THE PREHISTORY OF THE BASALT DESERT, TRANSJORDAN

AN ANALYSIS

Alison Venetia Graham Betts

Thesis presented for the degree of Doctor of Philosophy

London University, Institute of Archaeology

February 1986

Summary

The content of this thesis is based on original fieldwork by the candidate in the Black Desert, the basalt region of eastern Jordan. Very little is known about the prehistoric sequence of occupation in the area. The thesis attempts to outline this sequence through analysis of the survey data, and compare it to existing information from the better documented areas of Palestine and Syria.

The first chapter describes the environment of the study area, both at present and in history, and sets out the survey and sampling techniques used in the study. The second chapter gives a brief description of the slender evidence for Lower and Middle Paleolithic in the region and the third chapter examines the evidence for the Epipaleolithic, comparing sites found on the survey with those from similar contexts and more contrasting ones in the fertile areas to the west.

The fourth chapter covers the extensive evidence for aceramic Neolithic occupation and discusses the typelist adopted for the analysis. It describes the types of sites of this period, and includes detailed analyses of two excavated assemblages to demonstrate the special character of the sites in the survey area. The fifth chapter continues the discussion into the later Neolithic when there is a significant change in subsistance strategies in the desert. Many sites and findspots have been recorded for this period. The nature of their chipped stone

industries and their distribution are examined and analysed, and contrasted with the evidence for this period from surrounding areas.

The sixth chapter outlines the evidence for post-Neolithic occupation in the study area and elsewhere in the desert regions. It also presents the data for the chipped stone assemblage from Jawa, an intrusive Late Chalcolithic/Early Bronze industry, the Cananean, typical of Palestine and western Syria. The final chapter sums up the results of the work and presents conclusions.

Table of Contents

List of Figures

"On the way there we met neither man nor beast for the country was undulating harra, a black waste of flints with no sign of life. A flint pierced the oil container of the American baggage car, but we were able to hammer it down and solder it satisfactorily with a fig."

Agnes Horsfield (1943)

Journey to Kilwa, Transjordan
The Geographical Journal CII/2

NASA Skylab: The Azraq Basin

Acknowledgements

The Black Desert Survey, the project on which this thesis is based, began in 1979 and between then and completion of the text, a great number of people and Institutions have given all kinds of help, assistance and co-operation. Preliminary survey work in 1979 was undertaken at the suggestion of Dr Svend Helms, whose excavations at Jawa had highlighted the need for further work on the prehistory of the Black Desert. This preliminary survey work was made possible by the British School of Archaeology in Jerusalem who awarded me the Annual Scholarship for 1978/9. My work was greatly facilitated by Dr Adnan Hadidi, Director of Antiquities of the Hashemite Kingdom of Jordan and Mrs C.M. Bennett, then Director of the British Institute at Amman for Archaeology and History. I had two short seasons, the first accompanied by Mr John Grey and Mr Ali Balcaz, the second by Dr Svend Helms.

In October 1980 I registered for a Postgraduate Degree at the Institute of Archaeology, University of London under the supervision of Mr P.J. Parr and began to prepare a major three season survey project to examine the prehistory of the Black Desert. The project was conducted under the auspices of the British Institute at Amman for Archaeology and History and was funded by a number of Institutions which are listed below. I am extemely grateful to all of these for their generous support. The Representatives of the Department of Antiquities who accompanied us into the field were Mr Hazzim Jasr (1981) and Mr Arif Abu Ghannem (1981,82,83). Field staff, without whose hard work and good humour the project would have been impossible, were Mr Cliff Denham and Miss Isabelle Ruben (1981), Miss Alison McQuitty and Miss Isabelle Ruben (1982), and Dr Svend Helms, Mr Brian Hitchcock and Miss Alison McQuitty (1983).

In addition I should like to thank Dr David McCreery, Director of the American Center for Oriental Research for all the assistance given by A.C.O.R., Geophysical Service International for much needed emergency vehicle maintenance in 1981 and the Aerial Archive for Archaeology and History in the Middle East for making available essential maps and photographs. I am also very grateful to many people who have given advice and guidance in the course of my study. I would especially like to mention Professor Ofer Bar-Yosef, Dr Chris Bergman, Mr Brian Byrd, Mlle Sylvie Calley, Mme Marie-Claire Cauvin, Mrs Lorraine Copeland, Mrs Joan Crowfoot Payne, Mr Peter Dorrell, Dr Andrew Garrard, Dr Donald Henry, Père Francis Hours, Dr Katsuhiko Ohnuma, Dr Mark Newcomer, Mr Peter Parr, Dr Gary Rollefson and Dr Claudio Vita-Finzi. Lastly, I would like to acknowledge with gratitude all the assistance offered by Dr Adnan Hadidi and the staff of the Department of Antiquities of Jordan.

The Black Desert Survey was supported by the following Institutions:

(1981) The British Institute at Amman for Archaeology and History
The British School of Archaeology in Jerusalem
The G.A. Wainwright Fund
The Central Research Fund (University of London)
The Gordon Childe Bequest Fund
The Ashmolean Museum
The City Museums and Art Gallery, Birmingham
The Manchester Museum

(1982) The Gordon Childe and Margery Bequest Funds
The G. A. Wainwright Fund
The British School of Archaeology in Jerusalem
The British Museum
The Palestine Exploration Fund
The British Institute at Amman for Archaeology and History
The County Museum, Liverpool
The Ashmolean Museum
The Pitt Rivers Museum
The City Museums and Art Gallery, Birmingham
The Manchester Museum

(1983) The British Institute at Amman for Archaeology and History
The Central Research Fund, (University of London)
The British School of Archaeology in Jerusalem
The Palestine Exploration Fund
The G.A. Wainwright Fund
The Ashmolean Museum
The County Museum, Liverpool
The Gordon Childe and Margery Bequest Funds
The Pitt Rivers Museum
The City Museums and Art Gallery, Birmingham
The Manchester Museum

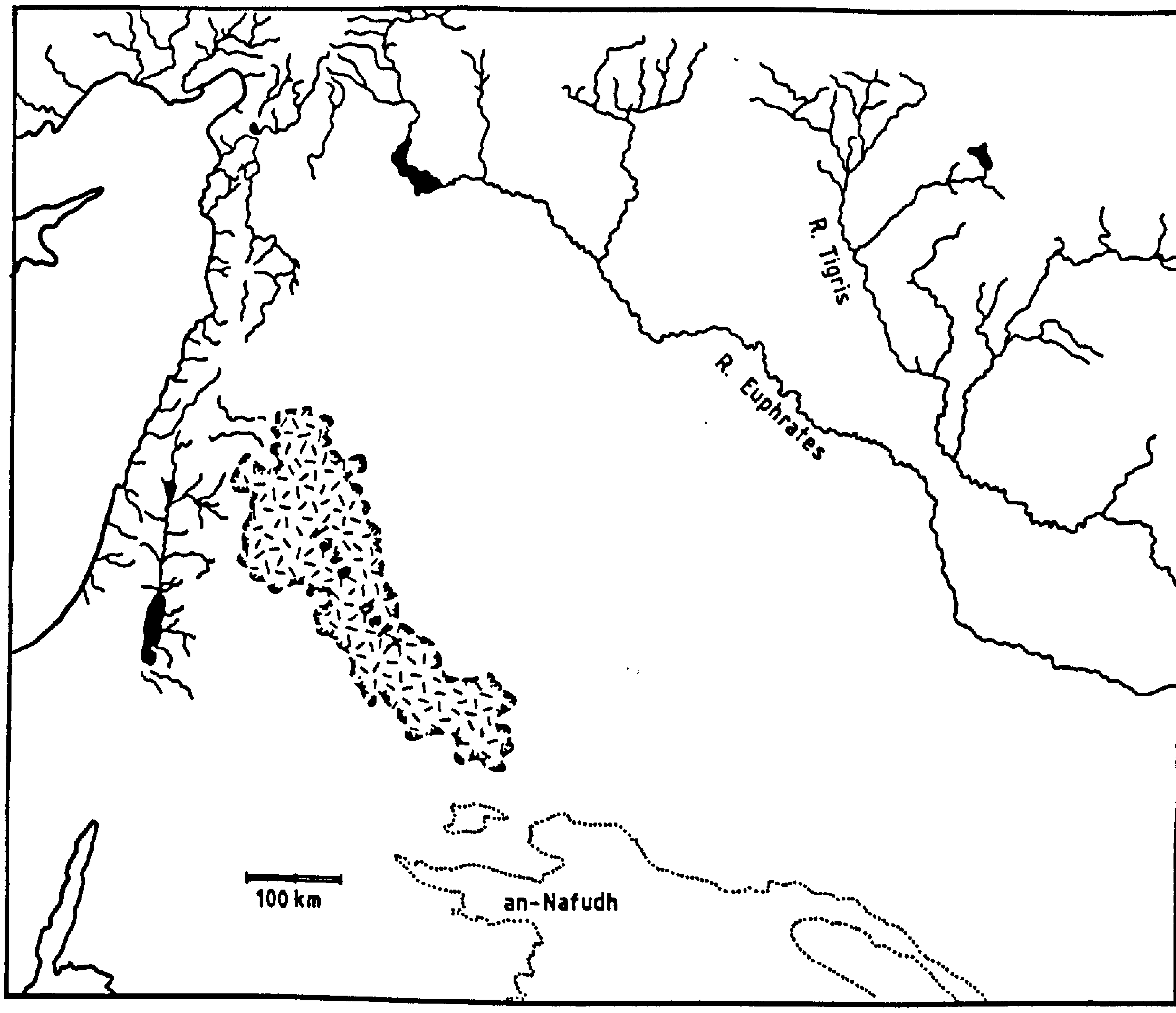


Fig. 1.1 Near East: location of the lava belt (Black Desert)

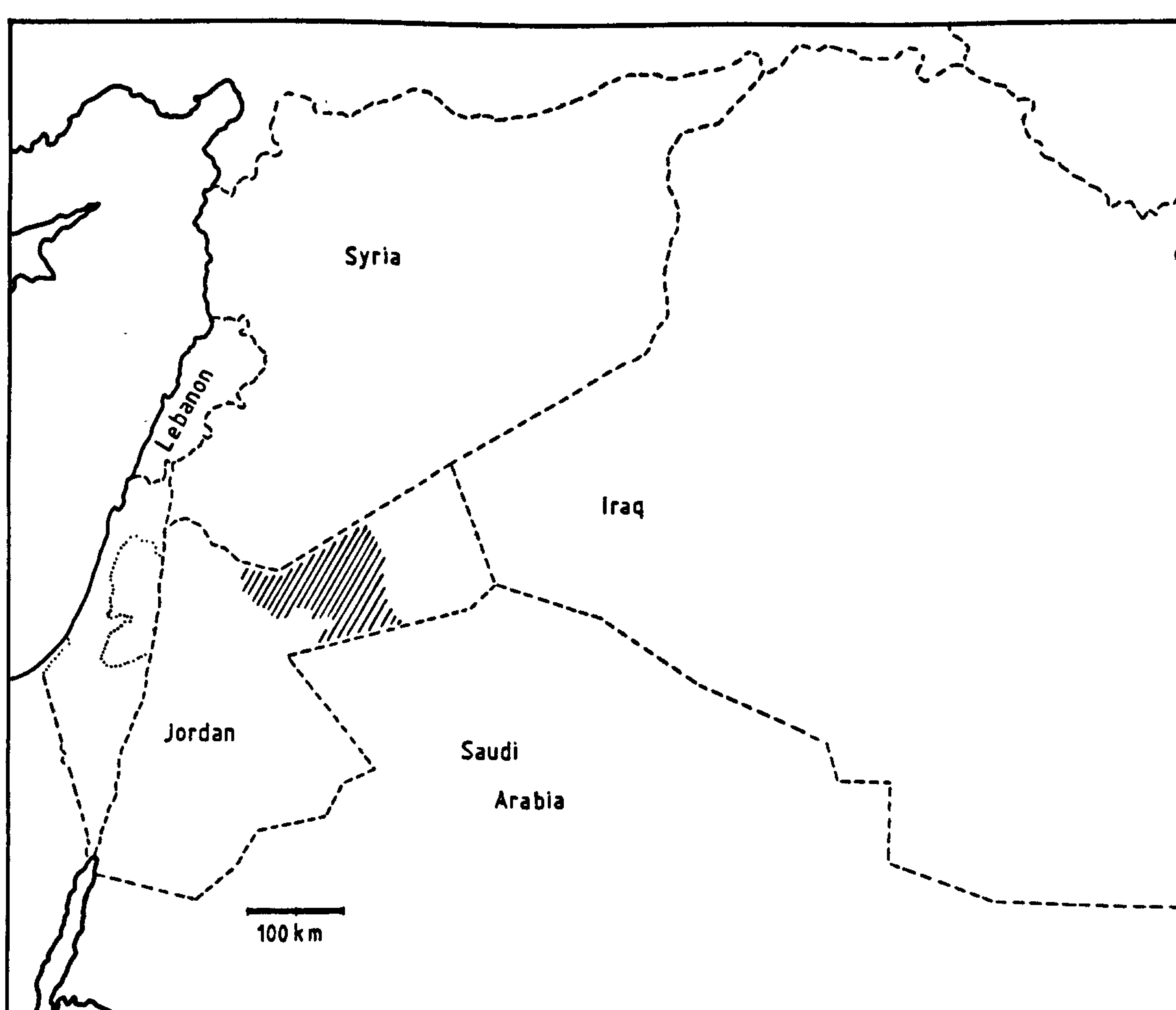


Fig. 1.2 Near East: modern political boundaries and the location of the study area

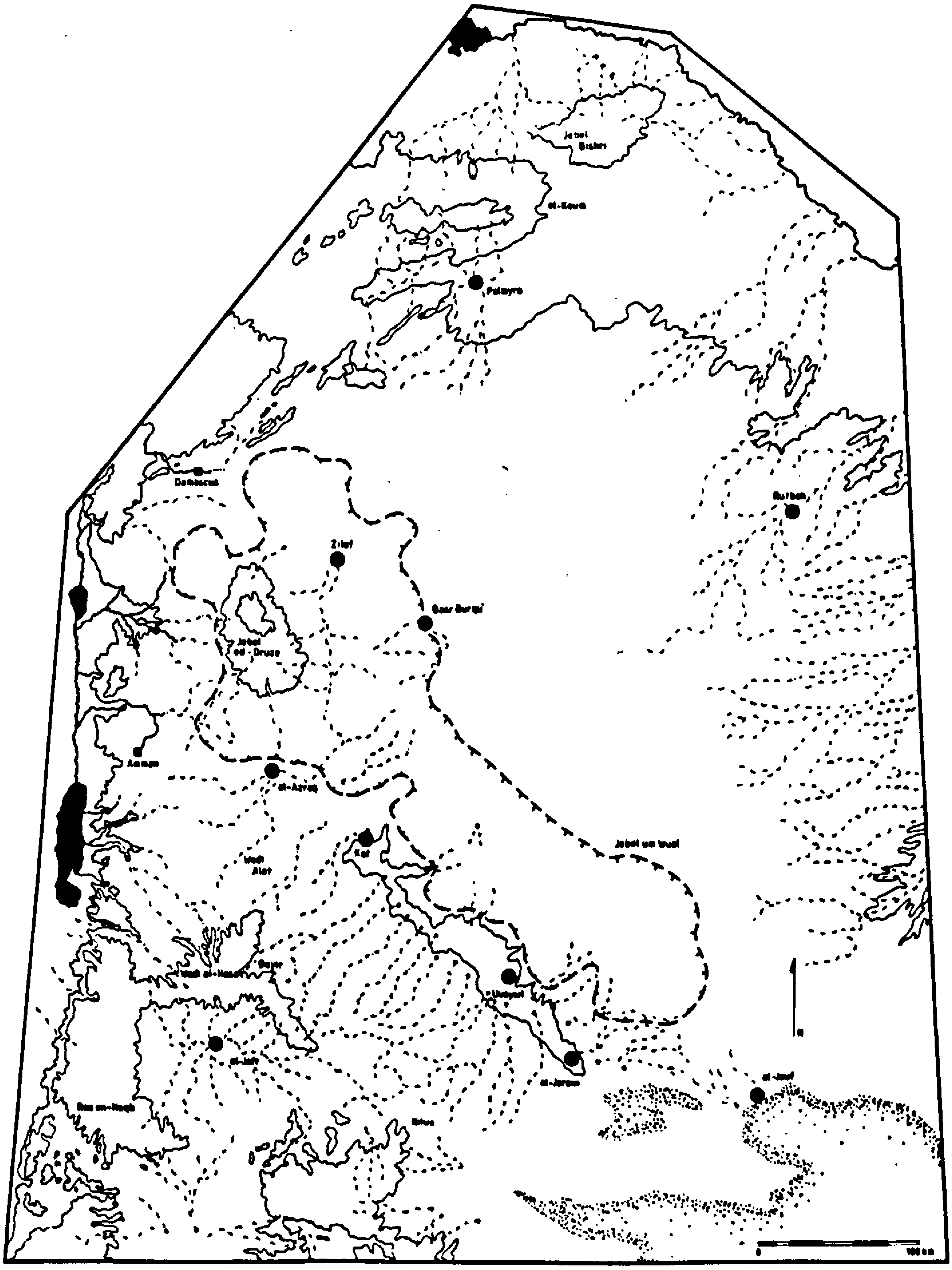


Fig. 1.3 The Syrian Desert: main features of drainage and location of principal wells and oases.

