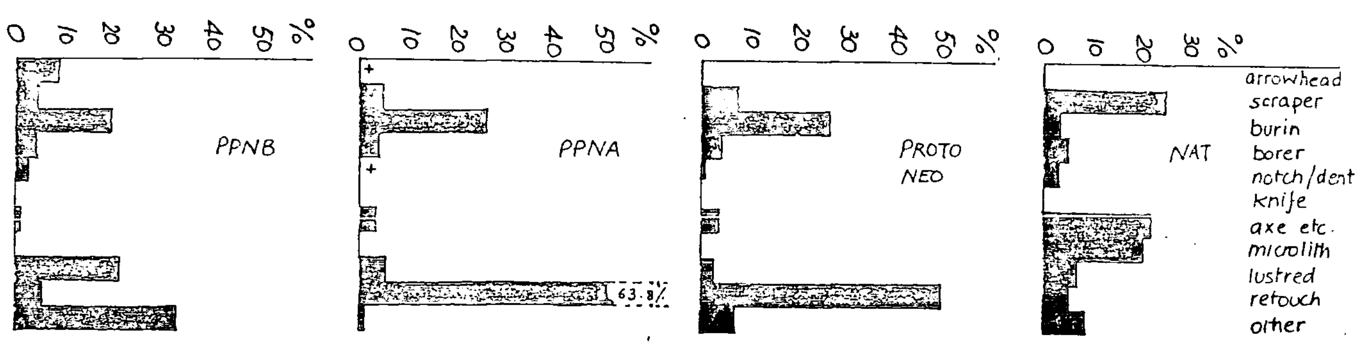


TABLE V:1
FREQUENCIES OF RETOUCHED TOOLS FROM JERICHO
(excluding derived and intrusive tools)
(After Crowfoot Payne 1983)

Area/ Level	Sq E I,II,V	Sq DI	Sq DII	Sq F	Tr I	Sq M	Tr II	Tr III	Sq EIII -IV	Site H	TOTALS
Natufian	4									*	4
Proto-Neo.					9						9
PPNA (Sultanian)	49	31	26	46	40	35		4			231
PPNA?B	25	6	2	28	4	8	7	3			83
PPNB	250	55	45	146	112	247	63	80			998
Derived Acer,Neo		16		12	8	5	30	31	4		106
PNA		12		11	7	8	8	5	1		52
Derived PNA		2		2	5	3	7	8	5		32
PNB		3			4			3	1		11
Derived PNB					4	2		3	6	3	18
Proto-Urban									9		9
PU/EB							2				2
Derived PU/EB					3		5	4	*(3)	13	28
EB		4		3	18	3	23	42	60	27	181
EB-MB					4		3	2			9
MB					3		3	8		47	61

* = intrusive

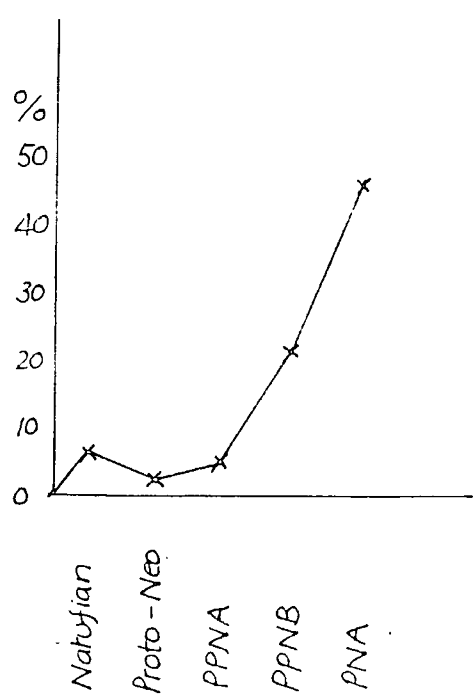


TABLE V:2
OCCURRENCE OF LUSTRED BLADES AT JERICHO

Table V:2). Lustred blades were also, of course, found during earlier excavations; those from Garstang's excavations were also reported by Crowfoot Payne (Crowfoot 1935 and 1937) but not included with the Kenyon material (though they are sometimes cross referenced).

Crowfoot Payne describes fourteen different classes of lustred blade in seven periods, each with a different industry (Crowfoot Payne 1983, 623). In order to try to ascertain the reasons for some of the changes in the types of lustred blades in different periods I re-examined a sample of about 40 % of the lustred blades using the criteria discussed above on the more complete examples. The results of this analysis are detailed in Appendix V and summarized below. Contemporary lustred blades from other sites are discussed in Chapter VI against the general cultural background outlined in Chapter II.

14 Natufian

Epipalaeolithic levels were reached only in Sq E at the north end of the mound. No plant remains were recovered (Hopf 1983, 577) but three deep stone-pipe mortars were present (Dorrell 1983, 489-90). The lithic industry is later Natufian in affinity (Crowfoot Payne 1983, 623). Only four lustred pieces were recovered from Natufian levels and two from residual contexts (see Table V:2 & Crowfoot Payne 1983, 639,726), none of which I re-examined, though they are illustrated by Crowfoot Payne (1983, Fig. 246,1-4, Fig. 263,1). The attributes are detailed in Appendix V.

The raw material is a fine grained nodular flint probably found locally (Crowfoot Payne 1983, 624, 629). The technology is based on the production of flakes and small 'microlithic' blades which were also used for 'sickle' blades. The lustred blades measure between 31 and 38 mm in length which is about the middle of the length range of unused blades (see Fig.V:17). They are all of Class I with undenticulated edges. All have retouched backs and two sub-types are identifiable: those with unifacial abrupt retouch like backed blades (from which they are distinguished only by the presence of lustre), Class I.E1i (Fig. V:2,3), and those with fairly abrupt bifacial retouch (Fig. V:2,1 & 4), Class I.E2ii. The ends are unretouched.

The lustred edge is irregular in outline and abraded. The configuration of the lustre is not mentioned by Crowfoot Payne. The lustre only extends for part of the length of the available edge. On Fig.V:2,1 it is on the upper two thirds as also probably on no.2, though it is incomplete. On the other two it is in the middle portion only (Fig. V:3,3 & 4). There is no direct evidence of hafting and no blades had any traces of bitumen on them. The absence of lustre at either end suggests that the whole of the back was encased in the haft, possibly slightly obliquely in the case of Fig.V:2,1 (cf the El Wad examples described by Büller 1983). There has been no functional analysis of these blades.

15 Sultanian: Proto-Neolithic and Pre-pottery Neolithic A

The lithics from these two stages are described separately by Crowfoot Payne, although she suggests that the differences between the assemblages are not enough to separate them without stratigraphic confirmation (Crowfoot Payne 1976; 1983, 664). Also the C14 dates from a Proto-Neolithic context fall within the range of the PPNA dates (Appendix I). During this stage the area of the tell covered 10 acres and by PPNA times it was surrounded by a wall. There are twenty-five levels of occupation lasting some 700 years.

15.1 Proto-Neolithic

Proto-Neolithic levels were encountered in area M at the centre of the mound and to a lesser degree in other areas. No plant remains were found in these contexts, but ground stone equipment included pestles and a quern, though this appears to have been used for grinding pigment (Dorrell 1983, 490). Only nine lustred blades are listed by Crowfoot Payne (Crowfoot Payne 1983 Table IV) but 10 were present in the sample examined by me (see Appendix V).

The raw material described by Crowfoot Payne includes a small amount of fine-grained nodular flint similar to that used in the Natufian period as well as a newly exploited source, probably in the area of Gilgal in the Jordan Valley, which is very fine-grained and of sandy brown, mauve or pink colour or banded. Some material may have been heat treated (Crowfoot Payne 1983, 629, 759). She does not detail the use of the different types of flint.

The classes present are I.B, I.E11 and I.E21. Attribute analyses are summarised in Appendix V.

Technology is based on blade production with a variety of core types, but with pyramidal forms predominating. Most of the cores were worked to the point of exhaustion, perhaps indicating the need to conserve raw material. The presence of core-reviving flakes suggests careful preparation (Crowfoot Payne 1983, Fig 253). The blades are larger than the Natufian ones though still mostly under 60mm in length. They have ground butts which are often V-shaped.

Five of the lustred blades have their backs blunted by abrupt retouch and are straight or slightly convex (Classes I.E11 and I.E21) (Fig.V:2,10, 11 and 12). Butt and distal ends appear to be unmodified though several distal ends are broken. The rest are unmodified (Class I.B). The dimensions of the complete examples are c 60 x 16 mm, but as some fragments are up to 30mm wide, it seems probable that they were originally longer than some of the complete pieces suggest. The sickle blades seem to be amongst the largest blade tools present and are larger and wider than most of the unused blades which Crowfoot Payne describes as slender (Fig. V:17).

The lustred edges, though undenticulated except for Fig V:2,12 which has fine, fairly regular denticulations (but not definite enough to be classed as a denticulated blade), are generally irregular and abraded (Fig V:2,7). The lustre is on one edge (8 examples) or both edges (2 examples Fig.V:2,8 & 9). It extends from the distal end to the butt, though on those examples with the bulb intact stops short of the bulb except for Fig.V:2 . Edge angles vary from 22° to 47°. The average is about 33°.

Traces of bitumen (presumably an adhesive) remain on five of the blades, two of which suggest that the blades were hafted lengthwise as single blades (Crowfoot Payne 1983,632). The bitumen on the examples shown in Fig V:2,5 & 12 forms a a broad band about 10 mm wide, which on no.5 is on both faces. On another, (Fig.V:2,9), which has lustre on both edges, the bitumen forms a band down the centre of the blade. It is unlikely that this blade was hafted axially and more likely that the blade when worn, was reversed in the haft; the bitumen remains only in the middle of the blade because, as Crowfoot Payne suggests, it would not adhere to the lustred surface (Crowfoot Payne 1983, 632).

15.2 Pre-pottery Neolithic A

PPNA levels were excavated in areas DI and DII, F, M, Trench I, Tr III and Squares E I, II and II. Plant remains are scarce but there are chaff and grain impressions in bricks confirming that domestic cereals were used (Hopf 1983, 591 & 610). Ground stone equipment now includes a number of querns and grinding stones as well as mortars, cup holes and pestles (Dorrell 1983, 491-520). There is a considerable increase in the number of lustred blades: 231 from stratified contexts of which 74 were examined by me and the 69 more complete examples are detailed in Appendix V. However, this still represents only a small proportion of the retouched pieces (see Table V:1).

The raw material is similar to that exploited in the Proto-Neolithic except in Area EI, II and V, where more of the translucent Natufian type raw material was used. The blades from this flint are smaller than other PPNA blades, showing a length distribution similar to the

Natufian ones (Fig.V:3; Crowfoot Payne 1983, 641). This is also the only area in which Natufian remains were found.

The technology is one of the production of small blades with punctiform striking platforms from single ended cores, the majority of which had been worked down to a small size. There is also some attempt at core preparation with some crudely crested blades (Crowfoot Payne 1983, 640, Fig. 265); lustred edges occasionally occur on blades struck from such cores.

Crowfoot Payne (1983, 649-50) divides the lustred blades into two main forms:

Type IA	Unretouched blades (34%)
Type IB	Blades with retouch on all or part of the back or across ends or rarely both (35%)
Fragments	31%. In the sample examined by me 32% were medial fragments, 18% butt and 12 % distal, 5% were 3/4 complete and the rest unclassifiable.

In terms of the classification proposed in Appendix IV the following classes are present: blades with undenticulated edges Classes I.B, I.C, I.E1 and I.E2, blades with denticulated edges: II.B, II.C/D, II.E and possibly Class II.G, though blades of Class II are rare; details of the attribute analyses are given in Appendix V.

Blades of Class I.C have modified butt ends. In some instances this could be due to damage, but in two the end appears to have been deliberately squared off (Fig.V:3,4). Though these two blades are technically 'truncated', they are different from those in later levels and have been included with Class C here. Backs are naturally straight. Lustred edges are unmodified though sometimes irregular and chipped. A few are convex (Fig.V:3,3 & Fig.V:4, 3 & 4). The lustre extends either the complete length of the blade (rare) or it avoids one or both ends; it mostly extends to the first ridge on the dorsal face and is diffuse on the ventral and is parallel of slighlty oblique in configuration.

Crowfoot Payne's backed type IB (my general class I.B) consists of a number of different forms and retouch types. They include backed blades usually convex in outline, with semi-invasive often bifacial scaled retouch (Beit Tamir type, my class E.2ii, Fig.V:5). Others (Fig.V:6) have abrupt unifacial retouch, some only for part of the length and straight or convex backs (Classes E.Ii and ii). Lustred edges are unmodified, but a few have fine irregular chipping probably sustained in use. The lustre normally forms a broad band and is either parallel to the edge or may end in an oblique line. Fig.V:6,6 is exceptional in its shape and the narrowness of the band of lustre.

The lustred blades of Class II are sometimes difficult to distinguish from blades with extensive chipping on their edges like Fig V:4 nos. 3 & 4. Most are fragmentary, but of those with ends which survive one is unmodified (Class II.B). One has been retouched to form an oblique edge and the other is pointed. There is a backed blade with a truncated end which is very similar to some in PPNB levels (Fig.V:6,5) and has tentatively been classed as Class II,G, but is an isolated example. In general denticulations are finer than those typical of PPPNB levels but the possiblity remains that they are intrusive.

Dimensions of the lustred blades are shown in Fig.V:18. Crowfoot Payne has noted that the convex blades are on broader thicker flakes and this is confirmed by a comparison of dimensions though the sample is rather small. Edge angles seem to be slightly more abrupt on the blades which have convex-shaped lustred edges and on those with retouch, though most are under 40°.

Hafting

Bitumen is found in small patches on the surface of some of the blades (Fig.V:3,3 & Fig.V:6,4). It covers more than half of the width of the blade (between 12 and 19 mm) and extends from one end to the other. Lustre configuration suggests that hafts would probably have been straight, with one or more blades held lengthwise (Crowfoot Payne 1983, 651), though those with an oblique band lustre may have been set slightly obliquely in the haft.

Function

Unger-Hamilton examined 19 PPNA lustred blades for micro-wear traces. She found that only 4 had been used to cut cereals and that one had striations similar to those from crops in tilled ground (see Chapter III); 3 had been used to cut stipa or reed, 5 bullrushes and 1 grass; the rest were indeterminate (1985a, 274; 1985b, 122).

Despite Crowfoot Payne's claim for the overall similarity of the Proto-Neolithic and the PPNA industries, PPNA lustred blades are larger than the Proto-Neolithic ones (Figs.V:17 and 18) and new forms are present though numbers are rather too small to allow firm conclusions to be drawn.

16 Pre-pottery Neolithic B

The PPNA comes to an abrupt end c 7500 bc and there is a break stratigraphically, structurally and in all equipment between A and B (Kenyon 1970, 47). When the site is re-occupied c 7300 there is more evidence for domesticated cereals including the presence of naked forms and other plant remains (Hopf 1983, 592-54) and some suggestion of irrigation (Dorrell 1978, 16-17), though Hopf does not see any need of irrigation until PN times when there is evidence for increasing aridity (Hopf 1983,610). The ground stone equipment also shows a change of form, for instance the querns are different, the trough type being characteristic; there are also less pestles probably because of the introduction of naked wheats and barley which do not need pounding (Dorrell 1983, 527). Lithic industries also are different. Crowfoot Payne distinguishes an early and a late phase on the basis of the arrowhead typology (Crowfoot Payne 1983, 683), though this is cannot be seen in other tools.

Numbers of lustred blades show a great increase at this time, numbering some 998 from stratified contexts (about 20 % of the tool kit) and some derived pieces were also found in PNA and later contexts (Crowfoot Payne 1983,712, 722). A further 700 or more were recovered by Garstang (Crowfoot 1935, 181: 1937, 49). They were found in Sqs EI, II, V, DI, DII, F, Tr I, M, Tr. II and Tr. III. Detailed information is available for 358 of the 402 blades which were either examined by me or which are published in sufficient detail to allow comparisons to be made.

Raw Material

The flint is the same light brown, mauve or pink coloured flint first used in the Proto-Neolithic but the technology now includes the use of large naviform cores as well as smaller flake and blade cores (Crowfoot Payne 1983, 667).

Technology

Blades struck from naviform cores seem to have been used almost exclusively for sickle blades (Crowfoot Payne 1983, 669) which were frequently re-worked as gravers and arrowheads. The careful preparation of the core allows the detaching of blades of predetermined shape and size which require little further modification. They have pointed distal ends and tapered butts; the bulb of percussion is small and the striking platform punctiform and often ground - a feature confined to the aceramic Neolithic at Jericho. The blades are longer than the PPNA ones measuring up to 180 mm in length although almost 45 % fall between 40 and 100 mm (see Figs. V:17-19). Groups of unused blades were sometimes found together providing a 'store' of new blades (Crowfoot Payne 1983, 671). The lustred blades taken as a whole fall within the range of the unmodified blades (up to 180 mm long) a higher proportion of lustred blades are larger (i.e. between 60 and 120 mm), c78% of lustred blades compared to 38 % of unused blades. As would be expected blades are also larger than the surviving cores (cf Crowfoot Payne 1983,667, 671).

The variation in the lustred blades are detailed in Appendix V. They include undenticulated forms of Classes I.A I.B, I.C, I.D and I.E and denticulated forms of Classes II.B, II.C, II.D, II.E and possibly Class II.F. Crowfoot Payne subdivided them into two basic classes:

Type I: Blades without denticulation (as in PPNA levels)

Type 2: Blades with fine denticulation

She further subdivides them into unretouched blades(A) and blades with retouched (B) backs and/or ends.

While I agree with the basic division into undenticulated and denticulated forms with and without retouch I found a number of sub-groups among the pieces with retouch in the sample which I looked at. Some are variations on a basic form, especially Classes B-D, but others do seem to have more radical treatment (e.g. bitruncated pieces).

I Undenticulated blades

Undenticulated blades (ClassI) form 15% of the total of lustred blades (Crowfoot Payne 1983, 683) but only 7.8 % of the sample, though if those with chipped edges are included the proportion increase to c. 13%. They are mainly single-edged, only two double-edged pieces being present in the sample; the left edge is more commonly lustred than the right. A small sub-group (Crowfoot Payne's type IB) have been modified by retouch (Fig.V:8). These were not explicity described or quantified by Crowfoot Payne but clearly form only a small percentage of the blades (see her Fig. 316). As can be seen from Appendix V, retouch is largely confined to the ends and only three backed examples were recorded. The lustre forms a band along the the edge. On about half it reaches to the ridge on the dorsal face, but is only on the edge on the ventral face. On the rest it is confined to the edge on both faces.

II Denticulated blades (Crowfoot Payne's Type 2A and 2B)

The majority of the lustred blades from PPNB levels (c 75% according to Crowfoot Payne and nearly 93 % of the sample) have denticulated edges. The most regular denticulations are c. 2 mm apart, though there are a few finer and coarser examples; some denticulations are very irregular and difficult to distinguish from chipping caused by use. The deliberate denticulations are usually on the left edge of the blade and formed by inverse unifacial retouch (Fig.V:9). On most the retouch is confined to the edge but a few have more invasive retouch. Crowfoot Payne also noted that those with denticulations made by direct retouch are either double-edged pieces or have denticulations on the right side, or one edge may be lustred and worn in use. A few are bifacially retouched and other attributes suggest that they may form a separate sub-group (Class II.F see below). The denticulated blades include retouched (Classes II.C and D) and unretouched forms (Class II.B) and a few backed and truncated pieces. The retouched forms predominate.

II. B: Unmodified blades (Fig.V:9)

These are suitably shaped blades which are used without further modification. The lustred edge is normally straight or convex. The lustre is oblique in shape and tends to avoid the butt and sometimes the distal end. Fig.V:9,4 is unusal in that only the upper two-thirds are lustred. The dimensions of this form are very varied, but they are amongst the largest and slenderest blades present (Fig.V:19 and Appendix V).

II.C and D: Denticulated blades with modified ends (Fig.V:10 and 11)
The butt end of the blade is normally tapered and the modification mostly serves to emphasise or regularize the shape and may be executed in various ways from minimal abrupt edge retouch to flat, invasive inverse retouch. About half of this type (Class II.D, complete and fragmentary pieces) have retouch on their distal ends as well as on the butt (Fig.V:11,3 and 4). Lustre patterns seem to be similar to those on unmodified blades (Appendix V). The blades in this category show a similar length/breadth distribution to Class II.B, confirming the minor nature of the modification. Similarities in other attributes such as shape, features relating to the lustred edge, etc., also suggest that they are probably variations of the same basic class.

II.E: Backed blades (Fig. V:12)
A small proportion of the blades have retouched backs, though they do not form a homogeneous category. Some have nibbling retouch on protruding edges and the retouch seems to modify this rather than to be a deliberate re-shaping of the blade. Others, however, are abruptly reotuched and a few are bifacially flaked (Fig.V:12,3).

II.F: Truncated blades (Fig.V:13)
This class was not distinguished by Crowfoot Payne. Nevertheless, the blades assigned to this category are sufficiently different from other lustred blades to suggest that they could be classed as a separate group. A few blades have one or both ends truncated and/or retouched

(Appendix V). They include triangular and rectangular forms though they cannot always be distinguish from accidentally broken pieces. One piece does have bitumen on its truncated end, suggesting that it abutted another in a haft. Another (Fig.V:13,5), though small has both ends retouched, suggesting that the truncation was deliberate. Most of these blades, especially the triangular forms have other features which distinguish them from Classes II.B & C. For example, denticulations are very regular and slightly more invasive, more widely spaced and often bifacially executed; on pointed pieces denticulation and lustre goes right up to the point (which it does not usually do on other types, compare Figs.V:9 and 10 with Fig.V:13). The lustre appears to be parallel to the edge rather than oblique.

Hafting

No difference in hafting method could be detected between the denticulated and undenticulated blades, both having roughly equal proportions of blades with parallel and oblique bands of lustre. The presence of bitumen on the back and in one case on one end (Fig.V:12,3), and the absence of lustre on the butt end, suggest that these blades had the butt end encased in the haft and probably most of their back, but that the tip might have protruded obliquely (Crowfoot Payne 1983, 686; Cauvin 1983,74). However, on the examples which I have examined, the oblique line of the lustre is in the wrong direction for this (Fig V:9). One blade had streaky lines of a white substance on it (Fig V:10,2) but it is not clear whether this is the remains of adhesive.

Function

Functional investigation of 33 blades of Crowfoot Payne's Type 2 (i.e. those with denticulated edges) by Unger-Hamilton has demonstrated that 75 % of them were used to cut cereals and that all had striations parallel to the cutting edge consistent with those found on tilled ground. The others (apparently the same type) were used to cut reed, stipa and bullrushes.

17 Pottery Neolithic A (Yarmukian)

The site, like many others in Palestine during the late seventh and sixth millennia was abandoned c 6600 bc and was not occupied again for another 1000 years. When it was reoccupied, the settlement seems to have been impoverished and there is very little evidence for agriculture, either in the plant remains (Hopf 1983, 578f) or in the ground stone equipment. The relevant types of the latter, though present, are few in number and consist of pestles, mortars, querns, probably saddle querns like Bronze Age ones and grinding stones (Dorrell 1983, 544-551). The flint industry is numerically small and there is a decline in the number of lustred blades. Most of the flint of this date comes from pits sunk into PPNB levels and is likely therefore to contain a certain amount of derived material. Fifty lustred blades considered to be of Yarmukian affinity (defined on the basis of the finds from Sha'ar Hagolan [Stekelis 1972]) distinguished by the characteristics described below were found in stratified in PNA contexts; 35 were found in derived positions in PNB and PU levels (Crowfoot Payne 1983, Tables 17-30). I examined 37 of this type. Garstang recovered 243 though this is an inflated figure as it appears that they were mixed with Tahunian ones (Crowfoot 1937,40; Crowfoot Payne 1983, 623, 714).

Raw materials

The raw material used in PNA levels is completely different from that used in the aceramic Neolithic, although some PPNB blades were reused (Crowfoot Payne 1983, 708). It is slightly coarser, not banded and ranges from buff to dark brown in colour. Tabular flint is also used for scrapers and knives but not for sickle blades.

Technology

PNA technology is not well documented. Blank production seems to be oriented towards flake production and no blanks suitable for sickle blades were recovered (Crowfoot Payne 1983, 706). Naviform cores are no longer used. All the lustred pieces have been modified in some way, including the re-used PPNB blades; typically they have coarse denticulations, formed either by a single blow or by flat invasive retouch.

Typology

Three main forms are present, namely Classes III.F and G, Class IV.G and Class V.G. The details are summarized in Appendix V. They are rectangular or triangular in shape.

Crowfoot Payne also made a similar distinction, her three classes being labelled A-C, though she suggests that there may be some overlap between them (Crowfoot Payne 1983, 709).

The blades in Class III (Fig.V:14) have the denticulations formed by a single blow from either face; they are mainly unbacked (III.F) or, if backed (III.G), are only unifacially retouched, though the flaking may be invasive. They are shorter and narrower than Classes IV and V.

Class IV (Fig.V:14,4-11 and 15:1-3) blades have bifacial retouch on the functional edge and on the back which may be invasive. They show a great range of sizes.

Blades in Class V (Fig V:15) have bifacially flaked edges but the teeth are so shallow as to be virtually non-existent. The edges tend to be markedly concave.

In all cases the lustre forms a narrow band parallel to the edge, it reaches to both ends. The retouched edge sometimes obliterates the lustre, suggesting that some pieces were reworked.

Hafting

There is no direct evidence from Jericho as to how these blades were hafted and no bitumen was found on any of them. However, a set of blades of Class III was found at Sha'ar Hagolan arranged as if hafted, although the haft had decayed. The blades were placed end to end with the triangular pieces forming terminal elements (see Chapter IV and Fig IV:9). The lustre configuration suggests that the blades from Jericho were hafted thus. Blades of Class V have concave edges, and where recorded, the lustre has a concave configuration, suggesting that they may have been placed in a curved haft.

Function

Experimental functional studies have indicated that blades with coarse denticulations are unsuitable for harvesting cereals and better suited to cutting reeds (Steensberg 1943; Cauvin 1968 and cf Unger-Hamilton 1985a 276). Microwear analysis is hampered by the difficulties in identifying polishes on a retouched edge, but reed and stipa polishes were identified on blades of Class III. However, some have striations parallel to the edge, a feature which when found with cereal polish is associatied with tilled ground; the presence of striations with reed and stipa polish is unusual. The apparent absence of sickles used to cut cereals seems to be corroborated by the paucity of palaeobotanical evidence (Hopf 1983, 579) and the situation appears to be similar throughout Palestine.

18 Pottery Neolithic B and Later Material

Although strictly beyond the limits of this thesis the continued use of flint for sickles cannot be ignored and the basic classification of these blades is summarized for comparative purposes.

Ghassulian

Evidence for Ghassulian occupation and artefacts at Jericho is slight, though there is enough to suggest similarities with the Ghassulian culture (Crowfoot Payne 1983, 718). Crowfoot Payne recovered 11 blades which she considers to be Ghassulian.

They are of brown, rather coarse-grained flint. Blades have been selected as blanks but no further details are available and no cores survive. The lustred blades are of Class II.G (Fig.V:16) and are made on blade segments with abrupt retouch along the back (curved) and ends and have finely denticulated edges (the denticulations being much finer than on the PPNB examples). The lustre on the edge extends for the length of the segment and is often slighly concave in shape, perhaps suggesting a curved haft.

Proto-Urban - Early Bronze Age

Levels of this period were found in areas DI, EIII-IV, F, H, M, Tr L,II and III (though some of the upper levels contain a considerable amount of earlier material). Proto-Urban and Early Bronze Age industries though mixed with derived material can be isolated by the type of raw material and technology, for example the use of tabular flint for scrapers and large Canaanean blades (Class I.H, Fig.V:16) and of quite coarse-grained flint for sickles (see Appendix IV). There is no evidence that these blades were made on site, but as is the norm at this time, they were probably imported from specialized factory sites (Crowfoot Payne 1983, 723; Rosen 1983).

Normally, in the EBA the middle section of the blade is selected for use (only 2 lustred pieces have the bulbar end intact). Backs and ends are only occasionally retouched. The segments measure between 40 and 80 mm in length and 14 to 29 mm in width. One unsegmented lustred blade measured 130 mm. However, larger blades are more common in intermediate levels, often with the bulbar end still intact (Crowfoot Payne 1983, 723, 725).

The lustred edge is used initially without modification, but then it may be resharpened. About 50% are double-edged. The lustre extends for the length of the blade and is parallel to the edge (except for one example which has a diagonal line). On the larger types the lustre stops short of the butt.

There is no direct evidence for hafting among the Jericho examples but the configuration of the lustre suggests that they were set contiguously in a straight haft. Rosen suggests a cutting edge of c. 30 mm so that there would have been between 4 and 8 blades to a haft (Rosen 1982).

One blade has a micro-polish and striations consistent with cutting cereals (Unger-Hamilton 1985a, 279).

Middle Bronze Age

There is no information about lithic technology of this period at Jericho. The flint is brown, mottled with lighter patches (Crowfoot Payne 1983, 725), or light honey-coloured chert or brown or grey (Crowfoot 1937, 37). The lustred blades are very distinctive. A total of 61 were recovered from Kenyon's excavations and 15 from Garstang's (Crowfoot 1937, 37). They are made on large blade fragments or on flake blades. The striking platform remnants are plain and at an obtuse angle to the bulbar face. They average 70 x 25 mm (Crowfoot 1937, 37). They are abruptly retouched along one or both ends forming a triangle, parallelogram or rhomboid. The back is sometimes irregularly retouched (Fig V:16). The lustred edge extends for the length of the blade and is irregularly denticulated. The curve of the back as in analagous examples from contemporary sites in Palestine suggests that they were set in a curved haft.

Late Bronze Age

None were recorded from Kenyon's excavation. However, 2 out of the 6 flints found in Garstang's excavations were sickle blades. They are made of dark brown flint with orange cortex. They have retouched ends and backs and measure 50 x 35 mm and 39 x 30 mm. The cutting edge is irregularly denticulated and very lustrous (Crowfoot 1937, 37).

19 Summary and Conclusions

Following the theoretical framework outlined at the beginning of this chapter, a detailed analysis of a sample of the Jericho flints has been used to document changes in use of raw material, technology and lustred blade type. The following conclusions have been reached:

Raw Material

There are several changes in the type of raw materials used at different periods. The flint used in the Natufian continues through PPNA levels, though a fine-grained pinky-coloured flint is first introduced in Proto-Neolithic levels and continues in use until the end of the aceramic Neolithic. When the site was reoccupied in PN times different flint sources are exploited, including one from which tabular flint was obtained, though this was not used for sickle blades. In the Early Bronze Age Canaanean blades are imported for sickles and different flint again is used in MBA and LBA levels. The reasons for variation are obscure and it is not known whether potential sources reflect other contacts at each period.

Most of the flint seems to have been of good flaking quality though this has not been tested experimentally. It also remains to test the rate at which lustre forms on the different sorts of flint used and in particular on the heat-treated material of aceramic periods, because although this technique enables longer blades to be struck (Miller in Crowfoot Payne 1983, 759), it seems to impede polish formation (Bradley and Clayton 1987). It is not known whether heat treatment makes any difference to the useful life of the blade. Certainly the lustre is especially intense on the supposedly heated blades and there is a large number of them, though they do not form an appreciably higher proportion of the tool kit than at other sites (see also Chapter VI).

Technology

Technology changes through time, though not always with raw material, and the lustred blade forms reflect this. In the aceramic Neolithic there is a marked increase in the size of the blades (Fig, V:17). The fine long blades of PPNB date, struck from naviform cores, seem to have been made exclusively for sickle blades (though broken ones were subsequently re-worked into arrowheads and gravers). Later, in the Yarmukian and after, blades again seem to have been made exclusively for sickles and indeed imported in EBA times. In better stratified conditions, with recovery and recording techniques specifically oriented towards the problem, it might be possible to document the manufacturing processes (see for example the model proposed by Rosen 1987, 396, Fig 11.1).

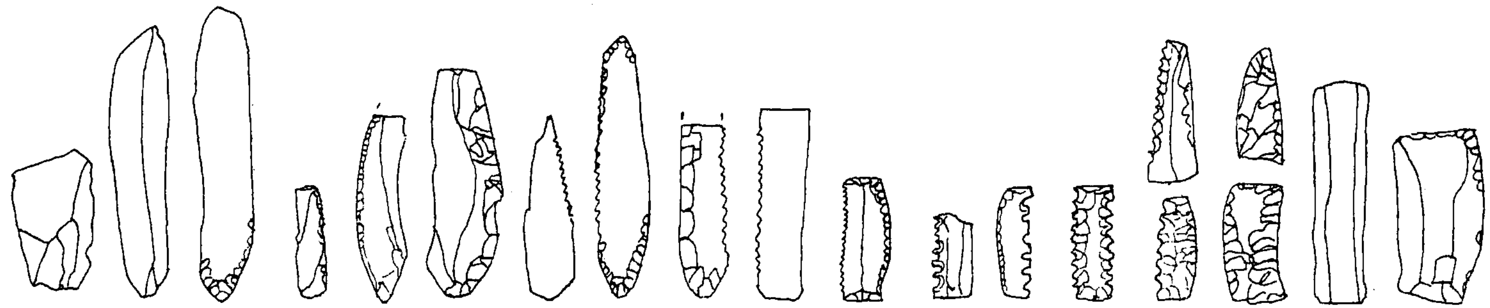
Dimensions

Comparison of the dimensions of lustred blades with unlustred blades suggests that the larger ones were chosen for use (Fig.V:17), though of course no such comparison can be made when blade segments were used. The increase in length of blade through time has already been mentioned but dimensions are to a certain extent inevitably affected by raw material as well as by technology, as the long blades from the naviform cores clearly show. A simple comparison of dimensions without consideration of other factors is, therefore, not particularly instructive and may indeed lead to the drawing of wrong conclusions

Retouch also reflects the technological processes. It is minimal on the fine, long, PPNB blades when technological investment was in blank preparation, (hence a relatively high proportion of narrow blades compared to earlier levels), but retouch is extensively used both to shape the sickle elements and to prepare their edges in PN levels and later.

Typology

The use of the class list allows comparison of forms by period. The forms present are summarized in Table V:3. Changes in form seem to correlate with changes in raw material and technology. The only time that a single form straddles two periods is in the PPNA and PPNB, the time when there is continuing use of the same raw material source, though there is some technological development. It was also noted that



	IA	IB	IC/D	IE$_1$	IE$_{2i}$	IE$_{2ii}$	IIB	IIC/D	IIE	IIF	IIG	IIIF	IIIG	IV.F	IVG	V	IIH	VI
Natufian				o	o													
Proto Neo.		o	o	o	o		o	o	o									
PPNA		o	o	o	o	o	o	o	o		o?							
PPNB	o	o	o	o	o		o	o	o	o?								
PNA												o	o	o		o		
PNB											o							
EBA																	o	
MBA																		o

TABLE V:3
Classes of Lustred Blades by Period

in Area E, where the same source of flint as that used in the Natufian was still used, the lustred blades were of different form.

The degree of modification to a blade seems in part to reflect the nature of the blank; there is, for example, little or no adaptaion to blades struck from naviform cores. It also reflects on the way the blade was to be hafted (cf M.-C. Cauvin 1983). The large blades of aceramic date were probably hafted singly so beyond basic shaping or blunting for insertion into the haft, little more was required, whereas elements which were intended as parts of composite tools needed much more attention to the ends and sides, as is apparent from the PN blades.

Hafting

Unlike other sites, no hafted blades have been found at Jericho, but comparison of the known hafts and the configuration of the lustre and the traces of bitumen have enabled some reconstructions to be made. The Natufian blades seem to have had their backs encased in the haft, some possibly hafted obliquely. During the PPNA and PPNB blades were hafted singly, some with the whole length of the back in the haft and others set slighlty obliquely (roughly in equal proportions). The coarsely denticulated pieces of PN date were set contiguously in a straight haft but the geometric forms were probably set in a curved haft and apart from the Canaanean blades this seems to have been the normal shape of the haft from then on.

Function

Attention to the functional (lustred) edge changes through time. Initially the edge is rather irregular and unmodified but seems to have been increasingly heavily chipped, presumably from more intensive use, though the chipping could have been caused by a different way of using the blade or by using it on a different material. By PPNB times numbers of lustred blades increase considerably; the edges are deliberately denticulated and have been positively identified as being used for cereal harvesting, thus suggesting a direct link between form and function (Unger-Hamilton 1985a). The subsequent coarsely denticulated blades of PNA date appear not to have been used to harvest cereals, but the EBA Canaanean blades were. Whether function and other attributes of the lustred edge can be correlated remains to be established. For example it would be interesting to see whether those with only a narrow band of lustre were used for a different purpose from those with a wide diffuse band of lustre or whether the latter is simply a more developed lustre resulting from more prolonged or intensive use.

Distribution

Little is known of the spatial distribution of the lustred blades , nor can levels be correlated across the site. However, some fluctuations can be detected in aceramic levels from Crowfoot Payne's diagram (1983, Fig. 316), reproduced here for convenience, though actual figures are not published. It suggests along with evidence from other sites discussed in Chapter VI, that there might have been activity-specific areas.

Quantitatively, comparison of numbers of lustred blades in different levels is not particularly meaningful because of the different volumes of deposits excavated and the different amounts of disturbance to some levels. Also, in some periods some blades were hafted singly whereas in others they were components of multi-bladed tools, thus causing variation in numbers because of the type of tool rather than the type of activity. Nevertheless, lustred blades do seem to reach a peak in the PPNB, both in numbers and in form, and it is a time when there were other major developments in agriculture and in other aspects of life (cf Hodder's analysis of similar phenomena at Çatal Hüyük [Hodder 1987]).

CHAPTER VI

COMPARISONS

1 Introduction

In this Chapter lustred blades from other sites in the Near East are reviewed by period; it is not intended to be a comprehensive survey but does aim to consider a representative range of lustred blades present in each area. Attributes relating to raw material, technology and typology are considered where possible, but this level of information is not always available from publications. The numerical and quantitative variation between sites is also detailed. They are also discussed in relation to evidence for hafting, considered in Chapter IV, function (Chapter III) and the general environmental and cultural background outlined in Chapter II. Details of lustred blades from each site are detailed by period in Appendix VI.

2 Period 1

2.1 Occurrence

Lustred blades occur regularly for the first time in the Near East during this Period, though isolated examples are known from the earliest Palaeolithic contexts (Keeley 1983, 251), from late Pleistocene contexts in Egypt (Reed 1977, 545-6) and from Kebaran tool-kits which immediately prededed Natufian industries, for example at En Gev IV, Shunera IV and Nahal Lavan (Goring-Morris 1987, 469). From about 9000 bc they are found in varying quantities in all the regions outlined in Chapter II, though not all sites have produced lustred blades. The pieces considered here are mainly from Palestine, Jordan and North Syria on the Euphrates and are listed in Appendix VI.

2.2 Previous classification

Although it is agreed that lustred blades are a characteristic feature of Natufian assemblages (Henry 1977, 229*) they have not been systematically described and quantified (Valla 1975, 85) except for Goring Morris' recent work in Sinai and the Negev (1987, 456). In Hours' type list (1974) they figure as Class M - Divers and they are not mentioned as a separate class by Tixier in his glossary of Epipalaeolithic tools, though he does refer to a backed blade as part of a sickle from Columnata (1974, 22). Indeed, they are not always counted as a separate type (Bar Yosef and Goren 1973, 56; Edwards and College 1985,186) and they may cut across several tool classes. This is reflected in publications when they often lack adequate or standardized description and quantification.

2.3 Raw Materials

Information about the selection of raw materials is derived from general comments. As far as can be ascertained locally available raw materials were exploited, accounting for the regional variations observed by Valla (1975, 74). Henry (1977, 232*) has noted that apart from colour variation, there is a general similarity in the type of flint used in Natufian assemblages. It is clear, however, that a fine-grained flint was preferred for smaller tools (Marks and Larson 1977, 223; Marks 1977, 222-3*; Calley 1986, 13; Goring-Morris 1987, 284). At El Wad B and Ramat Matred a distinction in raw materials and tool forms was noted: flint and chert was rarely used for microliths, and chalcedony rarely used for tools over 70 mm in length (Garrod and Bate 1937, 30; Yisraely 1967, 267 and cf Henry 1973,122). At Mureybit there is a definite trend away from the local Euphrates flint to the use of finer-grained flint as production became more standardized; Calley also noted a preference for a particular type of flint for a particular tool (Calley 1986, 100), though her study does not extend to lustred blades.

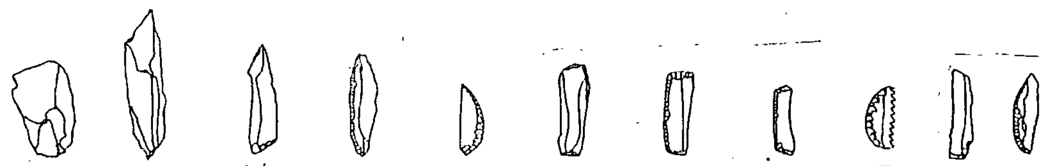
2.4 Technology

Epipalaeolithic core reduction strategies are relatively well known compared to other periods, though data is still scarce (Henry 1977, 232-40; Calley 1984; 1986; Olszewski 1986; 1988; Goring-Morris 1987, 284f). The evidence available shows that late Epipalaeolithic core reduction strategies are unstandardized compared to those of the preceding Kebaran period. It is not possible at present to distinguish between earlier and later Natufian technologies but geographical distinctions can be made. Levantine assemblages are characterized by short wide bladelets (Valla 1975, 74) struck from pyramidal and multi-platform cores, whereas the north Syrian assemblages are flake-based with the flakes being struck from single-platform or polyhedral cores without standardization (Calley 1986, 195-6). Different strategies are also apparent between the Negev and the rest of Palestine and blades from the Negev are markedly smaller (Valla 1975, 74). In the Negev cores are very rare (Goring-Morris 1987, 286), whereas at other sites the whole reduction process is present (Calley 1986, 196). As well as the method of blank production, retouch type seems to change with time: Helwan (bifacial oblique) retouch is more usually associated with earlier industries and abrupt unifacial retouch with later, although they are not completely chronologically distinct (Henry 1977, 235*).

2.5 Typology (Figs. VI:1-6)

The lustred blades are virtually all undenticulated. Early Natufian forms are made on small blades. Shapes include rectangular forms (Class I.F), convex forms (Class I.E2), various forms of backed blades (Class I.E) and unmodified pieces (Class I.B) though none are exclusive to lustred blades. Their occurence is summarised in Table VI:1. This has been drawn up on a presence/absence basis because quantified breakdowns are rarely given in published sources. Early Natufian lustred blades are more regular than later ones, as observed by Garrod (1932, 261; Garrod and Bate 1937, 31 & 34). Characteristically the examples from Palestine have truncated ends and retouched backs, Class IG (Fig. VI:1,1-4). The shape of the back is usually straight though it is sometimes slightly convex (Fig.VI:1,2). Ends are at right angles or are slightly oblique to the axis of the blade or are pointed.

Lustred edges are straight and for the most part unmodified, though a few from El Wad and Kebara (particularly the convex type) have fine denticulations (Fig.VI:1,10-12; VI:3,6). Edge angles, in so far as they can be determined, are acute (30° or less). The lustre on the El Wad examples is parallel to the edge of the blade and extends from end to end (unless the edge diverges from a straight line (compare Fig.VI:2,1 with VI:1,12). Some of the blades from Kebara have a different pattern of lustre. The regular forms are similar to those from El Wad (Fig.VI:2), but on the larger, wider examples the lustre is only on part of the blade and appears to be oblique or convex in outline (Fig.VI:3,1-4). Both sites have a few unmodified blades (some with cortex) with lustre on only part of the edge (Fig.VI:3,3).



	IA	IB	IC/D	IE$_1$	IE$_2$	IF	IG$_1$	IG$_2$	IIE	IIF/G
EARLY NATUFIAN										
El Wad B2	o	o		o	o		o	o		o
Kebara		o		o	o		o	o		o
Erq el Ahmar				o			o			
Eynan IV,III,II				o	o					
El Khiam B2				o						
Wadi Hammeh 27				o			o			
Hayonim Terrace				o	o					
Hayonim Cave					o					
LATE NATUFIAN										
Jericho				o						
El Wad B1				o			o	o		
Shukbah B	o			o			o			
Eynan 1b, 1c				o	o					
El Khiam				o						
Umm ez Zuwetina				o						
Tor Abu Sif				o						
Wadi Fazael IV				o	o					
Abu Ushba				o		o				
Rosh Horesha	o			o						
Rosh Zin	o			o						
Saflulim				o						
Khallat 'Anaza				o						
Jitta					o					
Taibé							o			
Mureybit IA		o		o						
Abu Hureyra				o						

TABLE VI:1
Classes of Lustred Blades by Site: Period 1

Later Natufian blades are much more varied, though blades with straight, abruptly retouched backs (Class I.E1) predominate, but convex backed pieces (Class I.E2) are known. Lustred edges are unmodified and can be quite irregular as for example at Hayonim (Fig.VI:4,2). Edge angles are normally under 30°. Details of the configuration of the lustre are rarely given in published sources. On the Fazael examples (Fig.VI:5,1-4) it is limited to the central portion of the blade and is convex in shape, suggesting, together with the unmodified ends, that they were hafted singly. The large blades from Mureybit of Class I.C and D (Fig.VI:6) stand out as different from the rest, although the modification is only minimal, but they do seem to prefigure the Period 2 forms with modified ends (M.-C.Cauvin's 'Mureybit type' [1978, 69]).

Dimensions vary from site to site, probably reflecting the size of blank available,and ultimately determined by the raw material. Most are under 50 mm in length except for the Mureybit blades which come from a different technological tradition (see 2.4 above). The data is summarized in Fig VI:37.

2.6 Hafting Methods

Hafts (see Chapter IV) have been found at eight early Natufian sites and at one later one (Umm ez Zuwetina); blades are found in the haft in only three instances (one from El Wad, which has two irregular unlustred blades, one from Umm ez Zouwetina, which has one blade with slight lustre, and a double-edged one with unlustred blades from Wadi Hammeh 27). The blades are set in a V-shaped groove, parallel to the body of the haft. However, apart from the Umm ez Zuwetina example there is no _a priori_ reason for the association of the hafts with lustred blades;

other artefact classes such as lunates, especially those with Helwan retouch, would have fitted into the V-shaped groove on the haft, whereas the abruptly backed blades would not (Garrod and Bate 1937, 38). Also Büller has shown that of those lunates and backed blades which he examined from El Wad, the lunates were used to cut meat and inserted into the bone haft with cutting edge parallel to the haft, whereas 4 out of 5 of the backed blades had plant gloss and had been set obliquely in a wooden haft (Büller 1983, 112, Tables V-X). However, it is not clear form his report whether the gloss was macroscopically visible. The configuration of the lustre on the rectangular lustred blades from El Wad suggests that they were set end to end with the pointed pieces forming terminal elements (Turville Petre 1932, 272; Garrod 1932, 215). The observed pattern of lustre on the Kebara blades however indicates that they may have been hafted obliquely (Fig.VI:3,5). Other lustred blades, as far as can be ascertained from the distribution of the gloss (Fig.VI:3,3), seem to have been hafted singly or perhaps hand-held.

2.7 Function

The regular appearance of lustred blades in tool-kits from about 10,000 bc is presumed to be the consequence of some new activity (but see Boserup 1981). This is generally thought to have been the harvesting of cereals, but micro-wear analysis of the blades suggests that more were used to cut rushes and grasses than cereals (see Table III:1). However, one blade from Khallat 'Anaza has 'sickle gloss' on it (Moss in Betts 1982) and exceptionally at El Wad and Kebara the micro-polishes on some of the lustred blades have been identified as the result of cutting cereals, the presence of micro-striations similar to those found on blades used to cut cereals on tilled ground has led Unger-Hamilton

(1985b, 121-5 and see report in The Independent 21.7.88) to infer that the cereals were cultivated (but see Keeks et al 1982, 333). If phytoliths were present on the edges, such as Anderson-Gerfaud observed on experimental and archaeological data (1982), it might be possible to establish the validity of Unger-Hamilton's hypotheses. There is no data on spatial distribution or association of lustred blades which might provide additional clues as to their function.

2.8 Comparisons

Some sites (El Wad, Hayonim Cave, Nahal Oren and El Khiam) have earlier and later Natufian levels but are difficult to isolate stratigraphically, because of later pits and other features dug into earlier levels. Only at El Wad is any change in form identifiable, where lustred blades change from being a predominantly (though not exclusively) standardized rectangular shape with regular Helwan retouch of Class I.G1 in level B2 to roughly backed blades of Class I.E1 in B1 (Garrod 1932). Analogous differences are detectable between other early and late Natufian industries. Early industries tend to have regular rectangular blades whereas in later industries the rectangular forms are virtually absent and backed blades of various forms predominate (see Table VI:1 and Henry 1977, 235*).

Lustred blades form varying percentages of the tool kit (Table VI:2) and in some cases (for example Beidha) are absent altogether. At El Wad, Wadi Fazael, Jericho and Shukbah B they form between 5 and 10 % of the retouched pieces and at Kebara almost 40 % . Other sites, apart from Eynan, have less than 1%. These variations probably reflect the regional groupings outlined in Chapter II.

SITE	a scr	b perf	c burin	d micr	e notch	f pick	g sickl	h back /tr	i ret	j oth	Total
EARLY NATUFIAN											
El Wad B2	129	238	174	6243	34	29	630	-	-	157	7634
Kebara	5	3	4	85	-	-	67	-	-	6	170
Erq el Ahmar	21,5%	2,5%	5%	64%	-	-	-	-	6%	-	-
Eynan IV-III	20	26	106	298	81	-	6	-	-	211	748
Eynan III	28	25	92	197	112	-	16	-	-	220	690
Wadi Hammeh	23	16	130	359	82	2	x	25	-	26	663
Khallat 'Anaza	47	89	47	345	162	-	6	153	420	19	1288
Hayonim Cave	75	-	245	340	109	-	?	40	19	170	998
LATE NATUFIAN											
Jericho	15	3	2	12	2	13	4	5	3	-	59
Eynan Ib	13	17	68	248	89	?1	17	-	186	-	639
El Khiam	167	54	236	371	32	-	?	-	295	-	1155
El Wad B1	39	117	123	3253	43	9	394	-	-	150	4128
Shukba	38	34	35	435	5	?	74			220	841
Nahal Oren VI-V	22	28	107	636	180	?	8	-		269	1250
Wadi Fazael IV	12	-	1	299	163	-	73	161	243	191	1143
Rosh Horesha	86	47	392	1153	517	-	19			959	3173
Rosh Zin	89	24	128	510	182	-	6			278	1217
Saflulim	1	-	4	43	52	-	?	19		16	135
Taibé	21	13	33	592	92	-	4		55	73	883
Abu Hureyra	406	138	151	555	481	43	?			622	2396

Sources; El Wad; Garrod and Bate 1937, Kebara; Olszewski 1986, Erq el Ahmar;Bar Yosef and Goren 1973, Eynan; Olszewski 1986, Wadi Hammeh; Edwards and Colledge 1985, Khallat 'Anaza; Betts 1986, Jericho: Crowfoot Payne 1983, El Khiam; Olszewski 1986, Shukba; Olszewski 1986, Nahal Oren; Olszewski 1986, Wadi Fazael IV; Bar Yosef et al 1974; Ros Horesha; Olszewski 1986, Rosh Zin; Olszewski 1986, Saflulim; Goring-Morris 1987, Taibé; M,-C,Cauvin 1974, Abu Hureyra; Olszewski 1986,

KEY FOR HISTOGRAMS OPPOSITE

a=scraper	f=axes, picks, chisels etc
b=perforator/borer	g=lustred blades
c=burin	h=backed and/or truncated
d=microlith	i=retouched
e=notched or denticulated	j=other

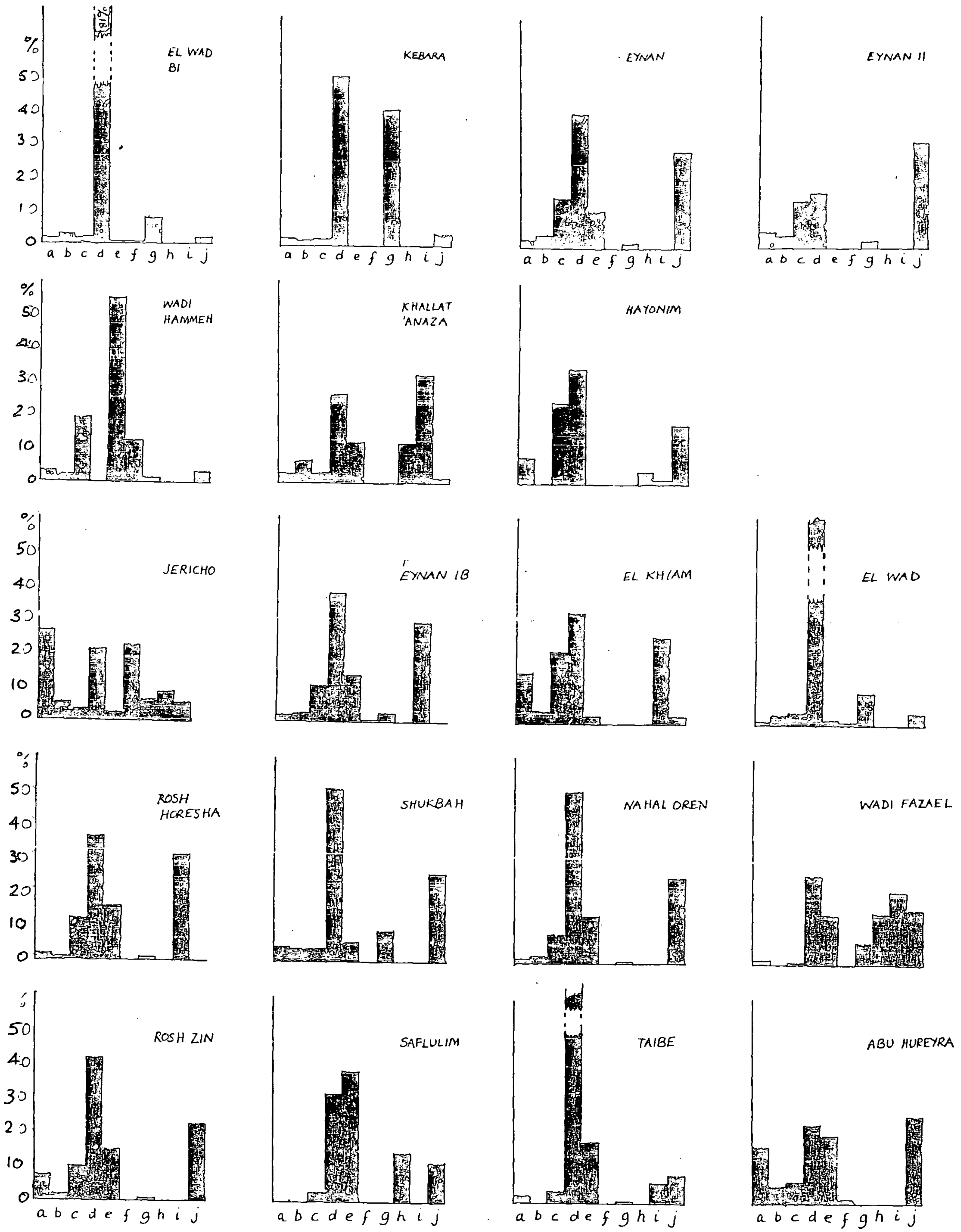


TABLE VI:2
FREQUENCIES OF RETOUCHED TOOLS : PERIOD 1

Present knowledge suggests that there were at least two subsistence strategies in the Epipalaeolithic which are related to environment, one, in desertic regions which is based primarily on hunting, the other in forest steppe zones seems to rely more on the intensive gathering of cereals which may even have been cultivated at some sites. This pattern continues throughout the Neolithic (Bar Yosef 1983, 28). The evidence for plant collection is largely indirect as plant remains only survive at a few sites (see Table II:3), and hinges on the presence of grinding stones and lustred blades, despite the fact that the function of both is largely unproven (see Chapter III). In addition, at some sites there is evidence from skeletal remains that plant food was a major part of the diet.

Just as the presence of lustred blades is not necessarily an indicator of cereal exploitation, so their absence cannot always be taken to indicate the lack of it. At Abu Hureyra and Mureybit, both located in a zone unsuited to agriculture today, but probably moister c 8000 bc and where wild einkorn might have grown (van Zeist and Bakker-Heeres 1984, 195), plant remains attest to the use of cereals (wild einkorn) as does the ground stone equipment (Nierlé 1982), but lustred blades are very rare and those that are present were probably not used to cut cereals (Anderson-Gerfaud 1983). In other areas where there would have been wild cereals, lustred blades are also rare (Hayonim) or even absent at some sites (Yabrud and Beidha), but present (though not quantified) at others (Eynan, Nahal Oren). At El Wad and Kebara, on the other hand, lustred blades are numerous even though these sites are located in forested zones and outside the presumed range of wild cereals (Chapter II.5, Figs.II:3 a-c) and in an area not particularly suited to cereal cultivation (Vita Finzi and Higgs 1970, 19-21, Table I). Furthermore, micro-wear analysis has shown that some were used to cut cultivated cereals (Unger Hamilton 1985b 122, and see report in The Independent 21.7.88) though others were used to cut rushes which were abundant in the area.

Explanations for the virtual absence of lustred blades from Mureybit and Abu Hureyra include the possibility that cereals were harvested without tools (Chapter III). At Mureybit the absence of spikelet fragments amongst the grain has been taken to indicate that the grain was imported into the site though recent evidence suggests that it could have grown in the area (van Zeist and Casparie 1968; van Zeist and Bakker-Heeres 1984, 195-6), so that the absence of spikelets could be due to differential activity areas for processing and consuming grain, as found later at Çayönü, Yiftahel, etc. Detailed analysis of the cereal remains from Abu Hureyra is not yet available so it is not possible to determine whether a similar situation is present there.

In an attempt to see whether any dietary differences could be detected in the strontium/calcium ratios in bone, either through time, between earlier Kebaran and subsequent Natufian populations or synchronously, betwen populations in different environmental areas, analyses were undertaken by Schoeninger (1981) and Sillen (1984 and 1986) of some of the human remains from Kebara C and B, El Wad, Hayonim Cave, Eynan and Nahal Oren. Schoeninger found higher Sr/Ca levels in the bones from early Natufian sites compared with those from Kebara C and also less variation between individuals, suggesting a more consistent diet. Sillen found a slightly higher ratio in Sr/Ca levels in the Kebaran than in the early Natufian bones but considered that there was a basic continuity. He also found no difference in the ratio between the two environments. He did, however, find a major drop in the Sr/Ca levels in later Natufian skeletal remains (Eynan, Nahal Oren and El Wad) which did not increase again until PPNA times (Nahal Oren). In his preliminary conclusions Sillen suggests that this was due to a marked decrease in the use of plant foods during the Later Natufian. Although there may be other interpretations for the decrease in Sr/Ca levels, other skeletal material over a wider area needs examining to see if a similar phenomenon is found. There is some corroborative evidence from other data in that as the climate became cooler and drier (see Chapter II) and there was a movement of settlement into hillier regions in the later Natufian, perhaps to compensate for the increasing aridity, though Bottema and Van Zeist argue that this is not apparent in the pollen core from Lake Huleh near Eynan (Bottema and Van Zeist 1981, 113) and there is no difference in the proportion of lustred blades at Eynan between earlier and later levels, though the stratigraphy may be mixed.

It is possible to demonstrate that the late Epipalaeolithic is different from the preceding Kebaran period in a number of ways such as site size, permamency of settlement, ground stone equipment (Kraybill 1977) and in lithic technology (Calley 1986). These changes are thought to have been brought about because of a change in economic practices from mobile hunting and gathering to farming or at least proto-farming, which required a more permament base. Schoeninger and Sillen's work on the skeletal remains suggest, however, that in some zones at least, the means of subsistence was not noticeably different between the Kebaran and Natufian periods though the method of collection may have changed and become more regular. Keeley considers that the technological change in tool kits is probably due more to sedentism than farming (Keeley 1983, 256), though farming seems to have 'enabled' sedentism.

Lustred blades themselves can, to a certain extent, be used as a measure of change and variation in economic activity (but see Keeley 1983, 250-251) who notes that the basic instruments for harvesting and preparation of plant foods were already there in Palaeolithic times (cf also Reed 1977; Harris 1977). In the early Natufian, however, they do begin to occur regularly and in some numbers and to have a standardized form. Microwear analysis suggests that some were used to cut cereals. Later, however, and for reasons that have yet to be satisfactorily explained, they seem in most instances to be less regular, forming an ad hoc group. The presence or absence of lustred blades from a tool kit cannot, on present evidence, be ~~be~~ used as an argument for or against the exploitation of cereals. Where they are present their function is not necessarily to cut cereals (Chapter III.8 and Table III.1). Conversely, their absence need not be an indicator of a lack of cereal exploitation, though their absence from tool-kits in desertic regions seems to imply this. However, the two sites with the best direct evidence for the exploitation of cereals, Abu Hureyra and Mureybit, had virtually no lustred blades.

3 Period 2 8300 - 7600 bc

3.1 Occurrence

The distinction between Epipalaeolithic and the earliest Neolithic (Sultanian) industries is largely based on the proportion of microliths present in the tool kit and is documented in transitional industries, namely the Harifian in the Negev, the Khiamian in Palestine and the Proto-Neolithic at Jericho, as well as by fully Neolithic industries (Bar Yosef 1981b, 561 and see Chapter II.10). Some of the main occurences of lustred blades in these and PPNA industries are listed in Appendix VI. At Jericho the Proto-neolithic phase is stratigraphically separated from the Natufian and Sultanian levels and Crowfoot Payne sees it as developing from the Natufian but as technologically undifferentiated from the subsequent Sultanian (Chapter V.15; Crowfoot Payne 1983, 664 and see below). Mureybit also has continuous occupation from the Epi-palaeolithic to early Neolithic phases (IB and II) (Levels I-VIII [M.-C. Cauvin 1978]) but no lustred blades appear in the transitional level (IB). Statigraphic disturbance at Nahal Oren and El Khiam BI make it difficult to separate the industries.

3.2 Raw Materials

Where information is available, for example from Mureybit and Jericho, it is clear that good quality fine- grained flint was preferred to the nodular flint used in the Natufian (Calley 1986, 189; Crowfoot Payne 1983, 629 and 639). Flint type and tool type seem to correlate at Nahal Oren (Stekelis and Yisraely 1963, 3). There is some evidence of heat treatment of flint (Chapter V:5 & 19; Crowfoot Payne 1983, 629; Calley 1986), a practice which continues throughout the aceramic Neolithic.

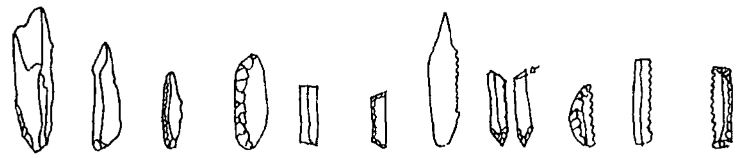
3.3 Technology

The technology of Period 2A is difficult to document in any detail. There is no information on Khiamian industries; Harifian industries show a continuity with the Epipalaeolithic tradition and core reduction strategies remain unstandardized, though there is an increase in the production of bladelets. Similarly at Mureybit (phase IB), though there is no major change, there is the beginning of bladelet production and an increase in blades, pointing to the Neolithic (Calley 1986, 201-2). There is insufficient data from Jericho to make detailed comparisons though blades were being produced. At Karim Shahir blade cores predominate but at Zawi Chemi, though there are blade cores, flake production is more common and cores are completely worked down. Little is known of other sites in that area.

By Period 2B, on the other hand, blade technology is universally established. At Jericho there is a standardization in core type and an increase in the length of the blades (see Chapter V:15). At Mureybit and Aswad IA a new and sophisticated technique of blade production appears, the use of the naviform core which is not found in Palestine until Periods 3 and 4. Retouch is normally abrupt, but flat, invasive retouch is found on arrowheads and sometimes occurs on sickles but only on the butt.

3.4 Typology (Figs.VI:7-11)

There is no detailed information on lustred blades from Period 2A and amongst the few blades which are known no characteristic form stands out (see Table VI:3 and Appendix VI). Those from Salabiyah are unmodified (Class I.B), as are most from Jericho, although one from Jericho and one from Mureybit has an abruptly retouched back (Class I.E). By contrast, in Period 2B more distinctive forms appear along side the unmodified and backed blades. These include the Beit Tamir type (Class I.E2), found in Palestine at Jericho, Gilgal and Netiv Hagdud



PERIOD 2A	IB	IC/D	IE1	IE2:ii	IF	IG	IIB	IIC/D	IIE	IIF	IIG
Jericho Proto-Neo.	o		o						o		
Salabiyah IX	o										
Abu Salem			o								
Maaleh Ramon E			o								
Maaleh Ramon W			o								
Har Arod			o								
Romam			o								
Mureybit II	o	o	o		o						
Karim Shahir	o										
PERIOD 2B											
Jericho PPNA	o	o	o	o			o	o	o		o
Gilgal III	o		o	o							
Netiv Hagdud				o							
Aswad IA		o					o	o		o	
Mureybit III	o	o			o						
Qaramel					o					o	
Kadim					o	o					

TABLE VI:3
Classes of Lustred Blades by Site: Period 2

(Fig.VI:3) (the one found at Eynan [Fig.VI:8,2] illustrated by Valla [1975, Fig 1,19] and apparently from an early Natufian level would be much more at home in a Period 2 context). Other blades have modified ends (Class I.C & D); these include blades, measuring c 60 mm in length, from Mureybit with a distinctive sharply pointed butt formed by abrupt retouch and a straight or rounded distal end shaped by retouch or burin blows (Fig VI:10) hence M.-C. Cauvin's term 'Mureybit type'; there is a possible example from Aswad IA (Fig.VI:9). There are also a few larger blades measuring up to 110 mm (complete or nearly complete) with retouch around the butt, which is sometimes invasive and not as pointed as the Mureybit type. The distal end is either squared off or slightly modified. These have been found at Mureybit, Aswad IA and Nahal Oren (Fig.VI:9,1 and 2). Bi-truncated blades (Class I.F), are also present at Mureybit (Fig. VI:10,3) and Qaramel (Fig.VI:11); ends are usually unretouched (Class I.F.1) but some with retouch (Class I.F2 & 3) are present at Qaramel and Kadim.

Lustre is normally on one edge only. The edge is unmodified except at Aswad IA where the majority of the blades are finely denticulated and the angle is acute (c 30° where determinable). The lustre extends for about two-thirds of the length of the blade, avoiding the butt on the type with modified butts. At Mureybit (Fig. VI:10,6) it is clearly oblique (M.-C. Cauvin 1978,70). On some of the larger blades (Fig. VI:9,1) it is only on the upper part. On the truncated blades it appears to reach from end to end. The lustre is normally on both faces, though half of those from Karim Shahir had lustre on one face only (Howe 1983,67). The intensity of the lustre varies at Karim Shahir and is described as weak at Zawi Chemi (Solecki 1981). At Mureybit, by the end of Phase III, edges are renewed with a flattish retouch (Fig.VI:10.3), though this form of retouch is not used as a primary technique (M.-C. Cauvin 1978, 69-70).

3.5 Hafting Methods

From the distribution of the lustre and bitumen on the blades from Salabiyah IX and those from Jericho (Figs.V:2,+3 and VI:7) it would appear that the blades were hafted lengthwise as were the truncated blades of period 2B (M.-C. Cauvin 1978, 71). On the pieces with modified butts the lustre stops short of the end and is often oblique, suggesting that the blades may have been set obliquely in their haft (M.-C. Cauvin 1978, 71). On size grounds (average blade length c 60 mm) the Mureybit examples were probably composite tools, but three larger blades (over 90 mm in length) could have been hafted individually, as the similarly sized blades from Aswad and Jericho ~~pr~~obably were, perhaps in the same manner as the hafted example found at Egozwil, Switzerland (Class 1.5 ~~(~~Fig. App. A05 ~~IV:3~~; M.-C. Cauvin 1978, 70). Cauvin also states that the Beit Tamir class (based on an example from Jericho [M.-C. Cauvin 1983a, 75, Fig. 2,1]) were hafted thus. However, some appear to have been set with the entire back encased in the haft judging by the lustre configuration on those from Gilgal and Netiv Hagdud (Fig.VI:8), The haft may have been convex, though the cutting edge would have been straight (Class 1:6, Table IV:1; Fujii B'' 1.)

3.6 Function

There is no specific information on function for the Period 2A pieces, though Marks has remarked that the Harifian blades have a heavier lustre than the Natufian ones (Marks 1977, 225*. In Period 2B phytoliths of the <u>festucoïdes</u> group (i.e. domesticated cereals) were found on 3 blades examined by Anderson-Gerfaud from Mureybit III (1982, 155) and of the 19 PPNB blades from Jericho examined by Unger Hamilton 4 were used to cut cereals (1985b, 122). Edge damaged from use seems to have been more extensive than in previous periods. Crowfoot Payne noted that the lustred edges from Jericho were abraded (1983, 632), which she suggests implies intensive use, though it could result from working hard material. At Mureybit, especially towards the end of Period II, as has already been remarked, edges were reflaked (M.-C. Cauvin 1978, 71).

3.7 Comparisons

Intra-site comparisons can only be made for Jericho and Mureybit. At Jericho plain blades (Class I.B) occur in both industries as do straight backed blades (Class I.E1), but the convex form (I.E2) is only found in PPNA levels of Jericho. At Mureybit all types represented are present in both levels and differentiation seems to be in quantity rather than form (see below).

Inter-site comparisons (see Table VI:3) indicate that lustred edges on unmodified blades (Class I.B) occur everywhere, but that the Beit Tamir class (Class I.E2) is restricted to Palestine in Period 2B; the blades with pointed butts and retouch on the distal end (Classes I.C & D), only occur at Mureybit and Aswad, though an analogous form is found later in Palestine. Aswad seems to be unusual at this stage in having only one class of lustred blade and in regularly having blades with denticulated edges (Class II. C & D; Fig.VI:9), though a few from Mureybit are also denticulated. Denticulation is not found until later in Palestine, (denticulated pieces from PPNA levels at Jericho are of a different sort see Chapter V.15). These differences also echo technological and other differences between the two areas already seen in the Epipalaeolithic and may suggest that Mureybit and Aswad were more 'advanced' than Palestine at this time (M.-C. Cauvin 1979, 158).

Lustred blades in transitional tool kits still form a very small proportion of the tools (1.6 % at Mureybit Phase IB, 2 % at Jericho) but by the early aceramic Neolithic (PPNA) as numbers of lustred blades begin to increase, their relative proportion in the tool kit also increases (for example reaching 12 % in Mureybit level X [Cauvin 1978, 76]). Aswad I has by far the highest proportion, starting off with 24% of the tools being sickles. The form of the blade also becomes more standardized as numbers increase. This seems to correlate with an increase in the use of cereals.

Variation in the proportions of lustred blades seems to reflect, as in Period 1, other variations of the composition in the tool kit (Table VI:4). This variation may be affected by environmental conditions and so perhaps by the economy, though this is difficult to establish with certainty because, as in the Epipalaeolithic, there is a lack of identification of the function of lustred blades and because cereals do not need to be harvested with sickles. However, it may be remarked here that a number of industries from sites in arid regions where cereals would only have been available in upland areas and which were probably temporary hunting camps (Goring-Morris 1987, 349 and Table IX-2) have no or only one or two lustred blades. Though their function remains to be established it is hard to get away from the hypothesis that there is some sort of correlation between the presence of lustred blades and agricultural settlements.

SITE	a ah	b scr	c bur	d perf	e not	e den	f kn	g axe	h mic	i sic	j ret	k oth	TOTAL
Jericho Proto neo	-	26	95	15	-	1	-	13	-	9	'179	25	363
PPNA	9	206	712	202	-	33	-	113	-	231	'2725	40	4271
Maaleh Ramon W	8	32	1	-	38	-	-	-	89	1	30	32	¤231
Maaleh Ramon E	32	60	-	4	55	-	-	-	155	2	49	45	¤402
Har Arod	2	45	7	2	50	-	-	-	30	2	25	23	¤186
Abu Salem	61	30	4	4	33	-	-	-	311	1	41	86	571
Romam	34	19	2	-	18	-	-	-	128	1	11	22	235
Mureybit I-VIII	64	137	65	93	64	73	*50	112	-	16	234	65	973
IX-XIV	104	114	38	28	24	19	*10	25	-	41	108	29	540
XV-XVII	118	166	130	26	26	16	*20	1	-	64	115	48	730
Gilgal III excav	10	3	2	11	9	-	-	‡	-	?7	12	-	54
slope	11	5	21	33	15	-	-	-	-	-	165	-	250
Salabiyah IX	22,3%	0,5%	4,5%	16,1%	-	13,7%	-	-	13,3%	3,3%	10,9%	6,6%	a211
Aswad IA	27	6	17	20	-	-	-	-	9	59	-	‡-	235
Karim Shahir	-	1046	80	134	7006	15	*19	‡	351	24	'3252	b424	c12351
Zawi Chemi	-	356	13	150	133	1019	-	‡	861	2	-	243	2777

*= racloirs
'=nibbled
b=backed
c also 22,623 used flakes and blades
a percentages only add up to 91,2%
‡=present but not quantified (axes of ground stone at Zawi Chemi and Karim Shahir)
¤ Totals adjusted

Sources; Jericho; Crowfoot Payne 1983; Maaleh Ramon, Har Arod, Abu Salem and Romam; Goring-Morris 1987; Mureybit; M.-C.Cauvin 1978; Gilgal; Noy *et al* 1980; Salabiyah; Bar Yosef 1980; Aswad; M.-C. Cauvin 1974; Karim Shahir; Howe 1983; Zawi Chemi; Solecki 1981.

KEY TO HISTOGRAMS OPPOSITE.

a=arrowheads
b=scrapers
c=burins
d=perforators/borers
e=notches and/or denticulates
f=knives
g=axes, picks, chisels etc
h=microliths
i=lustred blades
j=retouched
k=other

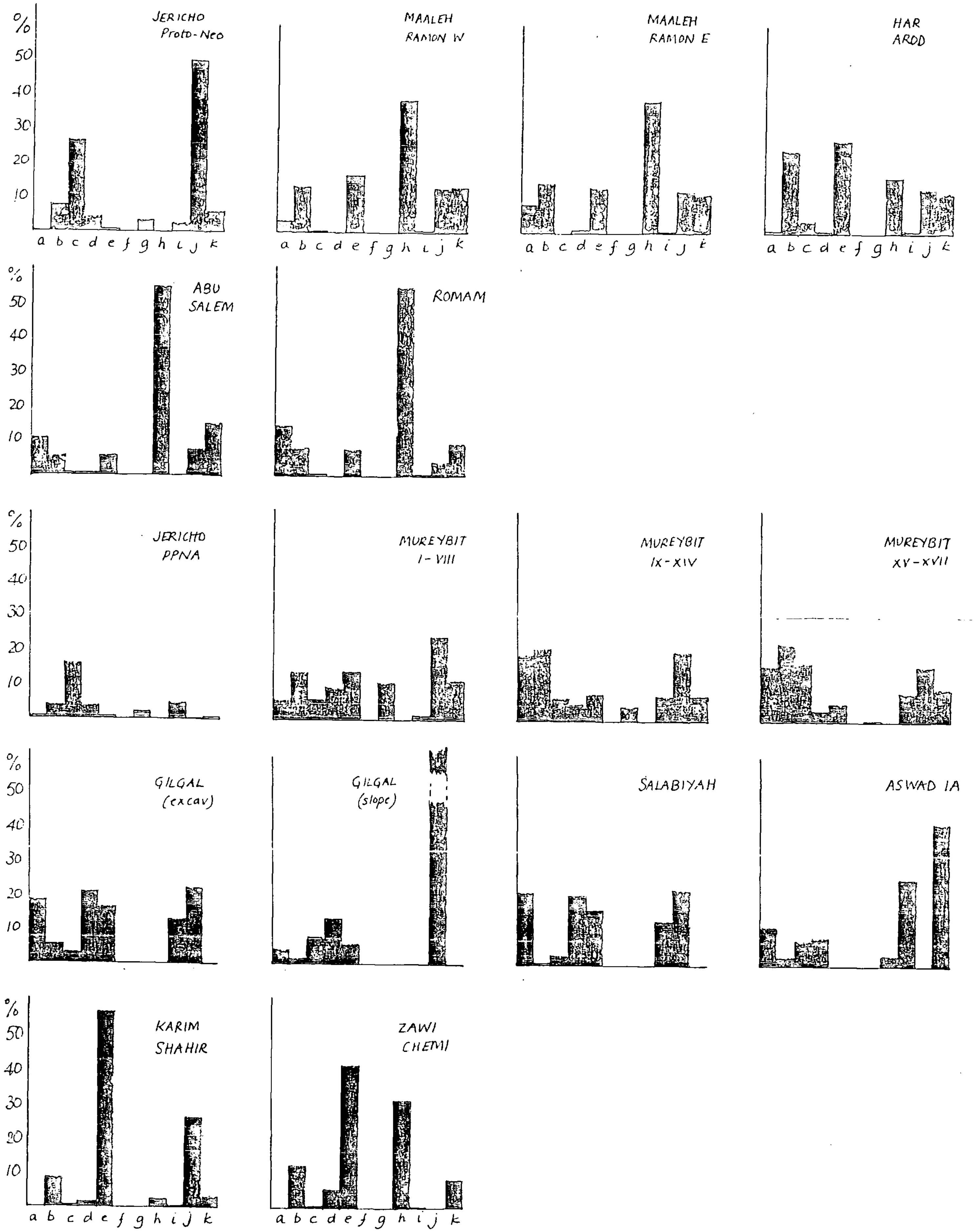


TABLE VI;4
FREQUENCIES OF RETOUCHED TOOLS ; PERIOD 2

Palaeobotanical remains come from Aswad IA, Jericho PPNA, Nahal Oren and Karim Shahir (where cereals are domesticated) and Mureybit, where they were still exploiting wild crops (Chapter II:5 and Table II:3). Skeletal remains have strontium/calcium levels comparable to those of Early Natufian date, which Sillen interprets as being due to the increased consumption of plant foods (1984).

The apparent lack of standardization both of lustred blades and of hafting method led Cauvin to suggest that it was symptomatic of an experimental stage in the development of agriculture (a factor which is difficult to quantify) and of harvesting methods (J. Cauvin 1983, 270). In this respect it may be noted that at Aswad, which has evidence for domesticated crops from the beginning, there is, relative to other tool kits, a very high proportion of sickle blades. These are different from contemporary forms from other sites in that they are standardized and have denticulated edges and seem to pre-figure those in PPNB Palestine.

4 Periods 3 and 4 (7600 - 6000 bc)

4.1 Occurrence

At about 7600 bc there is a considerable increase in number and relative importance of lustred blades in tool kits. The distribution of sites is much more wide spread and extends into Anatolia and North Mesopotamia (Figs. II:17a and b). The period is divided into two sub-periods at about 6600 bc although not all sites, particularly those in the Zagros and in environmentally marginal areas or those which lack diagnostic artefacts, can be so compartmentalized (see Chapter II:11). Some of the main occurences of lustred blades are detailed in Appendix VI.

4.2 Raw Materials

High quality, fine-grained flint was used in many instances; purple flint, found in NW Jordan, was frequently selected (Jericho, 'Ain Ghazal, Abu Gosh) as was honey-coloured flint (Moore 1973, 47). This latter flint seems to have been used universally at Jericho (Crowfoot Payne 1983, 667), though at Abou Gosh the fine quality violet flint, apparently similar to that used at Jericho, is not used used for sickles (Lechevallier 1978, 45). There seems to have been differential use of flint at 'Ain Ghazal (Rollefson and Abu Ghaneima 1983). There is continued evidence for the heat treatment of cores at Jericho (Crowfoot Payne 1983,667), Ramad I (de Contenson 1985, 18) and Ras Shamra (de Contenson 1977). Obsidian is also used for sickle blades in north-east Syria, Anatolia and the Zagros. At Cafer and Magzalia it is used virtually to the exclusion of flint, at Çayönü flint is used in similar proportions to obsidian but at Bouqras obsidian forms only about 18% of the raw material (Roodenberg 1986,203).

4.3 Technology

Blade technologies predominate, but method of production varies from area to area. In Period 3 the use of naviform cores is widespread in Palestine, though not necessarily the exclusive method of blade production (Jericho c 42%, Beidha and Yiftahel 'characteristic' [Garfinkel 1987, 203], Aswad , Ghoraifé and Mureybit [found in Cauvin's but not Van Loon's excavations, M.-C. Cauvin 1978, 5; Calley 1986]). At Jericho broken lustred blades were made into arrowheads and burins, perhaps reflecting their exceptional size and regularity (Crowfoot Payne 1983, 677, 686). At Cafer and Cayönü blades were detached by pressure, the earliest evidence of this technique (Calley 1985, 96) though the use of pressure to detach blades is also remarked at Bouqras (Roodenberg 1986, 203). At Ali Kosh single platform 'bullet cores' are characteristic (Hole et al 1969, 344). In Period 4 naviform cores are still found for example at Ras Shamra VC (de Contenson 1977), Abu Gosh and Beisamoun (Lechevallier 1978) and though present at Ghoraifé they are less common than at other sites (de Contenson 1985, 17). At Ramad they are quite rare and small polyhedral and Levallois type cores are more frequent (de Contenson 1985, 18). They are also found amongst bipolar cores at Qdeir (Aurenche and Cauvin 1982, 54) and at Bouqras where they are described as irregular (Roodenberg 1986, 203). At 'Ain Ghazal single platform punch struck cores predominate (Rollefson and Abu Ghaneima 1983, 193-4). At Abu Hureyra cores are conical and initially they are irregular but later become more regular and bipolar (Moore 1975, 61).

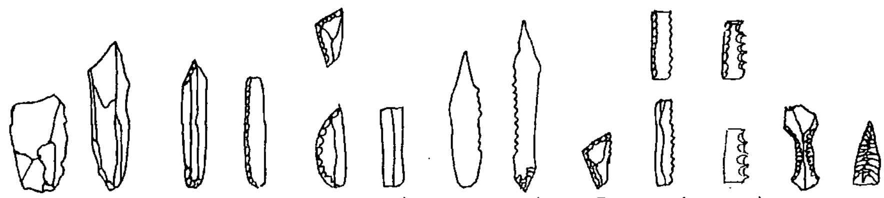
Retouch types include abrupt and invasive retouch and pressure flaking.

4.4 Typology (Figs.VI:12-23)

In Periods 3 and 4 a variety of lustred blades are recognizable. They are also often present in sufficient numbers to allow for a more meaningful breakdown into different classes, though it is not always possible to gauge the relative importance of each class from the published data (Table VI:5 and Appendix VI). The Classes present include undenticulated and denticulated forms.

Undenticulated lustred blades

Apart from truncated forms, undenticulated blades seem to be virtually restricted to Period 3:



PERIOD 3	IA	IB	IC/D	IE_1	IE 2/3	I F/G	IIB	II C/D	IIE	II F/G	III F/G	VII	V
Jericho PPNB		o	o	o	o		o	o	o	o			
Beidha	o	o		o		o	o			o			
Aswad II		o	o			o		o		o			
Ghoraifé IA							o	o		o			
Ghoraifé IB								o		o			
Asikli Höyük						o							
Çayönü	o	o				o						o	
Cafer			o							o		o	
Tell Magzaliyah												o	
Ali Kosh (B.M.)		o				o							
PERIOD 4													
El Khiam				o	o	o		o					
Abu Gosh								o	o	o	o		
Beisamoun								o			o		
'Ain Ghazal								o					
Dhuweila				o									
Ibn el-Ghazzi				o						o	o		
Azraq 31				o									
Tell aux Scies								o		o	o		
Ghoraifé II								o			o		o
Ramad I		o						o		o			o
Ramad II										o	o		o
Aatné						o							
Ras Shamra Vc						o							
Qdeir								o	o	o			
Nadaouiyeh									o	o			
Abu Hureyra		o			o								
Bouqras	o				o	o			o				
Çatal Hüyük										o			
Hayaz Höyük						o							
Jarmo		o				o							
Ali Kosh (A.K.)						o		o		o			

TABLE VI:5
Classes of Lustred Blades by Site: Periods 3 & 4

Class I.A: Flakes with lustred edges occur only sporadically, for example at Jericho and Beidha (Fig.VI:12,4)

Class I.B: Unmodifed blades are found at Jericho (rare), Beidha (Fig.VI:12,1 & 2) where they are difficult to quantify precisely but form over 23% of the lustred blades, at Ghoraifé and Aswad II (not quantifiable) and at Çayönü (Fig.VI:16,1+4). The lustre nearly always avoids the butt end. Edge angles are acute.

Class I.D: These are present at Jericho (rare), Beidha (Fig.VI:13,6) and Aswad II where they form the dominant group.

Class I.F & G: Bitruncated blade segments are present at many sites. Ends are mostly unretouched truncations but some have retouched ends and a few have retouched backs. This is probably a device to modify the blade to fit a particular haft rather than a deliberate stylistic feature. The lustre configuration varies. On most it reaches from end to end and is parallel to the edge but on the majority from Çayönü Redman records that it is present for only 75% of the blade length (1982,34). The form continues throughout Periods 3 and 4 and later (see Appendix VI) though it is sometimes difficult to separate deliberately truncated blades from accidentally broken ones. The tool-kits with this class of blade include those from Beidha (Fig.VI:13,9) where they form the largest category, Aswad II (rare) and Ghoraifé (not quantified) with retouched ends, possibly Jericho (very rare), Bouqras (Fig.VI:21), Hayaz Höyük, Çayönü and Cafer (Fig.VI:16), Çatal Hüyük, Hacilar and Jarmo and Ali Kosh (Fig.VI:23) where they are the most usual form. They are also the main form (though numerically insignificant) in the desertic areas of Jordan, for example at Duwheila, Ibn el Ghazzi and Jilat 7 (fig. VI:18) Bitruncated blades of obsidian (unlustred, but heavily worn) may have been used as sickle blades at Askili Höyük (Fig.VI:16; Todd 1966,154-55).

Denticulated lustred blades

Class II.C: Long blades (some over 120mm) with retouched butts and denticulated edges (Crowfoot Payne's type 2B and similar to those of Period 2 date from Aswad IA) are found at Jericho (dominant form), Beidha (common), Aswad II (less frequent than undenticulated forms) and Ghoraifé IA in Period 3 and continue in use in Period 4 at Abu Gosh, Beisamoun (the predominant form), Tell aux Scies, Ramad I and Ghoraifé II. The lustre is slightly oblique and avoids the butt end (Figs. VI:13,1 and 15,1). Observation (from published data) of the edge angles suggest that they tend to be steeper than unretouched blades. The class does not continue in use beyond Period 4.

Class II.E2 & 3: Convex or angle backed pieces with lustre on the upper two-thirdsand sometimes denticulated edges are found at Bouqras and the El Kowm basin (Fig. VI:20).

Class II.F: Denticulated truncated blades are present at Beidha (Fig.VI:13,2 & 4), and Ghoraifé (Fig.VI:15, 6 & 7) and forms with less pronounced denticulation have be recorded at Çayönü, Jarmo and Ali Kosh.

Other lustred blades

Class III.F: Coarsely denticulated blade segements occur at Ramad, Beisamoun and Tell aux Scies (a form more usual in Periods 5 and 6) though they are rare (Fig.VI:19, 1-3).

Class V: In the Damascus basin at Aswad in Period 3 (Fig.VI:14, 2 & 5). and at Ramad II and Ghoraifé in Period 4 (Fig.VI:19, 4-7) there are lustred pieces of geometric shape with bifacial flat invasive retouch and a virtually undenticulated edge. A similar form occurs much later at Jericho PNA (Period 7).

Obsidian 'enlarged head' sickle blades

Class VII: In north-east Syria, Anatolia and northern Mesopotamia a new type of sickle, the enlarged head type (see Appendix IV), made exclusively of obsidian, is present. It has been found at Çayönü, Cafer, Gritille and Bouqras (Roodenberg 1986, 80-81, Fig. 43,2-6) and Tell Magzaliyah (Fig.VI:17).

4.5 Hafting Methods

The only hafts recovered from Periods 3 and 4 contexts are the two antler ones from Çayönü (see Chapter IV), which are without inserts and the horn one from Nahal Hemar. A set of four blades set in bitumen (but without the rest of the haft) were found at Jarmo. Lustre configuration and the form of the insert suggests that both straight and curved hafts were in use and that inserts were set either to form a continuous edge (bitruncated pieces) or were set obliquely. Curved hafts are also evidenced by the curved bifacially flaked pieces from Ghoraifé and

(Fig. VI: 19, 4,5+7)
Ramad, with the pointed forms being terminal elements (~~Fig VI:10~~ (after reconstruction by M.-C. Cauvin 1983, 71, Fig.7:5). The coarsely denticulated pieces on the other hand, by analogy with a later occurence of a set of blades from Sha'ar Hagolan (Fig.IV:9 ; Stekelis 1972, 18, Pl. 18,1), were probably set end to end in a straight haft. The long blades with fine to medium denticulation may have been hafted singly and set obliquely to the haft (see discussion of Jericho examples in Chapter V.6; Crowfoot Payne [1983, 686] and M.-C. Cauvin [1978, 70; 1983, 71]). The smaller angle- backed elements are likely to have been set obliquely in a curved haft (cf those from Aswad (Balikh) in Period 5, Fig.IV:16).

4.6 Function

Microwear analysis has established that just over 75% (25 out of 33 blades examined by Unger-Hamilton [1986b,122]) of long denticulated lustred blades form Jericho were mostly used for cutting cereals; the presence of domesticated cereals amongst the plant remains give some credence to the striations on the blades being indicative ofcultivation (but see Chapter III:8). Phytoliths of the festucoïdes group were found on two obsidian blades of the enlarged head class from Cafer (Anderson-Gerfaud 1982, 155) thus establishing their use as sickles.

4.7 Comparisons

Agriculture was by this time established in most regions capable of supporting rain-fed agriculture, but in less favourable areas hunting still appears to be the predominant mode of subsistence.