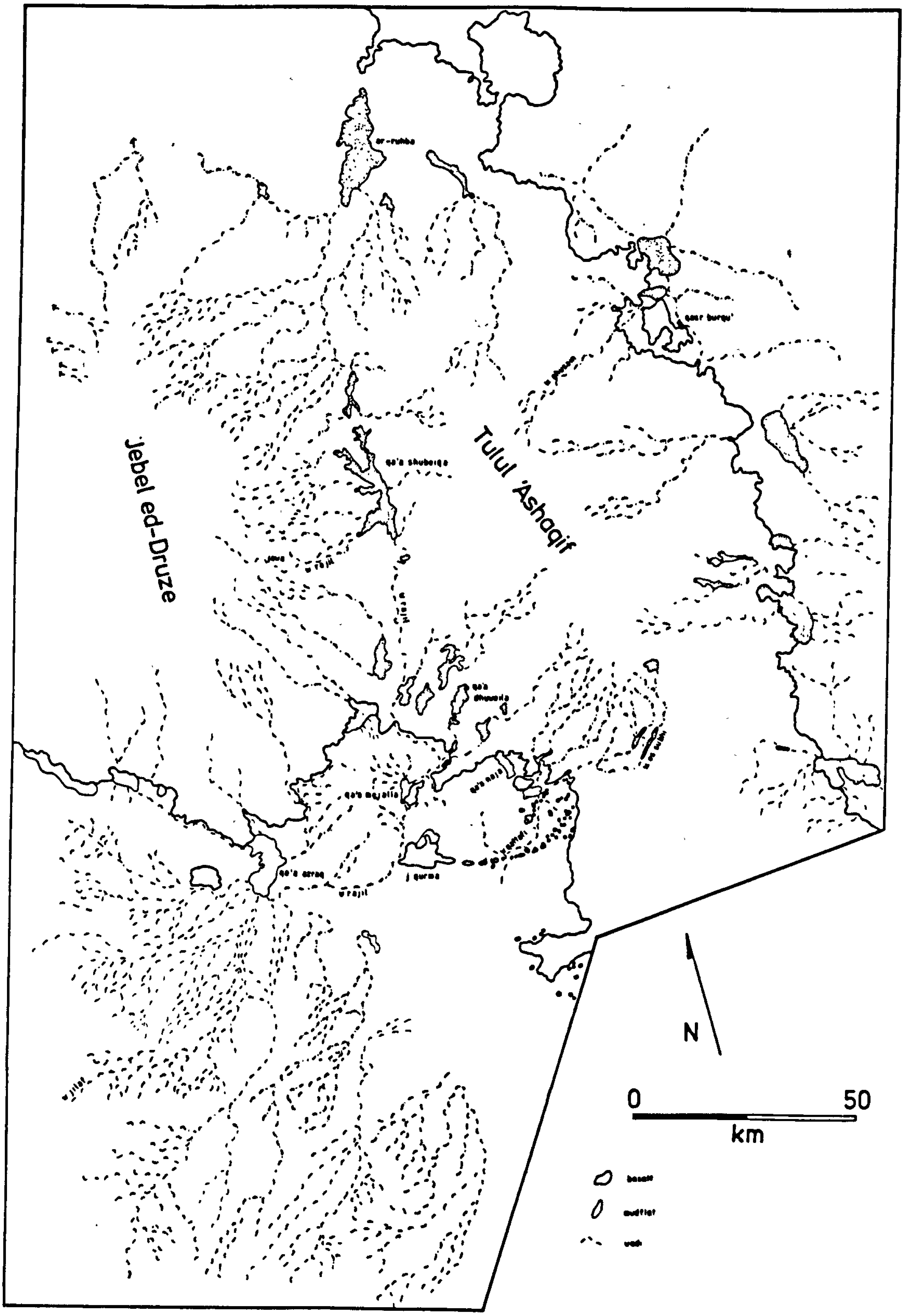


Fig. 1.4 The Black Desert: extent of lava and main features of drainage

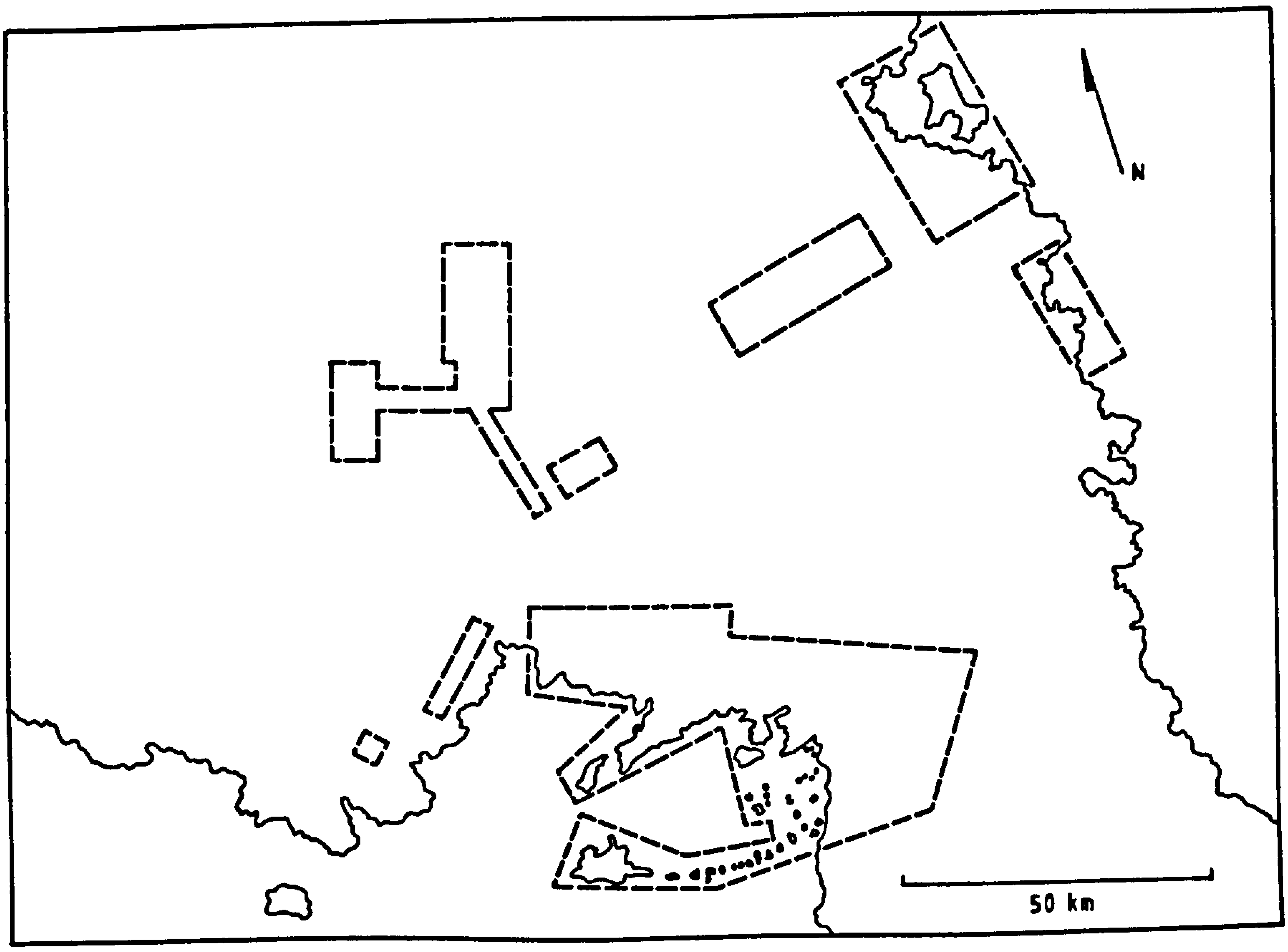


Fig. 1.5 The Black Desert, eastern Jordan: general survey areas

Chapter 1

The data which are presented and discussed in this thesis were obtained through a programme of survey and excavation in eastern Jordan. This chapter describes the survey area, its environment, and the research methods and sampling strategies of the fieldwork.

Introduction

The basalt desert of eastern Jordan, the area on which the survey has concentrated, is a rocky expanse of boulder-strewn wasteland and lava fields stretching from Jebel ed-Druze southeast of Damascus, down across eastern Jordan into Saudi Arabia, to Jauf on the northern fringes of the Nafudh desert. The area is barren and inhospitable, much of it covered by a basalt hammada that makes movement of men and animals across it slow and cumbersome. This particular area was selected for investigation for a number of reasons. One of the most obvious was that until recently there was a large gap on the archaeological maps of the Near East. Earlier work had concentrated on the fertile Mediterranean areas of Palestine, western Syria and the Euphrates, while the desert regions remained largely unexplored. Isolated collections, often by interested amateurs, made it clear that there was information to be obtained in these marginal zones, but logistics and also political difficulties had very much restricted research.

A second reason for chosing this area was the excellent state of preservation of the sites. The basalt hammada is unsuitable for any type of modern industrial or agricultural activity without large-scale and highly expensive clearance work. The few road-building and pipelaying operations conducted in the area are described in very bleak terms in reports relating to these projects. The very nature of the landscape then has protected the traces of men who only required to move across the land slowly and on foot. Flint scatters are preserved on the surface or buried under a light covering of sand, exactly as they were left. Furthermore, sites are easier to identify here than on the open gravel plains surrounding the basalt. It is possible for a trained eye to locate scatters of worked flint on a level plain entirely covered with broken flint pebbles, but it is much easier to identify such sites in the basalt region where any flint lying on the ground can only have been brought there by human agency.

Similarly, the open plains offered little in the way of materials for shelter, while the basalt hammada provided an abundance of convenient rocks and boulders for windbreaks, tent weights, corrals, corbelled huts and even animal traps. All these structures are still preserved, at least in part, in the survey area today. Selection of this area for survey has been fully justified, as several seasons of fieldwork have resulted in a vast body of miscellaneous data, the central aspects of which have been carefully distilled down to form the material for this thesis.

Because the work presented here covers such a long timespan - from the Middle Paleolithic through to the beginning of the Early Bronze Age - it has been necessary to restrict discussion of related evidence in some way. Lying as it does in such a central positon in the heart of the Near East, the survey region is likely to have connections with areas too vast to explore in detail in this work. However the selection process has been undertaken carefully. The key to this selection is the marked dichotomy between prehistoric sites in the fertile lands of the Mediterranean zone and those in the marginal steppe/desert regions. One of the aspects demonstrated in this thesis is that sites in the eastern steppe are more likely to have close parallels in arid areas such as Sinai than in the hill-country on the eastern slopes of the Jordan Rift Valley. There is already a considerable body of literature on sites of most prehistoric periods that lie within the fertile zones, and so rather than cover this again in detail, the thesis seeks instead to examine the nature of prehistoric occupation outside or on the margins of these areas, comparing sites in the survey area with those in northern Saudi Arabia, Sinai and the Negev, and the Syrian steppe. Clearly however, it is also important to look at the relationships between sites on either side of this major environmental divide, and this aspect has been carefully considered, although detailed descriptions of sites in the fertile areas have been omitted.

Research background

Two short preliminary surveys were made in 1979 which clearly established the value of research into the prehistory of the area (Betts 1982a). One of these surveys examined the nature of prehistoric activity in the immediate vicinity of Qa'a Mejalla, a mudflat on the lower reaches of Wadi Rajil, one of the major wadis in the survey area. The second survey focused on the study of animal traps, of which a large number of stone-built examples is known in the region. Since the results of these first preliminary surveys were so promising, a full programme of research was proposed in order to study the extent and nature of man's activities in the basalt region up to the proto-historical periods. Two full seasons of area survey were conducted in 1981 and 1982, and in the third season in 1983, soundings were made at the four most important and promising survey sites (Betts 1983, 1984a,1985). The fundamental aim of the project was to record information on as many sites as the constraints of logistics would allow. The diversity of sites in the area is surprising and it was necessary to obtain a large sample in order to begin to understand the range and scope of human activity throughout prehistoric times.

Little was known about the prehistory of the region prior to the survey programme. Sites in the area first came to the attention of the public through the reports of RAF pilots who flew across the desert on the Airmail Route from Cairo to Baghdad in the 1920's (Maitland 1927; Rees 1929). They described walls and corrals visible from the air and scatters of flints around the desert landing grounds. Later, sites along the line of the Airmail Route were examined by Field (1960), and a Government groundwater survey drew attention to a number of sites around

Azraq oasis, some of which were more fully sampled by Kirkbride (Zeuner et al. 1957). Waechter and Seton Williams made soundings in two prehistoric sites a little to the west in Wadi Dhobai (Jilat) (Waechter & Seton Williams 1938) in the flint desert surrounding the basalt. In 1966 Helms began survey in the lava east of Mafraq and continued this work as part of the fieldwork associated with excavations at the 4th millennium site of Jawa, covering the immediate vicinity of the site and also parts of the desert around Qasr Burqu' east of the basalt, and along the T.A.P.Line (Trans Arabian Pipeline) (Helms 1981). In 1975 Garrard and Stanley Price conducted systematic surveys of the Azraq basin (Garrard & Stanley Price 1975), work which Garrard is still continuing (Garrard et al. 1985,in press;in prep.). Similar work on lake basins was also undertaken by Huckriede and Wiesemann at Jafr (Huckriede and Wiesemann 1968).

Since 1980 there has been a considerable increase in the number of expeditions to this part of the eastern desert. Rollefson continued the work of Kirkbride at 'Ain al-Assad, Lion's Spring (Rollefson 1982) and surveyed sites at Jebel Uweinid, a basalt outcrop west of Azraq (Rollefson & Fröhlich 1982). Copeland, Hours and others began, in conjunction with Garrard's surveys, work on Paleolithic sites in the immediate vicinity of Azraq oasis (Besançon et al.in prep.). There have also been a number of epigraphical surveys of the prolific rock inscriptions in the area and work on historic sites, particularly of the Roman and Islamic periods.

Over the past 20 years, much work has also been done in other marginal desert/steppe areas in the Near East. Major projects include Rothenberg (1972), Bar Yosef & Phillips (1977) and Marks (Marks ed.1976,1977,1983) in Sinai and the Negev, the activites of the CNRS under the direction of J. Cauvin at el-Kowm in central Syria (J.Cauvin et al. 1979, CNRS 1982) and the survey of Saudi Arabia under the auspices of the Department of Antiquities of the Kingdom of Saudi Arabia (McC Adams et al.1977; Parr et al. 1978, Ingraham et al.1981, Gilmore et al. 1982). There have also been studies of the Palmyra Basin by Suzuki and Hanihara (Hanihara & Akazawa 1979,1983) and work by Henry in southern Jordan (Henry 1982).

Terminology

Some of the terms used in this study have a number of meanings which tend to vary with different authors. Their meaning here has been defined for the sake of clarity. Use of the terms "reg" and "hammada" to describe desert pavements and rocky deflation surfaces is one such area of confusion. Here "reg" has been used for deflated alluvial or other secondary depositional material, and "hammada" for deflation surfaces formed by eroding bedrock. The terms "flint" and "chert" are also ill-defined. Geologically, both are compact crypto-crystalline silicas. Flint, chert, and also jaspar and chalcedony, are all forms of Chalcedonic Silica, essentially a mixture of quartz and opal (Kirkaldy 1963:124). Usually flint occurs in chalks and chert in limestones but the term "flint" has come into general use in archaeology to describe chert, flint and chalcedony when such rocks are used by man. Here, in archaeological contexts, the term "chert" is used for coarse-grained rock, "flint" for fine grained rock and chalcedony for very fine smooth opalescent rock.

Modern Environment

The study area is defined by geology. It is the Jordanian sector of a large tract of volcanic rocks stretching in a broad band down the North Arabian desert from Damascus to al-Jauf. This belt of igneous rock forms part of the Transjordan Plateau, the vast open plains extending eastwards from the Rift Valley for several hundreds of kilometres across Syria, Jordan, Iraq and Saudi Arabia. Surrounding the lava belt are the low rolling hills of the Ardh es-Sawwan, the flint desert, formed of cretaceous limestones intersected by shallow wadis, and covered by a desert pavement or reg of exposed and weathered flint pebbles.

The basalts and tuffs that make up the lava belt were formed through a series of massive volcanic upheavals with several centres of extrusion (Bender 1968). From Jebel ed-Druze to the northern edge of the Azraq basin the zone is made up of Neogene and Quaternary basalts which stretch in overlapping layers over an area of 11,000 sq. km. in Jordan alone. East and south of Azraq they join with the lavas of the Uneiza-Ruwalla hill country ḥ
(~~H~~arra).

Six major phases of eruption can be traced. The four earliest are dated to between the Upper Eocene and the Miocene, and are for the most part overlaid by fossil soils and Miocene sandstones. The fifth flow forms the major portion of the exposed basalt of the lava belt in N.E. Jordan. It is up to 25m thick and in the east overlies Miocene limestones, giving it a Miocene/Pleistocene date. After the fifth flow came the main extrusion of tuffs. Thin layers of tuff beds with lapilli, bombs and tuff volcanoes cover the older basalt. The sixth and last major eruption formed a layer many kilometres long running N-S which overlies the earlier basalts and some of the tuff beds. Bender (1968) suggests a mid-Pleistocene date for this period. It was also at this time that the fissure lines and rows of small volcanic cones developed. The beds and fissure lines of this youngest eruption phase extend possibly into the Holocene. One lava flow at Kheurbet el-Ambachi northwest of Jebel Druze (Dubertret & Dunand 1954) has been dated to 2125 ± 160 BC (de Vries and Barendsen 1954) which suggests that localized volcanic activity was taking place throughout the prehistoric period in the region.

The basalt desert within the study area is rocky and difficult to cross. It rises up above the limestone plains to a rolling plateau strewn with large basalt cobbles, interrupted in places by small rocky peaks. To the south this plateau is broken up into a series of basalt-capped limestone hills surrounded by mixed flint reg and basalt hammada. The basalt flows have been cut by a series of wadis, most flowing off the central watershed of Jebel Ashaqif either westwards into the Azraq basin or eastwards into the Wudian. The main exception to this is Wadi Rajil, one of the largest, which flows directly off Jebel ed-

Druze, cutting southwards and then running in an arc around the western margins of the basalt to enter the Azraq lake from the south-east. In places along the wadis, the cutting back of waterfalls has created deep pools which act as natural reservoirs, holding standing water well into the dry season. Playas formed through the silting actions of seasonal lakes have also developed in the larger depressions in the basalt, often along the major wadis. The greatest of these is at Azraq and covers about 50 sq. km. (Garrard et al. 1985) (see also National Water Master Plan 1977).