Proportions of lustred blades in the tool kit vary from region to region as in Periods 1 and 2, agriculturally marginal areas having, as in previous periods, only a token presence (Table VI.6). Different types seem to polarize in particular areas (see Chapter II:11). Direct quantitative comparison between sites is complicated by the vastly different numbers and types of lustred blades present, some sites having over 800 blades whilst others only have 6 or 7. Also it is not certain that all had the same function. Relative proportions of lustred blades reflect other variations in the tool kit (Table VI:6) and though it might ultimately be possible to apply multivariate statistical tests (cf Henry 1977 and Olszewski 1986 & 1988) to check the validity of these apparent groupings, it is felt that at present, the database is of rather uneven quality and comparsions are best kept at the level of inspection until more detailed and standardized analyses of attributes are available. From inspection of the data it does seem that the variations in the tool kit, and especially the lustred blades, reflect as in the Epipalaeolithic, the two contrasting groups of PPNB Mediterranean and Desert Societies. It is also apparent that the Mediterranean societies had varying economies and/or were at different stages of domestication (Garfinkel 1987, 199). More general regional differences are also apparent: for example lustred blades in Anatolia and the Zagros are different from those in the Levant. It seems to be with these areas that the subsequent settlement in northern Mesopotamia has its affinities (Roodenberg 1986,205).

Direct correlation between lustred blades and palaeobotanical evidence for cereal cultivation is difficult because of the varying levels of data, but with the exception of Abu Hureyra, sites with cereals produced quantities of lustred blades. At Yiftahel, however, there are lustred blades (interim report without quantification, also function untested),

SITE	a ah	b scr	c bur	d perf	e n/d	f kn	g axe	h micr	i sic	k nibb	j ret	k oth	TOTAL
Jericho	405	212	913	191	111		59		998	1046	268	[b]459	4662
Beidha	301	373	164	803	159	610	71	-	380	-	6584	424	10469
Aswad IB	17		5	5			1	2	24			[q]35	89
II	323	26	68	30			11	8	338			449	1253
Çayönü [1]	-	423	54	907	-	-	-	-	[y]896	-	2767	953	6000
Cafer	33	87	31	17	64	†22	-	107	62	-	199	48	670
Ali Kosh (BM)		125	2	138	321			161	42		426	1	1216
Ghoraifé IA	6,8%	(3)	15,4%	1	x	†x			29%		x		177
IB	12,5%	few	15,1%	-	-	-	-	-	30,3%		x		152
IIA	26%	(1)	4%		x		x		22%		x		45
IIB	30%	4%	5%				x		10%		x		99
Ras Shamra VC	19,6%	22%	9%	5,8%	few	25%			14,8%				
El Kowm Caracol[2]	(3)	20%	50%										723
Qdeir	31	108	156	few	x	†x	?		10			(168)	473
Nadaouiyeh 7	4	10	19	1		†9	9		2				54
Bouqras[2]	216	532	757	60			*		53		1951		
	4,6%	9,7%	22,8%	1,7%					1,9%		56,7%	2,6%	[z]4900
'Ain Ghazal		182	724	151	284	19	33		160		146	[u]420	2119
Dhuweila	218	19	140	7	24				2		141	-	551
Ibn el Ghazzi	325	15	332	12	29				4		231	-	948
Wadi Jilat 7	177	20	177	33					4		254	23	688
Azraq 31	175	44	218	42					6		416	138	1039
Jarmo JI	-	583	x	169	x			73	176	-	1356	268	2625
Ali Kosh (AK)		125	2	113	692			171	114		852	2	2071

[1] sub phases only
[2] absolute totals not available for every type, Percentages taken from summary
* Axes etc of stone
† racloirs
[b] includes 187 backed blades
[q] not mentioned in report
[u] utilized
x present but unquantified
[y] inclludes 445 enlarged head type
[z] total less than 100 %

Sources; Jericho; Crowfooot Payne 1983; Beidha; Mortensen 1971; Aswad; M.-C.Cauvin 1974; Çayönü; Redman 1982; Cafer; M.-C.Cauvin and Balkan 1985; Ali Kosh; Hole et al 1969; Ghoraifé; M.C.Cauvin 1975-77; Ras Shamra;de Contenson 1977; El Kowm Caracol; Stordeur et al 1982; Qdeir; Aurenche and Cauvin 1982; Nadaouiyeh 7; J.Cauvin 1982; Bouqras; Roodenberg 1986; 'Ain Ghazal; Rollefson and Simmons 1984; Dhuweila and Ibn el-Ghazzi; Betts 1986; Wadi Jilat; Garrard et al 1986; Azraq 31; Garrard et al 1987; Jarmo; Howe 1983.

Key as in Table VI:4

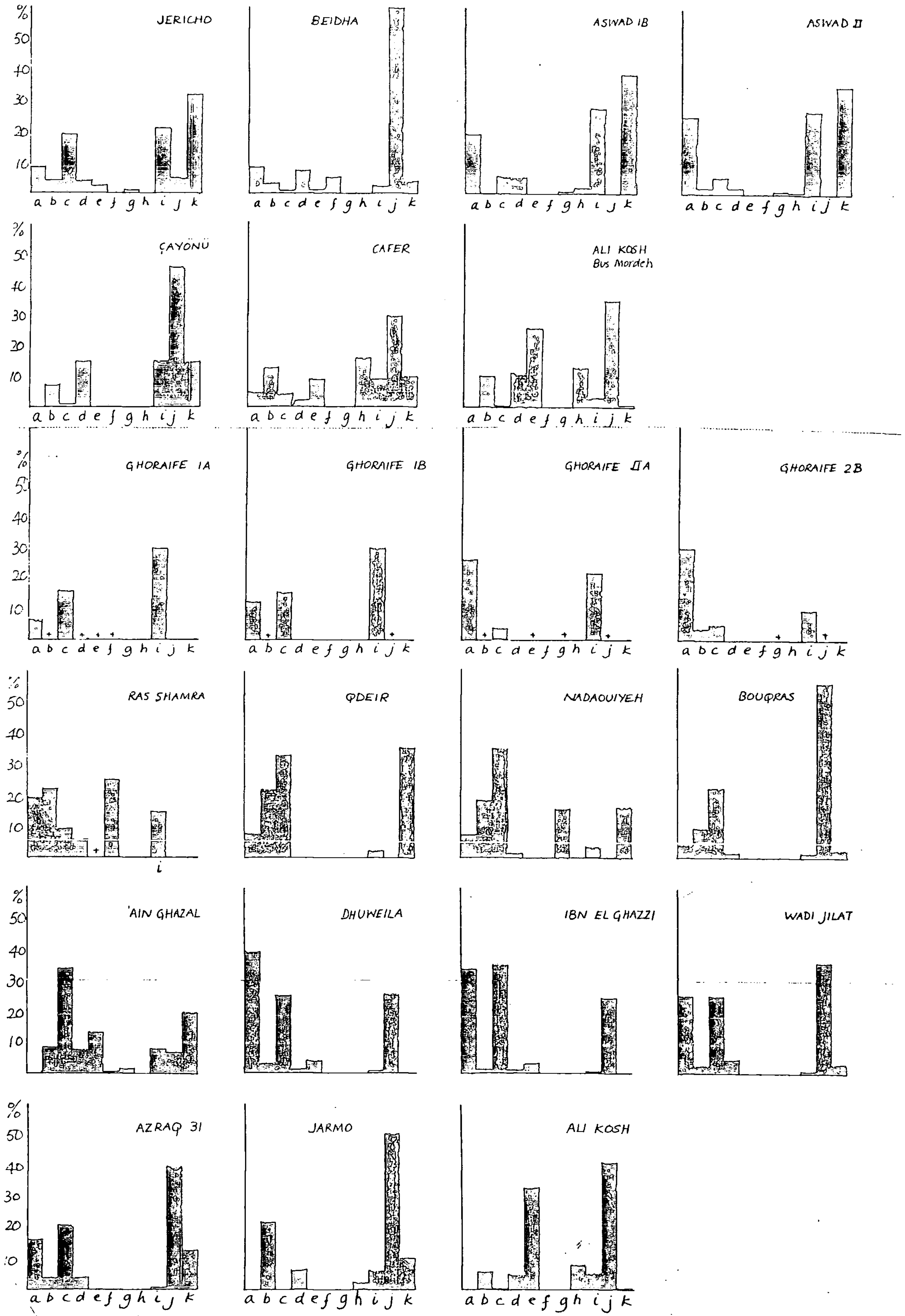


TABLE VI;6
FREQUENCIES OF RETOUCHED TOOLS ; PERIODS 3 AND 4

but as yet no cereal remains (despite the survival of horse bean and lentil). Straw was used for temper in the construction of a lime plaster silo and there is a corn grinding area (Garfinkel 1987, 210), so it could be that grain was used but stored separately from other food plants and the processing equipment.

Lustred blades are either absent or present only in very small numbers and in a non-standard form in some of the environmentally marginal areas where there is evidence of cultivation of cereals though they appear to have been used. A possible explanation is that some sites, like Nazad Mazzal, were seasonally occupied and that cereals were not grown on the site but that grain was taken there (and hence there was no need of harvesting equipment) (Taute 1981). If cereals were available for these communities to gather they could have been harvested by hand or by uprooting as was still practised in the Beidha area in recent times (Kirkbride 1985, 123) and in weed infested fields near Damascus (van Zeist and Bakker-Heeres 1979, 166)

4.8 Overview Periods 3 and 4

Periods 3 and 4 are times of continuity, expansion and consolidation. There is a great increase in the number of settlements and an adjustment of location to 'better' areas when some regions such as Palestine and the Damascus basin became, because of increasing dryness, unsuitable for agriculture, a situation exacerbated by farming and climatic change. Agriculture is well established in most areas, though wild forms continue to be exploited at some sites (see Table II:3) and pulses seem to be preferred at others (Yiftahel and 'Ain Ghazal). Naked cereals are present from about this time and their presence is reflected in the inventory of ground stone equipment which has less emphasis on pounding tools and more on grinding, presumably because naked forms of cereal and barley do not need to be pounded to release the grain. The positive identification at Jericho of the use of lustred blades to cut cereals (albeit from a small sample) together with the increasingly important position they hold in the tool kit and the fact that they are made on specially prepared blades and that they are of standard form suggest that they can now be taken as a reliable indicator of agriculture. Equally, their rarity in non-agriculturally viable areas also seems to reflect the mode of subsistence there. It is, however, still not clear whether the presence of several different forms in one tool kit is significant.

5 Periods 5 and 6

5.1 Introduction

The main aspect of material culture which distinguishes Period 5 from the preceding periods is the regular use of pottery and in many ways it is a period when the developments of Period 4 are consolidated. Indeed some sites like Bouqras and Ramad II and III which began to use pottery in Period 4 have C14 dates which overlap the end of Period 4 and the beginning of Period 5 (see Chapter II). Different regional groups are more easily identifiable from ceramic styles and become more polarized later. Towards the end of Period 5 there is a marked change in the distribution of settlements when the emphasis shifts from Palestine to Mesopotamia about 5500 bc. There is little detailed information on lithic industries and the lustred blades from the two periods have been considered together. The lustred blades of relevance to this discussion are detailed in Appendix VI.

5.2 Raw Materials

At Ras Shamra VB there is still some evidence of heat treatment of flint, perhaps to facilitate pressure flaking (de Contenson 1977, 14), though it is not clear whether this flint was used for sickle blades. At Apamea Otte noted a change in raw materials from the earlier level, when better flint had been used alongside local nodules (Otte 1976, 102, 104). At Jarmo the flint may also have been heat-treated (Hole 1983, 264 fn 7). In Khuzistan at the beginning of the Sabz phase, however, the quality of flint used declined (Hole et al 1969, 74). Good quality flint was selected for sickles at Choga Mami (Mortensen 1973, 38 fn 13) and Umm Dabagiyah (Mortensen 1983). Obsidian was also used for sickle blades and an obsidian blade was found hafted with flint at Hassuna. Obsidian was used in varying quantities in Halafian industries, but no sickle blades of obsidian are recorded from them (Watson 1983, 240).

5.3 Technology

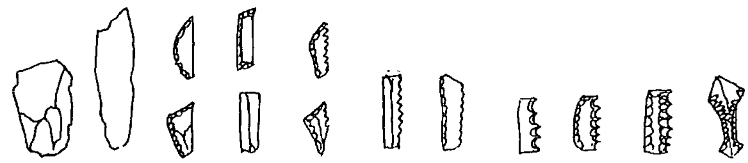
In Period 5 technology changes from one predominantly of blade manufacture to more general manufacture of flakes (Ras Shamra, Jarmo and Kumartepe (Roodenberg et al 1984, 8), though blades are manufactured in the Amuq (Crowfoot Payne 1960, 529). At Ali Kosh (Mohammed Jaffar phase) bullet-shaped blade cores are the most common form, but by the Sabz phase there are virtually no blade cores, a technological change which is coincident with a change in raw material (Hole et al 1969, 91). In Period 6, in Samarran contexts, blades are still manufactured for sickle blades, usually from single platform blade cores, for example at

Tell es Sawwan (Al Tekriti 1968, 53), Hassuna (Lloyd and Safar 1945, 269), Choga Mami (Mortensen 1983, 39-40) and in Syria and Palestine at Judaidah (Crowfoot Payne 1960, 529) and Sha'ar Hagolan (Stekelis 1972, 22-3). Workshops specialising in the manufacture of blades for sickle elements were found at Hassuna (Lloyd and Safar 1945, 273) though the hafted pieces are irregular flakes (see Fig.IV:15) and at Hammadiyeh (Kaplan 1965, 543-4). Halafian industries are not well documented, but enough is known to indicate variation between sites; some sites are blade-based, but flakes predominate at Girikihaciyan and Banahilk (Watson 1963, 239-40).

5.4 Typology

This summary follows the regional groupings defined by the pottery styles. The range of lustred blades is shown in Table VI:7. The main form is the truncated blade segment but sub-groups are defined by the type of denticulation and the method of modification to the ends and backs.

In Syria and Lebanon two classes are recognizable. Firstly there are the distinctive, coarsely denticulated segments (Class III.F), found at Ramad, Byblos, Tabbat al Hamman and Megiddo (Fig. VI:24). They have retouched ends but rarely retouched backs. Secondly there are the finely denticulated truncated blades of Class II.F from Ras Shamra, Tell Judaidah, Tabbat al Hammam, Apamea and Arjoune, where they are unretouched (Figs.VI:26 and 28). Undenticulated truncated blades of Class I.F are found in Anatolia at Çatal Hüyük, Kumartepe and Hacilar (Fig. VI:29). In the Zagros two-thirds of the Jarmo segments are completely unmodified (Class I.F) but one third are retouched as at Ali Kosh (Fig.



	IA	IB	IE2/3	IF/G	IIE/23	IIF	IIG	IIIF	IIIG	IVG	VII
Sha'ar Hagolan								o	o		
Munhatta								o		o	
Megiddo								o			
Byblos								o	o		
Tabbat al Hammam				o		o		o	o		
Ramad III								o	o		
Apamea VB		o	o	o							
Apamea VA		o				o				o	
Arjoune		o		o			o				
Ras Shamra VB						o		o			
Ras Shamra IVC						o					
Ras Shamra IVB						o					
Amuq A and B						o					
Amuq C				o		o	o				
Amuq D							o				
Mersin						o					
Aswad (Balikh)			o	o	o						
Çatal Hüyük				o							
Hacilar				o							
Umm Dabagiyah						o	o				
Hassuna	o			o							
Banahilk	o	o									
Choga Mami	o	o	o	o							
Tell Shimsharra				o							o
Tell es Sawwan	o		o	o							
Jarmo J-II		o		o		o					
Ali Kosh (M.J.)				o							
Sabz		o		o							

TABLE VI:7
Classes of Lustred Blades by Site: Period 5 & 6

VI:30). By the Sabz phase they are backed and truncated and become more regular from then on (Hole et al 1969, 81). At Aswad (Balikh) short blade segments (Class II.G) with one obliquely truncated end and one concave or with a convex or angled back, Class II.E2 & 3, are typical (Fig. VI:27); the lustred edge is denticulated, but only on the upper two-thirds of the blade and has an oblique or convex configuration. In the new industries in Mesopotamia of Hassunan type lustred edges are irregular and sometimes are on flakes, Class I.A (Hassuna and Umm Dabagiyah [Fig VI:30]. Samarran industries are relatively well known from Mortensen's work (1970; 1973; 1983). The lustred blades show great variety. He lists 8 types from Choga Mami which are mainly variations of wide, truncated blades of Class I.F & G and unmodified flakes Class I.A (Fig VI:31).

5.5 Hafting methods

Two complete sickles (i.e. hafts and blades) were found at Hacilar and several hafts without inserts were also recovered as well as one from Çatal Höyük. This type contained smallish bi-truncated blades similar to those found at Hacilar and Catal Höyük. Blades and flakes set in bitumen (the presumably wooden haft having decayed), forming a curved shape, were recovered from Hassuna and Tell es Sawwan. At Hassuna the inserts overlapped so that they formed a pseudo-denticulated edge. The coarsely denticulated blades were probably set end to end in a straight haft like the set found at Sha'ar Hagolan (Fig. IV:9; Stekelis 1972, 18-19, Pl. 21,1). The oblique setting of the blades from Aswad (Balikh) (Fig.IV;16) is established by the configuration of the lustre and the remains of adhesive (M.-C. Cauvin 1973). Unger-Hamilton's study of the blades from Arjoune revealed seven different lustre patterns. The majority were inserted into a straight or slightly curved haft, but some appeared to have been in a curved haft but with the blades forming a straight edge, and others appear to have been hand held or hafted axially (1985a, 259).

5.5 Function

Only the blades from Arjoune have been examined for microwear traces. Of the 80 blades looked at by Unger-Hamilton (1985a, 261) 53 had sickle polish (i.e. over 65%), 10 were used to cut stipa and the rest were indeterminate. All had been used in a cutting or sawing motion. She could find no relationship between the type of sickle and the plant species cut. The coarsely denticulated blades are deemed by most analysts to have been unsuitable for harvesting cereals because the stalks slip between the teeth and these get damaged (Steensberg 1943, Sauer 1958; J. Cauvin 1968). Unger-Hamilton (1985a, 274) found the micropolishes difficult to see because of the retouch, but where identifiable they seem to have been used to cut reeds or stipa.

5.6 Comparisons

The relative importance of lustred blades in the tool kit seems to increase, although actual figures are hard to establish (Table VI:8). In Period 5 lustred blades are relatively frequent and though the bi-truncated blade, sometimes with a finely denticulated edge, is ubiquitous, other forms have localised distributions like the coarsely denticulated blades and the oblique form from Aswad. With the increasing dryness and the consequent decline of agriculture in Palestine the emphasis of settlement shifts to Mesopotamia. The form of the lustred blades there is rather different from other areas though Hassunan and

Site	a ah	b scr	c bur	d perf	e not	e den	f kn	g axe	h mic	i sic	j ret	k oth	TOTAL
Sha'ar Hagolan	28	51	53	793	84	34		146		337	190	51	1757
Byblos (néo,anc)	188	38	198	18	128	117	'22	121	3	689	161	496	2179
Tabbat al Hammam	12	10	16	3	1,8			5		53		56	
Ras Shamra VB	12,74%	11,8%	17,45%	rare			15,57%			37,74%			c,242
Ras Shamra VA	-	4,7%	28,4%				17%			17%			c,338
Amuq A and B	'63	29	10	18						380		*131	631
Amuq C		1	2	4						34		*2	43
D		3	1	1						24		*2	31
Apamea VA	3	1	37	3	14	20		2		66	44	3	193
VB	2	3	45	1	12	19				97	74	2	255
Arjoune	1	18	3	4	1		2	1		16	24	10	80
Aswad VIII-VII	14%	8,7%	16%							9,9%			300
Çatal Hüyük	132	91	1	29						16		×45	314
Hacilar Late neo		3					1		?4	11	10	14	43
Kumartepe	12,5%	3,2%	7,6%	10,9%	13,1%	1,6%				1,1%		50%	-
Umm Dabagiyah	41	132	26	54	50		158	23	5	2	362	7	860
Jarmo J-II		1304	17	500	165				173	606	4604	2	7371
Ali Kosh (M-J)		50	1	109	463				211	121		614	1569
Choga Mami		24	13	37	26			4	25	161	72	18	380
Sabz		1	1	2	31				2	24	29	14	104

' Javelin heads
× Includes 26 daggers
* Nibbling retouch present but not quantified
' Racloirs

Sources; Sha'ar Hagolan; Stekelis 1972; Byblos; J. Cauvin 1968; Tabbat al Hammam; Hole 1959; Ras Shamra; de Contenson 1977; Amuq: Crowfoot Payne 1960; Apamea; Otte 1976; Arjoune;Copeland in Marfoe et al 1981; Aswad; Cauvin 1974; Çatal Hüyük; Bialor 1962; Hacilar; Mellaart 1970; Kumartepe; Roodenberg et al 1984; Umm Dabagiyah; Mortensen 1983; Jarmo; Hole 1983; Ali Kosh; Hole et al 1969; Choga Mami; Mortensen 1983; Sabz; Hole et al 1969.

KEY TO HISTOGRAMS OPPOSITE

a=arrowheads
b=scrapers
c=burins
d=perforators/borers
e=notches and/or denticulates
f=knives
g=axes, picks, chisels etc
h=microliths
i=lustred blades
j=retouched
k=other

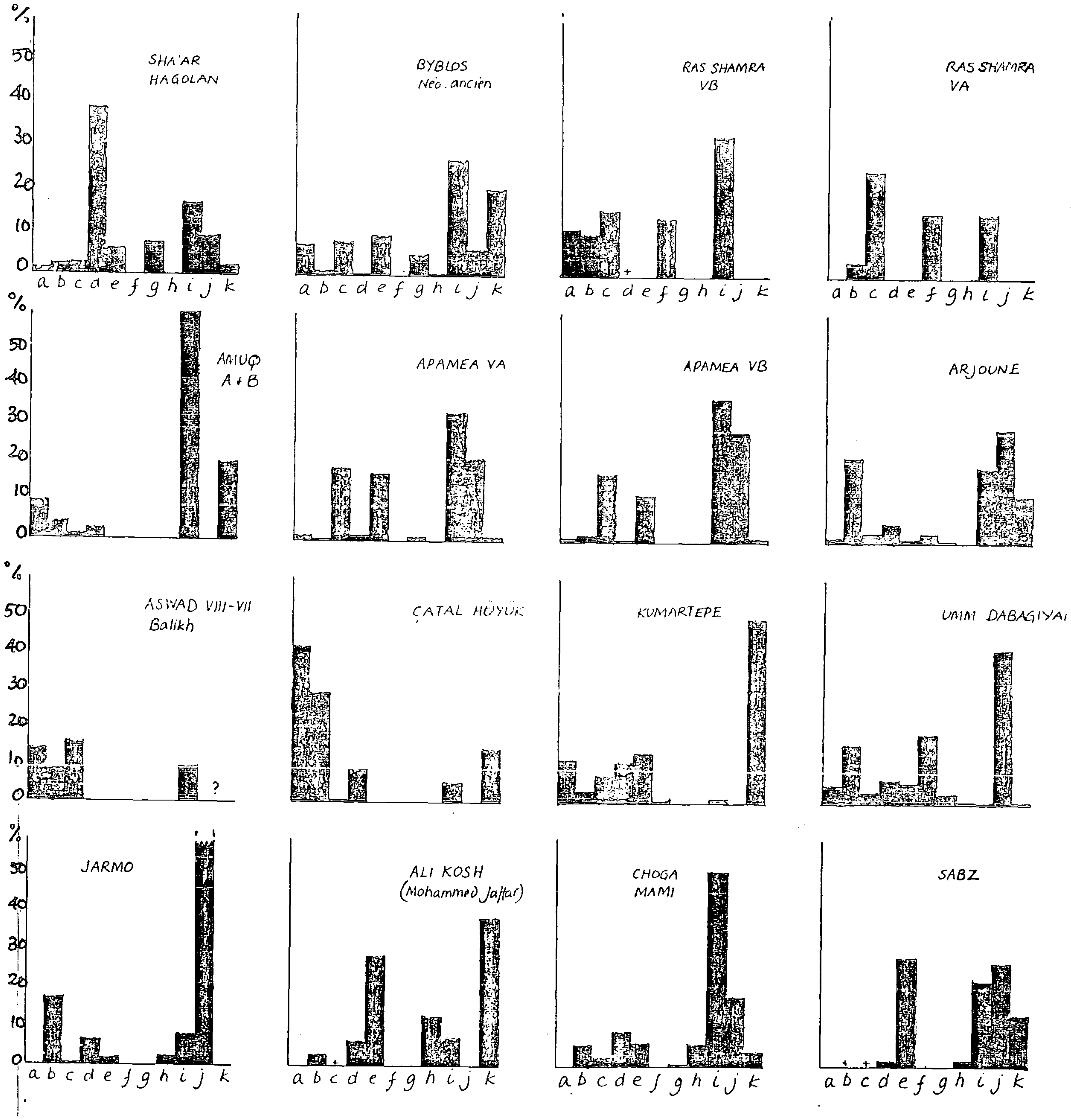


TABLE VI:8
FREQUENCIES OF RETOUCHED TOOLS; PERIODS 5 AND 6

Halafian sites are all situated in the region in which rainfed agriculture is possible. Lustred blades are relatively rare in Hassunan tool kits and some sites such as Umm Dabagiyah apparently had little or no evidence for agriculture. Halafian industries are poorly understood and the proportion of lustred blades is not known, but their form (Class I.G2iii) is fairly distinctive (Fig. VI:33). Samarran sites are situated in regions where irrigation is necessary and despite high levels of production consequent upon irrigation, lustred blades are present only in small quantities, though the blades do appear to be more standardized compared to contemporary industries. When Palestine is re-occupied coarsely denticulated forms (Class III.F) seem to predominate. The suggestion that these were used to cut reeds rather than cereals would corroborate the lack of evidence for agriculture there at this time.

6 Lustred blades post 5000 bc

Documentation of lithic industries becomes more and more patchy after the Neolithic and while examples of lustred blades are known from many sites, it is only in a few cases that they can be set in the context of an industry.

6.1 Palestine

In Palestine the coarsely denticulated blades (Class III.F) like those of Periods 5 & 6, are the predominant form, for example in the Yarmukian levels at Jericho and elsewhere (Moore 1973; Crowfoot Payne 1983, 714-16). Later, in the Ghassulian, industries from sites such as Tell es Ghassul (Mallon et al 1943; Hennessey 1969), Byblos (J.Cauvin 1968) and Jericho (Crowfoot Payne 1983, 716) have lustred blades with convex backs, obliquely retouched ends and finely serrated edges (Class II.G2 [Fig. VI:36]). At Abu Matar there were many sickles made of the jaw bones of ruminants, though they had no flint inserts (Perrot 1957,19 ,Pl.III,5). Possible ceremononial ivory sickles of Chalcolithic date have been found in Palestine for example at Bir es Safedi and Nahal Mismar (Levy 1986, 82, Pl 1).

6.2 Ubaid and Uruk

In the alluvial plains of Mesopotamia the earliest blades are from Ubaid contexts (Oates 1960) at Al Ubaid, Tello and further north at Choga Mami (Ubaid well). They do not seem to form a recognizable group, though they tend to have finely denticulated edges, convex backs and unretouched ends (Class II.E2, Fig.VI:33). They were set in bitumen in a wooden haft. Although Ubaid influence is very widespread, lustred blades are not particularly standardized. In Saudi Arabia for example at Abu Khamis (Masry 1974) lustre occurs on large irregular flakes (Fig. VI:35,4) but in Syro-Cilicia (Amuq E, Crowfoot Payne 1960) the blades have a similar form to those from Mesopotamia (Class II.G, Fig. VI:28).

Sickles made of highly fired clay (Semenov 1965) are characteristic of this period though they do also occur later (Fig. VI:34 ; Adams and Nissen 1972, 208-209). Micro-wear analysis has shown that they were used for harvesting grains (Semenov 1974; Anderson-Gerfaud and Stordeur 1983). It used to be thought that they were made because flint was not available in the region, but lustred flint blades do occur, sometimes on the same site, and other reasons for the choice of clay must be sort.

Some have suggested that they were held in the left hand and used to gather the stalks together for cutting with a sickle held in the right.

Large numbers of lustred blades also occur in Susiana though they are not precisely dated. Valla's detailed classification indicates that there are two types, one single-edged and the other double. The single-edged pieces were delimited by truncations and hafted end to end in a grooved haft. Triangular elements were probably terminal pieces. Some of the double-edged pieces Valla considers were re-used elements of the first class, but others seem to have formed double edged tools. Occasional unmodified flakes and blades were used. The majority are made on blade segments measuring between 20 and 60 mm depending on type and were clearly part of composite tools, but one or two larger pieces may have been hafted singly (Valla 1978).

The blades from the Uruk period are again found throughout the region for example at Warka, in the El Kowm region and at Byblos. Typically they are broad parallelograms with abruptly retouched sides and ends (Fig. VI:35,56; Eichmann 1986; J. Cauvin and Stordeur 1985; J. Cauvin 1968). It is not clear from the information avaiable, whether lustred blades when found in the Uruk colonies on the Euphrates are of a different class from those found in the 'native' hinterland (Sürenhagen 1986; Weiss 1985,81)

6.3 Early Bronze Age Palestine and Syria

Early Bronze Age industries in Palestine are well known. Lustred edges are found on Canaanean blades (see Appendix IV and Fig.VI:36) or as before on ordinary blades or segments; they have been extensively discussed by Rosen (1982; 1983; 1987). It appears that they were made in workshops each of which traded over an area of about 40 km (Rosen 1982; 1983, 141, Fig 6). They are found for example at Jericho (Crowfoot Payne 1983), Arad (Šhick 1978, 628), En Shaddud (Rosen 1985), Megiddo (Loud 1939), Lachish IV (Waechter 1958), Beth Shan (Fitzgerald 1934) and somewhat earlier in Amuq F-H contexts in Syria (Crowfoot Payne 1960, 534, 537) where they are somewhat larger than those in Palestine. They have a restricted life in Palestine, being solely confined to the Early Bronze Age (Rosen 1982, 141) though a form derived from them is used in the EB.MB levels at Iktanu and other sites (Prag 1974, 99).

Although Canaanean blades are concentrated in Palestine they appear to be found as far a field as Habuba Kabireh (Sürenhagen 1986, 19) and Hassek Höyük on the Euphrates, where they are alleged to have been made (Behm-Blanke et al 1981, 24, Pl. 14), at Tell Kudrush in Iraq (see also Braidwood 1960, 315) and even in Susiana. However, the supposed Cananean blade from Tepe Gawra (Tobler 1950, 200) though similar in general appearance, was in fact produced by a different technique as indicated by the striking platform (Betts 1986, 283). An examination of the technology of the other outlying examples may show that they too were made by a different process.

There is no direct evidence of how Canaanean blades were hafted but Rosen has suggested that 5 to 7 elements inserted longitudinally into a haft would produce a cutting edge of about 30 mm in length. Steensberg (1943) claimed that the long Canaanean blades must have been axially hafted and Prag thinks that they may have been hand held or end hafted (Prag 1974, 99), but blades from Arad with bitumen all along their backs suggest that they at least were longitudinally hafted (Šhick 1978, 60).

Functional analysis of a few Canaanean blades from Jericho confirms that they were used to cut cereals (Unger-Hamilton 1985a, 274). At En Shadud they were found together with unused blades in a place which has been interpreted as a store room for agricultural tools and their blanks (Rosen 1985, 159).

6.4 Early Dynastic Mesopotamia

In Mesopotamia the lustred flint blades are found in Early Dynastic contexts at Kish, Nippur, Abu Salabikh, Fara (Crowfoot Payne 1979, E06), Ur (Woolley 1934, 302) and Khafajah (Delougaz 1940) (fig. VI:) and copper sickles are also known at Fara and Ur from contemporary contexts (Deshayes 1960, 337 - 9). Unlike the Cananean blades the blade blanks for these sickles were manufactured on site, but the flint must have been imported, perhaps all from the same source (Crowfoot Payne 1980, 105 and see also Miller 1987, 209). They have been described in detail by Crowfoot Payne (1980, 106 -109). The blades are rectangular and shaped by retouch or truncation. Crowfoot Payne notes that snapped (unretouched) ends are more frequent in EDI-II contexts and that retouched forms are more common than truncated pieces in ED III contexts and that this pattern is consistent at both Kish and Abu Salabikh. The lustred edge is coarsely denticulated by direct retouch, the denticulations being about 4 or 5 per 2 cm, though closer spacing is known. Lustre occurs on the denticulated edge on both faces and is wider on the ventral than on the dorsal face. Double-edged examples are known but the denticulation is usually more worn on one edge than the other (Crowfoot Payne 1980, 108-9).

No functional analysis of these particular lustred blades has been undertaken but generally similar, though bifacially flaked, coarsely denticulated blades from the Levant have been shown to have reed or stipa polish (Unger-Hamilton 1985a, 274). It has already been mentioned that such blades are considered to be unsuitable for harvesting cereals but good for harvesting reeds. It may not be without signficance that these forms occur in the marshy areas of Iraq where reeds are the main building material today.

6.5 Middle Bronze Age to Iron Age in Palestine and Syria

The distribution of lustred blades appears to reflect late third and early second millennium cultural frontiers at this time which are defined by the distribution of flaked stone arrowheads (Miller 1985, 16). They are used in the Upper Euphrates valley along-side copper but in Mesopotamia metal seems to have taken over after the Early Dynastic period. Flint continues in use in the Levant well into the Iron Age (Rosen 1983, 504).

In the Levant lustred pieces are segmented blades of wedge-shaped cross section and of various geometric shapes including rectangles, parallelograms, trapezes, crescents and sub-triangular pieces which are probably terminal elements (Fig. VI:36; Coqueugniot 1983; Crowfoot Payne 1983, 725-6), the shape being adapted to fit a particular position in the haft. Parallelograms are more common in the Late Bronze Age and crescents in the Iron Age in the Negev (Rosen 1982, 144). They measure between 20 mm and 30 mm in length. The length distribution of the elements suggest that as a group they become shorter through time, though this is only a trend and cannot be applied to individual pieces (Rosen 1982, 142-3 fig 5). The lustred edge is sometimes serrated and is considerably thicker and at a more abrupt angle than earlier forms. Typical examples are found in various levels at Gerar (Tell Jemmeh) (Petrie 1928), Gezer (Macalister 1912, 127), Gaza (Tell el 'Ajul) (Petrie 1931, 10. Pl XXII), and Beth Shemesh (Wright 1939) and other sites. Evidence of hafting comes from ~~Tell Gemmeh~~ Gaza where they are arranged in a curved haft (Fig.IV:20). In form they are not unlike the Egyptian sickles mentioned in Chapter IV. which experimental harvesting suggests would have been well suited to reaping (see Chapter III.4).

In the upper Euphrates in the late third and early second millennium Miller has identified specialist workshops from which flint as a raw material seems to have been traded (Miller 1987, 205). No sickle blades were found at Tell Hadidi though they are known from elsewhere in the area from contemporary and later sites, for example Hama and Halawa (Miller 1985, 2; 1987, 209). Bronze sickles are also found at contemporary sites in the area at Mari and Tell Brak (Deshayes 1960) though flint working was still practised at Mari (Parrot 1974).

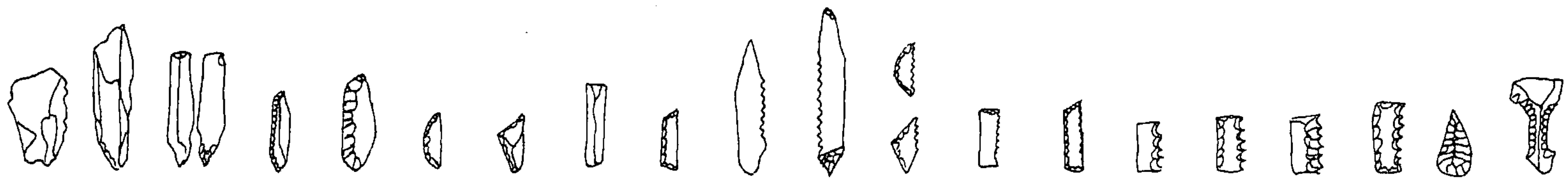
In the late Bronze Age in Syria and Anatolia lustred blades continue to be found. For example at Ras Shamra lustred blades were frequently found amongst debris (Yon et al 1987, 17,21,39), in store rooms (Yon et al 1987, 45) and in one instance in a kitchen (Fig. 35 79/6980), some being struck from a single nodule. Apparently abandoned examples were found in temples and have been interpreted as part of a ritual deposit (Temple of Rhytons, Mallet in Yon et al 1987, 224, 226, 233). Similar unretouched segmented blades were found with bitumen adhering in Mycenaean levels (Fig. IV:20; Ugaritica IV Fig 7, 169).

7 Overview

From this survey of lustred blades, a tool class defined by a macroscopically visible functional feature, it is clear that a number of forms are present, recognizable both in modification to the blank and in the distribution of the lustre. Some of these have limited distributions in time and space (see Table VI:9). Bar Yosef (1981b, 559) has intimated that lustred blades are, like arrowheads, indicators of cultural change.

Although very few have been confirmed as tools which were used to harvest cereals (Chapter III), the number and relative proportions of lustred pieces in tool kits seem to increase when agriculture becomes established and it does not seem unreasonable to accept that from that time most were used to harvest cereals. In Palestine and Syria for instance there is a marked increase in the number of lustred blades at several sites in Periods 3-4, together with a standarization of form, at the same time as agriculture is established and other socio-economic changes are apparent (see Chapter II). In Khuzistan, on the other hand, sickles do not show a significant increase until the beginning of irrigation agriculture in the Sabz phase when they are also of different form.

As a tool class lustred blades start as a non-specific form, being distinguished only by the presence of lustre. Gradually, and in particular at sites where agriculture is newly practised, they begin to



	IA	IB	IC/D	IE_1	IE_{2ii}	IE_{2i}	IE_3	IF	IG	IIB	IIC/D	IIE	IIF	IIG	IIIF	IIIG	IVF	IVG	V	VII
Period 1	o	o		o		o		o	o			o	o?							
Period 2		o	o	o	o			o	o	(o)	(o)	(o)	o	o						
Period 3	o	o	o	o				o		o	o		o	o	(o)		(o)		o	o
Period 4		o	(o)	o				o			o	o	o	o	o	o			o	o
Period 5-6		o				o	o	o	o			(o)	o	o	o	o	o			(o)

TABLE VI:9
Summary of Various Classes of Lustred blades by Period

form an independent class and by Period 3-4 are, in the Levant, Jordan and Syria at least, made on prepared blades suggesting that standardization in form was important. This was achieved by investment in blank preparation and technology rather than by elaborate secondary working. Later, standardization is achieved by secondary working (despite the presence of workshops specializing in blade manufacture) and it is only in Early Bronze Age Palestine with the use of Canaanean blades that the emphasis is again placed on blank standardization.

This line of development is clear in Palestine, Jordan and Syria. In Anatolia, Mesopotamia and the Zagros (including Khuzistan [Deh Luran sites]) forms are considerably less elaborate and show much less change over a longer period. In Khuzistan the earlier phases (to c 5000 bc) are very similar and it is only in the Sabz phase, when irrigation is introduced, that lustred blades change both in form and in relative proportion (Hole <u>et al</u> 1969, 74).

The continued use of flint for sickles into the Bronze Age and perhaps later (Childe 1951; Rosen 1982, Fig. 6, 1984), sometimes along side metal tools, suggests not impoverishment or archaization (<u>pace</u> Hopkins 1985, 225) but that they were efficient tools. Sickles also appear to take on a special or symbolic status. Amulets in the form of sickles were recovered at Arpachiyah (Fig. III: 3; Mallowan 1935) and a miniature clay sickle was found at Ur, which Woolley interprets as a votive model (Hall and Woolley 1927, 151). Actual sickles are found in shrines, for instance at Çatal Hüyük and Ras Shamra, or in grain pits (Hacilar, Fayuum) and in burials (Aswad and Egyptian tombs). Their presence in Egyptian tombs, together with the painted scenes of reaping where flint sickles are clearly depicted (see Chapter III:2) shows the importance of the harvest which carried on into the next life. Occasionally sickles have the name of their owner inscribed on them, for example that of Amennkkhte from Thebes and one from the tomb of Hemaka. As the blades in these tools are lustred it appears that they had been used before being placed in the tomb, though at that stage they may have taken on a non-utilitarian status. Literary and iconographic representations show sickles as weapons (Barb 1972, 387-8), the one on the statue of Ashurnasipal allegedly being armed with flint blades (on the outside curve of the haft) (Fig. III.3 ; Chenet 1931; 1939). The sickle of Chronos is sometimes described in translation as being armed with flint, though the Greek text is not specific on this point (Hesiod Theogony "ἅρπην καρχαρόδοντα" lines 175 + 179.) and it is more likely to be of iron (Barb 1972, 388).

CHAPTER VII

SUMMARY AND CONCLUSIONS

1 Summary

The analysis of lustred blades in Chapters V and VI indicates that their presence, together with changes in their morphology and relative proportions in a tool kit, can be used as an index of innovation and cultural change (Mortensen 1970) as well as an indicator of economy (but see Chapter III). In other words, apart from their intrinsic interest as artefacts their presence also has a wider relevance which can be assessed by the analysis of the changes in the artefacts themselves.

J. Cauvin (1983) considers that classification by form is of limited usefulness for the understanding the changes in lustred blades and that techno-morphological classification can be meaningfully applied only when the elements are stereotyped. Variations in form, he believes, are dictated by the hafting method and there need not be any set method of achieving the desired product, so that any attempt to try to classify them using a rigid classification system would result in an endless and meaningless variety of types. He also says that unmodified blades cannot be integrated into a typological system. Whilst sharing Cauvin's concern about the proliferation of classification for its own sake or as a tool with which to define diagnostic types, I believe that this is a narrow view of the purposes of classification. Quantification of the various characteristics of lustred blades can highlight technological preferences and may show cultural connections. Such an analysis involves a consideration not only of the variation of the tools but also an examination of raw material type and origin and of tool manufacturing processes, as well as of evidence for hafting and function. Not all these factors are equally documentable and there are also disagreements about how this information is to be obtained and interpreted. With this in mind I examined in some detail a sample of lustred blades from Jericho (Chapter V) and in Chapter VI reviewed lustred blades from other sites over a wide area of the Near East using the same criteria where possible. The following conclusions have been reached:

1.1 Raw materials

The potential sources of supply are poorly documented, but it is clear from Jericho and other multi-period sites that supplies of raw materials changed through time. But whether this was for functional reasons or economic and socio-political reasons or whether a particular supply was exhausted is not known. The best quality flint was preferred for the manufacture of sickle blades. A clear example of this is the choice of purple flint used in Periods 2-4 in Palestine. There is some indication of heat treatment to improve the flaking quality.

1.2 Technology

Technology, when considered from the point of view of core reduction strategy and the resulting tool blank, becomes progressively more standardised through time (Calley 1986), the most technically competent blade manufacture being found in Periods 3 and 4 in

Palestine, Anatolia and Syria. Some of the blades were struck, using prepared 'naviform' cores, to a predetermined shape. At Jericho the blades were used almost exclusively for sickles, though this remains to be tested over a wider area. Later, there are sporadic indications of workshops producing blanks for sickle blades.

1.3 Morphology

Retouch has often been considered to be a stylistic attribute. However, recently it has been suggested that it is actually functional and either results from a modification to fit into a particular haft (J.Cauvin 1983; Perlès 1988) or some modification to the active edge for a particular purpose. Retouch must also be partly a function of technology. The fine long blades struck from the specially prepared cores required only minimal modification, whereas later, though blades are still manufactured for sickles, they are not as predictable in form and required more modification to fit as part of a series into a particular haft. The type of retouch used seems to reflect that used on other artefacts in any particular industry, particularly on arrowheads, and it seems likely that there is also a stylistic or cultural factor involved as well (compare the use of Helwan and abrupt retouch in earlier and later Natufian industries and the innovation of pressure flaking in Period 3).

1.4 Hafting

In comparison to many other tool forms there is an unusual amount of evidence for the hafting of lustred blades both from the hafts themselves and from the distribution of lustre and traces of bitumen on the blades. The type of haft must reflect the way the tool was used and must, to some extent at least, account for the shape of the blades, though which was the primary cause can only be guessed at. Hafts are likely to have lasted longer than blades which would have been replaced when worn. The length of the blade must have been dictated by the space in the haft and likewise the shape of the blade must have been determined by the hafting method (J. Cauvin 1983). There is no clear chronological development of types of haft though sickles tend to become larger in time and curved hafts are not certainly doucmented until agriculture is established in Periods 3-4. Ethnographic data suggests that different forms of sickles had specific functions.

1.5 Function

If lustred blades were used for cutting cereals, then they would have been used for only a short length of time (probably only 2 or 3 weeks) (see Chapter III). Thus they represent a very specific episode of activity. Direct evidence for function is rare. There has been no direct correlation of form with function, but it seems that if we can accept the evidence available at its face value, standardized forms, whether of Natufian type, the long denticulated blades of Periods 2, 3 and 4 or Canaanean blades, were used for cereal harvesting, whereas the less regular forms which have less extensive gloss may not have been used to cut cereals. This is based on a very small sample and needs testing over a wider area. Also the function of the occasional lustred piece from present day desertic contexts needs investigating. Some sickles, for example one from Jarmo and one from Tell es Sawwan were found on reed covered floors possibly suggesting that they were the implement used to cut the reeds. The coarsely denticulated blades in the Levant are unsuited to cutting cereals, but may have been used to cut reeds. We may note that they occur when evidence for agriculture is declining, both in the early versions at Ramad and in Period 5-7 contexts in Palestine. They are also the type of sickle blade found in the marshy areas of Iraq in Early Dynastic times. If they were used for cutting reeds, harvesting tools of these periods remain to be found.

Little is known of the reason for the discard of lustred blades, though many appear to be very worn. Experimental reaping suggests that most would not be much use beyond a season, though the hafts may have been kept. Some clue is given by their location and association (though no specific spatial analysis has been done). For example, in the Late Bronze Age levels of Ras Shamra some are found in streets amongst general domestic rubbish, but others, particularly complete forms, appear to be deliberate deposits in temples. At Hacilar hafts and complete sickles are found in houses and granaries and at Çatal Hüyük in a shrine. Others are found in burials. At some sites areas of different activities are found as well as storage areas. Thus the tidiness (or otherwise) of the occupants and the season of the year in which the site was abandoned may go some way to explaining different numbers present.

This much documents some of the variations in the blades though it suggests little of the reasons underlying the variation.

2 Conclusions

Perlès (1988) has already noted that there is a difference in assemblage composition and tool form from two regions of Greece, one of which had a pre-agricultural settlement, whereas the other began as a farming settlement. A similar model might help to explain some of the differences in the tool kits in the Near East where some regions have extensive pre-agricultural settlement and evidence for the exploitation of cereals, but others are completely unoccupied. Jericho, for example, which has levels of earlier occupation (with lustred blades), has a much lower proportion of lustred blades in the PPNA levels than the contemporary site of Aswad IA in the Damascus basin which is the first evidence for occupation in that region, though both have similar evidence for agriculture and domesticated varieties of cereals. There is also a difference in the form of the lustred blades and at Aswad they are more standardized. Elsewhere, however, the situation is less clear and needs further investigation and possibly other explanations should be sought. At Mureybit, where wild cereals were exploited in Epipalaeolithic and Neolithic levels, blades are similar in form but not in number to Aswad. At Abu Hureyra in Neolithic levels, though domesticated crops are grown, lustred blades are rare. A different situation seems to pertain in the Zagros (Redman 1978, 106), where the earliest use of plant foods is contemporary with that in Palestine and Syria, but where agriculture seems to develop more slowly, and though lustred blades are found from the start there is little change in form from the early basic types.

It seems then, that lithic artefacts, both in general and in specific forms such as lustred blades, have a major role to play in the interpretation of sites. Cultural factors may determine the selection of raw material and the way in which core reduction processes are carried out. Functional factors may account for other variations. Once these factors have been isolated they need to be considered in the context of the whole tool kit (not only of flint but also of bone, wood, metal, etc.) and in terms of socio-economic and environmental data. Only in this way can their information potential be realized.

APPENDIX I

C14 DETERMINATIONS

(The dates are uncalibrated and based on the 5570 half life)
See Also Figs II:1-5 * = not plotted)

EPIPALAEOLITHIC

R = Radiocarbon

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
El Wad cave	B2	UCLA		± 560	9970	Bar Yosef 1981
	B2	UCLA		± 600	9525	
	B1	UCLA		± 600	7845	
Kebara	B	UCLA		± 400	9200	Bar Yosef 1981
Eynan	III	Ly-1662		± 880	9350	Goring Morris 1987
		Ly-1661		± 570	9790	
		Ly-1660		± 540	9640	
		OxA-543	330	± 100	*	Legge 1986
Nahal Oren	V	BM-746		± 318	8096	Henry and Servello 1974
		OxA-389		± 120	990	Goring Morris 1987
		OxA-390		±	31050*	
		OxA-395		±	1150*	
Rosh Horesha		SMU-10		± 290	8930	Bar Yosef 1981
		SMU-9		± 430	8540	
		I-5496		± 200	11140	
Hayonim Terrace	D	SMU-231		± 90	9970	Bar Yosef 1983
Hayonim Cave	Loc 4/7	OxA-742		± 140	10410	Goring-Morris 1987
		OxA-743		± 180	10060	
Wadi Hammeh 27		OxA-393	11920	± 150	9970	Edwards et al 1985
		OxA-507	11950	± 160	10000	Harris 1986
		OxA-394	12200	± 160	10250	
		BM-1723		± 500	8750*	
Wadi Judayid	C	SMU-805		± 800	10140*	Henry 1981, 437
		SMU-806		±1000	10800*	Henry et al 1983,12
		SMU-803		± 659	10834*	
Jericho		GL-69		± 240	7900	see Burleigh 1983
		GL-70		± 180	8850	
		GL-72		± 240	7850	
		P-376		± 107	9216	
		BM-1407		± 90	9140	

Rakofet		I-7032	± 260	9030	Goring-Morris 1987
		I-7030	± 140	8630	
		OxA-541	± 200	810*	
Salibiya I		RT-505A	±1550	9580*	
Mureybit	IA	Mc-731	± 170	8230	M.-C. Cauvin 1977
		Mc-732	± 170	8280	
		Mc-733	± 150	8080	
		Mc-635	± 200	8220	
		Mc-675	± 150	8400	
		Mc-674	± 170	8150	
Abu Hureyra		BM-1121	± 82	8642	Moore 1986
		BM-1719	± 50	7170	Gowlett & Hedges 1986
		BM-1718	± 150	9210	
		OxA-475	± 140	7110	
		OxA-170	± 200	8650	
		OxA-407	± 180	8000	
		OxA-406	± 160	9300	
		OxA-471	± 150	8670	
		OxA-386	± 160	8850	
		OxA-473	± 170	8050	
		OxA-472	± 170	8800	
		OxA-474	± 150	8980	
		OxA-397	± 140	8470	
		OxA-434	± 150	8540	
		OxA-435	± 180	8500	
		OxA-171	± 200	8650	
		OxA-430	± 150	9070	
		OxA-431	± 150	8730	
		OxA-172	± 150	8950	
		OxA-387	± 160	9120	
		OxA-468	± 150	9140	
		OxA-407	± 140	8970	
		OxA-470	± 160	8870	
		OxA-406	± 250	7350	Goring-Morris 1987
		OxA-882	± 120	4150*	
		OxA-883	± 300	9500	
		BM-1723	± 500	8750	
		OxA-432	± 170	7590*	

PROTO-NEOLITHIC

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Abu Salem	4	I-5498		± 150	8020	R 15, 295-296
	6	I-5499		± 150	8280	
	6	I-5500		± 150	8280	
		Pta-3292		± 90	8600	Goring-Morris 1987
		Pta-3293		± 100	8470	
		Pta-3291		± 80	8190	
		Pta-3080		± 90	9710	
		Pta 3290		± 90	8390	
		Pta 3289		± 100	8350	
Abu Madi		Pta-2699		± 100	8160	Bar Yosef 1981
Maaleh Ramon E		Pta 3371		± 100	8580	Goring-Morris 1987
		Pta 3403		± 80	8480	
W		Pta 3439		± 100	8450	
				± 200	8050	
Ramat Harif		Pta-3009		± 100	8550	Goring-Morris 1987
		Pta-3284		± 100	8430	
		Pta-3001		± 100	8350	
		Pta-3285		± 100	8440	
		Pta-3288		± 100	8300	
		Pta-3286		± 100	8150	
Mureybit IB		Lv-607	10,590	± 140	8640	M.-C. Cauvin 1977
II	I-VII	P-1217	10,232	± 117	8265	
	I-VII	P-1215	10,023	± 96	8056	
		P-1216		± 118	8142	
		Lv-605	10,590	± 170	8640	
		Lv-606	10,460	± 200	8510	
Jericho PI		BM-106	10,300	± 200	8350	see Burleigh 1983
		BM-1323	9380	± 85	7430	Listed as PPNA but
		P-379	9655	± 84	7705	from same context as first date
El Khiam		Lv-358	10,040	± 250	8090	R, 1969 11;152
Zawi Chemi		W-681		± 300	8920	Solecki 1981
Shanidar		W-667		± 300	8650	
Ganj Dareh		Gak-807	10,400	± 150	8540	Young & Smith 1966

PPNA

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Jericho DI		BM-250	10,300	± 500	8350	see Burleigh 1983
		BM-252	9320	± 150	7370	
	DII	BM-110	10,180	± 200	8230	
		BM-251	9390	± 150	7440	
	E	P-377	9582	± 89	7632	
		BM-1324	9430	± 85	7480	
	F	BM-1327	9560	± 65	7610	
		BM-1326	9230	± 220	7280	
		BM-1321	9230	± 80	7280	
		BM-105	10,250	± 200	8300	
		P-378	9775	± 110	7825	
		BM-1322	9380	± 85	7430	
		GL-39	8770	± 150	6820	
		GL-40	8690	± 150	6740	
		GL-43	8895	± 150	6945	
		GL-46	7300	± 200	5350	
Netiv Hagdud		RT-502A	9790	± 300	7840	Bar Yosef *et al.* 1980
		RT-502C	10,180	± 300	7840	
		OxA-744		± 150	7750	Goring Morris 1987
Mureybit III		P-1220	9965	± 115	8018	Cauvin 1977
		Lv 604		± 40	7780	
		Mc-734	9950	± 150	8000	
		P-1224	9509	± 122	7542	
		P-122	9921	± 114	7954	
	IIIB	Mc-612	9520	± 150	7570	
		Mc-613	9620	± 200	7670	
		Mc-614	9570	± 130	7620	
		Mc-615	9540	± 130	7590	
				± 122	7559	
		P-663		± 150	8000	
		Mc-735	9730	± 150	7780	
		Mc-616	9675	± 110	7725	
		Mc-611	9840	± 260	7890	
Aswad IA		GIF-2372		± 120	7690	de Contenson 1981
		GIF-2633		± 120	7790	
Salabiya IX		Pta-2699		± 100	16500*	Goring-Morris 1987

PERIOD 3

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Jericho DI		P-380	8610	± 75	6660	see Burleigh 1983
		BM-1793	8560	± 130	6710	
	E I,II,V	GL-36	8390	± 200	6440	
		GL-28	8200	± 200	6250	
		BM-253	8710	± 150	6760	
		BM-115	9170	± 200	7220	
		P-382	8955	± 103	7005	
		P-381	8658	± 101	6708	
	FI	GL-38	7800	± 160	5850	
		GL-41	8670	± 150	6720	
		GL-42	8700	± 200	6750	
		GrN-942	9140	± 70	7190	
		GrN-963	9025	± 100	7075	
	HI	BM-1320	8540	± 65	6590	
	H	BM-1769	8700	± 110	6750	
	H	BM-1770	8680	± 70	6730	
		BM-1771	8660	± 260	6710	
		BM-1772	8810	± 100	6860	
		BM-1773	8730	± 80	6780	
		GrO-942	8900	± 240	7850	
		GrO-963	8785	± 100	6835	
Nahal Divshon	6	I-5501	8620	± 140	6670	Bar Yosef and Goren 1973
		SMU-3	8900	± 180	6950	Henry and Servello 1974
	5/6	Tx-1123	8170	± 180	6220	
Yiftahel		RT-736A	8570	± 130	6620	Garfinkel *et al*
		PTA-4242	8870	± 90	6920	1987, 42
		EY-3938	8740	± 140	6790	
		RT-736B	8890	± 120	6940	
		PTA-4245	8720	± 70	6770	
		Ly-3939	8940	± 140	6990	
Munhatta IVA		M-1792	7370	± 400	5420	Henry and Servello 1974
IVB		M-1793	9160	± 500	7210	
Aswad IB		GrN 6679		± 60	6915	de Contenson 1981
		GrN-6678		± 55	6925	
		GrN-6677C		± 75	6770	
II		GIF-2369		± 110	6590	
		GIF-2373/5		± 110	6610	
		GrN-6676		± 55	6700	
Ghoraifé I		GIF-3374	8400	± 190	6450	de Contenson 1978
		GIF-3375	8480	± 190	6530	
		GIF-3376	8710	± 190	6760	
Jilat 7		OxA-526	8810	± 110	6860*	
		OxA-527	8520	± 110	6570*	Garrard *et al* 1987,7

Beidha II	GrN-5062	9030	± 50	7080	Kirkbride 1966 and
	K-1085	8850	± 160	6600	Henry and Servello 1974
	P-1382	8892	± 115	6942	
IV	K-1084	8730	± 160	6780	
	BM-111	8790	± 200	6830	
IV (?VI)	P-1381	8765	± 102	6815	
	GrN-5136	8810	± 50	6850	
	P-1380	9128	± 103	7178	
V	K-1083	8640	± 160	6690	
VI	P-1379	8546	± 100	6596	
	P-1378	8715	± 100	6765	
	GrN-5063	8640	± 50	6690	
	K-1086	8940	± 160	6990	
	K-1082	8710	± 130	6760	
	K-1410	8850	± 150	6900	Mortensen 1971
	K-1411	8770	± 150	6820	
	K-1412	8720	± 150	6770	
Asikli Höyük	P-1238		± 120	6057	Todd 1980
	P-1239		± 108	6651	
	P-1240		± 130	7008	
	P-1241		± 127	6843	
	P-1242		± 128	6828	
Çayönü	GrN-8013	10,430	± 80	8480	Çambel 1981, 543
	GrN-5935	9795	± 260	7845	
	GrN-4458	9520	± 100	7570	
	GrN-6243	9320	± 55	7370	
	GrN-6241	9275	± 95	7325	
	GrN-8079	9250	± 60	7300	
	GrN-4459	9200	± 60	7250	
	GrN-8821	9175	± 55	7225	
	GrN-6244	8980	± 80	7030	
	GrN-8820	8865	± 45	6915	
	GrN-6242	8795	± 50	6845	
	GrN-8078	8355	± 50	6405	
	GrN-8819	8080	± 90	6130	
	GrN-5954	8055	± 75	6105	
	GrN-5952	6100	± 80	4150	
	GrN-5827	5815	± 65	3846	
	GrN-10358		± 80	7230	Çambel and
	GrN-10359		± 140	7100	Braidwood 1980
	GrN-10360		± 140	7350	
	GrN-10361		± 110	7340	
	M-1609		± 250	6840	
	M-1610		± 250	6620	
Cafer Höyük	Ly-2182	8990	± 160	7030	J. Cauvin 1985, 124-5
	Ly-2181	8450	± 160	6500	
	Ly-3089	8150	± 210	6200	
	Ly 3091	8980	± 150	7030	
	Ly 3090	8920	± 160	6970	
Hacilar aceramic	BM-127		± 180	6570	Todd 1980

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Can Hasan III	5	Hv-11		± 65	6634	R 24, 1982, 286
		Hv-12		± 66	6693	
Asiab		UCLA-1714F	9050	± 300	7100	
		UCLA-1714C	8700	± 100	6750	
			8900	± 100	6950	
		GrN-6431	9755	± 85	7805	
Ali Kosh		I-1496	7380	± 130	5430	Hole *et al* 1969, 333
(Bus Mordeh)		I-1489	7670	± 170	5720	
		UCLA-750D	9900	± 200	7950	
Ganj Dareh D		P-1484	7018	± 100	*	
		GaK-994		± 770	6960*	
		GaK-807		± 150	8450*	Hole *et al* 1969

PERIOD 4

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Mazad Mazal		B-2727	8480	± 70	6530	Bar Yosef 1981, 566
		KN-2443	8070	± 75	6120	
		Hv-9106	8240	± 95	6290	
		KN-2444	8350	± 75	6400	
		Hv-9107	8330	± 75	6390	
		Hv-9108	8440	± 80	6490	
Nahal Issaron C		Pta-3000	8430	± 80	6480	Goring Morris & Gopher 1983, 159-60
		Pta-3376	8050	± 80	6100	
		Pta-3377	8180	± 80	6230	
Ujrat el Mehed		Pta-2703	8220	± 80	6270	Bar Yosef 1981, 566
Wadi Tbeik		Pta-2700	10,350	± 100	8400	Bar Yosef 1981, 556
Nahal Hemar		RT-650	8180	± 150	6230	R 29 i 1987
		BM-2298	8250	± 70	6300	
		BM-2299	9110	± 300	7160	
		?-230	8690	± 90	6740	
Shiqmim		RT-649B		± 180	5750	
		RT-649D		± 180	6150	
Sefunim V	top	HV-2597		± 115	5780	Henry and Servello 1974
		HV-3368		± 130	7445	
Dhuweila		BM-2349		± 60	6240	Betts 1988, 7
Ramad I		GrN-4826	8210	± 50	6260	de Contenson 1976
		GrN-4428	8200	± 80	6250	
ii		GrN-4823		± 55	5930	
		GrN-4882		± 50	5950	
		GrN-4427		± 50	5950	
pre III		GrN-4426	8210	± 50	6260	
Ghoraifé II		GIF-3372		± 190	6200	de Contenson 1976
Ras Shamra Vc		P-460		± 101	6414	de Contenson 1964 and Paléorient 1982
		P-459		± 100	6192	
		Gsy-102		± 400	7080	
		GIF-3960		± 140	5950	
Bouqras I		GrN-4852	8252	± 100	6290	de Contenson 1985
		GrN-4818	8140	± 60	6190	
		GrN-8262	8380	± 45	6430	
		GrN-8263	8330	± 80	6380	
II		GrN-4819	7960	± 55	6010	
		GrN-8261	8155	± 45	6205	
		GrN-8259	7925	± 40	5975	
		GrN-8260	7905	± 45	5995	

III	GrN-4820	7840	± 60	5890	
	GrN-8258	8115	± 40	6165	
	GrN-8264	7860	± 40	5910	
	GrN-9831	8170	± 100	6220	Roodenberg 1986
	GrN-8280	8280	± 40	6330	
Aswad (Balikh) VIII	Mc-864	8450	± 120	6500	Cauvin 1974, 203
VI	Mc-507	12,500	± 160	10,500	
III	Mc-865	8560	± 120	6670	
Mersin basal	W-617	7950	± 250	6000	
Suberde II	P-1385		± 88	5956	Todd 1980
	P-1386		± 76	6045	
	P-1387		± 300	6326	
	P-1388		± 79	6226	
	P-1389		± 85	5643	
	P-1319		± 91	6299	
basal	I-1867		± 140	6570	
Çatal Höyük XII	P-1374		± 95	5007	Todd 1980
X	P-782		± 98	6142	
	P-1370		± 104	6085	
	P-1369		± 109	5987	
	P-1372		± 85	5965	
	P-1371		± 102	5894	
IX	P-779		± 99	6240	
VIII	P-1367		± 97	5903	
	P-1366		± 90	5734	
VII	P-778		± 89	5588	
Jarmo-I	F-45	6570	± 165	4620	Hole et al. 1969
	H-551/491	8525	± 175	6575	
	C742	6606	± 330	4656	
	C-113	6707	± 320	4757	
	W-652	7950	± 200	6000	
	W-657	11240	± 300	9290	
	W-608	7750	± 250	5800	
	W-607	9040	± 200	7090	
	W-663	11200	± 700	9250	
Ali Kosh (Ali Kosh)	SI-207	7740	± 600	5790	Hole et al. 1969
	I-1491	8100	± 170	6150	
	I-1490	9950	± 190	8000	
	O-1845	8250	± 175	6300	
	O-1848	7770	± 330	5820	
	O-1833	8425	± 180	6475	
	O-1816	8425	± 180	6475	
	-1246	8410	± 200	6460	
	-1174	8850	± 210	6900	
Guran	K-1006		± 200	6460	
Ganj Dareh Tepe	H		± 150	6065*	
Sarab	K-1006		± 98	6006	

PERIOD 5

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Bouqras	III	GrN-4620		± 60	5990	R 9, 1967, 128
Ras Shamra VB		P-458		± 112	5736	de Contenson 1964
Ramad III		GrN-4823		± 55	5930	
Kadesh Barnea 3		SMU-662	7350	± 100	5050	Goring-Morris & Gopher 1983, 160
Çatal Höyük	Vi	P-1364		± 98	5906	Todd 1980
		P-770		± 94	5962	
		P-1362		± 111	5954	
		P-777		± 91	5754	
		P-797		± 90	5679	
		P-1365		± 80	5779	
		P-772		± 91	5622	
		P-781		± 90	5574	
		P-769		± 93	5555	
		P-1363		± 103	5961	
		P-1375		± 99	5711	
		P-827		± 86	5629	
	V	P-776		± 91	5690	
		P-1361		± 93	5549	
	IV	P-775		± 96	6087	
	III	P-774		± 91	5581	
	II	P-796		± 77	5571	
Hacilar	IX	P-314		± 94	5390	Todd 1980
	VII	BM-125		± 180	5820	
	VI	BM-48		± 60	5600	
		P-313A		± 85	5400	
Erbarba		I-5151		± 120	5780	Todd 1980
		Gx-2545		± 430	5580	
		GX-2544		± 550	4975	
		GX-2543		± 570	5600	
Can Hassan	3	Hu-10		± 140	5846	R 24, 1982, 286
	1/2	Hu-9		± 70	5924	
Matarrah VI-4		U623		± 250	5620	Oates 1973
Halaf early		GrN-2660	7570	± 35	5620	Oates 1973
Tolul eth Thalathat		TK-24		± 120	5570	Oates 1973
Guran H				± 150	5810	Hole et al 1969

Site	Level	Lab No	Years BP	2σ	Years bc	Ref
Ali Kosh	A2	I-1494	7820	± 190	5870	Hole *et al.* 1969
		SI-160	8920	± 100	6970	
		I-1495	7220	± 160	5270	
Jarmo		C-744	5266	± 450	3316	Hole *et al.* 1969
		C-743	6695	± 360	4745	
		F-44	6650	± 165	4700	
		U-651	8830	± 200	6880	

PERIOD 6

Site	Level	Lab No	Years BP	1σ	Years bc	Ref
Jebel Naja		OxA-375	7430	± 100	5480	Betts 1986
Ras Shamra VA		P-457		± 94	5234	de Contenson 1964
El Kowm		GrN-6778	7400	± 45	5450	
		GrN-6777	7290	± 45	5340	
Byblos		W-627	6550	± 200	4600	
				± 70	5410	
				± 130	4710	
Hacilar II		P-316		± 134	5220	Todd 1980
		P-315		± 121	5040	
Arpachiyah	TT8	P-584	7027	± 83	5077	Oates 1983
	Well	P-585		± 78	6114	
	TT10	BM-1531	6930	± 60	4980	
Hassuna V		W-660		± 200	5090	
				± 206	5301	
Tell es Sawwan	I	P-855	7456	± 73	5506	Oates 1973
	III	P-855	7299	± 150	5349	
	III	P-857	6808	± 82	4858	
		BM-1434	7069	± 66	5119	Oates 1983
		BM-1435	7015	± 66	5065	
		BM-1436	7052	± 57	5102	
		BM-1437	7037	± 69	5087	
		BM-1438	6980	± 59	5030	
Mean Date:			7030	± 28	5080	
Sabz B3		I-1497	6740	± 190	4790	Hole *et al* 1969
BI		UCLA-750	9050	± 160	7100	
		SI-255	1460	± 400	AD 490*	

APPENDIX II

CLASSIFICATION OF HAFTS

CLASSIFICATION

I Straight Hafts

1 Multiple inserts with cutting edge parallel to haft
  - a Carved ends
  - b Flat
  - c Perforated
  - d Double edged

2 Single insert set parallel to haft
3 Multiple inserts with coarse denticulation, set parallel to haft
4 Obliquely set blades in straight hafts
5 Single blades hafted obliquely
6 Other hafts with straight cutting edges
7 Axially hafted blades

II Curved Hafts

1 Multiple inserts set parallel to curve of haft
  - a Directly in haft
  - b in bitumen
  - c Set overlapping

2 Multiple inserts with coarsely denticulated edge set parallel to curve of haft
3 Multiple inserts with wide geometric blades set parallel to curve of haft
4 Obliquely set blades in curved haft
5 Other curved hafts

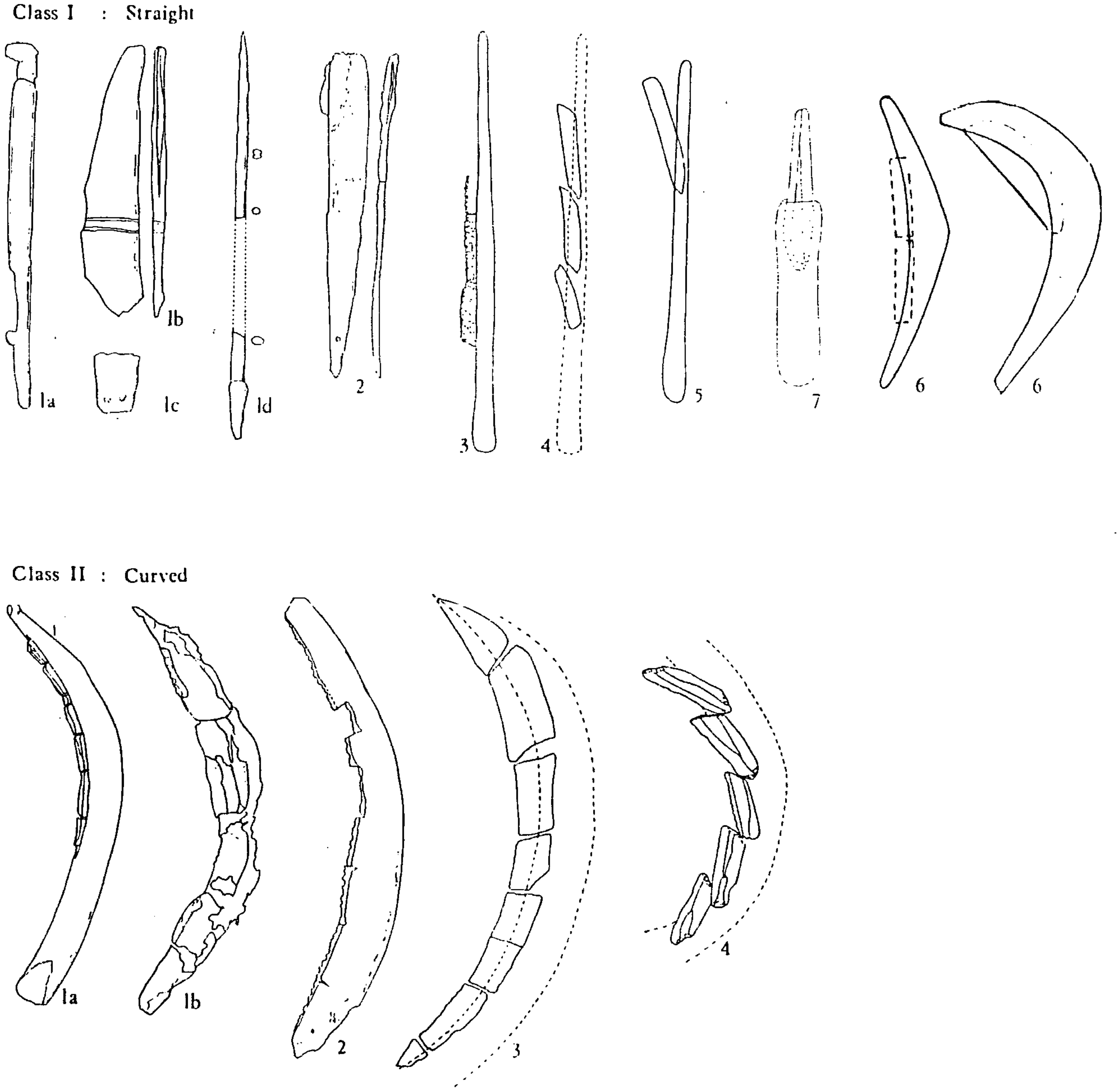


FIG. APP:II. CLASSIFICATION OF HAFTS

APPENDIX III

CATALOGUE OF HAFTS

The catalogue is arranged in chronological order. Each haft is prefixed by a Period number or other identifier, thus hafts from Period 1 are numbered 1,1, 1,2 , those from Period 2 2,1, 2,2 and so on and those from Early Dynastic and Bronze Age contexts ED,1, ED,2 and BA,1, BA,2 etc.

Dimensions are given are respectively length, width and thickness in mm unless otherwise stated.

SUMMARY OF OCCURRENCES OF VARIOUS TYPES OF HAFT

CLASS	CATALOGUE NUMBER	TOTAL
I,1a	1,1, 1,15, 1,16	3
I,1a?	1,3, 1,17, 1,18, 1,21, 1,23, 9,3	6
I,1b	1,2, 1,5, 1,6, 1,7, 1,19, 1,22*, 1,26, 1,27, 1,28, 1,29, 1,30, 1,33, 1,34, 1,35, 1,36	15
I,1b?	1,24, 1,25, 1,32	3
I,1c	1,8, 1,9, 1,20	3
I,1d	1,22*, 1,37, 5,1	3*
I,1	1,4	1
Uncl	1,10-14, 1,31*	6*
I,2	2,2	1
I,3	6,2	1
I,5	4,2	1
I,6	2,1, 7,3, 7,4, 7,5	4
II,1a	3,1, 3,2, 4,1, 5,2, 5,3, 5,4, 5,5, 5,6, 5,7, 5,8, 5,9, 5,12	12
II,1a ?	5,10, 5,11	2
II,1b	4,3, 5,13, 5,14, 6,3, 9,1, 9,2	6
II,2	9,4, ED,1, ED,2, ED,3, ED,4, ED,5, ED,6, ED,7, ED,8, BA,3	10
II,3	BA,1, BA,2	2
II,4	7,1, 7,2	2
II,6	6,1	1

DESCRIPTIVE CATALOGUE

PERIOD 1

NO. 1.1 | El WAD | FIG.IV;4,6

REFS:	Garrod 1932, 266 Pl. XXII, no.1 Garrod 1937, 38, Pl. XIII, Fig. 3
TYPE:	I.1a
DIMENSIONS:	Frag. 110 x width of handle 45 mm, shaft 22mm
BODY:	-
DISTAL END:	-
HANDLE:	Sculpted
INSERTS:	-
MATERIAL:	Long bone, probably ox
ADHESIVE:	-
DECORATION:	3-dimensional head of cervid, probably deer, sympathetically carved. Belly and legs in low relief on shaft. 2 pairs of 4 incised lines on body
OTHER:	Burnt

==

NO. 1.2 | EL WAD B2 | FIG.IV;6,7

REFS:	Garrod 1932, Pl XXII, Fig. 2; Garrod and Bate 1937, 37, Pl XIII, Fig. 1, no. 1.
TYPE:	I.1b
DIMENSIONS:	Frag. c 130 mm in length (according to illustration, but 150 mm in Garrod and Bate 1937,39) x 20 mm x c.5 mm
BODY:	Flat on one face, slightly convex on other. Groove on convex edge.
DISTAL END:	Slight swelling
HANDLE:	-
INSERTS:	-
MATERIAL:	Long bone, probably ox
ADHESIVE:	-
DECORATION:	-
OTHER:	Burnt

==

NO. 1.3 | EL WAD

REFS:	Garrod 1932; Garrod and Bate 1957,38
TYPE:	I.1 (?1a)
DIMENSIONS:	-
BODY:	Grooved
DISTAL END:	Semi-circular projection
HANDLE:	Present to groove. No details.
INSERTS:	-
MATERIAL:	Long bone, probably ox
ADHESIVE:	-
DECORATION:	-
OTHER:	Two fragments probably from same haft.

NO. 1,4	EL WAD B
REFS;	Garrod and Bate 1937,38
TYPE;	I,1
DIMENSIONS;	
BODY;	
DISTAL END;	
HANDLE;	Present to beginning of groove
INSERTS;	-
MATERIAL;	Bone
ADHESIVE;	-
DECORATION;	-
OTHER;	Probably from same haft as No.3.

NO. 1,5	El WAD B2	FIG.IV;6,10
REFS;	Garrod 1932; Garrod and Bate 1937, Pl XIII, Fig 1, no 2.	
TYPE;	I,1b	
DIMENSIONS;	width 14 mm	
BODY;	-	
DISTAL END;	Pointed	
HANDLE;	-	
INSERTS;	2 contiguous but irregular; apparently unretouched. No lustre.	
MATERIAL;	Bone - rib	
ADHESIVE;	Blades held in place by 'chalky concretion' - possibly resin, though Garrod says no traces of adhesive remain (1957,37).	
DECORATION;	-	
OTHER;	Found in tough red earth. Burnt.	

NO. 1,6	EL WAD
REFS;	Garrod and Bate 1937, 38
TYPE;	I,1b
DIMENSIONS;	-
BODY;	Broad and thick; groove seems to extend to base
DISTAL END;	Broken
HANDLE;	Roughly rounded and smoothed
INSERTS;	-
MATERIAL;	Bone
ADHESIVE;	-
DECORATION;	-
OTHER;	Probably derived from Layer B. Perhaps broken and remade

NO. 1,7	EL WAD A	FIG.IV:6,8

REFS:	Garrod and Bate 1937, 38, Pl. XIII, Fig. 1, no. 3
TYPE:	I,1b
DIMENSIONS:	width 13 mm
BODY:	Grooved
DISTAL END:	2 notches on opposite edges
HANDLE:	'presumably had some sort of handle' (on grounds of size)
INSERTS:	
MATERIAL:	Bone; spinous process of vertebra, probably deer
ADHESIVE:	-
DECORATION:	-
OTHER:	Badly damaged

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NO. 1,8	EL WAD B

REFS:	Garrod and Bate 1937, 38.
TYPE:	I,1c
DIMENSIONS:	-
BODY:	Broad and flat with groove running almost to base
DISTAL END:	-
HANDLE:	Bevelled and roughened; 2 perforations possibly for attaching separate handle
INSERTS:	-
MATERIAL:	-
ADHESIVE:	Bone
DECORATION:	-
OTHER:	-

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NO. 1,9	EL WAD B	FIG.IV:6,4

REFS:	Garrod and Bate 1937, 38, Pl. XII, Fig. 2, no. 6
TYPE:	I,1c
DIMENSIONS:	Width 29 mm
BODY:	Broad and flat with groove reaching to end
DISTAL END:	-
HANDLE:	Similar to No. 8 above. 4 perforations in 2 sets
INSERTS:	-
MATERIAL:	Bone
ADHESIVE:	-
DECORATION:	Upper perforation outlined with incised circle
OTHER:	-

NOS. 1.10 - 14 EL WAD

REFS:	Garrod and Bate 1937, 38.
TYPE:	5 fragments; no details; ?I.1
DIMENSIONS:	-
BODY:	-
DISTAL END:	-
HANDLE:	-
INSERTS:	-
MATERIAL:	-
ADHESIVE:	-
DECORATION:	-
OTHER:	-

NO. 1.15 KEBARA FIG.IV:4.1

REFS:	Turville Petre 1932, Pl. XXVII, Fig. 1
TYPE:	I.1a
DIMENSIONS:	length 380 mm, width of handle 39 mm, shaft 23-14mm
BODY:	Slightly curved; grooved edge concave. Groove extends from base of handle to tip, c.175 mm long
DISTAL END:	Semi circular knob
HANDLE:	Sculpted; thicker than blade
INSERTS:	-
MATERIAL:	Long bone
ADHESIVE:	-
DECORATION:	3-dimensional head of goat
OTHER:	-

NO. 1.16 KEBARA FIG.IV:4.2

REFS:	Turville Petre 1932, 272, Pl. XXVII, Fig. 3
TYPE:	I.1a
DIMENSIONS:	230 mm long; width of handle 16 mm, shaft 10 mm
BODY:	Grooved
DISTAL END:	Semi-circular knob
HANDLE:	Sculpted
INSERTS:	-
MATERIAL:	Long bone
ADHESIVE:	-
DECORATION:	3-dimensional head of animal
OTHER:	-

NO; 1,17 KEBARA FIG,IV;4,3

REFS; Turville Petre 1932, 272, Pl. XXVII, Fig. 3
TYPE; ? I,1a
DIMENSIONS; width 20 mm, thickness 10 mm
BODY; Grooved, possibly on both edges
DISTAL END; -
HANDLE; Sculpted
INSERTS; -
MATERIAL; Bone
ADHESIVE;
DECORATION; 3-dimensional head of bovine
OTHER; Handle carved in same plane as shaft of sickle (not at right angles as nos 15 & 16)

NO, 1,18 KEBARA FIG,IV;4,4

REFS; Turville Petre 1932, 272, Pl. XXVII, Fig. 3
TYPE; ? I,1a (head only)
DIMENSIONS; -
BODY; -
DISTAL END; -
HANDLE; Sculpted
INSERTS; -
MATERIAL; Bone
ADHESIVE; -
DECORATION; 3-dimensional head of deer
OTHER; -

NO, 1,19 KEBARA

REFS; Turville Petre 1932, 272
TYPE; Fragment, ? I,1b
DIMENSIONS;
BODY;
DISTAL END;
HANDLE;
INSERTS;
MATERIAL; Bone
ADHESIVE;
DECORATION; Decorated; no details given
OTHER;

NO. 1,20 KEBARA

REFS; Turville Petre 1932, 273
TYPE; Fragment, I,1c
DIMENSIONS;
BODY;
DISTAL END;
HANDLE;
INSERTS;
MATERIAL; Bone
ADHESIVE;
DECORATION;
OTHER; Pierced near centre

NO. 1,21 NAHAL OREN FIG,IV;4,5

REFS; Stekelis and Yisraely 1963, Pl, 4 D; Perrot 1960, 371 col, 2
TYPE; (?) I,1a
DIMENSIONS; -
BODY; -
DISTAL END; -
HANDLE; Carved, head of gazelle
INSERTS; -
MATERIAL; Bone
ADHESIVE; -
DECORATION; -
OTHER; ? Not part of a haft

NO. 1,22* NAHAL OREN

REFS; Stekelis and Yisraely 1963, 12
TYPES; I,1b and I,1d (?)
DIMENSIONS; -
BODY; Deep groove on one or both sides
DISTAL END; -
HANDLE; -
INSERTS; -
MATERIAL; Bone
ADHESIVE; -
DECORATION; -
OTHER; * Total number present uncertain

NO. 1,23 EYNAN

REFS: Perrot 1966 (cited by Camps-Fabrer and Courtin 1983, 4).
TYPE: ? I,1a
DIMENSIONS: -
BODY: -
DISTAL END: Semi circular notch for semi-circular piece (cf Kebara nos.15 & 16)
HANDLE: -
INSERTS: -
MATERIAL: Bone
ADHESIVE: -
DECORATION: -
OTHER: -

NO. 1,24 EYNAN FIG.IV;6,1

REFS: Perrot 1960, 18 and 20; Perrot 1966, Fig 22 no 26
TYPE: ? I,1b
DIMENSIONS: 162 (min) x 35 x 8 mm
BODY: Slightly convex. Groove in upper haft 95 mm long (Valla 1975, 101)
DISTAL END: Tapered rounded
HANDLE: Damaged; wider than body
INSERTS: -
MATERIAL: Bone
ADHESIVE: -
DECORATION: Two grooves around body of haft at mid point, just below end of groove
OTHER: -

NO. 1,25 HAYONIM FIG.IV;6,2

REFS: Bar Yosef and Tchernov 1970, 144-45, Fig. 3 no. 5
TYPE: Fragmentary, I,1b or possibly I,2
DIMENSIONS: 49 (min) x 22 x 9 mm
BODY: Flat, grooved to end. Groove 2 mm deep by 3 mm across
DISTAL END: Not present
HANDLE: Rounded; damaged.
INSERTS: -
MATERIAL: Split limb bone, polished
ADHESIVE: -
DECORATION: Deeply incised groove around circumference
OTHER: Decoration similar to that on other bone objects

NO. 1,26 HAYONIM FIG.IV;6,5

REFS; Bar Yosef and Tchernov 1970, 144-45, Fig. 3 no. 6
TYPE; I,1b
DIMENSIONS; 109 (min) x 19 x 8
BODY; Slighlty curved; grooved edge on convex side, appears to be for whole length
DISTAL END; Not present
HANDLE; Enlarged
INSERTS; -
MATERIAL; Split limb bone
ADHESIVE; -
DECORATION; Incised lines in two groups; reticular pattern on face.
OTHER; -

NO. 1,27 HAYONIM CAVE FIG.IV;6,9

REFS; Bar Yosef and Tchernov 1970, 144-146, Fig. 3, no. 3.
TYPE; I,1b
DIMENSIONS; 74 (min) x 15 x 6,5 mm
BODY; Grooved to tip
DISTAL END; Tapering, rounded
HANDLE; Not present
INSERTS; -
MATERIAL; Split limb bone, polished
ADHESIVE; -
DECORATION; Incisions near edge probably caused during manufacture
OTHER; -

NO. 1,28 HAYONIM FIG.IV;6,6

REFS; Bar Yosef and Tchernov 1970, 144-45, Fig. 3, no. 7
TYPE; I,1b
DIMENSIONS; length 146 (min), width of handle 34mm, width of shaft 24 mm, thickness 12 mm
BODY; Slightly curved. Grooved on upper part (V-shaped) 4 mm deep x 5 mm across
DISTAL END; Not present
HANDLE; Wider than body and on curve of bone
INSERTS; -
MATERIAL; Split limb bone
ADHESIVE; -
DECORATION; Incised lines
OTHER; -

NO. 1,29	UMM EZ ZUWETINA	*FIG.*IV;6,11
REFS:	Neuville 1934 (?), Fig. no 1	
TYPE:	I,1b	
DIMENSIONS:	46 x 15 mm	
BODY:	Grooved to tip	
DISTAL END:	Tapered, rounded	
HANDLE:	Not present	
INSERTS:	One in place at end. Obliquely pointed blade 43 mm long. Hafted longitudinally. Helwan retouch on back. Cutting edge retouched. Lustred.	
MATERIAL:	Split limb bone	
ADHESIVE:	No information given	
DECORATION:		
OTHER:		

NO. 1,30	UM QALA'A	FIG.IV;6,3
REFS:	Neuville 1934, Pl. XVIII,4	
TYPE:	I,1b	
DIMENSIONS:	56 (min) x 20 x 6 mm	
BODY:	Straight. Grooved but extent not indicated. groove 3 mm deep and 6 mm wide	
DISTAL END:	Rounded	
HANDLE:	Not present	
INSERTS:	-	
MATERIAL:	Bone	
ADHESIVE:	-	
DECORATION:	-	
OTHER:	-	

NO. 1,31*	EL KHIAM
REFS:	Neuville 1934
TYPE:	?
DIMENSIONS:	-
BODY:	-
DISTAL END:	-
HANDLE:	-
INSERTS:	-
MATERIAL:	-
ADHESIVE:	-
DECORATION:	-
OTHER:	* 'Many fragmentary examples'

NO. 1,32 WADI HAMMEH FIG.IV:7,1

REFS: Edwards 1986, Fig.4,33 and pers comm.
TYPE: ? I,1b
DIMENSIONS: 245 x 30 x 10 mm
BODY: Length of groove 170mm, thickness 4-6mm; V-shaped
DISTAL END: -
HANDLE: Damaged
INSERTS: -
MATERIAL: Animal bone
ADHESIVE: -
DECORATION: Protruberance on distal end
OTHER: -

NO. 1,33 WADI HAMMEH FIG.IV:7,2

REFS: Edwards 1986, Fig.4,33 and pers comm.
TYPE: I,1b
DIMENSIONS: 225 x 35 x 18 mm
BODY: Length of groove 110mm, thickness 5mm; V-shaped
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: Animal bone
ADHESIVE: -
DECORATION: -
OTHER: -

NO. 1,34 WADI HAMMEH FIG.IV:7,3

REFS: Edwards 1986 and pers comm
TYPE: I,1b
DIMENSIONS: 140 x 15 x 4mm
BODY: Groove length 120 mm, thickness 2mm; V-shaped
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: Animal bone
ADHESIVE: -
DECORATION: -
OTHER: -

NO. 1,35 WADI HAMMEH FIG.IV;7,4

REFS; Edwards 1986, Fig.4,33 and pers comm.
TYPE; I,1b (off set)
DIMENSIONS; 260mm x 40 x 15 mm
BODY; Groove length 130mm, thickness 3-5 mm; V-shaped
DISTAL END; -
HANDLE; Off-set; length 110mm
INSERTS; -
MATERIAL; Animal bone
ADHESIVE; -
DECORATION; -
OTHER; -

NO. 1,36 WADI HAMMEH FIG.IV;5

REFS; Edwards 1986, Fig.4,33 and pers comm.
TYPE; I,1b (off set)
DIMENSIONS; 18 x 25 x 12 mm
BODY; Groove length 90 mm, thickness 5mm; V-shaped
DISTAL END; -
HANDLE; Off set
INSERTS; -
MATERIAL; Animal bone
ADHESIVE; -
DECORATION; -
OTHER; -

NO. 1,37 WADI HAMMEH FIG.IV;7,6

REFS; Edwards 1986, Fig.4.33 and pers comm.
TYPE; I,1c
DIMENSIONS; 324mm x 30 mm
BODY; Grooved, V-shaped
DISTAL END; -
HANDLE; -
INSERTS; Two rows of Helwan bladelets in situ; none lustred. Five of pale brown chert, five of dark grey chert
MATERIAL; Caprid horn core, split and joined down mid-line
ADHESIVE; No macroscopic traces found
DECORATION; Protruberance towards distal end
OTHER; -

PERIOD 2

NO. 2.1	ZAWI CHEMI	FIG.IV;10,1

REFS; Solecki and Solecki 1963,; Solecki 1981, 49, Pl. 11 b,c
TYPE; I,6
DIMENSIONS; 217 x 24 x 8 mm
BODY; Curved. Groove on concave side for whole length; wedge shaped and deeper and wider in middle than ends; max 4 mm deep x 6 mm across
DISTAL END; Continuation of body
HANDLE; -
INSERTS; -
MATERIAL; Bone ? rib
ADHESIVE; -
DECORATION; -
OTHER; -

NO. 2.2	SHANIDAR	FIG.IV;8,1

REFS; Solecki and Solecki 1963, 58-60, Pl. VI
TYPE; I,2
DIMENSIONS; 209 x 26 mm
BODY; Flat. Groove at distal end 51 mm long
DISTAL END; Straight
HANDLE; Tapered and perforated
INSERTS; Single
MATERIAL; Rib bone of large mammal
ADHESIVE; ? Bitumen
DECORATION; 6 shallow grooves on convex face, centring on middle of specimen The grooves extend c 1/3rd width of bone.
OTHER; Probably not a sickle

PERIOD 3 - 4

NO. 3,1 ÇAYÖNÜ Cell plan house FIG.IV;11,1

REFS:	Çambel and Braidwood 1980, 48, Pl. 46,20
TYPE:	II,1a
DIMENSIONS:	250 x 31 mm
BODY:	Curved. Groove not shown on published illustration, but probably 100-130 mm in length
DISTAL END:	Obliquely cut
HANDLE:	Distinguished from body by kink in curve
INSERTS:	-
MATERIAL:	Antler
ADHESIVE:	-
DECORATION:	-
OTHER:	'Smoothed and polished by rubbing'

NO. 3,2 ÇAYÖNÜ

REFS:	Çambel and Braidwood 1980, 48
TYPE:	II,1a
DIMENSIONS:	-
BODY:	Curved with shallow groove along concave section
DISTAL END:	-
HANDLE:	-
INSERTS:	-
MATERIAL:	Antler
ADHESIVE:	-
DECORATION:	-
OTHER:	-

NO. 4,1 NAHAL HEMAR Level 4 FIG.IV;11,2

REFS:	Bar Yosef & Alon 1986, 66; Bar Yosef 1985, 11
TYPE:	II,1a
DIMENSIONS:	None given
BODY:	Curved. Groove on inside of curve
DISTAL END:	Damaged
HANDLE:	Straight and at an angle to body
INSERTS:	3 blades in groove. No lustre. Cutting edge not continuous but separated by resin.
MATERIAL:	Antelope horn (gazelle or mountain goat). Heated and bent to shape
ADHESIVE:	Resin and lime
DECORATION:	Engraved zig zag of double lines on haft (not visible on published photograph)
OTHER:	Found in niche in north wall of cave.