Principal water sources are the springs and pools at Azraq and a small spring-fed lake at Qasr Burqu' on the far eastern margin of the basalt some thirty kilometres north of the pumping station at H4, but there are also other odd and intermittant supplies within the lava belt. Aquifers provide sporadic springs, often in deeply incised wadis, such as the "filthy spring" reported by Glueck at 'Ain Jawa (Glueck 1951) now dry, and the wells at Bir al-Ghusain described as "brackish" and unfit for use. When these wells were visited on the survey several were foul but one at least had fresh sweet water, even in July. There are also lava flow caves which have been used in the past as natural cisterns (Helms 1981) and at certain places some water can be obtained by digging into the wadi beds. Survey work has shown that the seasonal pools, such as those on Wadi Rajil, seem to provide an important focus for settlement. Prehistoric sites often concentrate quite close to the wadi banks but modern beduin using these pools tend to consider proximity to grazing more important in the choice of a campsite, driving their flocks over the hammada at intervals to drink, or fetching water to the grazing areas by truck if possible.

The temperatures, based on readings taken at Azraq (Nelson 1973) fluctuate from 45^{o} to -10^{o} C while annual precipitation in the region ranges from 200+ mm in the northwest to less than 50 mm in the south. The climatic zones according to Koeppen's seminal classification (Lamb 1972) run from BS, steppic grassland, in the north down into BW, warm desert, in the south. The overall precipitation averages 84 mm per year (U.N.D.P. 1966), most of this occuring as erratic winter storms and cloudbursts. The wet season generally lasts from November until March.

Studies of the flora of southern Syria, especially Jebel ed-Druze, have been made by Mouterde (1952,1966), although little has been published specifically on the flora of eastern Jordan (see for example Boulos et al.1977). Much vegetation has been lost quite recently in the eastern steppe through overgrazing and destruction of bushes and shrubs for fuel. This in turn has affected faunal populations and accelerated the rate of erosion. Even without climatic change, it is likely that the region would have been considerably less barren in prehistoric times. Today in spring the basalt hammada supports a short season of flowering annuals and grasses but permanent vegetation is found only in the wadis. Most of the plants are suited to dry conditions and often to saline soils. Thorny shrubs and bushes are most common, but there are a very few scrubby trees in the beds of the larger wadis. North of the survey area, the vegetation is lusher. Rainfall on Jebel ed-Druze provides sufficient water for oak/pistachio woodland, the famous oaks of Bashan (Ezekiel 27:6), and for dry farming of cereals. Dry farming is carried out as far south as Deir el-Kinn, about five kilometres northwest of Jawa.

The fauna of the basalt desert today bears very little relation to the great numbers and wide variety of species to be found there only a few centuries ago. Man as a predator has eliminated the large mammal population almost entirely. Modern species include jackal, fox and striped hyaena, a wide variety of birds, many of them migrants, hares, mice, jerbils and jerboas, snakes, scorpions and spiders. Gazelle are probably extinct, although there are occasional unsubstantiated reports of one or two animals deep in the basalt hammada (Harrison 1964,1968,1972; Nelson 1973).

Rocks and minerals of use to prehistoric man are rare in the basalt region. Medium to poor quality grey and brown cherts can be found eroding out of the underlying limestones all round the fringes of the lava belt and there are also rare beds of finer green banded flint in nodular form on the southern border of the survey area in levels cut by the lower reaches of Wadi Qattafi. Further up Wadi Qattafi where it emerges from the basalt, the local cherts are a distinctive red colour, sometimes with cream or brown mottling. Black crystalline nodules superficially resembling obsidian were found on the survey in an ancient volcanic crater in the heart of the basalt (Betts

1984a:34,1985:51) but there was no evidence of the use of this rather fragile substance on prehistoric sites. On the excavated sites it was found that the basalt itself had been used for such items as grinders, pounders and palettes, but there was no evidence that it was chipped for use as flake tools.

Ancient Environment

Although a great deal of information is available on the climatic history of the Near East (see for example Bintliffe & van Zeist eds. 1982) no specific studies have been made of the basalt region, which, because of its geology, is environmentally quite distinct from the rest of the Levant. Within the geological limits of the lava belt itself there is also considerable variety in environmental conditions. The upland mass of Jebel ed-Druze is cooler and attracts moisture. The central portion of the belt in the survey area, although more low-lying and hotter, benefits from the runoff from Jebel ed-Druze in the southward flowing wadis. South again, in Saudi Arabia, the climate becomes quite desertic, with very extreme temperatures and minimal rainfall.

Evidence for ancient environments and climatic fluctuation has been obtained from a number of different sources; lake levels, seabed cores, geological and geomorphological studies , botanical and faunal data. However the conclusions obtained through these studies do not necessarily support each other consistantly, and are heavily dependant on local conditions. Sample areas only a few kilometres apart can vary widely, and so caution must be used in interpreting the ancient environment of the survey area through data pertaining to conditions elsewhere in the Levant.

There is however a certain degree of consensus on broad patterns of climatic change. Work by Garrard (Garrard et al. 1985) has shown that location of settlement in the Azraq basin and the evidence obtained from local geomorphological studies indicates wetter conditions in the late Upper Paleolithic, Geometric Kebaran and early Natufian, and drier conditions in the Kebaran, late Natufian and Holocene. This pattern is reflected by the work of Goldberg (1981) who has studied a number of depositional sequences in Israel, chiefly in the desert regions of the Negev, Sinai and Judea. He suggests a sequence of a relatively moist Early Mousterian stage, 85,000 - 70,000 BP, followed by an arid erosional phase until about 40-45,000 BP. This in turn was followed by a depostional phase during the Upper Paleolithic with an accompanying moist climate, gradually becoming drier towards 22-23,000 BP in the final stages of the Upper Paleolithic, and then an arid phase until c. 17,000 BP when conditions reverted once again to moist during the Kebaran. Goldberg also reports a trend towards progressively drier conditions from the Natufian onwards, only briefly interrupted by a wet interlude in the PPNB.

Some clues as to localised ancient environments can also be obtained through both excavated material and historic records. There are quite recent reports of vast herds of gazelle wiped out by hunters in trucks and helicopters, armed with machine guns. It is also said that 'Ain al-Assad, the Lion's Spring at Azraq, gained its name when the last lion was shot there in the 1930s, although the animal in question was more likely to have been a leopard (Garrard pers. comm.) as the leopard has survived much longer in Palestine and southern Syria than the lion (Harrison 1972). Burkhardt writing in 1831 says that gazelles could be seen in considerable numbers all over the Syrian Desert, and Musil in 1928 describes the hunting of herds of gazelle near Palmyra using a form of hunting trap. Hunting scenes on the walls of the Ummayyad palace of Quseir Amra in the desert south west of Azraq show large herds of onager being driven into nets (Almagro et al. 1975) and pre-Islamic rock carvings in the basalt desert graphically illustrate ostrich, oryx, onager and gazelle (see among others Harding 1953).

Faunal studies for the area are still limited, although much work has been done recently by Garrard on material from sites covering most of the timespan of the later prehistoric periods in the eastern desert. He sees a general pattern in which a fairly broad spectrum of fauna are exploited in the Epipaleolithic, with a certain emphasis on equid and wild cattle, while gazelle become very common on Neolithic sites. The PPNB site of Jilat 7 had a very high proportion of gazelle bones, some hare and tortoise, a very few specimens of bird, cat, fox, one or two bones of equid and wild cattle and no evidence for domesticated sheep/goat. The slightly later Neolithic site of Azraq 31 had again high proportions of gazelle, but also moderate numbers of sheep/goat bones which might be from domestic animals (Garrard pers. comm.).

This pattern is reflected on the excavated sites in the survey area (Garrard 1985). Material from a late Natufian site, Khallat 'Anaza, included a slight predominance of sheep/goat bones with moderate proportions of gazelle, equid and hare, while the PPNB sites had a large proportion of gazelle. One site, Dhuweila, had nothing but gazelle. The later Neolithic site of Jebel Naja produced only a small sample which included sheep/goat, gazelle and hare in equal proportions. There is some possibility, given the evidence from Azraq 31, that the sheep/goat at Jebel Naja might be domesticated, but there is no direct proof at present.

Faunal remains from the 4th millennium settlement of Jawa (Köhler 1981) include domesticated sheep/goat, equids, cattle, gazelle and hare. The last two are certainly wild. Köhler was uncertain as to the status of the equid remains and she noted also that although the cattle were classified as domesticated, they fell almost within the size range of wild cattle. Although present day conditions at Jawa would be unsuitable for wild cattle, they would almost certainly have been found not far away on the wooded slopes of Jebel ed-Druze in the 4th millennium.

Bate (1938) in her analysis of Neolithic fauna from Wadi Dhobai B reports fox, badger, hare, gazelle, rock partridge and tortoise. Taibe (M.C. Cauvin 1974b), a Natufian site on the north-west side of the basalt had a small faunal collection, mostly of gazelle but with some fox, equid and wild cattle (Ducos 1968). The westerly wadis running directly off the wooded slopes of Jebel Druze into the Rift Valley lie within a much moister zone than the survey area and the presence of wild cattle would not be unusual. This area, the Biblical Hauran/Bashan, was later famous for its fine cattle (Ezekiel 40:18).

Earlier fauna from Upper Pleistocene levels at C Spring, Azraq, have also been studied (Clutton-Brock 1970). The fossil remains of seven species of mammal were identified. These included rhinoceros, camel and wild ass. Clutton-Brock concluded that the site was probably occupied during an early interstadial of the last glaciation when savannah conditons prevailed in the area. The bones were found together with a flint industry of Levallois Mousterian type with many bifaces.

Botanical evidence from sites in the eastern desert is very slight at present. Unfortunately the samples from the four sites in the survey area were all insufficient to provide information. This is a common problem on shallow desert sites. Preliminary analysis of botanical remains from Jilat 7 (Hillman and College pers. comm.) indicate that the inhabitants had domestic cereals, two row hulled barley (Hordeum sativum) and wheat, probably domestic einkorn (Triticum monococcum).

For the 4th millennium, Wilcox has studied material from Jawa and has identified six row hulled barley, einkorn, bread wheat, emmer, chickpea, bitter vetch, lentil, pea, bedstraw, grape and hawthorn. There was also oak charcoal, possibly from timber imported from Jebel Druze (Willcox 1981).

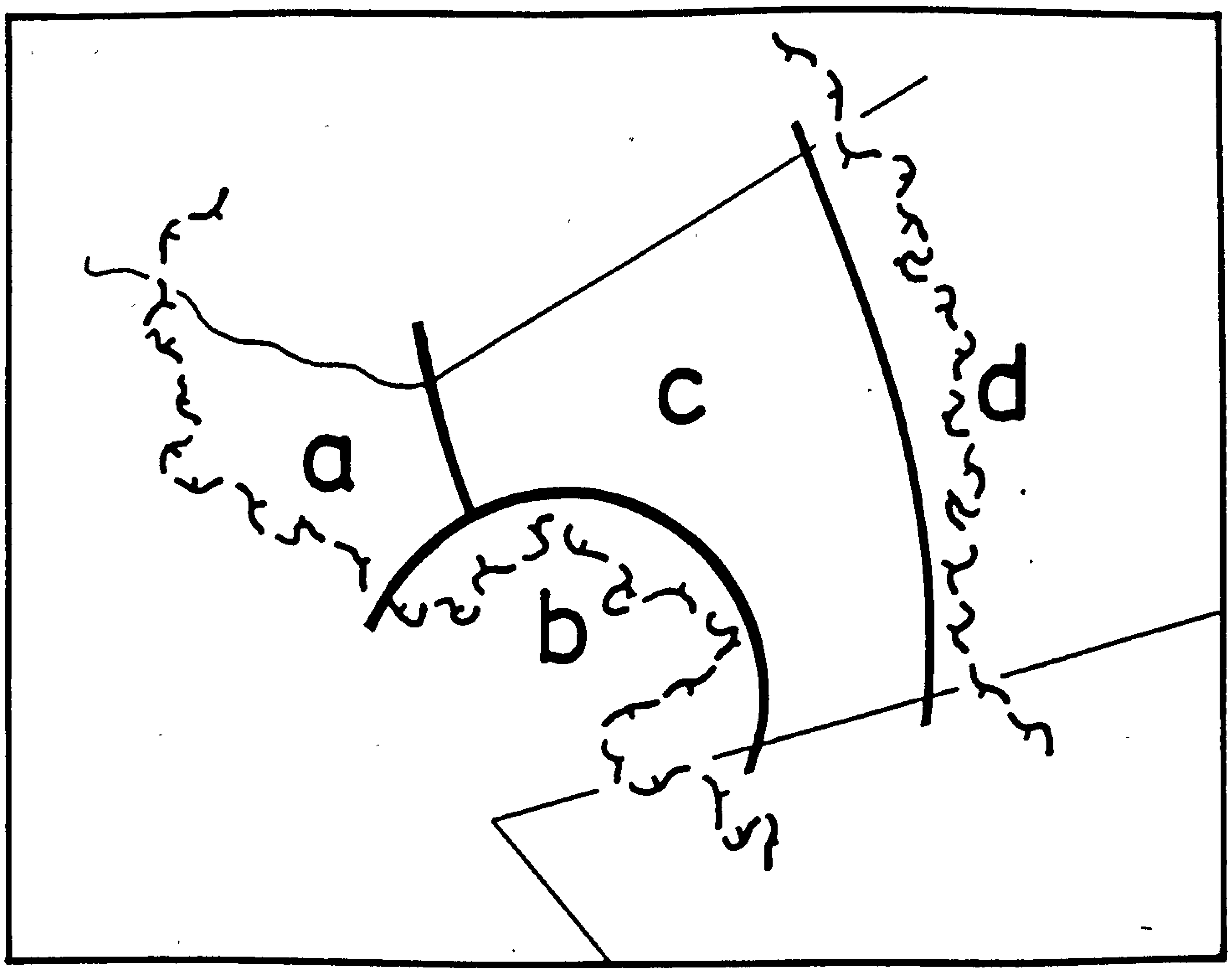
Sampling and Methodology

Methodology and sampling in archaeological survey have been discussed at length by a number of authors (see for example Mueller ed. 1975; Schiffer et al. 1978; Watson et al. 1984:155). Inevitably however, theoretical sampling techniques must be modified to suit the particular needs of an individual survey programme, and this has been especially true of the survey of the basalt region where logistic constraints are severe. The area is remote and rugged, the climatic conditions extreme and there is only very limited access to supplies of food, water and fuel. The research methodology described below was designed to adapt basic principles of theoretical sampling strategy to the aims of the survey programme and the restrictions under which it operated.

The aim of the survey was a straightforward one; simply to obtain as much information as possible on the prehistory of the central sector of the basalt region. The region itself was selected for a number of reasons. The basalt barrier is a discrete geological/geomorphological entity with clearly defined boundaries and a landscape which by its very nature has caused man to leave traces of his passing in re-ajusting the rocks of the hammada to suit his needs. These same rocks have protected much of the area from modern disturbance, leaving a rich record of prehistoric activity in the area. It is a little studied region, occupying a key position on the central Syro/Arabian steppe, and it also lies on the margins of the more temperate zones where a very slight increase in rainfall would radically affect the potential of the land for human settlement.

Having decided on the general survey area, the first step in the sampling process was to divide the region into four broad zones of major environmental diversity (Fig.1.6). Of these four, one (a) was then eliminated because of the problems of the disturbance caused by modern settlement. The next step involved selecting sample areas within each of the remaining zones which reflected the greatest possible amount of regional variety, but which were selected primarily on the basis of logistic criteria. Thus for zone (c) sample areas were chosen along the tracks around Jawa, along the H4/H5 highway and along the TAP Line track. Zones (b) and (d) because of their proximity to the open flint desert presented fewer logistic problems. It should be emphasised here that the basalt hammada is extremely difficult ground to cover on foot and is inaccessable in a vehicle except along cleared tracks. These do not always follow natural routes and so selection of survey areas adjacent to them does not necessarily imply a biased sample.

The third step in the sampling process took place in the field. Sites known from maps or areas of potential interest were selected and the survey team, consisting normally of three to four people, would fan out loosely and cover a series of transects between the track and the area of interest. All sites, scatters or traces of ancient occupation would be recorded along the way. This form of semi-purposive sampling was considered necessary because of the diffuse nature of prehistoric remains in the region.



a) western zone: area of older, well weathered basalt hammada, disturbed by modern settlement

b) western edge: broken country, playas and access to open flint desert and Azraq oasis

c) central zone: extensive rolling plateau covered by hammada of large basalt cobbles, volcanic peaks and fissure cones

d) eastern edge: lower, more broken basalt-strewn area, access to open flint desert

Fig. 1.6 Black Desert, eastern Jordan: major zones of environmental diversity

For ease of description in most instances in this thesis any place where man has left evidence of his activities has been refered to as a site. More precise definitions have however been recognised in the study of such places. Probably the most relevant reference work in relation to this is that of Bar-Yosef and Goren (1980) on the methods used in surveying areas in Sinai and the Jordan Valley. The authors propose a four part division into excavated sites with a high density of tools, surface collected sites, generally deflated and with slightly lower tool densities, findspots, and diffused large artefact concentrations extending over a wide area.

Because conditions are slightly different in the survey area, these divisions have been modified somewhat. Under the survey system, 3 basic divisions are recognised. The first is a true site. It will have a relatively high density of artefacts covering an area generally greater than 75-100 m^2 and will have some evidence to suggest that it represents an occupation site of some kind. This can often be deduced from the location, the toolkit, the nature of structures near or in the flint scatter and occasionally by direct evidence of occupation levels. The second group includes findspots or special activity areas such as knapping sites. These are much more localised than those of the first group and have varying densities of artefact scatter depending on the nature of the site. Tool kits from these sites tend to be much more restricted than those from the first group. The third group is the widespread diffuse scatter, into which most of the Middle Paleolithic sites fall. Such sites have no evidence of occupation and have probably been affected by processes of weathering and erosion. Tool densities are very low. To these main groups must also be added the isolated finds, a single arrowhead or one or two Levallois flakes, and structures with few or no related artefacts.

This division of sites into three main groups has also governed the choice of sampling technique. All sites were purposively sampled with the aim of collecting as many diagnostic artefacts as possible, diagnostic artefacts in this case including debitage, especially cores, core trimming elements and blanks. On the larger sites in the first group, occupation sites, total collections were also made on random metre squares. This was done partly to investigate intra-site variability and also to confirm that the typology suggested by the purposive sample was truly representative of the site.

After two seasons of area survey, four sites were chosen for test excavation. These sites were selected to represent the major stages of occupation in the survey area, one dating to the Epipaleolithic, two to the Pre-Pottery Neolithic and one to the later Neolithic. The aim of the soundings was to provide information on the lithic assemblages and subsistance basis of the site and to obtain a general idea of the nature of the occupation. Detailed information on structures could not be obtained in such limited soundings.

In order to complete the programme of test excavation in the time available, further sampling strategies were applied at trench level. All earth from the Epipaleolithic site was sieved, but only one bucket in three from the other three sites. Excavators were instructed to work as if no sieving was taking place and to attempt to remove as many artefacts as possible in the trench itself. All flint from the excavations and the surface collections was studied. A preliminary division was made into retouched pieces, debitage and waste, with debitage being defined as cores, core trimming elements and blanks. All retouched pieces were included in the final analysis. Excavated debitage and waste was also included but surface debitage and waste was discarded as quantitively unreliable. A sample of 100 blades and 100 flakes was selected from excavated contexts at each Neolithic site for detailed analysis and measurement. A larger sample of blanks was selected from the Epipaleolithic site.

Faunal remains were collected in the same way as the chipped stone. All material recovered was handed over for study. Botanical remains were more difficult as severely limited water supplies made it impossible to maintain a flotation unit in the field. Levels likely to produce organic remains were identified by the excavators and samples collected according to the extent of the deposit and the amount of charcoal present in the soil. These samples were then put aside for post-excavation processing. Charcoal for radio carbon determination was removed immediately upon excavation and placed in silver foil for transmission to the laboratory.

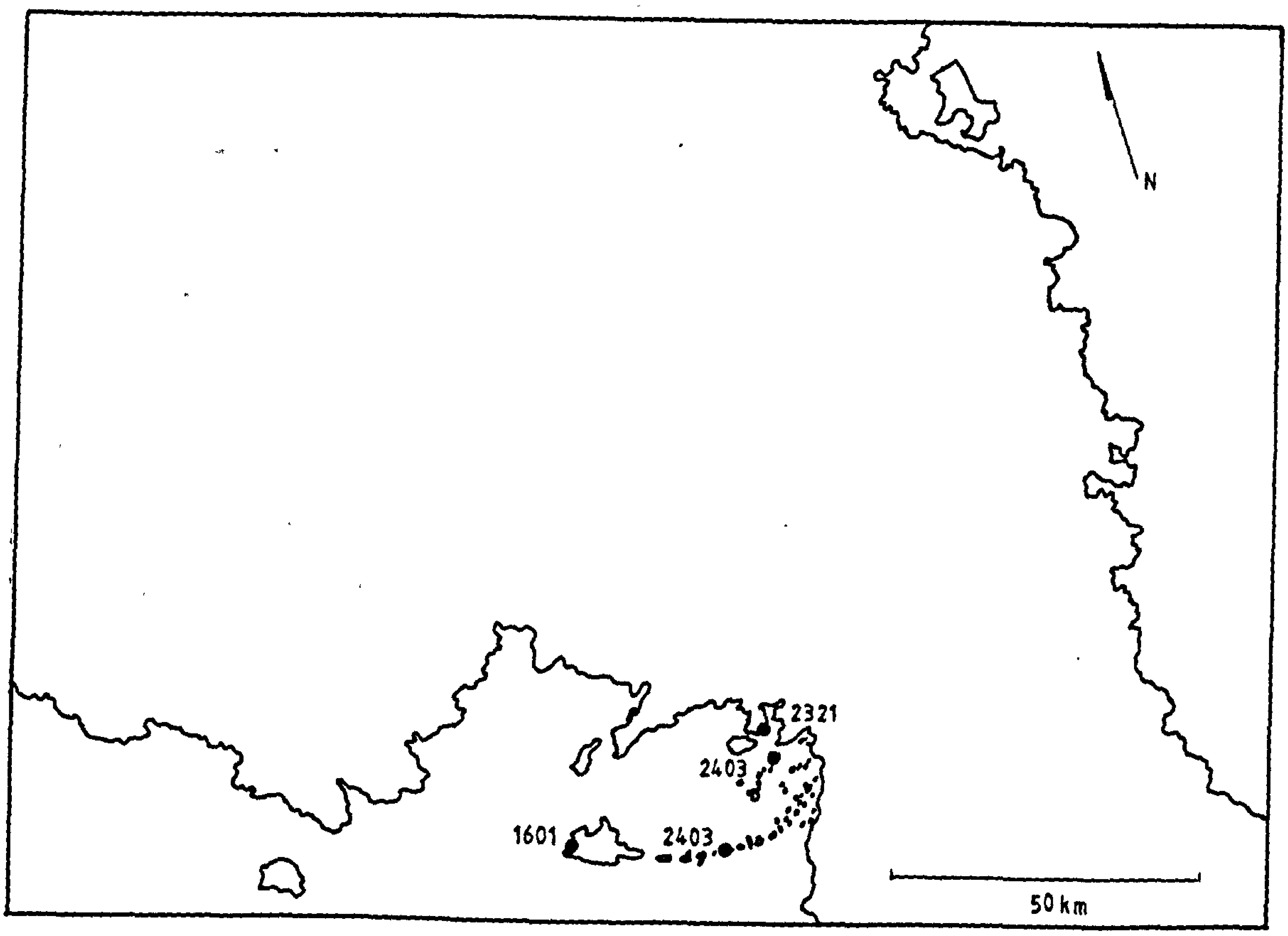


Fig. 2.1 Black Desert, eastern Jordan: location of major Middle Paleolithic sites

Chapter 2

This chapter describes the evidence for Middle Paleolithic occupation in the survey area and summarizes the available information on Lower and Middle Paleolithic material in eastern Jordan. No Lower Paleolithic material was found in the course of the survey, although this may be in part due to the fact that work was concentrated on the basalt region alone, and did not cover the wadis cut into the gravels surrounding the lava belt. Middle Paleolithic material was relatively common, although the findspots contained only scattered artefacts in derived contexts.

Lower and Middle Paleolithic material has been found in a number of areas in the eastern desert, mostly in wadis and near springs or fossil springs in the Ardh es-Sawwan, the flint desert west of the lava belt. Miscellaneous surface collections are described briefly in Zeuner, Kirkbride and Park's summary of Jordanian prehistoric sites (Zeuner et al. 1957) although most of the earlier collections mentioned in their reports are from sites to the south and west of the Azraq Basin. Henry Field also collected material from the eastern desert. Finds designated Upper Acheulean (Garrod 1960) were found at Bayir, a little way south of Wadi Jilat, but the material from around Azraq and the lava belt was chiefly Levalloiso-Mousterian. Collections were made at Landing Ground H and at Jebel Umm Wual to the east of the basalt zone in northern Saudi Arabia.

Some time later Garrard and Stanley-Price (1975) surveyed around Azraq Oasis and found more material from both the Lower and Middle Paleolithic periods. In the course of their study, they re-examined the spring at Ain el-Assad where bifaces had previously been discovered in quantity during cleaning operations, and also located a dense scatter of Levallois-Mousterian material in the wadi bed at Enoqiyyah, just north of the modern village of Azraq ed-Druze. In 1979 Rollefson revisited Ain el-Assad and made a collection of material from the dumps left by the sump excavations. He collected 538 artefacts, including 62 bifaces, 71 cores and 112 flake implements (Rollefson 1980). In 1980 he made a series of soundings around the spring but unfortunately failed to find any in-situ deposits of Lower or Middle Paleolithic material (Rollefson 1982). Similar material to that at Ain el-Assad was also found at C Spring on the edge of the Azraq marsh (Clutton-Brock 1970). Again, drainage operations turned up a rich collection of material including bifaces and flake tools. Waechter gave a preliminary identification of the assemblage as Levallois-Mousterian.

Work begun by Garrard and Stanley-Price on Lower and Middle Paleolithic sites and findspots in the Azraq area has been continued by Copeland and Hours, who have investigated the wadis systems near Qasr Kharaneh, the bed and terraces of the Wadi Rattama which drains into the north-western side of the Azraq lake, and the material eroding out of the bed of Wadi Enoqiyyah (Besançon et al. in prep.). In later surveys Garrard has also found bifaces and Levallois-Mousterian material in derived contexts in the gravels of Wadi Jilat (Garrard pers. comm.). In the Rattama area Paleolithic material has been found at more than

30 points (Besançon et al. in prep.) and includes Late Acheulean and a fairly early Levallois-Mousterian, while the finds from Wadi Enoqiyyah seem to relate to a somewhat later stage of the Middle Paleolithic with finely prepared elongated triangular points (Hours pers. comm.; Garrard & Stanley Price 1975:116).

Survey sites

Although a number of flint scatters located in the course of the survey included some recognisable Middle Paleolithic artefacts, few of them provided any reasonably sized sample, and even these few were without exception in disturbed contexts. One of the difficulties in dealing with mixed surface collections is that for the Middle Paleolithic, the only artefacts which can be assigned to this period with any certainty are Levallois flakes, points or cores (bifaces might be included in this category but none was found). All other pieces, regardless of patina or apparent association with identifiable artefacts, have to be treated with suspicion. It has been observed by some writers that caution must be used in assigning all "Levallois" flakes to the Paleolithic as the technique is also encountered in later periods, but in practice Middle Paleolithic artefacts exhibiting Levallois technique are in general fairly recognisable. Those that are not must of course also be treated with suspicion.

Thus the material from the survey area which has been categorized as Middle Paleolithic is all of Levallois-Mousterian type. Within this group there is naturally some variation, but the dominant artefact types are smallish, rather stubby points and flakes, and cores with radial preparation. The large cores and thick elongated points probably associated with the Final Acheulean/Early Levalloiso-Mousterian in the region such as the material from the wadi gravels at Wadi Jilat (Hours pers.comm.) and the terraces at Wadi Rattama (Besançon et al. in prep.) are completely absent from the collections, but because of the problems of identifying Middle Paleolithic artefacts in the surface collections, the lack of in situ deposits and the severe weathering and disturbance of material of this period, it is difficult to be more specific about the nature of the survey material. Data on relative proportions of tool types is not available, but the general form of both cores and flakes suggests a fairly late date for most of the collections.

Although odd pieces were found scattered throughout the survey areas, most of the Middle Paleolithic artefacts come from the south-west, from around the edge of the open gravel plains and the table mountains between Wadi Qattafi amd Jebel Qurma. Some of the larger scatters are on the summits of table mountains, and on peaks at the edge of the basalt massif overlooking open country. Other material is found on the slopes of the hills and the main plateau where it may have ended up after sliding down the scree slopes following erosion of the basalt capping. This pattern is similar to that reported from Saudi Arabia (Parr et al. 1978) where numerous thin scatters of Middle Paleolithic artefacts were found on ridges and slopes overlooking valleys and inland basins, as well as on alluvial surfaces adjacent to drainage channels and sabkhas.

The subdivisions of the Middle Paleolithic in the Levant represent a complex problem beyond the scope of this work. The subject has been summarized recently in several papers presented at the 1980 conference on the Prehistory of the Levant at Lyons (Copeland 1981; Jelinek 1981a,1981b), but information on the Middle Paleolithic material from the survey area is insufficient for detailed comparisons with stratified sequences.