NO. 4.2 'AIN GHAZAL

REFS: Rollefson and Simmons 1984
TYPE: Fragment, I.5
DIMENSIONS: -
BODY: -
DISTAL END: -
HANDLE: -
INSERTS: Lustred blade. Unretouched proximal end has asphalt and piece of wood. Hafted obliquely
MATERIAL: Wood
ADHESIVE: Asphalt
DECORATION: -
OTHER: Angle of grain of wood and pattern of gloss indicates that blade had been set at angle to long axis of haft.

NO. 4.3 JARMO *FIG.*IV:15,3

REFS: Hole 1983, 264, Fig. 123
TYPE: II.1b
DIMENSIONS:
BODY: Curved. Blades set in bitumen; arc c. 210mm
DISTAL END: -
HANDLE: -
INSERTS: Four elements, one a blade. 1st and 4th element had retouched backs Placed alternately with bulbar and dorsal face up
MATERIAL: Presumably wood
ADHESIVE: Bitumen
DECORATION: -
OTHER: Found on reed floor. Elements contrast with other blades with lustred which are mostly narrow and neat.

NO. 5.1 HACILAR FIG.IV;8,3

REFS; Mellaart 1970, 161, Fig. 179,3
TYPE; I,1d
DIMENSIONS; Reconstructed 255 x 9 x 6 mm
BODY; Groove on both sides of upper end, c 90 mm long x 2 mm deep x 3 mm across
DISTAL END; Pointed
HANDLE; Enlarged
INSERTS; -
MATERIAL; Antler
ADHESIVE; -
DECORATION; -
OTHER; -

NO. 5.2 HACILAR VI, House B FIG.IV;12,1

REFS; Mellaart 1970, 161, Fig. 178
TYPE; II,1a
DIMENSIONS; 255 x 23 x 18 mm
BODY; Curved, V-shaped groove on inside of curve, length 145 mm x 10 mm wide x 10 mm deep
DISTAL END; Carved into knob
HANDLE; Continuation of body; c. 90mm
INSERTS; 7 blades of chert. Mellaart 1970, 161 states no gloss, but says that they are shiney
MATERIAL; Red deer antler
ADHESIVE; Probably resin
DECORATION; -
OTHER; -

NO. 5.3 HACILAR VI; House FIG.IV;12,2

REFS; Mellaart 1970, 161 Fig. 178,2 Pl. CXX
TYPE; II,1a
DIMENSIONS; 268 x 25 x 17
BODY; Curved, V-shaped groove , 185 mm long, extends from near tip to handle, though last 20 mm of groove has no insert, depth 8 mm, width 9 mm
DISTAL END; Damaged
HANDLE; Continuation of body; probably c 100mm, but only 80 mm not grooved
INSERTS; 7 blades of chert
MATERIAL; Red deer antler
ADHESIVE; Resin
DECORATION;
OTHER; -

NO. 5.4 HACILAR VI, House Q.VI.4 FIG.IV;12,3

REFS;	Mellaart 1970, 161, Fig. 177, 1, Pl. CXX
TYPE;	II.1a
DIMENSIONS;	260 x 31 x 42 mm
BODY;	Curved, V-shaped groove; length 175 mm x depth 7 mm x 7mm wide
DISTAL END;	? damaged
HANDLE;	Continuation of body, c 70 mm ungrooved (but see V.3)
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	-
OTHER;	-

==

NO. 5.5 HACILAR VI House P VI I FIG.IV;13,1

REFS;	Mellaart 1970, 161, Fig. 179, 2, Pl. CXX
TYPE;	II.1a
DIMENSIONS;	min 265 x 28 x19 mm
BODY;	Curved, V-shaped groove extends from just below tip to handle; length 160 mm x 10 mm deep 8 mm across
DISTAL END;	Pointed
HANDLE;	Continuous with curve of body but distinguished from it by groove area which is narrower; min. 100 mm long (damaged)
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	Two grooves on handle forming ridge
OTHER;	-

==

NO. 5.6 HACILAR VI, House P VI.I FIG.IV;13,2

REFS;	Mellaart 1970, 161, Fig. 177, 2, Pl. CXX
TYPE;	II.1a
DIMENSIONS;	min. 245 x 30 x 19 mm
BODY;	Curved, V-shaped groove extends from tip to handle; length 185mm x depth 8mm x width 5mm
DISTAL END;	Damaged
HANDLE;	Continuation of body (damaged)
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	Incised line immediately above butt
OTHER;	-

NO. 5,7 HACILAR VI House Q VI,3 FIG.IV;13,3

REFS;	Mellaart 1970, 161, Fig. 179,1, Pl. CXX
TYPE;	II,1a
DIMENSIONS;	min. 240 x 20 x 20 mm
BODY;	Curved, V-shaped groove from c 20 mm below tip to handle; length 185 mm x 8 mm deep x 8 mm across
DISTAL END;	Pointed (extreme tip damaged)
HANDLE;	Continues line of body but distinguished from it by slight enlargement damaged
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	-
OTHER;	-

NO. 5,8 HACILAR VI House Q VI 4

REFS;	Mellaart 1970, 161, no. 435
TYPE;	II,1a
DIMENSIONS;	Fragment
BODY;	Curved
DISTAL END;	-
HANDLE;	-
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	-
OTHER;	-

NO. 5,9 HACILAR VI, House VI 2

REFS;	Mellaart 1970, 161, no. 436
TYPE;	II,1a
DIMENSIONS;	-
BODY;	-
DISTAL END;	-
HANDLE;	-
INSERTS;	-
MATERIAL;	Red deer antler
ADHESIVE;	-
DECORATION;	-
OTHER;	-

NO. 5,10 HACILAR VI, House Q VI 2

REFS: Mellaart 1970, 161, no. 436b
TYPE: ?II,1a
DIMENSIONS: -
BODY: -
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: -
ADHESIVE: -
DECORATION: -
OTHER: -

NO. 5,11 HACILAR VI, House P VI 2

REFS: Mellaart 1970, 161
TYPE: II,1a (?)
DIMENSIONS: Fragment
BODY: -
DISTAL END: Tip survives
HANDLE: -
INSERTS: -
MATERIAL: Red deer antler
ADHESIVE: -
DECORATION: -
OTHER: Burnt

NO. 5,12 ÇATAL HÖYÜK VI-V

REFS: Mellaart 1963, 101
TYPE: II,1a
DIMENSIONS: -
BODY: Curved
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: Red deer antler
ADHESIVE: -
DECORATION: -
OTHER: -

NO. 5.13 HASSUNA, Level II

REFS: Lloyd and Safar 1945, 269
TYPE II.1b
DIMENSIONS:
BODY: Curved
DISTAL END: -
HANDLE: -
INSERTS: Flakes set overlapping, in bitumen
MATERIAL: Wooden backing
ADHESIVE: Bitumen
DECORATION: -
OTHER: Found in workshop amongst sickle blades

NO. 5.14 HASSUNA, Level III FIG.IV;15,1 & 2

REFS: Lloyd and Safar 1945, 274, 269, Fig. 37
TYPE: II.1b
DIMENSIONS: Fragment; c 360 mm
BODY: Curved
DISTAL END: -
HANDLE: -
INSERTS: 2 Flint flakes
MATERIAL: Wooden backing
ADHESIVE: Bitumen
DECORATION: -
OTHER: Found on clay platform near grain bin

NO. 6.1 SHA'AR HAGOLAN FIG.IV:14

REFS: Stekelis 1972, 24 , Pl 62,no 1
TYPE: II,5
DIMENSIONS:
BODY: Curved
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: Jaw bone of deer
ADHESIVE: -
DECORATION: -
OTHER: -

==

NO. 6.2 SHA'AR HAGOLAN FIG.IV:9

REFS: Stekelis 1972, 24 , Pl 21,no 1
TYPE: I,3
DIMENSIONS: Cutting edge 235 mm
BODY: Straight (Haft decayed but 5 blades remain in position)
DISTAL END: -
HANDLE: -
INSERTS: -
MATERIAL: ? Wood
ADHESIVE: -
DECORATION: -
OTHER: -

==

NO. 6.3 TELL ES SAWWAN, Level II FIG.IV:17,1

REFS: EL Wailly and Abu al-Soof 1965, 22, Fig. 78. Iraq Museum No 60792
TYPE: II,1b
DIMENSIONS: -
BODY: Curved
DISTAL END: -
HANDLE: -
INSERTS: Three flint blades and one obsidian forming continuous curved edge.
MATERIAL: -
ADHESIVE: Bitumen
DECORATION: -
OTHER: -

PERIOD 7

NO. 7.1 ASUAD (BALIKH) FIG.IV;16

REFS; M.-C. Cauvin 1974 Fig. 3
TYPE; II.4
DIMENSIONS;
BODY; Curved
DISTAL END; -
HANDLE; -
INSERTS; Blades set obliquely
MATERIAL; ? wood
ADHESIVE; Bitumen
DECORATION; -
OTHER; -

NO. 7.2 TELL ES SAWWAN, Level IV FIG.IV;17,2

REFS; El Wailly and Abu al-Soof 1965, 22, Fig 78. Iraq Museum 63793
TYPE; II.4
DIMENSIONS;
BODY; Curved
DISTAL END; -
HANDLE; -
INSERTS; Blades set obliquely
MATERIAL; ? wood
ADHESIVE; Bitumen
DECORATION; -
OTHER; -

NO. 7.3 TELL SHIMSHARA, N10 fl 13 FIG.IV;10,2

REFS; Mortensen 1970, 58
TYPE; Class I.6
DIMENSIONS; 183 mm
BODY; Slightly curved back, raised in centre. V-shaped groove cut into both ends on lower edge c 4 mm deep, each section between 56 and 70 mm long.
DISTAL END; -
HANDLE; -
INSERTS; -
MATERIAL; Metacarpus or metatarsus of red deer
ADHESIVE; -
DECORATION; Irregular incised notches on back.
OTHER; Central part perforated

NO. 7.4	TELL SHIMSHARA, N10 floor 13	FIG.IV;10,3
REFS;	Mortensen 1970, 58	
TYPE;	I,6	
DIMENSIONS;	204 mm	
BODY;	Slightly curved back, raised in centre, V-shaped groove c 5 mm deep, each section being between 56 and 70 mm long.	
DISTAL END;	-	
HANDLE;	-	
INSERTS;	-	
MATERIAL;	Metatarsus or metacarpus of red deer	
ADHESIVE;	-	
DECORATION;	Irregular incised notches on back	
OTHER;	Holes drilled in central part of haft	

==

NO. 7.5	TELL SHIMSHARA, N10 floor 13	*FIG*.IV;10,4
REFS;	Mortensen 1970, 58	
TYPE;	I,6	
DIMENSIONS;	198 mm	
BODY;	Slightly curved back, raised in centre, V-shaped groove c 5 mm deep, each section being between 56 and 70 mm long.	
DISTAL END;	-	
HANDLE;	-	
INSERTS;	-	
MATERIAL;	Metatarsus or metacarpus of red deer	
ADHESIVE;	-	
DECORATION;	Irregular incised notches on back	
OTHER;	Holes drilled in central part of haft	

PERIOD 9

NO. 9.1 | TEPE GAURA XII | FIG.IV;17,1

REFS; Tobler 1950, 20, Pl. CLXXVI, 15
TYPE; II,1b
DIMENSIONS;
BODY; ?
DISTAL END; -
HANDLE; -
INSERTS; Blade
MATERIAL; -
ADHESIVE; Bitumen
DECORATION; -
OTHER; -

NO. 9.2 | TEPE GAURA XIA | FIG.IV;17,2

REFS; Tobler 1950, 20, Pl. CLXXVI,16
TYPE; II,1b
DIMENSIONS;
BODY; ?
DISTAL END; -
HANDLE; -
INSERTS; Blade
MATERIAL; -
ADHESIVE; Bitumen
DECORATION; -
OTHER; -

NO. 9.3 | TEPE GAURA | FIG.IV;5,6

REFS; Tobler 1950, 202, Pl. CLXXVI. Fig. 18
TYPE; cf Type I.1a
DIMENSIONS; 130 x 30 x 14 mm
BODY; Grooved area 90 mm
DISTAL END; -
HANDLE; ? Stylized carved head (described as a notch in report)
INSERTS; -
MATERIAL; Grey limestone
ADHESIVE; Traces of bitumen
DECORATION; -
OTHER; -

NO. 9.4	UR	FIG.IV:17,3

REFS:	Hall and Woolley 1927.
TYPE:	II,2
DIMENSIONS:	
BODY:	?
DISTAL END:	-
HANDLE:	-
INSERTS:	Blade
MATERIAL:	-
ADHESIVE:	Bitumen
DECORATION:	-
OTHER:	-

EARLY BRONZE AGE AND LATER

NO, ED,1 NIPPUR I FIG,IV;18,1

REFS;	McCown and Haines 1967, 156, Pl, 163, 13, Cat, No, 3N 317; Iraq Museum no 56576
TYPE;	II,2
DIMENSIONS;	c 290mm
BODY;	Curved
DISTAL END;	-
HANDLE;	-
INSERTS;	8 flint blades; denticulated
MATERIAL;	? Wood
ADHESIVE;	Bitumen, deeply grooved along back to take wood,
DECORATION;	-
OTHER;	-

==

NO, ED,2* KISH, ED I-II FIG,IV;18, 2-4

REFS;	Crowfoot Payne 1979, Fiche D 13; Crowfoot Payne 1980, 107-8
TYPE;	II,2
DIMENSIONS;	18 fragments
BODY;	Curved, Bitumen domed on one face (ventral face of flint) and flat on other,
DISTAL END;	-
HANDLE;	-
INSERTS;	Flint blades set so that ventral surface is uppermost in use,
MATERIAL;	Wood (identified as a hard wood [Crowfoot Payne 1978,D13,fn,12]), Imprint of wood runs diagonally across sickle on 2, possibly due to curve of haft, On the rest it runs the length of the blade,
ADHESIVE;	Bitumen
DECORATION;	-
OTHER;	* Total number of hafts uncertain

==

NO, ED,3 ABU SALABIKH ED III

REFS;	Crowfoot Payne 1980,106-9, Pl, XII, Fig, 7 1-4, No,51,II;121= AbS 1356
TYPE;	II,2
DIMENSIONS;	97 mm x 32 mm (fragment)
BODY;	Curved
DISTAL END;	-
HANDLE;	-
INSERTS;	Blades, two in place
MATERIAL;	Wood (imprint survives)
ADHESIVE;	Bitumen, flat on one face domed on other
DECORATION;	
OTHER;	Cord or rope at right end of sickle, Patches of wood near sickle ?=box Found in work room or store

NO. ED.4 ABU SALABIKH FIG.IV;18,5

REFS; Crowfoot Payne 1980,106-7, Fig. 7, No. 2. 51.21;171 = AbS 628
TYPE; II,2
DIMENSIONS; 39 x 23 x 1 mm (fragment)
BODY; Curved
DISTAL END; -
HANDLE; -
INSERTS; Coarsely denticulated blade
MATERIAL; Wood
ADHESIVE; Bitumen. Smooth and domed over bulbar surface of blade and flat over upper surface leaving working edge exposed.
DECORATION; -
OTHER; -

NO. ED.5 ABU SALABIKH FIG.IV;18,6

REFS; Crowfoot Payne 1980,107, Fig. 7, no. 4
TYPE; II,2
DIMENSIONS; 35 x 25 x 8 mm (fragment)
BODY; Curved
DISTAL END; -
HANDLE; -
INSERTS; Coarsely denticulated blade
MATERIAL; ? Wood
ADHESIVE; Bitumen. Smoothed and domed over bulbar face and flat over dorsal; working edge exposed.
DECORATION; -
OTHER; -

NO. ED.6 ABU SALABIKH FIG.IV;18,7

REFS; Crowfoot Payne 1980, 107, Fig. 7, no. 1, 66.36;152
TYPE; II,2
DIMENSIONS; 43 x 36 x 9 mm (fragment)
BODY; Curved
DISTAL END; -
HANDLE; -
INSERTS; Denticulated blade
MATERIAL; Wood
ADHESIVE; Bitumen. Covers blade to within 4mm of edge. Surface of bitumen rough, but that over bulbar surface of blade more domed.
DECORATION; -
OTHER; Blade probably last in sickle because at one end whole width of blade is exposed but only half at the other and the bitumen extends beyond blade.

NO. ED.7	ABU SALABIKH	FIG.IV;18,8

REFS:	Crowfoot Payne 1980,107, Fig. 7, no. 3, 5I,31;77
TYPE:	II,2
DIMENSIONS:	45 x 24 x 9 mm (fragment)
BODY:	Curved
DISTAL END:	-
HANDLE:	-
INSERTS:	Only imprint survives
MATERIAL:	Wood; imprint on flat face.
ADHESIVE:	Bitumen. One face domed, other flat. V-shaped groove in the edge to hold the blade. A line in groove probably marks the junction of 2 blades.
DECORATION:	-
OTHER:	-

NO. ED.8*	KHAFAJAH	FIG.IV;19

REFS:	Delougaz 1940, 30-31. Kh II, 65
TYPE:	II,2
DIMENSIONS:	c 250mm
BODY:	-
DISTAL END:	-
HANDLE:	No room for one in box (Crowfoot Payne 1980)
INSERTS:	Largest sickle has five denticulated flint blades (Crowfoot Payne 1978, E01)
MATERIAL:	Wood
ADHESIVE:	Bitumen
DECORATION:	-
OTHER:	*Several sickles in wooden box

NO. BA.1	GERAR	FIG. IV;20,1
REFS;	Petrie 1928	
TYPE;	II,3	
DIMENSIONS;		
BODY;		
DISTAL END;		
HANDLE;		
INSERTS;		
MATERIAL;	Wood ?	
ADHESIVE;		
DECORATION;		
OTHER;		

==

NO. BA.2	GAZA (TELL EL 'AJUL)	FIG.IV;20,2
REFS;	Petrie 1932, ii, 10 pl XXIII, 50	
TYPE;	II,3	
DIMENSIONS;	345 mm	
BODY;		
DISTAL END;		
HANDLE;		
INSERTS;	Eight blades, end ones pointed	
MATERIAL;	? Wood. Blades in position but haft rotted away	
ADHESIVE;		
DECORATION;		
OTHER;		

==

NO. BA. 3	RAS SHAMRA	FIG.IV;20, 3 and 4
REFS;	Chenet 1939,52-3, Fig.1	
TYPE;	?II,2	
DIMENSIONS;		
BODY;	?	
DISTAL END;	-	
HANDLE;	-	
INSERTS;	Blade	
MATERIAL;	-	
ADHESIVE;	Bitumen	
DECORATION;	-	
OTHER;	One appears to be end of sickle	

APPENDIX IV

CLASSIFICATION OF LUSTRED BLADES

AND DEFINITIONS OF THEIR ATTRIBUTES

A CLASSIFICATION

I Undenticulated

A Flake

B Blade

C Modification to one end
- 1 Oblique
- 2 Rounded

D Modification to both ends
- 1 Oblique/oblique
- 2 Oblique/rounded
- 3 Pointed/straight
- 4 Tanged/straight
- 5 Tanged/oblique

E Backed
- 1 Straight
  - i abrupt
  - ii bifacial
  - iii partial
- 2 Convex
  - i abrupt
  - ii bifacial
- 3 Angular
  - i abrupt
  - ii bifacial

F Truncated
- 1 unretouched
- 2 Straight/straight
- 3 Oblique/oblique
  - i trapeze
  - ii rhomboid
- 4 Straight/pointed
- 5 Straight/rounded

G Backed and Truncated
- 1 Straight back
  - i straight ends
  - ii oblique ends
- 2 Convex back
  - i straight ends
  - ii one end straight, other unretouched

H Cananean Blades

II Denticulated

B Blade

C Modification to one end
1 Oblique
2 pointed

D Modification to both ends
1 Pointed/straight
2 Pointed/rounded
3 Straight/pointed

E Backed
1 Straight
2 Convex

F Truncated
1 Unmmodfied
2 Straight/oblique
3 Straight/pointed

G Backed and Truncated

III Coarsely Denticulated

F Truncated
1 Unmodified
2 Straight/straight
3 Oblique/oblique
4 Straight/pointed
5 Straight/oblique

G Backed and Truncated
1 Straight i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique
2 Convex i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique

IV Bifacially Flaked Coarse Denticulations

F Truncated
1 Unmodified
2 Straight/straight
3 Oblique/oblique
4 Straight/pointed
5 Straight/oblique

G Backed and Truncated
1 Straight i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique
2 Convex i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique

V Bifacially flaked lustred blades with wide but very shallow denticulations

F Truncated
1 Unmodified
2 Straight/straight
3 Oblique/oblique
4 Straight/pointed
5 Straight/oblique

G Backed and Truncated
1 Straight i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique
2 Convex i ends unmodified
ii ends straight
iii ends oblique
iv ends pointed/straight
v ends pointed/oblique

VI Geometric pieces

VII Enlarged head type (obsidian)

VIII Other

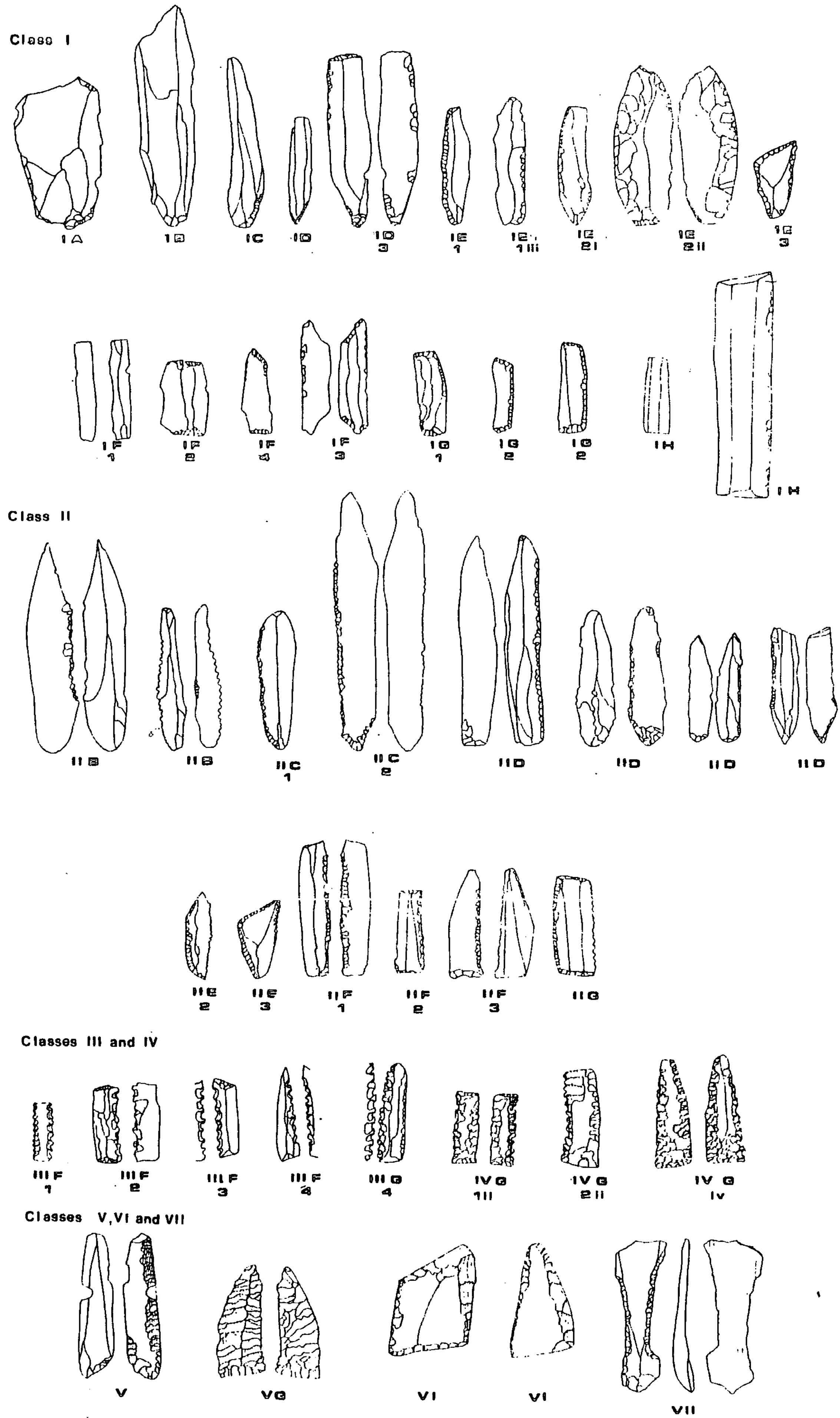

FIG. APP. VI: Classification of lustred blades

LIST OF ATTRIBUTES AND THEIR DEFINITIONS

The sets or groups of attributes listed and described below are based on those discussed in Chapter V.4-10. The broad groupings are the treatment of the functional edge (which forms the basis for the initial classification used here), the degree of modification to the blank, the shape of the artefact and the method of modification. New groups or individual variations can be added as circumstances demand. They may be used in combination (in any order) to form the basis of a classificatory scheme.

B LISTS OF ATTRIBUTES

EDGES

Denticulation:
- Undenticulated
- Fine-medium denticulation
- Coarse denticulation
- Flat invasive retouch (en pelure)

Edge Shape:
- Straight
- Concave
- Convex
- Sinuous
- Irregular

Extent of Lustre
Length:
- End to end
- Avoiding butt (up to distal end)
- Avoids distal end (up to butt)
- Avoids both ends (complete examples only)
- On distal end, butt not observable
- On butt end, distal not observable
- Medial

Width: (dorsal face described first)
- Edge to edge
- Ridge to edge
- Ridge diffuse
- Edge diffuse

Configuration of Lustre:
Straight (parallel to edge)
Convex
Oblique

Angle of Lustred Edge

TOOL BLANK AND EXTENT OF MODIFICATION

Flake
Blade
Canaanean blade

Modification to one end
Modification to both ends
Backed blade
Truncated blade
Backed and Truncated blade
Geometric shapes

Enlarged head obsidian blades
Other

SHAPE OF BACK AND/OR ENDS

Straight
Oblique
Pointed
Concave
Convex
Angular
in combination

METHOD OF MODIFICATION

Unretouched truncation
Retouch

Type of modification:
Truncation by burin blow
Truncation by direct blow
Truncation by notch
Abrupt retouch
Semi-invasive retouch
Invasive retouch
Bifacial retouch
Helwan retouch

Style of retouch:
Serial
Scaled

DIMENSIONS

B DEFINITIONS

EDGE

Undenticulated

Blades or flakes on which lustre occurs on the unmodified edge of the blank (Fig.V.4).

Fine-Medium Denticulation

The edge has regular denticulations under 2 mm apart, more often on the bulbar than dorsal face (Fig.V.9,10).

Coarse Denticulations

Deep, widely spaced denticulations c 4 mm apart formed either by a single blow (may be bifacial) (Figs.V.14,1-3) or by bifacialscale flaking which is more invasive (Fig.V. 14.4).

Flat Retouch (en pelure)

Semi invasive or invasive serial (rather than scale) flaking on face of the flake, causing shallow denticulations (Fig.VI.14, 2 and 5; VI.19, 4-7).

Chipping

Irregular chipping causing sporadic 'denticulation' on the lustred edge. Probably accidental but sometimes difficult to distinguish from deliberate denticulation. Usually used as a qualification to undenticulated edges rather than as a separate class.

Shape and Regularity of Lustred Edge

The shape of the lustred edge is described in relation to a straight line.

Extent of Lustre

Decribed by length in relation to the available edge and by width in terms of diffuseness. The dorsal surface is described first. Edge lustre is a narrow band of lustre confined to the edge of the blade (Fig. VI.16, 2 and 4) and diffuse lustre is more extensive; ridge lustre means that the lustre extends to the flake ridge on the dorsal face (Fig. V.9,2).

Lustre Configuration

This refers to the shape of the lustre in relation to the edge and described as parallel (Fig. VI.1,3, 10 etc), oblique or semi-oblique (where it ends in an oblique line tapering towards the edge [Fig. V.5,2]) or convex (Fig. VI.8,1), which can in practice be difficult to distinguish from oblique.

Edge Angle

This measurement is the angle which the lustred edge forms with the (presumed) straight line of the ventral face (Fig.V.20) When the plane is altered by wear (rounded) or by retouch these lines are projected and measured.

TOOL BLANKS AND EXTENT OF MODIFICATION

The main forms selected for use as a sickle are blades though occasionally flakes and crested blades or other forms are used.

Blades (sensu stricto) are defined as being at least twice as long as they are wide, with parallel edges and flake beds. Less regular forms are described as blade-like flakes or blade-flakes

Canaanean Blades (Fig. V.16) are a form typical of EB Palestine tool kits, though they are known elsewhere. They are very regular, punch struck blades, often of fine grained flint. They are made in specialist workshops and traded as tool blanks, especially for sickles (Rosen 1983).

Unmodified Flakes and Blades

These are flakes (Fig. VI.12,4) and blades (Fig. V.9) with lustred edges (which may be denticulated), but which are otherwise unaltered

Modified Blades

The ends and/or backs of the tool blank are retouched or otherwise altered from their natural shape and are subdivided according to the degree and type of modification.

Blades with One End Modified

Blades with retouch or other modification on one end (usually bulbar) of the blade. The other end remains unmodified. The modification seems to be intended to shape the butt rather than remove it. The most usual forms are oblique or pointed (Fig.V.10). Can be further subdivided by shape and type of modification.

Blades with Modified Butt and Distal Ends

Modification to butt as above. Distal end similarly modified. Further subdivided by shape (straight, oblique, pointed or rounded) and method of modification (Fig.VI.10, 4-6).

Backed Blades

Retouch is confined to the back of the artefact (i.e. the edge opposite the lustred one). Subdivided by shape (see below) (straight [Fig.VI.2,4. Fig.VI.3,8-10], convex [Fig.V,5 and Fig. V.12,4] or angular [Fig.VI.27, 1-4]).

Truncated Blades

The length and shape of the element is determined by the removal of both ends. The back remains unmodified. Subdivided by shape and method of truncation or shaping. Shapes (straight, oblique, pointed) may occur in combination, in which case they may be described as rectangular (Fig. VI.2,1), trapeze-shaped (Fig. VI.2,2), pointed (Fig.VI. 24), etc.

Backed and Truncated Blades

Truncated blades as above, but with the back also retouched and the ends separately treated. Subdivided by shape and method of modification (Fig.VI.25).

Geometric Shapes with Invasive Retouch

Technically the forms are truncated blades falling within those of Classes F and G but are sufficiently distinct to warrant a separate class, subdivided by shape, extent and type of retouch, which is usually semi-invasive or invasive (Fig.VI.19, 4-7).

Other Geometric Shapes

Wide, thick truncated blades with a semi-abrupt edge angle. Sudivided by shape and retouch type (Fig VI36).

Enlarged Head Class

This form seems to made exclusively of obsidian and has not so far been recognised in flint. Though strictly speaking this is not a lustred blade, phytoliths of cereals have been found on its edge confirming its use as a sickle (Anderson-Gerfaud 1982), hence they are discussed here. The functional edge is matt and striated on the bulbar face. One or both edges are abruptly retouched with a distinctive lamellar flaking. The retouch is only along the middle portion of the blade and does not extend on to the ends; the retouch reduces the width of the blade in the middle part, producing a waisted effect which makes the ends appear enlarged, hence the term 'enlarged head' (Hours and Copeland 1983) (Fig.). Ends may be truncated, retouched or unmodified but never pointed. Subdivision is by the number of edges retouched and whether one or both ends are enlarged (see M.-C. Cauvin and Balkan 1985,56). As is evident from the illustrations (Fig.VI:17), a variety of sizes was used.

Other

Artefacts with lustred edges which do not conform to any of the above categories.

SHAPE OF BLANK

The ends and back are described in terms of their shape in relation to a straight line. When both ends are modified the distal end is described first and includes shapes such as straight/straight (rectangular), pointed/straight (pointed), oblique/oblique (trapezoidal) etc.; see also backed and truncated blades above.

METHODS OF MODIFICATION

This describes how the blades are shaped. Main subdivisions are by truncation and retouch and within that by method of truncation, style of retouch etc.

Truncation: three methods of truncation have been observed (Copeland 1981, 88; ~~Inizan and~~ Tixier, Inizan + Roche 1980 and ~~Barton~~ Bergman et al 1987):

a) burin blow from the edge of the blade across the width (Chanfrein - Copeland 1979,262); this sometimes travels down the side of the blade forming an abrupt back. Sometimes difficult to distinguish from sickle blades subsequently re-used as burins.

b) blow on central ridge (cassure volontaire or cassure a stigmate) this produces a scar of the thickness of the flake and is similar to the technique used to manufacture side-blow flakes (Braidwood ~~1958~~ in Hole 1983 fn 9.; Copeland 1979, 267-8).

b) by making two small notches on alternate sides of the blade and then snapping the blade across an edge - this often leaves a small hinge fracture on the truncated end. This method is used when a blade of an exact length is required (Crowfoot 1937).

Retouch: subdivided according to angle and type of retouch.

a) abrupt retouch is confined to the edge of the piece and is at an angle of c 75° or more (fig. V.2,1 and 12).

b) semi-invasive retouch is usually less steep than abrupt retouch and goes over the thickness of the flake (Fig. V.14, 5 - 11).

c) invasive retouch covers the surface of the tool (Fig. VI.19,5 and 7).

Direction of Retouch

This describes the surface from which the retouch is executed - direct retouch is from the bulbar on to the dorsal face (Fig. V.2,10), inverse retouch is from the dorsal on to the bulbar face (Fig. V.2,11) and bifacial retouch is on both faces (Fig. V.5, 2-6). Helwan retouch is abrupt bifacial retouch forming a ridge along the back (Fig. VI.2.2) (Olszeswki 1986,214).

Type of Retouch

This may be serial flaking which is formed by a series of narrow or lamellar scars (i.e. individual scars struck parallel to each other [Fig.VI.14,2]) or scale flaking (wide scars which overlap with each other) (Fig.V.5). Pressure flaking is a term used to describe flat invasive retouch, presumed to have been executed by pressure flaking rather than by percussion.

DIMENSIONS (Fig. V.20)

Length is measured at right angles to the striking platform.

Width is the maximum width of the blade at right angles to the length.

Thickness is the maximum thickness of the blank.

APPENDIX V

ATTRIBUTES OF A SAMPLE OF LUSTRED BLADES FROM JERICHO

1 NATUFIAN AND PROTO-NEOLITHIC

Amount surving/ Class	Natufian	Proto-Neolithic I,B	I,E1	I,E2	Uncl
Complete	3	2			
Middle			2		1
Butt	2	1		2	
Distal end					2
Frag, uncl,					
Sample Size	5	3	2	2	3

Back/ Class	Natufian	Proto-Neolithic I,B	I,E1	I,E2	Uncl
Straight abrupt	3		2		
bifacial	2				
Convex, abrupt				2	
bifacial					
Angular					
Irregular					
Partial, abr					
N/A		3 (1 with cortex)			3
Sample Size	5	3	2	2	3

Butt/ Class	Natufian	Proto-Neolithic I,B	I,E	I,E2	Uncl
Unmodified	4			2	
Straight		1 trunc,			
Oblique					
Pointed					
Rounded					
Damaged	1		2		
Other					
Cont, of back					
Not obs, or N/A		2			3
Sample Size	5	3	2	2	3

Distal/ Class	Natufian		Proto-Neolithic I.B	I.E1	I.E2	Uncl
Unmodified	1					
Straight	2	trunc				
Oblique						
Pointed						
Rounded						
Damaged	2					
Other						
Cont. of back						
Not obs. or N/A			3	2	2	3
Sample Size	5		3	2	2	3

Shape of edge/ Class	Natufian	Proto-Neolithic I.B	I.E1	I.E2	Uncla
Straight	2	1	1		
Convex	2	1	1		
Concave					
Sinuous					
Irregular	1	1		2	3
Sample Size	5	3	2	2	3

Edge Angle/ Class	Natufian	Proto-Neolithic I.B	I.E1	I.E2	Uncl
0-15°					
16-20°					
21-25°		1	1		1
26-30°	1		1	1	
31-35°	1			1	1
36-40°		1			
41-45°					1
46-50°	1	1			
51-55°	1				
56-60°					
61° and over					
Not obs.					
Sample Size	5	3	2	2	3

Config. of lustre/ Class	Natufian n	Proto-Neolithic I.B	I.E1	I.E2	Uncl
Parallel		1			
Oblique		2	1	1	
Convex				1	
Uncertain					
Not obs.	5		1		3
Sample Size	5	3	2	2	3

Extent of lustre/ Class	Natufian	Proto-Neolithic I.B	I.E1	I.E2	Uncl
Edge only		1	1		
Ridge/edge			1	1	
Ridge/diffuse		2		1	
Edge/diffuse					
Other					
Not obs.	5				3
Sample Size	5	3	2	2	3

Length of lustre/ Class	Natufian	Proto-Neolithic I.B	I.E1	I.E2	Uncl
End to end		1			
Avoids ends	2				
Not on butt, on distal					
Not on butt, distal br	2			1	
On butt, not distal		1			
On butt, distal br		1		1	
Not on distal, on butt					
On distal, butt br			1		
On distal not on butt					
Not on distal, butt br	3		1		
Frag. not obs.					3
Sample Size	5	3	2	2	3

Bitumen		1	1	1	2

Length in mm/ Class	Natufian	Proto-Neolithic I,B	I,E1	I,E2	Uncl
31-40mm	3				
41-50mm		1			
51-60mm		1			
61-70mm					
71-80mm					
81-90mm					
91-100mm					
101-110mm					
111-120mm					
121-130					
131-140mm					
141-150mm					
Frags.	2	1	2	2	3
Sample Size	5	3	2	2	3

Width in mm/ Class	Natufian	Proto-Neolithic I,B	I,E1	I,E2	Uncl
5-10mm	4				
11-15mm	1	1			1
16-20mm		1		1	
21-25mm		1	1	1	1
26-30mm			1		1
31-35mm					
Sample Size	5	3	2	2	3

Thickness in mm/ Class	Natufian	Proto-Neolithic I,B	I,E1	I,E2	Uncl
0-3mm	2	1			1
4-5mm	2	1		1	1
6-7mm		1	2	1	
8-9mm					
10-11mm					
12-13mm					
Not obs	1				1
Sample Size	5	3	2	2	3

2 PPNA

Amount surving/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	Frags*	II,B	II,C/D	II,E	II,G	Frags*
Complete	5	3		6	3					?1	
Middle			1	1	1						
Butt	1	3	3		2		1		1		
Distal				1	1			1			
Uncl						22					7
Sample Size	6	6	4	8	7	22	1	1	1	1	7

* Not further analyzed, except for width and thickness

Back/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G
Straight abrupt			1						1nibbling
bifacial									
inverse			2						
Convex, abrupt dir				1					
inv				2					
semi inv				3					
partial				1					
alt				1					
bifacial					7			1	
Angular									
Irregular									
Partial, abr									
Frags too small to classify									
N/A	6	6							
Sample Size	6	6	3	8	7			1	1

Butt/ Class	I,B	I,C/D	I,E1	I,E2	I,E2	II,B	II,C/D	II,E	II,G
Unmodified			1	2					
Straight, trun		2		1					
rot		1							1
Oblique		1	1						
Pointed									
Rounded		2							
Damaged				2					
Other			2	1	2		1	1	
Cont.of back				2	5				
Sample Size		6	4	8	7		1	1	1

Distal Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G	
Unmodified		2	4							
Straight		1	1	?1					1	trunc
Oblique										
Pointed							1			
Rounded										
Damaged		3		1						
Other										
Cont. of back				5	4					
Not obs.				1	3			1		
Sample Size		6		8	7		1	1	1	

Shape lustred edge/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G
Straight		2	2	6	3	1		1	1
Convex	2	1	1		1		1		
Concave	2				2				
Sinuous									
Irregular	1	3	1		1				
?	1			2					
Sample Size	6	6	4	8	7	1	1	1	1

Edge Angle/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	Frags	II,B	II,C/D	II,E	II,G	Frags
0-15°											
16-20°						1					
21-25°	1		1								1
26-30°	1	2	1			1	1		1		
31-35°				2	1						2
36-40°		1	1	1	2	4		1		1	1
41-45°	1			1							
46-50°			1		2	1					
51-55°						1					
56-60°											
61° and over											
Not observable	3	3		4	2	14					3
Sample Size	6	6	4	8	7	22	1	1	1	1	7

Direction of denticulation/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G
Direct						1			
Inverse							1	1	1
Bifacial									
Other									
Sample Size	N/A	N/A	N/A	N/A	N/A	1	1	1	1

Config. of lustre/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G
Parallel		2	2	2	1				1
Oblique	1	1	1		1	1	1		
Convex	2			1				1	
Uncertain			1	1	3				
Not observable	3	3		4	2				
Sample Size	6	6	4	8	7	1	1	1	1

Width of lustre/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	II,B	II,C/D	II,E	II,G
Edge only	1				1				
Ridge/edge			3	1		1	1		1
Ridge/diffuse	2	3	1	3	4			1	
Edge/diffuse									
Other	3	3		4	2				
Sample Size	6	6	4	8	7	1	1	1	1

Length of lustre/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif		II,B	II,C/D	II,E	II,G
End to end	2			2						1
Avoids ends	2	1		1	2					
Not on butt, on distal		1								
Not on butt, distal br				1					1	
On butt, distal br			2			2				1
Not on distal, on butt										
On distal, butt br		1				1				
On distal not on butt			2		3	1				
Frag			4	2	1					
Other										
Sample Size	6	6	4	8	7		1		1	1

Bitumen

Length in mm/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	Frags	II,B	II,C/D	II,E	II,G	Frags
31-40mm											
41-50mm											
51-60mm				3							
61-70mm											
71-80mm		1		1	1					1	
81-90mm		1			1						
91-100mm	3			2							
101-110mm	2				1						
111-120mm		1									
121-130											
131-140mm											
141-150mm											
Frags	1	3	4	2	4	22	1	1	1		7
Sample Sizes	6	6	4	8	7	22	1	1	1	1	7

Width in mm/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	Frag	II,B	II,C/D	II,E	II,G	Frag
5-10mm				1							
11-15mm	1			2		3					
16-20mm		3	2	3	1	3	1	1		1	5
21-25mm	3	3	1	1	5	1			1		2
26-30mm	1		1	1	1	2					
31-35mm	1										
Not obs.						13					
Sample Sizes	6	6	4	8	7	22	1	1	1	1	7

Thickness in mm/ Class	I,B	I,C/D	I,E1	I,E2	I,E2 bif	Frag	II,B	II,C/D	II,E	II,G	Frag
0-3mm						2					
4-5mm		3	5	3	2	3					4
6-7mm	3		2	1	1	3	1	1		1	3
8-9mm	1		2		2	1			1		
10-11mm											
12-13mm											
Not obs	2	3		4	2	13					
Sample Sizes	6	6	4	8	7	22	1	1	1	1	7

3 PPNB

Amount surviving/ Class	I,B	I,C	I,E1	I,E2	ret butt	unret dist	oid seg	oid edgex2
Complete	3	3	2					
3/4 complete								
Tip damaged								
Middle				2			5	2
Butt	4				1			
Tip								
Distal 1/2			2	1		1		
Frag. uncl.								
Sample Size	7	3	4	3	1	1	5	2

Back/ Class	I,B	I,C	I,D	I,E	ret butt	unret dist	oid seg	oid edge x2
Unmodified	7	3	3		1	1	5	
Straight abrupt					1			
bifacial					1			
Convex, abrupt								
bifacial								
Angular								
Irregular								
Partial, abr			1	1				
Frags too small to classify								
Other								2
Sample Size	7	3	4	3	1	1	5	2

Butt/ Class	I,B	I,C	I,D	I,E	ret butt	unret dist	oid seg	oid edge x2
Unmodified	7							
Straight								
Oblique								
Pointed, abr			1					
bif,inv		2						
Rounded						1		
Tanged			1					
Burin		1						
Damaged								
Other								
Cont. of back								
Not obs			2	3	1		5	2
Sample Size	7	3	4	3	1	1	5	2

Distal/ Class	IB	IC	ID	IE	ret butt	unret dist	oid seg	oid edge x2
Unmodified	3	2	1			1		
Straight								
Oblique								
Pointed			2	1				
Rounded		1						
Damaged			1					
Other								
Y								
Continues curve of back								
Not obs	4			2	1		5	2
Sample Size	7	3	4	3	1	1	5	2

Shape of lustred edge/ Class	IB	IC	ID	IE	ret butt	unret dist	oid seg	oid x2
Straight	5	1		2		1	2	1
Convex	1	1	3	1	1		2	1
Concave			1				1	
Sinuous	1	1						
Irregular								
?								
Sample Size	7	3	4	3	1	1	5	2

Angle of edge/ Class	IB	IC	ID	IE	ret butt	unret dist	oid seg	oid x2
0-15°								
16-20°								
21-25°				1				
26-30°	2	2	1					
31-35°			1	1			2	
36-40°	1	1		1	1			2
41-45°	2						2	
46-50°	2					1	1	
51-55°								
56-60°								
61° and over			1					
Not observable			1					
Sample Size	7	3	4	3	1	1	5	2

Config. of lustre/ Class			IB	IC	ID butt	IE dist	ret seg	unret x2	oid	oid
Parallel	4	1	3	3	1	1	3			
Oblique							1	1?		
Semi-oblique	3	2								
Convex										
Uncertain			1	faint						
Not obs.							1	1		
Sample Size	7	3	4	3	1	1	5	2		

Width of lustre/ Class	IB	IC	ID	IE	ret butt	unret dist	oid seg	oid x2	
Edge only	3	1	2	2			2		
Ridge/edge	4	2	1		1		3		
Ridge/diffuse				1		1			
Edge/diffuse									
Other			1					2	
Sample Size		7	3	4	3	1	1	5	2

Length of lustre/ Class	IB	IC	ID	IE	ret butt	unret dist	oid seg	oid x2
End to end								
Avoids ends	3	2						
Not on butt, on distal				1				
Not on butt, distal br			3		2			
On butt, distal br								
Not on distal, on butt				1		1		
On distal, butt br					1		1	
On distal not on butt				1				
Frag	1		1					2
Other							4	
Sample Size	7	3	4	1	1	1	5	2

Bitumen 1 2 1

Length in mm (complete examples only) Class	IB	IC	ID	IE	ret butt	unrot dist	mid seg	mid x2
31-40mm								
41-50mm								
51-60mm	1							
61-70mm	1	1	1					
71-80mm		1	1					
81-90mm								
91-100mm	1							
101-110mm		1						
111-120mm								
121-130								
131-140mm								
141-150mm								
Sample Sizes	3	3	2					

Width in mm/ Class	IB	IC	ID	IE	ret butt	unrot dist	mid seg	mid x2
5-10mm								
11-15mm	2		3			1	1	
16-20mm	1	1	1	2	1		4	2
21-25mm	2	1		1				
26-30mm	1	1						
31-35mm	1							
Sample Sizes	7	3	4	3	1	1	5	2

Thickness in mm/ Class	IB	IC	ID	IE	ret butt	unrot dist	mid seg	mid x2
0-3mm								
4-5mm	4		2	1			3	
6-7mm	2	3	1	1		1	2	1
8-9mm				1	1			1
10-11mm	1							
12-13mm								
Not obs			1					
Sample Sizes	7	3	4	3	1	1	5	2

PPNB ; DENTICULATED

Amount surving/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Complete	25	10	12			16		
Middle								109
Butt	24			44				
Distal		26					49	
Frag, uncl,								
Sample Size	50	36	12	44	17	16	49	109

Back/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Unmodified								
Straight abrupt						4		
bifacial						1		
alt					1			
Convex, abrupt					3			
bifacial						1		
Angular								
Irregular ch,					7			
Partial, abr								
Frags too small to classify								
Sample Size	N/A	N/A	N/A	N/A	17	N/A	N/A	N/A

Butt/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Unmodified					1			
Straight, trunc			1				8	
ret				1		3		
Oblique, ret			2	7		2		
trun						2		
Pointed		7	10	20		1		
Rounded			2					
Damaged				1				
Other				7				
Burin blow		2						
Not obs.		26			16			
Sample Size	N/A	36	12	44	17	16	N/A	N/A

Distal/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Unmodified					1	4		
Straight,trunc						5		
ret			1		2	2	3	
Oblique, ret					1	4	4	
Pointed			9				37	
Rounded			1		1		1	
Damaged			1		2			
Other					9	1	4	
Cont, if back					1			
Sample Size	N/A	N/A	12	N/A	17	16	49	N/A

Shape/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Straight	26	18	5	32	14	12	32	66
Convex	15	15	5	2	2	1	12	19
Concave	3				1	3		
Sinuous	1			2				1
Irregular	5	2	1	7			2	23
Frag?		1	1				3	
Sample Size	50	36	12	44	17	16	49	109

Edge Angle/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
0-15°								
16-20°	1							3
21-25°	1				1	1		1
26-30°	6	5	4	9	3	2	10	10
31-35°	8	6		9	3	1		17
36-40°	14	15	3	11	3	4	25	39
41-45°	4	4		7	2	4	1	6
46-50°	5	5	1	6	5	2	13	23
51-55°	2					1		1
56-60°			1	1				6
61° and over								1
Not obs.	9	1	3	1		1		2
Sample Size	50	36	12	44	17	16	49	109

Direction of denticulation Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Direct	2	1		2	1	3	5	
Inverse	48	34	12	41	15	9	43	
Bifacial		?1		1	1	4	?1	
Other								?
Sample Size	50	36	12	44	17	16	49	?

Config, of lustre Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Parallel	9	8	21	14	5	10	18	
Oblique	30	16	9	26	4	21	19	25
Convex		3					1	
Uncertain		4			5	4		
Not observable	11	5	2	4	2	1	11	84
Sample Size	50	36	12	44	17	16	49	109

Width of lustre/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
Edge only	4	1		4	2	3	5	9
Ridge/edge	14	10	6	10	5	3	4	17
Ridge/diffuse	23	21	4	26	9	8	36	72
Edge/diffuse				2		1		1
Other	1			2		1	3	10
Not obs,	8	4	2		1			
Sample Size	50	36	12	44	17	16	49	109

Length of lustre/ Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist frag	mid seg
End to end	2	1	3			16		
Avoids ends	6	6	7					
Middle only								
Not on butt, on distal			17	3	1	38		
Not on butt, distal br		21				1		
On butt, distal br		1			6	1		
Not on distal, on butt			1					
Not on distal, butt br							1	
On distal, butt br			15			1		
On distal not on butt						1		
Frag		7			1			
Other	2	4			11			
Sample Size	50	36	12	44	17	16	N/A	N/A

Bitumen	10	2	1	5	5	2	9	

Length in mm/ (complete blades only)

Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist	mid
							frag	seg
21-30mm						1		
31-40mm								
41-50mm						1		
51-60mm			3			4		
61-70mm	3		3			1		
71-80mm	4	2	3			4		
81-90mm	6	2	1			3		
91-100mm	3	1	1			2		
101-110mm	3	2	1					
111-120mm	7	1						
121-130mm								
131-140mm		1						
141-150mm								
155mm		1						
Sample Sizes	26	10	12			16		

Width in mm /

Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist	mid
							frag	seg
5-10mm				1				
11-15mm	5	9	2	5	2	3	5	30
16-20mm	27	19	8	21	10	10	29	54
21-25mm	17	6	2	13	5	3	13	21
26-30mm	1	2		3			2	4
31-35mm				1				
Sample Sizes	50	36	12	44	17	16	49	109

Thickness in mm/

Class	II,B	II,C	II,D	II,C/D	II,E	II,F	Dist	mid
							frag	seg
0-3mm								2
4-5mm	14	16	5	13	7	7	10	32
6-7mm	20	12	4	23	6	5	22	57
8-9mm	6	7	1	6	4	1	15	16
10-11mm	1			1		1	2	1
12-13mm	1							
Not obs	8	1	2	1		2		1
Sample Sizes	50	36	12	44	17	16	49	109

PNA (Yaroukian)

Amount surving/	III	IV	V
Complete	13	13	11
3/4 complete			
Tip damaged			
Middle			
Butt			
Tip			
Distal 1/2			
Frag. uncl.			
Sample Size	13	13	11

Back/ Class	III	IV	V
Unmodified	8	1	
Straight abrupt			1
bifacial			3
Convex, unifacial		4	1
bifacial			6
Angular			
Irregular			
Double edged	1	1	–
und / not obs	4	7	
Sample Size	13	13	11

Butt/ Class	III	IV	V
Unmodified			
Straight	8	10	7
Oblique	4	3	4
Pointed			
Rounded			
Damaged	1		
Other			
Cont. of back			
Sample Size	13	13	11

Distal/ Class	III	IV	V
Unmodified			
Straight	8	6	4
Oblique	4	2	3
Pointed	1	4	3
Rounded			1
Damaged		1	
Other			
Cont. of back			
Sample Size	13	13	11

Shape of edge/ Class	III	IV	V
Straight	6	9	5
Convex	4	1	
Concave	3	2	6
Sinuous			
Irregular			
?		1	
Sample Size	13	13	11

Angle of edge/ Class	III	IV	V
0-15°	1	1	
16-20°	1		
21-25°			
26-30°	2		
31-35°	2	1	1
36-40°	5	4	2
41-45°	1		1
46-50°			
51-55°	1		
56-60°		1	
61° and over		1	
Not observable		5	7
Sample Size	13	13	11

Direction of denticulation/ Class	III	IV	V
Direct			
Inverse			
Bifacial	13	13	11
Other			

Config of edge/ Class	III	IV	V
Parallel	13	7	3
Oblique		1	
Semi-oblique			
Convex			1
Uncertain			
Not observable		5	7
Sample Size	13	13	11

Width of lustre Class	III	IV	V
Edge only	13	8	2
Ridge/edge			1
Ridge/diffuse			
Edge/diffuse			
Other			
Not observable		5	8
Sample Size	13	13	11

Length of lustre / Class	III	IV	V
End to end	13	13	11
Avoids ends			
Not on butt, on distal			
Not on butt, distal br			
On butt, distal br			
Not on distal, on butt			
On distal, butt br			
On distal not on butt			
Frag			
Other			
Sample Size	13	13	11

Bitumen None

Length in mm/ Class	III	IV	V
21-30mm		2	1
31-40mm	8	1	6
41-50mm	4	6	2
51-60mm	1	2	2
61-70mm		1	
71-80mm			
81-90mm			
91-100mm		1	
101-110mm			
111-120mm			
121-130			
131-140mm			
141-150mm			
Sample Sizes	13	13	11

Width in mm/ Class	III	IV	V
5-10mm	2	1	
11-15mm	9	3	
16-20mm	2	7	8
21-25mm		1	2
26-30mm			1
31-35mm		1	
Sample Sizes	13	13	11

Thickness in mm/ Class	III	IV	V
0-3mm	2		
4-5mm	8	5	3
6-7mm	2	4	1
8-9mm	1	1	
10-11mm			
12-13mm			
Not obs		3	7
Sample Sizes	13	13	11

APPENDIX VI

CATALOGUE OF LUSTRED BLADES FROM SELECTED SITES

EARLY NATUFIAN

SITE;	EL WAD B2	Fig. VI;1-15

REFERENCES;	Garrod 1932, 261, Fig. C 15-21; Garrod and Bate 1937, 34, Pl. IX, 15-21
TOTAL LUSTRED;	630
CLASS;	Illustrations and descriptions indicate Classes I,B, I,El and 2, Gl and 2 A few Class II (see below) Blunted back 262 (196 with pointed ends, 66 with square ends) Helwan retouch 291 (72 with pointed ends, 219 with square ends) Various 77 (22 unretouched) Denticulated edges occur on a few examples in all groups
DIMENSIONS;	Helwan blades narrower than in Level BI
HAFTS;	14, one with blades <u>in situ</u>
FUNCTION;	Unger-Hamilton 1985b, 122-5 ; 5 reed or <u>stipa</u> Büller 1983, Table IX ; 4 out of five had sickle gloss. Of these 2 were hafted in wood, 1 in bone; 1 held with resin, 2 set parallel to line of haft, rest set obliquely.

SITE;	KEBARA B	Fig. VI;2, 1-11 Fig. VI;3, 1-7

REFERENCES;	Turville Petre 1932, 272, Fig. F 6-11
TOTAL LUSTRED;	1000 + ("the most numerous of implements")
CLASS;	Report indicates Classes I,B, I,El and 2, G 1 and 2 Some denticulated forms (Class II) present, though not mentioned in report Flat back retouched Helwan retouch, no details Ends square or slighlty curved, sometimes pointed Some backed with cortex Bulb not always removed but trimmed to pointed shape Distal end straight; lustre not on butt Denticulated pieces illustrated and present amongst material in Ashmolean see also Unger-Hamilton 1985a and b
DIMENSIONS;	-
HAFTS;	6
FUNCTION;	Unger-Hamilton 1985a, 270-71 ; 5 <u>stipa</u> or reed (denticulated) 6 cereal or grass
OTHER;	One of the blades illustrated by Turville Petre appears to be a PPNB type (Fig.F, 8).

SITE;	ERQ EL AHMAR	Fig. VI;3,8-11

REFERENCES; Neuville 1951, 112-3, Fig. 51,17-20
TOTAL LUSTRED; Not quantified
CLASS; I,E and G
Backed blades; ends may be truncated and retouched, but often not
DIMENSIONS; Range 40 - 60 mm in length, most between 20-40 mm; 10 mm wide
HAFTS; -
FUNCTION; -
OTHER; Intrusive lame a maio (Fig. 52, no 8)

SITE;	EYNAN IV-III-II	

REFERENCES; Valla 1975b, Fig. 2; Perrot 1960
TOTAL LUSTRED; ? Abundant (Perrot 1968, 371)
CLASS; I,E1 and E2ii
Bifacially flaked back; ends unmodified
Convex backed blades
DIMENSIONS; -
HAFTS; 2 out of 4 in wood, 1 indeterminate (Büller 1983, Table X)
FUNCTION; 2 out of 4 have sickle gloss, 1 indeterminate (Büller 1983, Table X)
OTHER; One (Valla 1975a, Fig 16,24) from lower levels is very similar to Beit Tamir type of sickle blade and may be intrusive

SITE;	EL KHIAM B2	Fig VI;3,12

REFERENCES; Neuville 1951, 157, Fig. 67,5
TOTAL RETOUCHED; -
TOTAL LUSTRED; Not quantified
CLASS; I,E; Backed bladelets
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; None listed by Olszewski 1986,227-8 after Echegaray 1966

SITE: WADI HAMMEH 27

REFERENCES: Edwards and Colledge 1985, 103 and pers comm
TOTAL LUSTRED: 42 (from published data)
CLASS: I,E and G?

Helwan 25	(out of total blades 108)	
Inverse 0		49
Abrupt 4		16
Other 5		18

DIMENSIONS: -
HAFTS: *6, one double sided with 9 out of 10 blades in situ all with Helwan retouch*
FUNCTION: Analysis in progress
OTHER: -

SITE: POLEG 18-M

REFERENCES: Prausnitz 1966, 226
TOTAL LUSTRED: 1,8%
CLASS: No details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: IRAQ EL BAROUD

REFERENCES: Prausnitz 1966, 225f
TOTAL LUSTRED: 1,8%
CLASS: No details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: HAYONIM TERRACE Fig VI;4,1-2

REFERENCES: Henry et al 1981
TOTAL LUSTRED: 2
CLASS: I,E1 and 2ii; one straight backed and one convex
DIMENSIONS: 45 x 9 mm and 43 x7 mm
HAFTS: -
FUNCTION: -
OTHER: Lustred edge chipped

SITE;	HAYONIM CAVE	Fig VI;4,3-4

REFERENCES; Bar Yosef and Goren 1973, 57, Fig 5 nos 12-14; Bar Yosef and Tchernov 1970
TOTAL LUSTRED; 11
CLASS; I,E2ii; Backed and retouched blades; convex in shape
Cross-section suggests Helwan retouch
DIMENSIONS; Illustrated examples under 50 mm in length
HAFTS; Flat bone hafts
FUNCTION; -
OTHER; -

LATE NATUFIAN

SITE;	JERICHO	Fig,V;

REFERENCES; Crowfoot Payne 1983, 625, Fig,246 1-3 and 6
TOTAL LUSTRED; 4 (and 2 from derived contexts)
CLASS; I,E1i and ii and I,E2 Backed blades
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	EL WAD B1

REFERENCES; Garrod 1932; Garrod and Bate 1937, 31 Pl, VIII, 37,38,42,43,45,46
TOTAL LUSTRED; 394
CLASS; I,E; 284 rough blunted back (ends pointed 29,
a few roughly squared, rest rounded)
II,E; 1 with serrated edge
I,G1 and 2; Helwan (ends pointed 42, square 39)
DIMENSIONS; 25 to 75 mm long, majority c 50mm
HAFTS; -
FUNCTION; Unger-Hamilton 1985a,271; 4 out of 5 had cereal polish, 3 with striations,
Denticulated ones had reed or stipa polish
OTHER; -

SITE:	SHUKBAH B	Fig. VI:4, 5-9

REFERENCES: Garrod 1942, 258 Fig A, 8-10
TOTAL LUSTRED: 74
CLASS: I,B: Unretouched 34
I,E & G: Blunted back 39 (ends pointed or broken off square)
Helwan 1 (with squared end)
DIMENSIONS: Max length 60 mm, min 40mm
HAFTS: -
FUNCTION: -
OTHER: 73 have lustred on one edge, 1 on both.

SITE:	EYNAN Ib, Ic	Fig. VI:4

REFERENCES: Valla 1975
TOTAL LUSTRED: -
CLASS: I,E1, I,E2 and ?I,F
Backed, convex back and bi-truncated
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	NAHAL OREN VI-V

REFERENCES: Noy et al 1973; Olszewski 1986,226 after Valla 1981
TOTAL LUSTRED: Level VI 2, level V 6
CLASS: No details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	EL KHIAM

REFERENCES: Neuville 1951
TOTAL LUSTRED: Not quantified
CLASS: I,E: Abruptly retouched bladelets
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: None listed from Natufian levels by Olszewski 1986, 227-8
after Echegaray 1966

SITE; UMM EZ ZUWEITINA

REFERENCES; Neuville 1951, 122
TOTAL LUSTRED; Not quantified
CLASS; I,E; Backed
DIMENSIONS; -
HAFTS; 2 blades in haft
FUNCTION; -
OTHER; -

SITE; TOR ABU SIF

REFERENCES; Neuville 1951, 128
TOTAL LUSTRED; Not quantified
CLASS; I,E; Backed
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; WADI FAZAEL IV Fig VI;5,1-4

REFERENCES; Bar Yosef, Goldberg and Leveson 1974,423, Fig & 23, 26-9
TOTAL LUSTRED; 73 (out of 186 backed blades)
CLASS; I,E1 and 2; Abrupt retouch on back, curved and straight
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; ABU USHBA

REFERENCES; Stekelis and Haas 1952
TOTAL LUSTRED; -
CLASS; I,E & F; Abruptly retouched backs and ends
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Date uncertain, stratigraphy mixed

SITE:	SEFUNIM CAVE
REFERENCES:	Bar Yosef 1983, 25
TOTAL LUSTRED:	4
CLASS:	No details
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	Possibly from one sickle

SITE:	ROSH HORESHA
REFERENCES:	Marks and Larson 1977; Goring-Morris 1987,490
TOTAL LUSTRED:	19
CLASS:	I,B; Unmodified 10 I,E; Backed 9
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE:	ROSH ZIN
REFERENCES:	Marks 1969, 118-20; Henry 1973; Goring-Morris 1987, 490
TOTAL LUSTRED:	6 (5% of tools in Area A), Goring-Morris 1987, 490 lists 5
CLASS:	I,E; Unilaterally backed 4 I,B; Unmodified 2 (Goring-Morris 1987 all this type)
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	Found in midden area (result of differential activities in task specific areas?)

SITE:	SAFLULIM	*Fig. VI;5,10*
REFERENCES:	Goring-Morris 1987, 292-2, Fig. VIII-14	
TOTAL LUSTRED:	1	
CLASS:	I,E; Backed	
DIMENSIONS:	-	
HAFTS:	-	
FUNCTION:	-	
OTHER:	-	

SITE: IRA 22

REFERENCES: Goring-Morris 1987, 292
TOTAL LUSTRED: 1,5%
CLASS: No details given
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: IRA 10

REFERENCES: Goring-Morris 1987, 292
TOTAL LUSTRED: 0,3%
CLASS: No details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: IRA 25

REFERENCES: Goring-Morris 1987,502
TOTAL LUSTRED: 3,2% (of scrapers, burins, lunates, sickles, truncations & notches)
CLASS: No details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: KHALLAT 'ANAZA Fig. VI;5,10

REFERENCES: Betts 1982; 1986,52, Fig. 3;11, 6-10
TOTAL LUSTRED: 6 (5 excavated, one surface)
CLASS: I,B: One bladelet unmodified
I,E: One backed
3 frags, one double sided
DIMENSIONS: -
HAFTS: -
FUNCTION: 1 (Fig VI;5,10) with sickle gloss (identified by Moss)
OTHER: -

SITE; JITTA III

REFERENCES; Copeland in Hours 1966
TOTAL LUSTRED; -
CLASS; I,E2; Convex with abrupt retouch
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; TAIBE A2 & A3 Fig, VI;5,5-9

REFERENCES; M,-C, Cauvin 1973
TOTAL LUSTRED; 5; Level A3 2; level A2 3
CLASS; I,E and I,G1
Abruptly retouched backs; one obliquely truncated
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; MUREYBIT IA Fig, VI;6, 1-6

REFERENCES; M,-C, Cauvin 1977,13, Fig,2,14 and 15
TOTAL LUSTRED; 'a small number'
CLASS; I,C and D; retouch on butt and also on distal end
DIMENSIONS; length 67 - 88 mm; width 15 - 25 mm
HAFTS; One possible evidence for hafting (Anderson-Gerfaud 1983)
FUNCTION; Anderson-Gerfaud 1983,93; 6 examined, Edge angles 20 - 30°
Identifications; reeds, rushes or sedges; pasture grass or einkorn;
3 other blades have faint gloss and steeper edge angle
Gloss on dorsal surface only 3/6, 1 double sided, ventral
face only, 1 both,
OTHER; Used in a uni-directional arced motion and pulled towards user

SITE; ABU HUREYRA Fig, VI;6,7

REFERENCES; Moore 1975,56f ; Olszewski 1986
TOTAL LUSTRED; 2 identified by Anderson-Gerfaud 1983 (none noted by Moore or Olszewski)
CLASS; I,E1 and 2; One lunate, one broken backed piece
DIMENSIONS; -
HAFTS; Hafted with others, probably with longitudinal axis parallel
to haft (Anderson Gerfaud 1983)
FUNCTION; Anderson-Gerfaud 1983, 85,95-97, Fig,1,5,Pl,I,7b;
2 identifications of stipa or dry einkorn; striations,
4 with borage,
OTHER; Olszewski 1986, 148; 13 lunates with dull lustre (? meat polish)

SITE:	JERICHO	Fig.V:2,5-12

REFERENCES: Crowfoot Payne 1983, 632, Fig 257
TOTAL LUSTRED: 9 (?) See Chapter V and App.V
CLASS: I,B x 3
I Eli, II,E x2 and 3 unclassifiable
DIMENSIONS: 60 x 16 x 30 mm; broken ones upto 30mm wide
HAFTS: Bitumen in broad band along length of blade
FUNCTION: -
OTHER: -

SITE:	SALABIYAH IX	Fig.VI:7,1-2

REFERENCES: Bar Yosef 1980,193, Fig.2
TOTAL LUSTRED: 7 (3.3% of 211)
CLASS: I,B; Unretouched blades "generally devoid of any modification retouch"
DIMENSIONS: -
HAFTS: Longitudinal - bitumen along back of blades
FUNCTION: -
OTHER: -

SITE:	ABU SALEM

REFERENCES: Marks et al 1972,73-85; Goring-Morris 1987, 493 & 502
TOTAL LUSTRED: Locus 1 0.6%, Locus 22 0.4%
CLASS: I,E; 1 ; other unknown
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	MAALEH RAMON E

REFERENCES: Goring-Morris 1987, 494
TOTAL LUSTRED: 2
CLASS: I,E x 1; I,E2 (convex) x 1
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	MAALEH RAMON W

REFERENCES:	Goring-Morris 1987, 494
TOTAL LUSTRED:	1
CLASS:	I,E1 Retouched back
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE:	HAR AROD

REFERENCES:	Goring-Morris 1987, 494
TOTAL LUSTRED:	2
CLASS:	I,E: 1; I,E2 (convex) 1
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE:	ROHAH GXX

REFERENCES:	Goring-Morris 1987, 494
TOTAL LUSTRED:	1
CLASS:	I,E1 (Retouched back)
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE:	MUREYBIT II (Levels I-VIII)	Fig. VI:7,3-7

REFERENCES:	M.-C. Cauvin 1978,69-71, Fig.33,1,5-8
TOTAL LUSTRED:	16
CLASS:	I,B x2; I,C= x1; I,D3/1 str, I,D3/2= "Mureybit Type" x6; I,E1a= Backed x1; I,F1=Bitruncated x7
DIMENSIONS:	Most under 60mm
HAFTS:	Truncated type hafted longitudinally with length of edge outside haft, Mureybit type hafted obliquely
FUNCTION:	-
OTHER:	-

SITE: ZAWI CHEMI SHANIDAR

REFERENCES: Solecki 1981,21
TOTAL LUSTRED: '2 fragments with weak sheen'
CLASS: No details
DIMENSIONS: -
HAFTS: One
FUNCTION: -
OTHER: -

SITE: KARIM SHAHIR

REFERENCES: Howe 1983,67-68,108
TOTAL LUSTRED: 24
CLASS: I, A x 6 and I, B x 18 and some on core fragments; unstandardized morphology;
Edges damaged
Sheen on one edge 75%
Sheen on both edges 25%
Sheen on both faces 50%
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: Sheen of varying intensity, clarity of definition and extent of invasion from edge and distribution along edge.

SITE: GANJ DAREH TEPE E

REFERENCES: Smith 1968
TOTAL LUSTRED: Not quantified. 'Fairly common except in level E'
CLASS: -
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: M'LEFAAT

REFERENCES: Dittemore 1983,676-677
TOTAL LUSTRED: No lustred blades specifically mentioned, but some nibbled bladelets exhibit polish
CLASS: -
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE; ASIAB

REFERENCES; Braidwood, Howe ~~and Reed~~ 1960; Howe 1983,115

TOTAL LUSTRED; Not quantified.'Blades and bladelets with edge sheen definitely present, but in limited numbers'

CLASS; -

DIMENSIONS; -

HAFTS; -

FUNCTION; -

OTHER; -

SITE;	JERICHO	Figs.V;3-6
REFERENCES;	Crowfoot Payne 1983,649-51, Fig.274-275	
TOTAL LUSTRED;	231	
CLASS;	I,B1; I,B2; I,C; I,D, I,E II,B, II,C/D,II,E and ?II,G (Class2 rare)	
DIMENSIONS;	Length 50-120mm, width 5-35mm, th, 3-13mm	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE;	GILGAL III	Fig.VI;8,3 & 4
REFERENCES;	Noy et al 1980,	
TOTAL LUSTRED;	7	
CLASS;	I,B I,E Elongated type (one blade per sickle)	
DIMENSIONS;	90 x 31 x 14; 116 x 36 mm	
HAFTS;	Bitumen adhering to blades	
FUNCTION;	-	
OTHER;	Lustre convex (cf Beit Tamir type)	

SITE;	NETIV HAGDUD	Fig.VI;8,1
REFERENCES;	Bar Yosef, Gopher and Goring-Morris 1980,202, Fig. 3,6	
TOTAL LUSTRED;	-	
CLASS;	No details, but includes Beit Tamir type (I,E2ii)	
DIMENSIONS;	-	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE;	EL KHIAM B1	
REFERENCES;	Neuville 1951, 165-6, Fig. 71,9	
TOTAL LUSTRED;	-	
CLASS;	-	
DIMENSIONS;	-	
HAFTS;	-	
FUNCTION;	-	
OTHER;	cf Aswad, but more likely to be PPNB in this area	

SITE;	NAHAL OREN Stratum I & II
REFERENCES;	Noy et al 1973; Stekelis and Yisraely 1963,4, Pl,2C
TOTAL LUSTRED;	Not quantified
CLASS;	'a few small and long sickle blades' (Noy et al 1973, 86), Some with tang (?I,C/D) (Stekelis and Yisraely 1963) Some I,E
DIMENSIONS;	-
HAFTS;	-
FUNCTION;	-
OTHER;	-

SITE;	ASWAD IA	Fig,VI;9,1-4
REFERENCES;	M,-C, Cauvin 1974,430-431, Fig, 1,3,6,7,10; de Contenson 1977,209	
TOTAL LUSTRED;	59	
CLASS;	I,D x18; Denticulated x 41 II,B, II,D butt ends pointed or notched, distal straight; II,F x1 (oblique),Others appear to be bi-truncated, Some have flat retouch on butt,	
DIMENSIONS;	Illustrated pieces between 95 and 110 mm in length	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE;	MUREYBIT III Levels IX-XVIII	Fig,VI;10,1-10
REFERENCES;	M,-C, Cauvin 1978,69-71, Fig, 33,2-4,9	
TOTAL LUSTRED;	105	
CLASS;	I,B x20=lustred blades + 17 with flat retouch; I,D x37='Mureybit type' + 15 frags; I,F x 15 (7 with flat retouch); Edges sometimes denticulated or renewed with flat inverse retouch, but denticulation is not a primary attribute	
DIMENSIONS;	Mostly under 60mm, a few over 90 mm	
HAFTS;	Some with bitumen in level IX; Lustre configuration suggests some hafted obliquely,	
FUNCTION;	3 with phytoliths of <u>festucöides</u> (Anderson-Gerfaud 1982, 115/155)	
OTHER;		

SITE; MUREYBIT IVa

REFERENCES; M.-C. Cauvin 1974, Fig.19,5
TOTAL LUSTRED; 1-2.5%
CLASS; No details; illustrated one quite coarsely denticulated
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; TELL QARAMEL Fig.VI;11,1-4,6

REFERENCES; Copeland (in Matthers) 1981,89, Fig. 63,9-11,14-17
TOTAL LUSTRED; 27
CLASS; I,F1 x20 on plain blade segments
I,F2 x7 retouched truncations
Some blades retouched near butt
II,F x1 with fine denticulation
One possible enlarged head type, but in flint?
Lustre on one or both edges. Lustred edges unretouched but chipped
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Surface collection

SITE; KADIM Fig.VI;11,5

REFERENCES; Copeland (in Matthers) 1981,92, Fig. 64,7 & 8
TOTAL LUSTRED; 2
CLASS; I,F x1; I,G x1 (?)
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Surface collection

PERIOD 3

SITE;	JERICHO PPNB	Figs.V;7-13

REFERENCES; Crowfoot Payne 1983,683-686, Figs. 313-315
TOTAL LUSTRED; 998
CLASS; I,B; IC;I,E1 and I,E2
II,B; II,C; II,D; II,E; II,F.
DIMENSIONS; Length 30mm-165mm, width 5-35mm, th. 4-13mm
HAFTS; Traces of bitumen. Some with oblique lustre indicate oblique setting in haft
FUNCTION; Unger-Hamilton 1985a and b, 25 out of 33 cereals, 3 reed or stipa,
3 bullrushes, 1 grass, 1 indet.
OTHER; -

SITE;	YIFTAHEL

REFERENCES; Garfinkel 1987,203
TOTAL LUSTRED; Not quantified
CLASS; No details
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Awaiting final report

SITE;	BEIDHA	Figs.VI;12 and 13

REFERENCES; Mortensen 1970,33-36, Figs. 36-38
TOTAL LUSTRED; 380
CLASS;

I,A & E(?)	= his	F1 x 7	= rectangular or trapezoidal flakes, gloss on one or two edges, back sometimes retouched.
I,B	=	F2 x 87	= blades with glossy, irreg. retouched cutting edge
II,B & F	=	F3 x 117	= blades or blade segments; fine denticulations
I,F	=	F4 x 169	= bitruncated blade segments, gloss and partial retouch on sides.

DIMENSIONS; F1 51 - 83 mm; F2 25 - 110 mm; F3 27-101 mm; F4 31-86 mm
HAFTS; Bitumen on several specimens
FUNCTION;
OTHER;

SITE; ASWAD IB

REFERENCES; M.-C. Cauvin 1974,435,
TOTAL LUSTRED; 17
CLASS; No details
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; ASWAD II Fig.VI;14

REFERENCES; M.-C. Cauvin 1974,435, Fig.2,9,10 and 11, Fig. 3,5,7,11 and 12;
de Contenson 1977,209, Pl.4
TOTAL LUSTRED; 338 Cauvin, 379 de Contenson
CLASS; II,D Denticulated 106
I,B & D Undenticulated 246
I or II, F Truncated 27
V Flat retouch, sometimes almost invasive, more common in later levels
DIMENSIONS; "Larger than those from level IA"
HAFTS; One blade with oblique lustre indicates oblique hafting
FUNCTION; -
OTHER; -

SITE; GHORAIFE IA Fig.VI;15

REFERENCES; M.-C. Cauvin 1978,279, Fig.1,2,3 & 6
TOTAL LUSTRED; c 51 (29% of 177)
CLASS; II,B
II,D
II,F1 unretouched, II,F3
Invasive retouch rare, Some double sided pieces
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; GHORAIFE IB

REFERENCES; M.-C. Cauvin 1978,297, Fig. 2, 3,5-7
TOTAL LUSTRED; 46 (30,3% of 152)
CLASS; II,D, Fine denticulations, base retouched;
II,F base unmodified, distal end truncated;
II,F2 oblique , truncated and retouched,
Double sided pieces rare
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE: MUREYBIT IV

REFERENCES:	M.-C. Cauvin 1974; Skinner 1968; Cauvin 1978
TOTAL LUSTRED:	1-2,5%
CLASS:	II, Denticulated (no further details)
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE: ASIKLI HÖYÜK — Fig.VI;16

REFERENCES:	Todd 1966, 154-155, Fig 5,27-29
TOTAL LUSTRED:	-
CLASS:	I,F unretouched, edge chipping
DIMENSIONS:	-
HAFTS:	-
FUNCTION:	-
OTHER:	Obsidian and unlustred blades with much chipping may have been sickle blades

SITE: ÇAYÖNÜ — Fig;VI;16 and 17

REFERENCES:	Redman 1982,33-5,Fig.2,9,3-6, Fig.2,14,1 & 2, Fig.2,15,1-3, Pl.2,II,14,15-18,Pl.2,III,4 & 5,
TOTAL LUSTRED:	896 blades (= c.7% of all blades) and 3 flakes with sheen
CLASS:	Evenly divided between use modified and retouched blades, sometimes with denticulated edges, 88,5 % single edged. Forms present included unmodified blades, truncated forms and a few (36) steeply backed pieces, Probably Classes I,A,I,B, I,F and II,F Class VII Enlarged head class in obsidian (described as backed blades) 87% have sheen on one face (46% ventral, 41 % dorsal) 13% on both, Extent of lustre on average is 75% of length; 25% of width (2 mm on ventral face, 3mm on dorsal)
DIMENSIONS:	Mean 34 x 12 x 3 mm, but wide diversity in size
HAFTS:	Two antler (Çambel and Braidwood 1981)
FUNCTION:	Distribution of sheen suggests used in a scraping or pulling motion
OTHER:	Undenticulated nibbled blades not exclusively lustred Denticulated edges virtually confined to lustred edges

SITE; CAFER Figs.VI;16,5 and 6; VI;17,1-4

REFERENCES; M.-C. Cauvin & Balkan 1985, 55-57,Fig. 3,5, 4,6
TOTAL LUSTRED; 62 - flint rare, obidian usual
CLASS; I,C retouched;
II,F bulb/str or ?-C
VII enlarged head type in obsidian
DIMENSIONS; -
HAFTS; -
FUNCTION; Phytoliths of graminae of festucoïdes group on class II,2 (Anderson- Gerfaud 1982, 126)
OTHER; -

SITE; ALI KOSH (Bus Mordeh)

REFERENCES; Hole et al 1969,79-81
TOTAL LUSTRED; 42
CLASS; I,B All plain (some I,F might be present)
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; TELL MAGZALIYA

REFERENCES; Bader 1979 Fig.6,3,6,7 and 10; Merpert et al 1984
TOTAL LUSTRED; -
CLASS; VII Obsidian, enlarged head class
Flint unretouched, probably Class I
DIMENSIONS;
HAFTS;
FUNCTION;
OTHER;

PERIOD 4

SITE;	EL KHIAM	Fig,VI;18
REFERENCES;	Neuville 1951,169, Fig. 71,1,2,3+8, Fig.73,11-15,	
TOTAL LUSTRED;	Relatively rare	
CLASS;	I,E1 & E2 ,Abruptly retouched back (may be convex) (?) I,G squared pieces of indeterminate size II,D Triangular sectioned blades with edges thinned by parallel retouch	
DIMENSIONS;	-	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE;	ABOU GOSH	*Fig,VI;18*
REFERENCES;	Lechevallier 1978,45	
TOTAL LUSTRED;	746	
CLASS;	I, ? 200 undenticulated II,D and E; 557 fine denticulations (71,99% inverse; 13,64%; bifacial 16,23%) I &/or II F and G - truncated pieces 76, retouched back rare III ? 7 with wide denticulation	
DIMENSIONS;	Blades 100 - 120 mm; truncated pieces av 34,3 mm	
HAFTS;	Much of blade in haft (20 to 30 mm used)	
FUNCTION;	-	
OTHER;	Blades normally triangular rather than trapezoidal in cross section	

SITE;	BEISAMOUN	Fig. VI;18
REFERENCES;	Lechevallier 1978	
TOTAL LUSTRED;	129	
CLASS;	II,D Blades with fine denticulation x 100 (direct) III, F & G Elements with coarse denticulation x 29 (5 with double truncation, 10 single) 1 backed Terminal elements present but not quantified. 6 double edged	
DIMENSIONS;	Truncated 44,2 x 12,4 x 4,1 mm; terminal 46,2 x 16,5 x 4,7mm	
HAFTS;	-	
FUNCTION;	-	
OTHER;	No truncated pieces have fine retouch	

SITE:	'AIN GHAZAL
REFERENCES:	Rollefson and Simmons 1984
TOTAL LUSTRED:	160
CLASS:	II,D denticulation obtained by inverse,regular retouch, Lustred not on proximal end
DIMENSIONS:	12 mm av,
HAFTS:	-
FUNCTION:	-
OTHER:	-

SITE:	DHUWEILA	Fig.VI;18
REFERENCES:	Betts 1986,127 Fig.4,15,11; Betts 1988,9,Fig 11,9	
TOTAL LUSTRED:	2	
CLASS:	I, ?E Lighlty retouched blades	
DIMENSIONS:	-	
HAFTS:	-	
FUNCTION:	-	
OTHER:	-	

SITE:	IBN EL-GHAZZI	Fig.VI;18
REFERENCES:	Betts 1986,154-55, Fig.4.20,8-10	
TOTAL LUSTRED:	4	
CLASS:	I,A & E ? 3 on slighlty modified flakes or blades II,F 1 truncated and denticulated	
DIMENSIONS:	-	
HAFTS:	-	
FUNCTION:	-	
OTHER:	-	

SITE:	AZRAQ 31	Fig.VI;18
REFERENCES:	Garrard et al 1987,22, Fig. 12,h	
TOTAL LUSTRED:	6 ('Very rare')	
CLASS:	?I,E2 Finely pressure flaked curving knives	
DIMENSIONS:	-	
HAFTS:	-	
FUNCTION:	-	
OTHER:	? used to cut reeds rather than cereals	

SITE: JILAT 7

REFERENCES: Garrard et al 1986,21 Table 7
TOTAL LUSTRED: 4 (0,58% of retouched pieces)
CLASS: No details
HAFTS: -
FUNCTION: -
OTHER: -

SITE: TELL AUX SCIES

REFERENCES: J, Cauvin 1968, 220-3, Fig,97,1
TOTAL LUSTRED: 'High percentage'
CLASS: II, D Blades with fine denticulation and shoulder at base on opposite edge
II ? ,F Truncated blades - one end only
III,F Elements with coarse denticulation
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: Surface collection

SITE: GHORAIFE II Fig,VI;19,7

REFERENCES: M,-C, Cauvin 1976,300 Figs,3;6 and 4,1
TOTAL LUSTRED: 20 (IIA 22% and IIB 10% of 99)
CLASS: II,D Fine teeth, some with invasive retouch
V, G Rectangular and triangular type with invasive retouch
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: RAMAD I

REFERENCES: de Contenson 1964,114; Pl, IA,1; IB,1-3;IC, 3; ID, 1-4
de Contenson 1985,18
TOTAL LUSTRED: Not quantified
CLASS: I ? Unretouched and intense lustre
II,C/D Finely denticulated and modified butt
II, F Bitruncated with 'small' teeth
V,G Bitruncated with invasive retouched, rectangular
and terminal elements
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	RAMAD II	Fig.VI:19, 1-6

REFERENCES: de Contenson 1964, 116-7, Pl IID,1-4 VIIIB
de Contenson 1984,22
TOTAL LUSTRED: -
CLASS: II,F small teeth, more or less regular, some with invasive retouch
III,F May be double sided (tend to supplant type II,F and V,G),
III,G rare
II,H 2 Terminal elements with flat invasive retouch
DIMENSIONS -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	AATNE	Fig.VI:18

REFERENCES: Coqueugniot 1982,92, Fig 5,1-2
TOTAL LUSTRED: Not quantified
CLASS: I,F Bitruncated with utilization damage
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	RAS SHAMRA VC

REFERENCES: de Contenson 1977, 13-14
TOTAL LUSTRED: 14%
CLASS: II,F bitrunated blades with finely denticulated edge. Backs not retouched.
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	EL KOUM 2 Caracol

REFERENCES: Stordeur, Maréchal and Molist 1982,39
TOTAL LUSTRED: 1
CLASS: no details
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE;	QDEIR I	Fig.VI;20

REFERENCES; Aurenche and Cauvin 1982,54-5, Fig.12
TOTAL LUSTRED; 10
CLASS; II,E 2, F & G angular, bitruncated denticulated
IV ? flat invasive bifacial retouch on lustred edge
Fig.12,4 has invasive retouch on butt and distal end like the arrowheads
DIMENSIONS; complete pieces: 45 x 32 mm, 62 x 20 mm, 56 x 32 mm, 38 x 19 mm
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	NADAOUYIEH 7	*Fig.VI;20*

REFERENCES; Cauvin 1982,80, Fig.6,1-2
TOTAL LUSTRED; 2
CLASS; II,F
DIMENSIONS; 54 x 34 x 5 mm and 45 x 22 mm
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	ABU HUREYRA	Fig.VI;21

REFERENCES; Moore 1975, 61, Fig.6,13-17
TOTAL LUSTRED; Sickle blades very rare
CLASS; I,B & E (do not fall into clear cut typological groups) and possibly Class II
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	BOUQRAS	Fig.VI;23

REFERENCES; Roodenberg 1986, 76-79, Fig.40,1-7 and p.80, Fig.43, 2-6
TOTAL LUSTRED; 53
CLASS; I,A unmodified flake with divergent sides
I,E or II,E ? Angular (Roodenberg's type with divergent sides) 14
I,F and G Parallel sides 39 (about half have retouched edges, but only one with retouched ends)
DIMENSIONS; l, 15-105 mm, b, 14-38 mm, th, 3-15 mm
HAFTS; Parallel lustre reaches from end to end and suggests straight haft.
One of divergent type has traces
of bitumen in oblique configuration
FUNCTION; Coarser grained flint shows less lustre
OTHER;

SITE: ÇATAL HÜYÜK (aceramic) Fig.VI:16

REFERENCES: Bialor 1962, 76 Fig. 2,11
TOTAL LUSTRED: 2 fragments
CLASS: II,F
DIMENSIONS: 40 x 26 x 7 mm & 40 x 16 x 6 mm
HAFTS: -
FUNCTION: -
OTHER: One flint and one obsidian. Obsidian blade v worn with invasive retouch

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SITE: HAYAZ HöYÜK

REFERENCES: Roodenberg 1986a,6, Fig.6,1-4
TOTAL LUSTRED: rare
CLASS: I,F (?)
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: Interim report

SITE: TELL RIHAN III (HAMRIN) *Fig.VI:23*

REFERENCES: Tusa 1985,318, Fig.21b
TOTAL LUSTRED: Many sickles
CLASS: ?
DIMENSIONS: -
HAFTS: -
FUNCTION: -
OTHER: -

SITE: JARMO J-I Fig.VI:23

REFERENCES: Hole 1983,243-44,250-2,264, Fig. 115,16-18, Fig. 116,3,4,7,15, Fig 123.
TOTAL LUSTRED: 176
CLASS: Plain 134 (?I,B and I,F)
Retouched on lustred edge 42, of which 5 are truncated (II,F)
Reused 44
Enlarged head type (VII) (Classified as pressure flaked obsidian fabricators)
DIMENSIONS: width 7-10mm 12%, 10-15 mm 60%, 15-20mm 21%, 20-25mm 6%, over 25mm 1%
HAFTS: 4 elements set in bitumen, their backs modified to fit curve of haft
FUNCTION: -
OTHER: Some edges chipped

SITE;	ALI KOSH	Fig,VI;23

REFERENCES;	Hole *et al* 1969,79-81, Fig 26,a,d,c,g
TOTAL LUSTRED;	114
CLASS;	I,F plain 110
	II,B or II,F Truncated and/or backed 4
DIMENSIONS;	-
HAFTS;	-
FUNCTION;	-
OTHER;	-

PERIODS 5 & 6

Aranged by region (see Chapter VI;5)

PALESTINE

SITE:	SHA'AR HAGOLAN	Fig.VI:24
REFERENCES:	Stekelis 1972, 18-19, Pl. 20 Pl. 21	
TOTAL LUSTRED:	337	
CLASS:	III,F rectangular x 116, pointed x 35 III,G rectangular x 94, pointed x 12 Double-edged 80	
DIMENSIONS:	40-60mm	
HAFTS:	Blades found arranged as if in haft	
FUNCTION:	-	
OTHER:	24 blanks (truncated blades, undenticulated and unlustred)	

SITE:	MUNHATTA 2B	
REFERENCES:	Perrot 1966, 60, Fig. 7, 6-7	
TOTAL LUSTRED:	-	
CLASS:	III or IV, F Regular ends; deep reg. dentic. formed by bifacial retouch on one or both edges	
DIMENSIONS:	-	
HAFTS:	-	
FUNCTION:	-	
OTHER:	-	

SITE:	MEGIDDO -XX, XX	Fig.VI:24
REFERENCES:	Crowfoot in Loud 1949, 141, Pl. 166, 1-3	
TOTAL LUSTRED:	13	
CLASS:	III, F 9 rectangular and 4 triangular elements; ends retouched, Wide denticulation (one double edged)	
DIMENSIONS:		
HAFTS:		
FUNCTION:		
OTHER:		

LEBANON

SITE;	BYBLOS (Néolithique Ancien)	Fig.VI;24

REFERENCES; J.Cauvin 1968, Fig 21
TOTAL LUSTRED; 689 (32.8% of retouched tools)
CLASS; III,F & G. Cauvin describes them as follows;
Bitruncated 470 (rect 60%,trapeze 20%, obl. trap. 27.6%, rhomboidal 7%)
Some backed with abrupt direct retouch.
10% double edges with direct, inverse and bifacial retouch.
Pointed 99 (distal 43, proximal 56) = terminal elements
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Truncated blades 'unachieved' sickles

SYRIA AND THE AMUQ

SITE;	RAMAD III	Fig.VI;25

REFERENCES; de Contenson 1964, 119, Pl IIIA, 1-5, Pl IIIC, 1-3
TOTAL LUSTRED; -
CLASS; III.F & G., IV.G
Large teeth predominate; retouched back and ends are rare.
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	TABBAT AL HAMMAM	Fig.VI;26

REFERENCES; Hole 1959, 149-183, Fig.
TOTAL LUSTRED; 53
CLASS; I.F and II.F. Only four of Class III.F or G. Hole's description may be summarized as follows;
Most on thin, narrow middle sections of blades, the majority with a fine or undenticulated edge.
29 have no retouch on the end and rarely on back, but lustred edge is usually retouched on dorsal surface (only 4 bulbar).
12 retouched on one or both ends.
6 double edged.
Four coarsely denticulated on one edge with retouched back.
DIMENSIONS; av. 45 x 16 mm
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	APAMEA VB	Fig.VI;26

REFERENCES; Otte 1976, 105 Pl V Fig. 35, 37-39
TOTAL LUSTRED; 97 (50 utilized but have no lustre, though of similar form to those with lustre)
CLASS; Classes present include I,B, I,E, I,F I,E and 2 of Class II but not further classifiable. Otte's description includes 14 pieces with lustre on one edge and flat inverse retouch on the other
8 truncated (one bitruncated)
25 abruptly retouched back, 7 partly retouched.
Ends; not truncated, 3 curved, 3 natural backing
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	APAMEA VA	Fig.VI;26

REFERENCES; Otte 1976, 103, Pl. I, 8 & 9
TOTAL LUSTRED; 66
CLASS; I, B (?) 43 unretouched (28 blades, 15 bladelets) with chipped edges.
IV,? 11 with flat inverse retouch forming denticulation
? F 4 truncated, (oblique or convex)
DIMENSIONS;
HAFTS; 8 have oblique lustre
FUNCTION; -
OTHER; Possibly some Ubaid material mixed in

SITE;	ARJOUNE	Fig.VI;27

REFERENCES; Copeland in Marfoe <u>et al</u> 1981, 11-17, Fig. 10; Unger-Hamilton 1985
TOTAL LUSTRED; 16 (of which only 9 have lustre)
CLASS; I,B , I,F I,G and some Class II,G
74 unretouched, 29 backed and truncated convex and concave
some truncated but not backed
DIMENSIONS; -
HAFTS; Majority straight or slightly curved haft; some in curved haft with blades forming straight edge, other hand held or hafted axially (Unger-Hamilton 1985)
FUNCTION; 80 examined; 53 sickle polish, 10 <u>stipa</u>, 17 indeterminate
OTHER; Used in a sawing or cutting motion

SITE;	RAS SHAHRA VB	Fig,VI;26

REFERENCES; de Contenson 1977, 14
TOTAL LUSTRED; c,91 (37,74% of c 242)
CLASS; II,F2 truncated by retouch (one only)
II,F1 snapped, Back not retouched, Most have finely denticulated edge, but
III,F some have deep retouch
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; RAS SHAHRA VA

REFERENCES; de Contenson 1977, 45-6
TOTAL LUSTRED; c, 58 (17% of 338)
CLASS; No details
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; RAS SHAHRA IVC

REFERENCES; de Contenson 1973, 92
TOTAL LUSTRED; -
CLASS; ? II,G 2
Backed, double truncation and fine denticulation
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; Obsidian backed blade possibly a sickle blade (RS 32267)

SITE; RAS SHAHRA IVB

REFERENCES; de Contenson 1971 178
TOTAL LUSTRED; -
CLASS; II,G2 Reg, dentic, and ret, back, gently curved
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	RAS SHAMRA IVA
REFERENCES;	de Contenson 1977, 107
TOTAL RETOUCHED;	-
TOTAL LUSTRED;	-
CLASS;	? flint and obsidian
DIMENSIONS;	-
HAFTS;	-
FUNCTION;	-
OTHER;	Local production

SITE;	TELL JUDAIYDAH (AMUQ A & B)	Fig.VI;26
REFERENCES;	Payne 1960, 256, Fig. 30, 4-7, Fig. 59, 5-9	
TOTAL LUSTRED;	380	
CLASS;	II,F1 Bi-truncated blades, back and ends unretouched, with fine denticulations, usually from bulbar face	
DIMENSIONS;	av. 35 x 15 x 4 (range ; length 17 - 83; width 8 - 32)	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE;	KURDU (AMUQ C)	Fig.VI;27
REFERENCES;	Payne 1960, Fig. 119, 1 & 7	
TOTAL LUSTRED;	34 (large proportion)	
CLASS;	I,F; II,F2 & G2 Payne's types. Type 1a Back steeply retouched, diag. ends 14, 1b Diag ends unret back 4; 1c Ret. back straight ends 6; 2 Large blades ret on back and ends 3 3 Double edged 3; 4 Short slender blades unret. 3 (cf Amuq A & B)	
DIMENSIONS;	Broader than Amuq B Type 1a av 51 x 19 x 6 (largest 67 x 22 x 6; smallest 45 x 16 x 3) Type 1b max 63 x 18 x 4; min 41 x 18 x 5 Type 2 30 x 22 x 4, 62 x 21 x 5 Type 3 51 x 15 x 5, 29 x 17 x 3	
HAFTS;	-	
FUNCTION;	-	
OTHER;	-	

SITE; KURDU (Amuq D) Fig.VI;27

REFERENCES; Payne 1960
TOTAL LUSTRED; 24
CLASS; II, G ??
Retouched on upper edge almost entirely, only 5 diagonal
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; ASUAD (Balikh) VIII-VII Fig.VI;28

REFERENCES; M.-C. Cauvin 1973, 103, Fig. 2 6-13; M.-C.Cauvin 1972, 91, Fig.5,1-56,1-3
TOTAL LUSTRED; 10% of retouched pieces 9 c 30 examples)
CLASS; I,F = Blades with obliquely truncated ends
Proximal end modified to form shoulder or tang
I & II,E 2 & 3 Convex and angle backed pieces on blades or flakes.
Lustred edge denticulated on distal third; lustre only on upper two thirds.
DIMENSIONS; -
HAFTS; Traces of bitumen suggests blades set obliquely in curved haft
FUNCTION; -
OTHER; Found with DBFW of Amuq A type and probably dated to end of 6th mill
(M.-C. Cauvin 1973, 103, fn. 9 though C14 dates suggest Period 4
and see also Copeland 1979.

ANATOLIA

SITE; MERSIN 32 - 29

REFERENCES; Garstang 1953, 15
TOTAL LUSTRED; 'a few' (not quantified), mostly of chert
CLASS; -
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; MERSIN 27-28

REFERENCES; Garstang 1953, 126, Pl. XVI, 14-17
TOTAL LUSTRED; 1.6%
CLASS; II,F Truncated, both edges serrated
DIMENSIONS; length 30-60 mm, width 16.5 mm
HAFTS; -
FUNCTION; -
OTHER; -

SITE;	ÇATAL HÜYÜK VI - II	Fig.VI;28
REFERENCES;	Bialor 1962; 81, 85, 88,96-103, Fig. 3, 11,12; Mellaart 1963,105	
TOTAL LUSTRED;	rare 16	
CLASS;	I,F Blade segments	
DIMENSIONS;		
HAFTS;	One found in shrine (Mellart 1963)	
FUNCTION;		
OTHER;	Some obsidian classed as sickles bec, of chipping on edges No chert sickles	

SITE;	HACILAR IX- I	Fig VI;28
REFERENCES;	Mortensen in Mellaart 1970, 155, Fig, 168 g-i	
TOTAL LUSTRED;	11	
CLASS;	I,F 11 truncated, irreg, retouch	
DIMENSIONS;	34-42 mm	
HAFTS;	7 hafts	
FUNCTION;	-	
OTHER;	Some irreg, serrated obsidian blades may have been used as sickles	

SITE;	KUMARTEPE
REFERENCES;	Roodenberg et al 1984,8
TOTAL LUSTRED;	1,1% of the tool kit
CLASS;	Truncated
DIMENSIONS;	-
HAFTS;	-
FUNCTION;	-
OTHER;	-

MESOPOTAMIA
HASSUNA

SITE;	UMM DABAGIYAH	Fig,VI;29
REFERENCES;	Mortensen in Kirkbride 1972, 11, Pl, XVIII,8-10,; 1983, 211, Fig, 6a	
TOTAL LUSTRED;	2 (1983); not totalled in 1972 report, but appear to be more than 2	
CLASS;	II ? , Truncated F and G One on parallel-sided blade, straight termination, 2 with curved backs and butt truncated (1 inversely retouched,1 with cortex),	
DIMENSIONS;	-	
HAFTS;	-	
FUNCTION;	-	
OTHER;	Some ground down for re-use	

SITE;	TELUL ETH THALATHAT 2 XV-XVI	Fig,VI;29
REFERENCES;	Fukai, Horiuchi and Matsutani 1970; Fukai and Matsutani 1977; Merpert, Munchaev and Bader 1977,54, Fig,3,5	
TOTAL LUSTRED;	?	
CLASS;	-	
DIMENSIONS;	-	
HAFTS;	Sickle sheen in crescent shape; traces of bitumen	
FUNCTION;	-	
OTHER;	-	

SITE;	HASSUNA Ib,II,III	Fig,VI;29
REFERENCES;	Lloyd and Safar 1945,269, 273-4, Fig,23,2,10, Fig,24 1,9, Fig,26,15, Fig,37	
TOTAL LUSTRED;	-	
CLASS;	I,A and I,F Described as blade segments and flakes	
DIMENSIONS;	-	
HAFTS;	Some set in bitumen and an almost complete sickle	
FUNCTION;	-	
OTHER;	Sickle blade industry	

SITE;	YARIM TEPE I	Fig,VI;29
REFERENCES;	Merpert and Munchaev 1973, 93-113; 1975,105, Iraq 35, 95; 1987, 15	
TOTAL LUSTRED;	Not quantified	
CLASS;	No details, Flint and obsidian	
DIMENSIONS;	-	
HAFTS;	-	
FUNCTION;	-	
OTHER;	Increase in number in upper levels	

SITE;	YARIM TEPE II
REFERENCES;	Merpert and Munchaev Iraq 35, 112
TOTAL LUSTRED;	200
CLASS;	? Sheen on corners, more commonly obsidian
DIMENSIONS;	-
HAFTS;	Diagonal sheen suggests set an at angle, Some have bitumen,
FUNCTION;	-
OTHER;	-

SITE;	MATTARAH
REFERENCES;	Braidwood and Howe 1960, 36
TOTAL LUSTRED;	Not quantified
CLASS;	I ? F A few blade sections, most on blade-flakes and flakes
DIMENSIONS;	-
HAFTS;	Some with bitumen
FUNCTION;	-
OTHER;	-

SITE;	BANAHILK
REFERENCES;	Braidwood and Howe 1960, 34
TOTAL LUSTRED;	-
CLASS;	I,A or B , Flake-blades, no retouch except for occasional blunting
DIMENSIONS;	-
HAFTS;	Traces of bitumen on blades
FUNCTION;	-
OTHER;	-

SAMARRAN

SITE;	CHOGA MAMI	Fig.VI;31
REFERENCES;	Mortensen 1973,45	
TOTAL LUSTRED;	161 (most numerous group of tools)	
CLASS;	All Class I, undenticulated; sub-classes A,B,E,F1,2 F3, and G1 & 2 appear to be present. Mortensen divided them into eight classes but these are not directly comparable with current system (shown in brackets): E1 flakes, rect or trapez 23(=IA) E2 blades inv ret 67 (=I,E ?) E3 Blade segs unret, 14 (=I,F1)) E4 Rect, fl trun ends obl or st 7(=I,F2 & 3?) E5 Trunc bl obl ret 7 (=I,F2) E6 Backed rect or trap,fl 15 (=I,G) E7 Backed blades 26 (=I,E) E8 Backed trap, seg trun obl ret 2 (=I,G2)	
DIMENSIONS;	E1 23-79 mm, E2 29-95 mm, E3 16-60mm, E4 24-56 mm E5 33-80 mm, E6 33-58 mm, E7 28-66mm, E8 22-48 mm	
HAFTS;	? 3	
FUNCTION;	-	
OTHER;	-	

SITE:	TELL SHIMSHARRA	Fig.VI:32

REFERENCES: Mortensen 1971, Fig. 27, a-g
TOTAL LUSTRED: 42
CLASS: I, F1 x36
II,F1 x 6
Truncated blades; ends unretouched, 36 plain, 6 serrated
VII enlarged head class (described as borers with steep retouch)
DIMENSIONS: av 16-40 mm (longest 57 mm); serrated 21-53 mm
HAFTS: -
FUNCTION: -
OTHER: -

SITE:	TELL ES SAWWAN II	Fig.VI:31

REFERENCES: El Wailly and Abu al-Soof 1965, 22; al Tekriti 1968, 54, Pl. III,5
TOTAL LUSTRED: 'insignificant in number'
CLASS: I,A and I,E or F ?
Blades, some with blunted back; they appear from photograph to be truncated
DIMENSIONS: -
HAFTS: Flakes set in bitumen - curved in shape
FUNCTION: -
OTHER: -

SITE:	JARMO JII	*Fig.VI:30*

REFERENCES: Hole 1983, 243-4, Fig. 115,0,10-15, 17,19; Fig. 116 1-2
TOTAL LUSTRED: 443 + 163 re-used
CLASS: I,B Plain 313
II,D and II, F Retouched 130
DIMENSIONS: Broader than in JI; majority 10-20mm
HAFTS: -
FUNCTION: -
OTHER: 46 have worn, rounded edges

SITE:	ALI KOSH (Mohammed Jaffar)	Fig.VI: 30

REFERENCES: Hole et al 1969,81 Fig 26, b c
TOTAL LUSTRED: 121
CLASS: I,F and I,G (rare). 'Trimmed to fit handle' 119 plain; 2 truncated or backed
DIMENSIONS: -
HAFTS: Bitumen on blades
FUNCTION: -
OTHER: -

SITE;	SABZ	Fig,VI;30

REFERENCES; Hole et al 1961, Fig,26, h,j,k,l
TOTAL LUSTRED; 24
CLASS; I,B & I,F
6 plain, 18 truncated
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; TEPE GURAN D-S

REFERENCES; Mortensen 1964,118
TOTAL LUSTRED; 'most common'
CLASS; -
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; TEPE TULA'I

REFERENCES; Hole 1974, 235
TOTAL LUSTRED; low (under 1% relative to plain blades)
CLASS; -
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

SITE; CHAGA SEFID ph, 4 & 3

REFERENCES; Hole 1969, 171-2 Iran 7
TOTAL LUSTRED; 4-8% (relative to plain blades [Hole 1974,235])
CLASS; -
DIMENSIONS; -
HAFTS; -
FUNCTION; -
OTHER; -

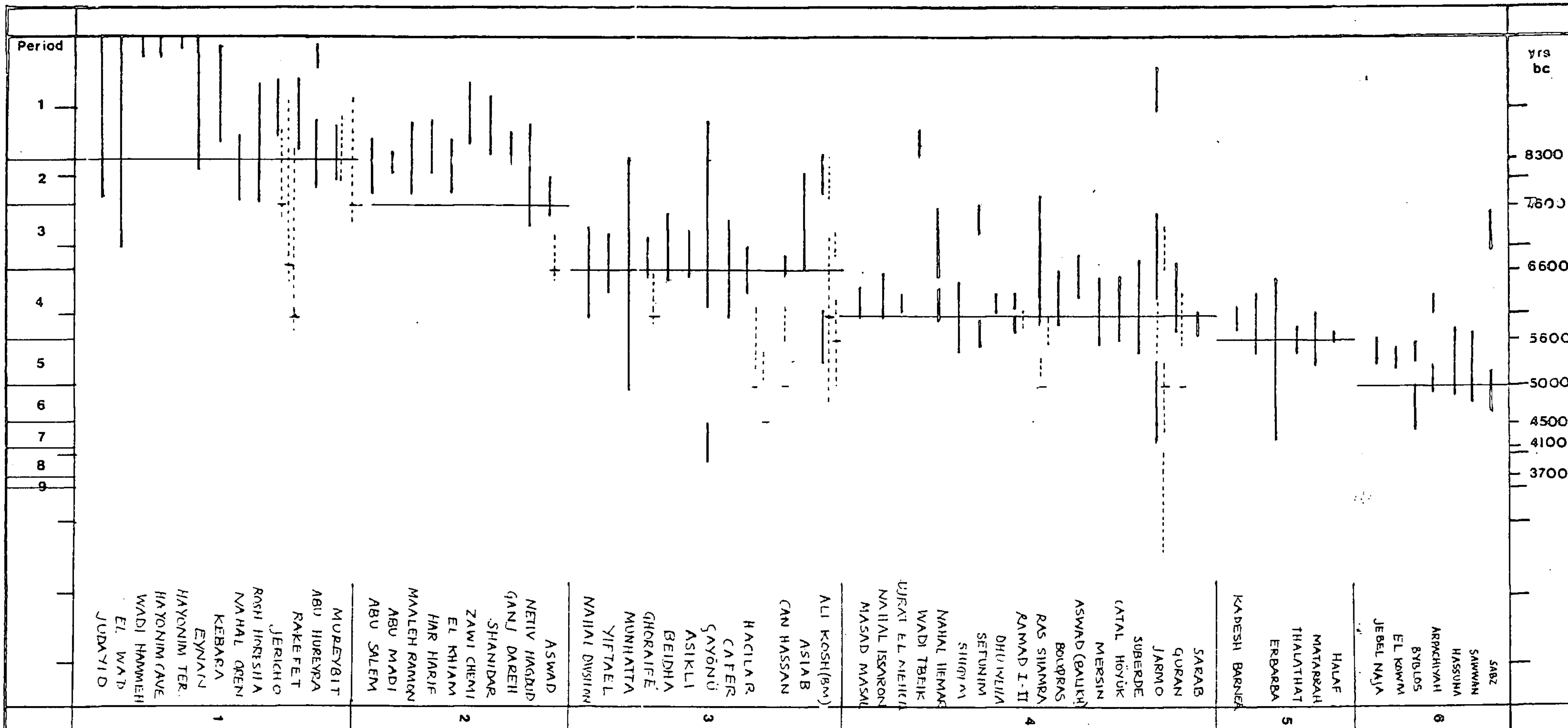


FIG.II: 1 Summary Chart of C14 dates

Plotted to 2σ

Broken line indicates dates of later period (shown by horizontal bar)

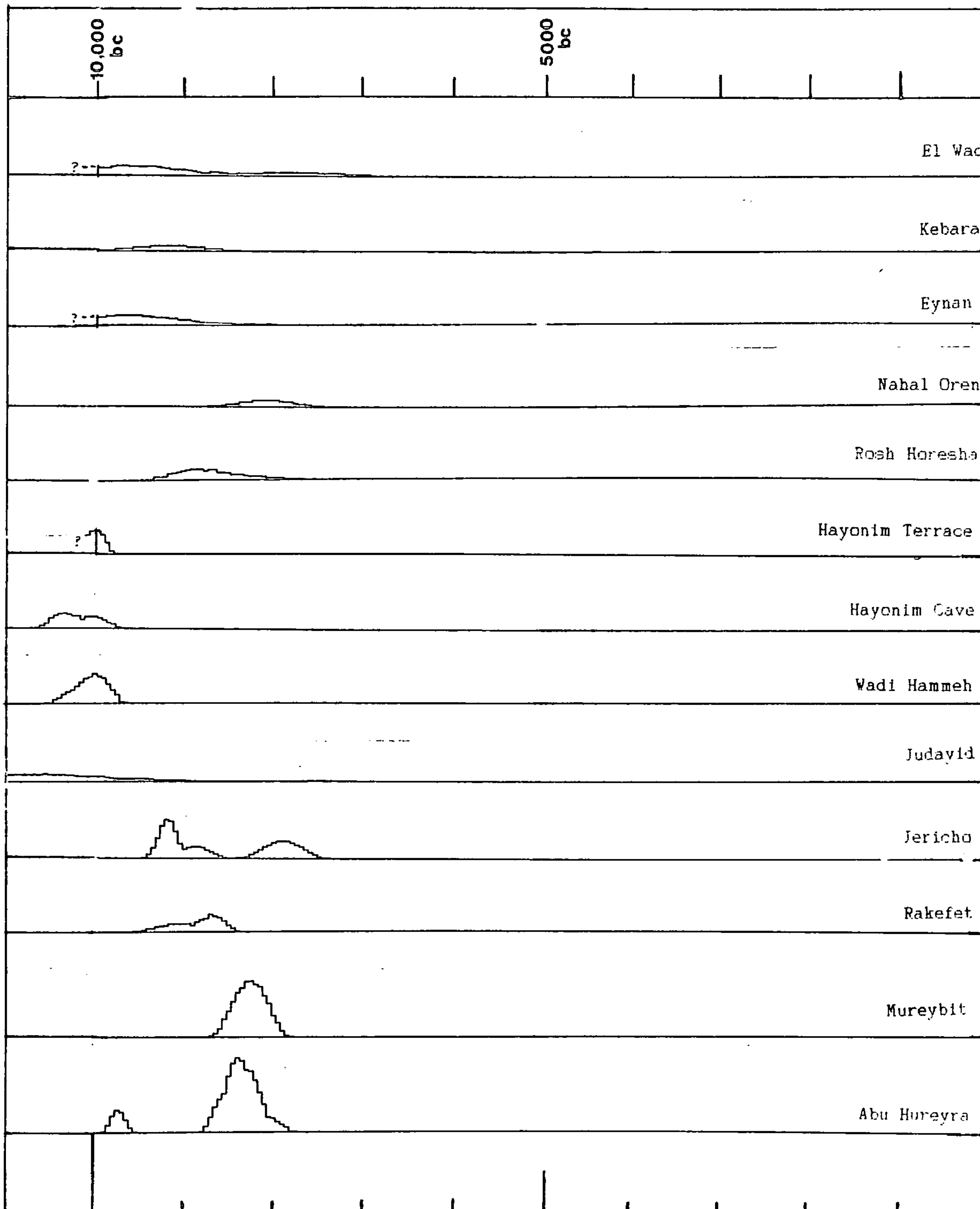


FIG.II: 2 Histogram Analysis of C14 dates: Period 1
See p. 24-25. Dates are listed in Appendix I

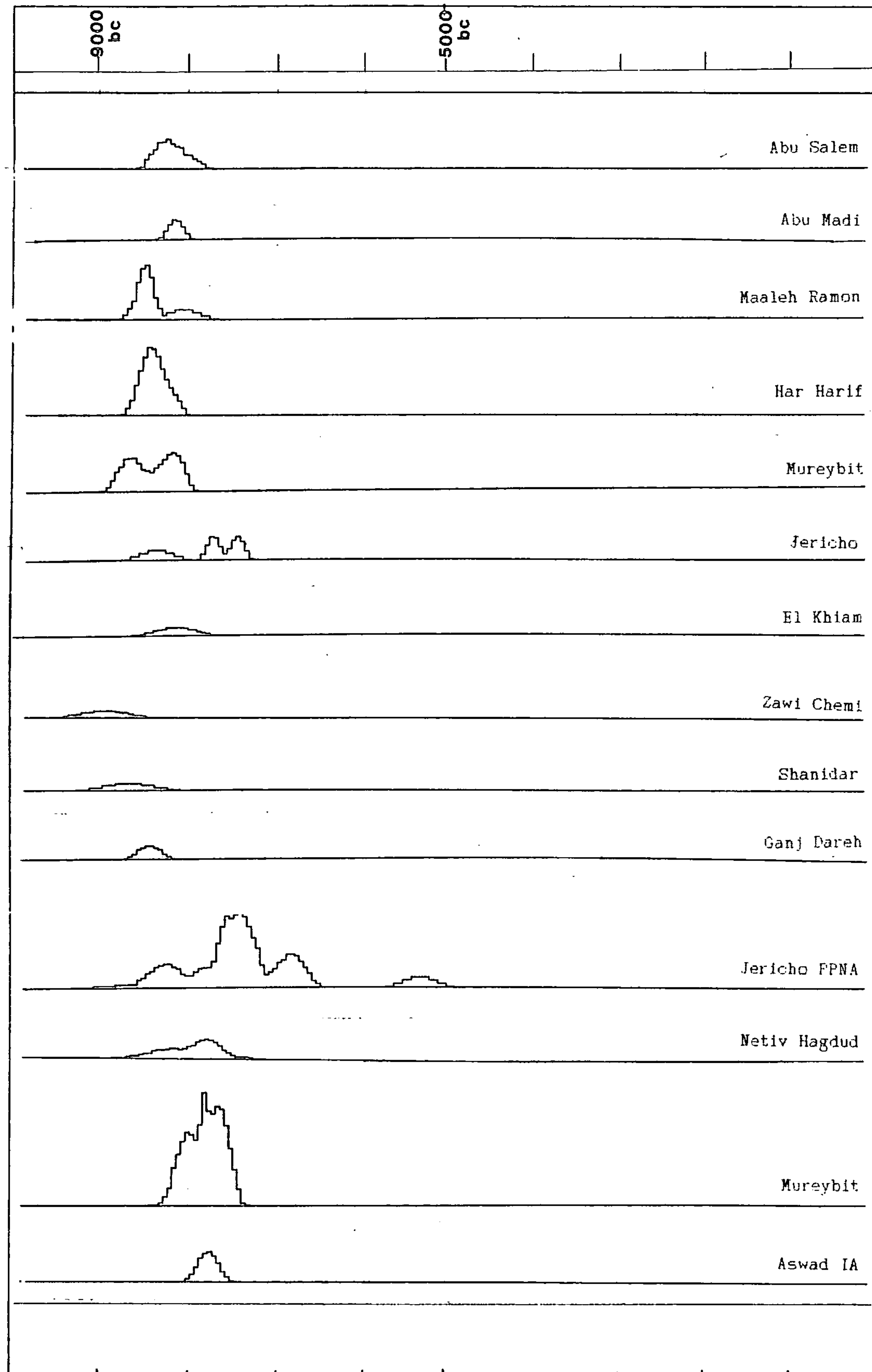


FIG.II: 3 Histogram Analysis of C14 dates: Period 2
See p. 24-25. Dates are listed in Appendix I

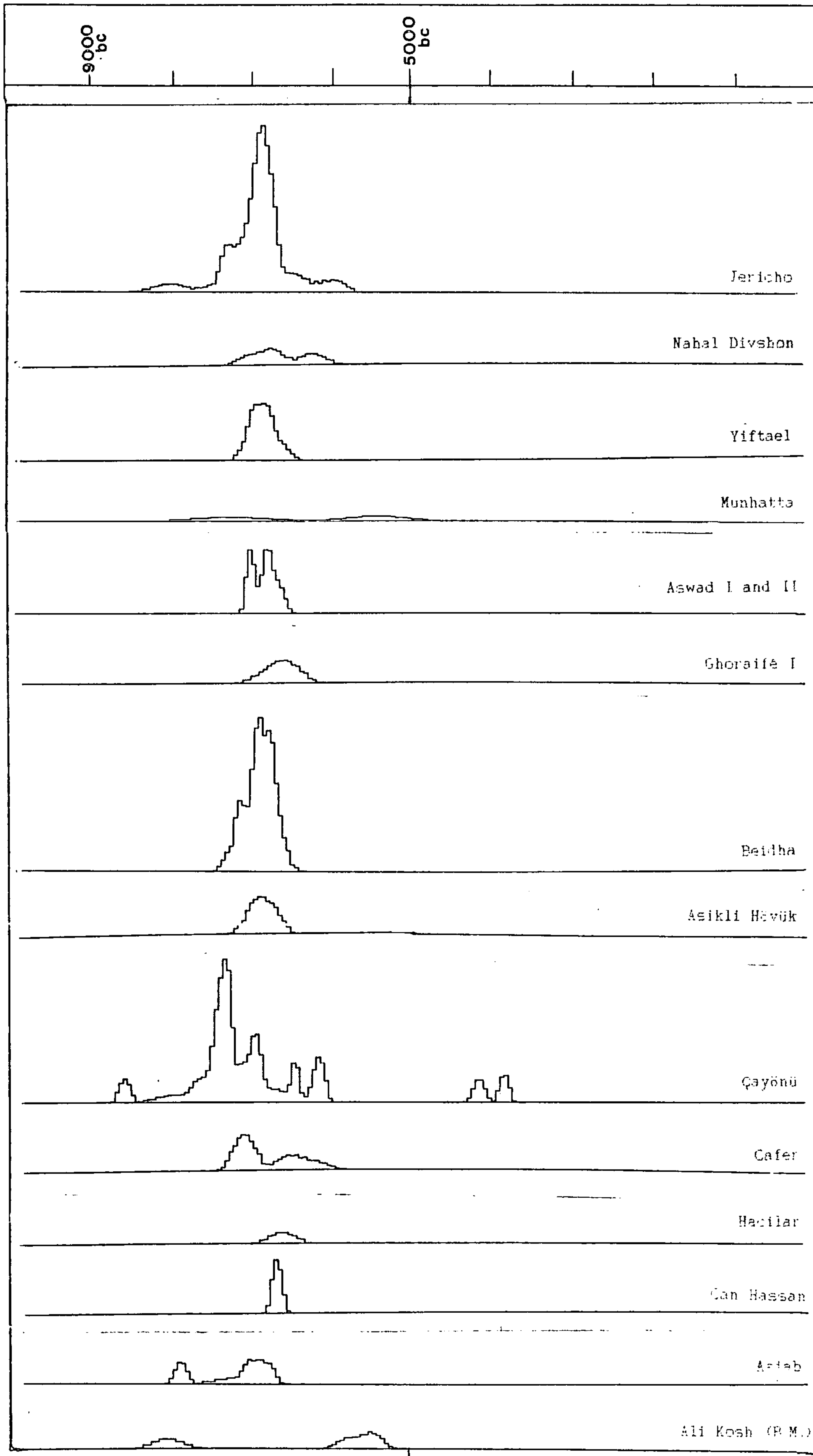


FIG.II: 4a Histogram Analysis of C14 dates: Period 3
See p. 24-25. Dates are listed in Appendix I

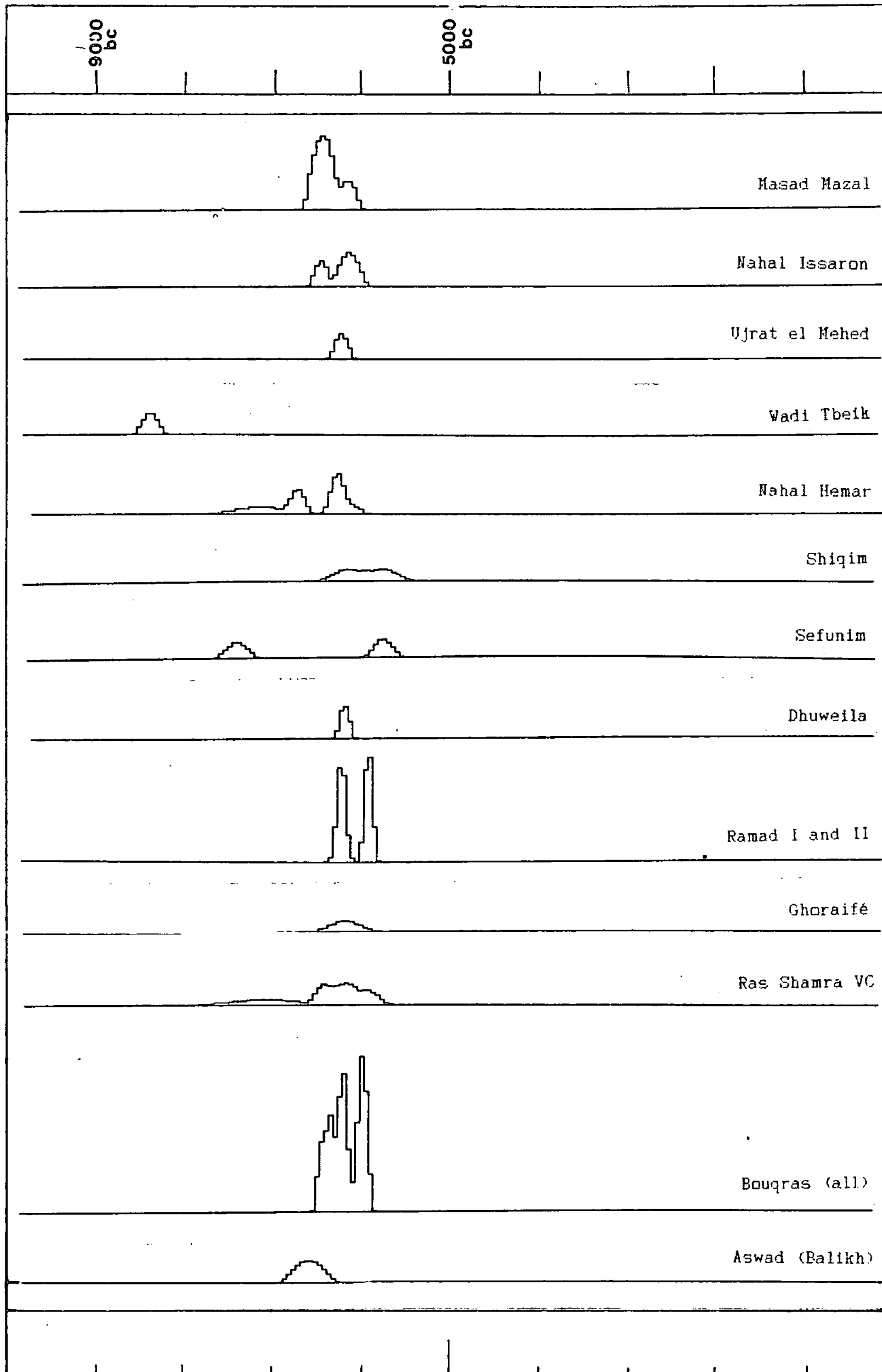


FIG.II: 4b Histogram Analysis of C14 dates: Period 4
See p. 24-25. Dates are listed in Appendix I

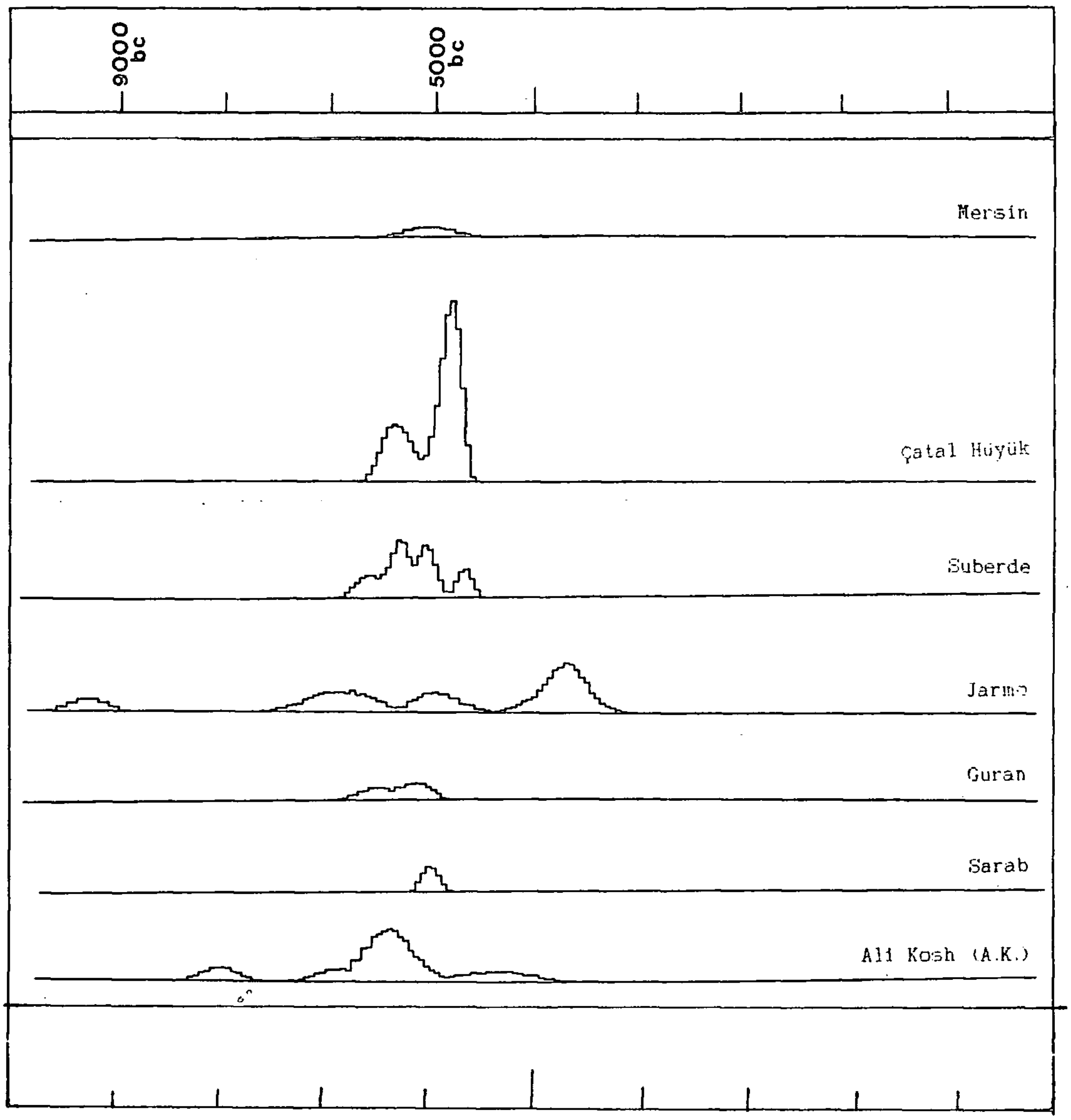


FIG.II: 4b cont.

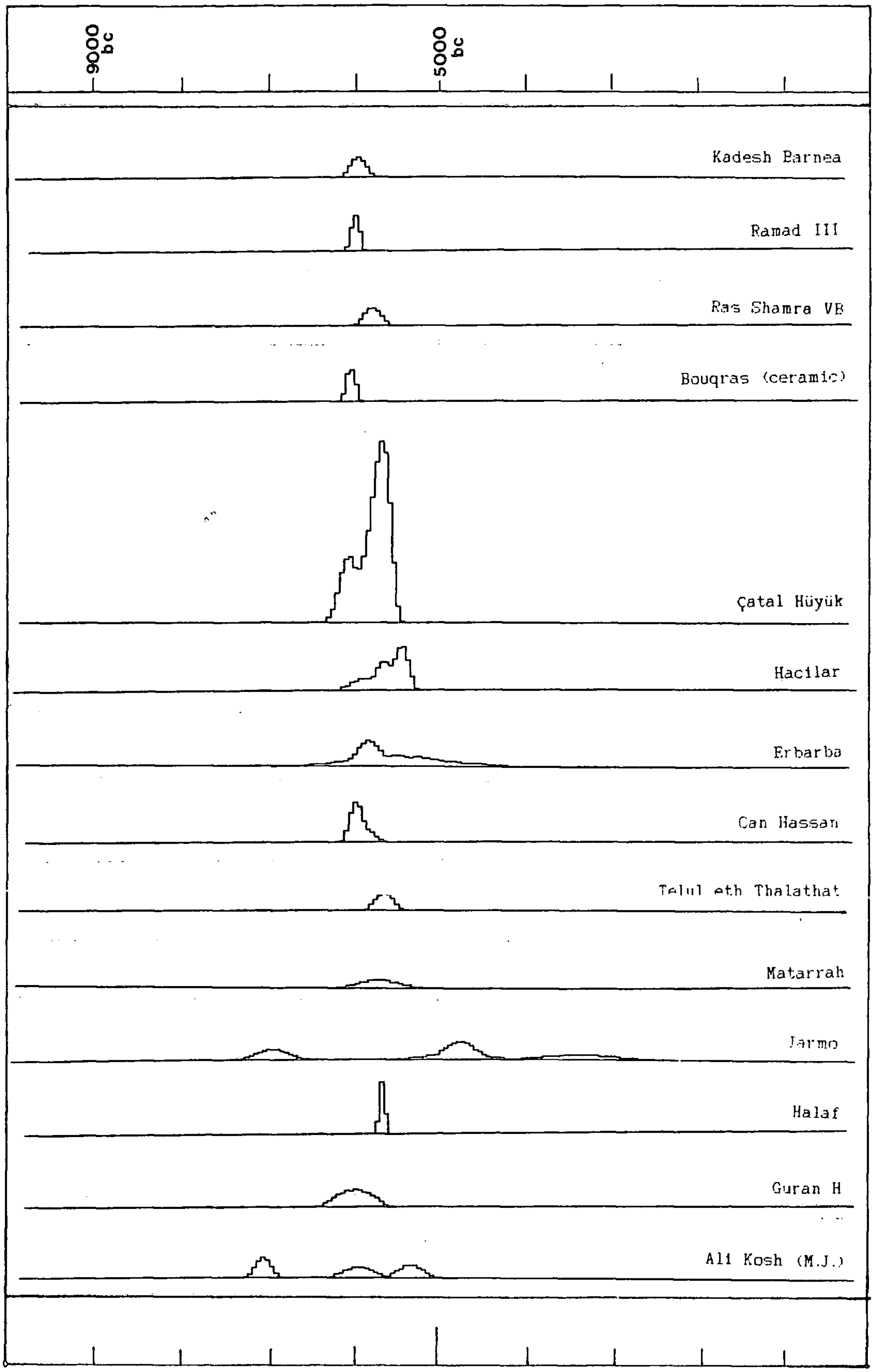


FIG.II: 5a Histogram Analysis of C14 dates: Period 5
See p. 24-25. Dates are listed in Appendix I

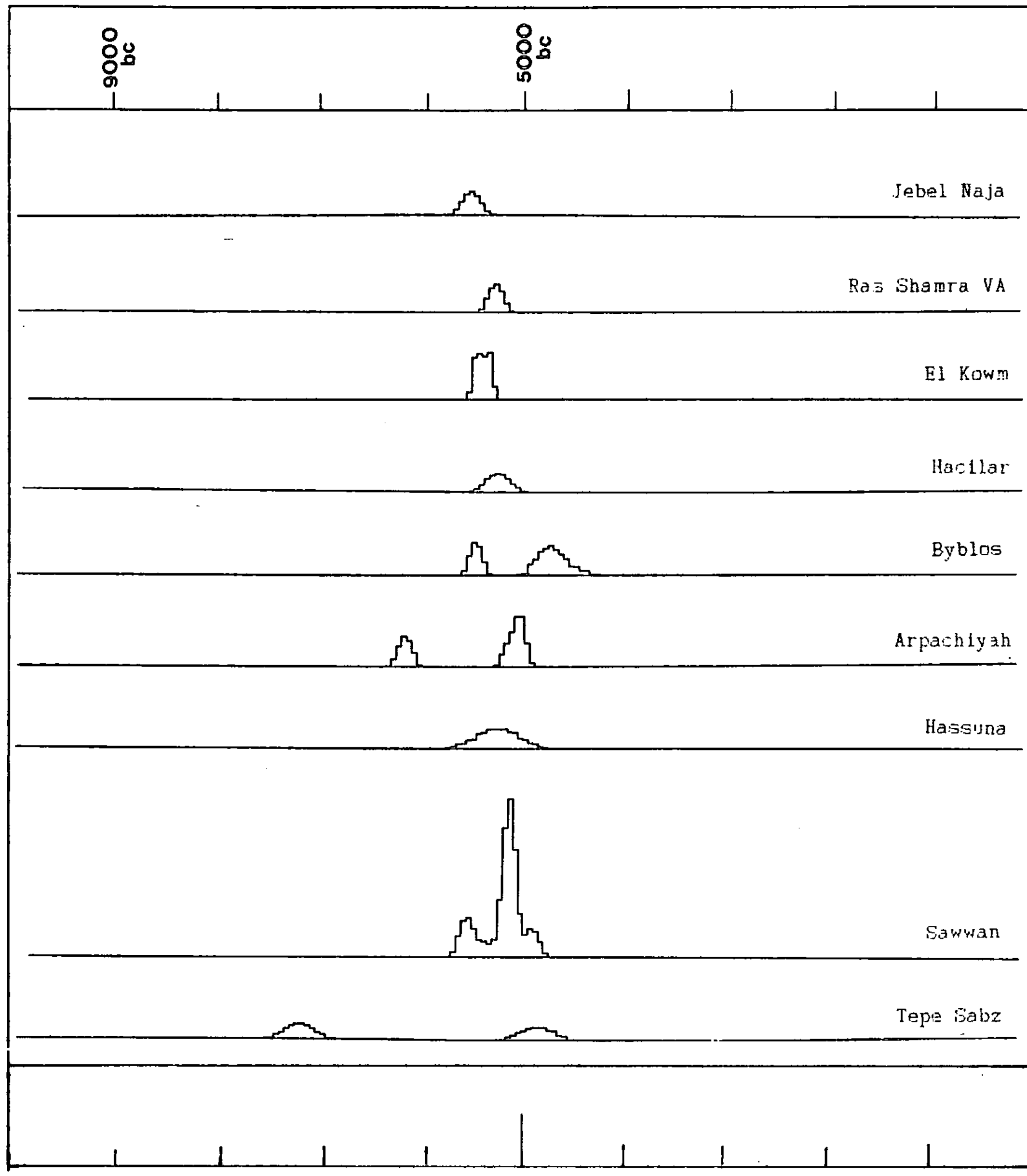


FIG.II: 5b Histogram Analysis of C14 dates: Period 6
See p. 24-25. Dates are listed in Appendix I

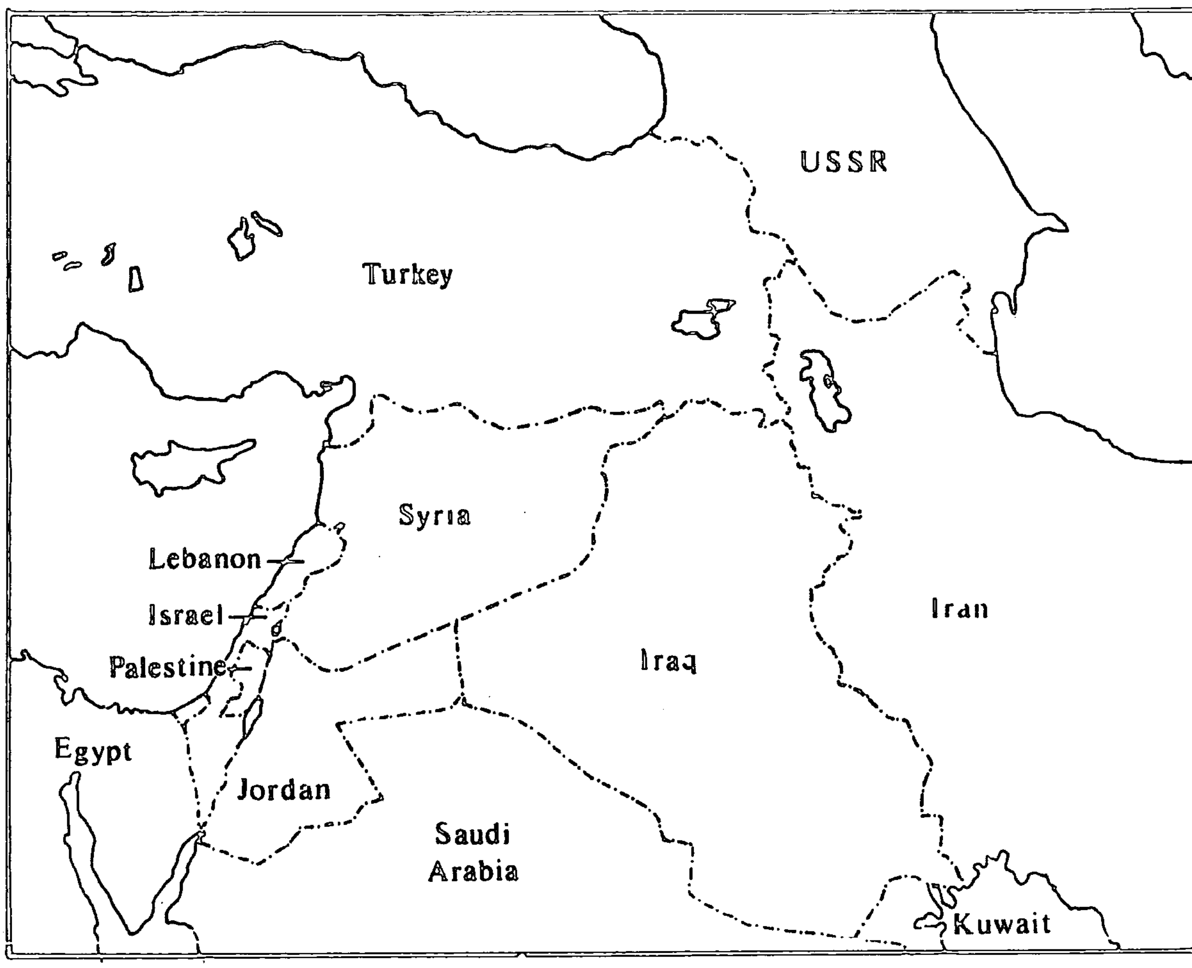
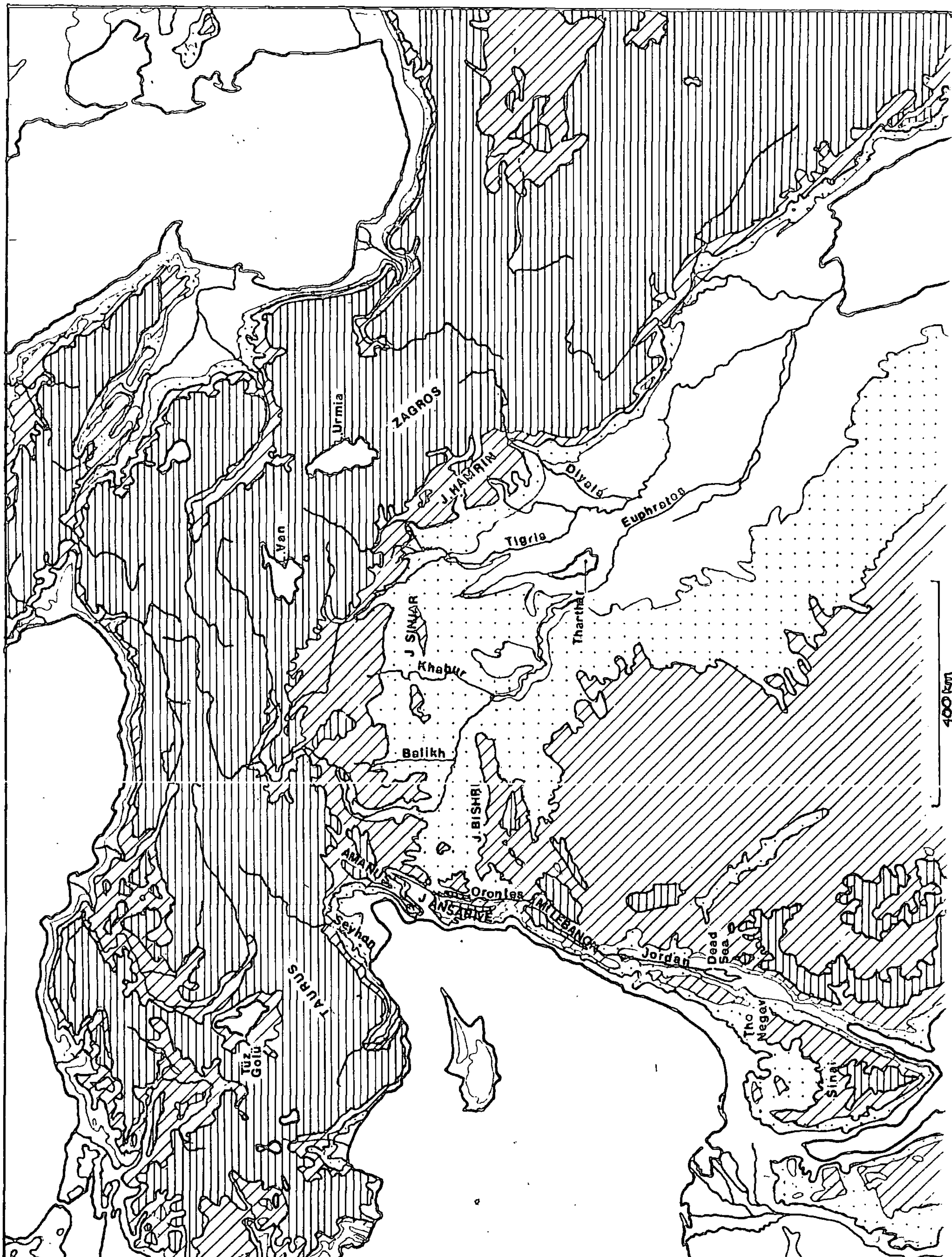


FIG. II:6 Modern Political Boundaries


ZAGROS
Urmia
Van
J. HAMRIN
Diyala
Euphrates
Tigris
Tharthar
J SINJAR
Khabur
Balikh
J. BISHRI
AMANUS
J. ANSARIYE
Orontes
MT LEBANON
Jordan
Dead Sea
The Negev
Sinai
Seyhan
TAURUS
Tüz Gölü
400 km

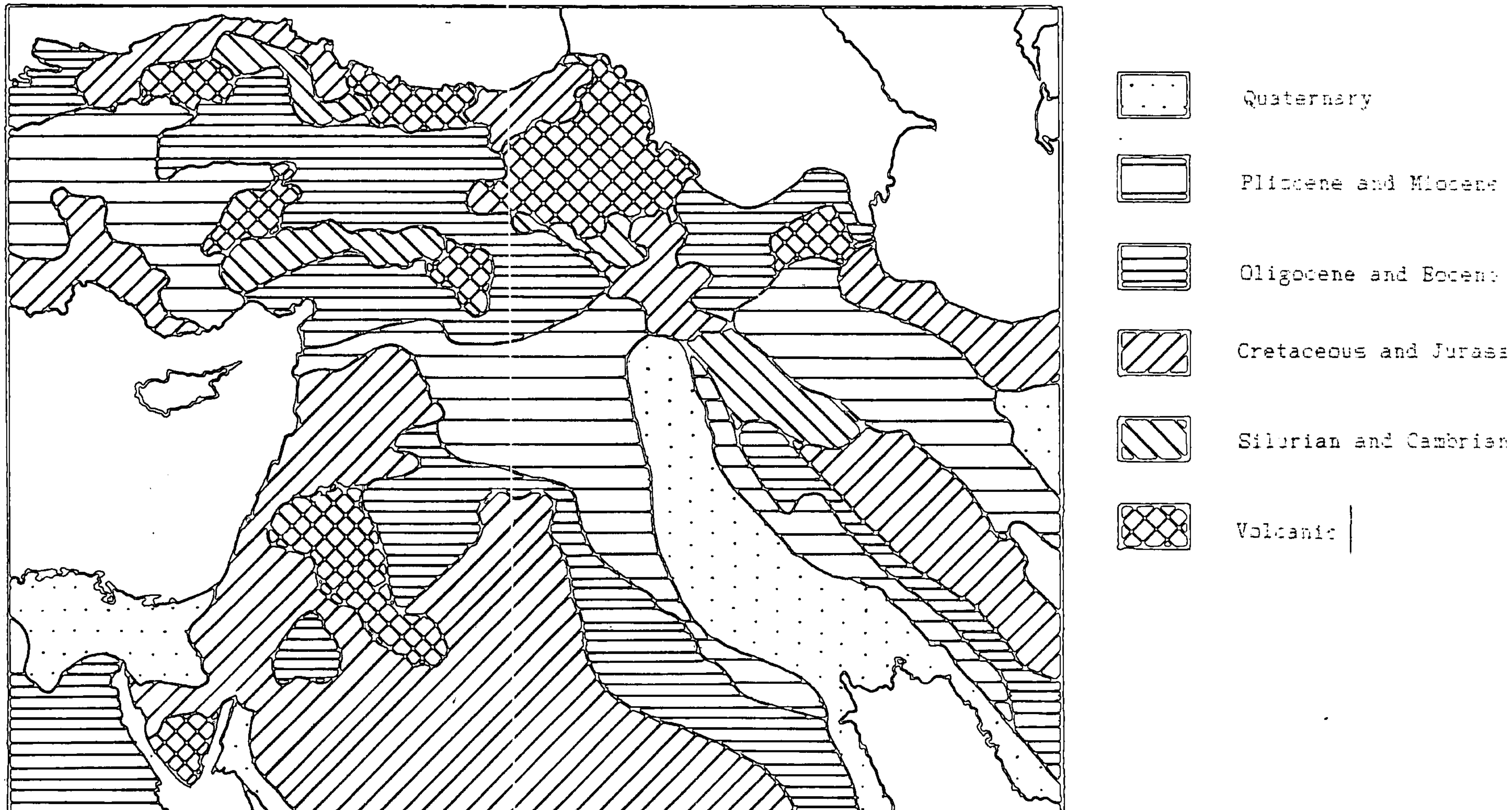
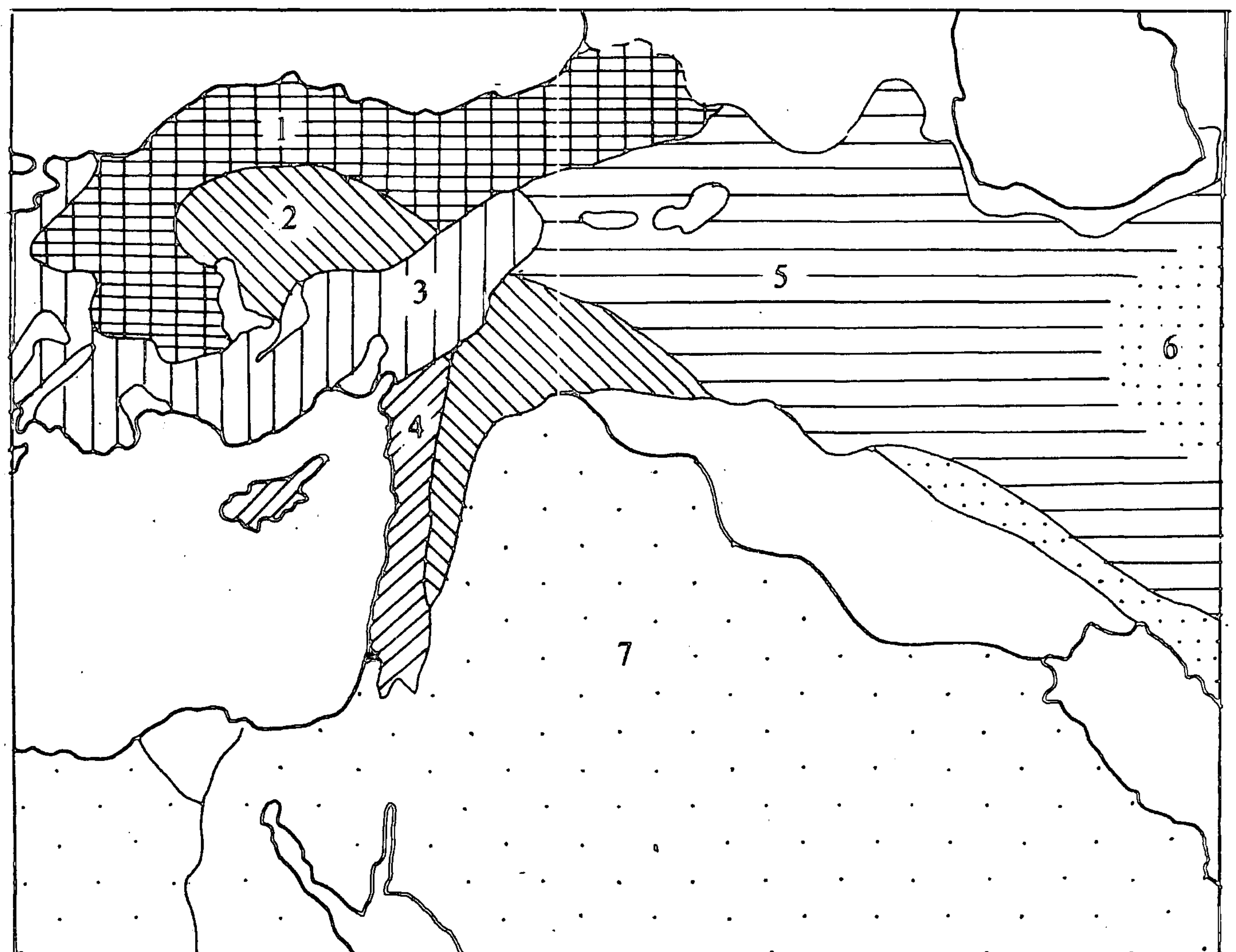


FIG. II:8 Simplified Geology
(based on Fisher 1978 and Beaumont et al 1976)



KEY

1 Brown Forest Soils

2 Brown and Chestnut Soils

3 Terra Rossa and Brown Soils

4 Terra Rossa and Rendzinas

5 Red Chernozems

6 Grey Soils and Sierozems

7 Lithosols

FIG.II: 9 General Soil Map (based on Fisher 1978 and Beaumont *et al* 1978)

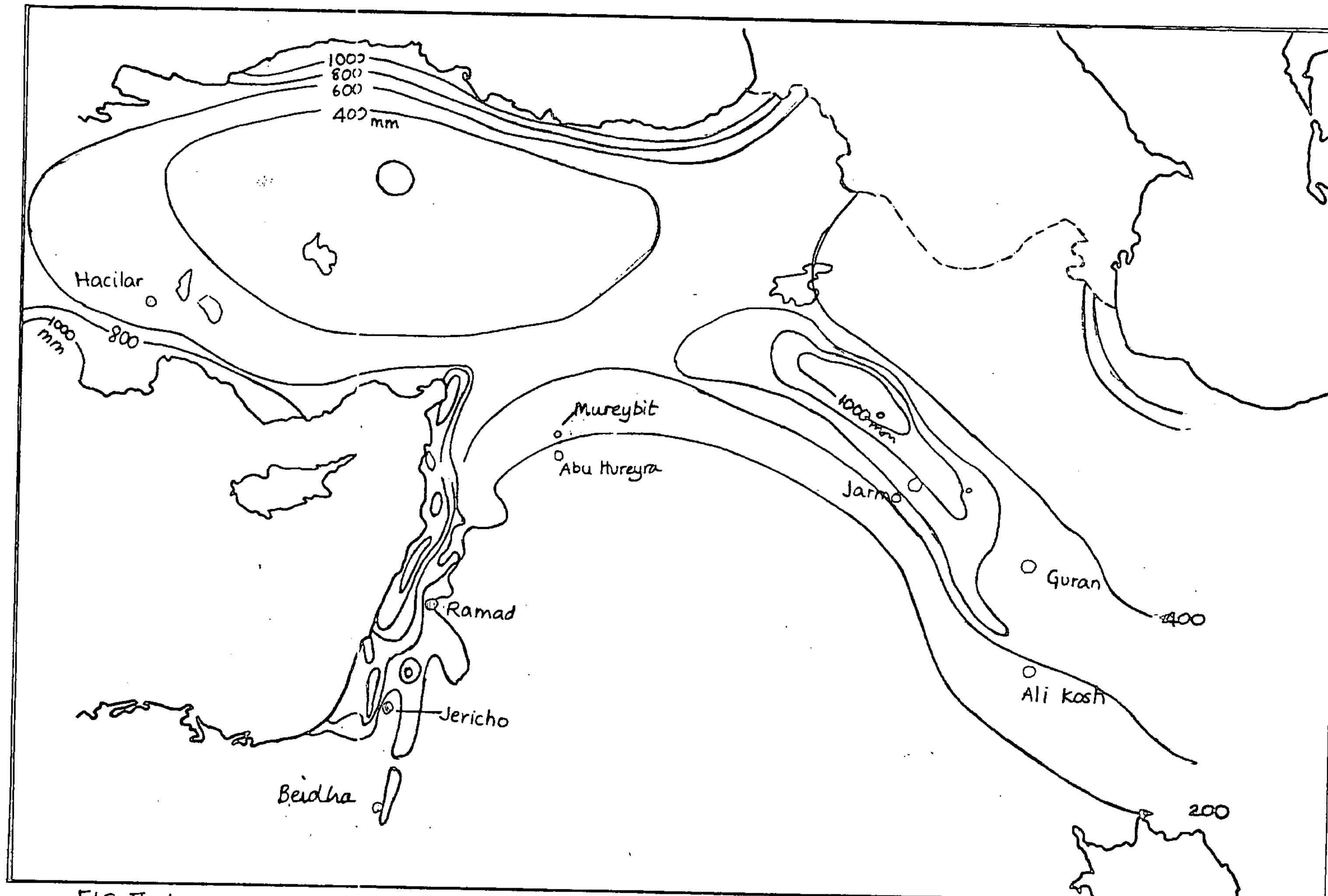


FIG. II: 10
Rainfall isohyets (after van Zeist) and location of early Neolithic sites with evidence for farming

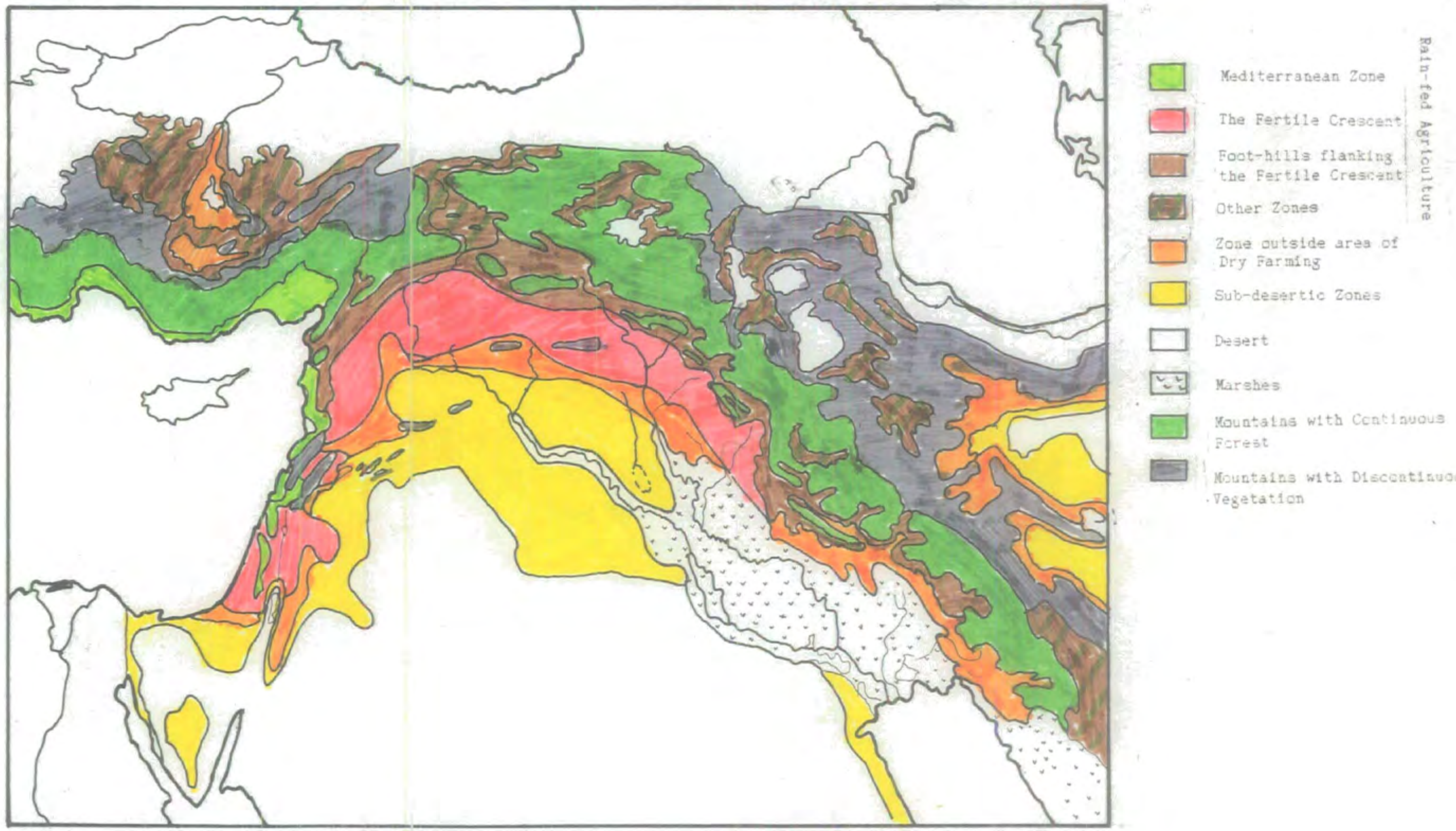


FIG. II:11 Major Bioclimatic Regions (based on Aurenche et al 1981)

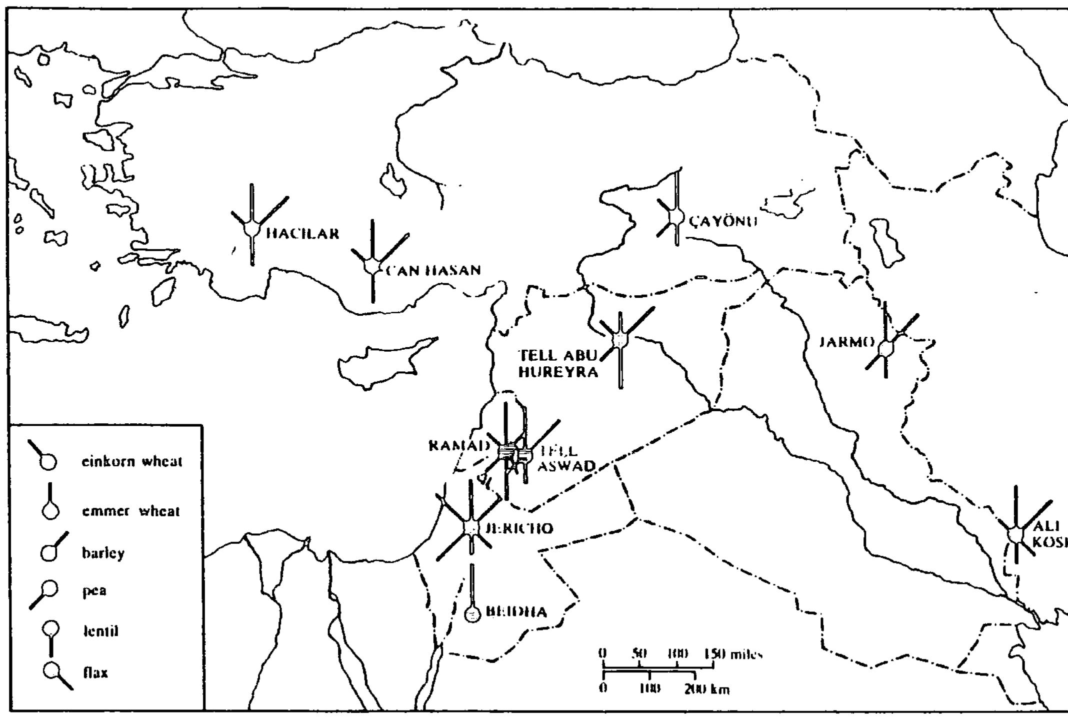


FIG.II:12 Cereal assemblages from selected Neolithic Sites
Zohary and Hopf 1988

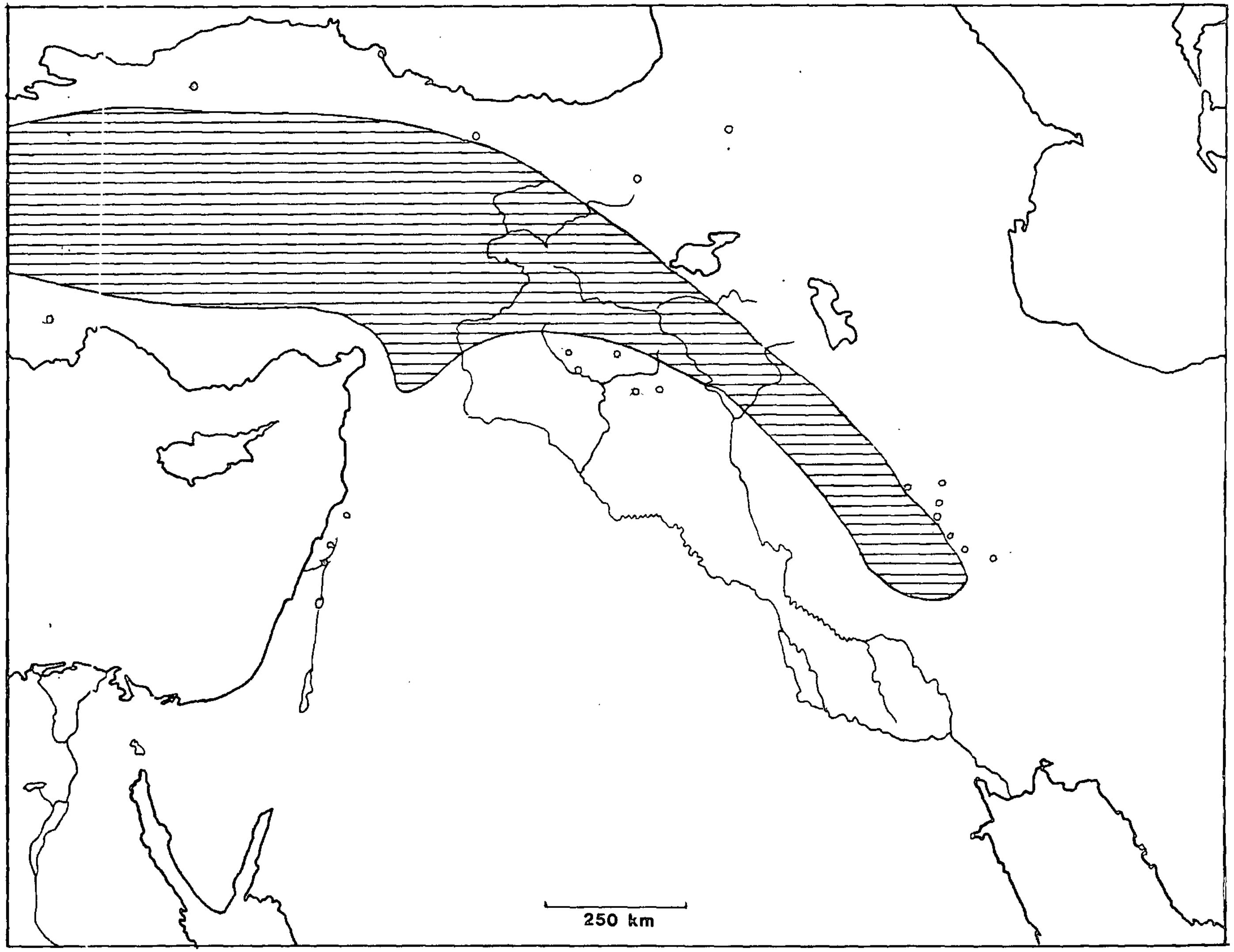


FIG. II:13a Distribution of Wild Einkorn (after Zohary and Hopf 1988)

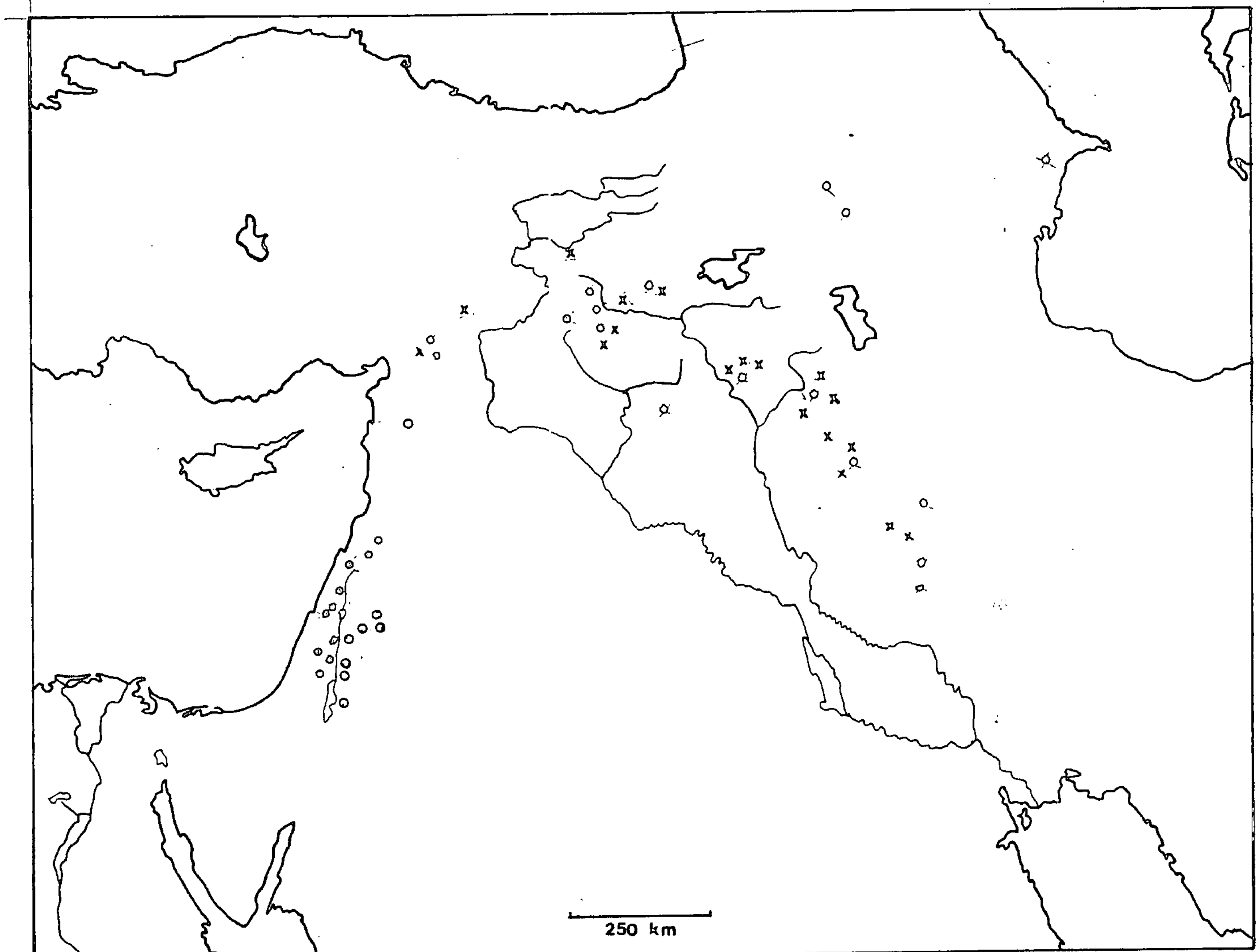


FIG. II:13b Distribution of Wild Emmer (after Zohary and Hopf 1988)

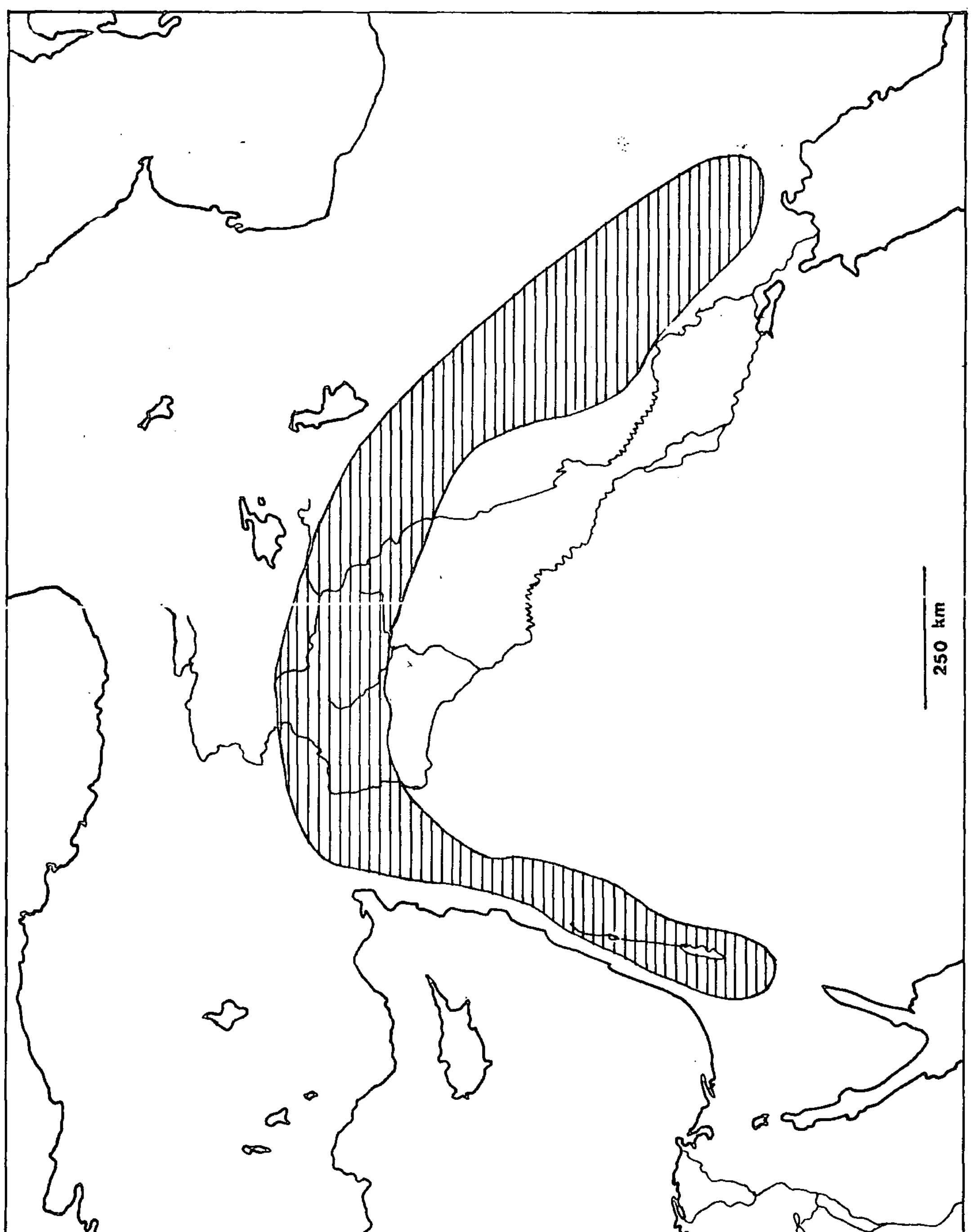


FIG. II:13c Distribution of Wild Barley (after Zohary and Hopf 1988)

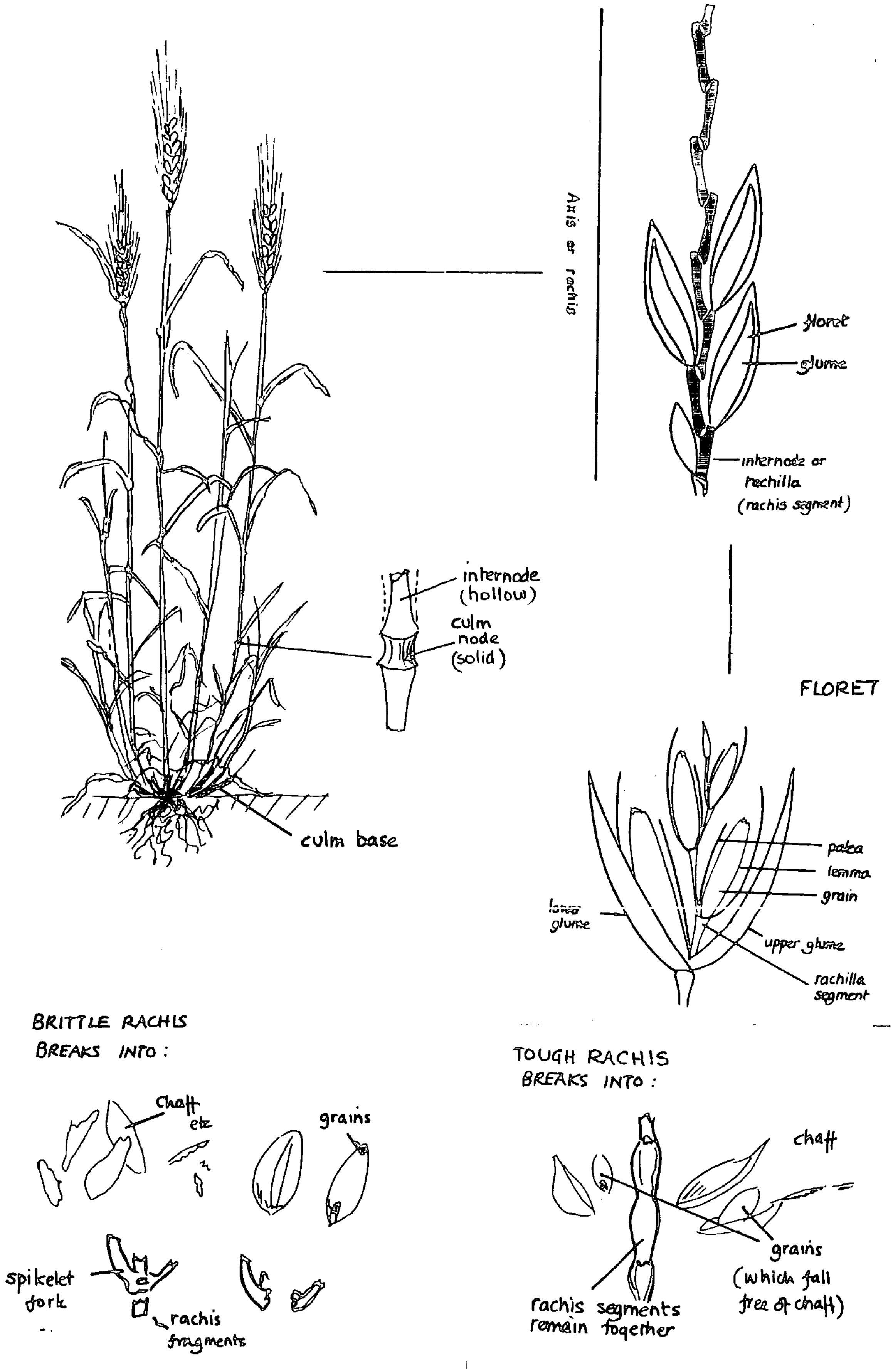
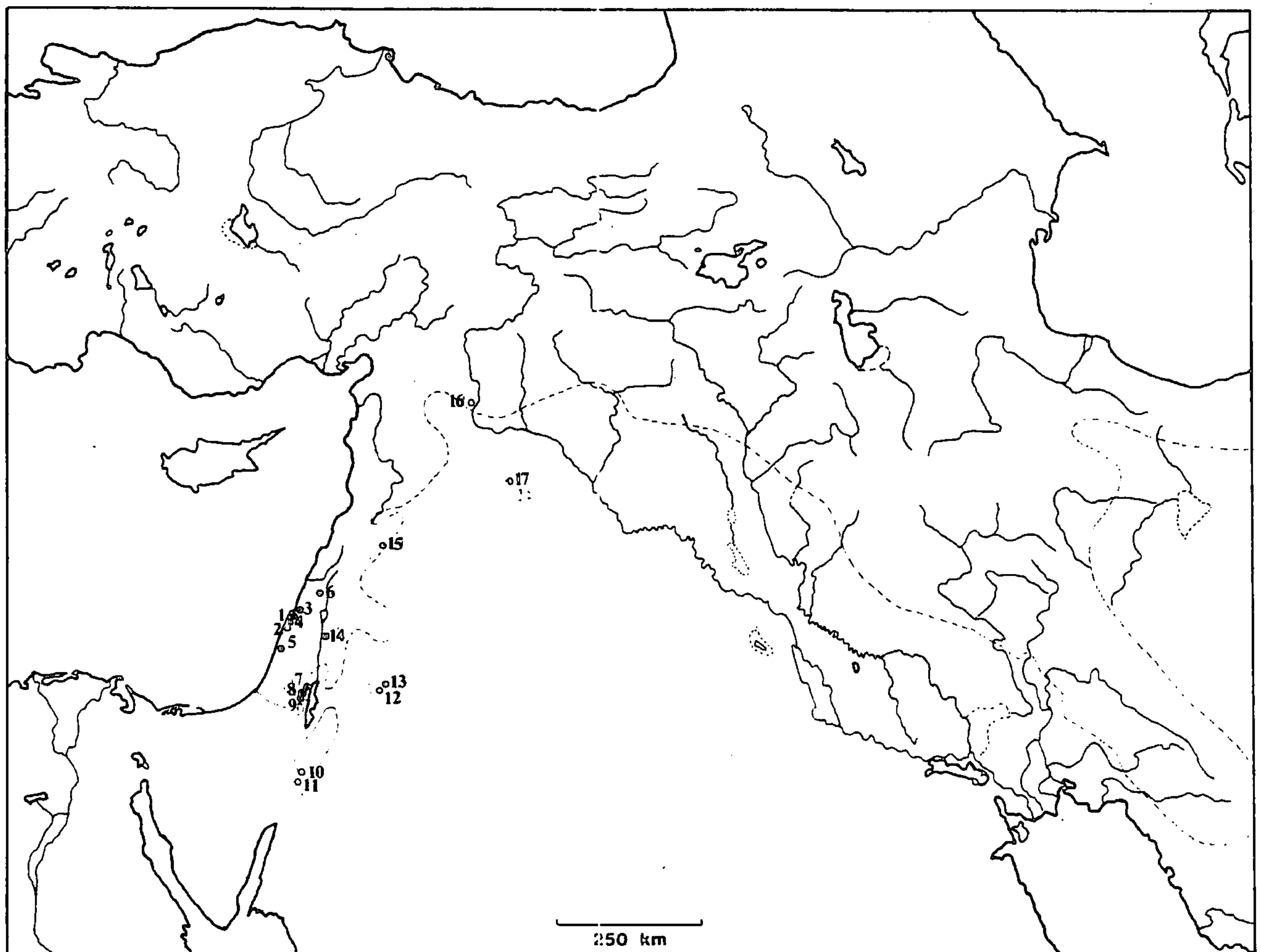