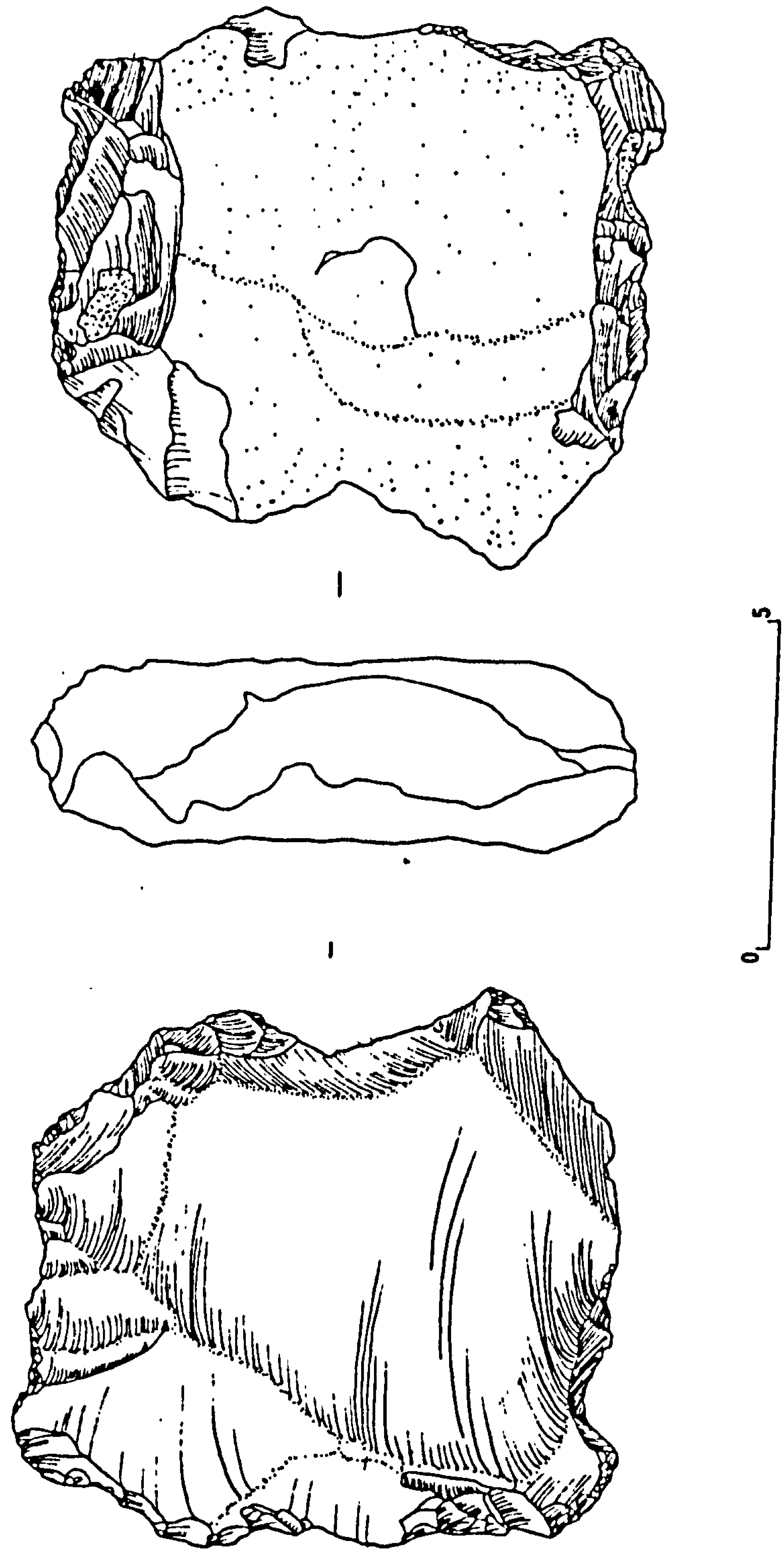


Fig. 2.2 1611: Levallois flake core

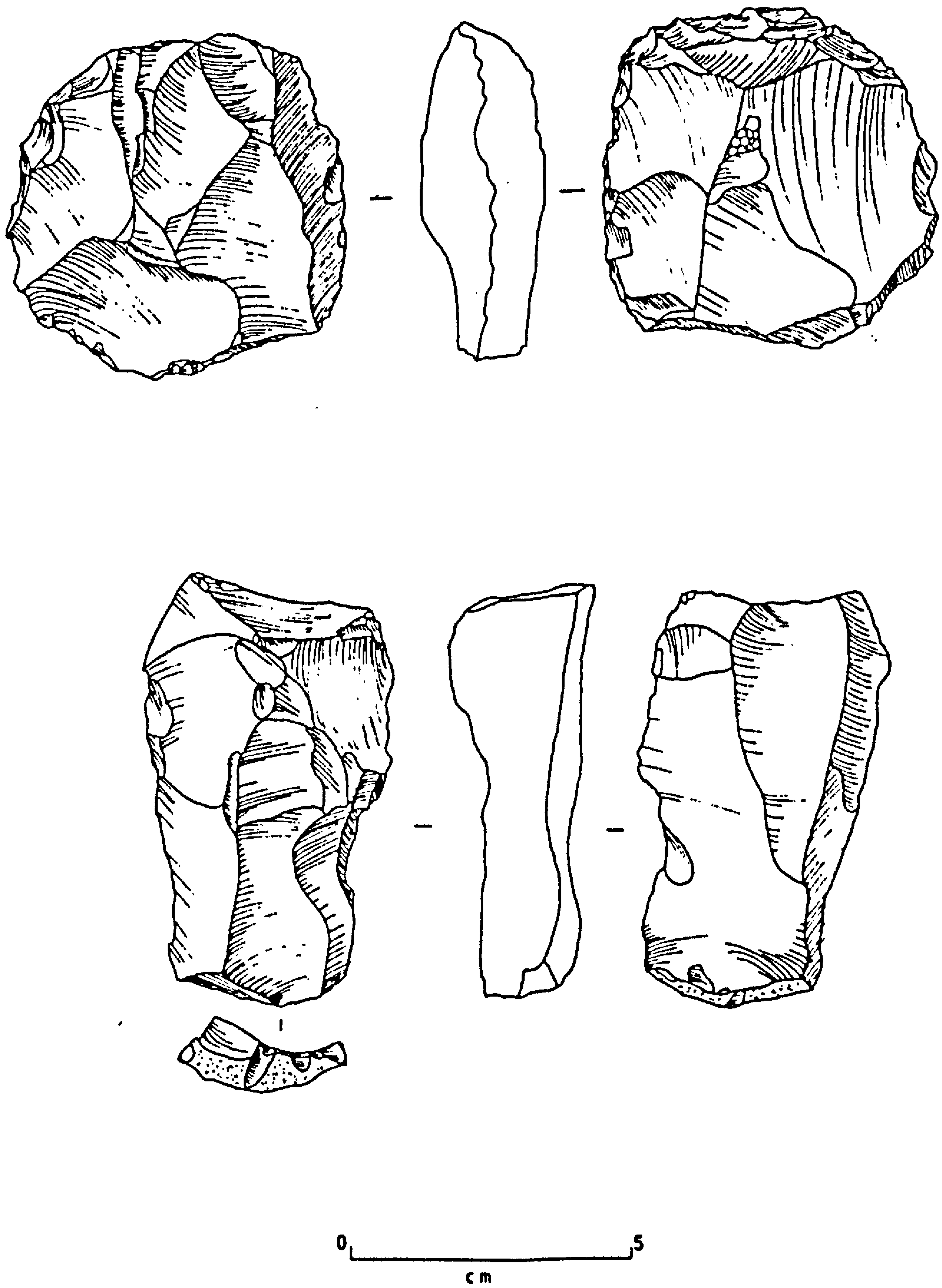


Fig. 2.3 3136: Levallois core
2403: Point core on Levallois flake

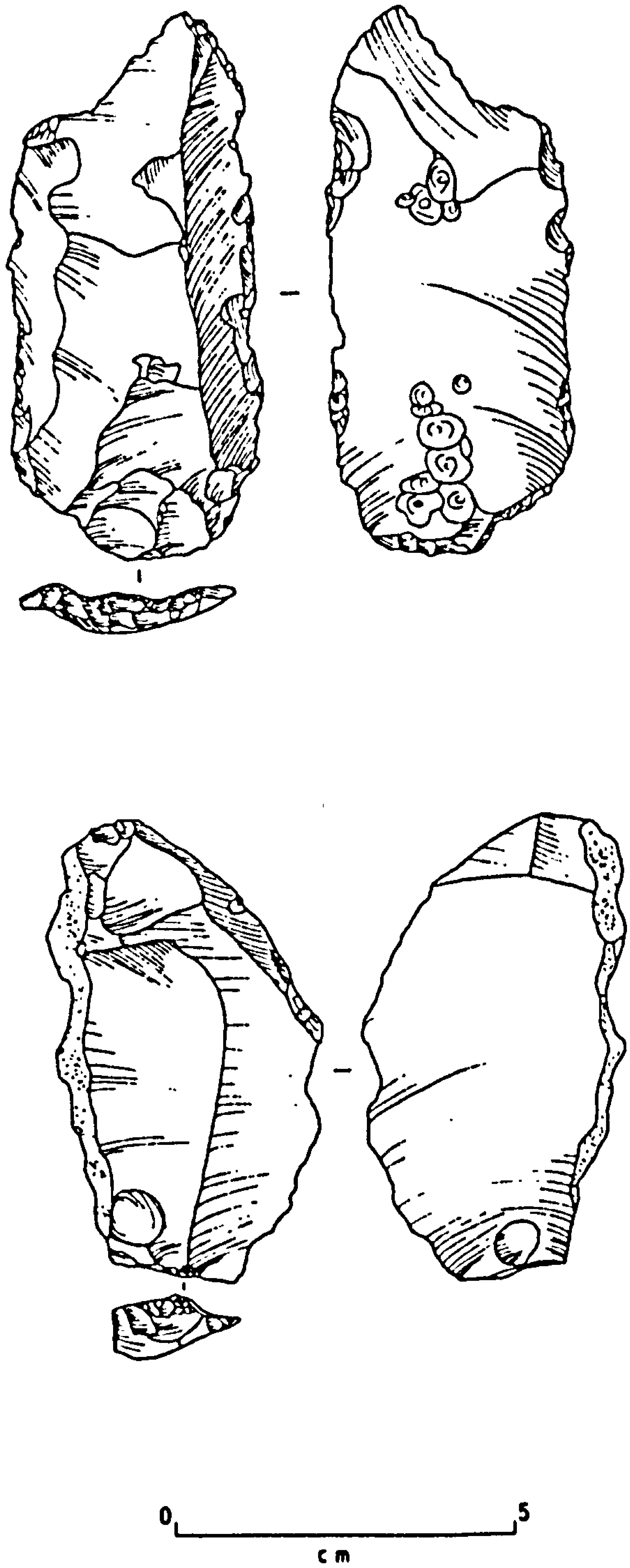


Fig. 2.4 2403: Levallois flakes

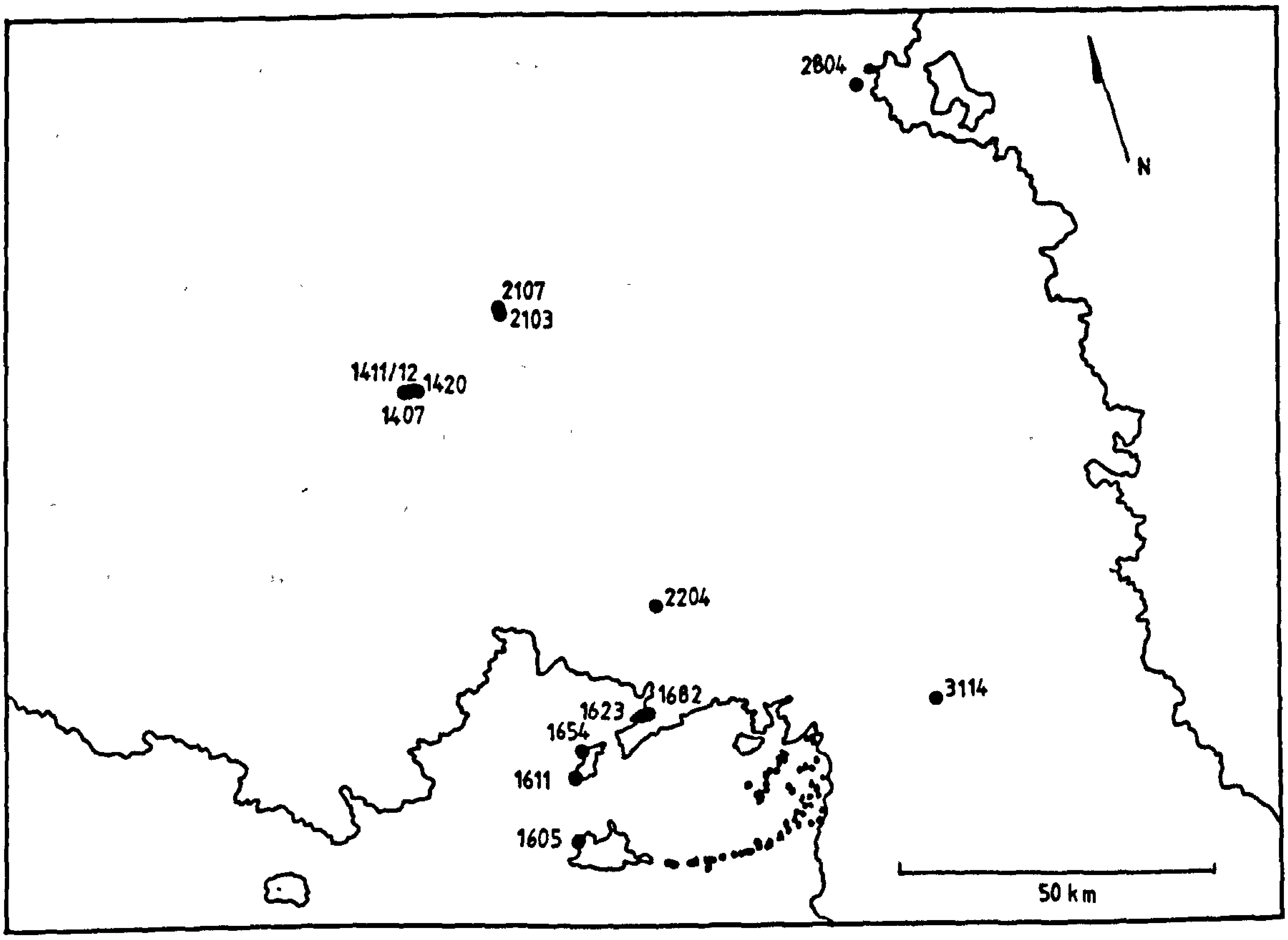


Fig. 3.1 Black Desert, eastern Jordan: major Epipaleolithic sites

Chapter 3

The following chapter covers the Upper Paleolithic and the Epipaleolithic up to the start of the Aceramic Neolithic. Sites of these periods are well documented in areas to the west of the Jordan Rift Valley (see for example Marks ed.1976,1977,1983; Bar-Yosef 1970; Henry 1973; Valla 1984) but little is yet known about the Transjordan plateau at this time. Some sites were recorded during early surveys (e.g. Zeuner et al. 1957) but the first systematic work was done by Garrard and Stanley Price at Azraq (Garrard & Stanley Price 1975) and by Henry in the area around Ras en-Naqb (Henry 1982). Patterns beginning to emerge from these studies show firstly that, as elsewhere in the Levant, the Upper Paleolithic is very poorly represented in Transjordan, and secondly that the Epipaleolithic sequence broadly corresponding to the Kebaran of Palestine is complex, exhibiting considerable regional/temporal diversity. Natufian sites, on the other hand, compare quite closely with their Palestinian counterparts.

Sites of all these periods have been found quite close to the basalt region. There is an Upper Paleolithic site, J9, in Wadi Jilat (Garrard et al.in press), a wadi draining into the west side of the Azraq lake basin, and derived Upper Paleolithic material has been recovered from the mouth of Wadi Enoqiyyah which runs into the north side of the Azraq lake (Hours & Copeland pers. comm.). A number of Epipaleolithic sites, some with bladelet industries and some with significant proportions of geometric microliths have been located by Garrard in Wadi Jilat, near Jebel Uweinid, a basalt outlier a few kilometres west of the modern lake, and also in the Azraq marshes (Garrard & Stanley Price 1975; Garrard et al.1985; Garrard et al. in press). An early Natufian site is recorded in the Azraq marshes (Garrard & Stanley Price 1975) and scatters of Natufian artefacts were found at Wadi Enoqiyyah. Early Natufian artefacts came from the wadi bed and Late Natufian tools were collected on the basalt above the wadi (Hours pers. comm.).

However the picture is a little different in the study area where sites of these periods are quite rare. No Upper Paleolithic site has been positively identified, although this does not preclude the presence of artefacts of this period among the undiagnostic collections from the survey. Only a few later sites have been found. 1407, Khallat 'Anaza, a small campsite in the northern part of the basalt region, can be positively identified as Natufian. There are a number of scatters of microlithic material near Khallat 'Anaza which probably represent earlier Epipaleolithic industries and there is another campsite further to the south, 3114, Qa'a es-Subhi, which has a slightly different inventory from 1407 and so has also been classed under the broader term Epipaleolithic. Apart from these, the only evidence for occupation of the survey area during the Epipaleolithic consists of a few very small isolated scatters. Evidence for these periods in the survey area is described below. The type-list proposed by Hours (1974) has been used for all analyses of survey sites.

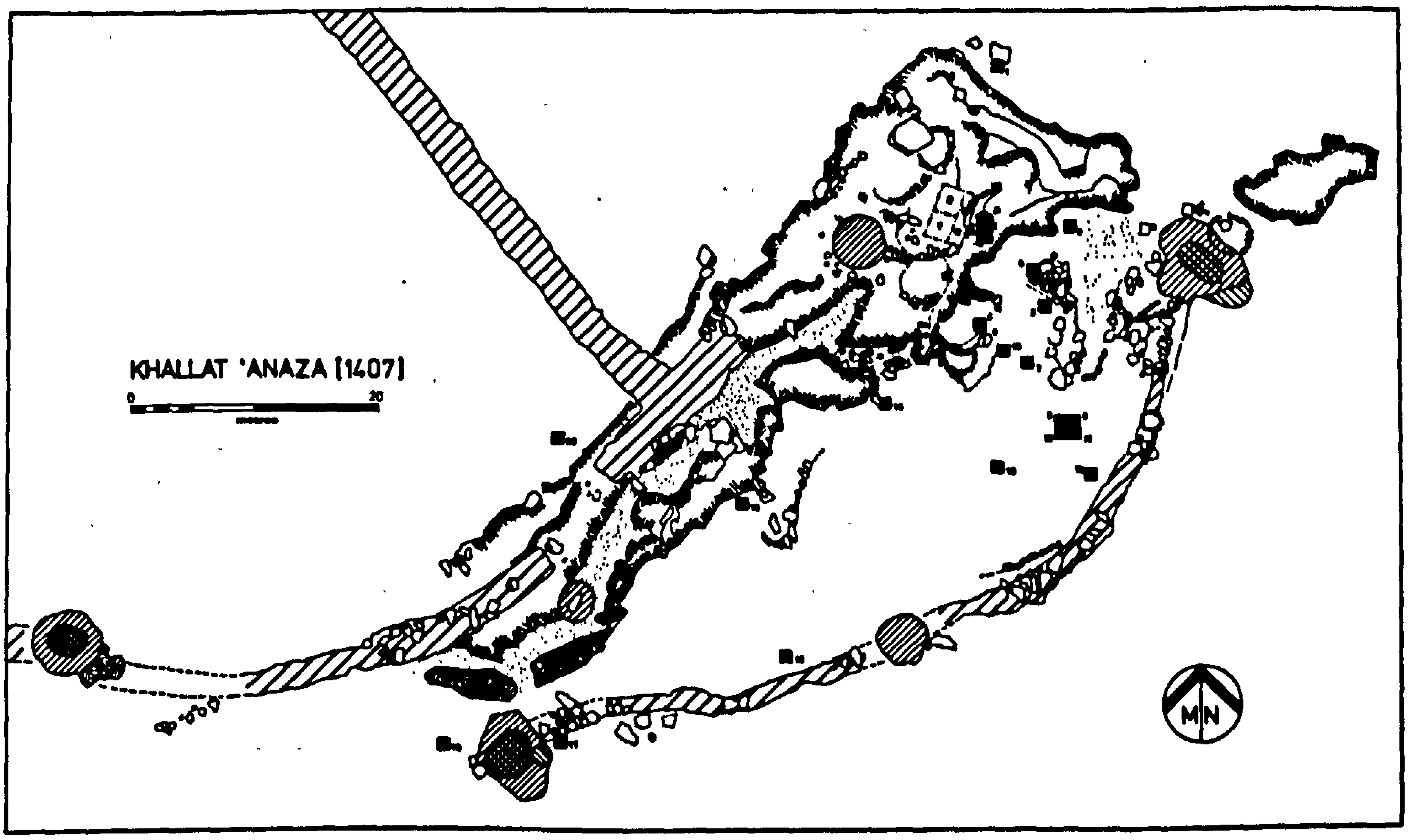


Fig. 3.2 Khallat 'Anaza 1407 Site Plan

1407 Khallat 'Anaza

Khallat 'Anaza, first published as 14/7 (Betts 1982b;1985), is on the southern bank of Wadi Rajil, a few kilometres below the ancient settlement of Jawa . The immediate area seems to have provided a focus for the people of this period as there are a number of small scatters of microlithic material along the top of the wadi gorge, although Khallat 'Anaza is the only site of any significant size yet to be discovered.

It lies on a small outcrop of jagged basalt slabs overlooking a bend in the wadi where a waterfall has cut deep pools into the streambed, creating a natural reservoir that holds water well into the dry season. The ridge of rock on which the site is located has been joined at either end by a low curving wall to form a small enclosed terrace of about 2,000 m^2 in extent. The scatter of surface flints over this terrace becomes quite dense towards the eastern end. From the enclosure, two walls run off north and westward, ending abruptly at the top of the cliff that defines the Rajil gorge. A low smoother patch in the bedrock ridge gives access from the main enclosure to the area contained by these two walls. The site has been slightly disturbed in later periods, but there is evidence to indicate that the enclosure and the walls running down to the gorge belong to the Natufian occupation. The site seems to have been only used twice in its history and the enclosure wall was disturbed in the second phase of use when it was partially destroyed for the construction of Safaitic cairns (Betts 1985:30). Two narrow conical bedrock mortars filled with Natufian artefacts were also found just below the bedrock ridge.

A collection of surface material was made by the random selection of 20 sample metre squares, and a sounding 3 x 4 metres was made at the eastern end of the site, at the point of the greatest concentration of surface finds. All earth from the sounding was sieved (3 mm mesh). There was little depth of occupation in the sounding. Jagged ridges of bedrock were found all through the trench, in some places breaking through the surface. The cracks between these ridges were filled with ashy occupation deposits, worked flints and bone fragments, and the deepest point lay only about 65 cm below the surface. A box-like feature constructed of four up-ended basalt slabs was found close to the lowest part of the occupation deposit.

The flint used at the site is mostly selected fine grained cherts with some smooth creamy translucent flint or chalcedony which seems to occur in small quantities on several epipaleolithic sites (see 3114 below). It is of an especially high quality and would be highly effective for the production of microliths. There is no flint source in the vicinity and the raw material must have been brought in from at least thirty to forty kilometres away.

Thirteen miscellaneous worked basalt artefacts were recovered from the sounding. Most of these were smoothed pebbles or hammerstones and there was one large mortar. Faunal remains (Garrard 1985) are varied and include gazelle (Gazella sp.), sheep/goat (*Ovis/Capra sp.*), equid (*Equus sp.*), canid (*Canis cf. aureus*) and hare (*Lepus cf.capensis*). These species are typical of the craggy steppe/desert environment of the site today. The evidence suggests that the inhabitants of Khallat 'Anaza were exploiting all the main herbivores then available.

	debitage	tools	total
cores	40	0	40
core trimming elements	20	10	30
primary flakes	24	25	49
flakes	832	149	981
blades	59	104	163
bladelets	326	570	896
spalls	69	0	69
microburins	47	0	47
pièces esquillées	16	0	16
chunks	85	0	85
chips	2705	0	2705
	4223	858	5081

Fig.3.3 1407: relative proportions of excavated debitage types

A total of 5081 artefacts was recovered from the sounding, of which 858 were tools, 84 were cores or trimming and preparation elements, 1217 were blanks and the remainder either the by-products of specialized knapping processes such as burin spalls and microburins or unclassifiable waste fragments. The tools are made primarily on blades and bladelets, with lunates and borers occuring most frequently. Use of the Helwan technique is rare, and most of the lunates are shaped by abrupt or bipolar retouch. Burins, backed bladelets, notches and denticulates, some scrapers and a very few pieces with silica sheen make up the rest of the inventory. The soundings proved shallow and possibly disturbed, and no clear stratigraphic distinctions were discernable beyond a basic division between greyish occupation deposits and the fine surface layer of windblown sand. Accordingly, in the analysis of the assemblage all the material from the sounding has been treated as a single unit.

There is some evidence for the use of the microburin technique, although the restricted index (rIMbt) (Henry 1974) of 17 falls below the figure of 50 recommended by Henry as indicative of habitual and intensive use. It seems probable though, that some intentional use was made of the technique as Henry's criteria 3 and 4 (Henry 1974:390) are generally fulfilled: the presence of retouched pieces representing the stages of manufacture of tools by this technique and the predomination of microburins with well developed negative conchoidal scars over microburins with flat planar scars. Tool blank removals were made primarily from irregular bladelet cores. Most of the examples recovered were quite heavily reduced. There were also a few small flake cores, some making further use of exhausted bladelet cores, and a number of elongated "pièces esquillées".

mm	CL	
0-5	0	CL: core (maximum dimension)
6-10	0	
11-15	0	
16-20	8	total 41
21-25	11	average: 27.74
26-30	7	
31-35	10	
36-40	2	
41-45	2	

Fig.3.4 1407:absolute and average dimensions of cores

The distinctive characteristics of the Khallat 'Anaza assemblage make it possible to identify it as Natufian. Bar-Yosef (1982) in a recent summary of the attributes of the Natufian (see also Bar-Yosef 1970:174; Henry 1973,1981:422) describes it as a "...predominantly blade/bladelet industry. The blades and bladelets were generally short and wide and had blunt tips (as opposed to convergent distal ends). Cores were exploited intensively from more than one striking platform and more than one knapping direction...". Specific technological features include use of the microburin technique and Helwan retouch. Henry (1981) also notes that quantitative attributes for the industry are markedly uniform from assemblage to assemblage, particularly in respect to the dimensions of bladelets. A sample of measured flakes and bladelets (Fig. 3.6) shows that the blanks from Khallat 'Anaza fall only slightly below the mean dimensions given by Henry.

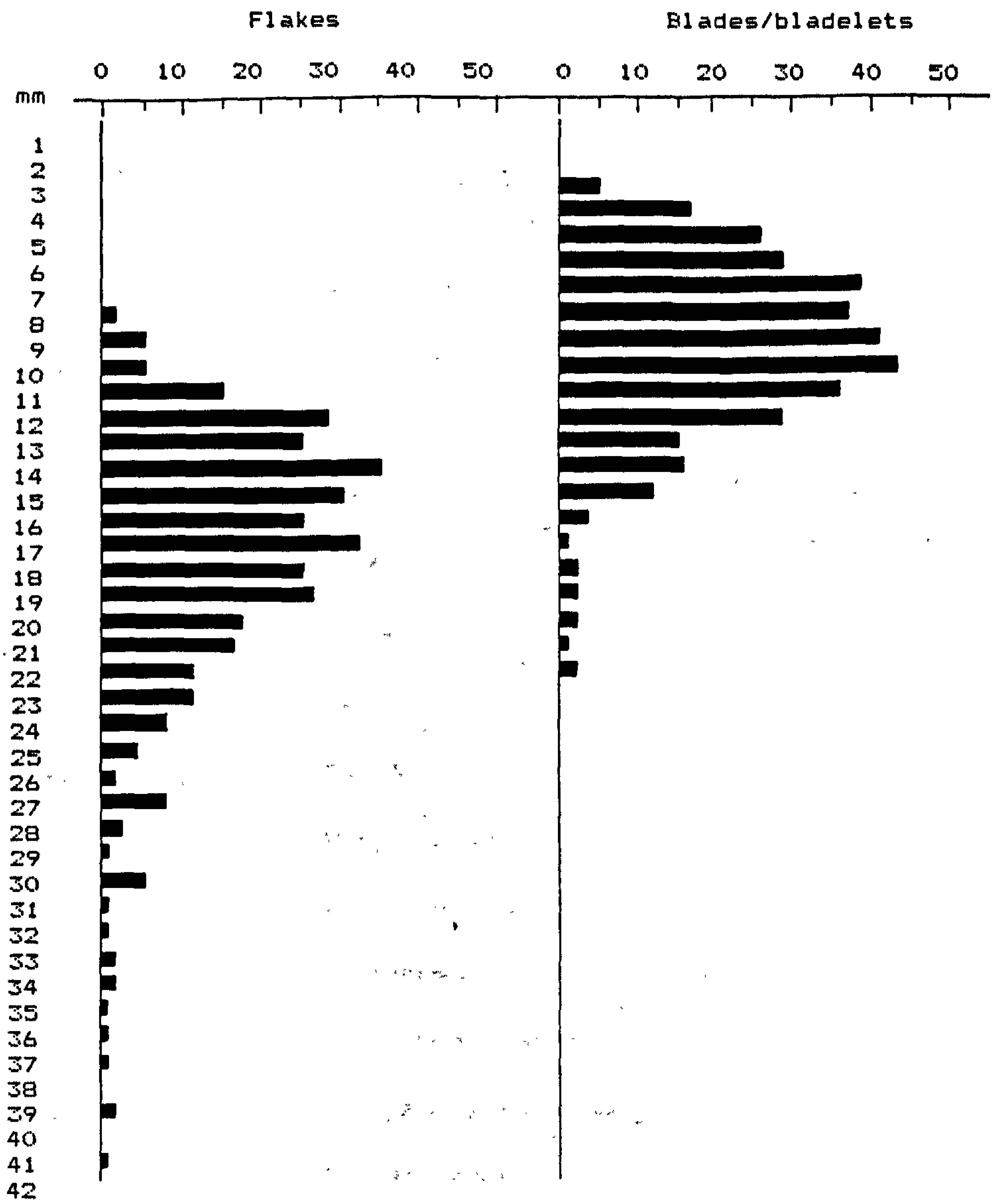
Typological characteristics of Natufian assemblages (Henry 1973; Bar-Yosef 1970) include scrapers, mostly simple endscrapers, burins, a variety of backed pieces, geometric microliths of which the lunate is predominant, together with small numbers of triangles, notches and denticulates, borers, sickle blades and massive pieces, usually only present in small numbers.

From these summaries, there seems to be little doubt that the Khallat 'Anaza assemblage falls within the established parameters of the Natufian industry. Unfortunately insufficient charcoal was recovered from the soundings to obtain a C14 date

Tool type	Surf.	Excav.	Tot.
Miscellaneous retouch	118	162	280
Single endscraper	12	10	22
Flake scraper	14	11	25
Dihedral burin	0	0	0
Multiple dihedral burin	0	1	1
Burin on break	9	25	34
Burin on transverse truncation	0	3	3
Burin on oblique truncation	0	1	1
Burin on concave truncation	0	5	5
Multiple mixed burin	3	0	3
Borer	22	64	86
Multiple borer	0	3	3
Naturally backed piece	5	13	18
Piece, irregular back	15	21	36
Piece, two backed edges	5	10	15
Backed fragment	14	35	49
Truncated flake	4	11	15
Truncated blade	7	11	18
Bitruncated piece	2	0	2
Retouched notch	22	42	64
Blade/bladelet, multiple notches	7	22	29
Denticulate	42	27	69
Flake, continuous retouch	2	12	14
Blade, continuous retouch, one edge	6	21	27
Blade, continuous retouch, both edges	8	18	26
Strangled blade/flake, wide notch	0	1	1
Piece, inverse or alternate retouch	25	41	66
Pointed piece	0	6	6
Pointed bladelet, fine retouch	3	22	25
Bladelet frag., fine retouch	11	34	45
Bladelet, back curved by abrupt retouch	3	16	19
Bladelet fragment,abrupt retouch	5	14	19
Bladelet, inverse retouch	11	15	26
Bladelet,alternate retouch	4	9	13
Bladelet, Helwan retouch	6	7	13
Truncated bladelet	1	2	3
Backed and truncated bladelet	3	7	10
Backed bladelet, inverse retouch	0	1	1
Triangle	4	12	16
Lunate	29	111	140
Helwan lunate	3	12	15
Multiple mixed pieces, various	7	9	16
Sickle blade/bladelet	1	5	6
Piquant trièdre	1	4	5
Other	1	2	3
total	435	858	1293

Fig.3.5 1407:relative proportions of tool types

for the site, but it is possible to obtain an idea of the relative date of the assemblage through examination of specific typological traits. The chief chronological indicator is the lunate. Helwan lunates are common in the early Natufian but gradually give way to higher proportions of abruptly retouched segments in the later part of the period (Neuville 1934; Garrod 1937; Bar-Yosef and Valla 1979; Henry 1981). The mean length of lunates decreases correspondingly through time as Helwan lunates are in general larger than those with abrupt or bipolar retouch. Analysis of the Khallat 'Anaza lunates in comparison with other sites where similar analysis has been undertaken (Fig. 3.7) shows that the assemblage fits into the Late Natufian group. The mean length of measurable segments from Khallat 'Anaza (Fig.3.8) also corresponds with similar measurements for the Late Natufian (see Bar-Yosef and Valla 1979:147, Table 1). Dates for sites with similar relative frequencies of Helwan and other types of lunates fall with a range of 11,140 ± 200 BC (Rosh Horesha) to 7845 ± 600 BC (El Wad B1).



total: 349
mean width: 17.9

mean width: 19.59
(Henry 1981)

total: 352
mean width: 9.1

mean width range: 9.6-11.6
(Henry 1981)

Fig. 3.6 1407: width distribution in excavated flakes and blades/bladelets

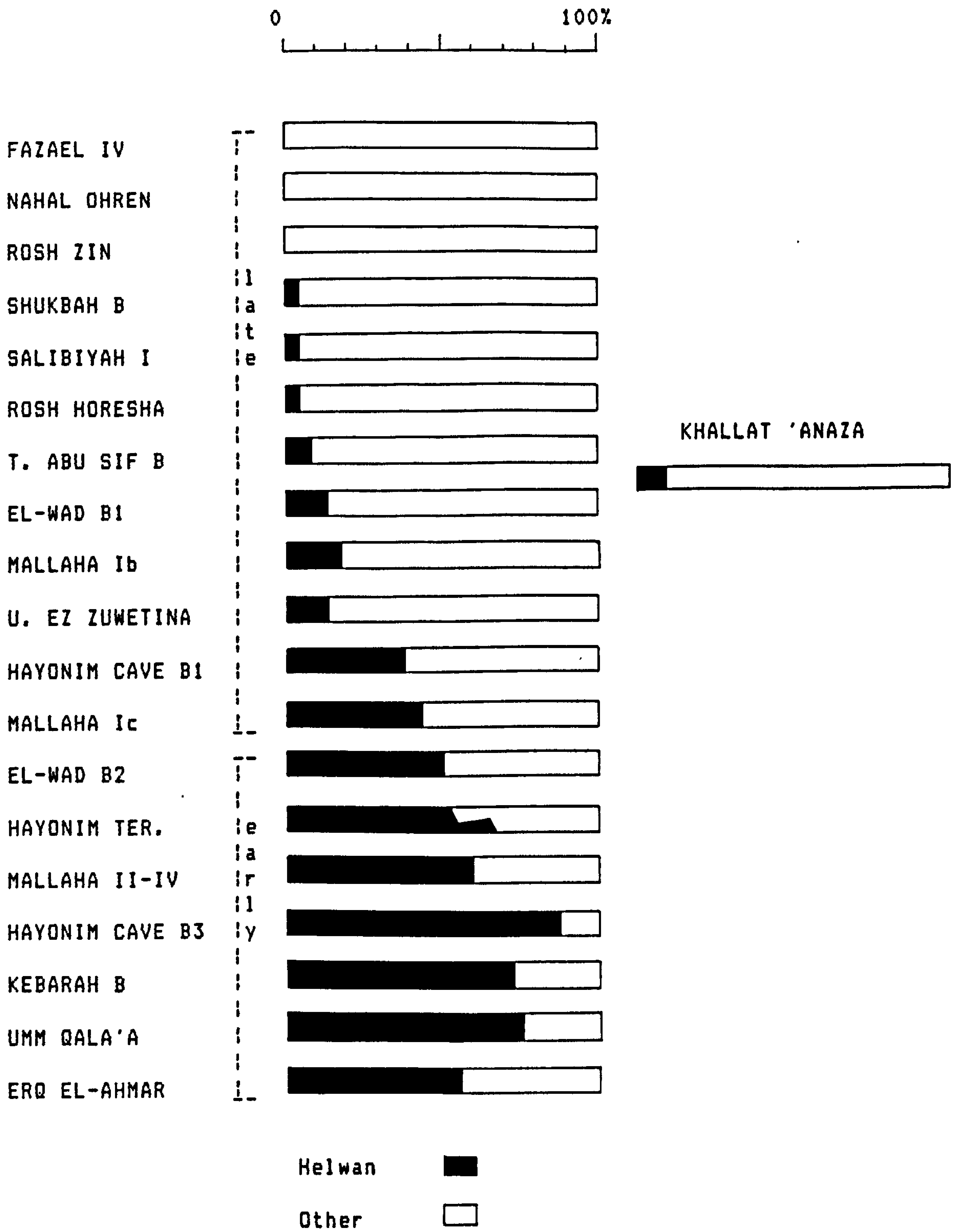


Fig. 3.7 Relative frequencies of Helwan and other lunates
(After Bar-Yosef & Valla 1979;Bar-Yosef 1981a:399)