FIG.II:14 Diagram illustrating main components of cereals (after Hillman, Helbaek and Renfrew)



1 El Wad B2
2 Kebara
3 Hayonim
4 Iraq el Baroud
5 Poleg 18
6 Eynan
7 Erq el Ahmar
8 Umm Qala'a
9 El Khiam
10 Beidha
11 Sabra and Sunkh
12 Wadi Jilat
13 Azraq Basin
14 Wadi Hammeh 27
15 Yarbrud
16 Nahr el Homr
17 El Kowm area

Fig.II:15a. Period 1: Early Natufian and Other Sites

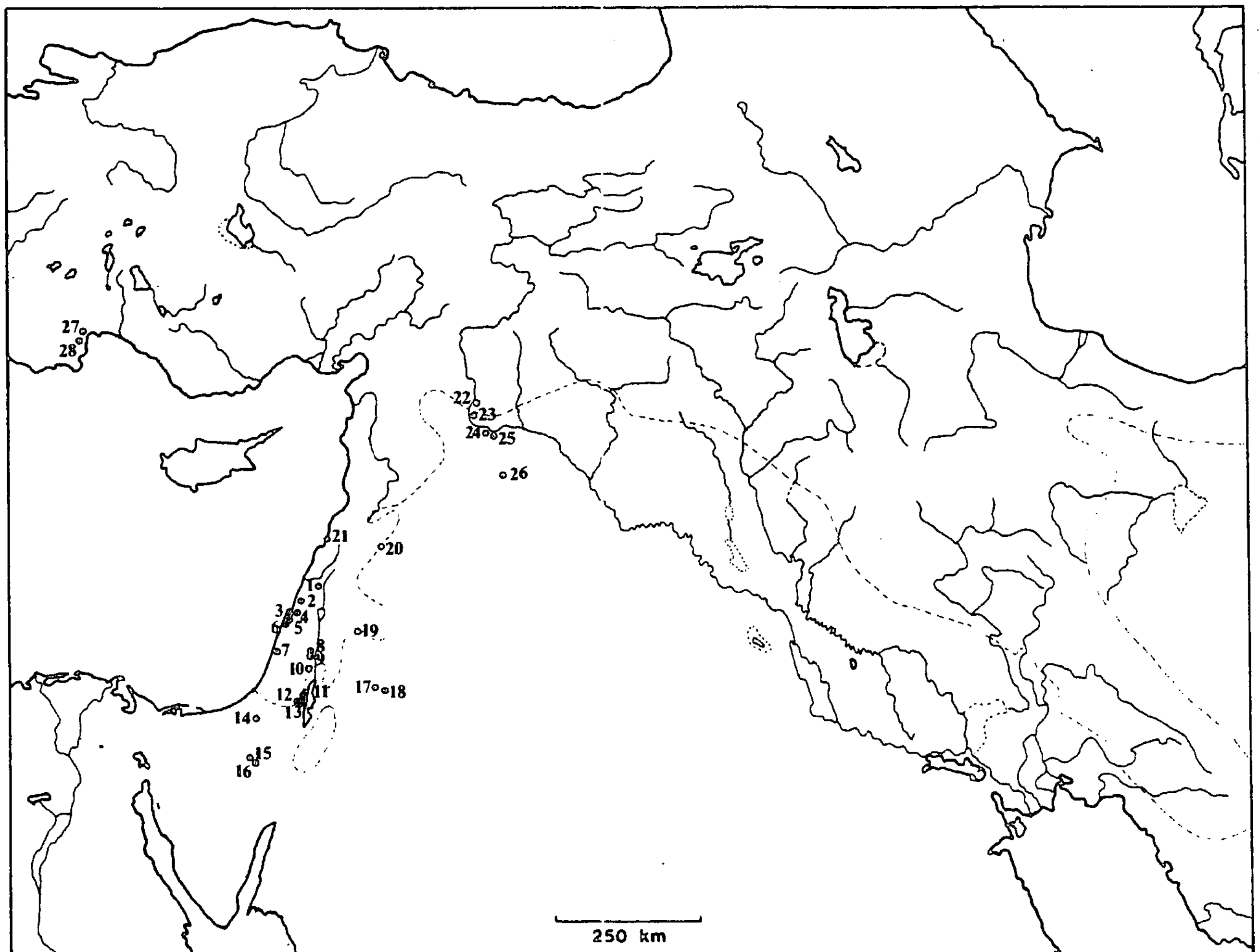
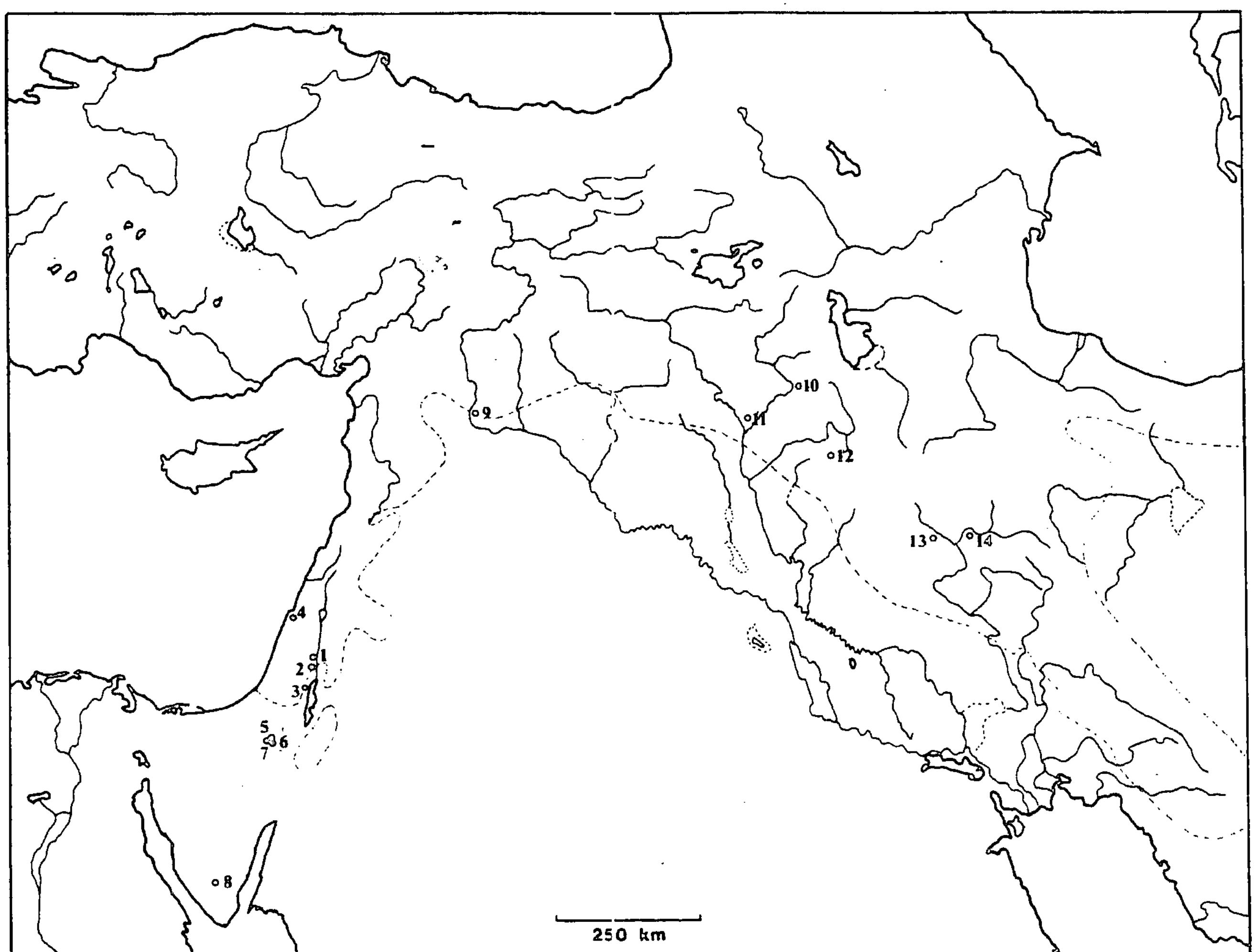
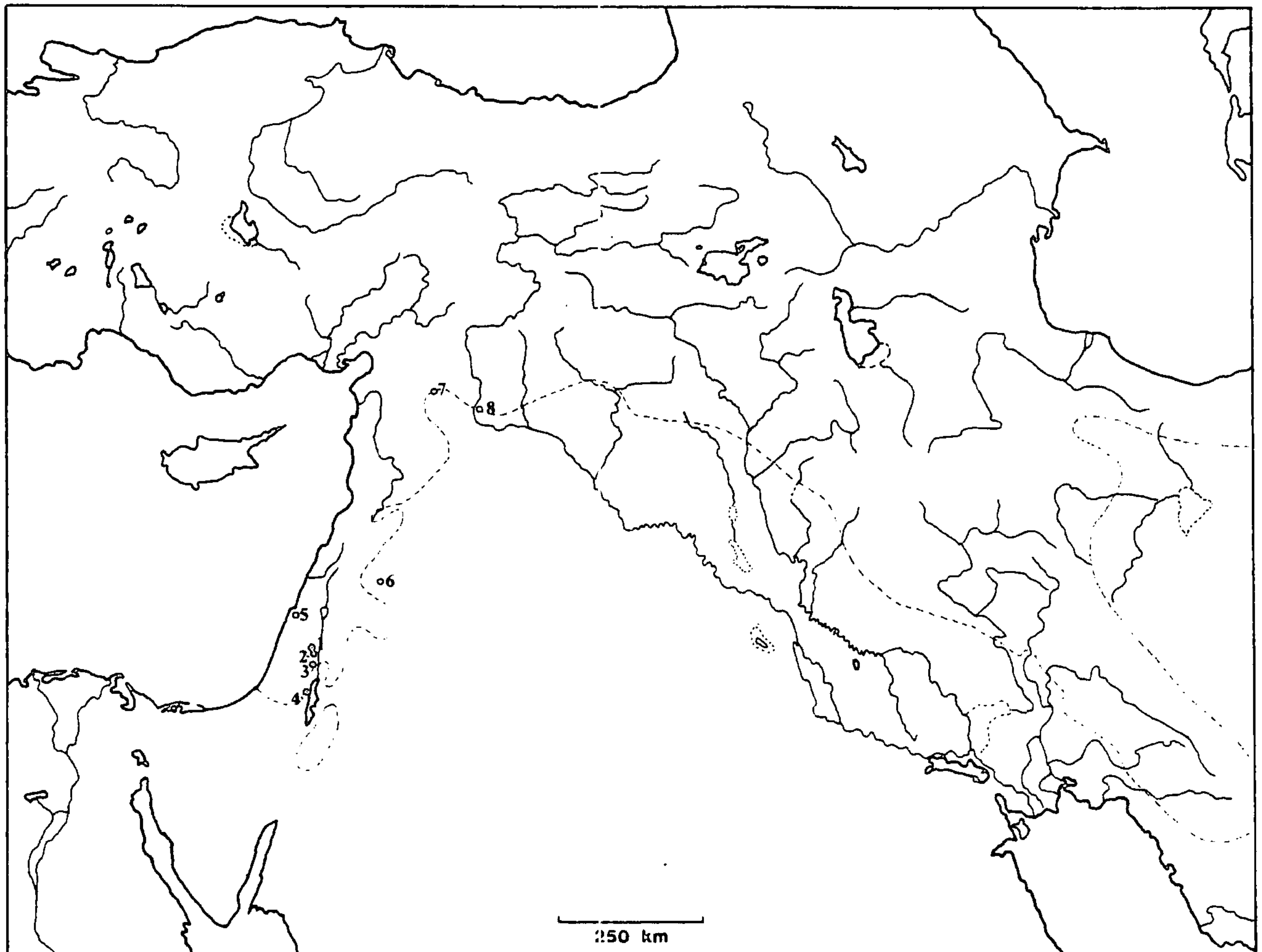


Fig.II:15b. Period 1: Late Natufian and Other Sites



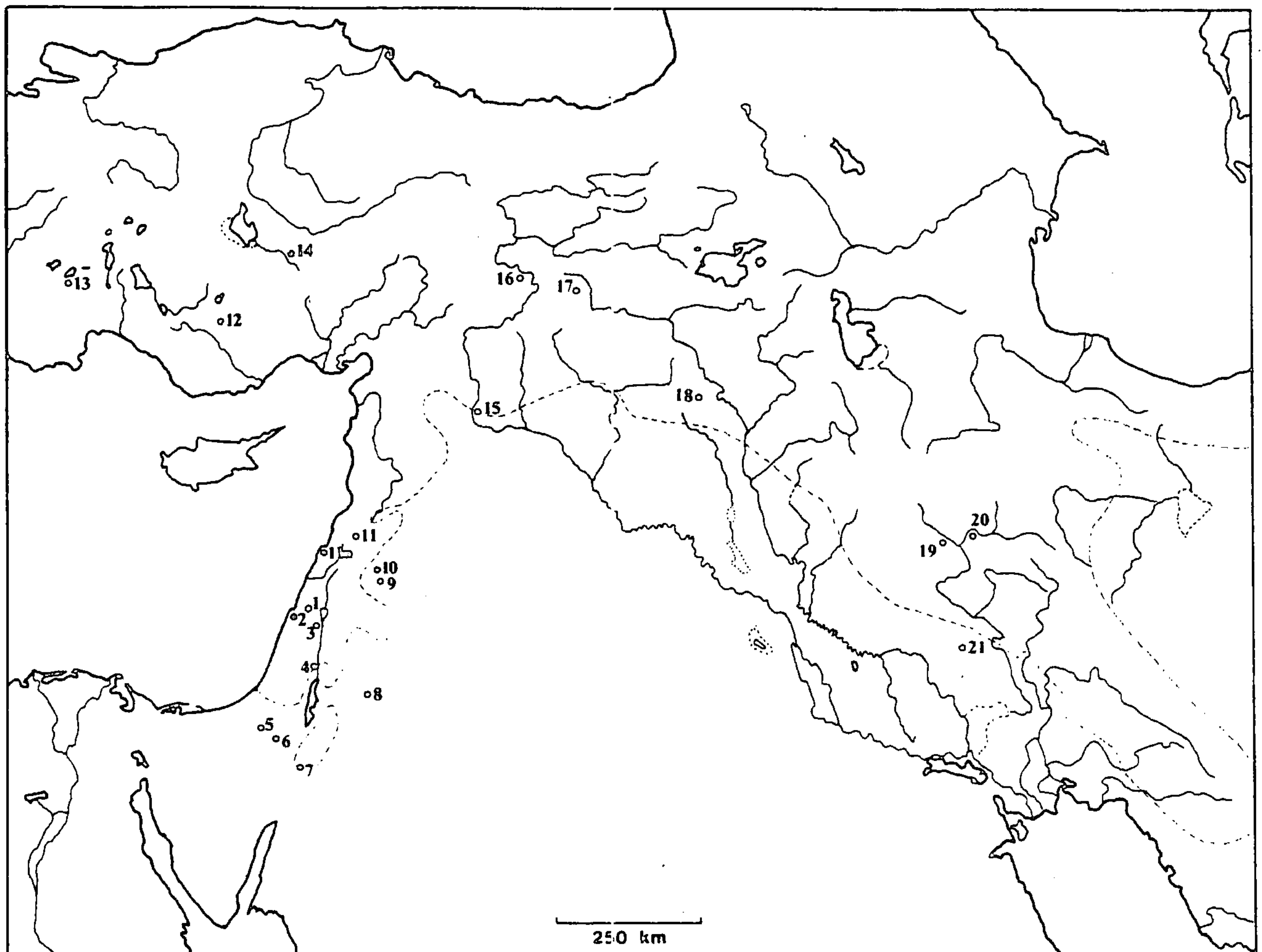
1 Salabiyah IX
2 Jericho
3 El Khiam
4 Nahal Oren
5 Maaleh Ramon
6 Har Arod
7 Romam
8 Abu Madi
9 Mureybit II
10 Zawi Chemi
11 M'leefaat
12 Karim Shahir
13 Asiab
14 Ganj Dareh

Fig.II:16a. Period 2A: Main Sites mentioned in Text



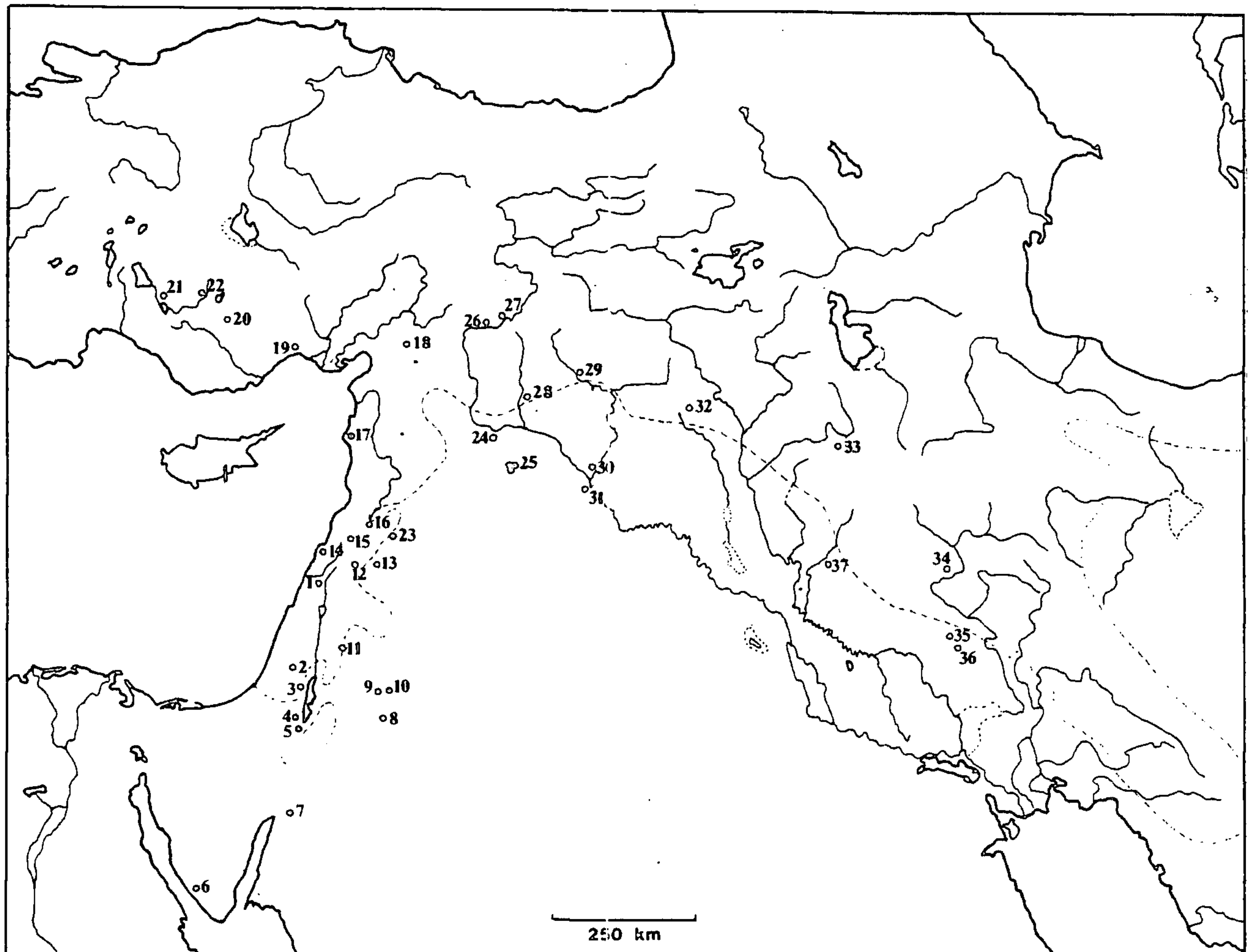
1 Netiv Hagdud
2 Gilgal III
3 Jericho
4 El Khiam
5 Nahal Oren
6 Aswad
7 Queiq sites (Qaramel and Kadim)
8 Mureybit

Fig. II:16b. Period 2B: Main Sites mentioned in Text



1 Yiftahel
2 Nahal Oren
3 Munhatta
4 Jericho
5 Nahal Lavan
6 Divshon
7 Beidha
8 Jilat 7
9 Aswad
10 Ghoraifé
11 Saadiyeh
11a Tell aux Scies
12 Can Hassan III
13 Hacilar
14 Asikli Höyük
15 Mureybit
16 Cafer
17 Çayönü
18 Tell Magzaliya
18 Asiab
20 Ganj Dareh
21 Ali Kosh

Fig.II:17a. Period 3: Main Sites mentioned in text



1 Beisamoun
2 Abu Gosh
3 El Khiam
4 Nahal Hemar
5 Hazad Hazzal
6 Ujrat
7 Ain Nekeli
8 Dhobai
9 Azraq 31
10 Black Desert sites (Dhuweila and Ibn el-Ghazzi)
11 'Ain Ghazzal
12 Ramad
13 Ghoraifé
14 Tell aux Scies
15 Saadiyeh
16 Labweh
17 Ras Shamra
18 Sacke Gozü
19 Mersin
20 Can Hassan
21 Suberde
22 Çatal Hüyük
23 Aatné
24 Abu Hureyra
25 El Kowm Area (Caracol, Qdeir, Nadaouyieh
26 Hayaz Höyük
27 Gritille
28 Khabour Valley (Hafraq Slouq)
29 Tell Fakariya
30 Tell es Sinn
31 Bouqras
32 Tell Magzaliya
33 Jarmo
34 Guran
35 Chaga Sefid
36 Ali Kosh
37 Tell Rihan

Fig.II:17b. Period 4: Main Sites mentioned in Text

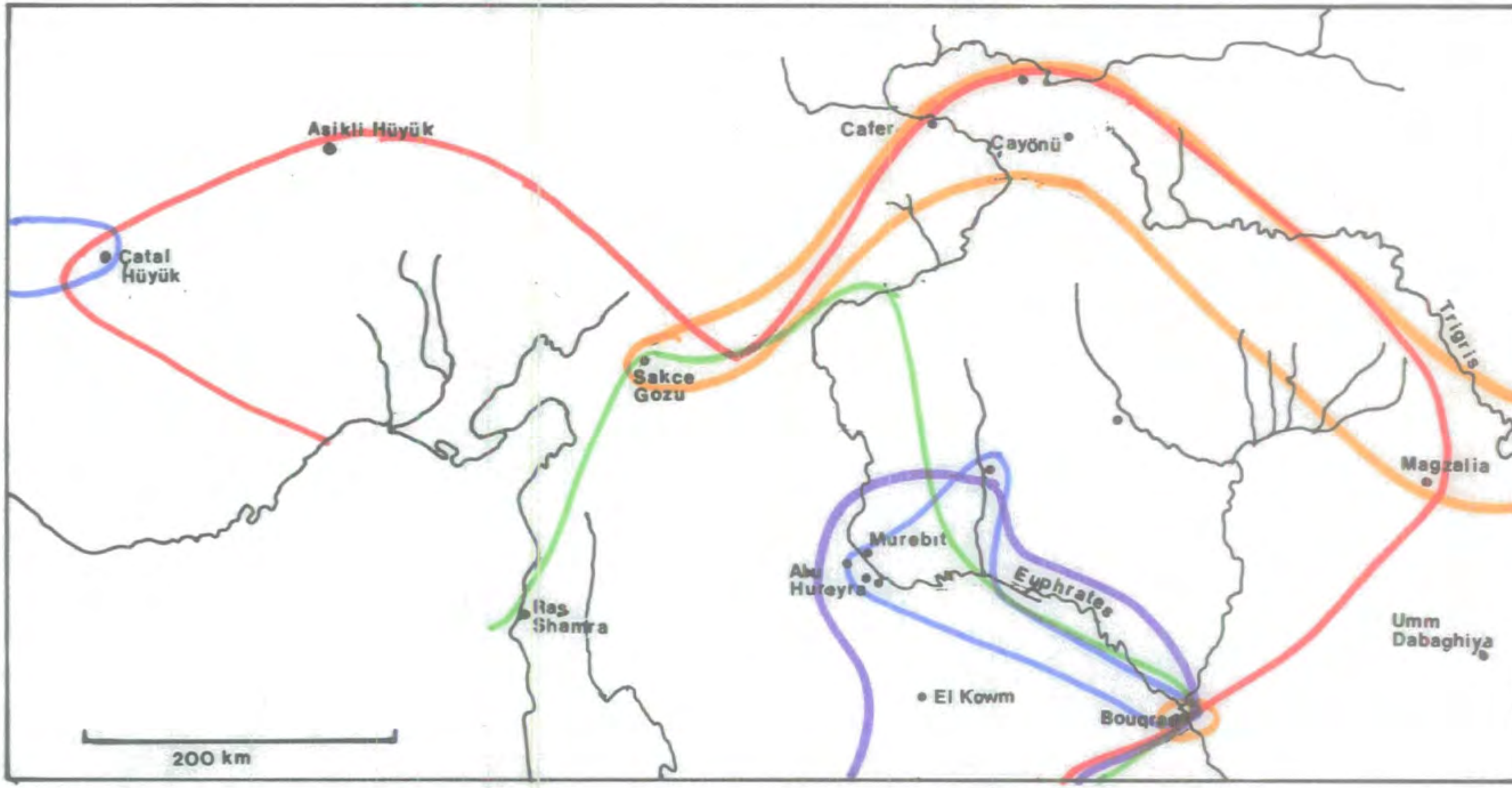
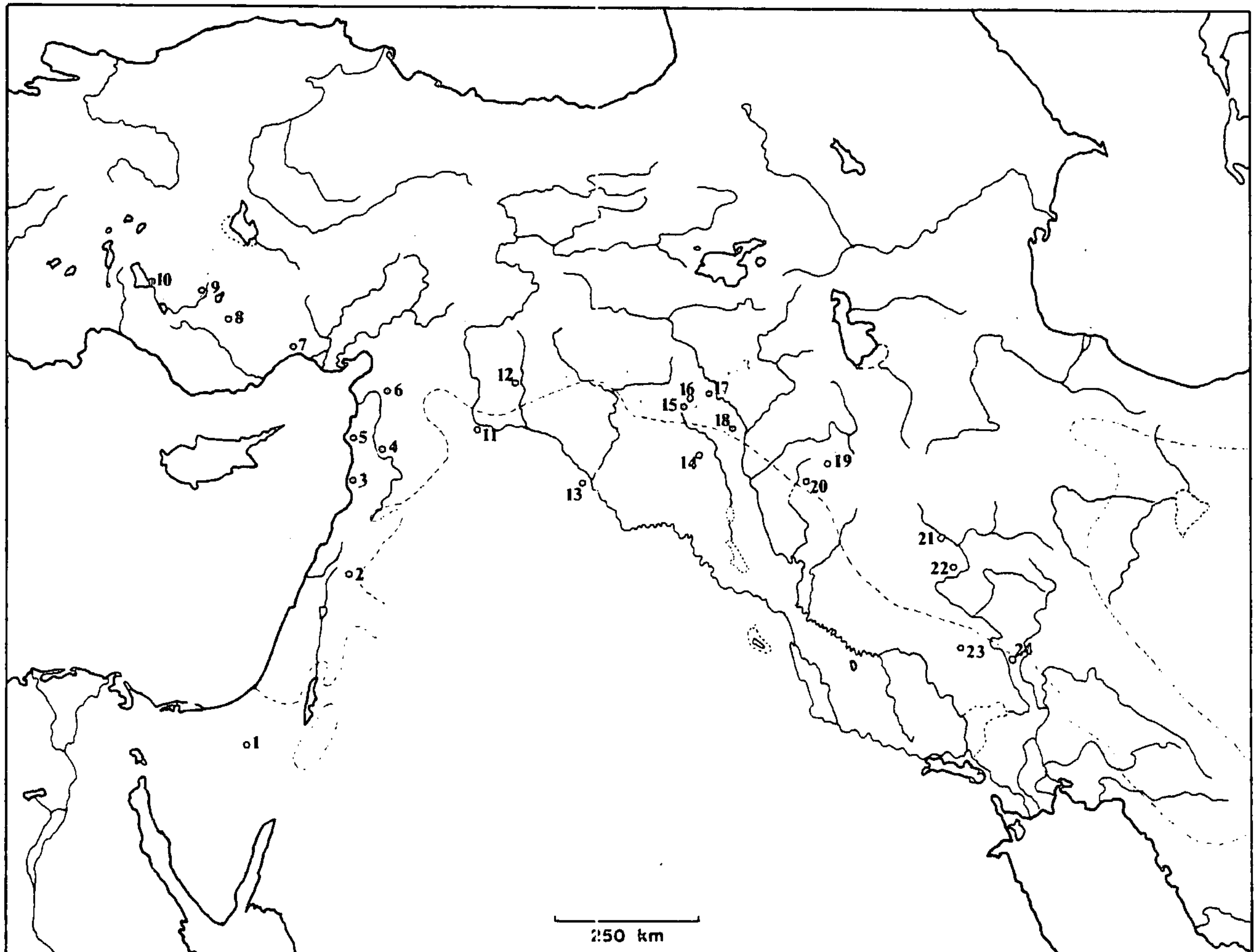


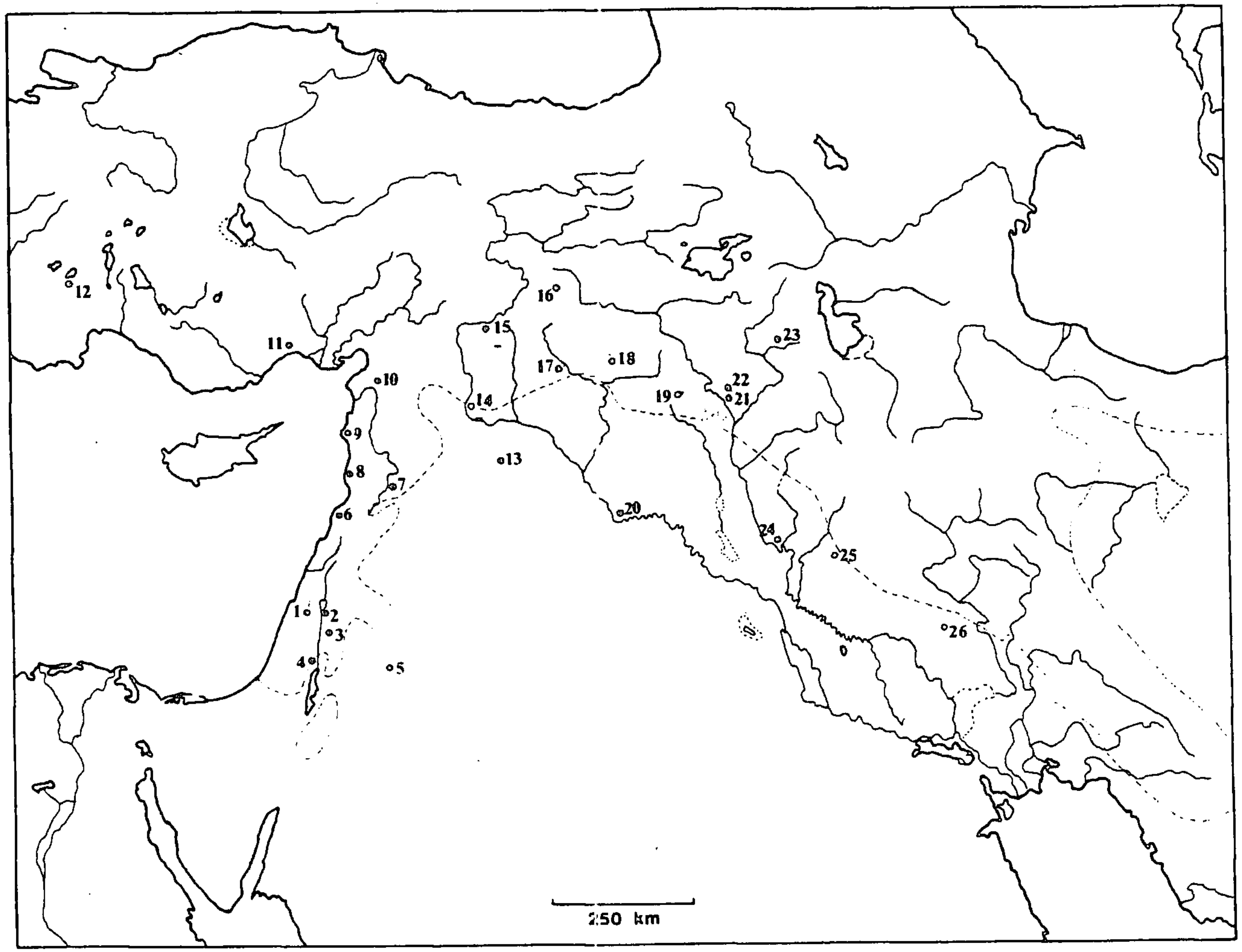
FIG. II:18 Cultural Entities: Periods 3 and 4

- Tanged Arrowheads
- Naviform Cores
- Sickles with Enlarged Heads
- White Ware
- Pottery (sporadic)



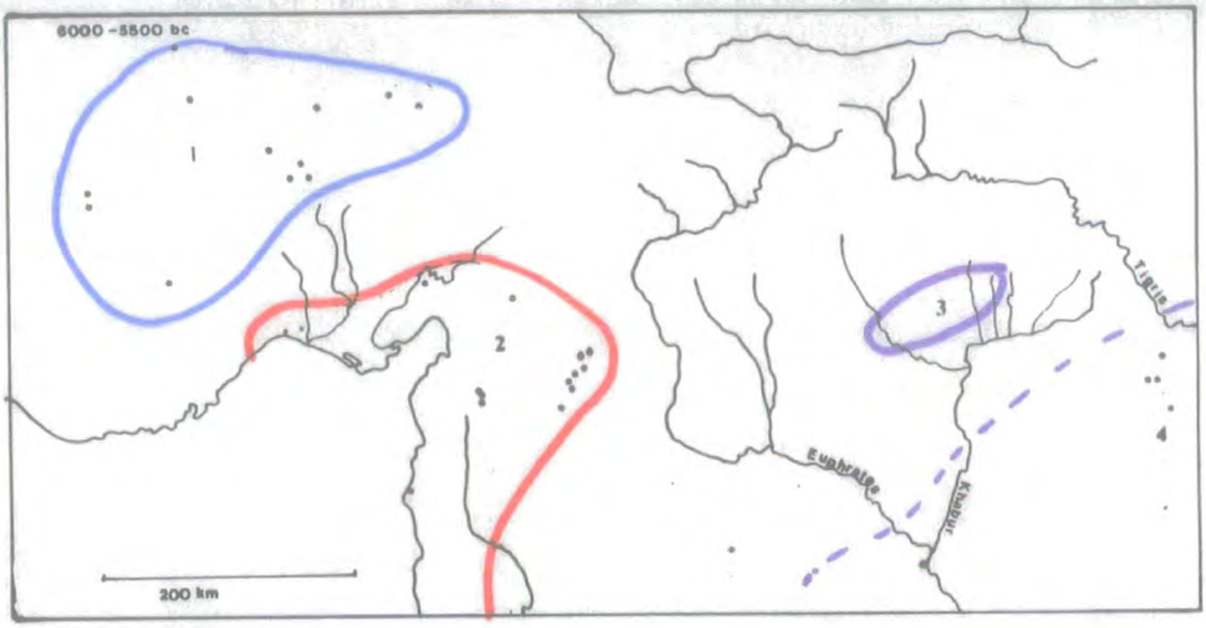
1 Kadesh Barnes
2 Ramad
3 Byblos
4 Apamea
5 Ras Shamra
6 Amuq
7 Mersin
8 Çatal Hüyük
10 Erbarba
11 Abu Hureyra
12 Aswad
13 Bouqras
14 Umm Dabagiyah
15 Yarim Tepe
16 Tell Sotto
17 Telul eth Thalathat
18 Hassuna
19 Jarmo
20 Mattarrah
21 Sarab
22 Guran
23 Choga Sefid
24 Tepe Tul'ai

Fig.II:19a. Period 5: Main Sites mentioned in Text



1 Megiddo
2 Sha'ar Hagolan
3 Thawwab
4 Jericho
5 Jebel Naja
6 Byblos
7 Arjoune
8 Tabbat al Hammam
9 Ras Shamra
10 Amuq Sites
12 Hacilar
13 El Kowm
14 Shams ed Din
15 Kumartepe
16 Girikihaciyan
17 Halaf
18 Chagar Bazar
19 Yarim Tepe
20 Baghouz
21 Nineveh
22 Arpachiyah
23 Banahilk
24 Tell es Sawwan
25 Choga Mami
26 Sabz

Fig.II:19b. Period 6: Main Sites mentioned in Text



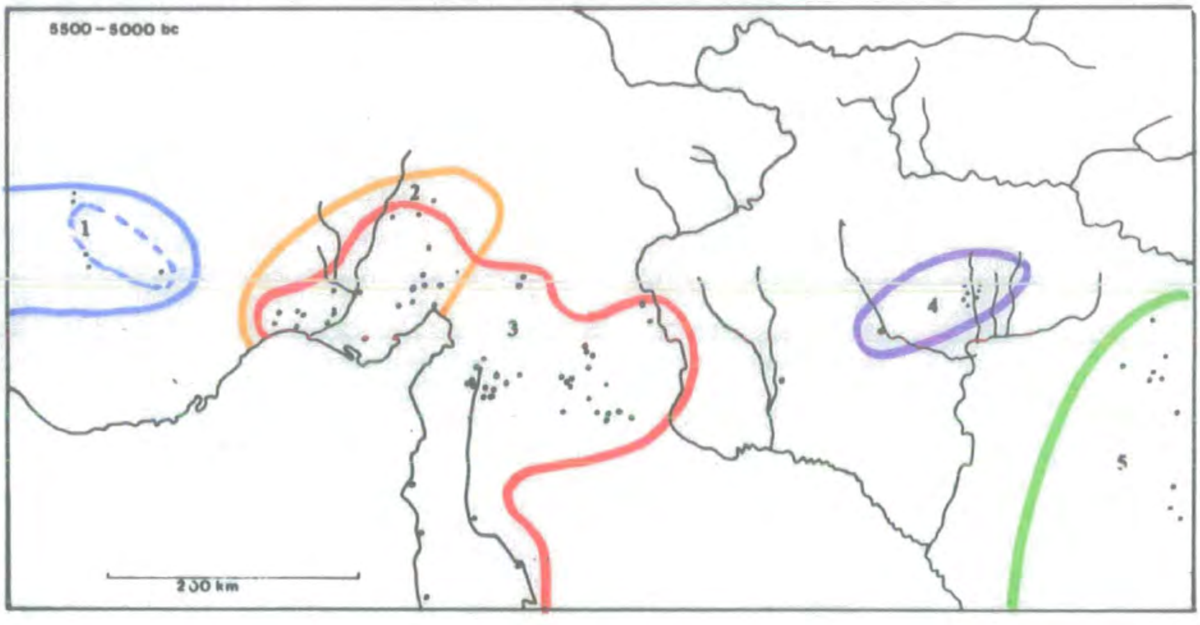
1 Konya Plain: Early Ceramic Neolithic

2 Syro-Cilicia: Amuq A

3 Alt Monochrom

4 Sotto-Umm Dabaghiyah

Boundary between painted + lustred ceramics



1 Konya Plain:
a Late Neolithic
b Early Chalcolithic

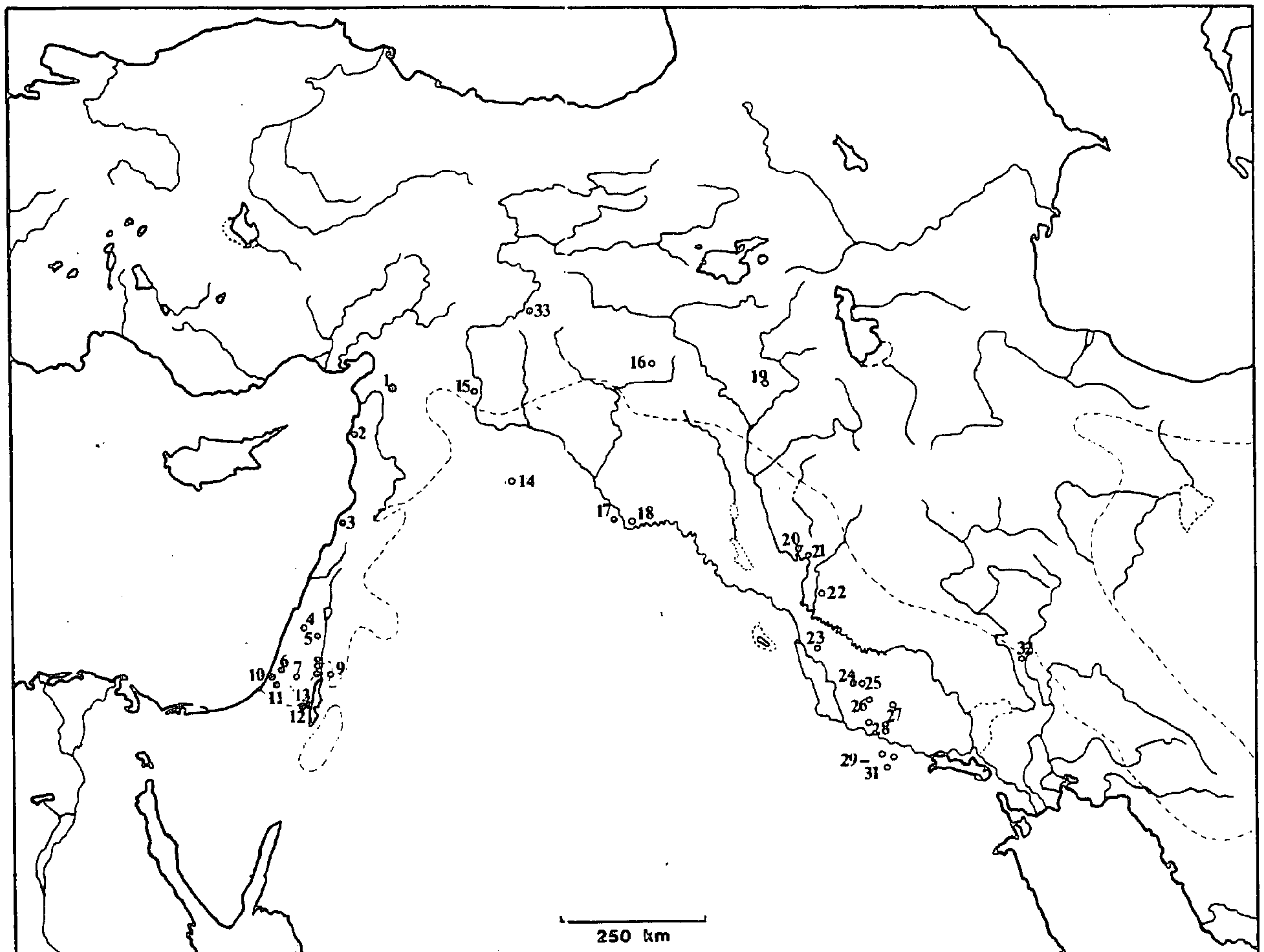
2 Syro-Cilicia: Amuq B

3 Pre-Halaf painted pottery

4 Halaf

5 Western extent of Hassuna and Samarran related sites

FIG.II:20 Cultural Entities: Periods 5 and 6



1 Amuq Sites
2 Ras Shamra
3 Byblos
4 Megiddo
5 Beth Shan
6 Gezer
7 Beth Shemmesh
8 Jericho
9 Tuleilat Ghassul
10 Gaza
11 Tell Gemmeh
12 Nahal Mismar
13 Arad
14 El Kowm
15 Habuba Khabira
16 Brak
17 Mari
18 Baghouz
19 Tepe Gawra
20 Samarra
21 Tell es Sawwan
22 Khafajah
23 Kish
24 Abu Salabikh
25 Nippur
26 Fara
27 Tello
28 Warka
29-31 Ubaid, Ur and Eridu
32 Susa
33 Hassek

FIG.II:21 Location Map of Main Later Sites mentioned in text

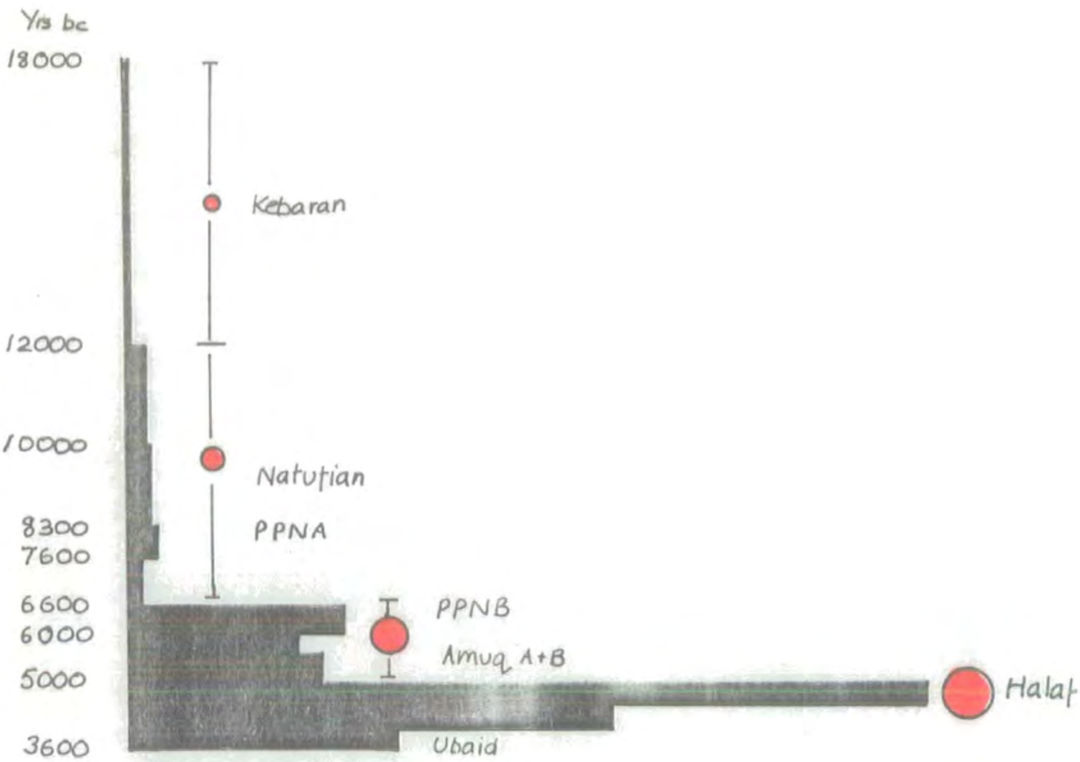


FIG. II:22 PATTERNS OF SETTLEMENT EXPANSION
After Hours 1982

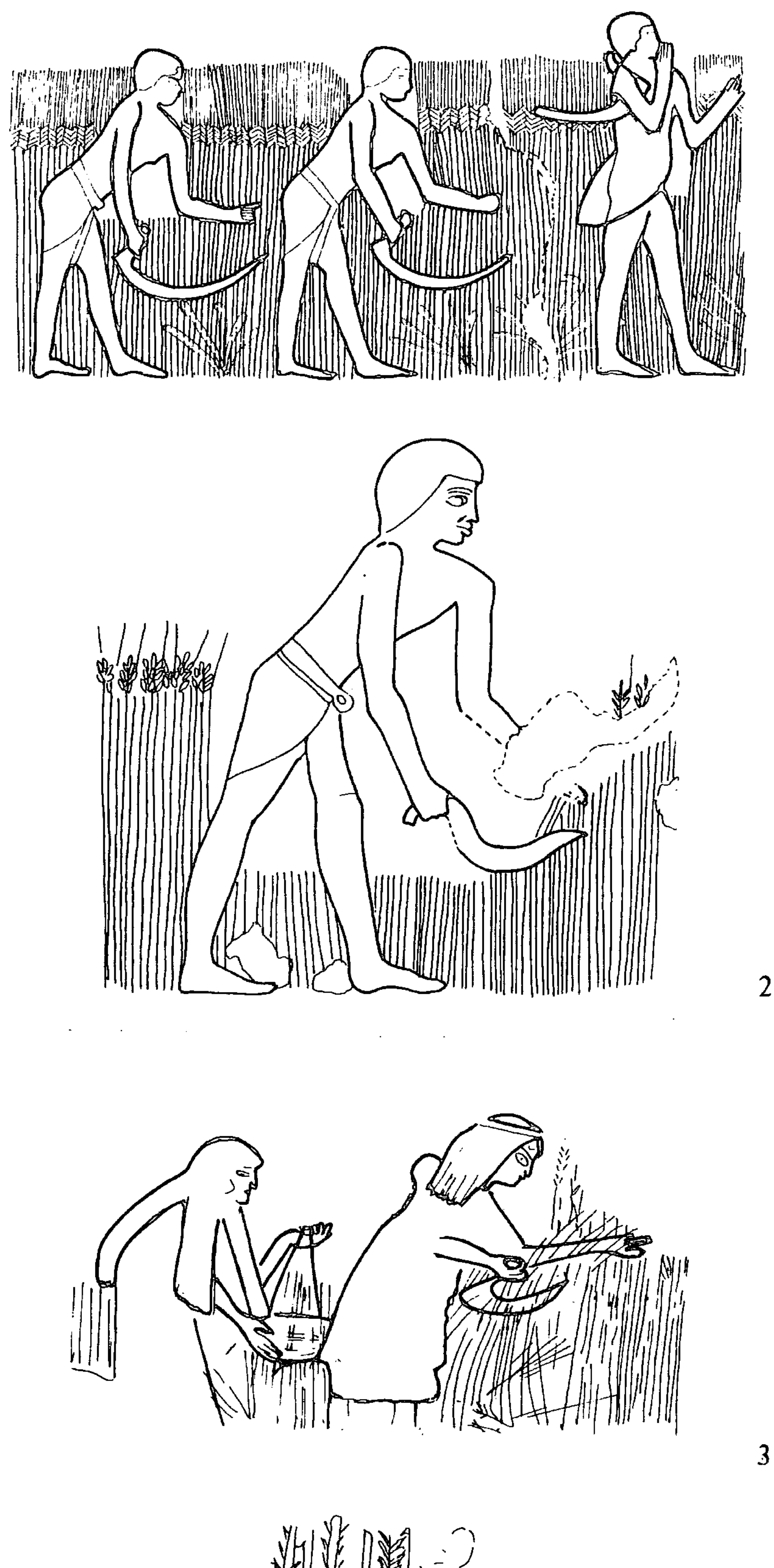


FIG.III:1 Ancient Depictions of Harvesting
no.1 Mastaba of Meruku, no.2 Tomb of Urana,
no.3 Wall painting, Medina, no. 4 Cylinder Seal
(Collon 722)

FIG.III:2 Harvesting: Tomb of Menna, Thebes (from Keel et al)

FIG. III:3 Sickles as symbols
No.1 Sickle Amulets from Arpachiyah (after Mallowan 1945) Scale 1:1. No. 2 Statue of Ashurnasipal holding a Sickle which is alleged to have flint blades (British Museum) (from Amiet *et al* 1981). No.3 Ivory plaquette from Nimrud depicting a king (?) holding a sickle (from Amiet *et al* 1981) No. 4 The 'Soldier Gods' with sickle swords on a relief at Yazilikaya

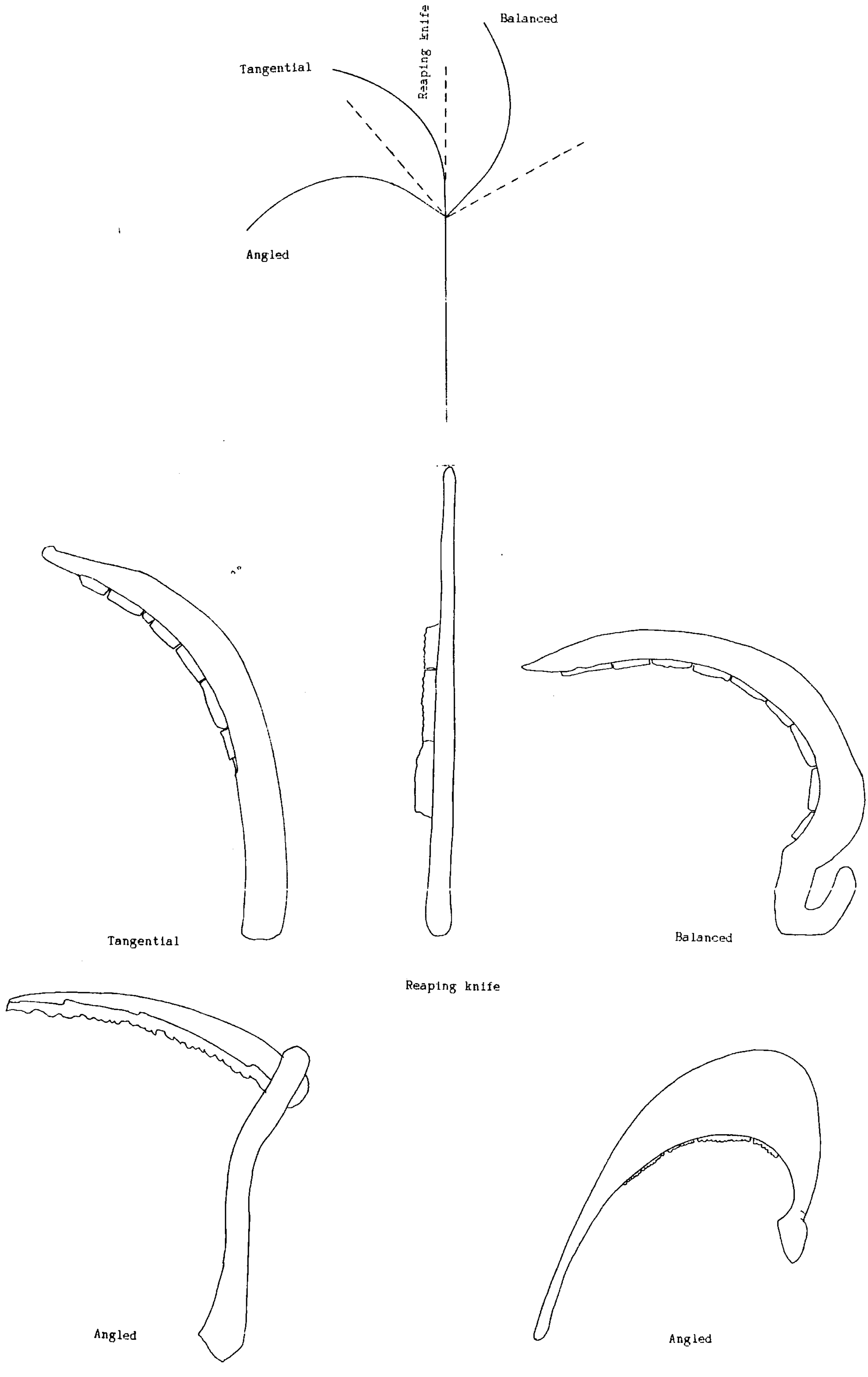


FIG. IV:1 Classification of sickles afer Childe 1951

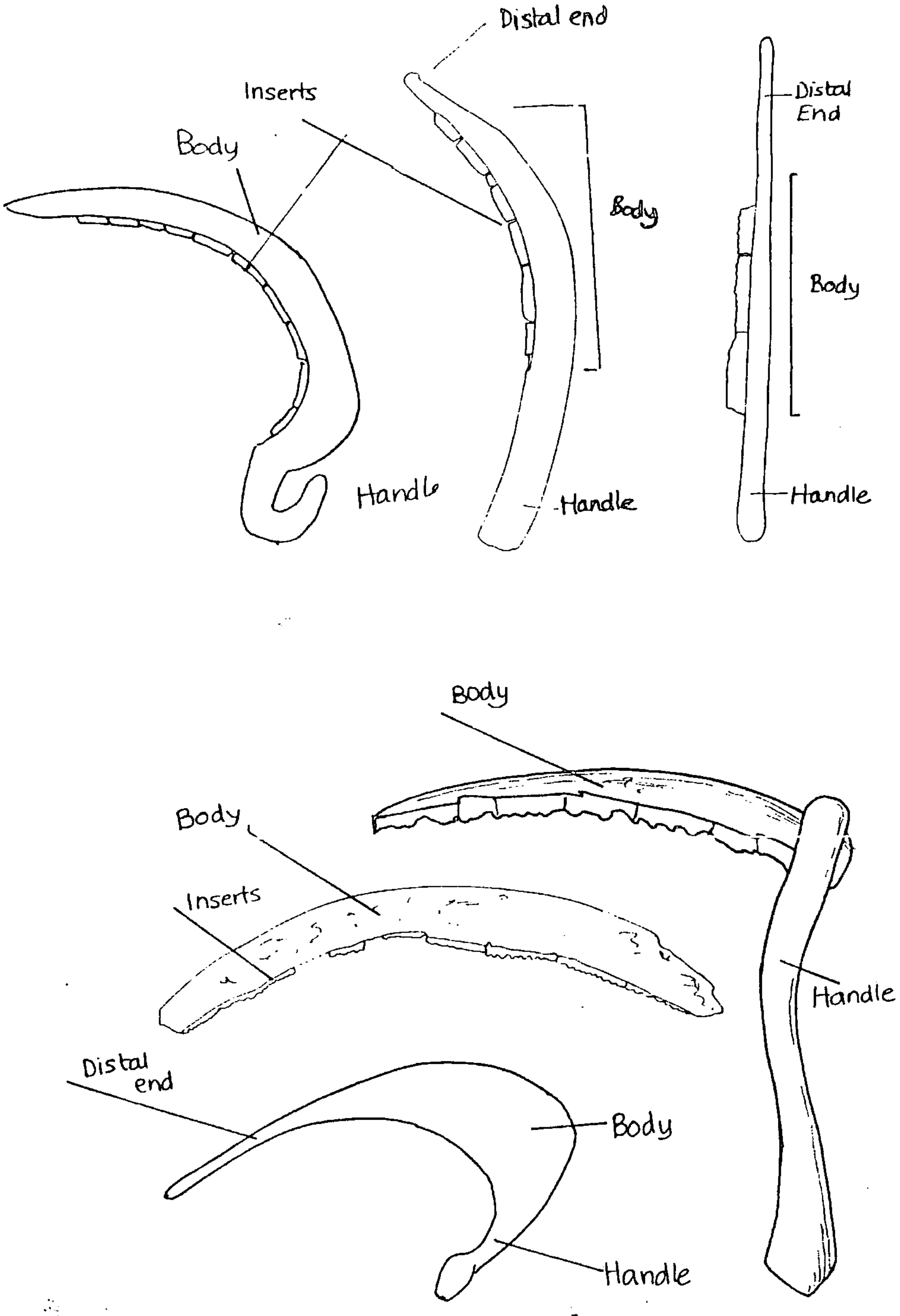
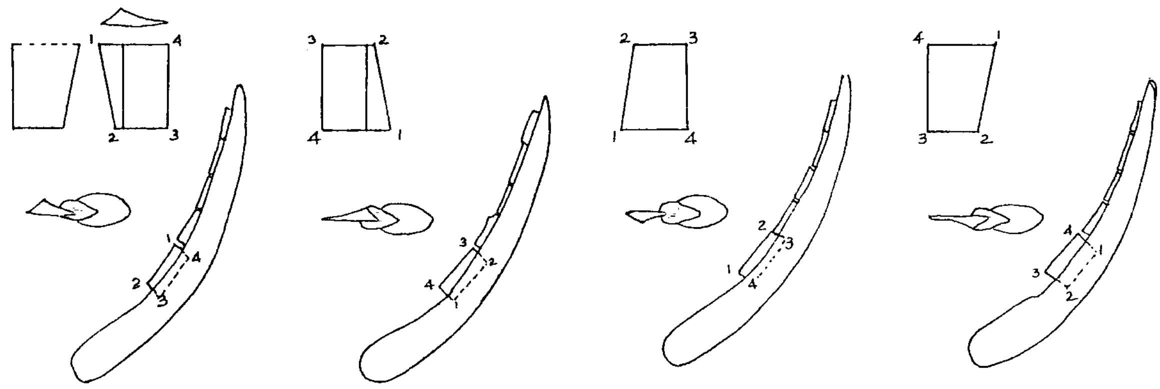
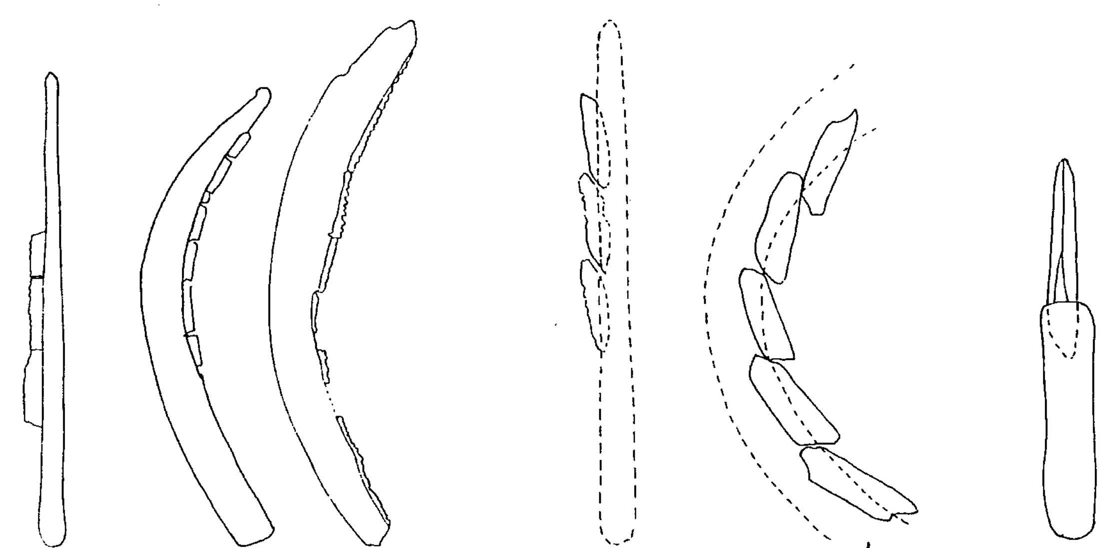


FIG.IV:2 Parts of a Sickle



Orientation of blades after Fujii

Insertions:



Parallel

a Oblique b

Axial

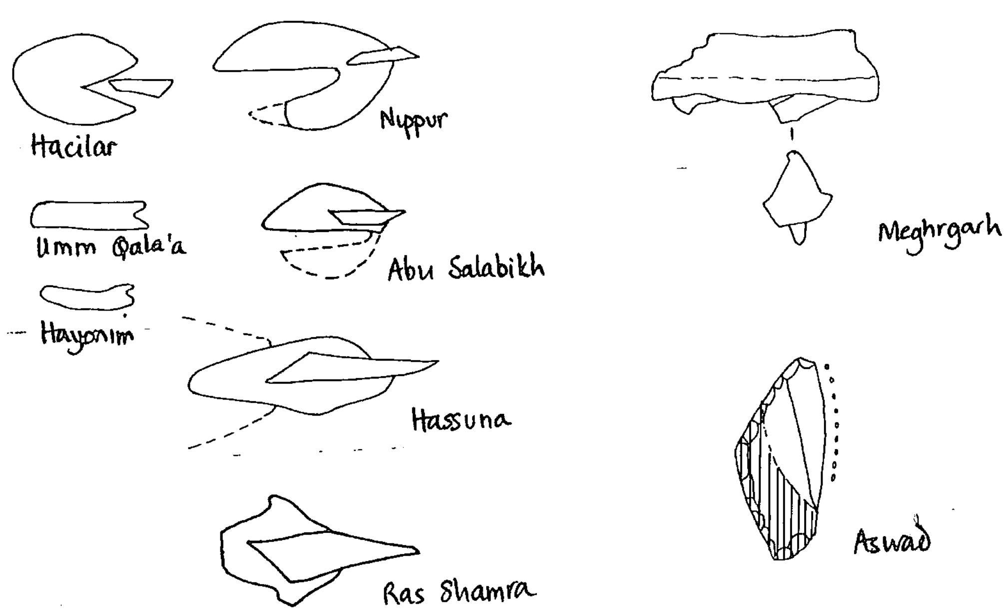


FIG. IV:3 Methods of Blade Insertion

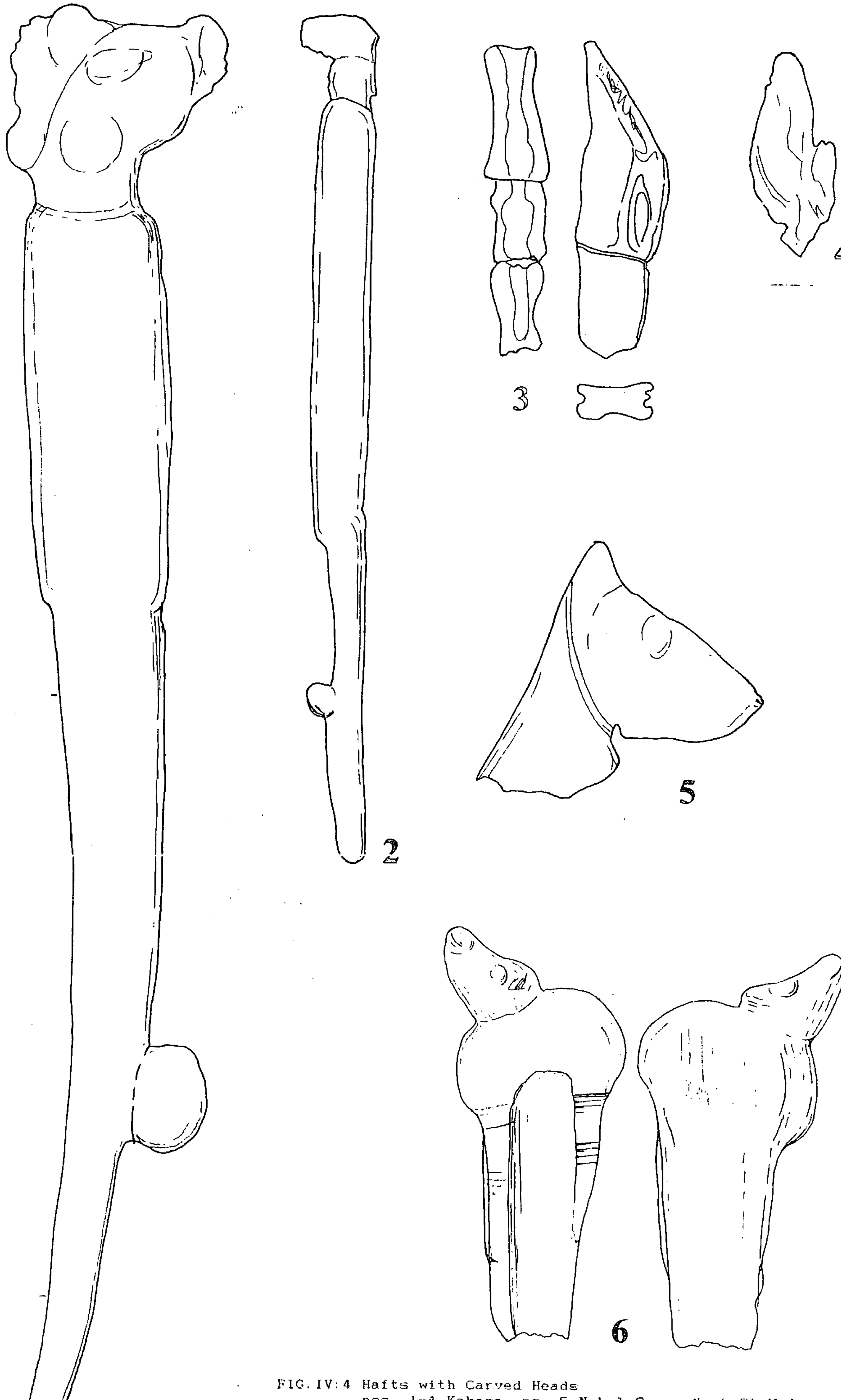


FIG. IV:4 Hafts with Carved Heads
nos. 1-4 Kebara, no. 5 Nahal Oren, No 6 El Wad.
Scale 1:2

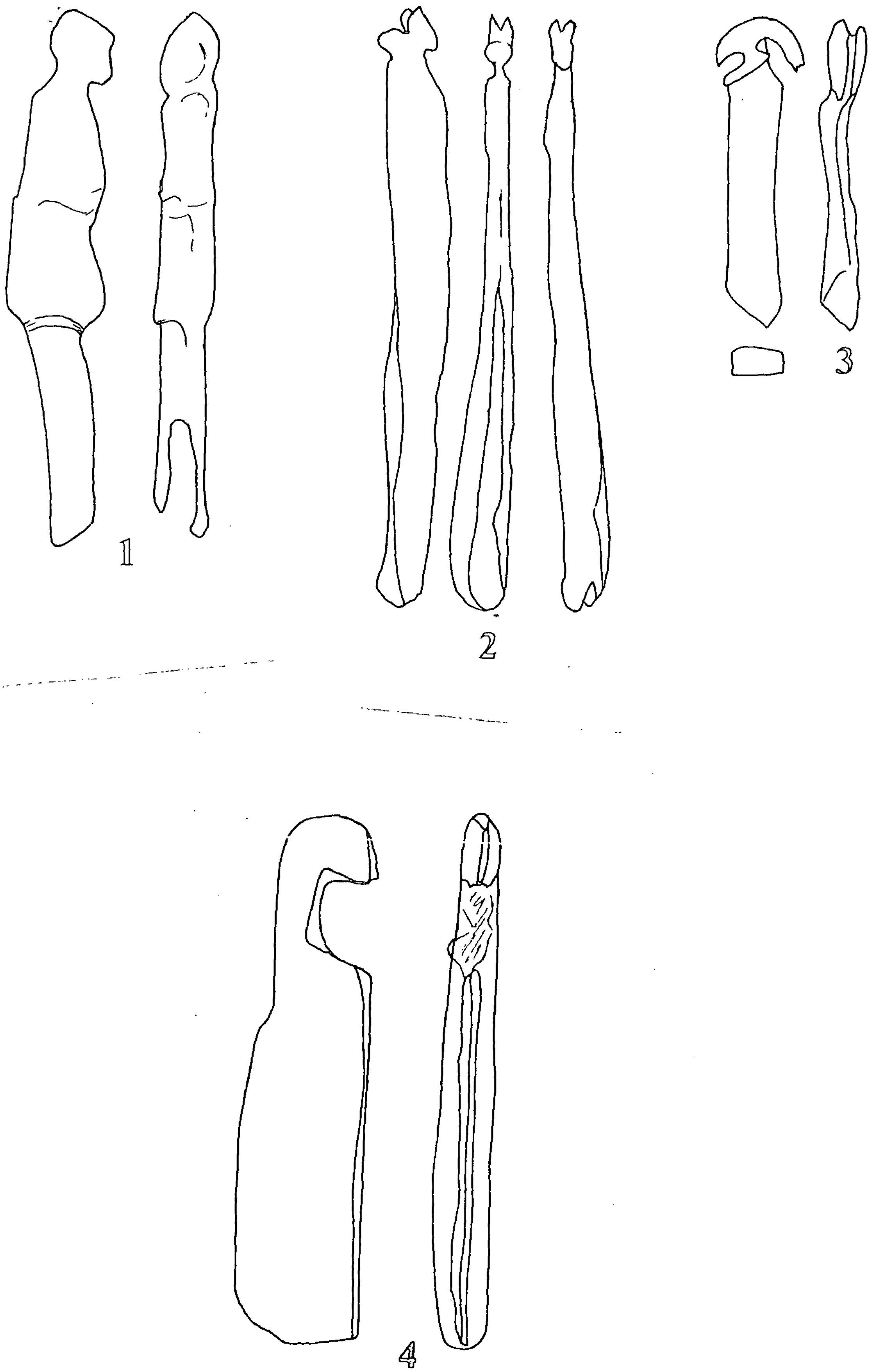


FIG. IV:5 Hafts with Carved Heads
nos. 1-3 Sialk, no. 4 Tepe Gawra. Scale 1:2

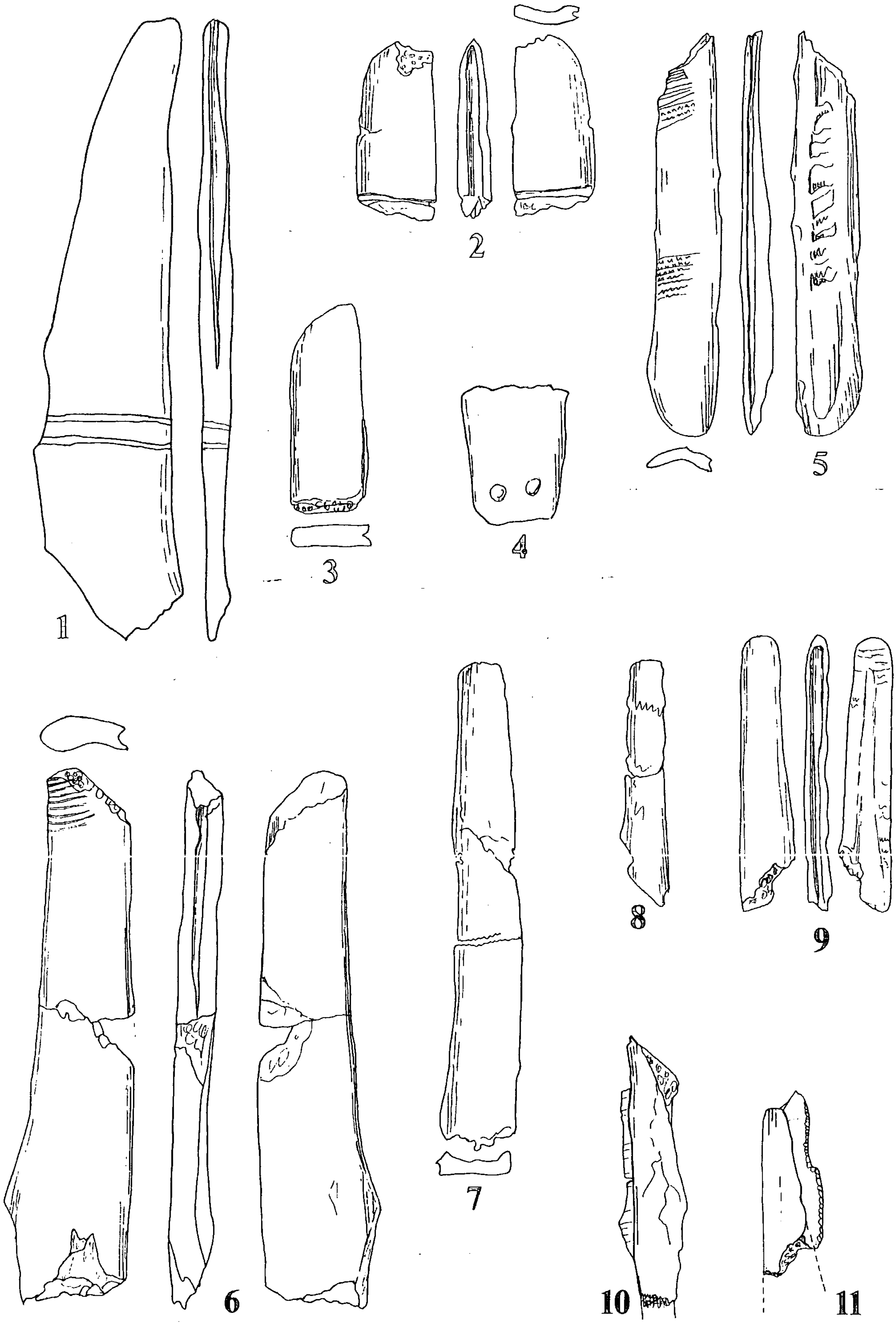


FIG. IV:6 Other Straight Hafts
no.1 Eynan, nos. 2,5,6,9 Hayonim, no.3 Umm Qala'a,
nos 4,7,8,10 El Wad, no. 11 Umm es Zuwetina. Scale 1:2

FIG. IV:7a Hafts from Wadi Hammeh. Scale 1:2

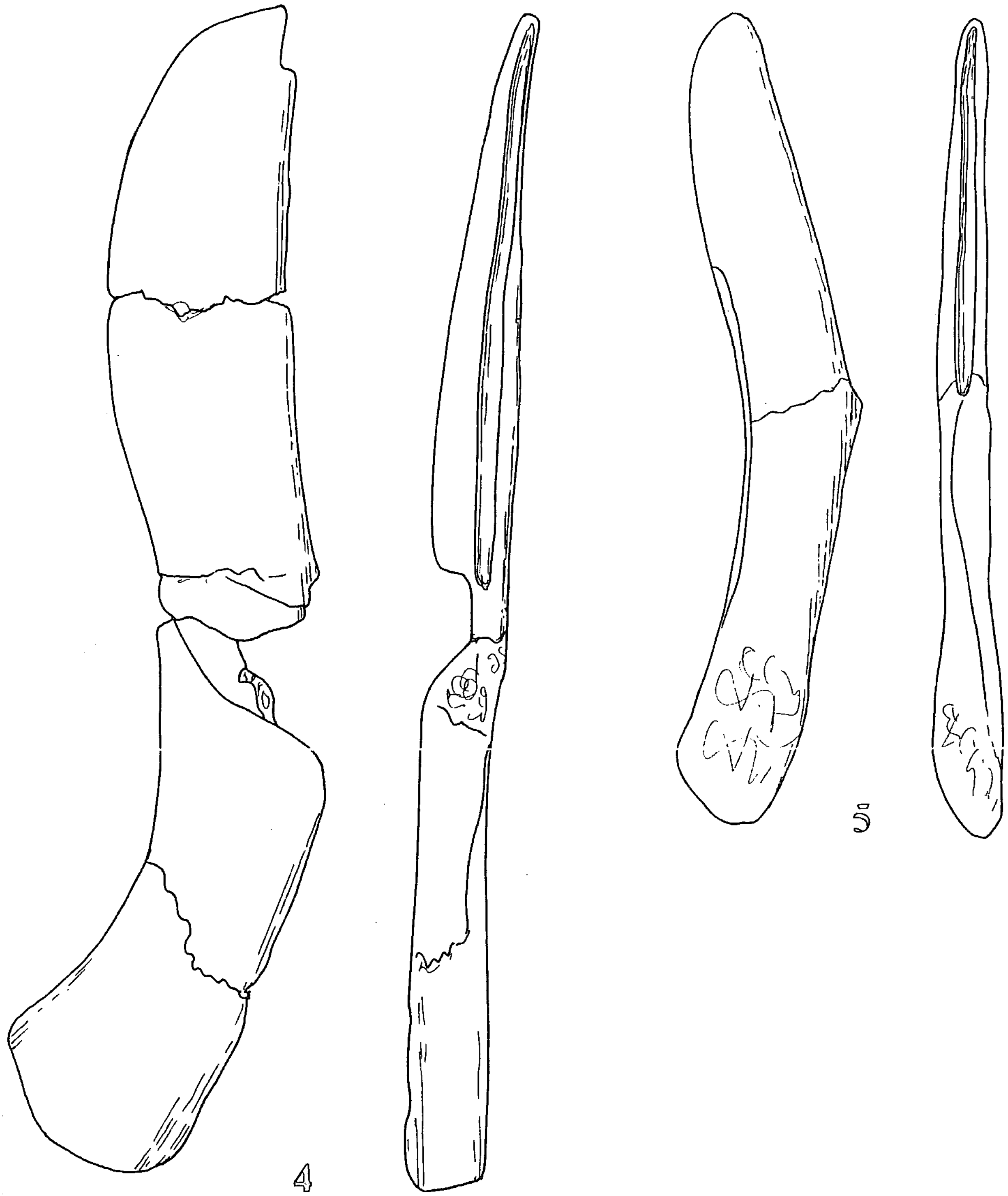


FIG. IV:7b Hafts from Wadi Hammeh. Scale 1:2

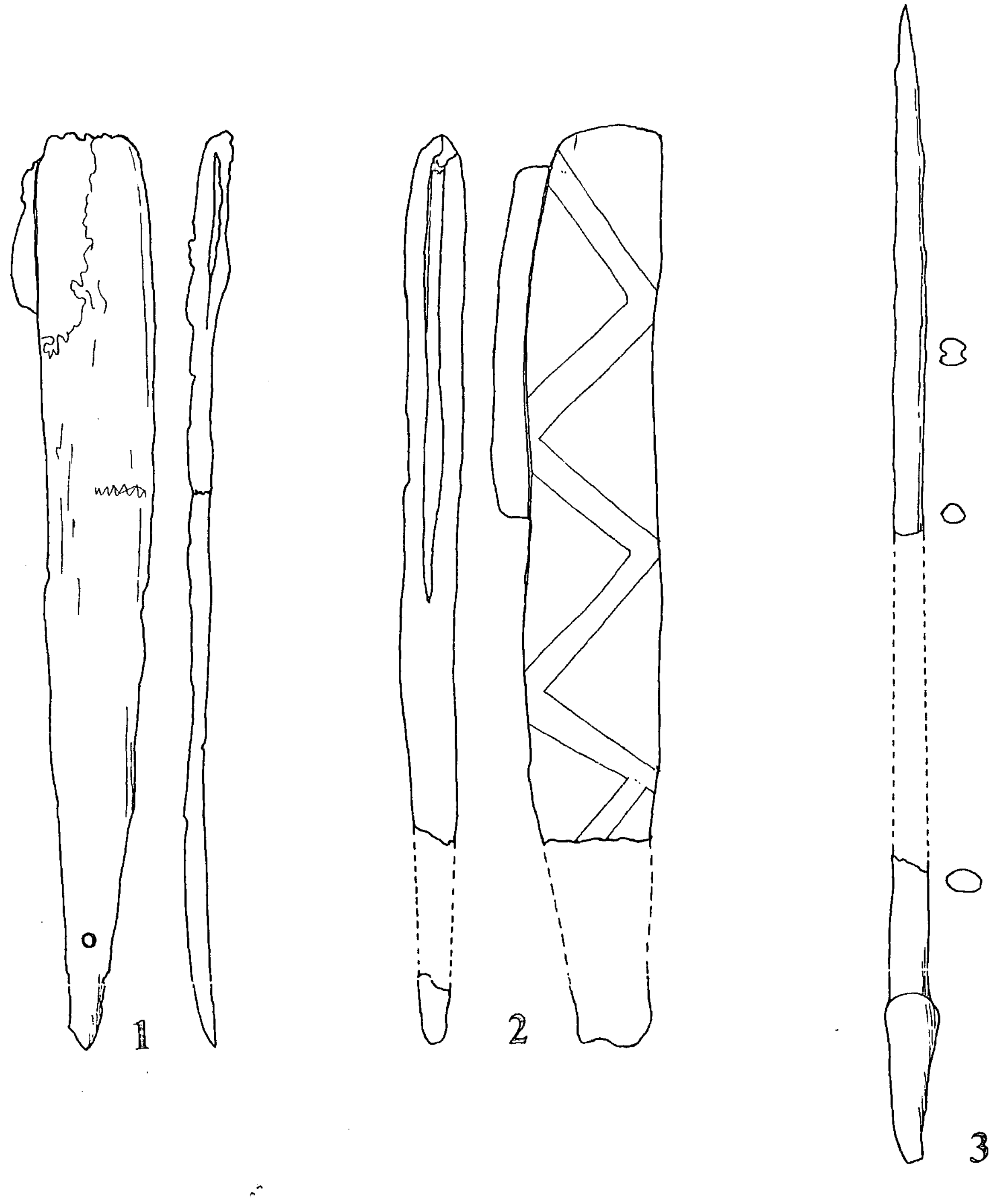
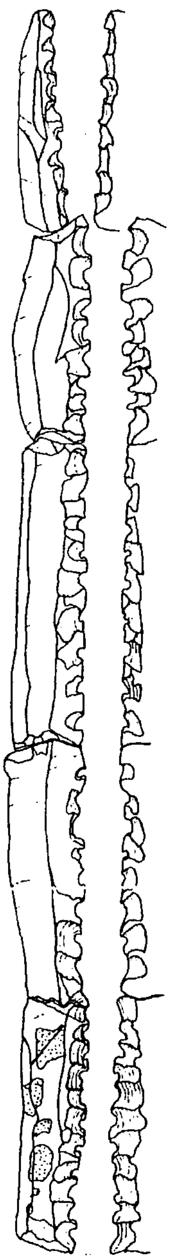
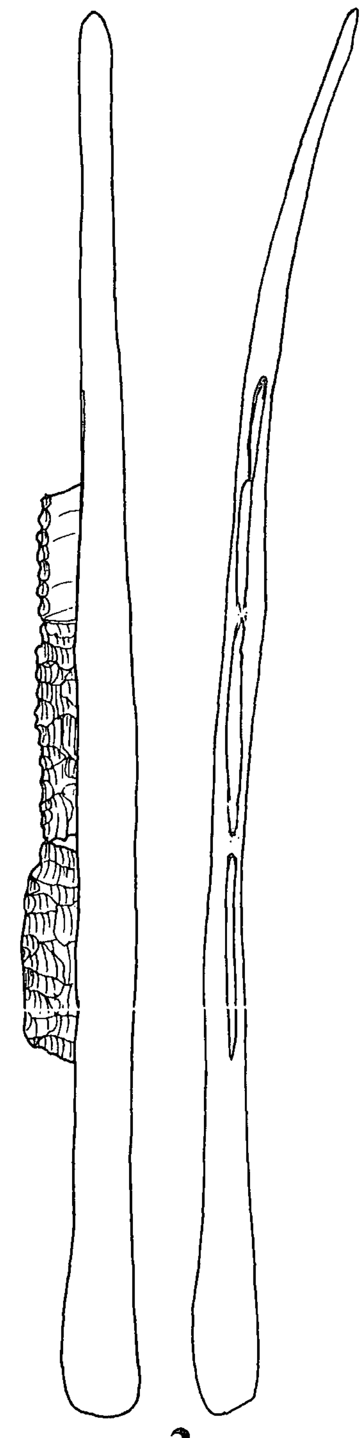


FIG. IV:8 Hafts with Single Blade and a Double-sided haft
no.1 Shanidar, no.2 Sialk and no.3 Hacilar



1



2

FIG. IV:9 Straight Hafts with Coarsely denticulated blades
no.1 Setting of Blades (haft decayed) from Sha'ar Hagolan. Scale 1:2
no.2 Haft with Blades from Fayum Scale 1:4

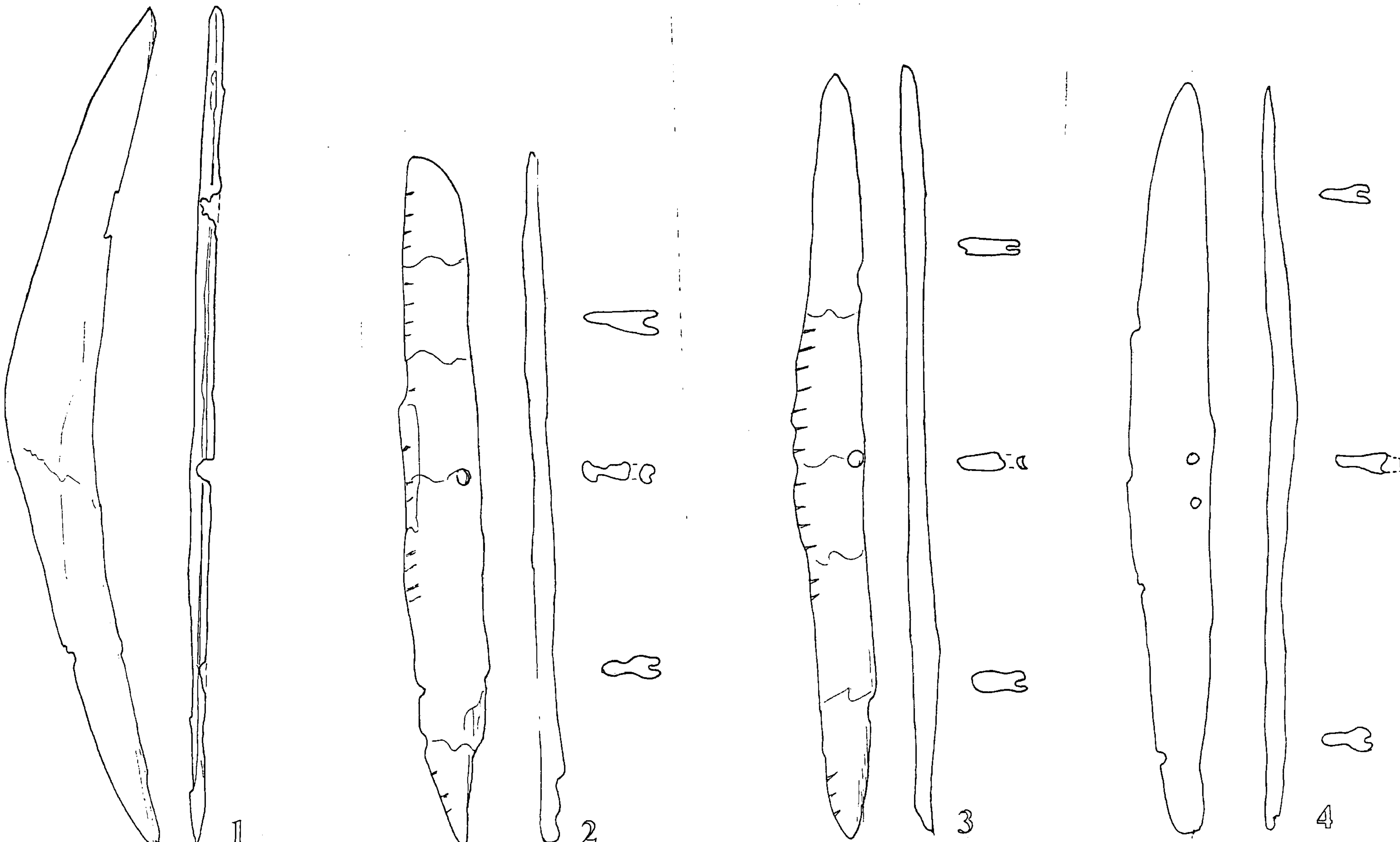


FIG. IV:10 Hafts from Zawi Chemi (no. 1) and Shimshara (nos. 2-4). Scale 1:2

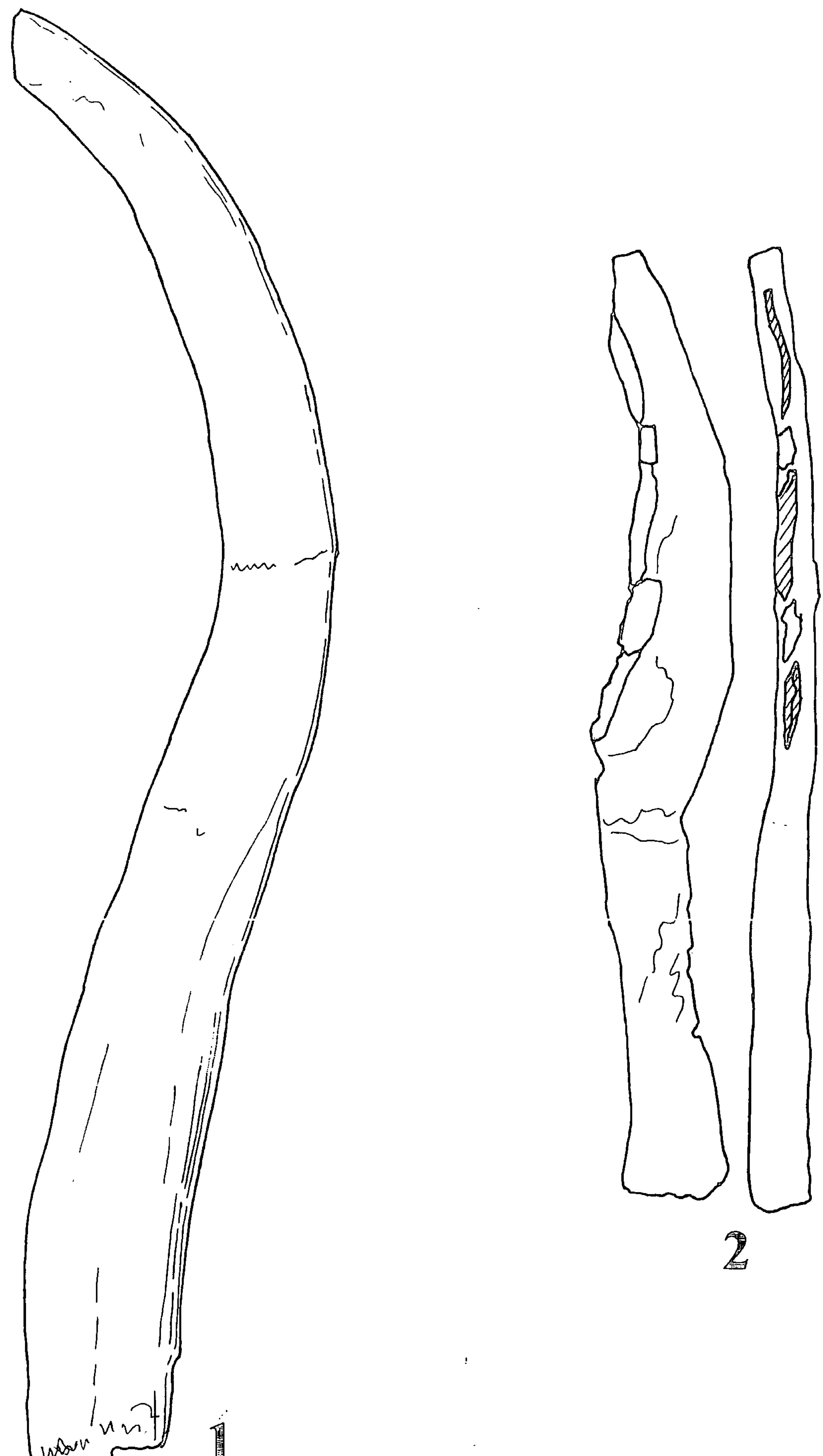


FIG.IV:11 Hafts from Çayönü (no. 1). Scale 1:1 and Nahal Hemar (size not known).