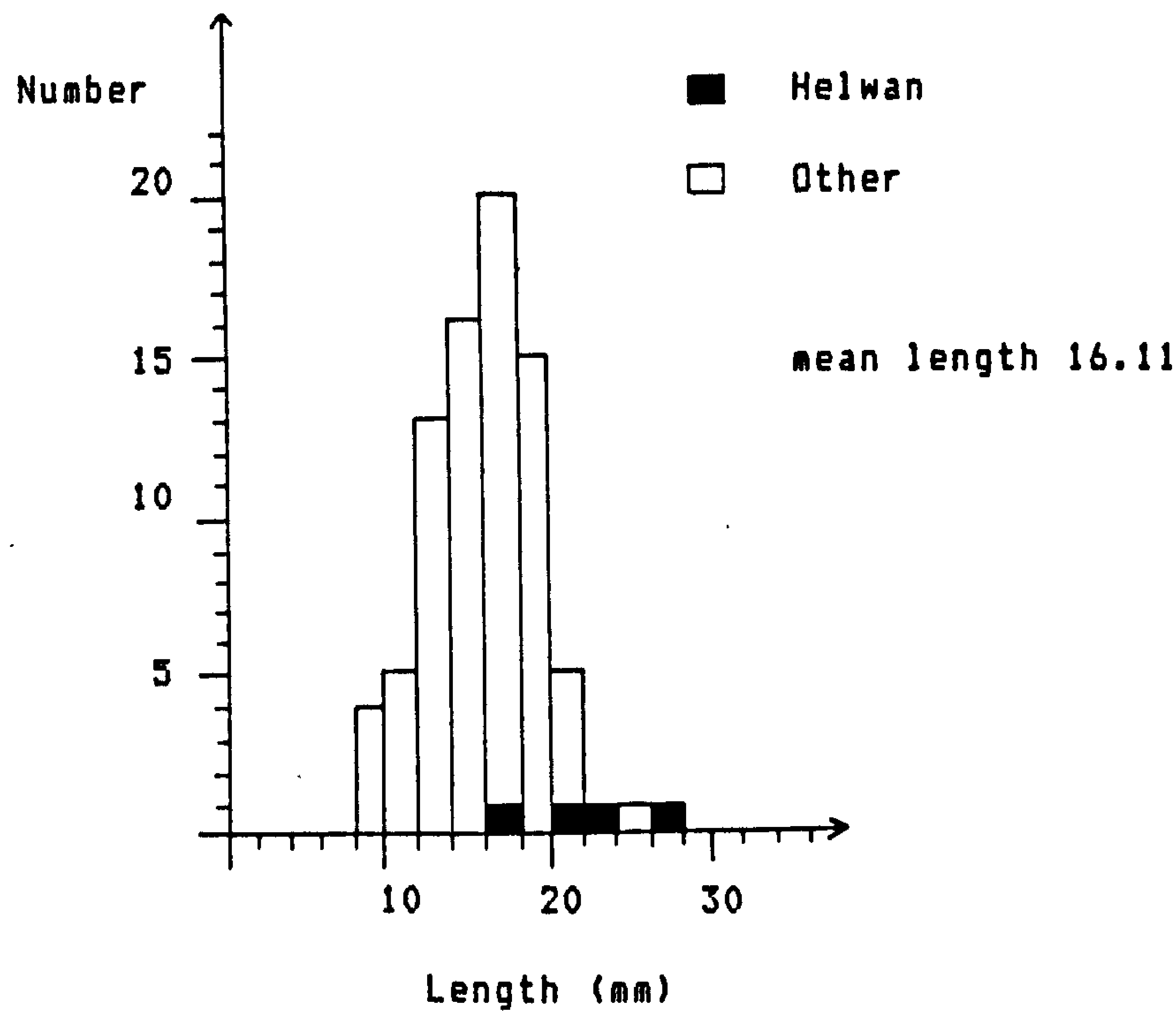


Fig. 3.8 1407: relative frequencies of lunate lengths

Fig.3.9 1407

1-8	microburins
9-11	pièces esquillées
12-15	cores

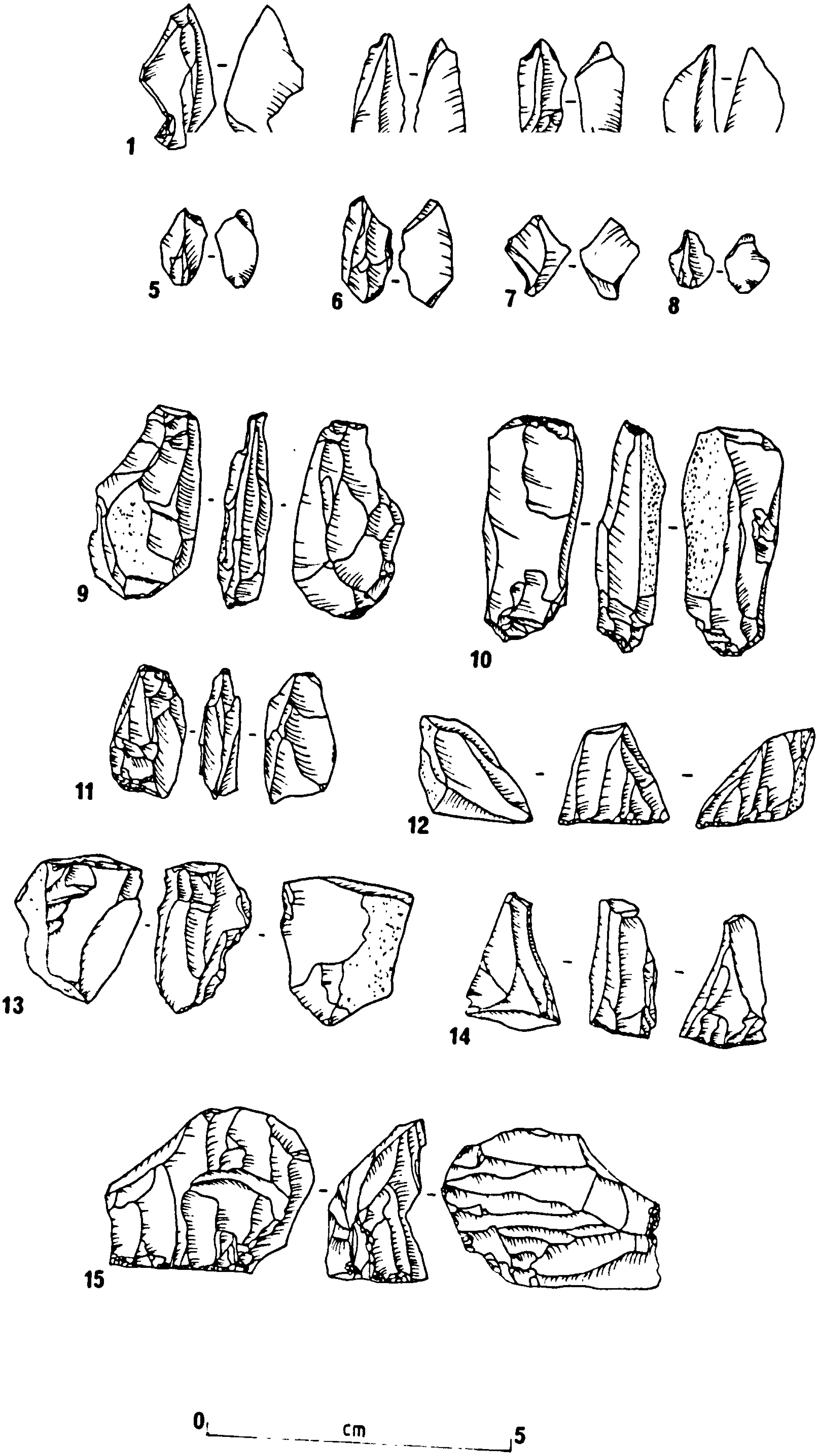

1
5
6
7
8
9
10
11
12
13
14
15
0
cm
5

Fig. 3.10 1407 tools

1-9	lunate, abrupt retouch
10-15	lunate, bipolar retouch
16	triangle, bipolar retouch
17	triangle, abrupt retouch
18-22	lunate, Helwan retouch
23-33	borer
34-35	multiple borer

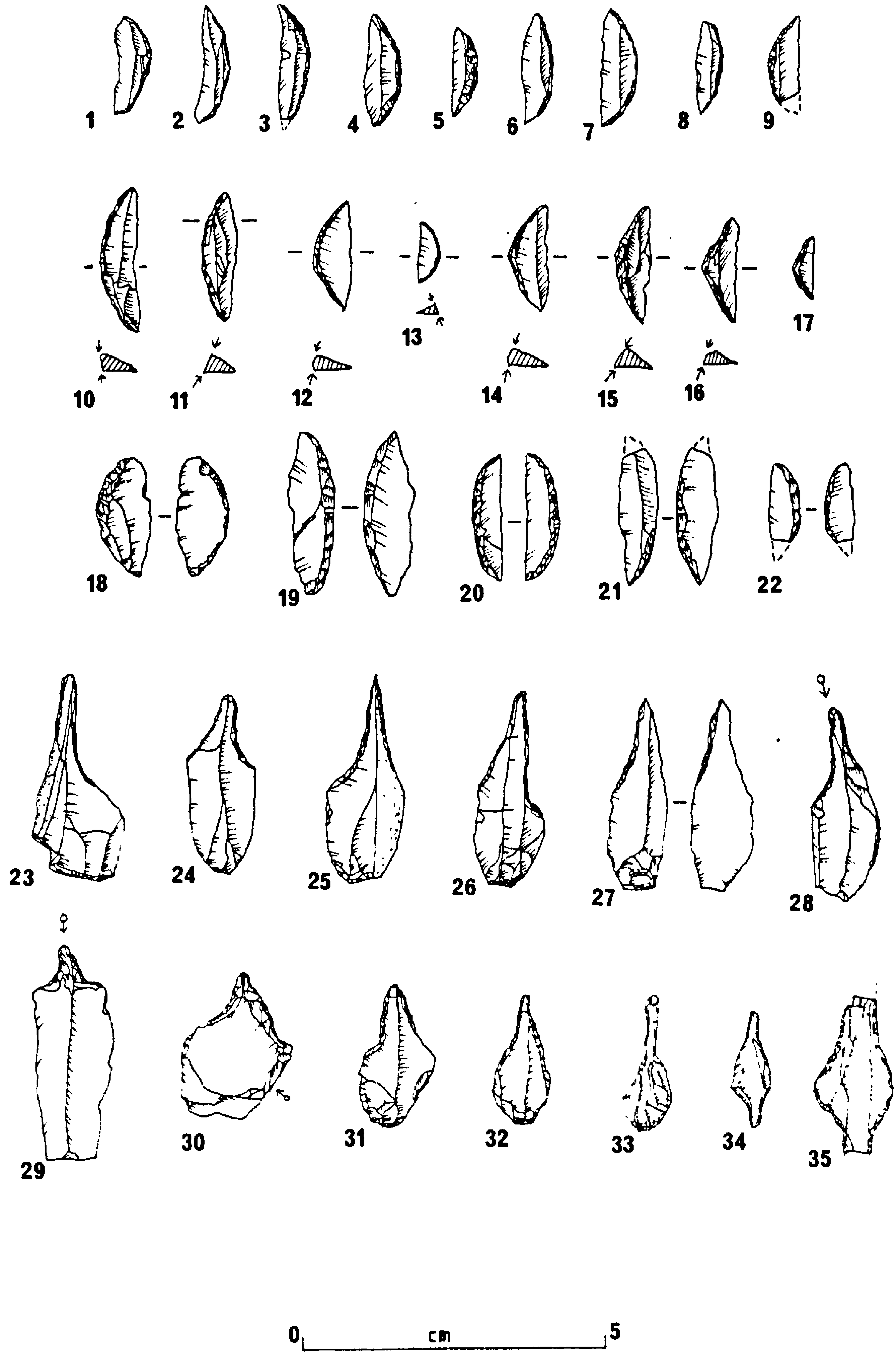
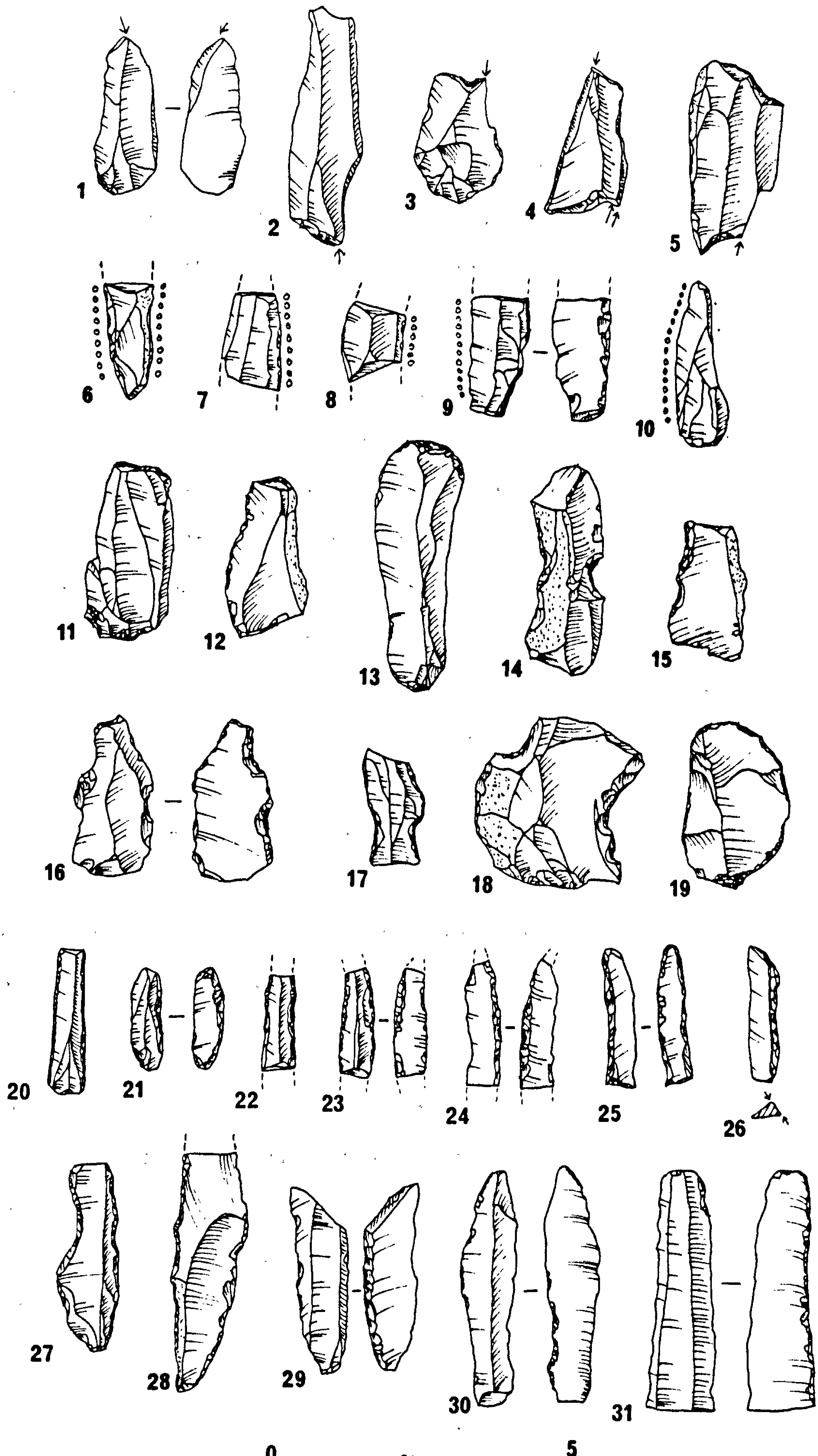

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17
18 19 20 21 22
23 24 25 26 27 28
29 30 31 32 33 34 35
0 cm 5

Fig. 3.11 1407 tools

1	burin on break
2	burin on oblique truncation
3	burin on concave truncation
4	multiple mixed burin
5	multiple mixed piece
6-10	sickle blade
11-13	endscraper
14	blade, retouched notch
15-16	denticulate
17	bladelet, multiple notches
18	flake, retouched notch
19	flake, continuous retouch
20	bladelet fragment, abrupt retouch
21	bladelet fragment, two backed edges
22	bladelet, alternate retouch
23-24	bladelet, Helwan retouch
25-26	backed and truncated bladelet
27	blade, continuous retouch, both edges
28	piece, irregular back
29	bladelet, inverse retouch
30	bladelet, alternate retouch
31	bladelet, inverse retouch


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
0
cm
5

3114 Qa'a es-Subhi

3114 is a small site on a low summit overlooking Qa'a es-Subhi, an elongated mudflat which provides a useful route into the heart of the basalt from the more open country to the southwest.

Collections from the site included a number of irregular flake and bladelet cores in smooth fine-grained cream and ivory flint or possibly chalcedony, and an assemblage in which the most common tools were endscrapers, mostly on stubby flakes. There were also burins, borers, notched pieces and backed bladelets, but very few geometric microliths. The Qa'a es-Subhi assemblage may belong to the Natufian, but the small size of the sample and the very low proportion of geometrics recovered make it difficult to assess. With so little evidence to go on, it is better merely to list it under the broader mantle of the Epipaleolithic without reference to specific industries. In general however, the finds do not differ greatly from the characteristics of Natufian assemblages as discussed above.

The selective use of chalcedony in the Natufian has been noted previously by Henry (Henry & Turnbull 1985:48). He points out that the fine, rather delicate chalcedony is used for small tools and microliths while the larger and more robust pieces are more commonly made on coarser grained flints and cherts (Henry 1973:132).

tool type	Surface
Miscellaneous retouch	21
Single endscraper	17
Flake scraper	6
Dihedral burin	2
Multiple dihedral burin	5
Burin on break	6
Burin on transverse truncation	2
Burin on oblique truncation	2
Burin on concave truncation	2
Multiple mixed burin	1
Borer	9
Multiple borer	0
Naturally backed piece	2
Piece, irregular back	5
Piece, two backed edges	2
Backed fragment	2
Truncated flake	2
Truncated blade	4
Bitruncated piece	1
Retouched notch	6
Blade/bladelet, multiple notches	2
Denticulate	0
Flake, continuous retouch	5
Blade, continuous retouch, one edge	8
Blade, continuous retouch, both edges	6
Strangled blade/flake, wide notch	0
Piece, inverse or alternate retouch	6
Pointed piece	2
Pointed bladelet, fine retouch	1
Bladelet frag., fine retouch	3
Bladelet, back curved by abrupt retouch	5
Bladelet fragment,abrupt retouch	6
Bladelet, inverse retouch	1
Bladelet, alternate retouch	3
Bladelet, Helwan retouch	0
Truncated bladelet	0
Backed and truncated bladelet	0
Backed bladelet, inverse retouch	1
Triangle	2
Lunate	2
Helwan lunate	0
Multiple mixed pieces, various	0
Sickle blade/bladelet	0
Piquant triedre	0
Other	2
total	152

Fig.3.12 3114:relative proportions of tool types

Fig. 3.13 3114 tools

1-5 single endscraper
6-7 flake scraper
8-9 dihedral burin
10 multiple dihedral burin
11 burin on transverse truncation
12 multiple mixed burin
13 burin on break
14 burin on oblique truncation