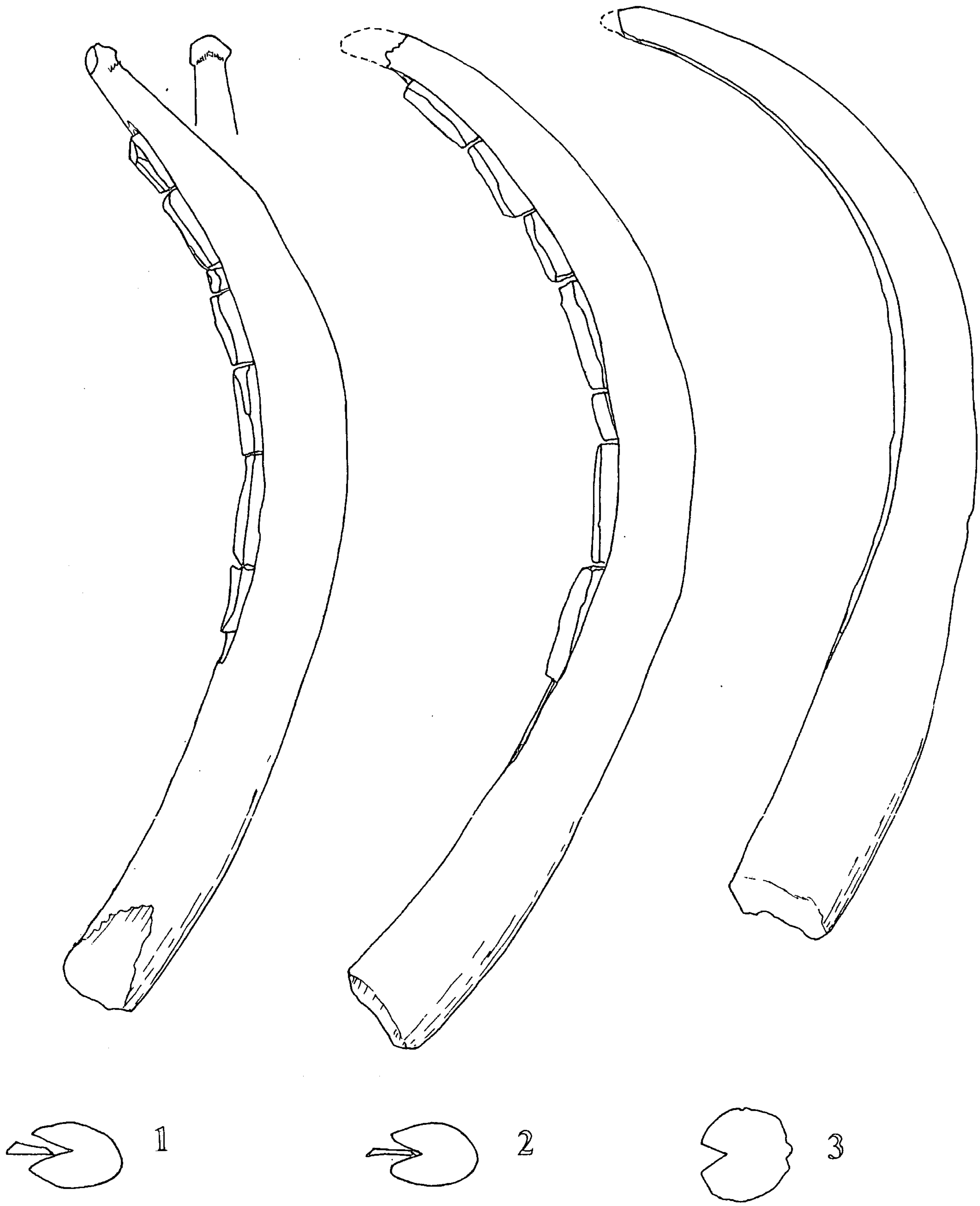


FIG. IV:12 Hafts from Hacilar. Scale 1:2

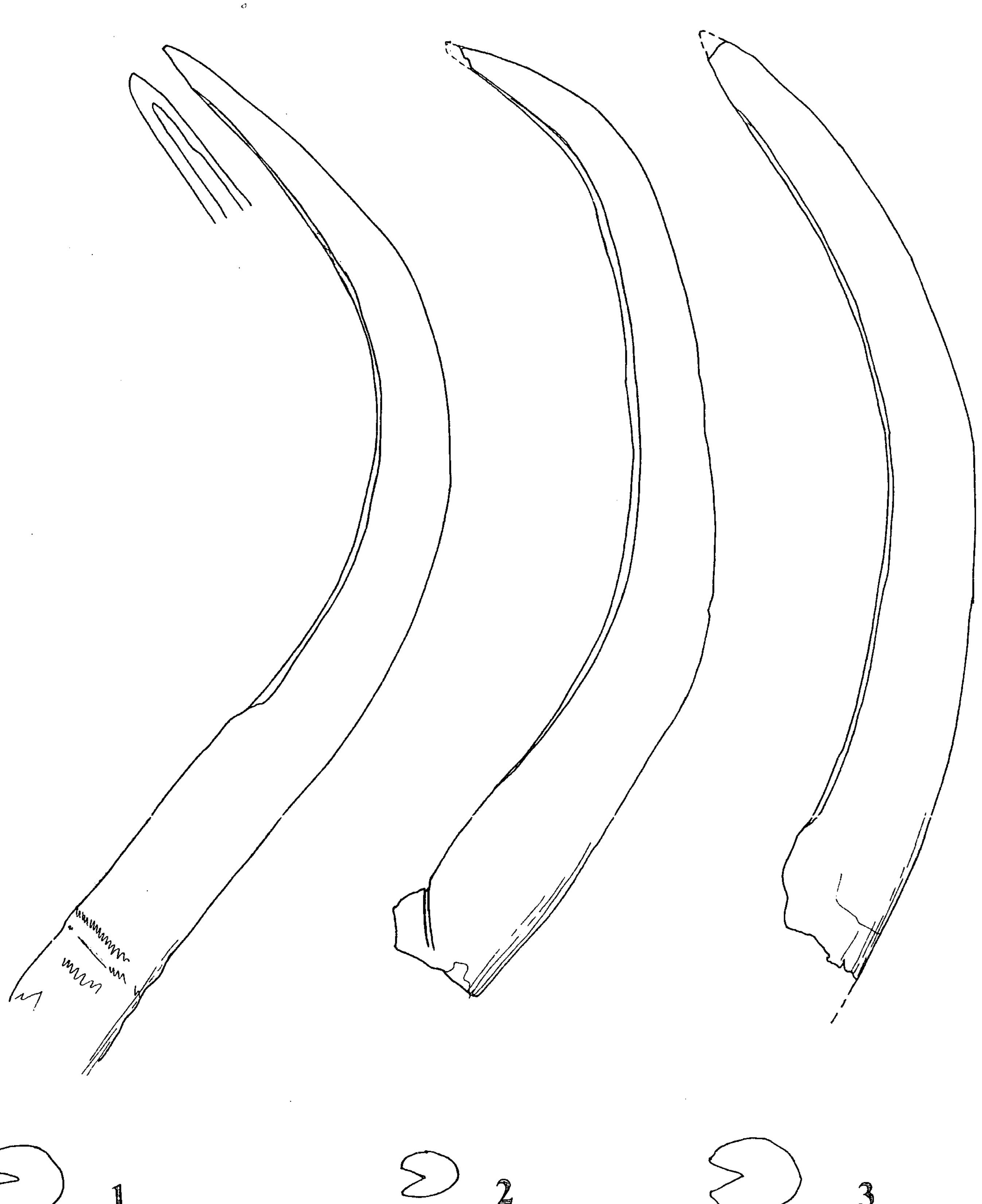
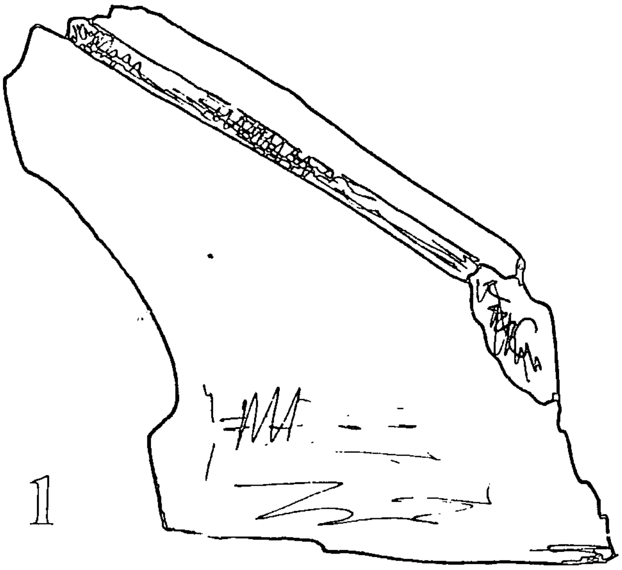


FIG. IV:13 Hafts from Hacilar. Scale 1:2



1

FIG.IV:14 Jaw-Bone Haft from Sha'ar Hagolan. Scale 1:1

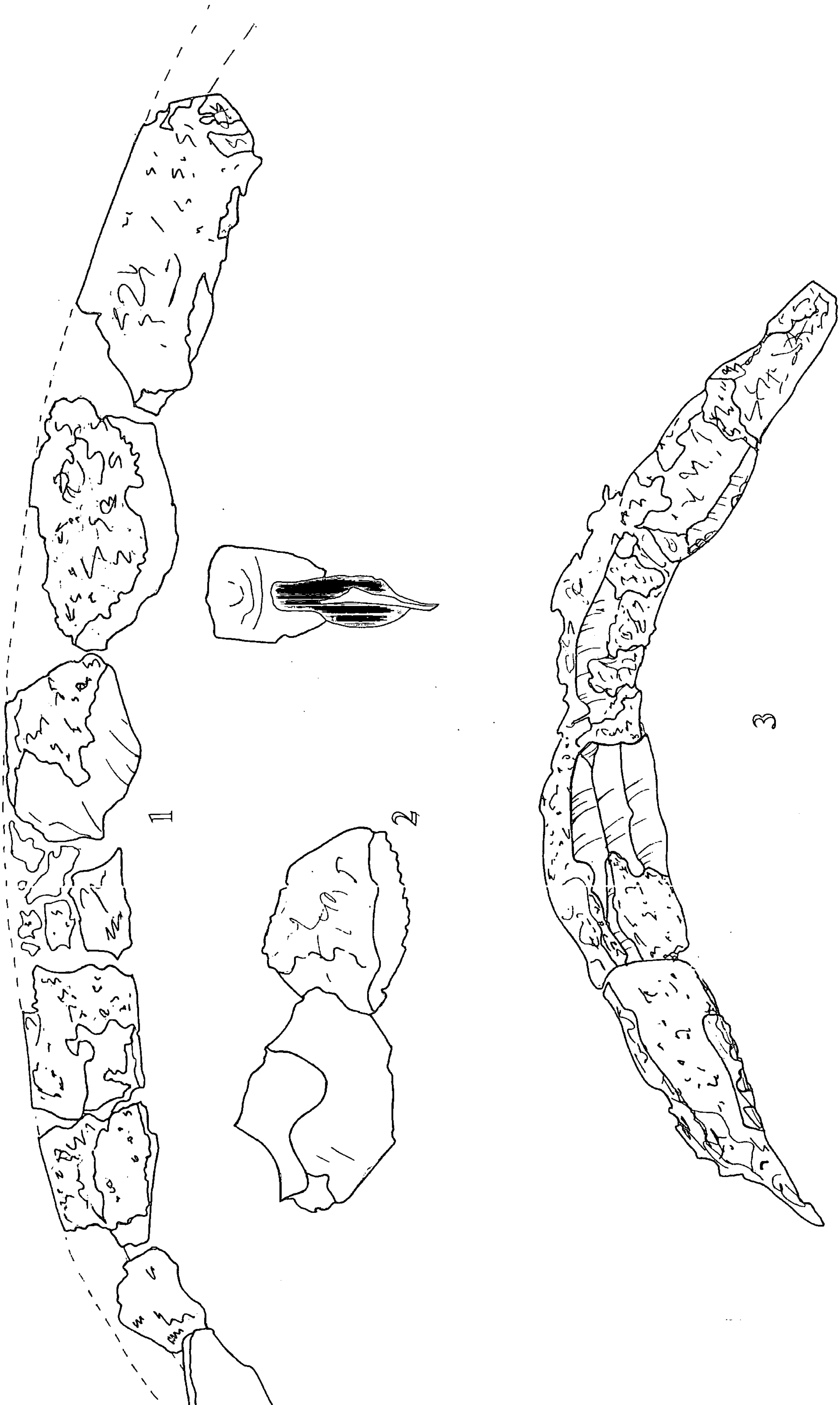


FIG. IV.15 Blades set in Bitumen from Hassuna (nos. 1 and 2) and Jarmo (no 3). Scale 1:2

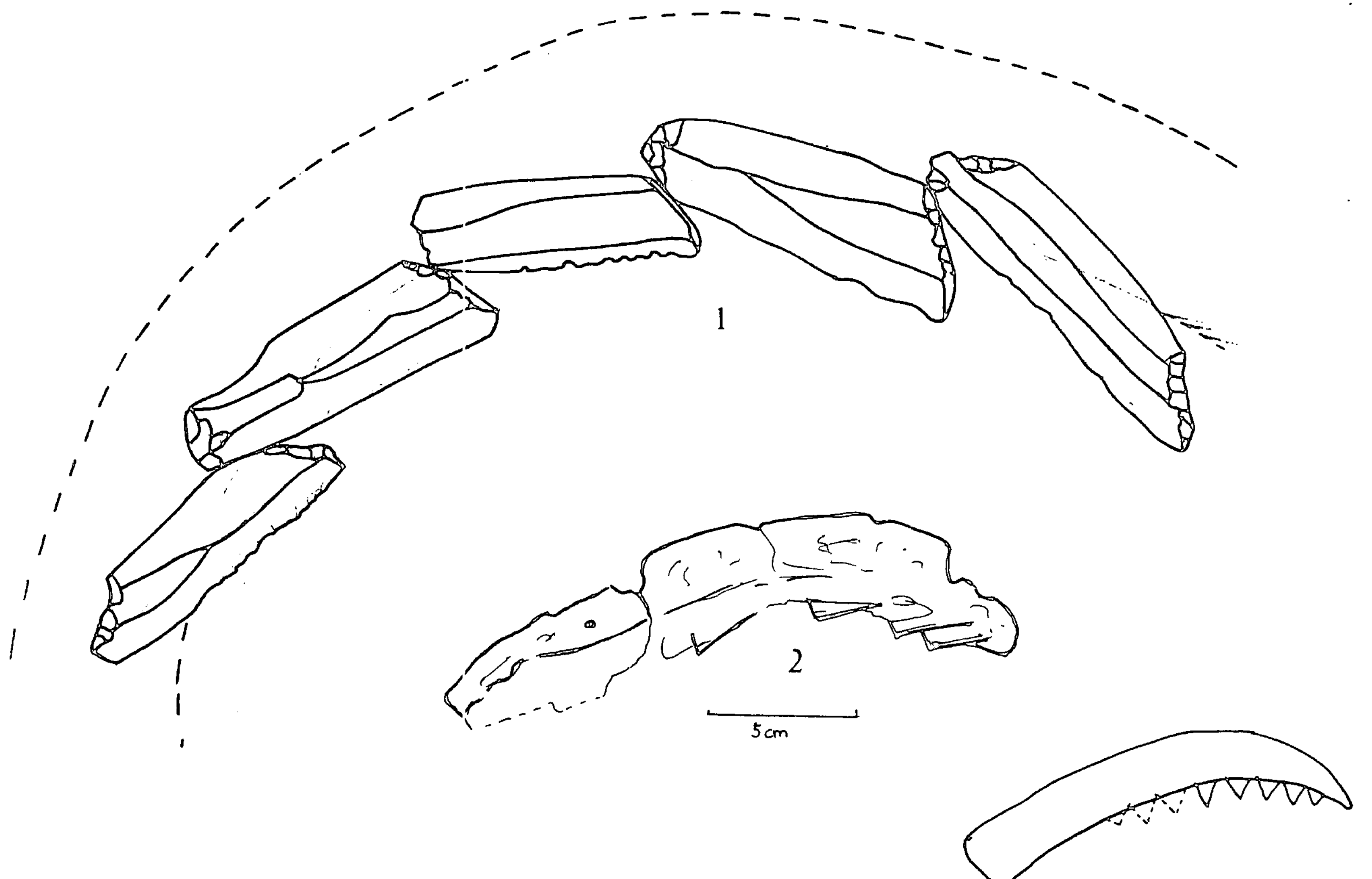
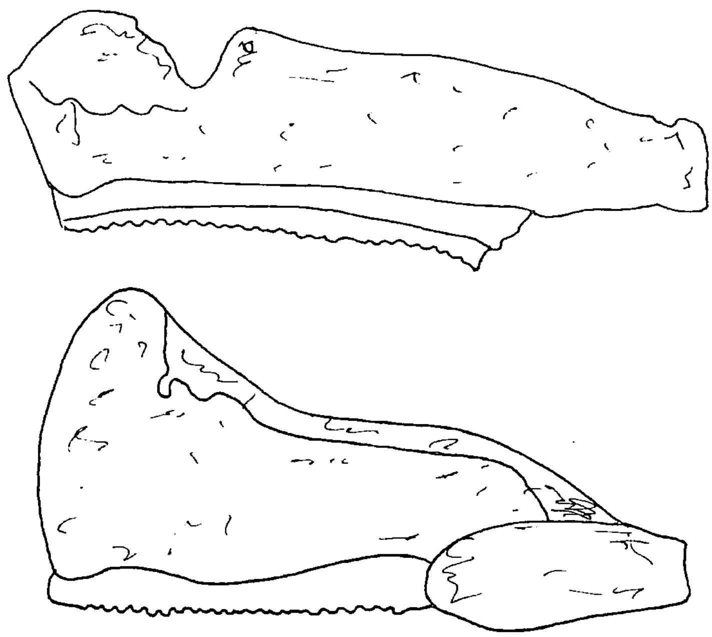
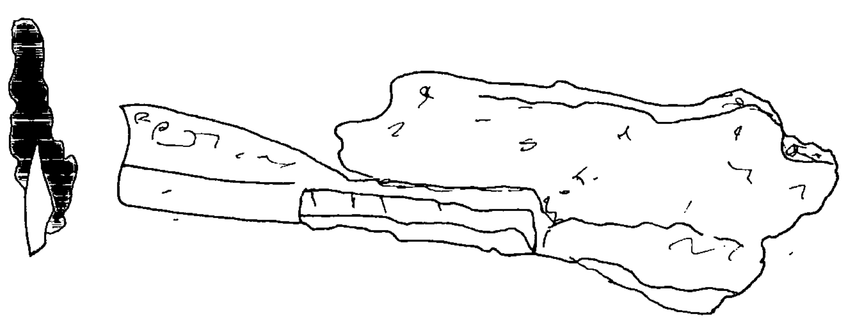


FIG.IV:16 Hafts with Obliquely Set Blades
No. 1 Reconstructed Haft from Aswad (Balikh) Scale 1:1
No. 2 Blades in Bitumen from Tell es Sawwan Scale 1:2
No. 3 Haft from Pulur, Anatolia



1



2

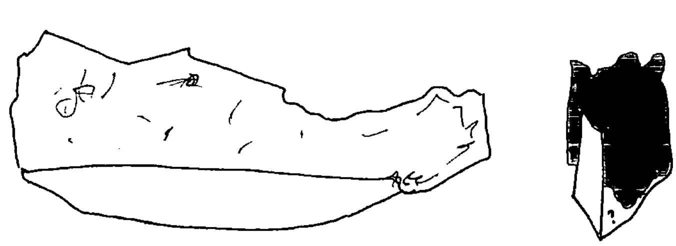


FIG.IV:17 Blades set in Bitumen
No. 1 Ur, no. 2 Tepe Gawra. Scale 1:1

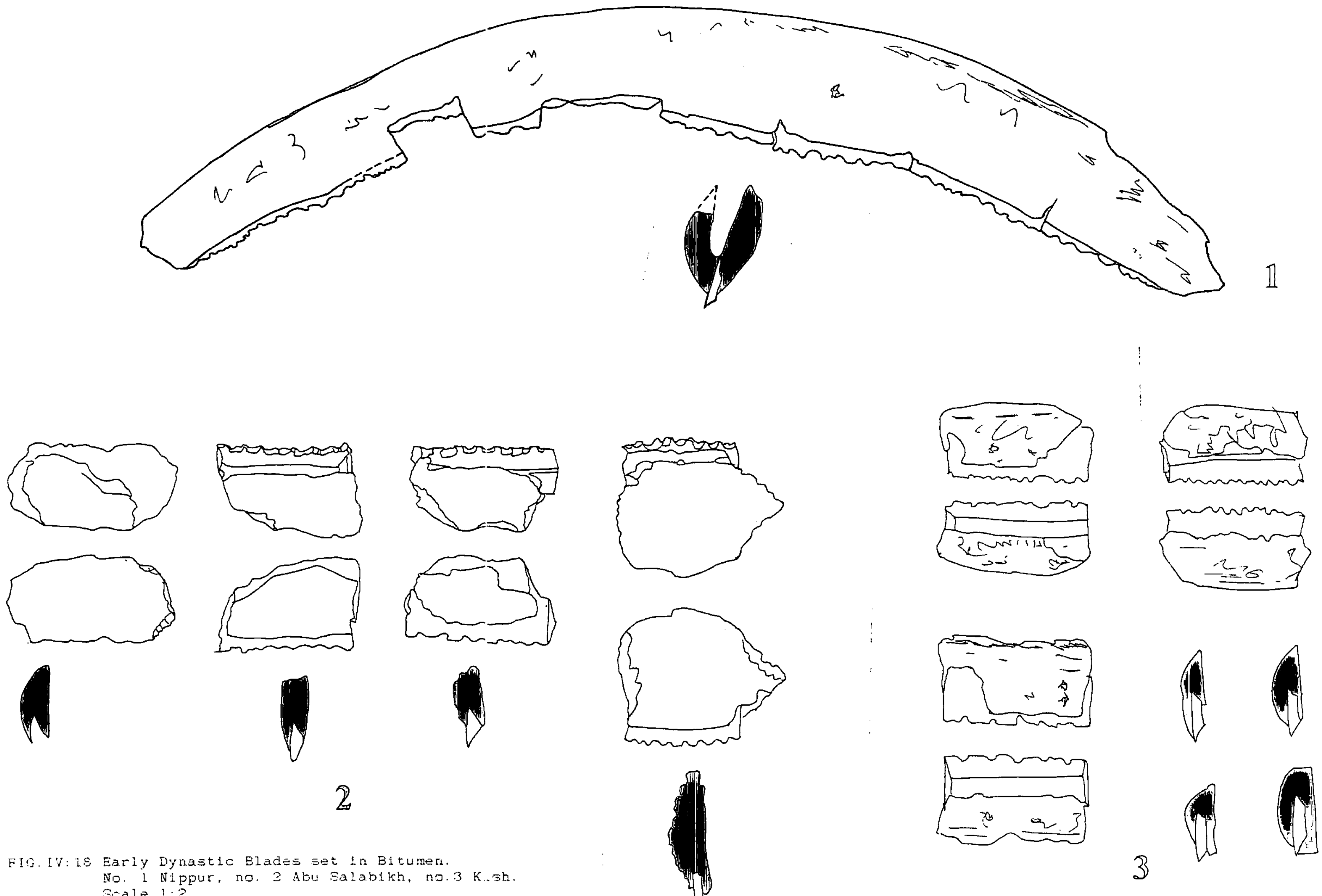


FIG. IV:18 Early Dynastic Blades set in Bitumen.
No. 1 Nippur, no. 2 Abu Salabikh, no.3 K.sh.
Scale 1:2

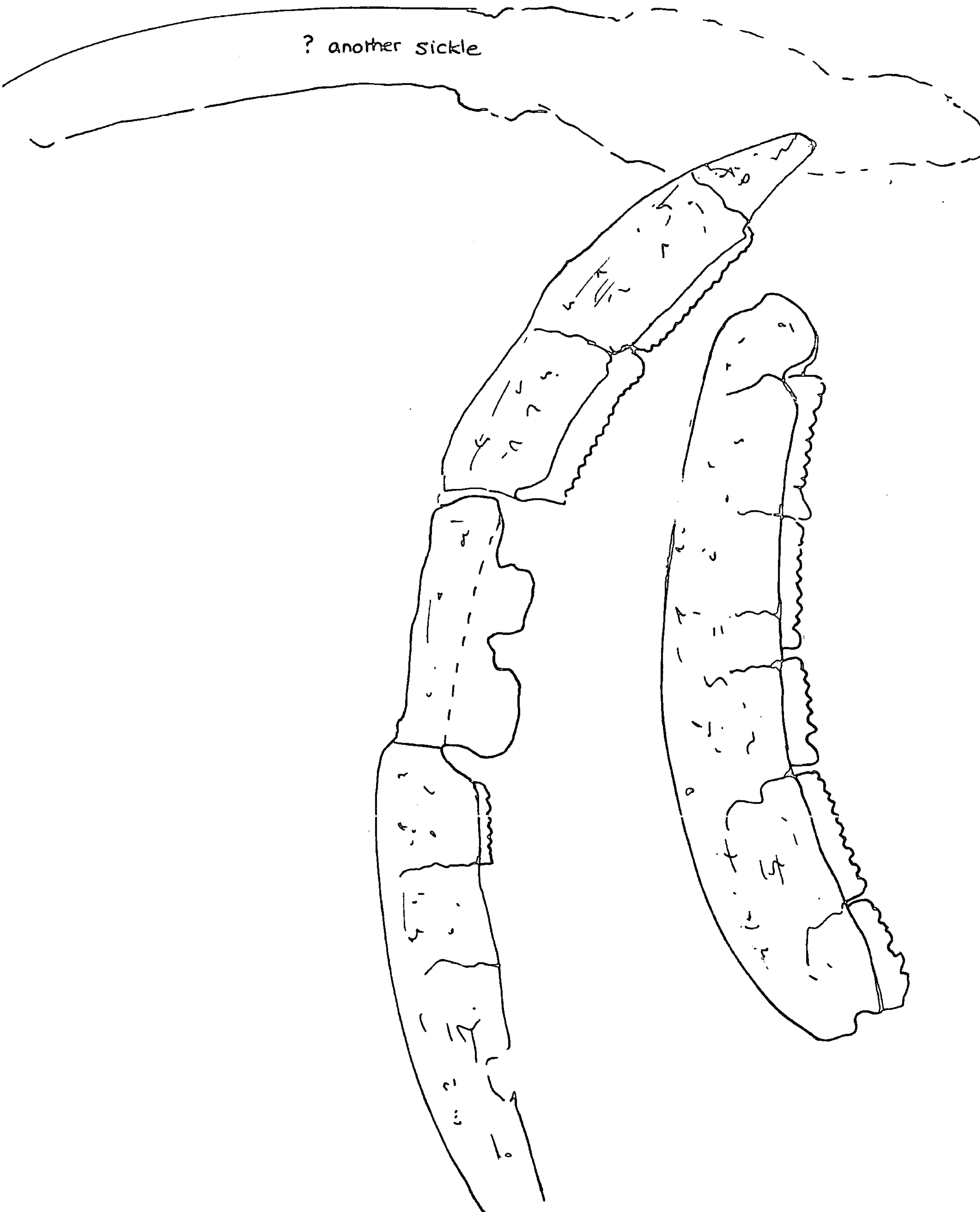


FIG.IV:19 Blades set in Bitumen from Khafajah. Scale approx. 1:2

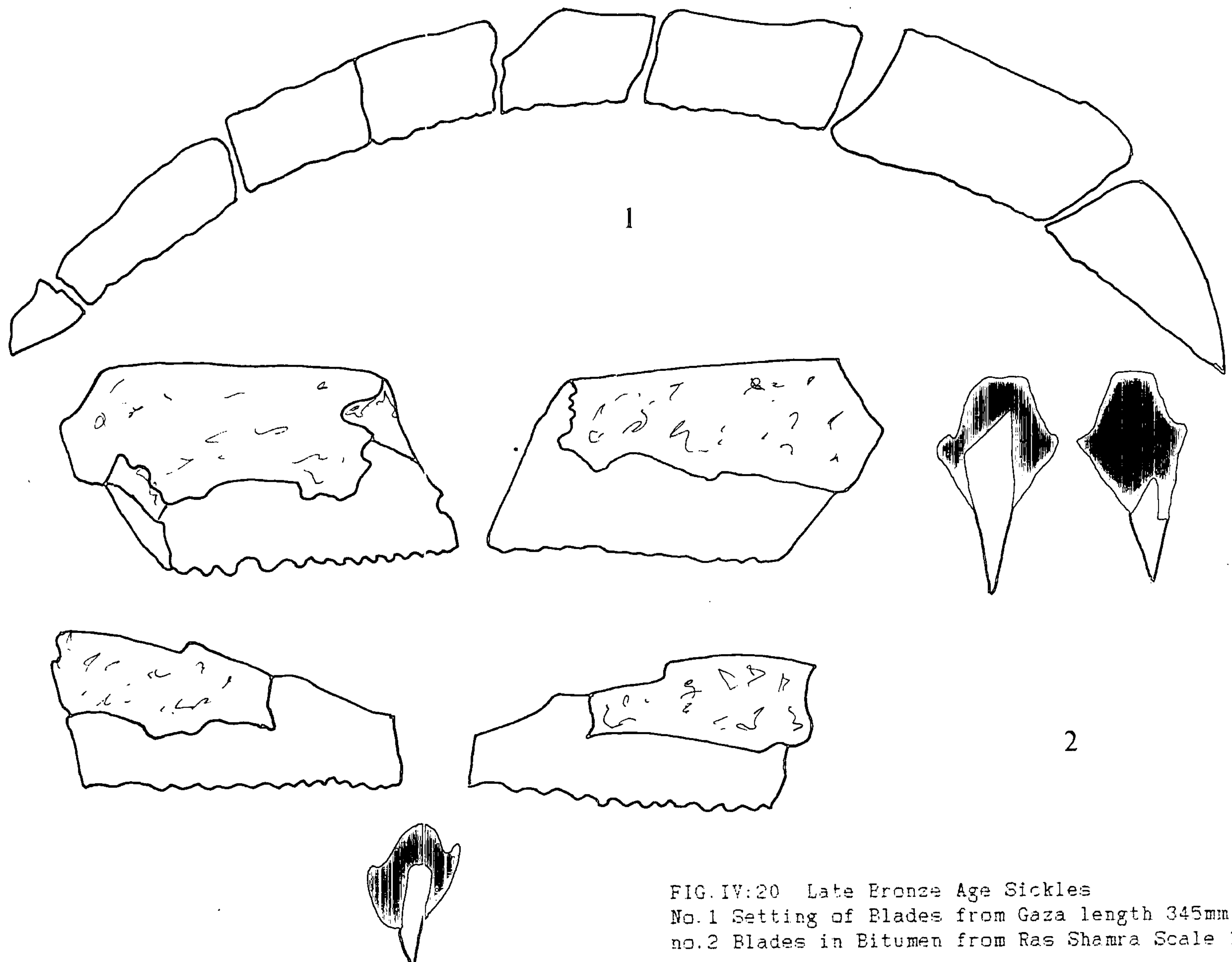


FIG.IV:20 Late Bronze Age Sickles
No.1 Setting of Blades from Gaza length 345mm
no.2 Blades in Bitumen from Ras Shamra Scale 1:1

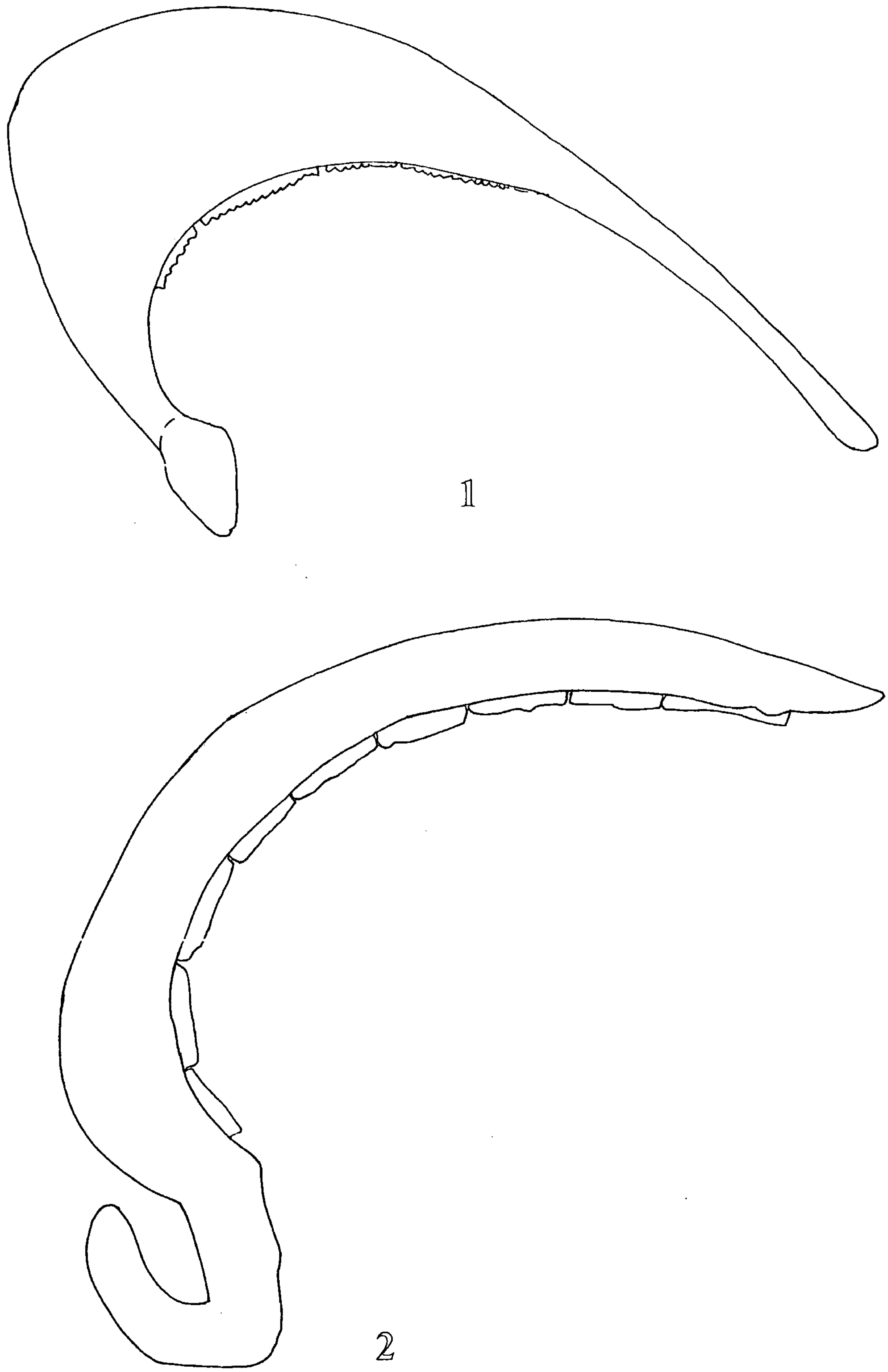


Fig.IV:21 Egyptian Hafts
No. 1 Kahun, no.2 Hemaka Scale approx. 1:4

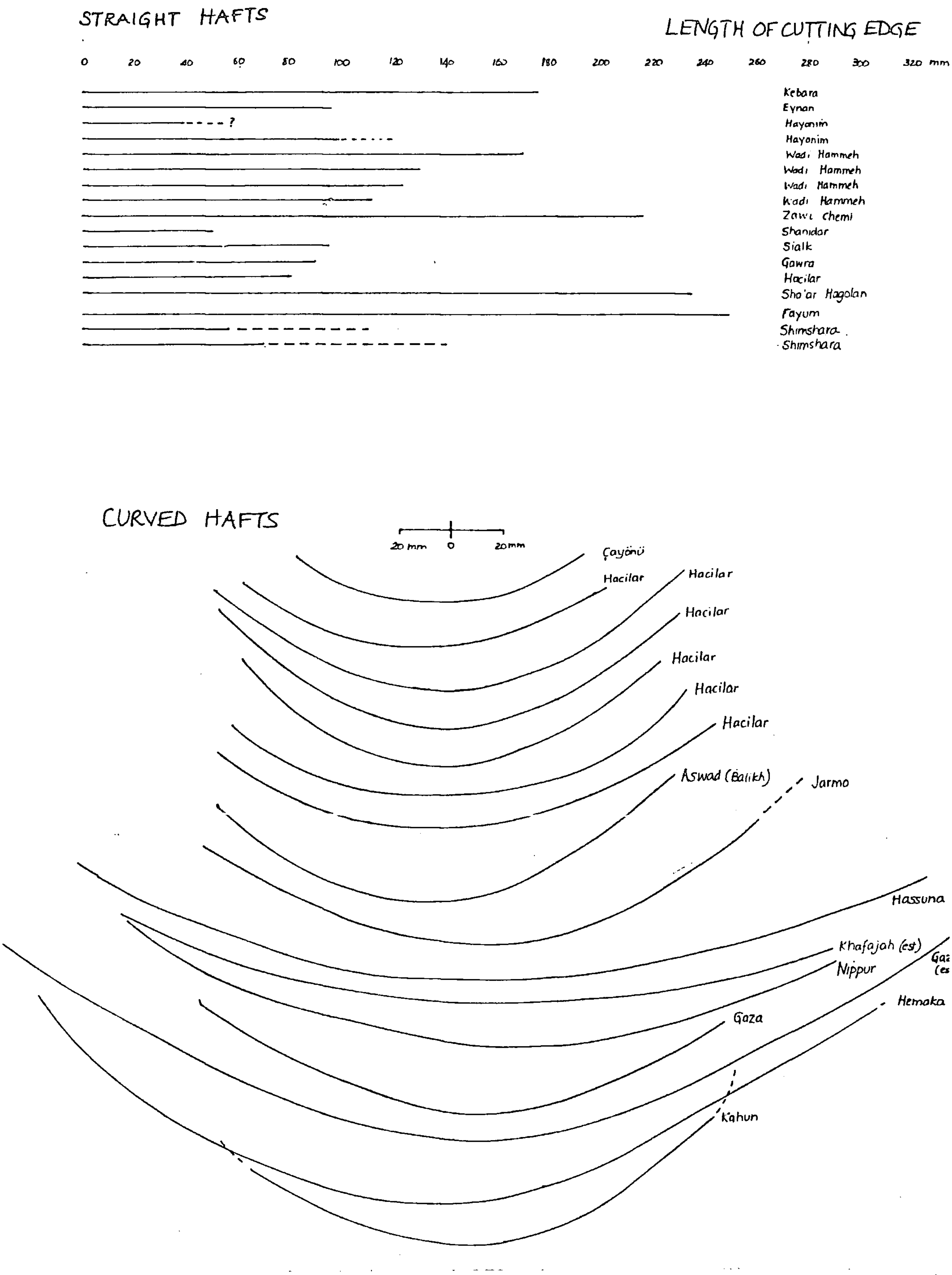


FIG. IV:22 Comparison of length of cutting edges of complete or reconstructable sickles

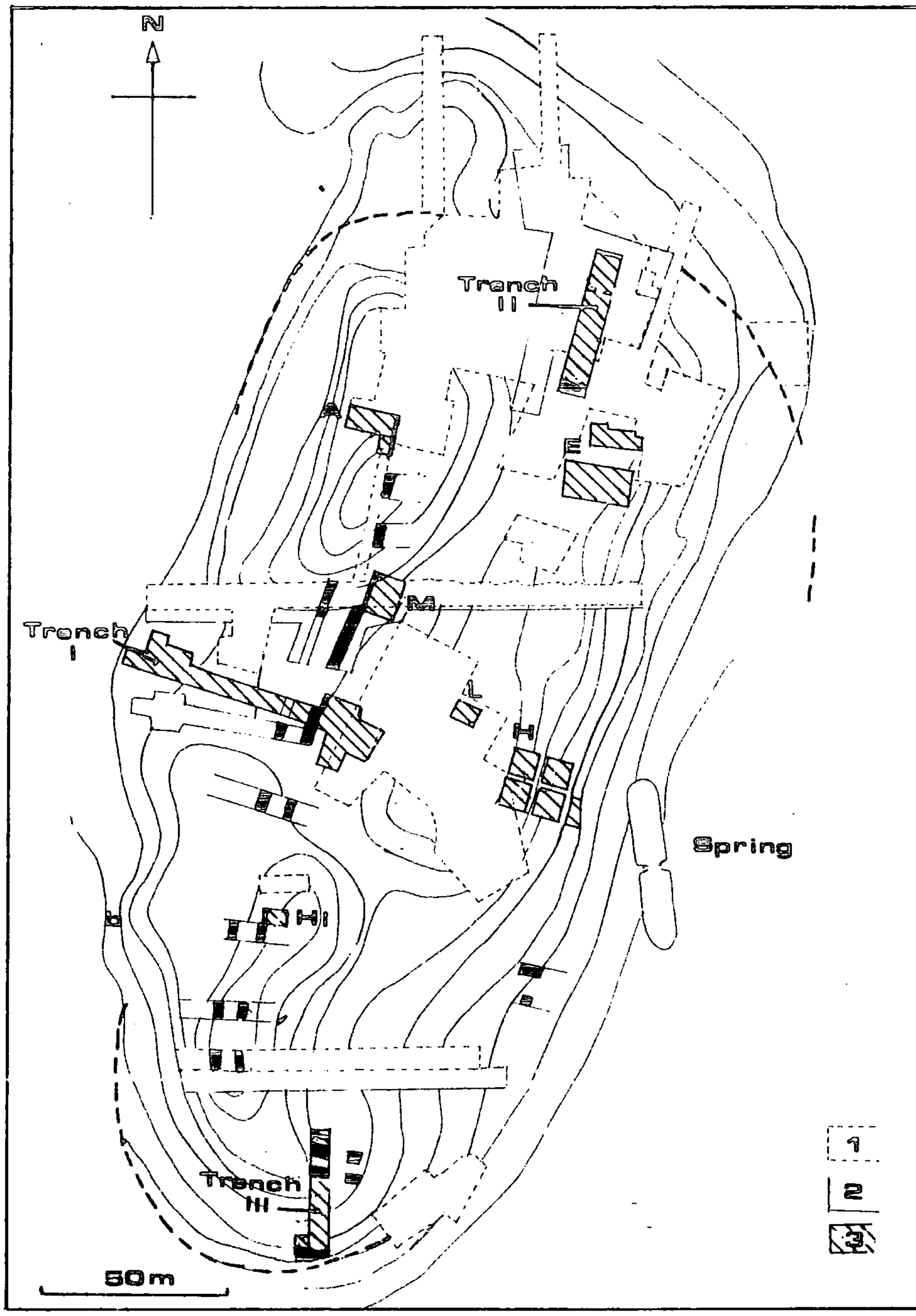


FIG.V: 1 Site Plan of Jericho
(after Kenyon and Holland) showing excavated areas: 1 Sellin and Watzinger, 2 Garstang 3 Kenyon

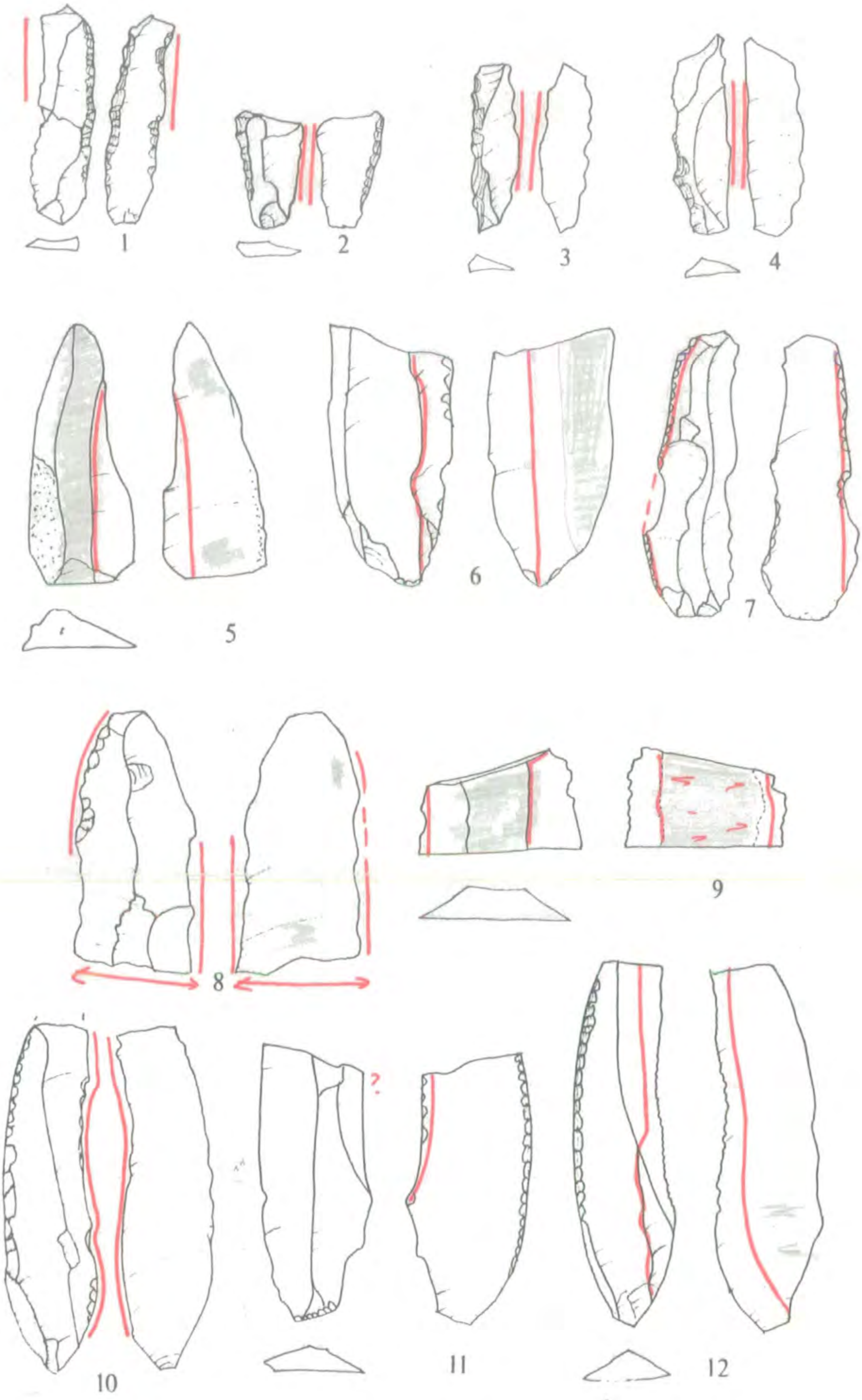


FIG.V: 2 Natufian and Proto-Neolithic lustred blades: Classes I.E and I.B.
Scale 1:1

— Extent of lustre = Bitumen

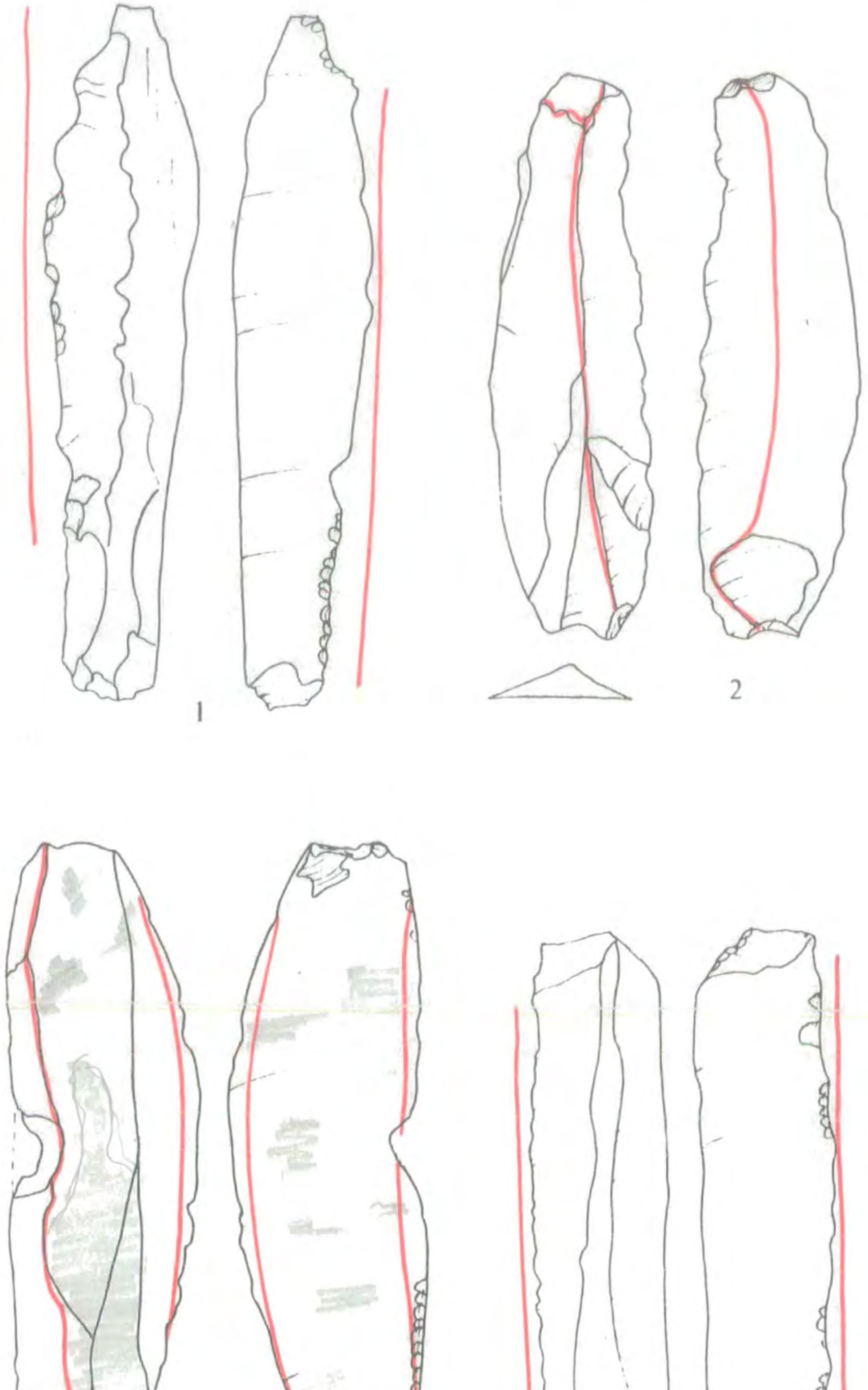


FIG.V: 3 PPNA Lustred Blades: Classes I.B and I.C (no. 4 possibly I.F). Scale 1:1

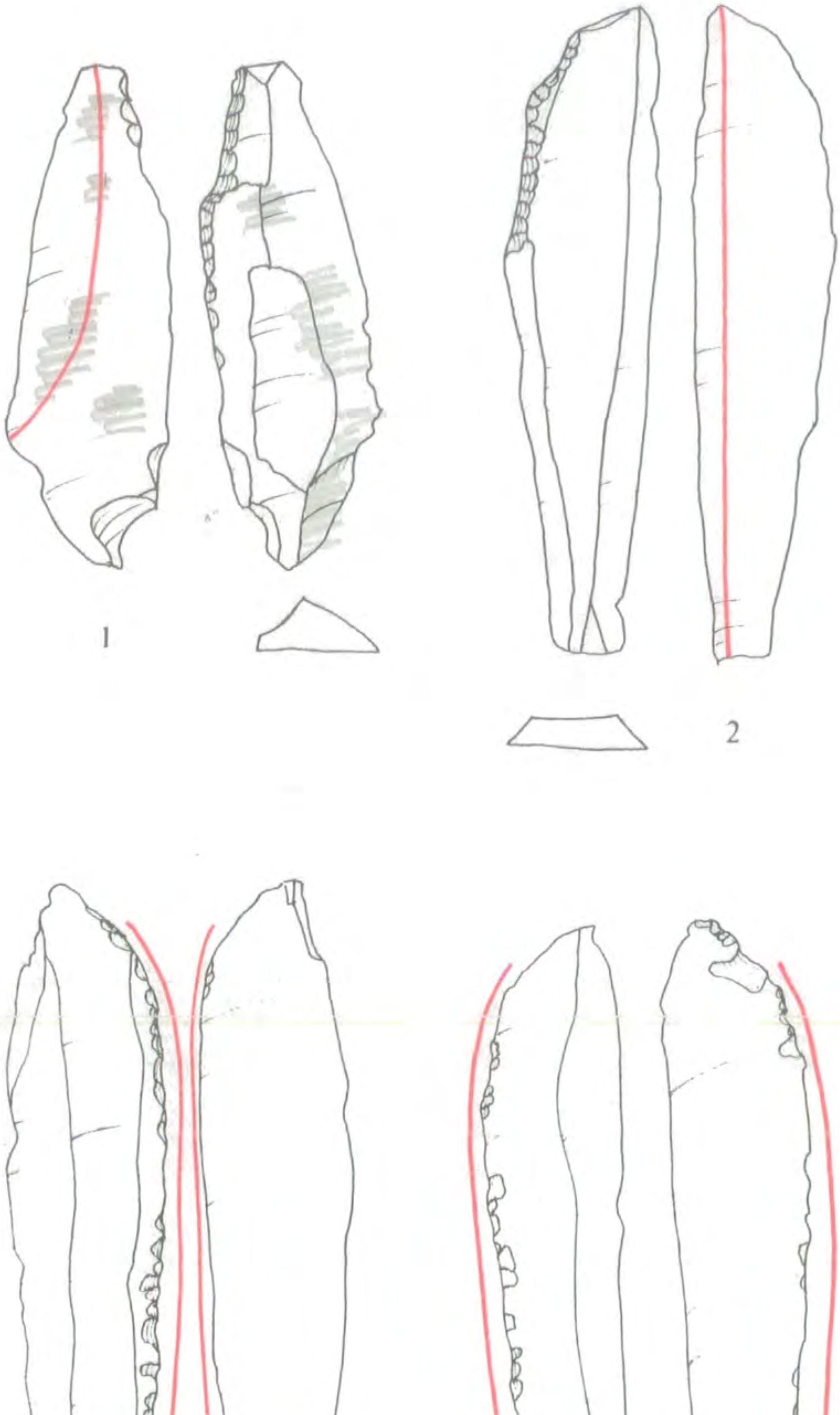


FIG.V: 4 PPNA Lustred Blades: Classes I.B and I.E. Scale 1:1

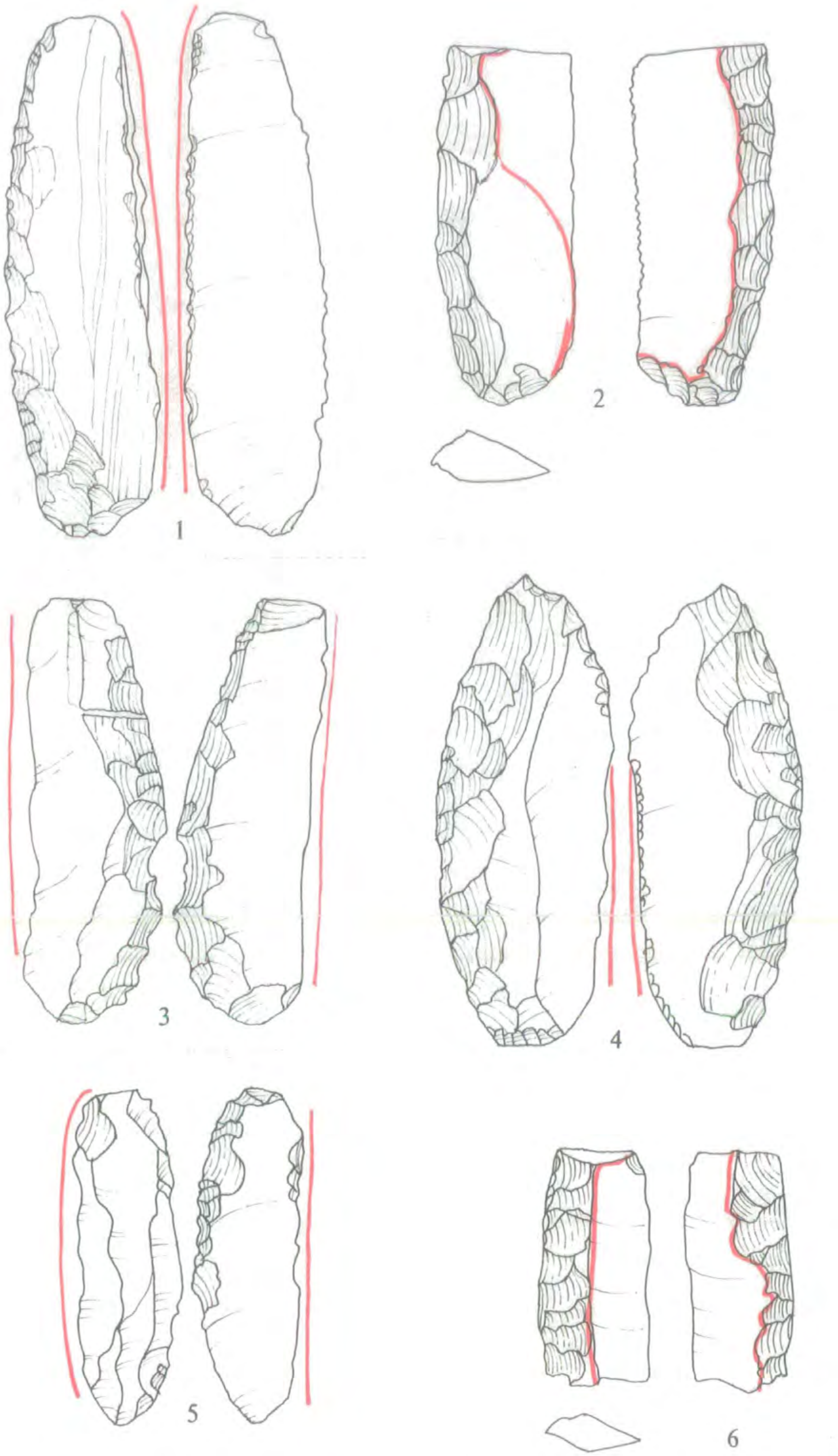


FIG.V: 5 PPNA Lustred Blades: Classes I.E (including Beit Tamir type).Scale 1:1

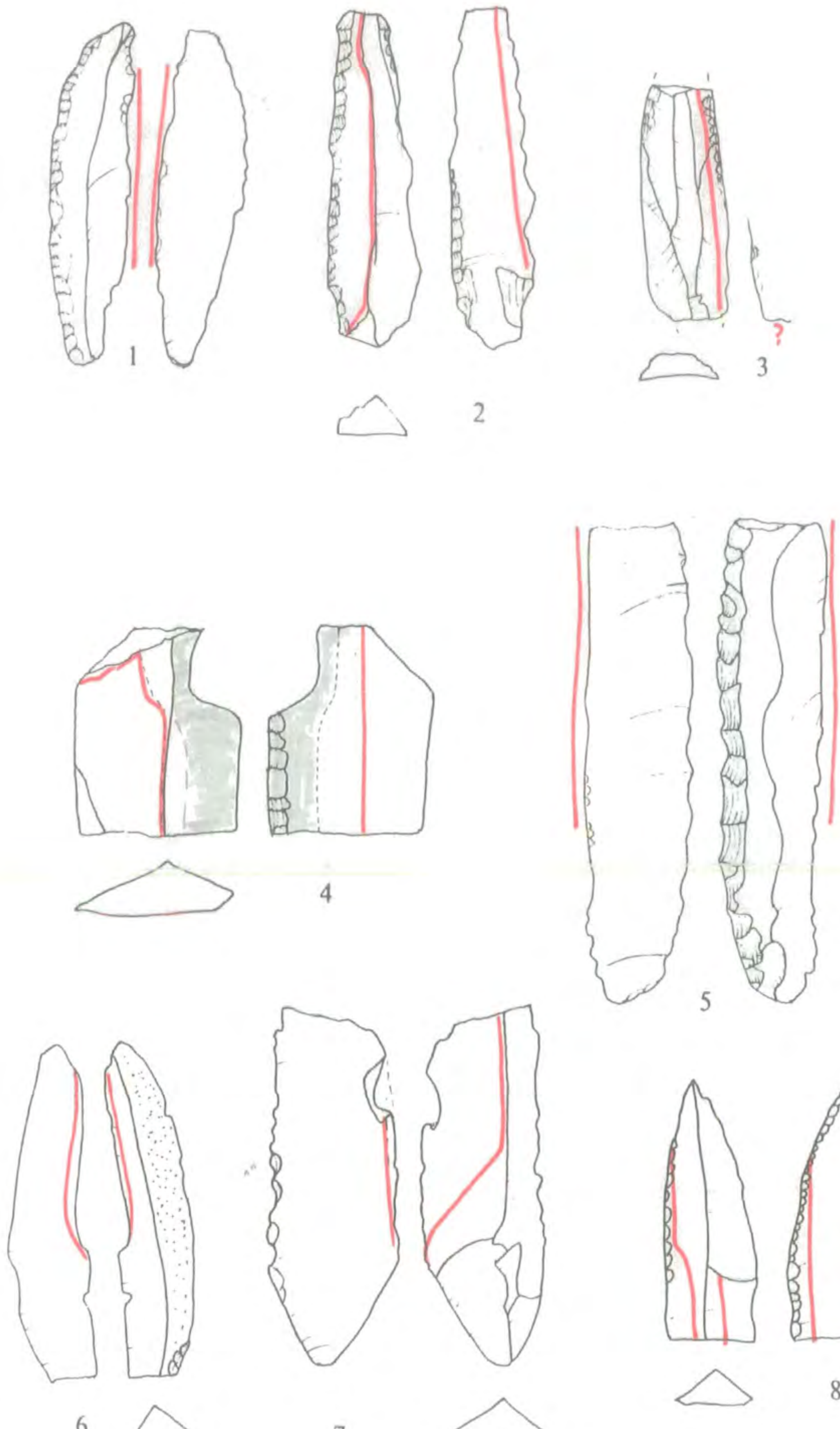


FIG.V: 6 PPNA Lustred Blades: Classes I.E and II.B. Scale 1:1

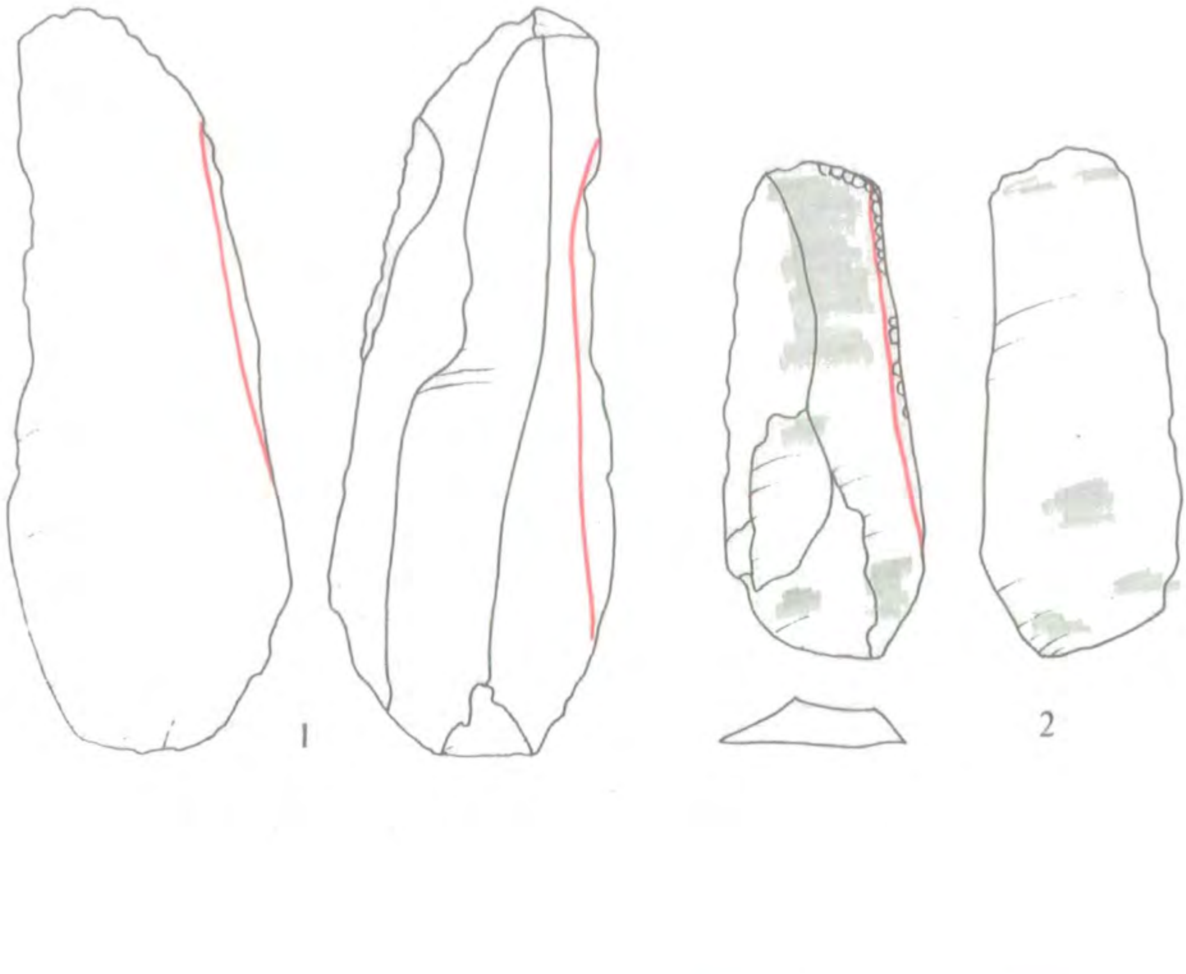


FIG.V: 7 PPNB Lustred Blades: Classes I.B. Scale 1:1

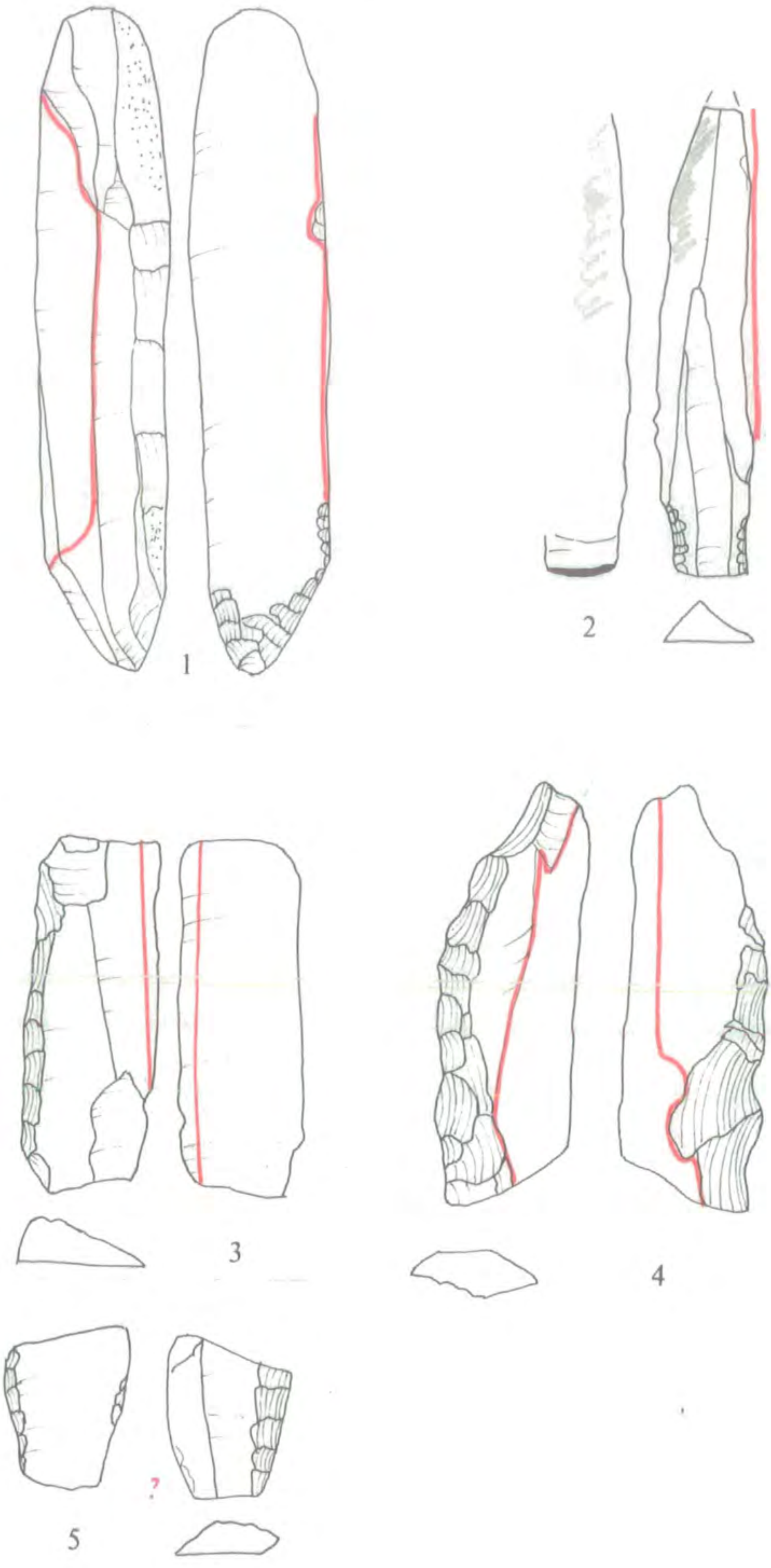


FIG.V: 8 PPNB Lustred Blades: Classes I.C and I.E. Scale 1:1

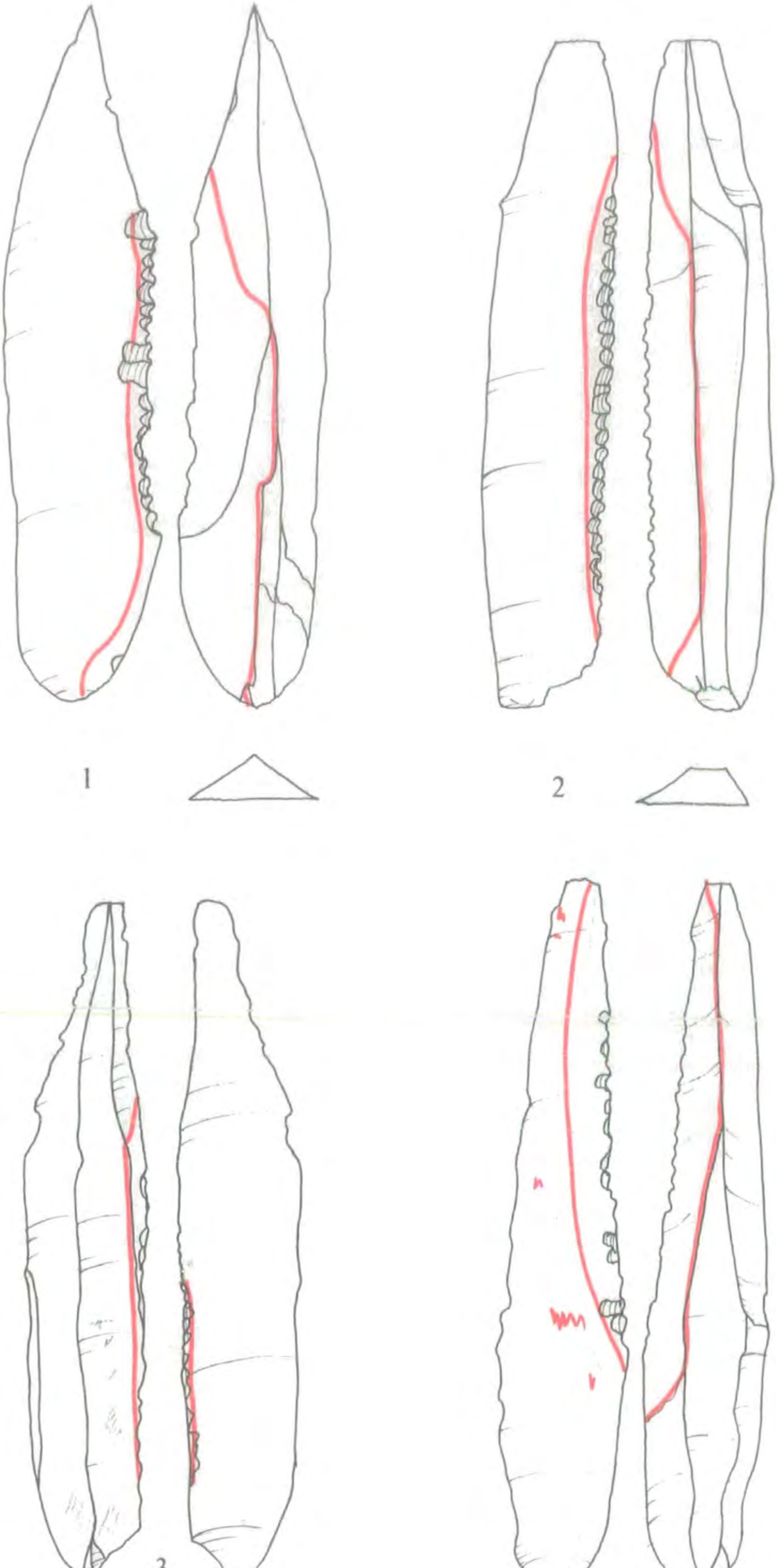


FIG.V: 9 PPNB Lustred Blades: Classes II.B. Scale 1:1

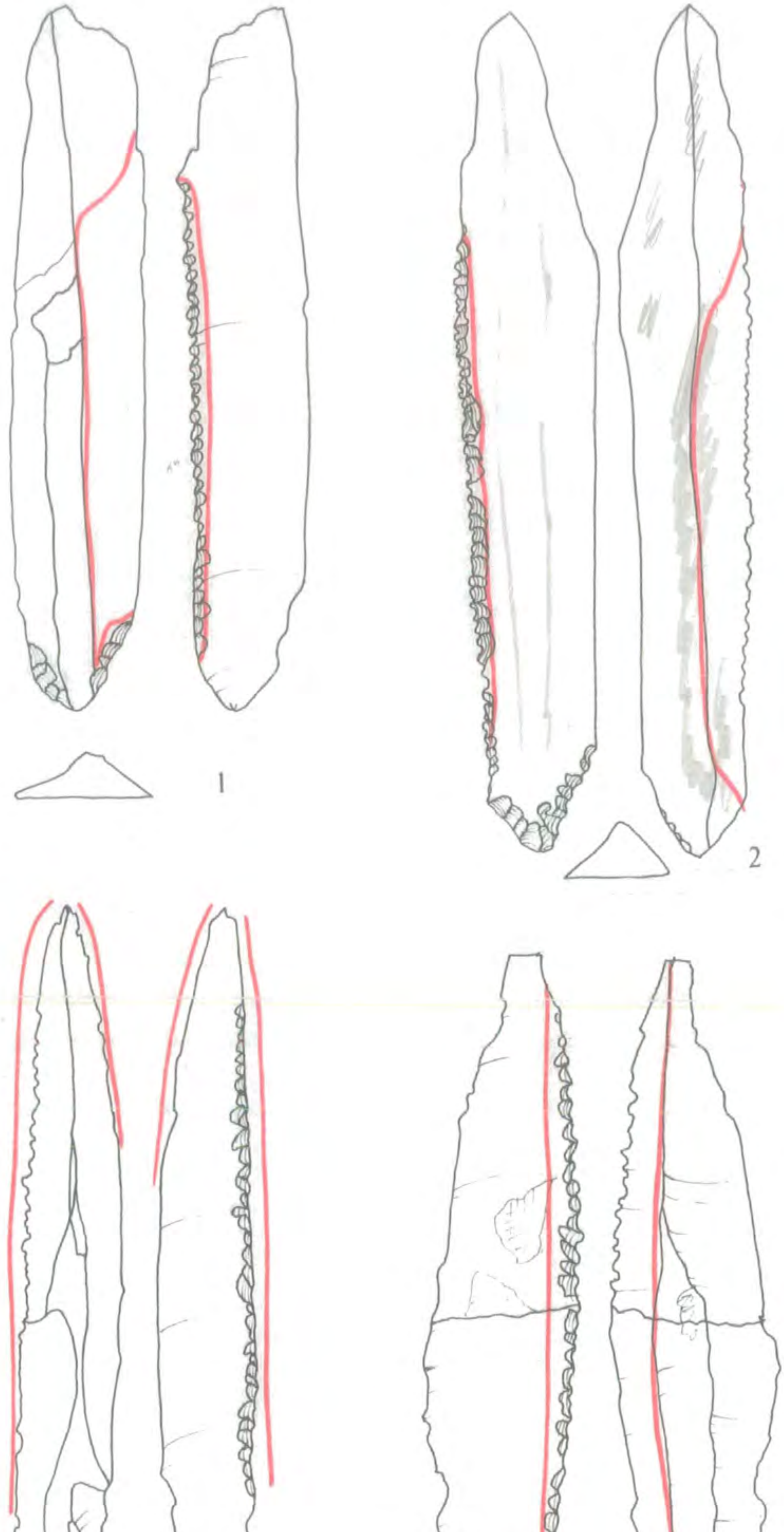


FIG.V:10 PPNB Lustred Blades: Class II.C. Scale 1:1

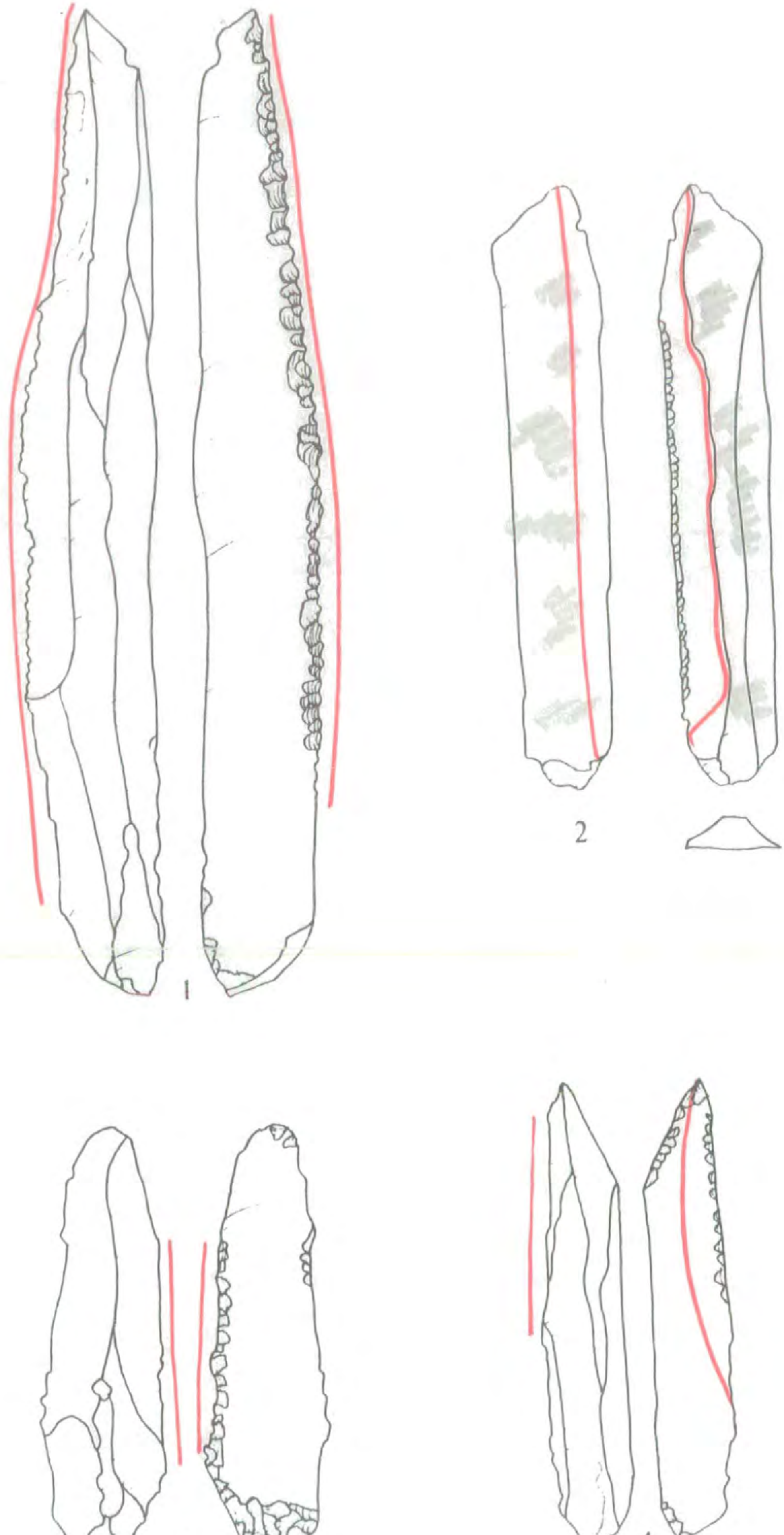


FIG.7.11 PPNB Lustred Blades: Classes II.C and II.D. Scale 1:1

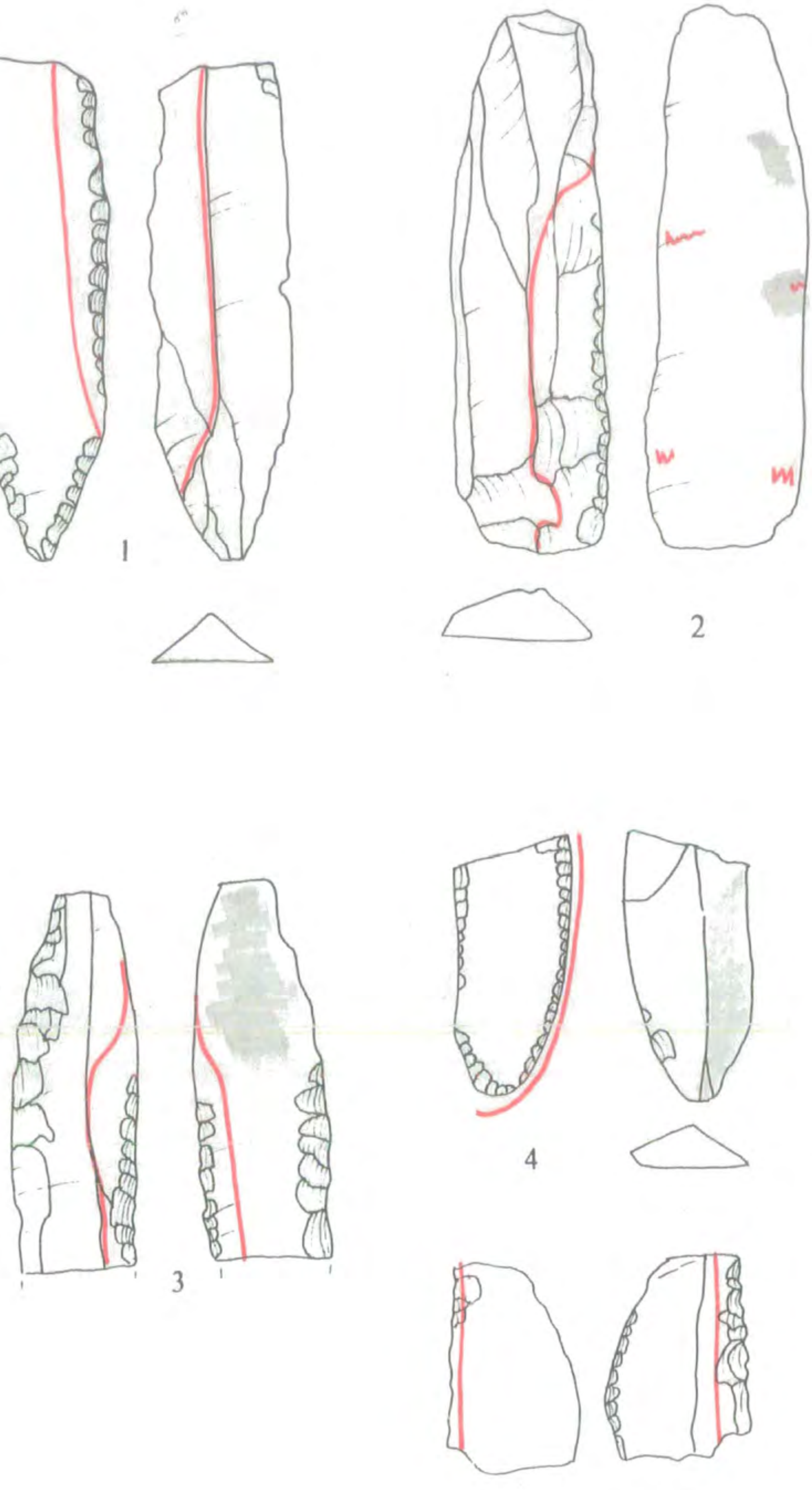


FIG.V:12 PPNB Lustred Blades: Classes II.C, II.D and II.E. Scale 1:1

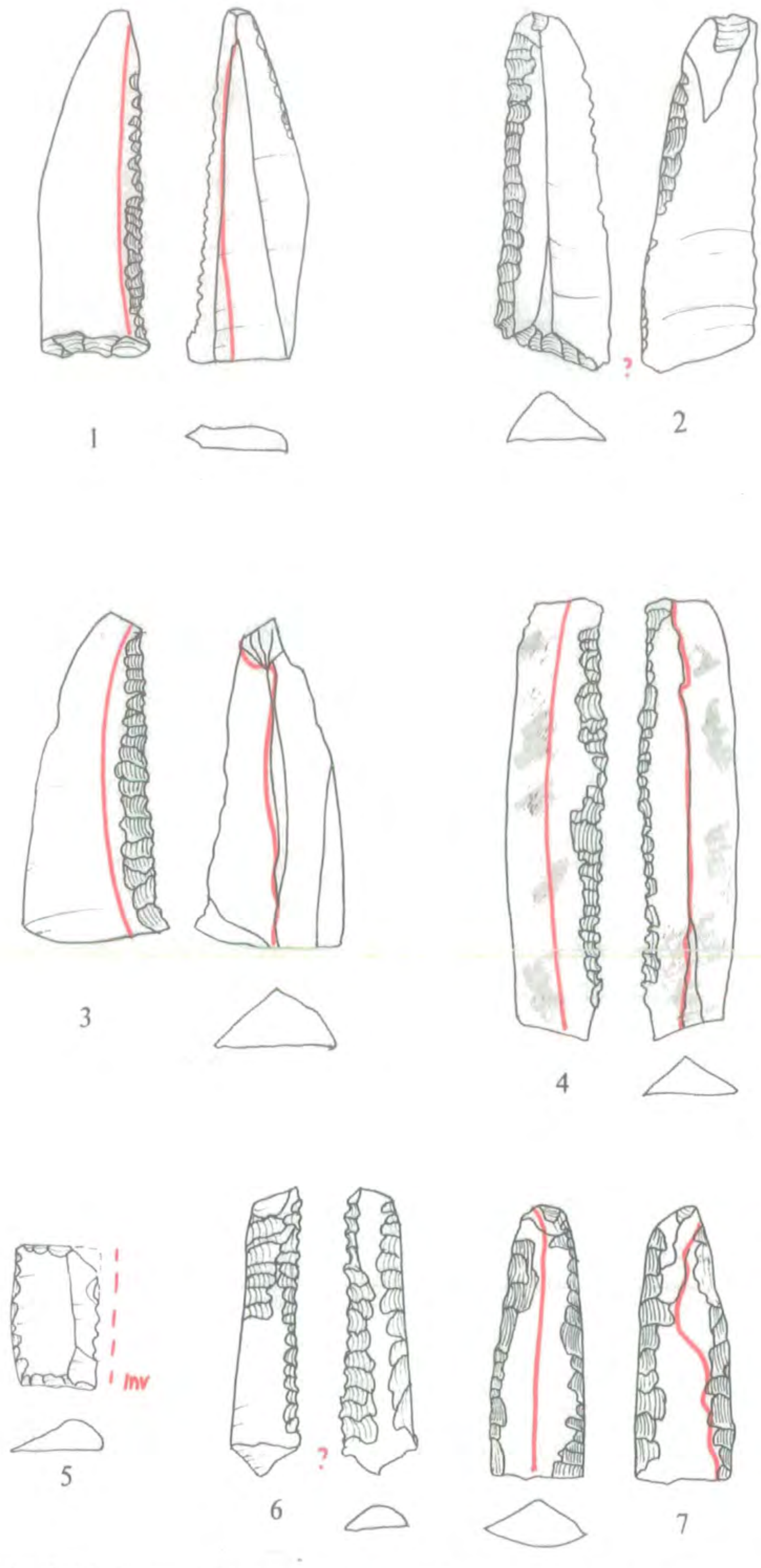


FIG.V:13 PPNB Lustred Blades: Classes II.F (?) (possibly truncated forms).
Scale 1:1

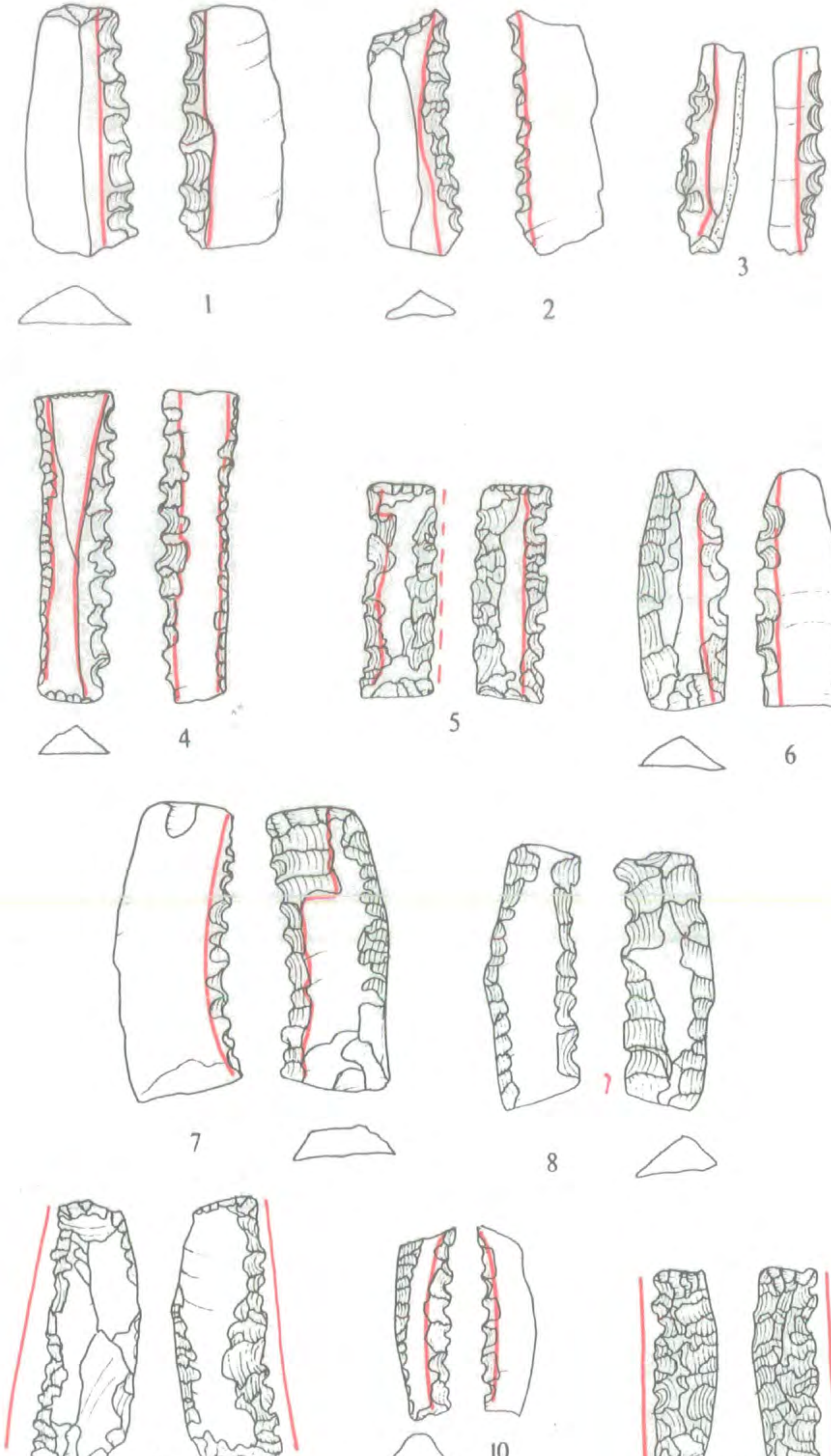


FIG.V.14 PNA Lustred Blades: Classes III and IV. Scale 1:1

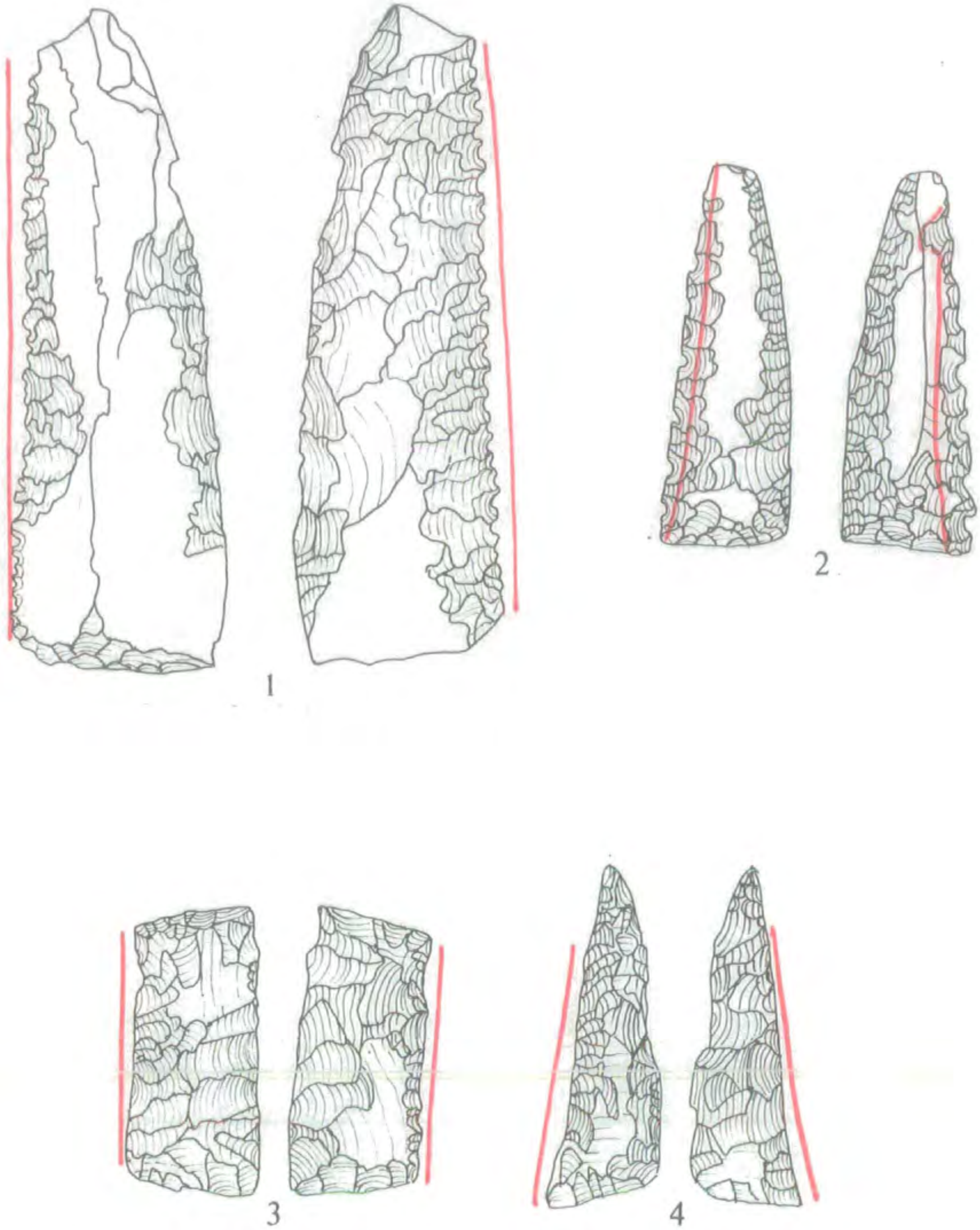


FIG.V:15 PNA Lustred Blades: Classes IV and V. Scale 1:1

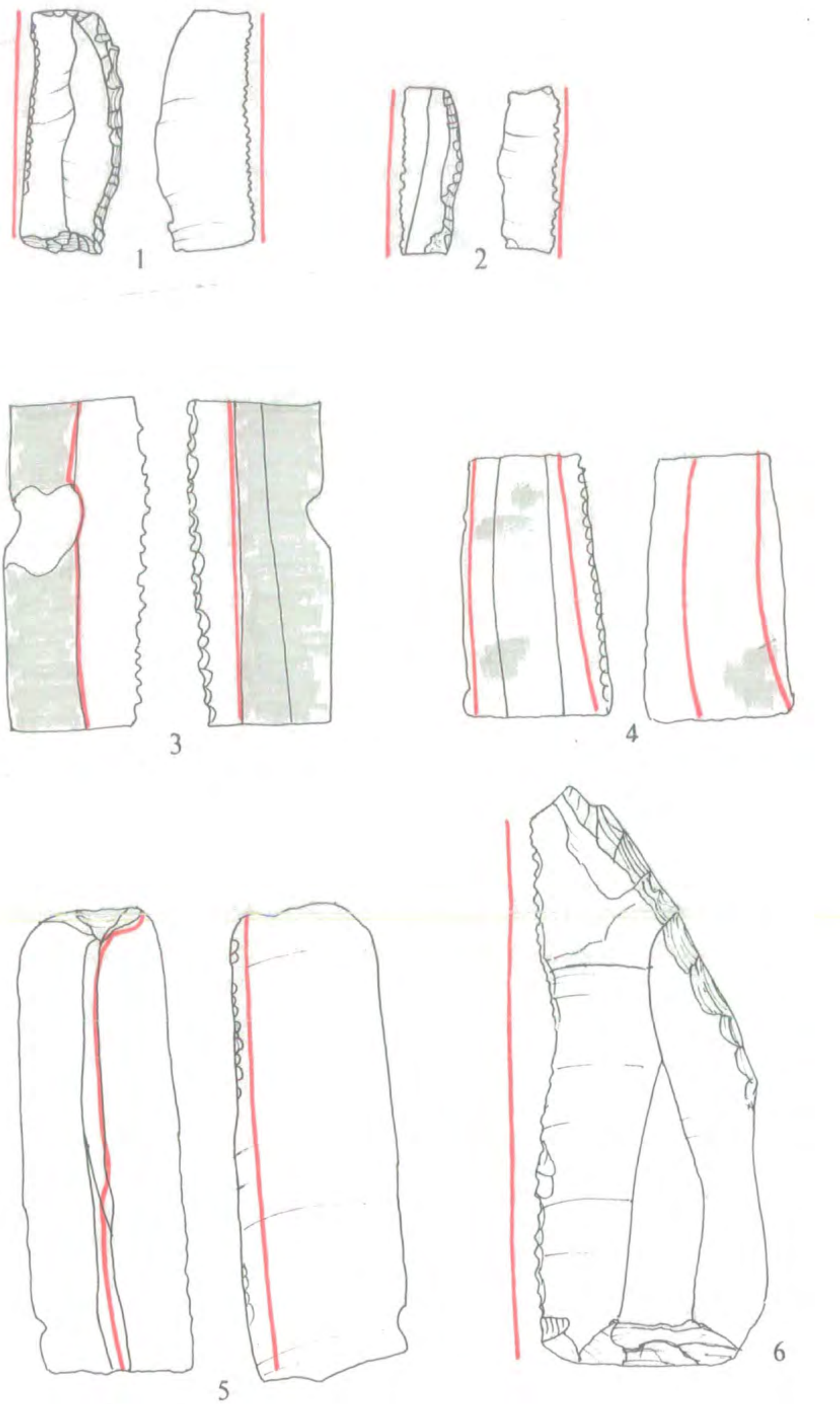


FIG.V:16 PNB, EBA and MBA Lustred Blades. Nos 1-2 Ghassulian, Nos. 3-5 EBA Canaanean Blades and no. 6 Class VI. Scale 1:1

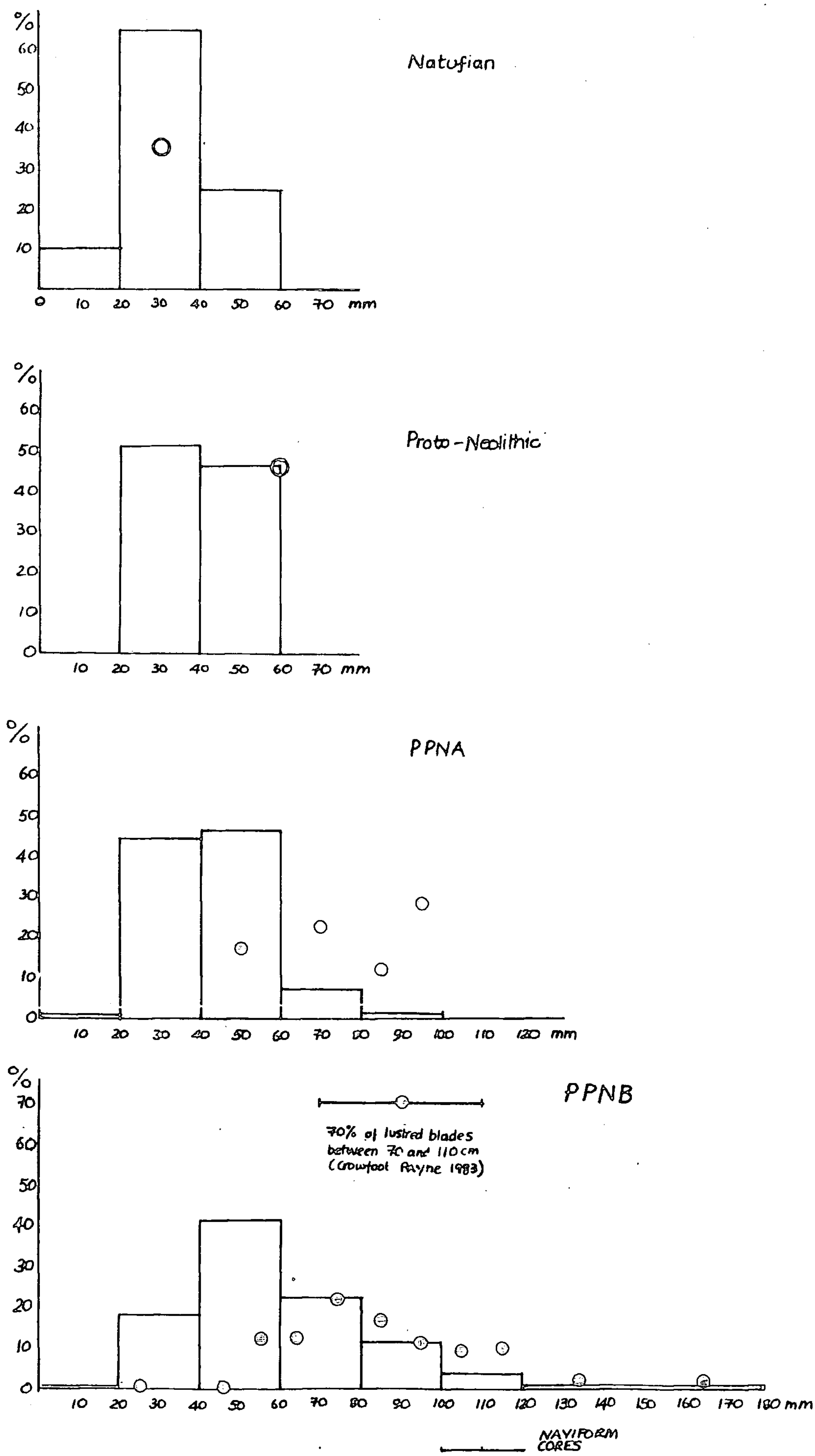


FIG. V:17 Comparison of Length of Unused and Lustred Blades from Jericho

○ = % of lustred blades from sample (see Appendix V)

O = Length of lustred blades (sample too small to calculate %)

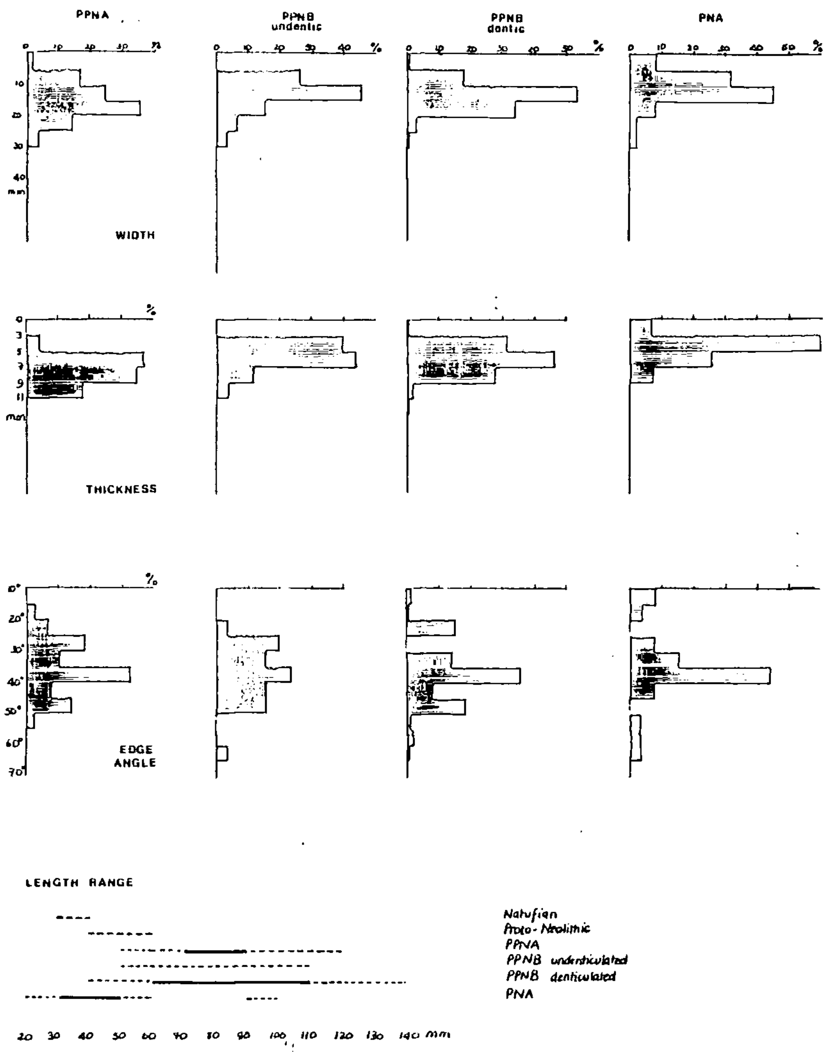
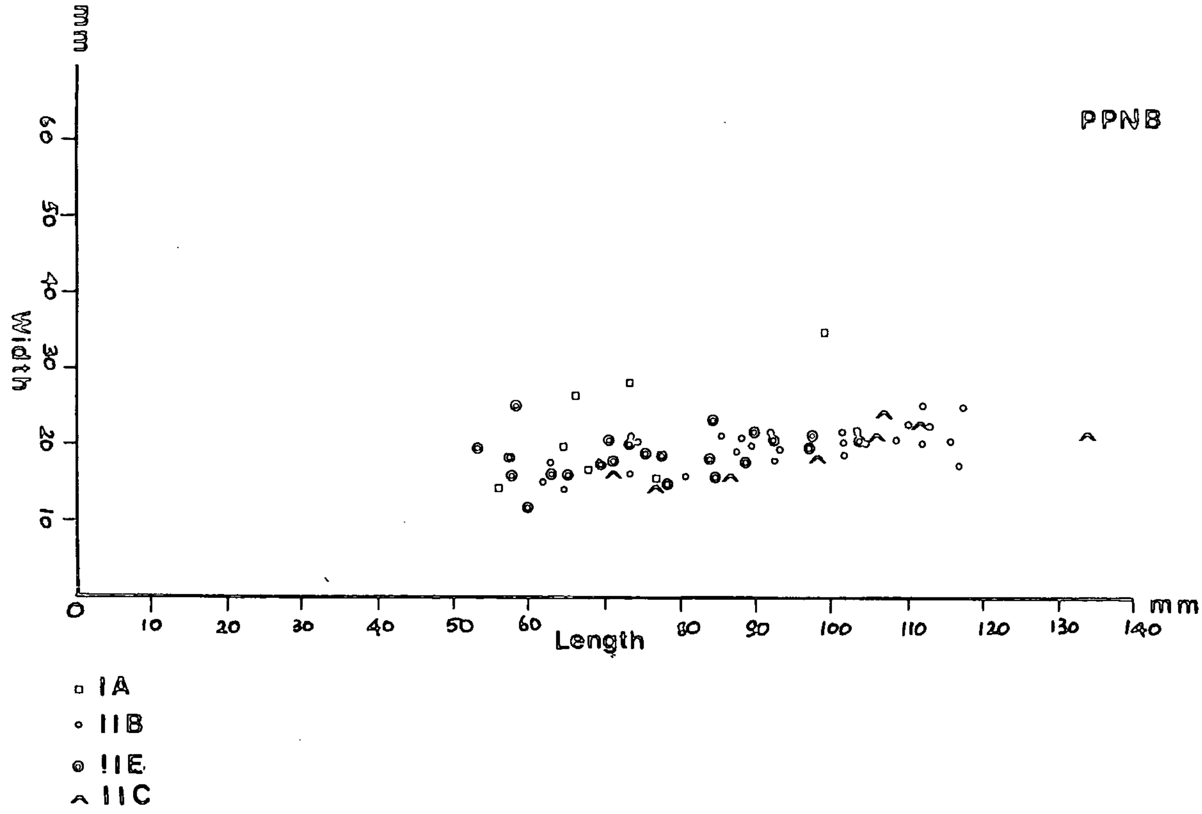


FIG. V: 19 Length/Breadth Distributions of PPNB and PNA
Lustred Blades from Jericho



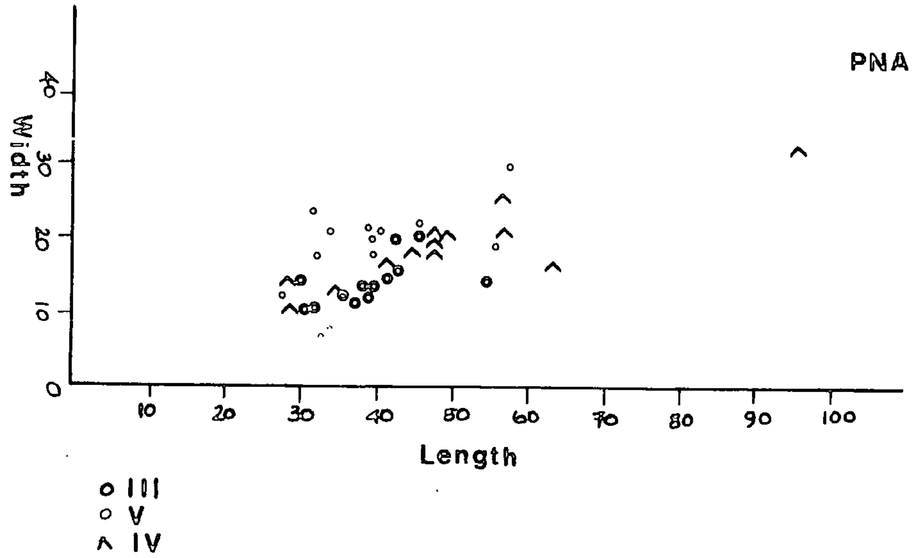


Fig. V:19 Length/Breadth Distribution of PPNB and PNA Lustred Blades from Jericho

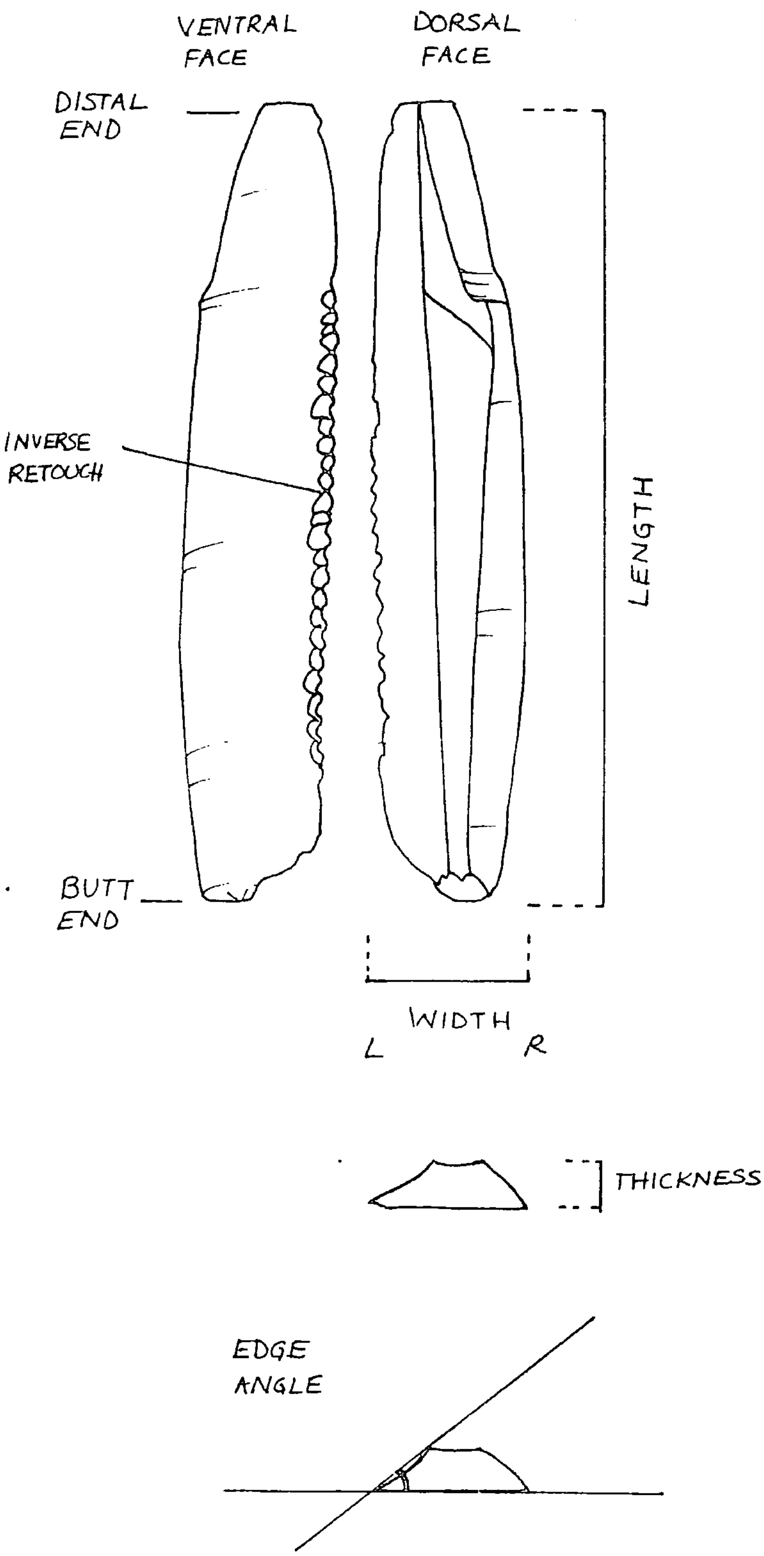


FIG. V:20 POSITION OF MEASUREMENTS AND OTHER DETAILS

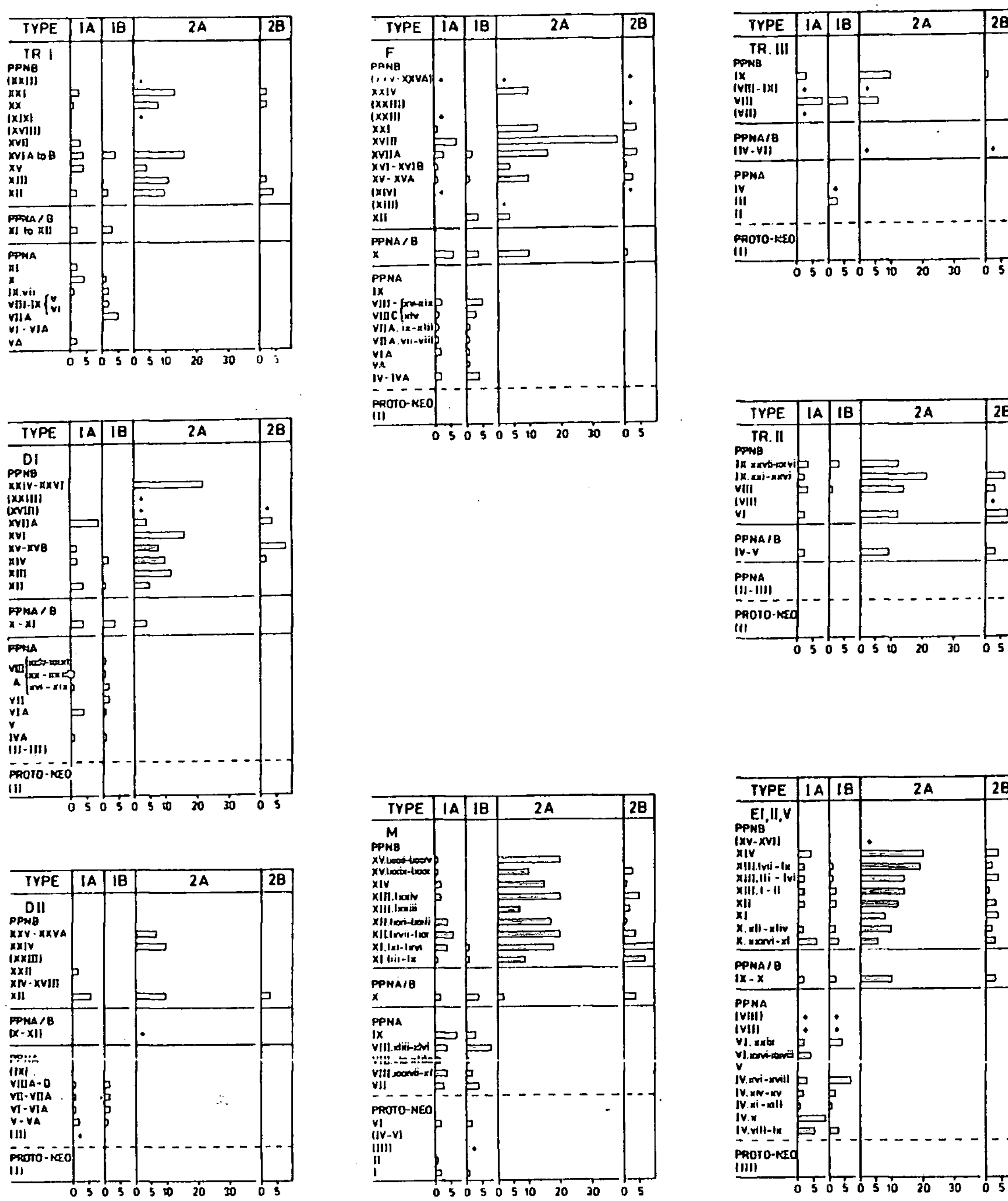


FIG. V:21 Percentage of Sickle Blades to Retouched Tools in PPNA and PPNB levels at Jericho from Crowfoot Payne 1983 Fig. 316.
Types are Payne's Types: 1A no retouch, 1B retouch on back or ends, 2A finely denticulated, 2B finely denticulated and retouched back or ends.

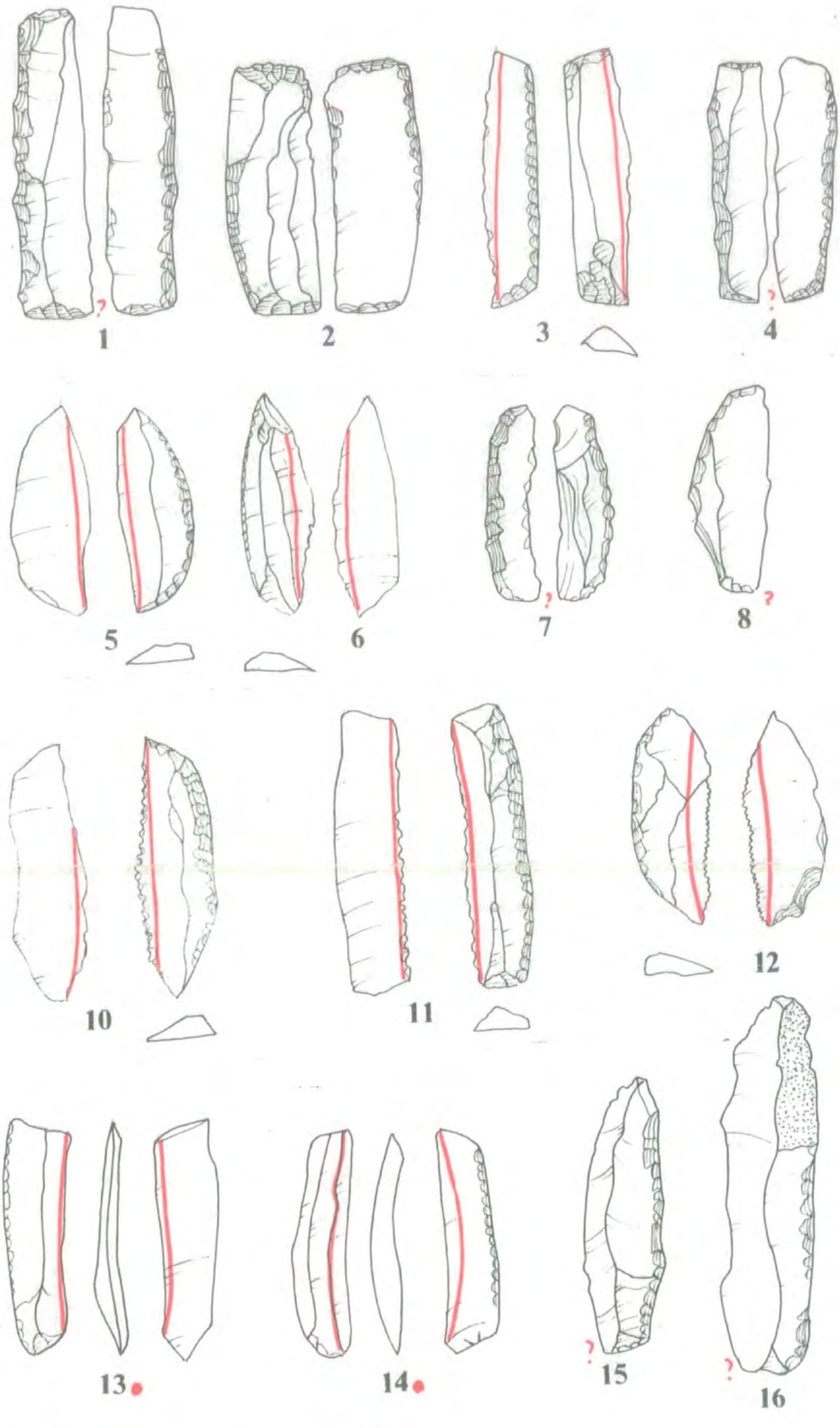


Fig.VI:1 Lustred Flint Blades: Period 1
El Wad (nos. 1 - 4, 7, 8, 15 and 16 after Garrod, nos. 13 and 14 after Unger-Hamilton). Scale 1:1

● Examined for wear traces

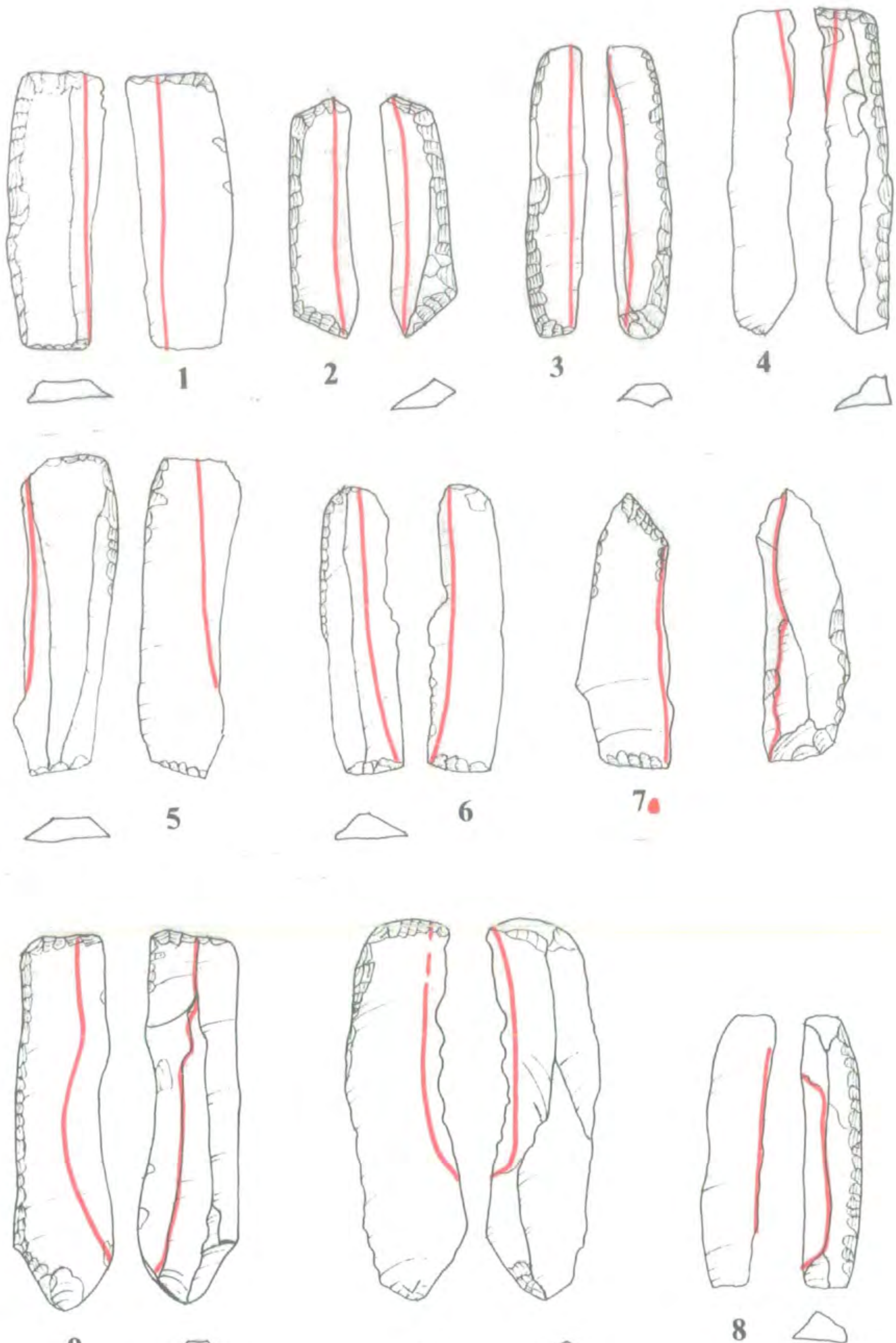


Fig.VI:2 Lustred Flint Blades: Period 1
Kebara (no. 7 after Unger-Hamilton). Scale 1:1

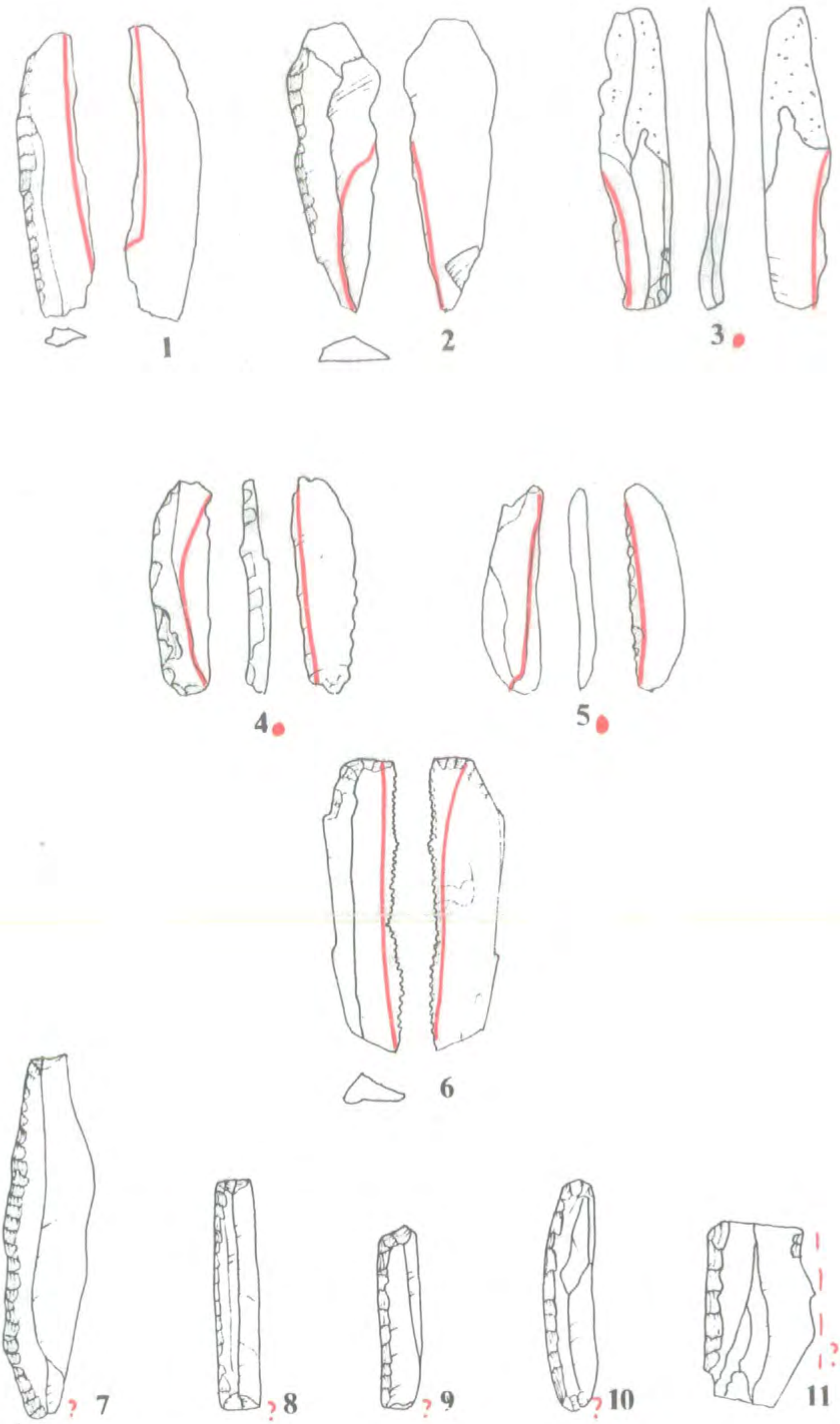


Fig.VI:3 Lustred Flint Blades: Period 1
nos. 1 - 6 Kebara, nos. 1-10 Erq el Ahmar (after Neuville),
no. 11 El Khiam after (Neuville). Scale 1:1

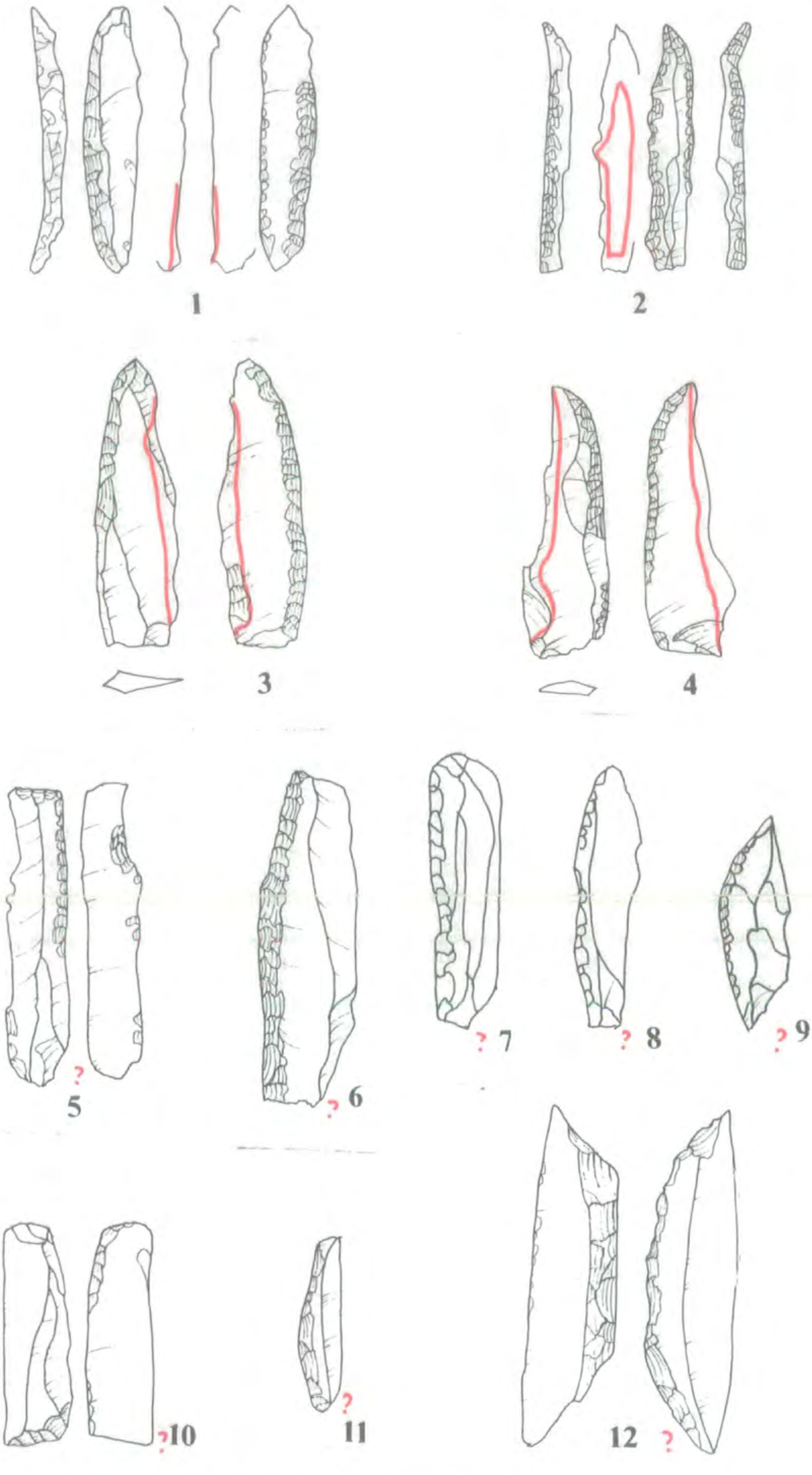


Fig.VI:4 Lustred Flint Blades: Period 1
nos. 1 - 2 Hayonim Terrace (after Henry _et al_),
nos. 3 - 4 Hayonim Cave (after Bar Yosef _et al_)
nos. 5 - 9 Shukbah (after Garrod), nos. 11 - 12 Eynan (after Valla).
Scale 1:1

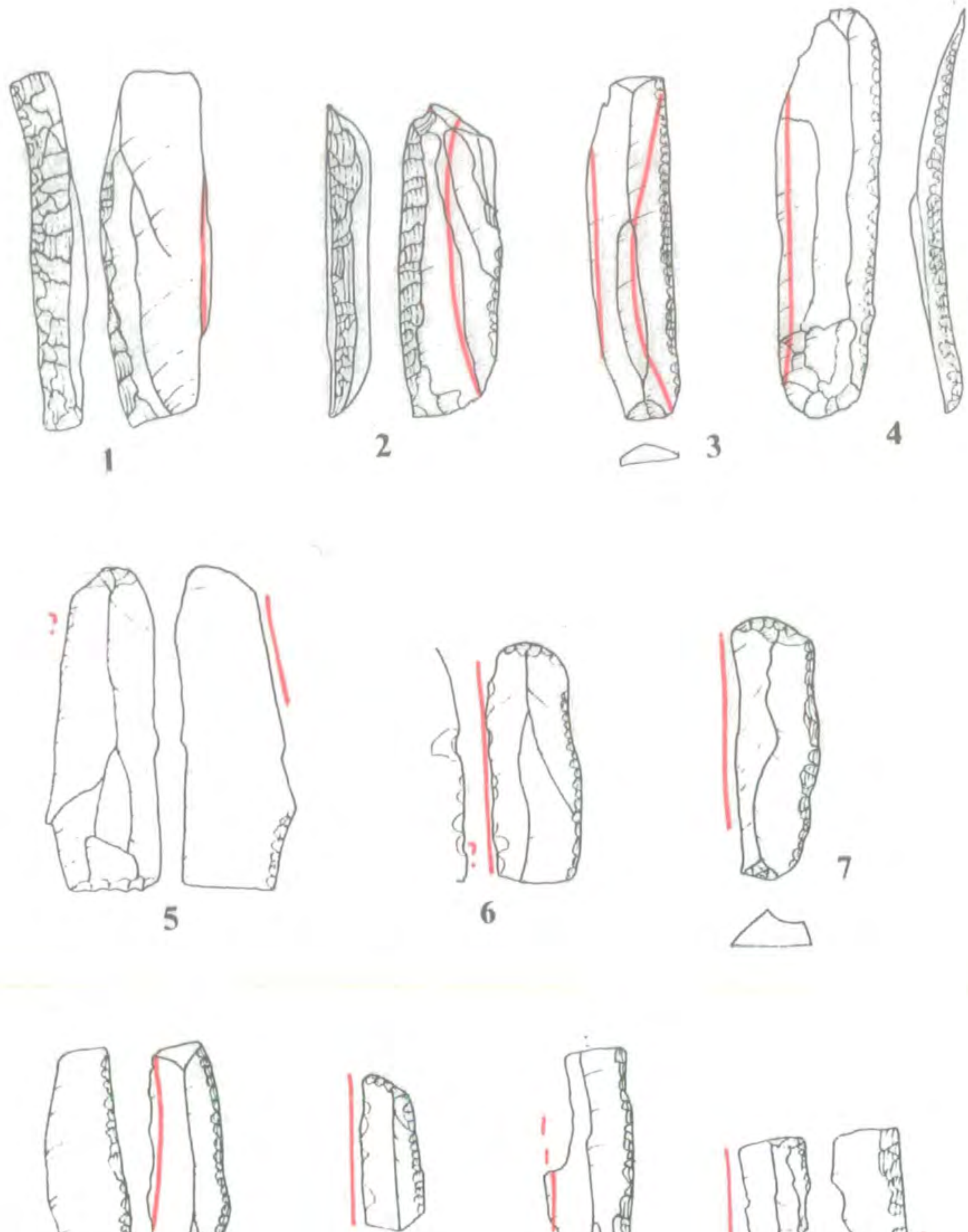


Fig.VI:5 Lustred Flint Blades: Period 1
nos. 1-4+8 Wadi Fazael (after Bar Yosef et al)
nos. 5-7+9 Taibé (after Cauvin), no. 10 Saflulim (after Goring-Morris)
no. 11 Black Desert (after Betts). Scale 1:1

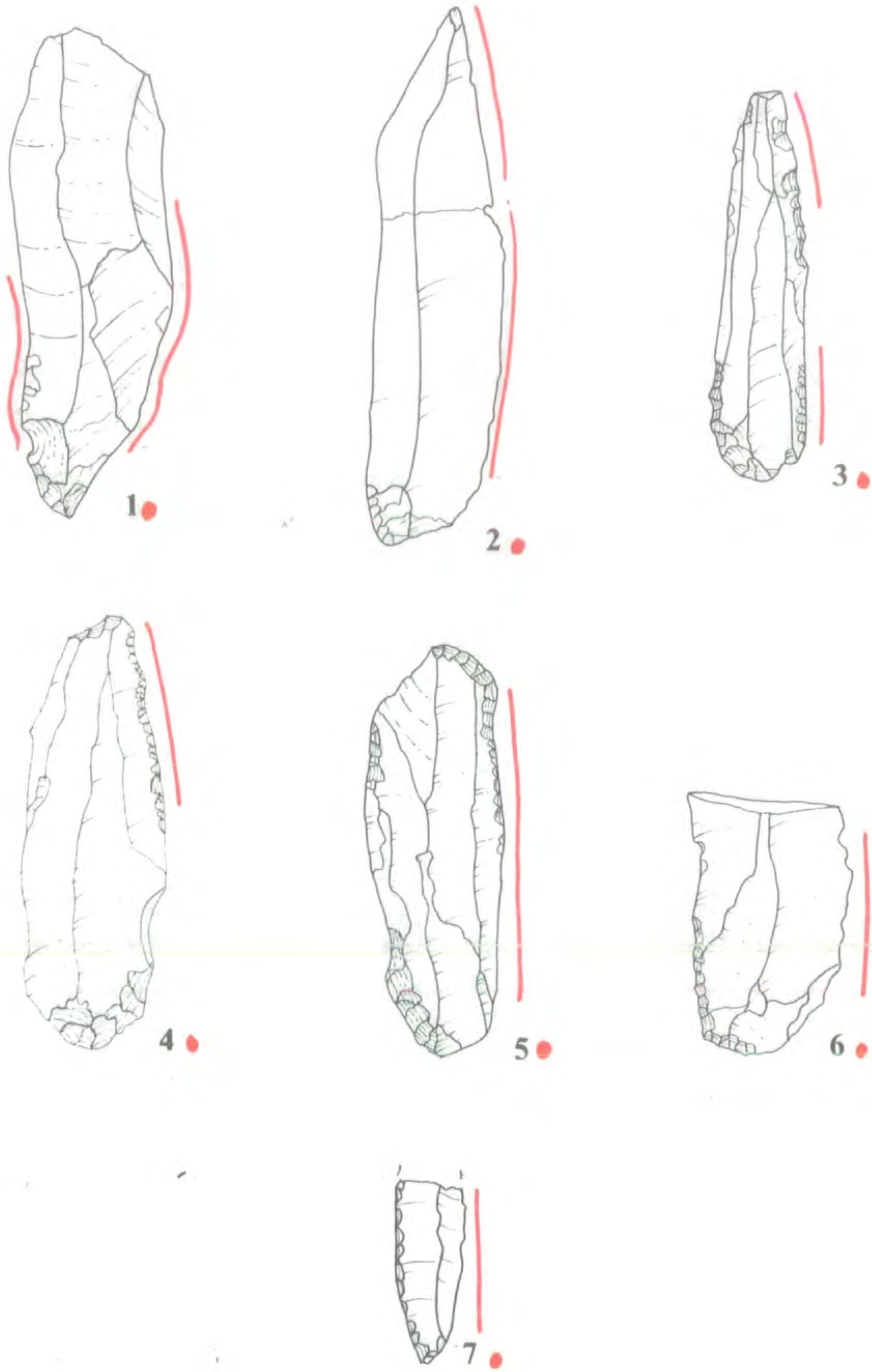


Fig.VI:6 Lustred Flint Blades: Period 1
nos. 1 - 6 Mureybit (after Cauvin and Anderson-Gerfaud)
no. 7 Abu Hureyra (after Anderson-Gerfaud). Scale 1:1

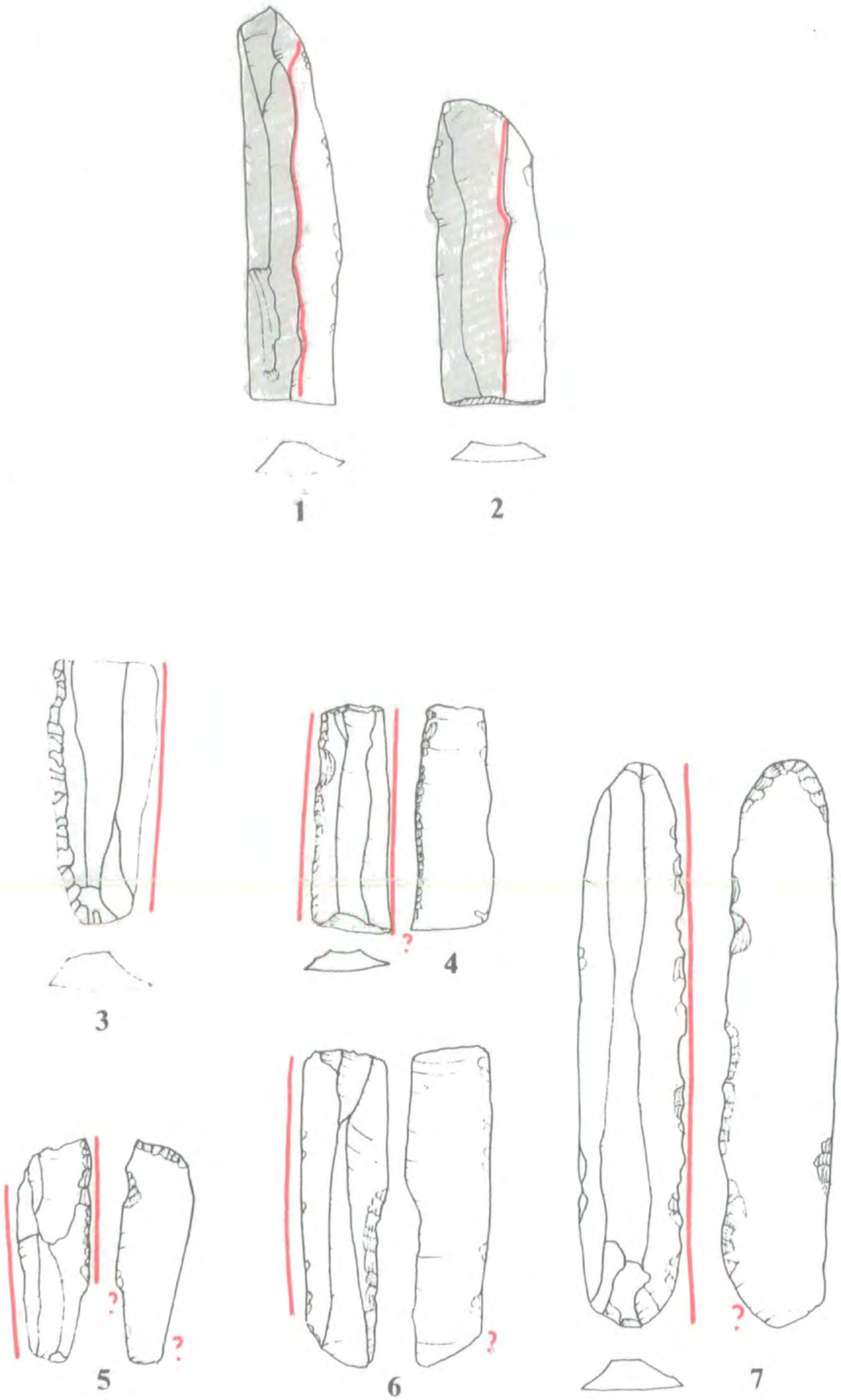
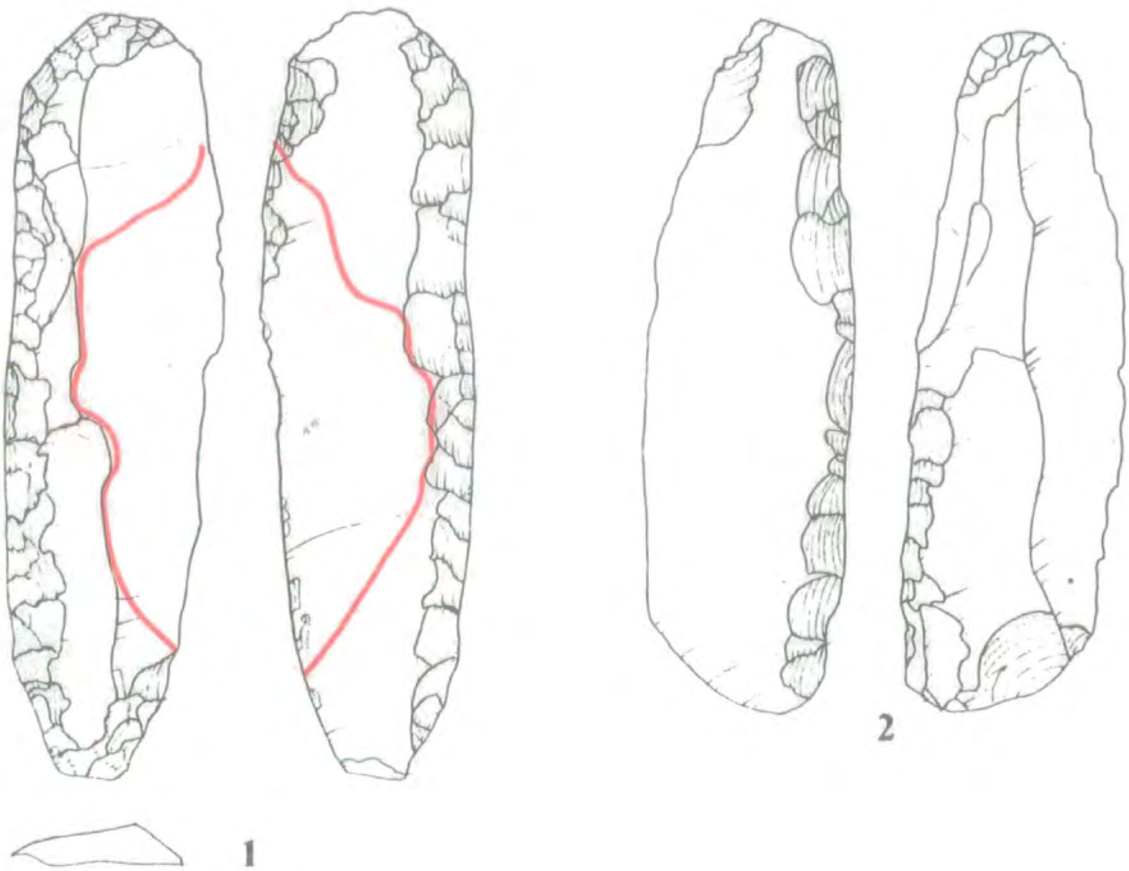
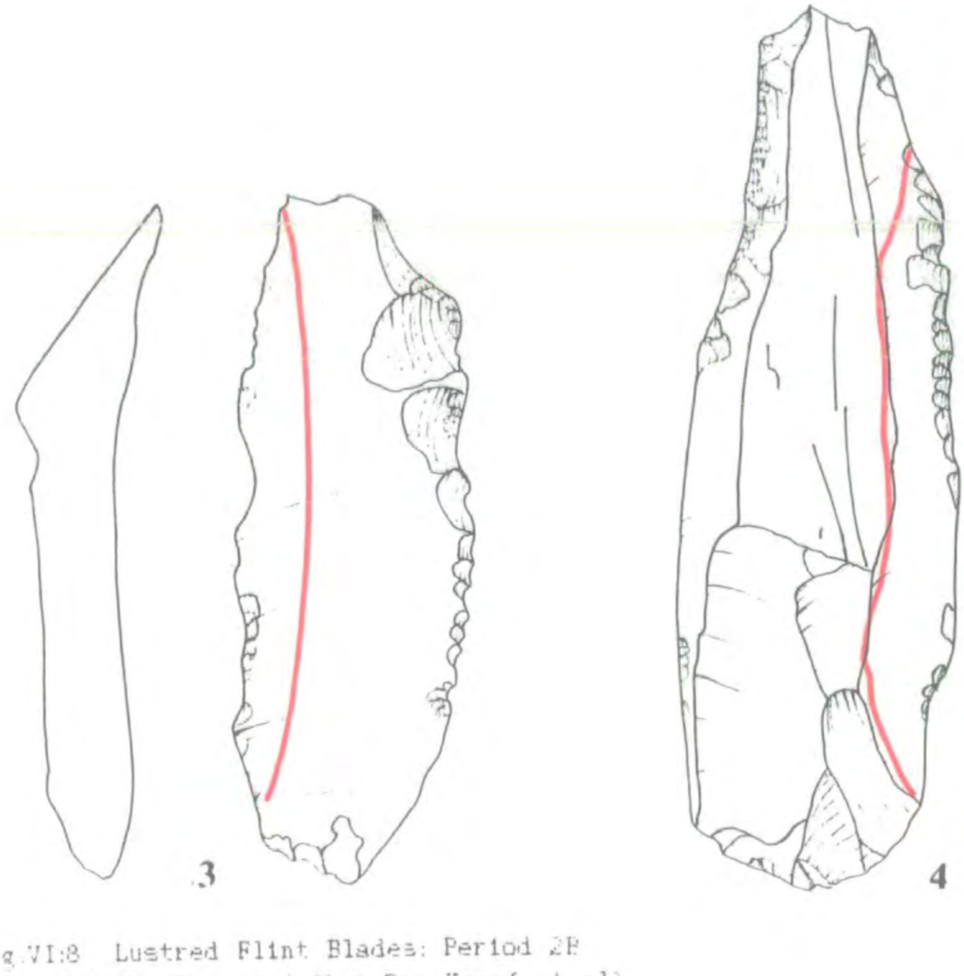


Fig.VI:7 Lustred Flint Blades: Period 2A
nos. 1 - 2 Salabiyah (after Bar Yosef), nos 3 - 7 Mureybit (after Cauvin). Scale 1:1



1

2



3

4

Fig.VI:8 Lustred Flint Blades: Period 2B
no. 1 Netviv Hagdud (after Bar Yosef et al)
no. 2 Eynan (after Valla)
nos 3 and 4 Gilgal (after Noy et al). Scale 1:1

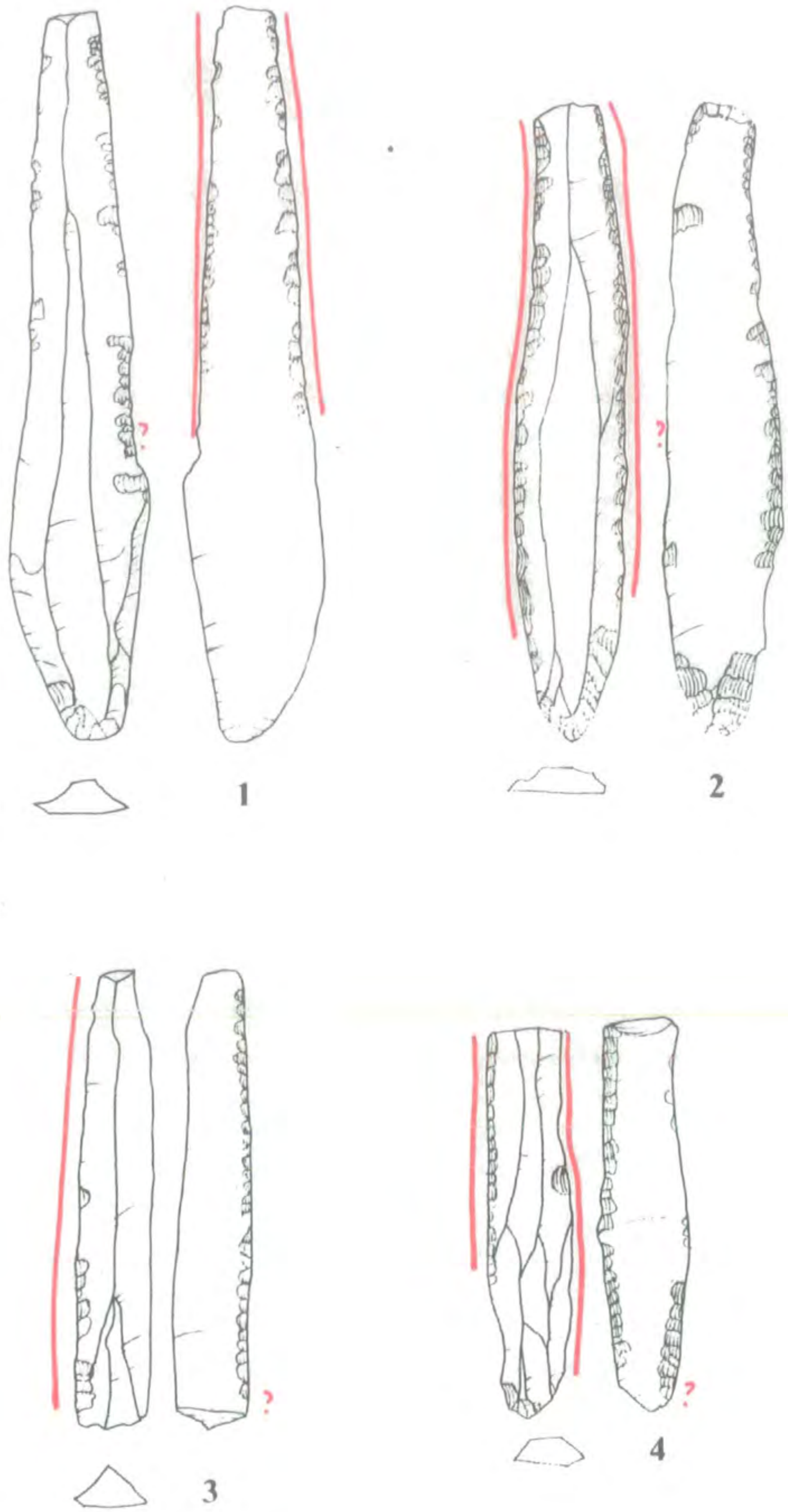


Fig.VI:9 Lustred Flint Blades: Period 2B
Aswad IA (after Cauvin). Scale 1:1

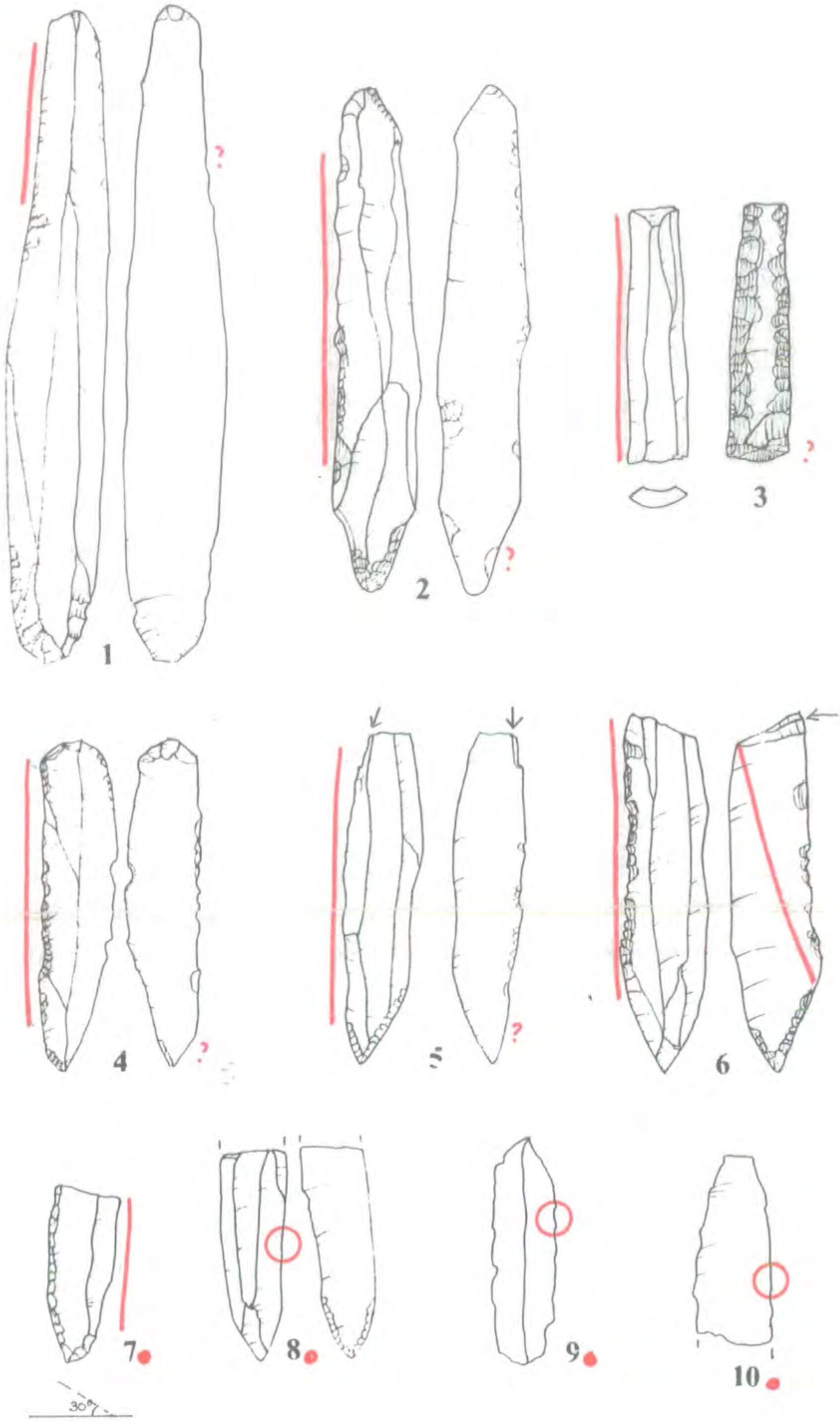


Fig.VI:10 Lustred Flint Blades: Period 2B
Mureybit II and III, nos. 1-6 after M.-C. Cauvin
nos. 1-10 after Anderson-Gerfaud). Scale 1:1

Phytoliths

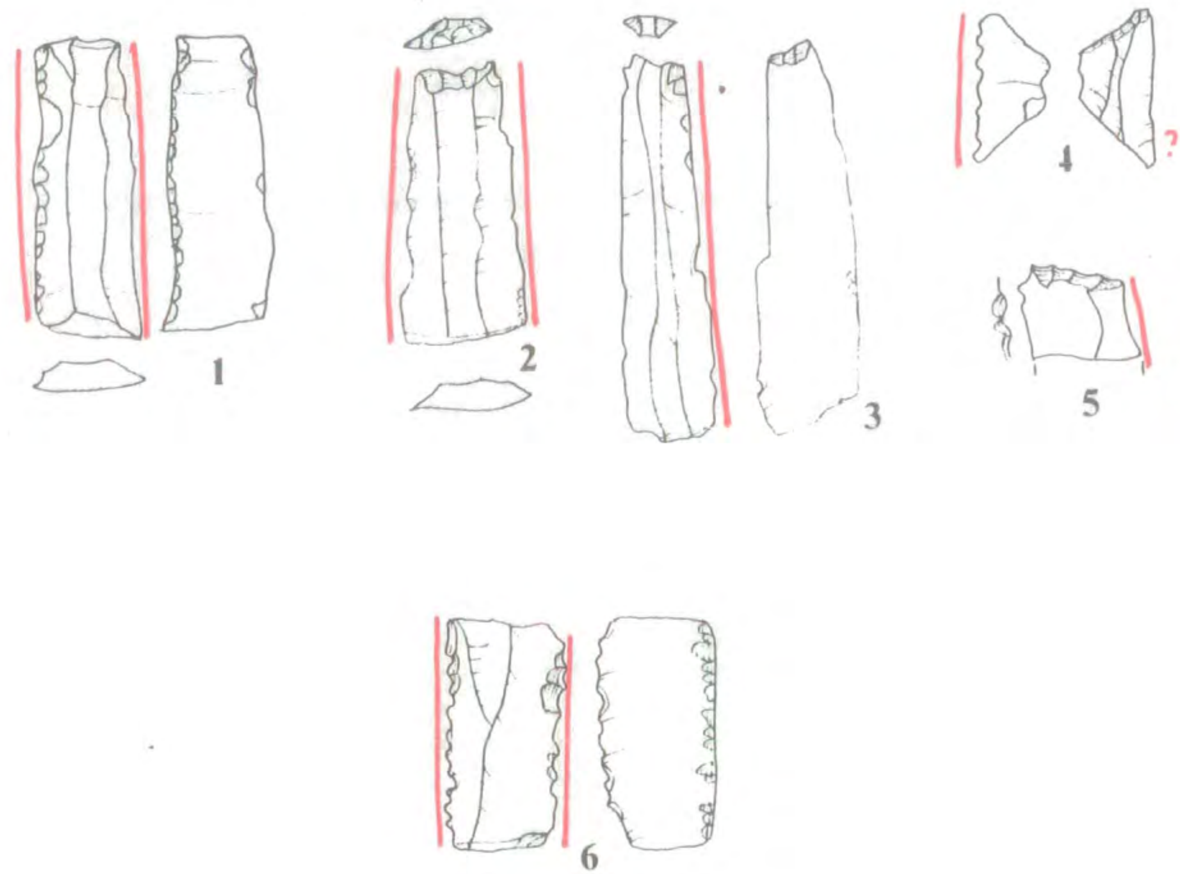


Fig.VI:11 Lustred Flint Blades: Period 2B
Qoueiq Valley: nos. 2+3, 6 Qaramel and nos. 4 and 5 Kadim (after Copeland). Scale 1:1

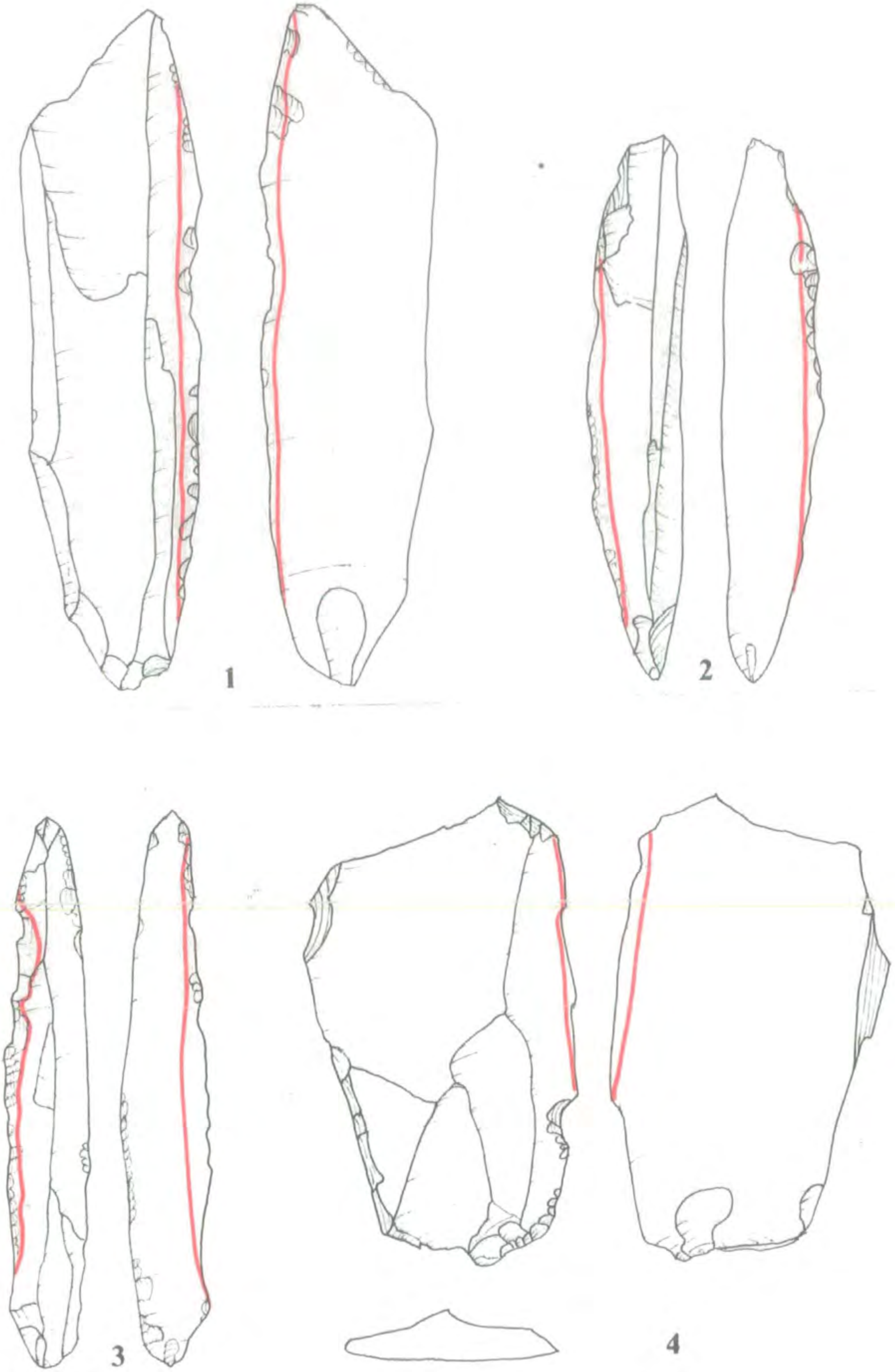


Fig.VI:12 Lustred Flint Blades: Period 3
Beidha (after Mortensen 1971). Scale 1:1

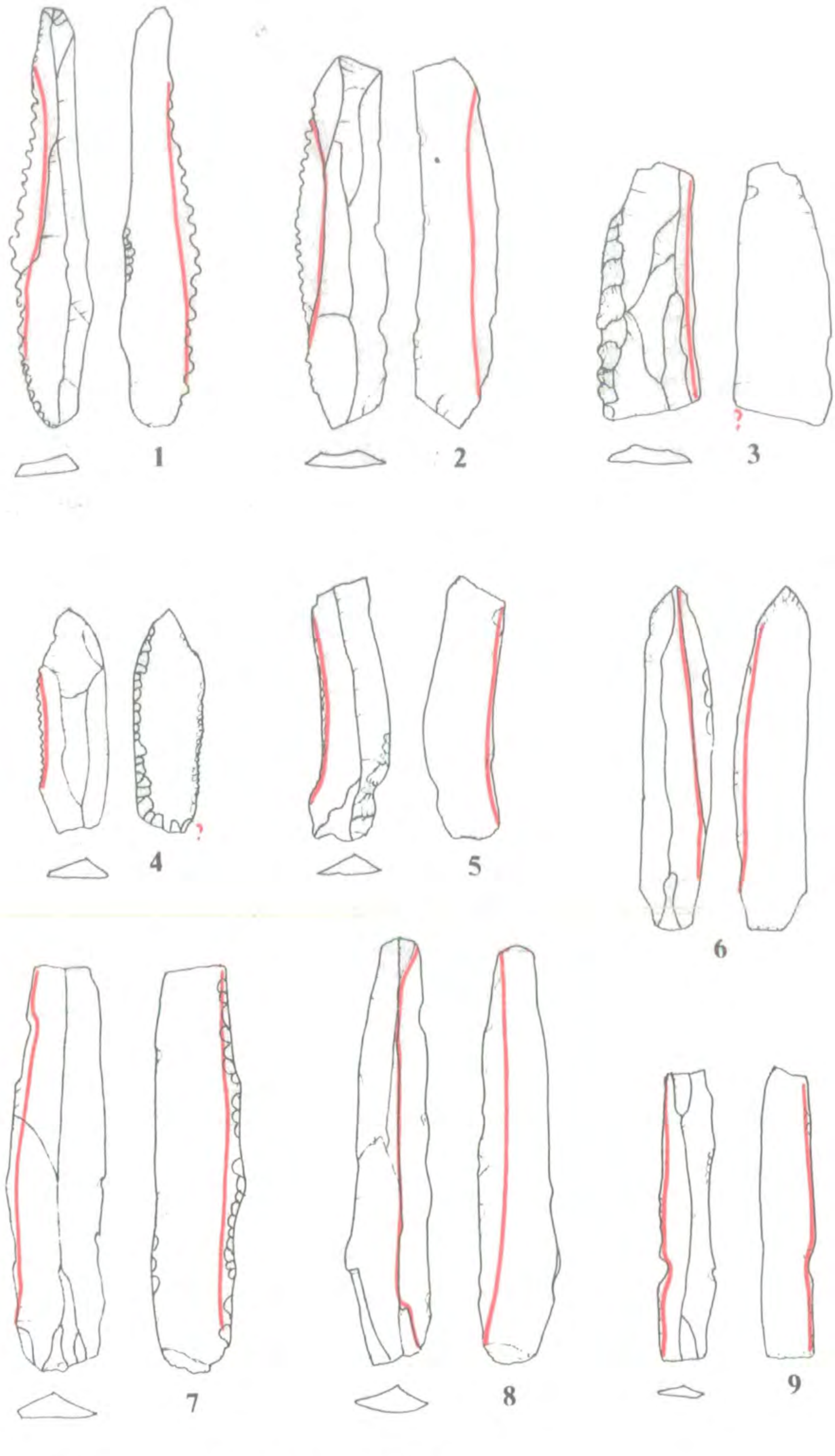


Fig.VI:13 Lustred Flint Blades: Period 3
Beidha (after Mortensen 1971). Scale 1:1

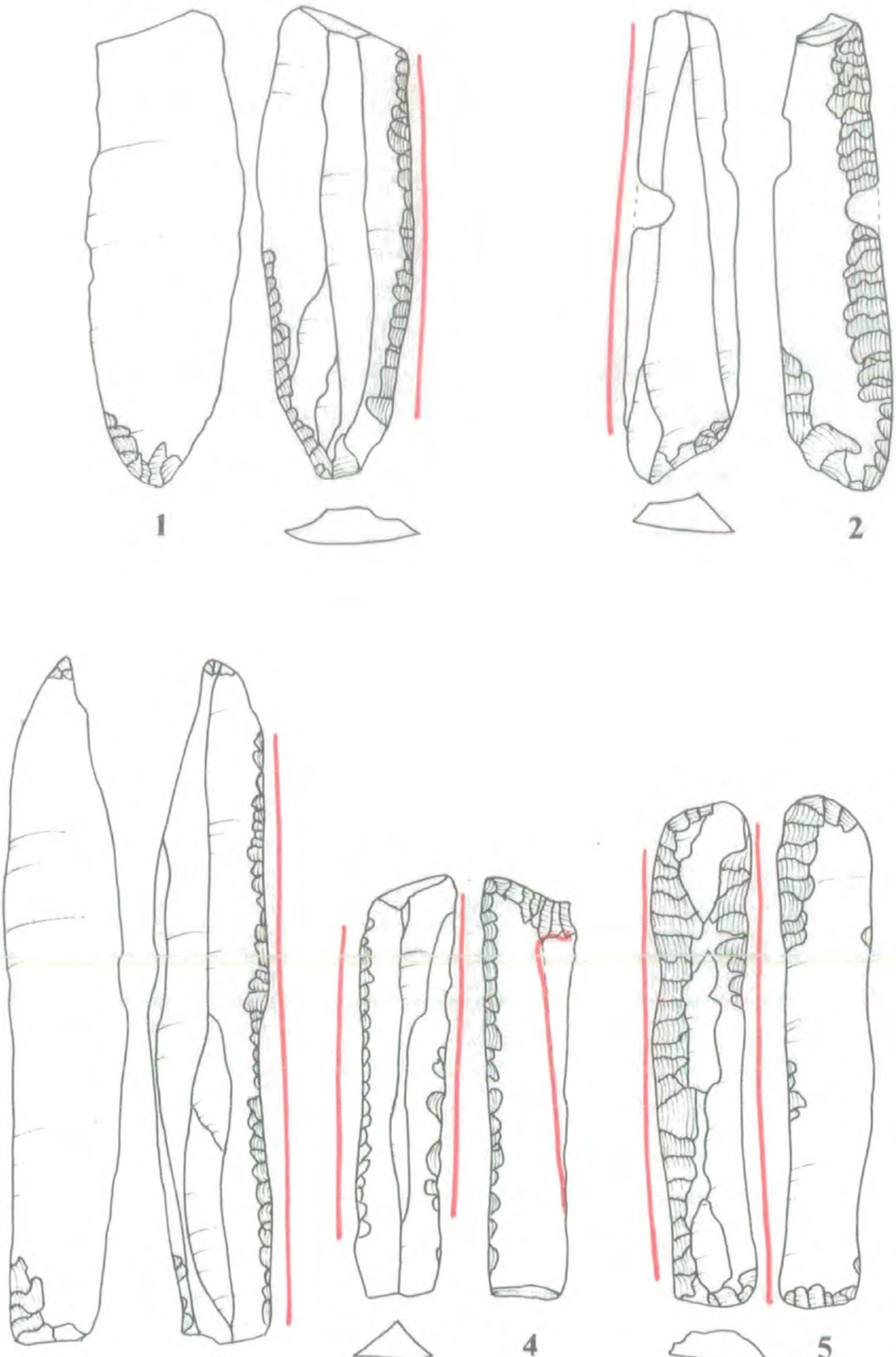


Fig.VI:14 Lustred Flint Blades: Period 3
Aswad II (after M.-C. Cauvin). Scale 1:1

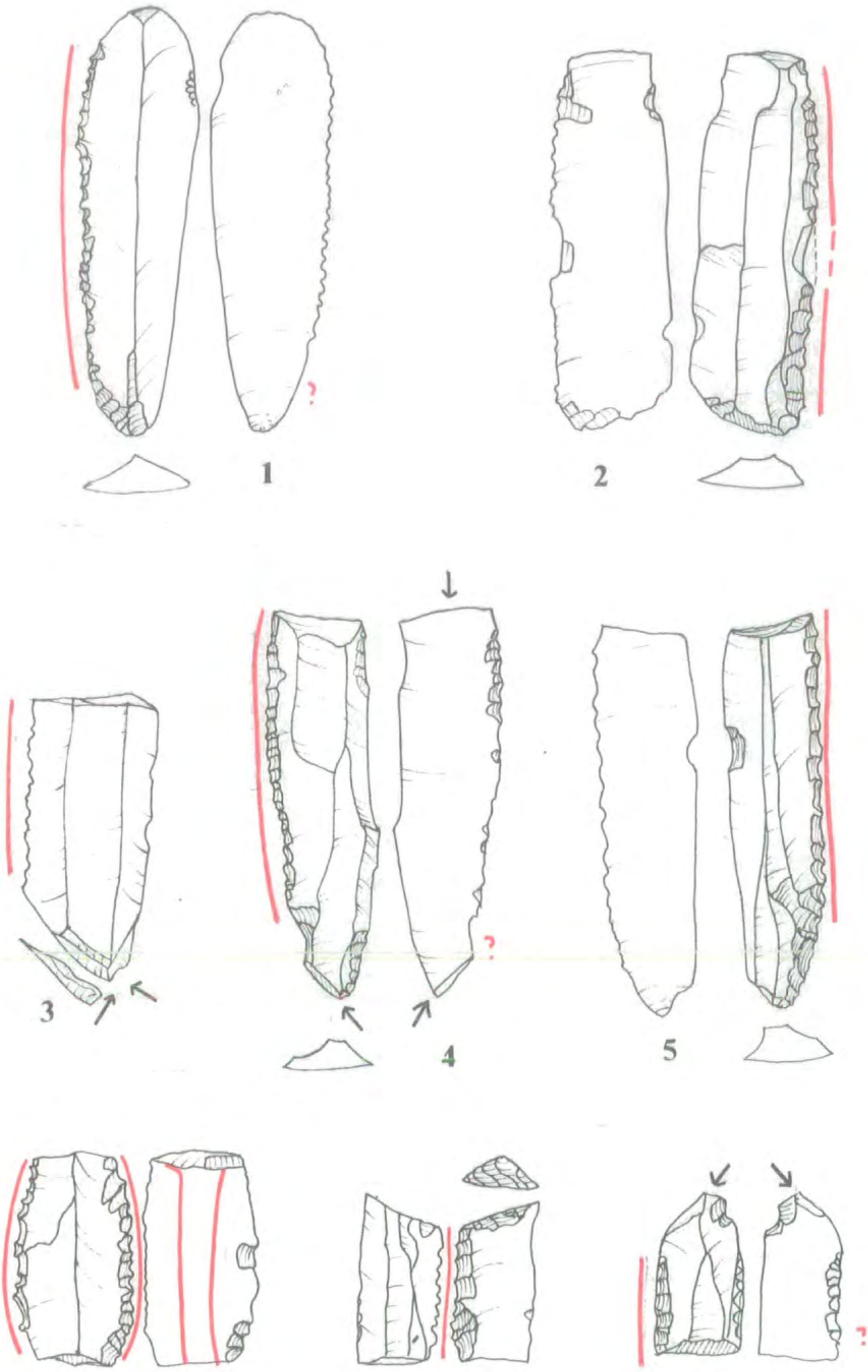


Fig.VI:15 Lustred Flint Blades: Period 3
Ghoraifé (after M.-C. Cauvin). Scale 1:1

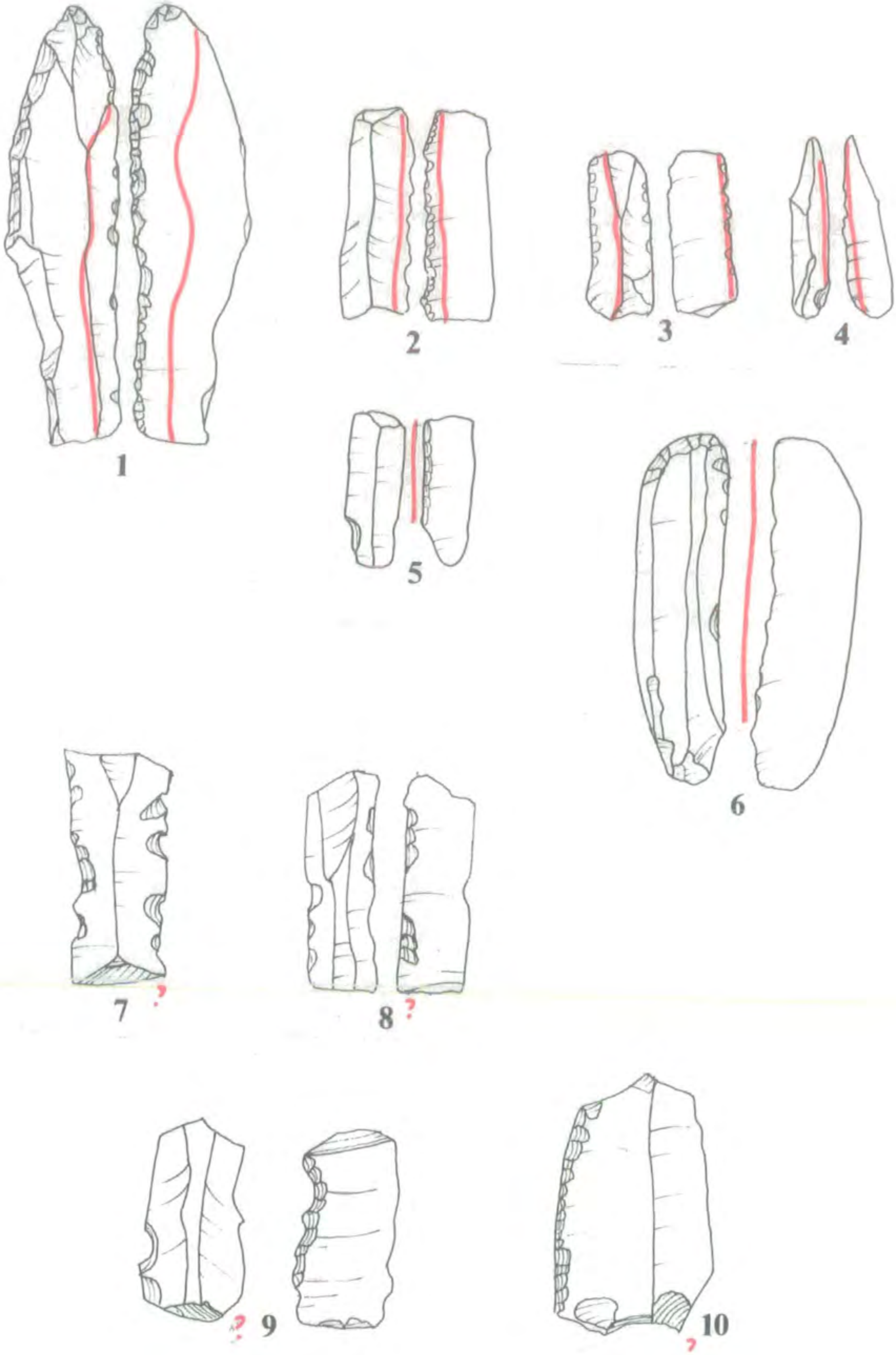


Fig.VI:16 Lustred Flint Blades: Period 3
nos. 1-4 Çayönü (after Redman)
nos. 5-6 Cafer (after Cauvin, M.-C. Cauvin and Balkan)
nos. 7-9 Asikli Höyük (after Todd)
no. 10 Çatal Hükük (after Bialor). Scale 1:1

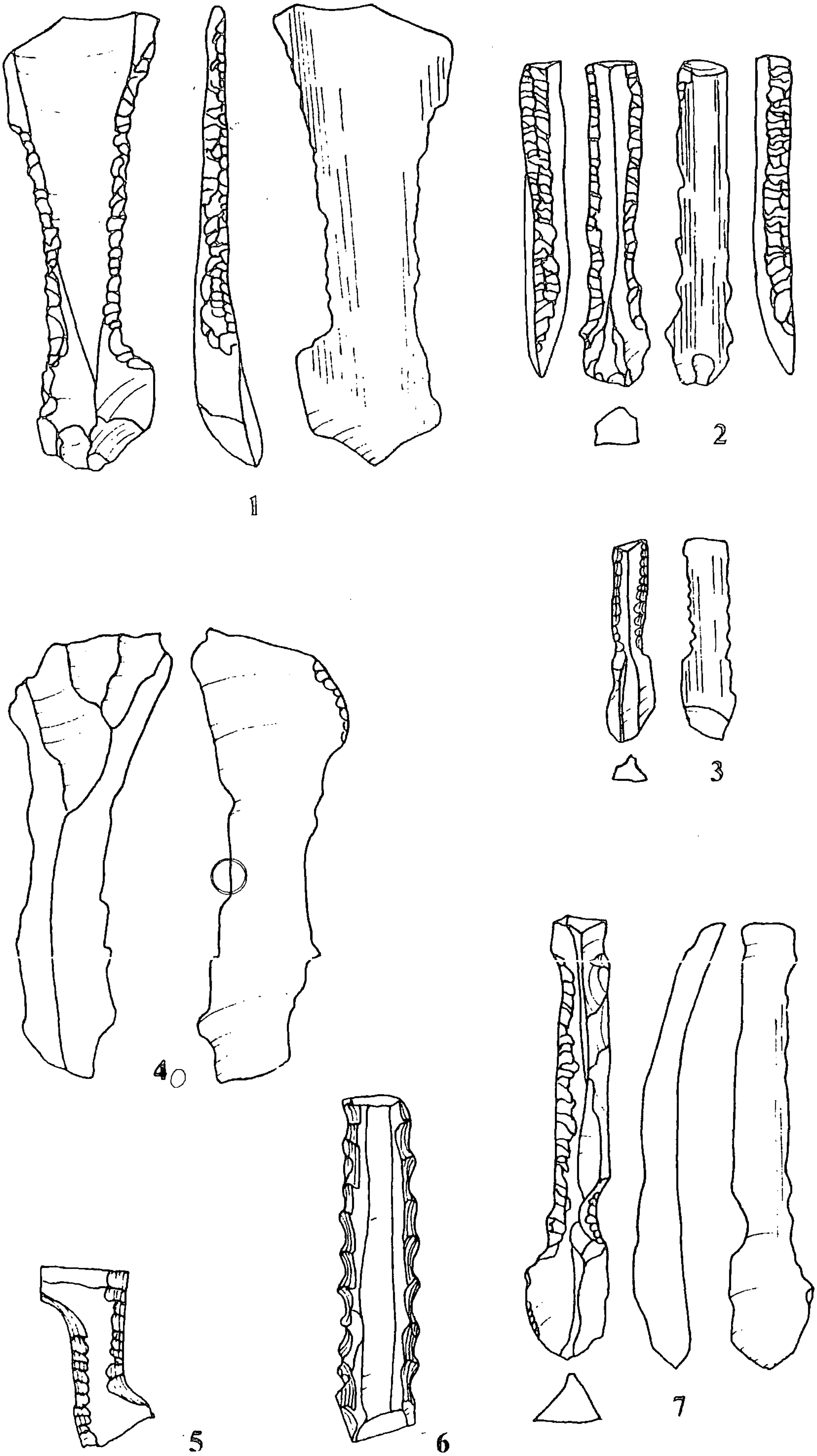


Fig.VI:17 Lustred Flint Blades: Period 3
nos. 1-4 Cafer (after Cauvin, M.-C and Balkan)
nos. 6-7 Bouqras (after Roodenberg), no. 8 Çayönü (after Redman). Scale 1:1

Phytolith

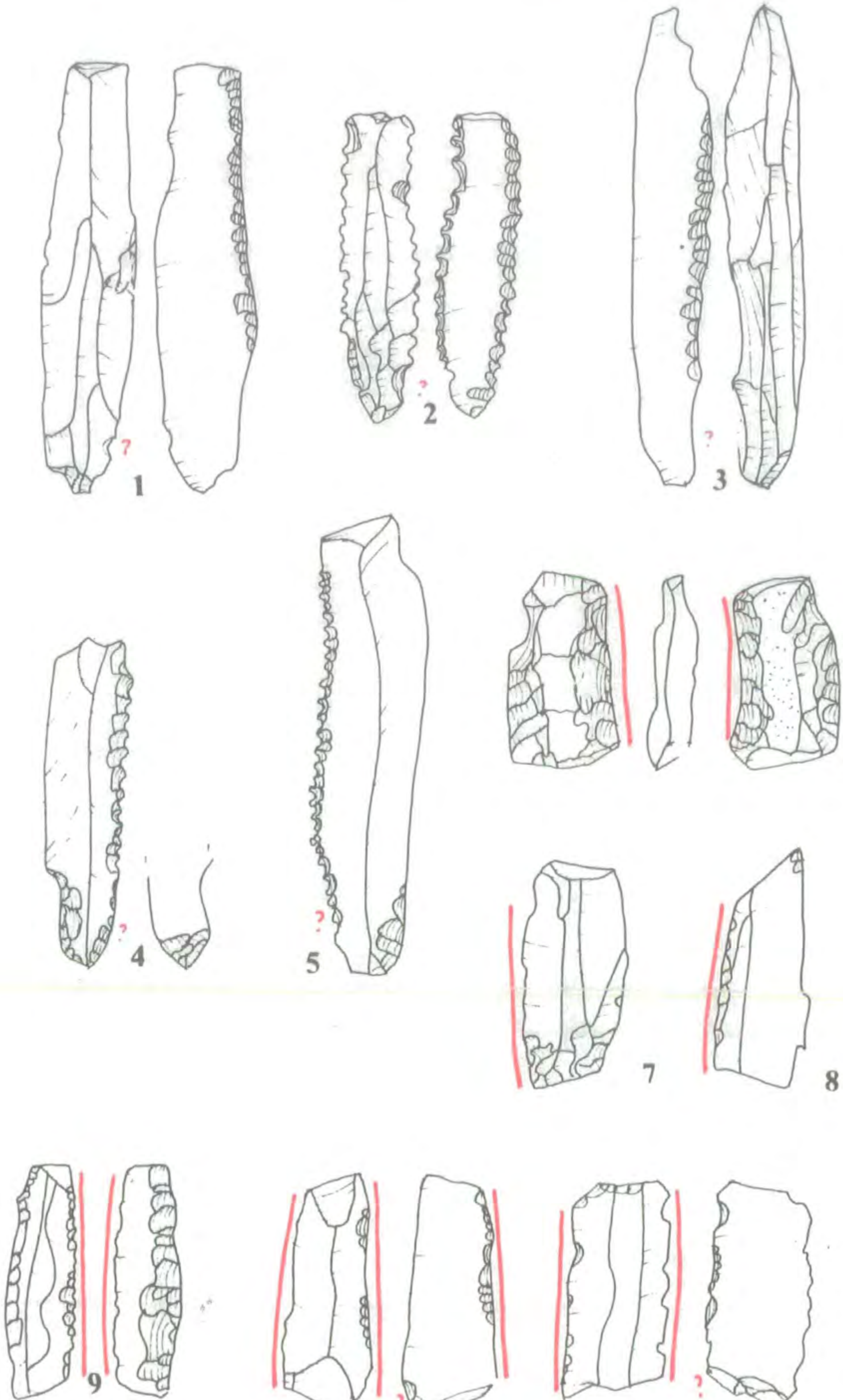


Fig.VI:18 Lustred Flint Blades: Period 4
nos. 1 and 2 Abu Gosh, no. 3 Munhatta (after Cauvin), nos 4 and 5 Tell aux Scies (after Cauvin, J.), no. 6 Azraq 31 (after Garrard et al), nos. 7-9 Ibn el-Ghazzi (after Betts), Nos. 10-11 Aatné (after Coqueugnot). Scale 1:1

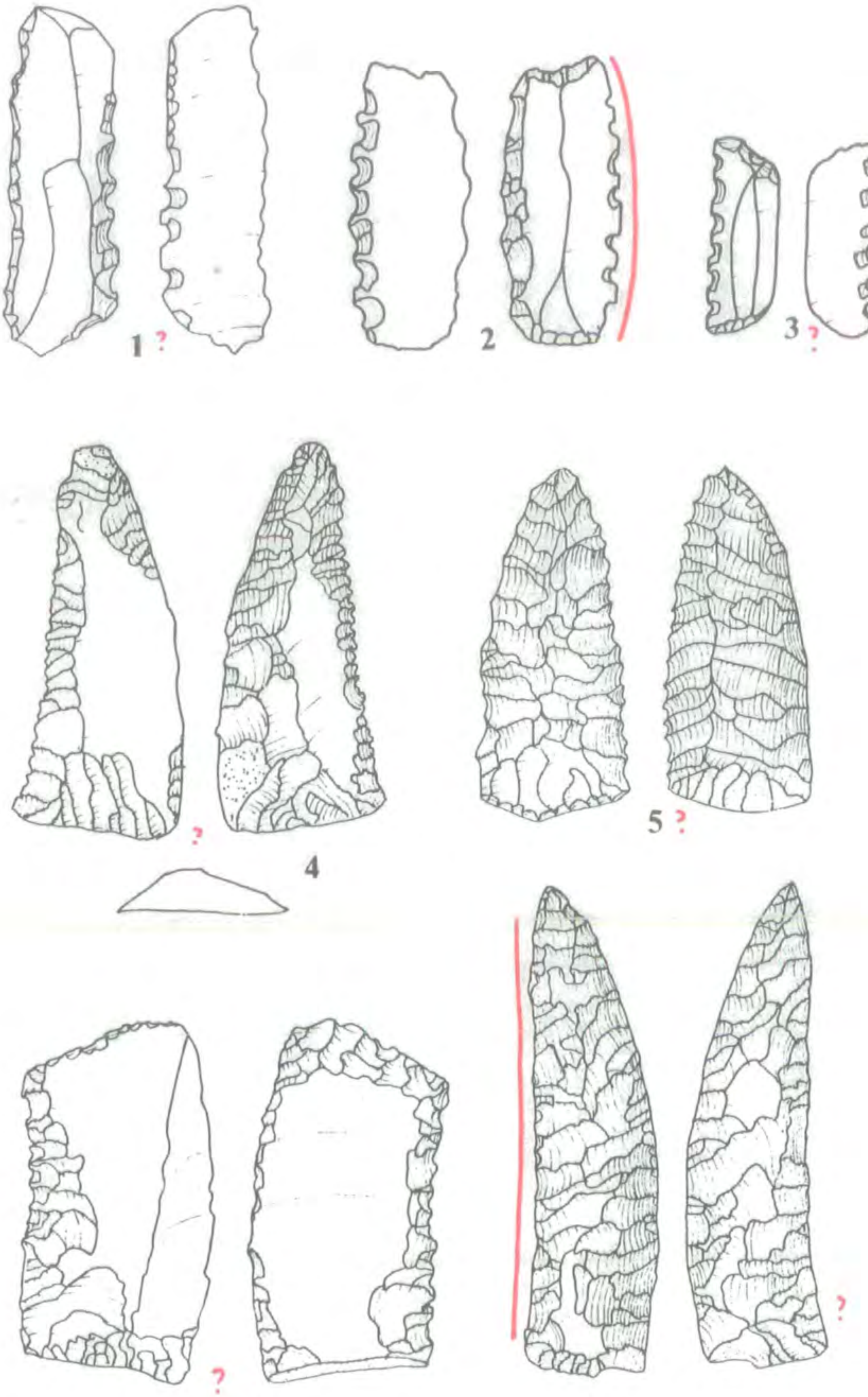


Fig.VI:19 Lustred Flint Blades: Period 4
nos. 1-6 Ramad II. no. 7 Ghoraifé (after M-C.Cauvin). Scale 1:1

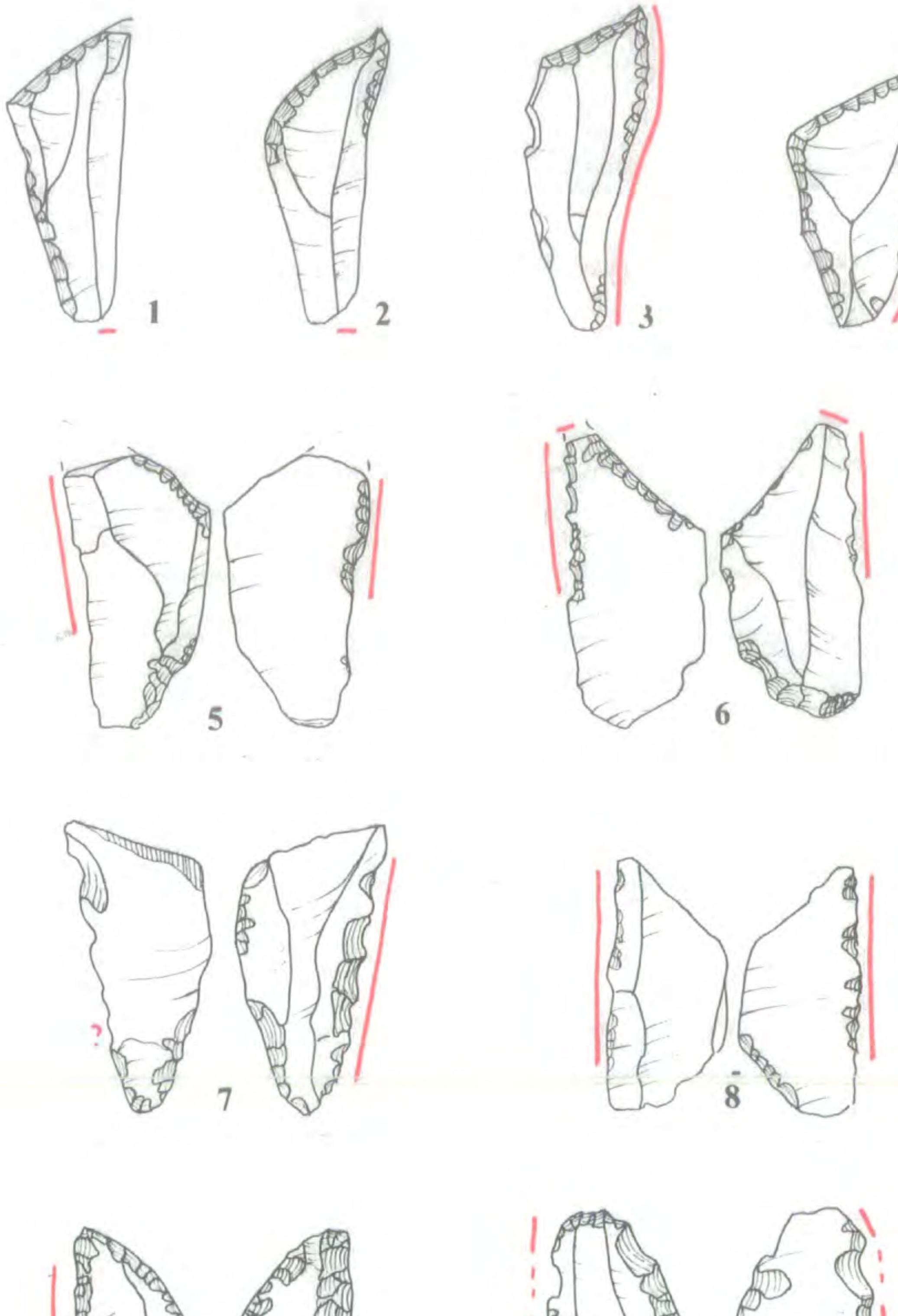


Fig.VI:20 Lustred Flint Blades: Period 4
nos. 1-4 Bouqras (after Roodenberg), nos. 5,6,8 and 9 Qdeir (after Aurenche and Cauvin), nos. 7 and 10 Nadaouiyeh (after Cauvin).
Scale 1:1

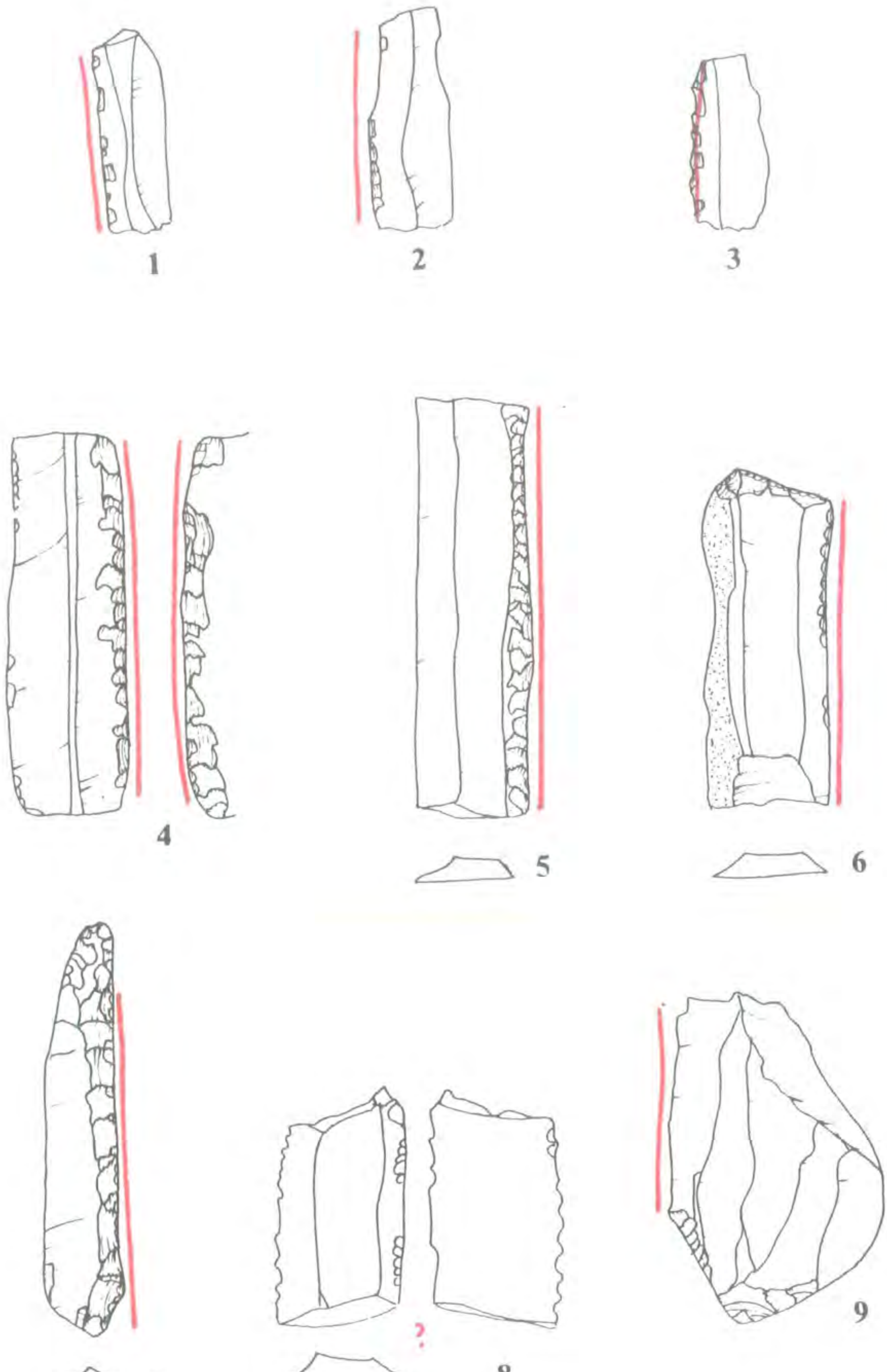


Fig.VI:21 Lustred Flint Blades: Period 4
Bouqras (after Roodenberg). Scale 1:1

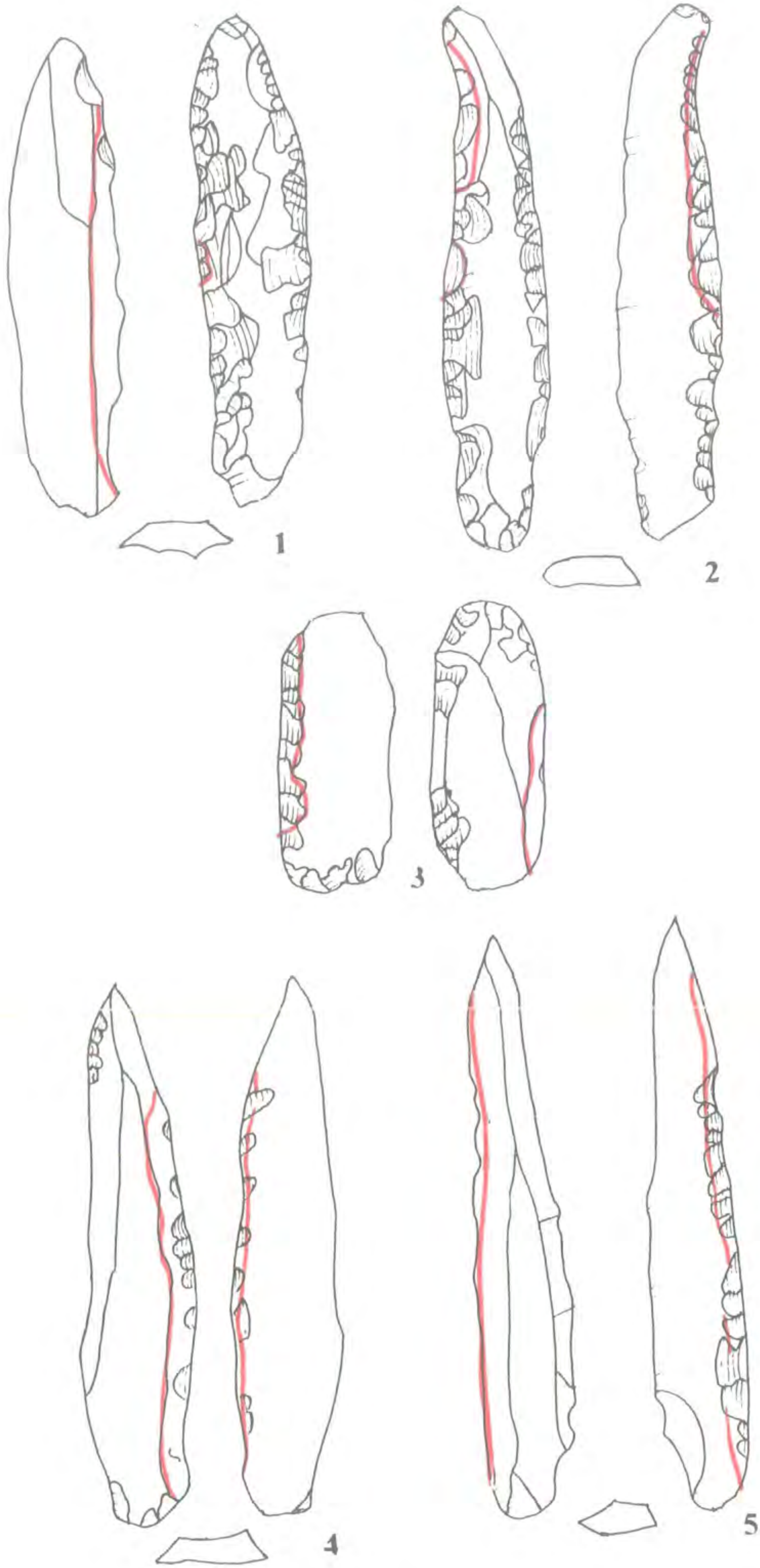


Fig.VI:22 Lustred Flint Blades: Period 4
Abu Hureyra (after Moore). Scale 1:1

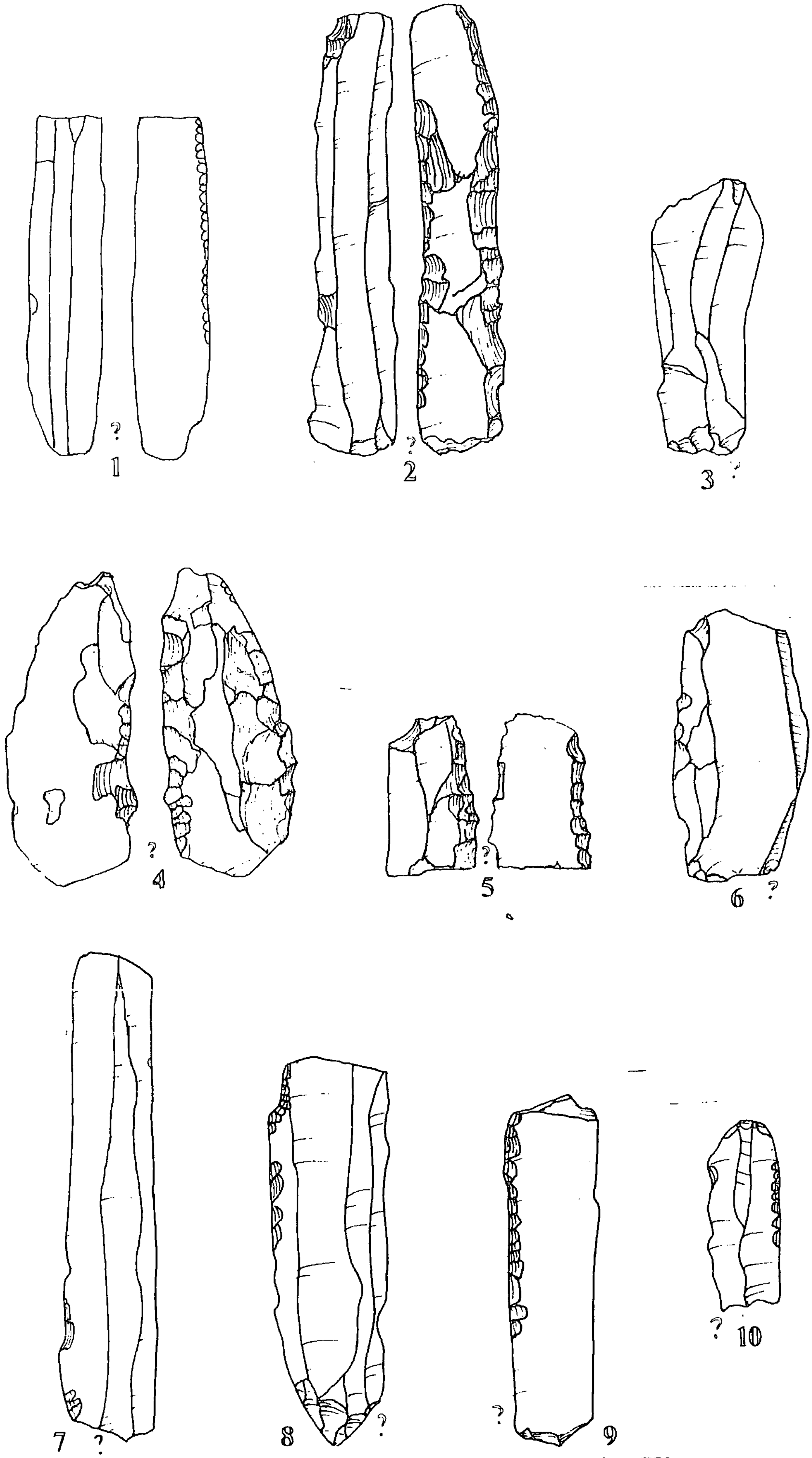


Fig.VI:23 Lustred Flint Blades: Period 3-4
no. 1 Tell Rihan (after Tusa), nos. 2-6 Jarmo (after Hole), 7-10 Ali Kosh (Ali Kosh phase [after Hole et al]). Scale 1:1

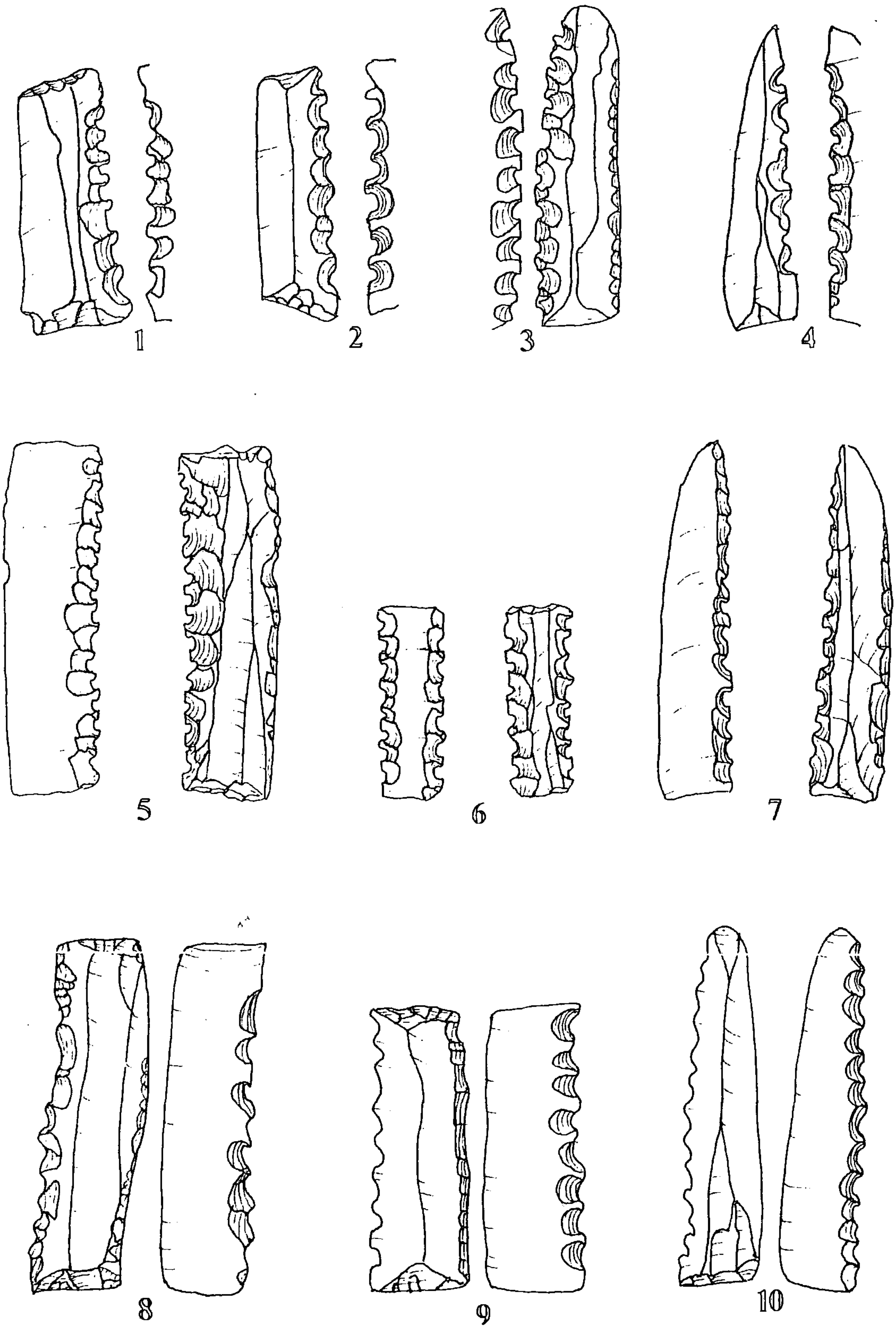


Fig.VI:24 Lustred Flint Blades: Periods 5 and 6
Sha'ar Hagolan (after Stekelis), nos. 6-7 Mediddo (after Crowfoot Payne), nos. 8-10 Byblos (Cauvin). Scale 1:1

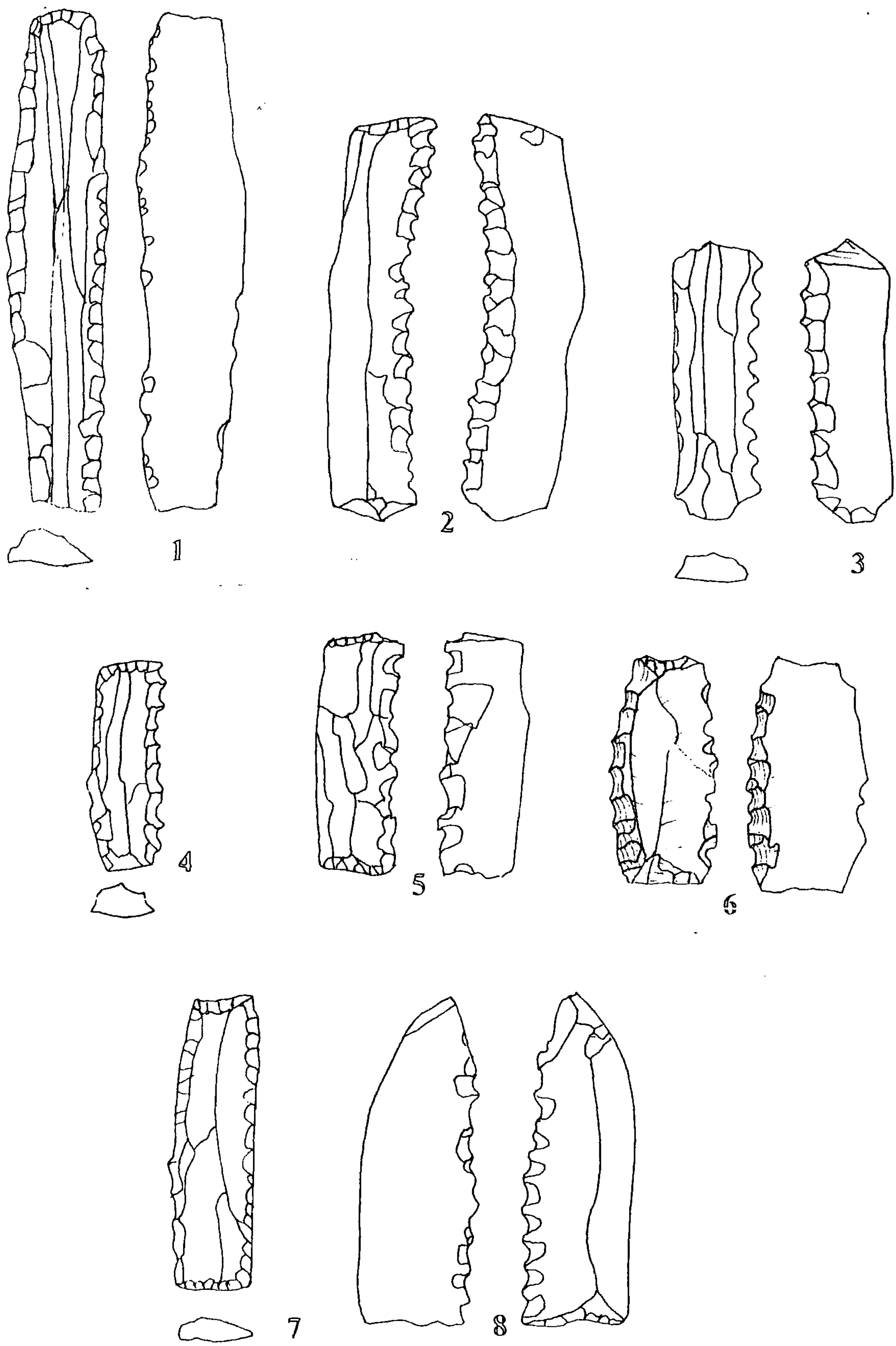


Fig.VI:25 Lustred Flint Blades: Period 5
Ramad III (after de Contenson). Scale 1:1

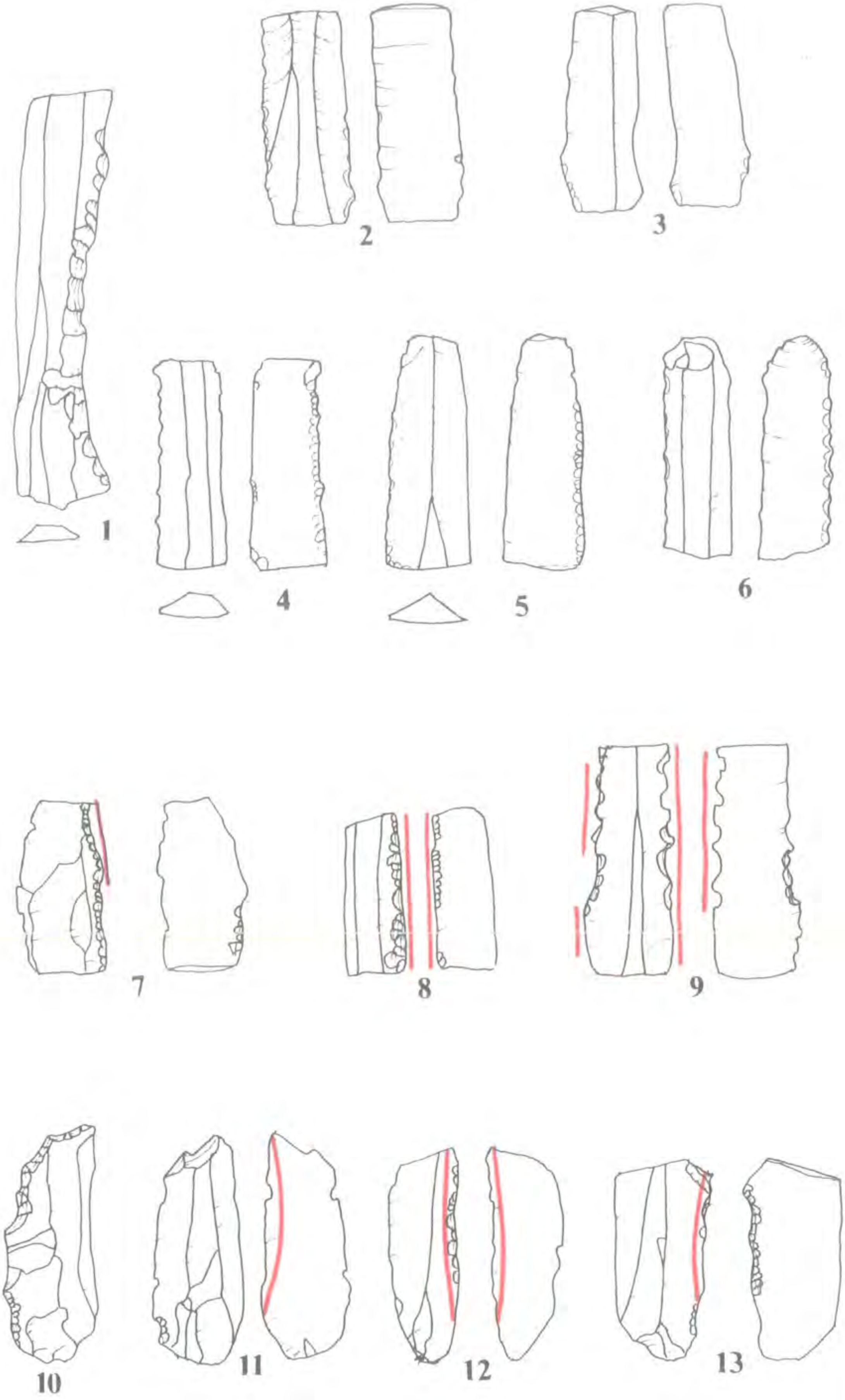


Fig.VI:26 Lustred Flint Blades: Periods 5-6
no. 1 Ras Shamra (after de Contensen), nos. 2-6 Amuq A and B
(Crowfoot Payne) nos. 7-13 Apamea VA and Vb (after Otte). Scale 1:1

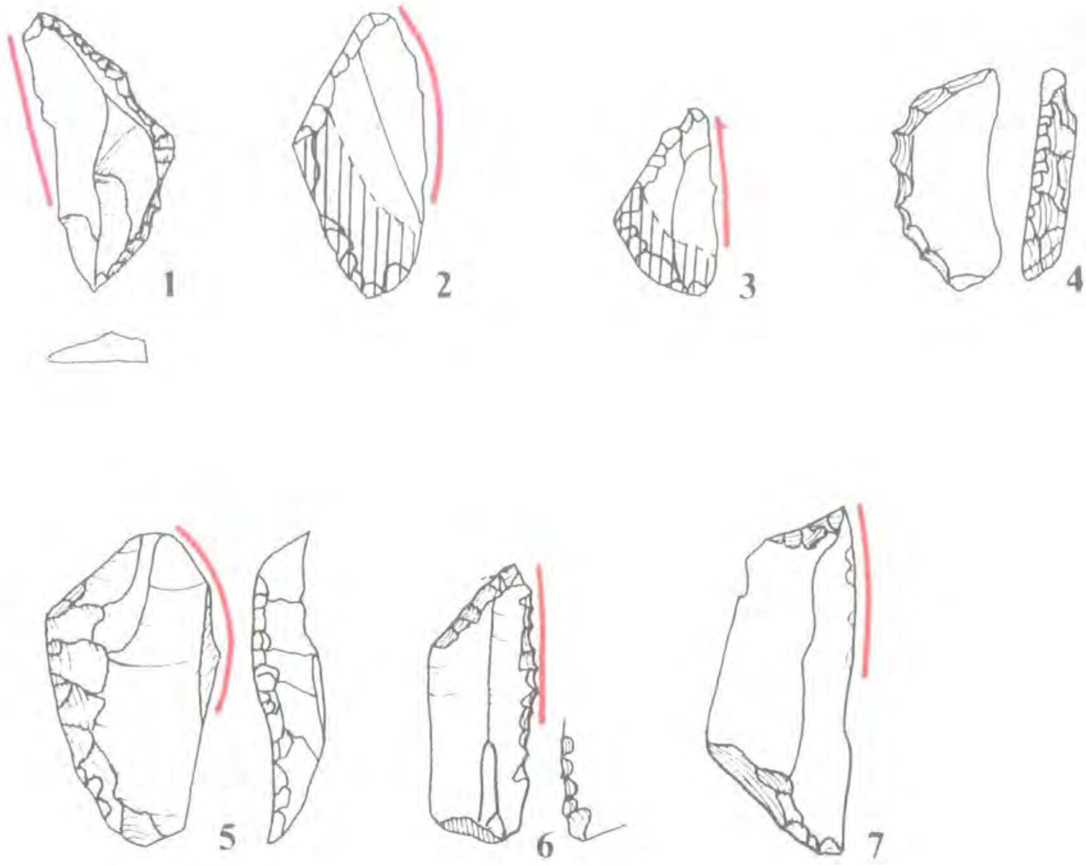


Fig.VI:27 Lustred Flint Blades. Period 5
Aswad (Balikh) (after Cauvin). Scale 1:1

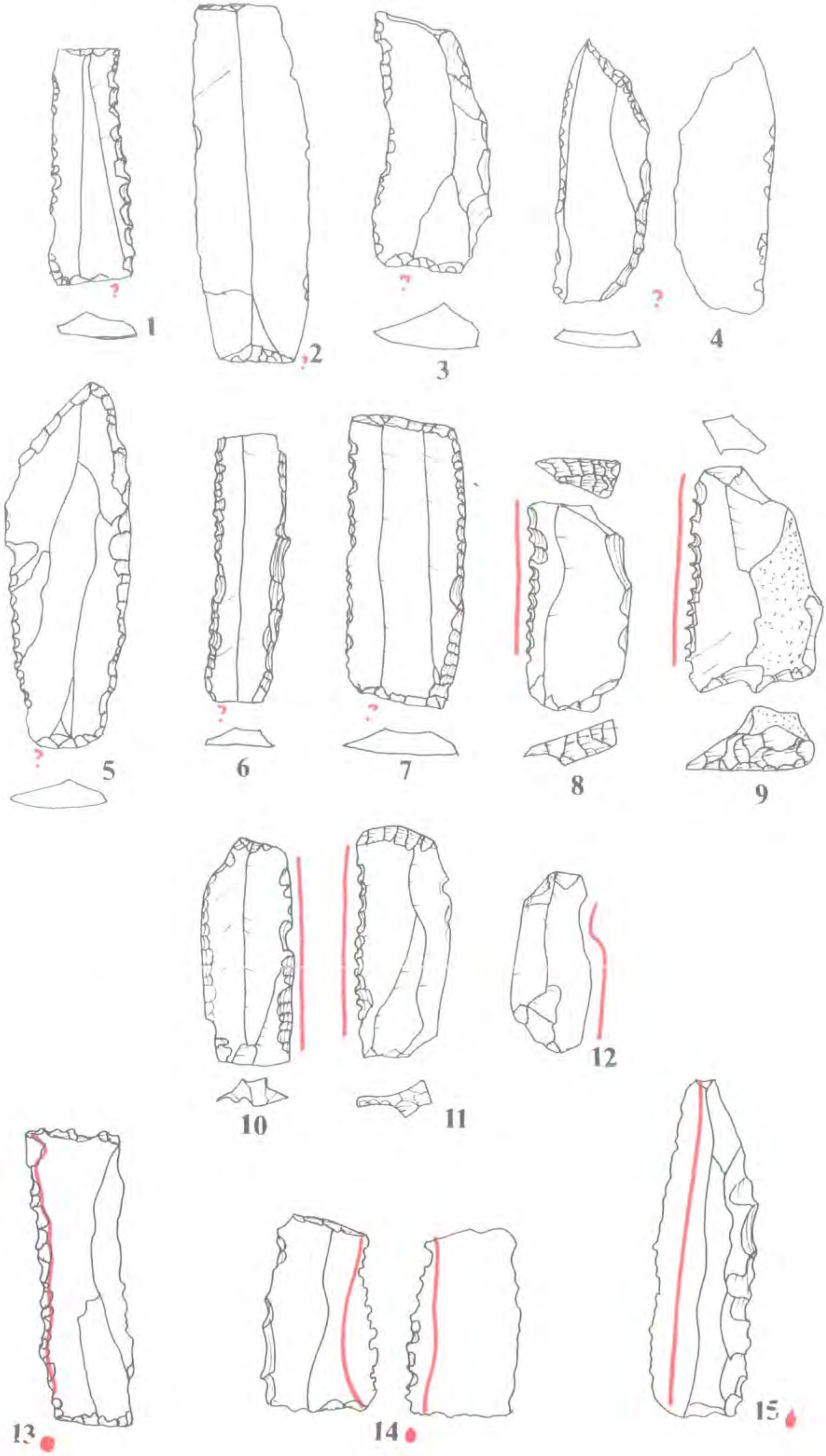


Fig.VI:28 Lustred Flint Blades: Period 6
nos. 1-7 Kurdu (nos. 1-5 Amuq C, nos 6 and 7 Amuq D [after Crowfoot Payne]), nos 8-15 Arjoune (nos 8-12 after Copeland, nos 13-15 after Unger-Hamilton). Scale 1:1

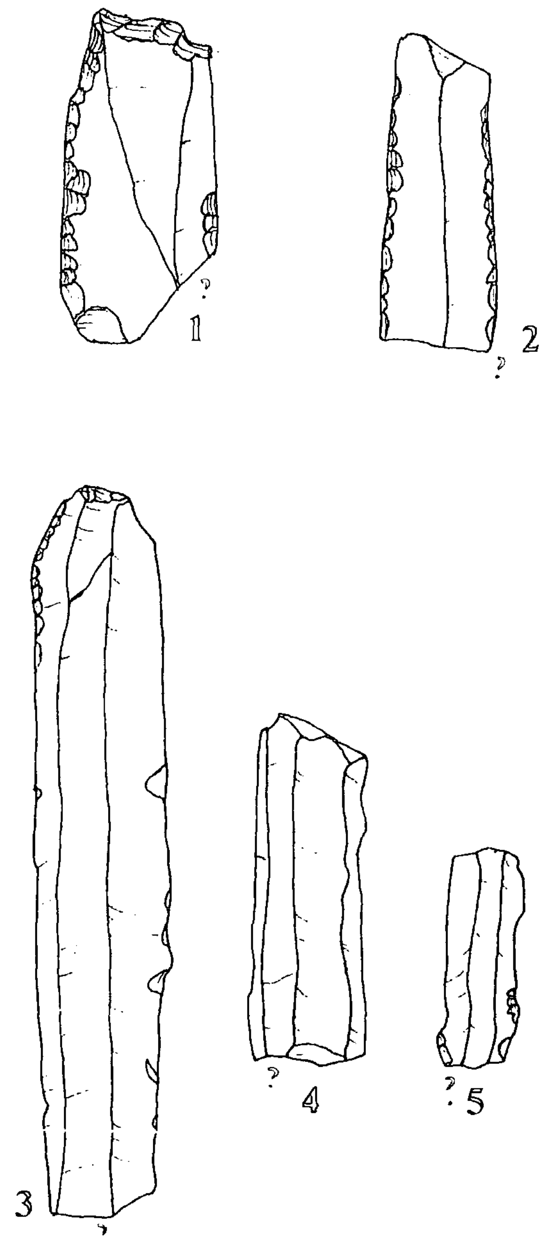


Fig.VI:29 Lustred Flint Blades: Periods 5-6 nos. 1-2 Çatal Hüyük (after Bialor) VI and V, nos. 3-5 Hacilar (after Mellaart). Scale 1:1

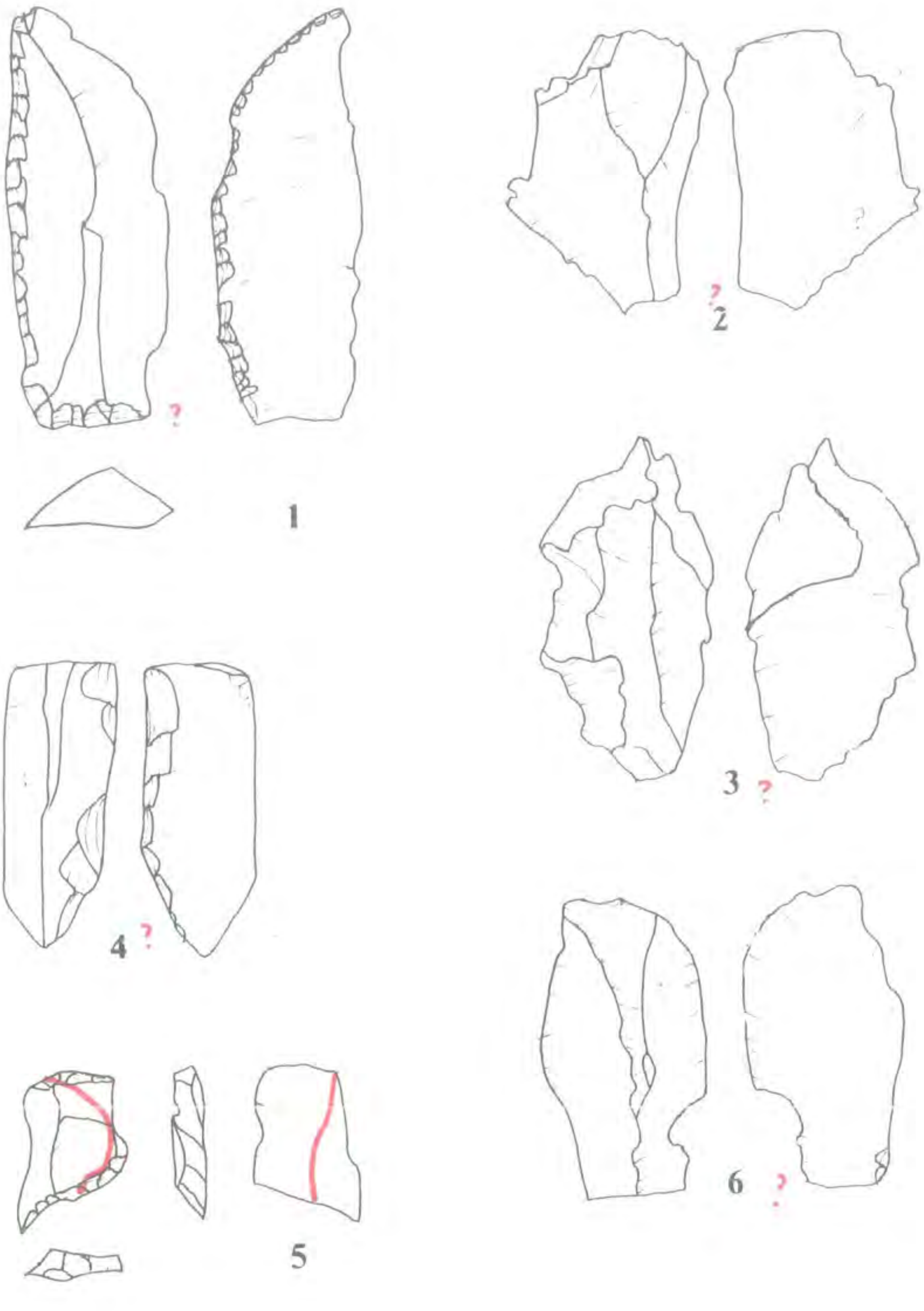


Fig.VI:30 Lustred Flint Blades: Periods 5-6
no.1 Umm Dabagiyah a (after Mortensen), nos 2,4, 6 and 7 Hassuna (after lloyd and Safar), no.5 Telul eth Thalathat (after Merpert *et al*). Scale 1:1

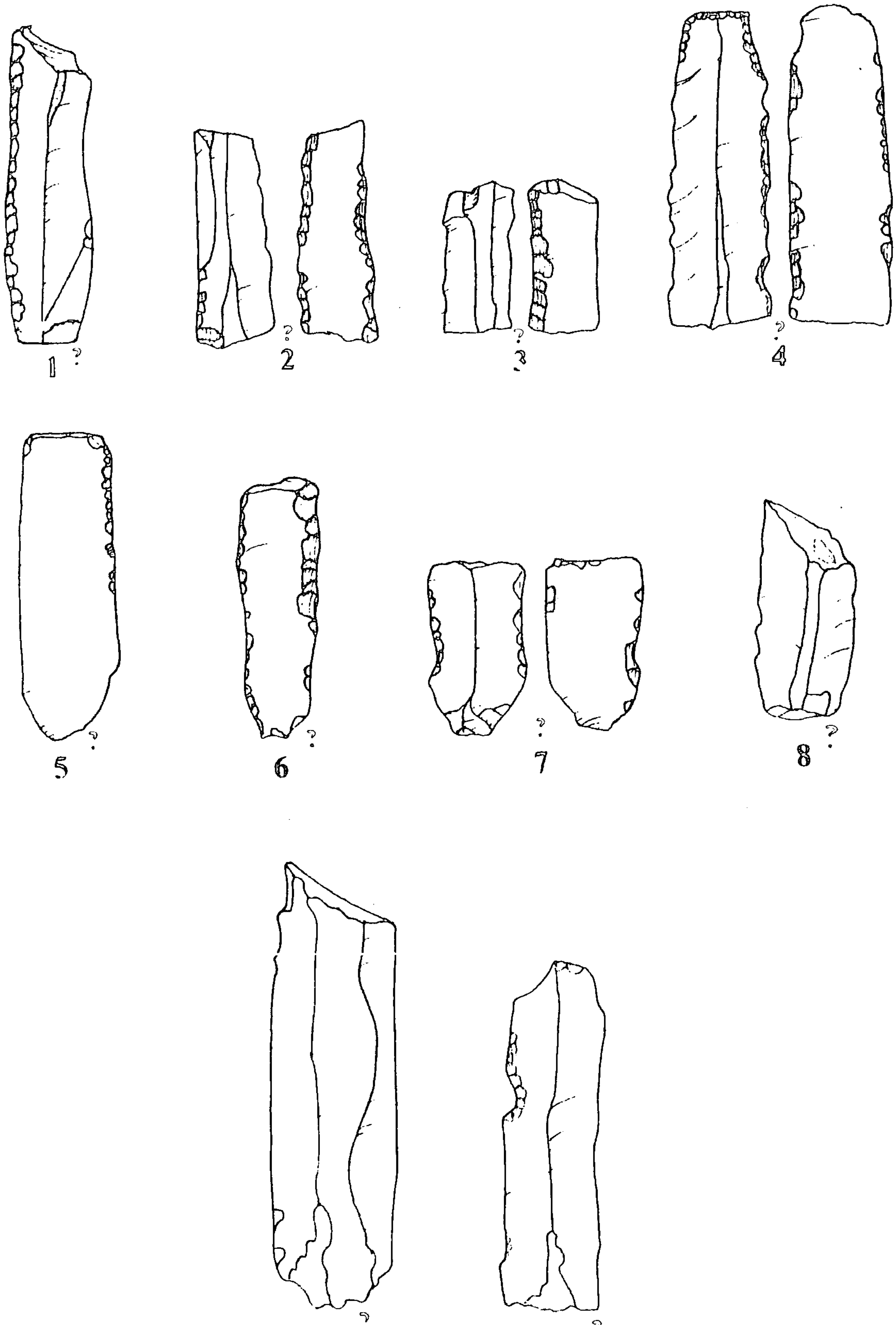


Fig.VI:31 Lustred Flint Blades: Periods 5-6
nos. 1-8 Jarmo J-II (after Hole), nos. 9 and 10 Ali Kosh (Mohammed Jaffar (after Hole et al)). Scale 1:1

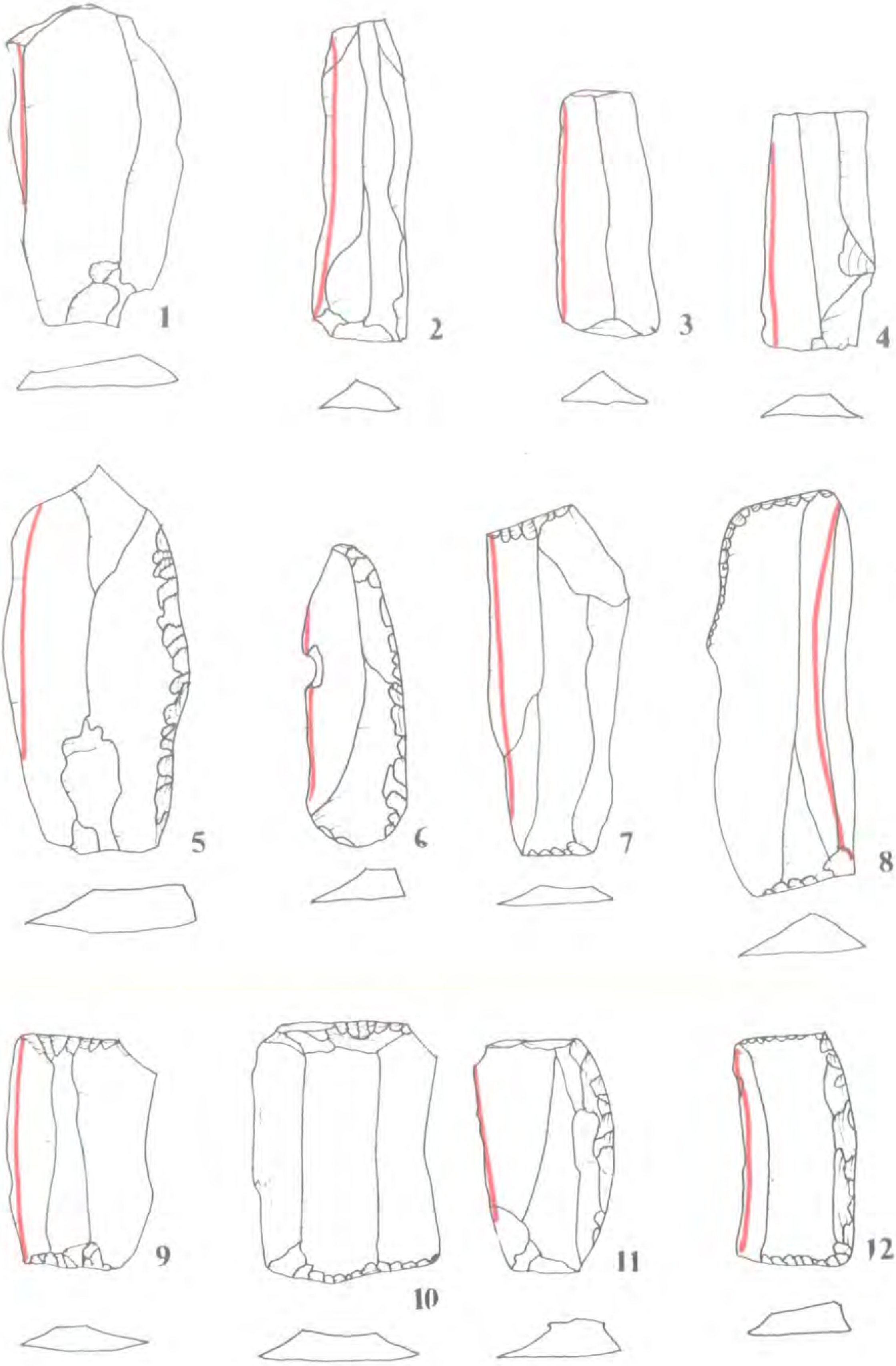


Fig.VI:32 Lustred Flint Blades: Periods 5-6
Choga Mami (after Mortensen). Scale 1:1

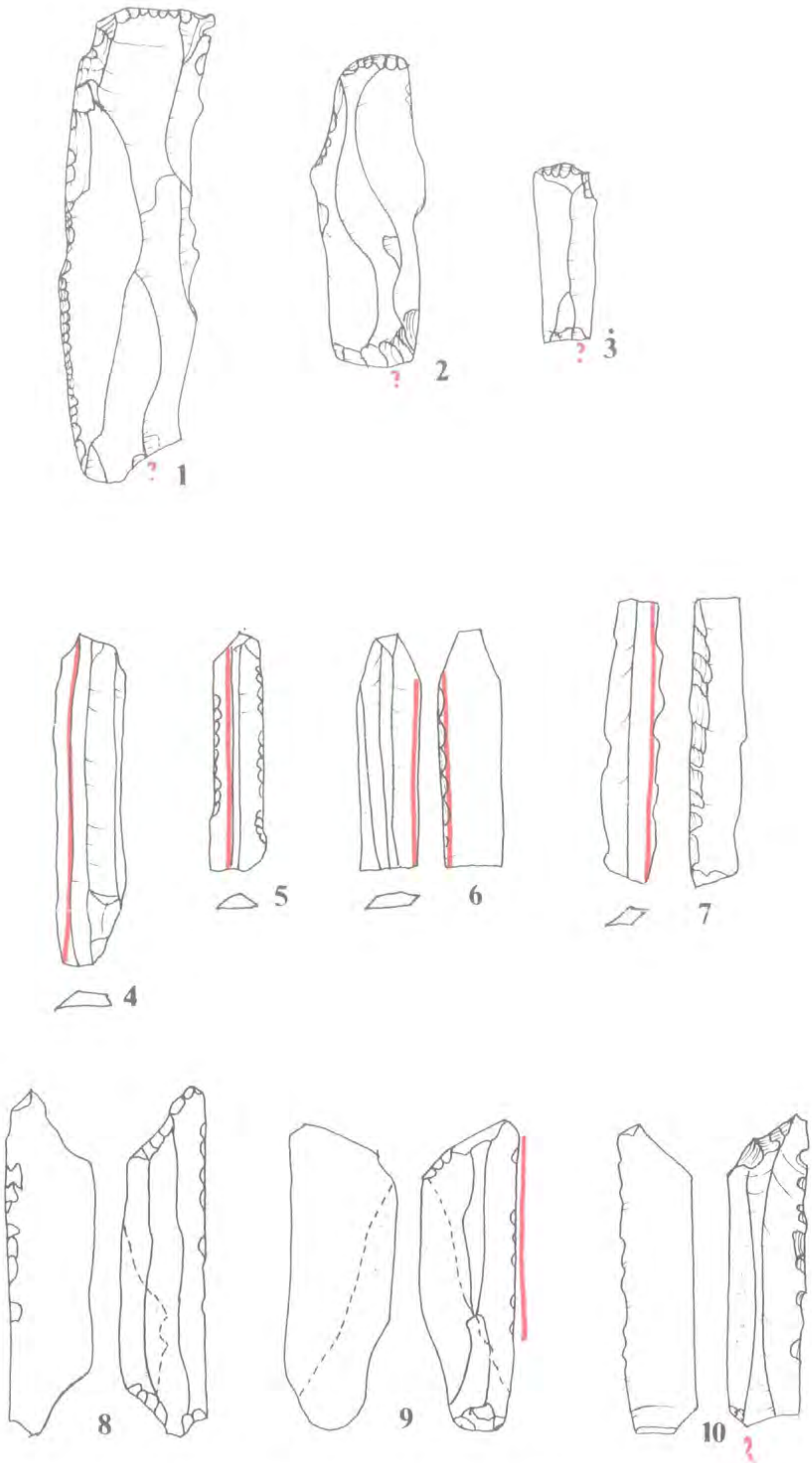


Fig.VI:33 Lustred Flint Blades: Periods 5-6 and 7
nos. 1-3 Sabz (after Hole <u>et al</u>), nos. 4-7 Shimsharra (after Mortensen), nos. 8-10 Aswad, Balikh (after Cauvin, M.-C.). Scale 1:1

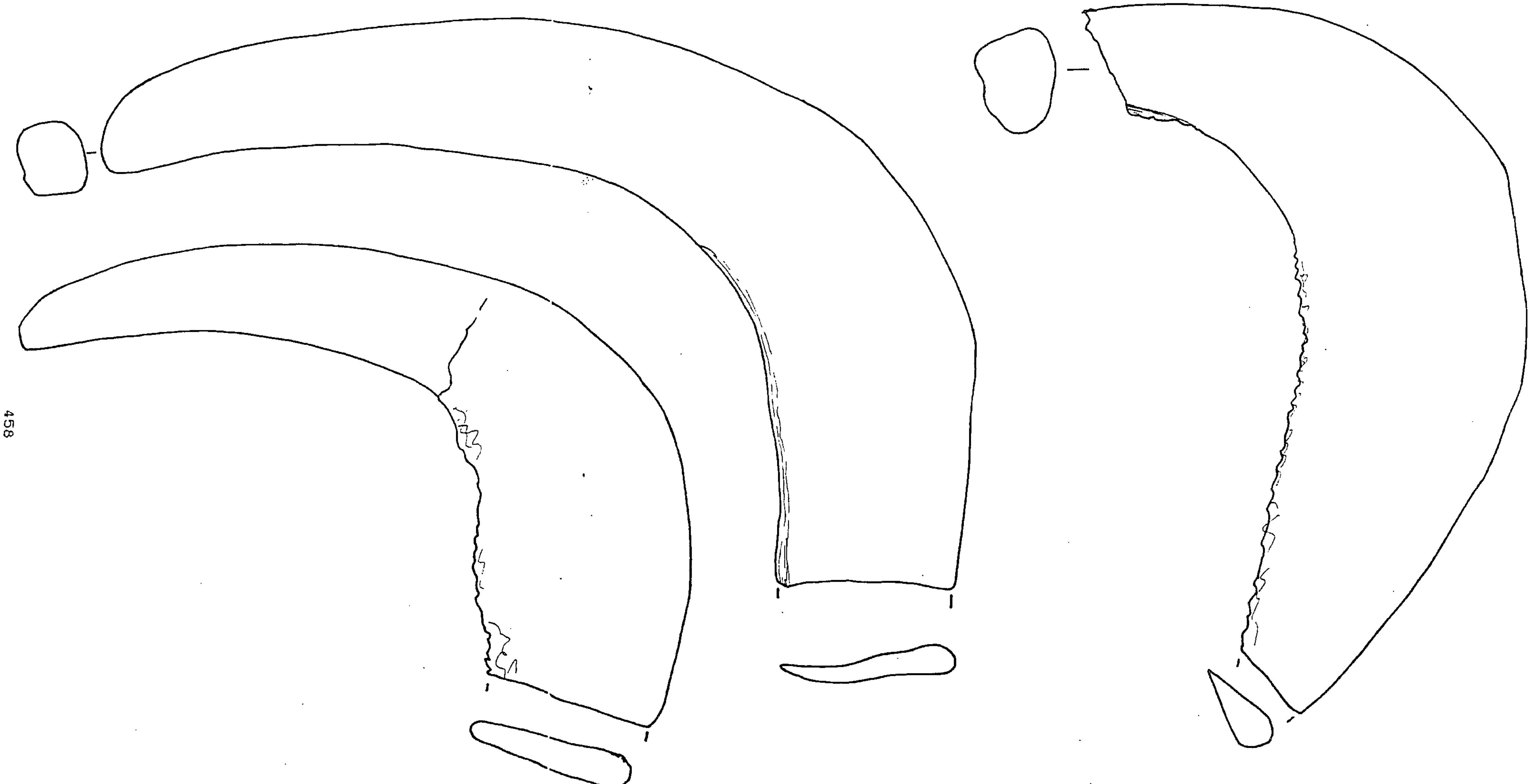


FIG. VI:34 Clay Sickles from Eridu.

Scale 1:2

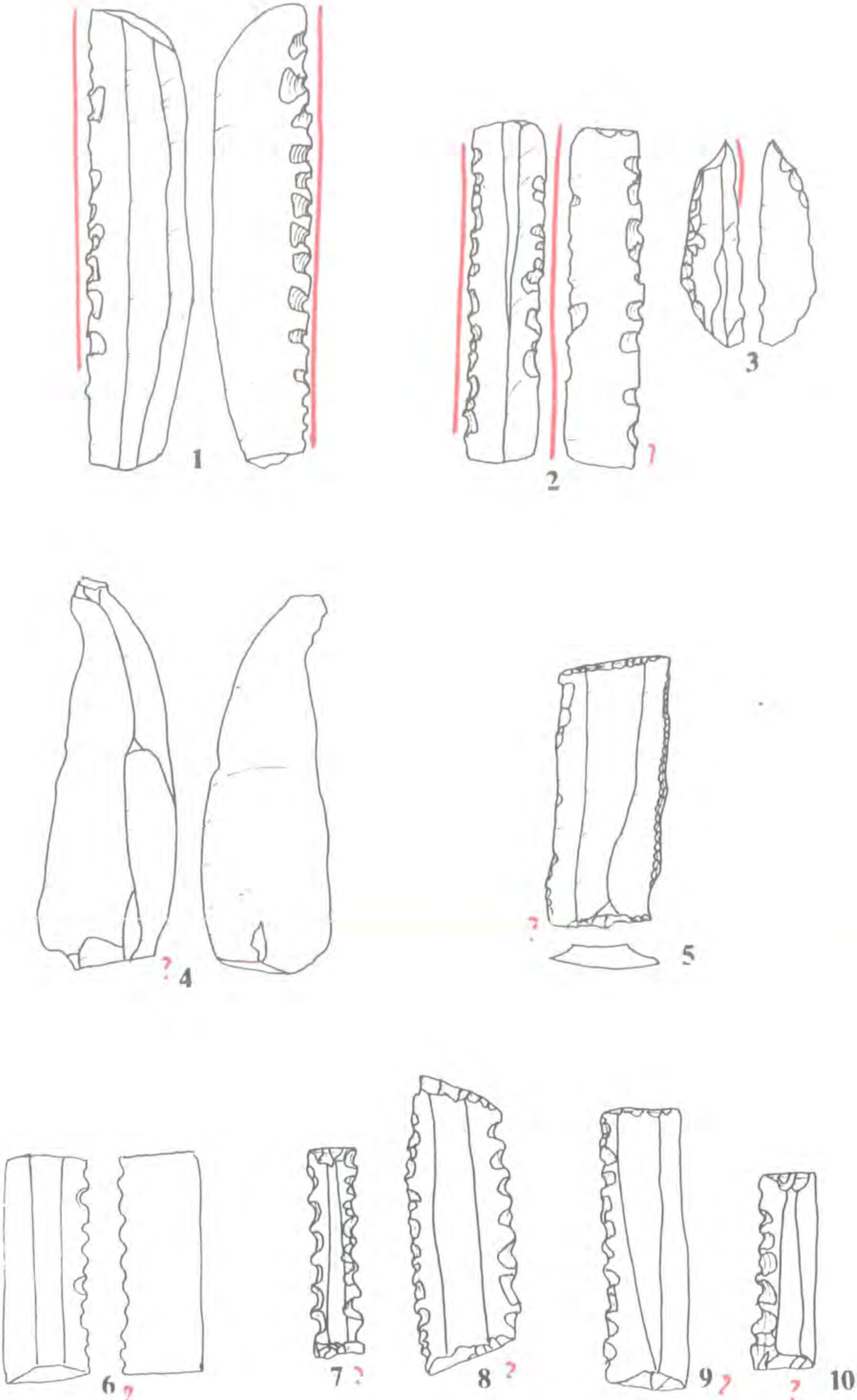


Fig.VI:35 Lustred Flint Blades: Ubaid, Uruk and Early Dynastic Period nos. 1-3 Tello (after Cauvin), no.4 Abu Khamis (after Masry), no.5 Uruk (after Eichmann), no. 6 Kish and nos. 7-10 Abu Salabikh (after Crowfoot Payne). Scale 1:1

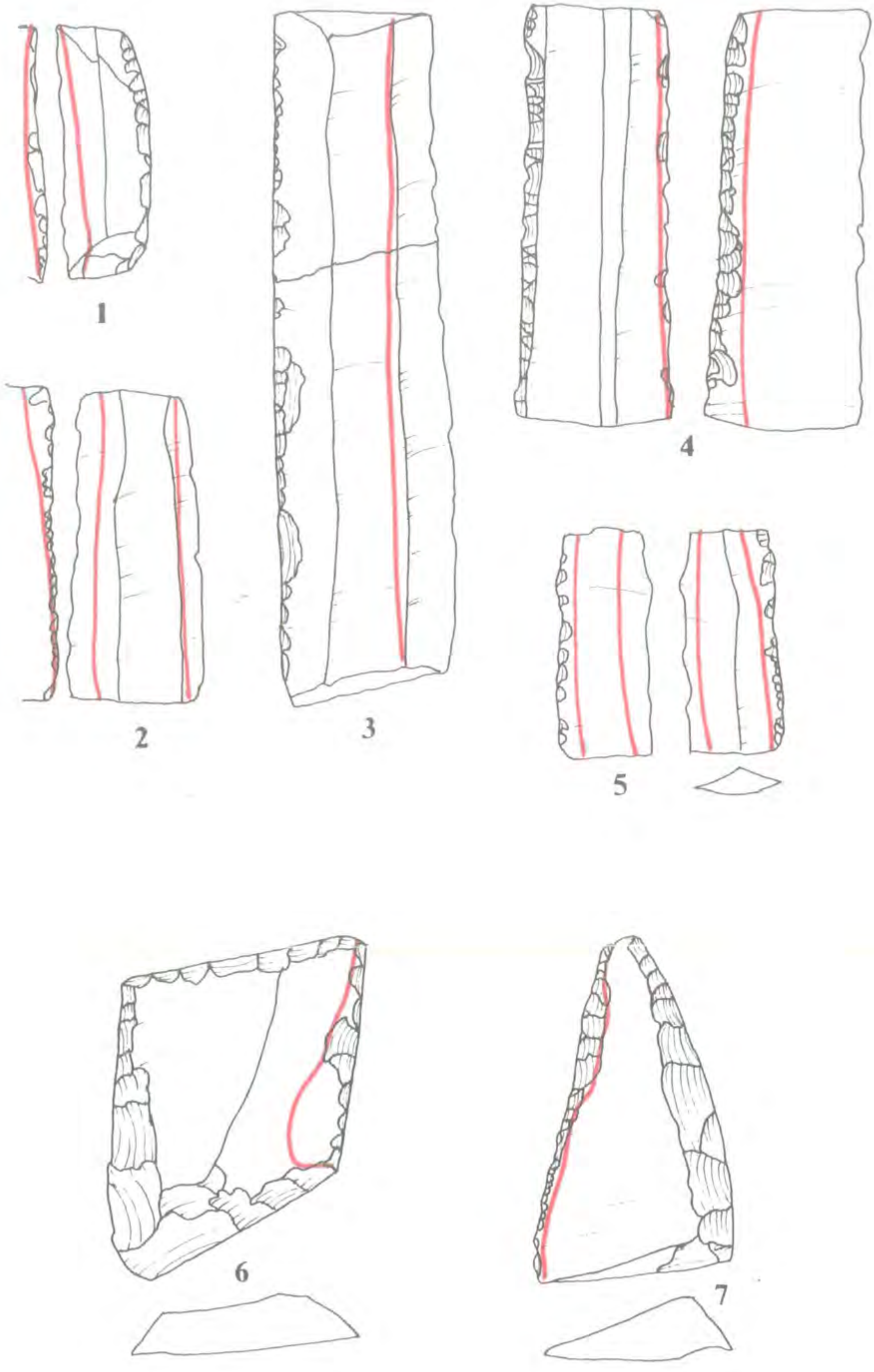


Fig.VI:36 Lustred Flint Blades: Chalcolithic and Bronze Age Palestine
no. 1 Arad Ghassulian (after Shick). nos. 2-4 Arad Early Bronze Age,
no. 5 en Shadud (after Rosen), nos. 6 and 7 Gerar Late Bronze Age.
Scale 1:1

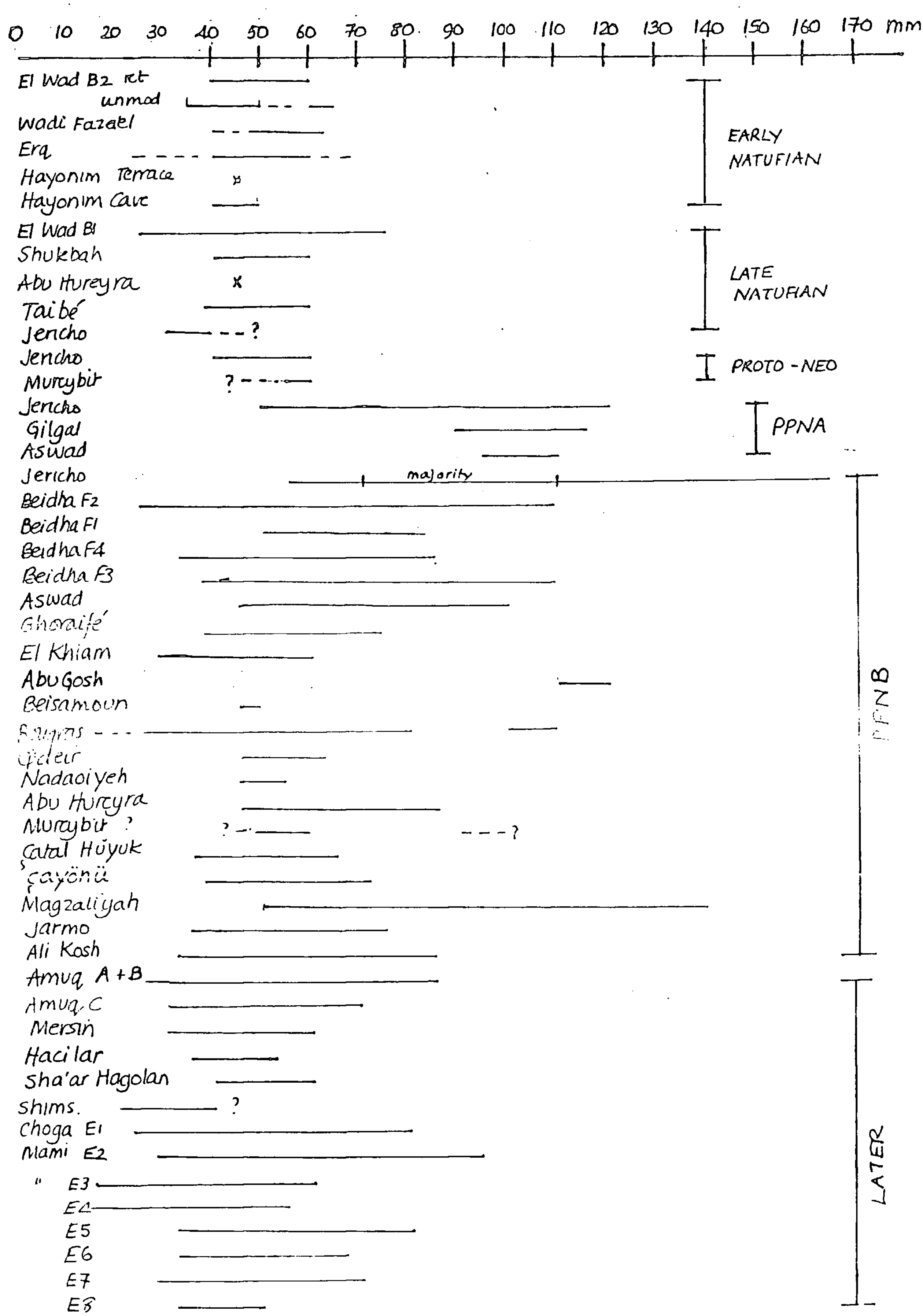


FIG. VI:37 LENGTHS OF LUSTRED BLADES

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