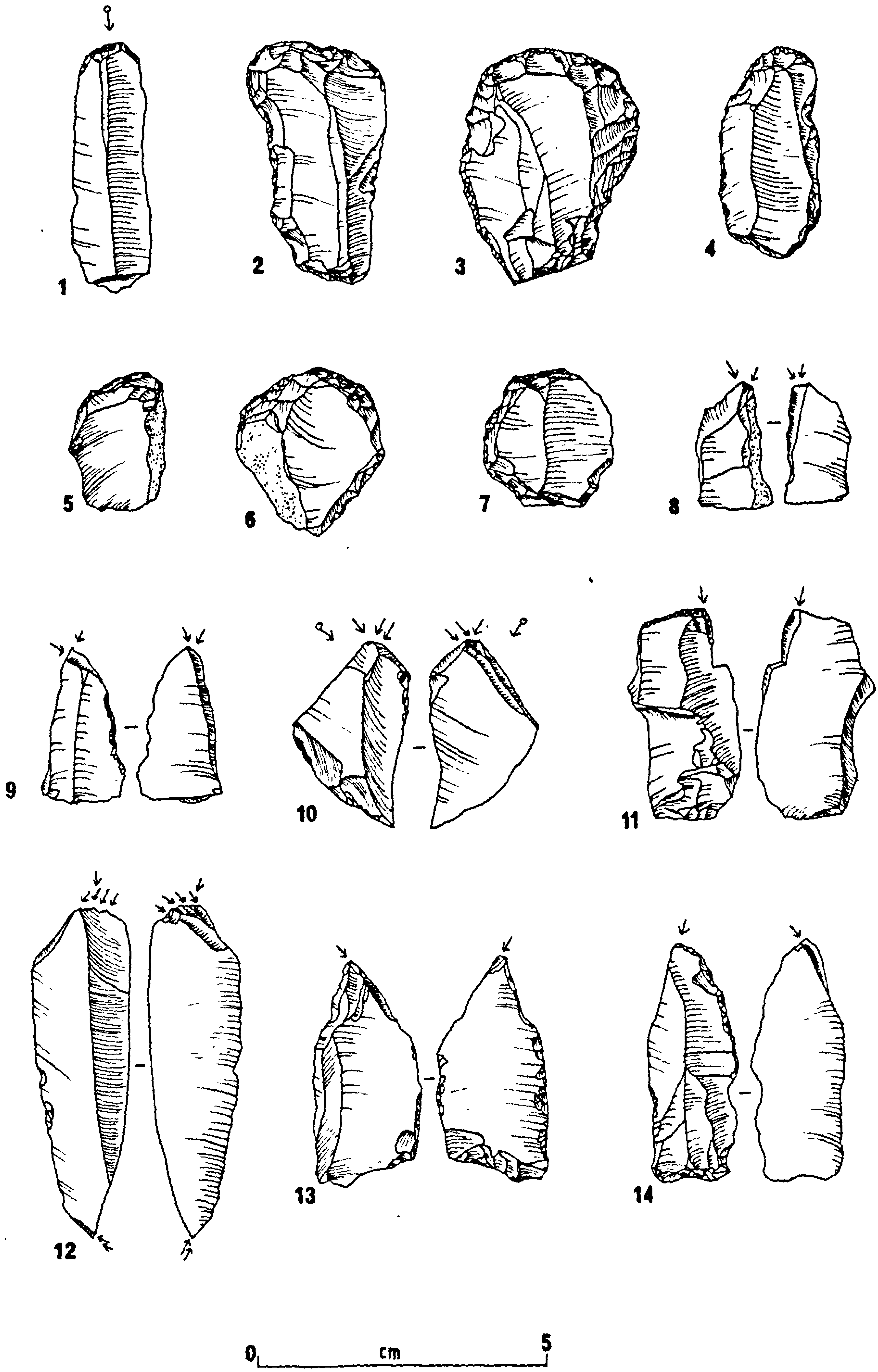
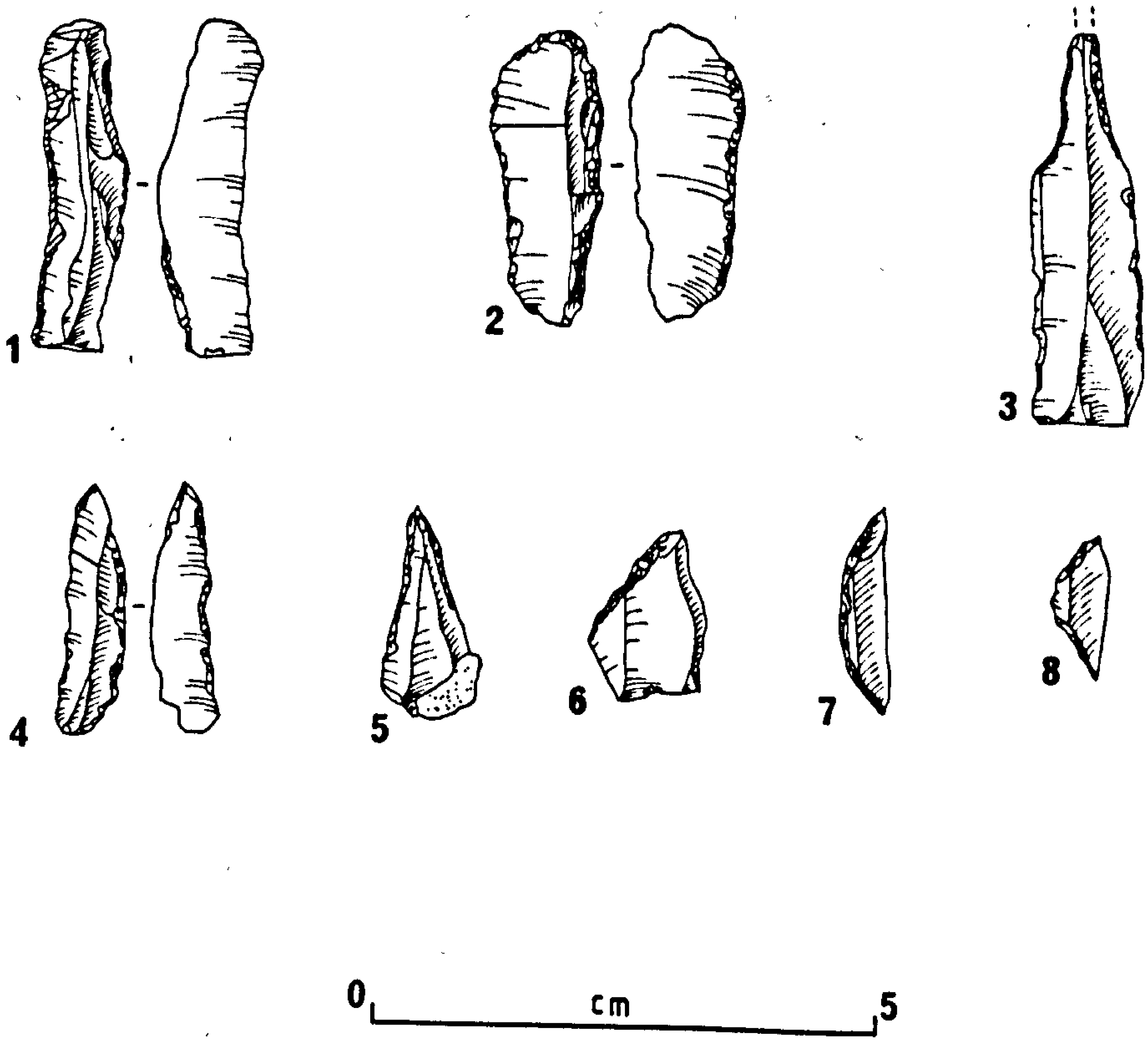

1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
cm
5

Fig. 3.14 3114 tools

1-2 bladelet, alternate retouch
3 borer
4 bladelet, alternate retouch
5 borer
6 truncated flake
7 lunate, abrupt retouch
8 triangle, abrupt retouch


1
2
3
4
5
6
7
8
0
cm
5

Discussion.

The closest parallel for Khallat 'Anaza is the site of Taibe in southern Syria (M.C. Cauvin 1974b). It is particularly interesting because it too is in basalt country, west of Jebel Druze, and in several aspects is very similar to Khallat 'Anaza. Taibe lies on Wadi Zeidi, an eastern tributary of the Yarmouk River. The wadi cuts through the local limestones forming a deep gorge just below the site and exposing chert beds which provided an abundant source of raw material for the lithic industry of the site. The site itself is on a basalt outcrop, the summit of which seems to have been cleared in antiquity and the rocks used to form "deux murailles chaotiques". It forms a perfect vantage point from which hunters could observe the flat land around for game. Apart from the flint source, the locations of the two sites are almost identical: small hilltops or mounds near to a large wadi with a clear view of the surrounding landscape. From Khallat 'Anaza the ground slopes off gradually to the east and the advantage afforded by the elevation of the site means that one can see anything moving up the wadi or any animals on open ground up to several kilometres away. The enclosure wall at Khallat 'Anaza too seems paralleled by the "deux murailles" at Taibe. Whether these walls were for defence against predators, for shelter against the wind or for concealment from hunted animals is uncertain.

Neither site has produced definite evidence of structures dating to the Natufian period other than the enclosure walls, although in both cases this may well be due to limited excavation and/or more recent disturbance of the sites. Two soundings were made at Taibe. B, 2 m^2, was sunk on the slope at the point where the surface scatter was densest but it produced almost nothing. Accordingly a second sounding, A, 4 m^2, was made on the flat summit of the site next to a cairn. The upper levels of the sounding were disturbed by the robbing of stones for the cairn and of the four levels distinguished, the upper two are artificially divided with no direct relation to stratigraphic distinctions. The upper limit of the third level was marked by a roughly flat surface of stones about 45 cms below the surface, sealing a grey ashy layer which was very rich in artefacts. Below, between this and sterile soil, at about 100 cms depth, was a thin level of reddish earth with a few artefacts.

The collections from the three lower levels are very similar in the proportions of tools and the excavator has suggested that they probably all belong to the same phase of the Natufian. The uppermost level is different as it contains a disturbed mix of Natufian and VIIth millennium Neolithic artefacts. Tools from Taibe include a large proportion of microliths (70-80%), many of these lunates. The use of Helwan retouch is uncommon, scrapers are rare and there is no "massive" element in the assemblage. Bar Yosef in his analysis of Natufian sites (Bar Yosef 1981a:Fig 8) lists Taibe as Late Natufian. Although no date is available for the site, as with Khallat 'Anaza the low proportions of Helwan lunates in the microlithic component indicate that the site most probably does belong to the latter half of the Natufian period. It is therefore possible, given the similarities in site location, date and lithic assemblages, that Taibe and Khallat 'Anaza both represent a local tradition of the Natufian, possibly specifically relating to an adaptive strategy based on the special conditions pertaining in the lava belt.

An analysis of the fauna from Taibe (Ducos 1968:81) showed that the animal chiefly being hunted was gazelle, but M.C. Cauvin also emphasises the number of grindstones at the site and the presence of sickle blades. She says that this implied harvesting and processing activity suggests "une halte de chasse temporaire", and that despite the apparent absence of structures the site might qualify as a base camp and not merely a hunting station.

In a recent publication Bar Yosef (1982) discusses his continued belief in the value of his division into these two groups. Base camps are recognised by the presence of substantial structures, graves, heavy duty tools and a rich bone industry. Seasonal camps have only evidence for flimsy structures, few heavy tools, little worked bone and no graves. These seasonal stations however are likely to be repeatedly reoccupied, resulting in quite some accumulation of occupation debris, yet still without the principal attributes of a base camp. Both Taibe and Khallat 'Anaza fall, by Bar Yosef's definition, quite clearly into the second category, the seasonal camp. In the lava belt with its abundant supply of surface rocks, the presence of basalt grinders does not necessarily imply a high degree of sedentism, and the bedrock mortars at Khallat 'Anaza might merely reinforce the argument that the site was in regular but intermittant use. Bar-Yosef's definition however is based mainly on evidence from the less marginal Mediterranean zones. It is possible that the steppe dwellers had to be more mobile and economically flexible to cope with more uncertain conditions and that consequently the pattern of large base camp and smaller hunting camps was not developed in these areas. If base camps for sites such as Khallat 'Anaza did exist, they would probably be found on the wooded, well-watered slopes of Jebel ed-Druze.

3114, although a less obvious parallel to Taibe, possesses similar characteristics in that it is sited on a small peak at the edge of the basalt plateau with a clear view over a large mudflat, again an ideal site for observing the movement of animals. Apart from occupation sites, a continuing tradition in the Black Desert through the Epipaleolithic and early Neolithic periods is the siting of knapping floors on such vantage points so that the hunter might usefully occupy himself while watching the movement of his prey. Several of these sites were located on the survey, especially in the Qurma/Qa'a Mejalla region where the lower end of Wadi Rajil provides water, pasture and access to the richer grazing areas of the Azraq basin. The wadi forms a natural routeway which the herds almost certainly followed as every summit overlooking it has a scatter of knapping waste.

The largest of these knapping sites is 1605 on the edge of the Qurma massif, a location used mainly in the Neolithic, but two Helwan lunates among the collections suggest some earlier use as well (Fig.3.18:6,7). Two knapping sites relating specifically to the Epipaleolithic are 1654 and 1682 (Sites 10 & 14o Betts 1982:7). The cores from 1682 are finely prepared single platform bladelet cores similar to the "axebacked" bladelet cores described by Copeland from Azraq 17 and Kharaneh 4 (Copeland 1975). These cores are very finely worked, unlike those from 1407 and may possibly belong to an earlier stage of the Epipaleolithic. Cores of this type have been described in some detail by Bar-Yosef (Bar-Yosef 1970:Fig.102) and are normally associated with the Kebaran or Geometric Kebaran industries (Bar-Yosef pers. comm.).

Substantial data on Epipaleolithic industries in the immediate vicinity of the basalt zone have come from work by Garrard (Garrard & Stanley Price 1975; Garrard et al. 1985) and Muheisen (1983) in the Azraq basin and the wadis flowing into the basin from the west. Garrard has located Epipaleolithic sites around the Azraq lake, near Jebel Uweinid (Uwaynid), in Wadi Kharaneh and in Wadi Jilat, the area refered to by Waechter in his original work there as Wadi Dhobai (Waechter & Seton Williams 1938).

At Azraq Garrard has found one Natufian site, Azraq 18. Surface collections from the site produced a very high proportion of microliths, over half of them lunates. The remainder were various types of backed bladelet fragments. A high proportion of Helwan lunates suggests that the site belongs to the early Natufian (Garrard et al.in prep.). Further to the southwest, in

Wadi Jilat, Garrard has made soundings in one Upper Paleolithic and three Epipaleolithic sites (Garrard et al. in press). Jilat 9, the Upper Paleolithic site, has a C14 date of 21,150 ± 400 BP (Oxa 519). It has a blade based industry in which endscrapers and retouched pieces predominate and microliths are rare. Jilat 10 has a C14 date of 14,790 ± 200 BP (Oxa 520). The industry has a low microlithic component and consists mainly of retouched blades, endscrapers, burins and truncations. Jilat 8 has a C14 date of 13,310 ± 120 (Oxa 521) and an industry based on short broken bladelet segments, some with one end truncated. The non-microlithic element includes endscrapers. Jilat 6 (Wadi Dhobai K (Waechter & Seton Williams 1938) is a large "tell" site. Three phases of occupation have been distinguished, the uppermost characterised by geometric microliths, especially triangles, the middle one by robust La Mouillah points and the lower by curved pointed arch-back pieces on thin bladelets. Several camp sites have also recently been examined by Garrard near Jebel Uweinid. Each seems to have a slightly different assemblage, all of them on bladelets with fairly high proportions of geometrics (Garrard et al. in prep).

Muheisen made soundings at the site of Kharaneh IV, a large mound similar to Jilat 6, on an island in the braided channel of Wadi Kharaneh west of Jebel Uweinid. Although like most of the eastern desert sites of these periods, each phase has its own distinctive aspects, Muheisen concludes that it covers a timespan corresponding to the Kebaran of Palestine, Phase A, the earliest, being broadly parallel to Wadi Dhobai K (Jilat 6), a form of Early Kebaran, and Phase D, the latest, being roughly equivalent to Late Geometric Kebaran (Muheisen 1983).

The Black Desert Survey also located some very small scatters of microliths, mostly in the area along Wadi Rajil near Khallat 'Anaza, in which backed and usually truncated bladelets dominated (see Fig.3.18:10-16). Geometrics of this type were very rare at Khallat 'Anaza and it seems that these scatters represent a different and probably earlier industry. The sample size however is in each case so small that no valid comparisons can be made with Garrard's sites beyond merely noting the presence of such Epipaleolithic bladelet industries in the survey region. Two other sites were found on the survey which probably belong to the sequence of Upper/Epipaleolithic industries in the area but which have produced insufficient evidence for it to be possible to do more than draw broad parallels with the Jilat sites. Both are on the lower reaches of Wadi Rajil where the wadi runs out of the basalt into the Azraq basin. 1611 (Fig.3.15) is a knapping site for the production of short thick blades with broad, plain, often cortical platforms. The cores typically are unprepared chunks of tabular flint with only one or two removals from each piece. The blades are quite heavily patinated to a rich mahogany colour. 1623 (Fig.3.17) is a small scatter of blades of the type produced at 1611, thick and quite heavily patinated with broad plain platforms. Three endscrapers and one multiple piece were among the collection.

Earlier surveys in the basalt desert and its immediate surroundings are rare. The two main reports on sites from the area are Zeuner (Zeuner et al. 1957) in his overview of early prehistoric sites in Jordan and Field (Field 1960). Zeuner describes among others the "Wall Site" at Qa'a Khanna, a Natufian site with lunates, backed blades and a few endscrapers. Helwan retouch is present in moderate proportions. Garrod in her report on the chipped stone from Field's surveys (Garrod 1960) describes a small number of sites which she classifies as Aurignacian. Sites 221 and 222, 20 miles east of Landing Ground D have an industry containing endscrapers, burins, flake scrapers, rostrate scrapers, steep scrapers, pounders and discs. The cores are small and roughly pyramidal. Site 218 at the west end of Landing Ground H she says is possibly Late Aurignacian. It has burins, endscrapers, hollow-ended scrapers, flake scrapers, steep scrapers, spurred scrapers, borers and microlithic blades.

Together with these are the more enigmatic sites of the Tellul el-Basatin industry, described by Garrod as possibly a rather specialized form of Aurignacian. The industry is characterised by burins and endscrapers, various other types of scrapers in lesser proportions and some massive used flakes. From Garrod's descriptions of these necessarily limited collections it is hard to comment on Field's sites in relation to data from other sites in the area. The most that can be said perhaps is that they are not out of place in the broad spectrum of Upper/Epipaleolithic sites in the eastern desert, and they appear to demonstrate to some degree that sites of these periods are to be found right across the lava belt and even in the open plains beyond.

Elsewhere in the Syrian steppe, a number of Epipaleolithic sites have also been found, particularly around the northern oases of Palmyra and el Kowm. M.C. Cauvin (1981) lists two Early Natufian sites from the el-Kowm basin, together with a number of Epipaleolithic sites. The two Natufian sites are Aarida 7, a small scatter with Helwan lunates, and el-Kowm 1, the basal deposits of the main tell with an industry including use of the microburin technique and a high proportion of Helwan lunates, together with some triangles and scrapers. The Epipaleolithic sites of Ain Juwal, Nadaouiyeh 2, Aarida Sud and the very lowest level of the main tell at el-Kowm are similar in that they all have geometrics among the microlithic components of their assemblages, but each seems to represent a different industry. At Ain Juwal geometrics are rare and the industry is characterized by bladelets with fine, often inverse retouch. Contrastingly, Nadaouiyeh 2 has a high proportion of geometrics and Aarida Sud is interesting in that even its geometric element is blade rather than bladelet based.

M.C. Cauvin has also found Epipaleolithic sites in the vicinity of Jayroud, on the steppe between Damascus and Palmyra. They lie on the east side of an ancient lake bed between two lines of hills forming part of the Qalmoun range, and they seem to represent three distinct phases of the Epipaleolithic. One of these is a variant of the Geometric Kebaran with numerous scrapers and geometric microliths - mostly trapezes with concave backing and oblique truncation - together with some scalene triangles. There is also an early Natufian element with short, wide lunates with Helwan or abrupt retouch. Five stations have Late Natufian material; mortars and grinders, shells and beads, and an elaborate lithic industry with abruptly retouched lunates (M.C. Cauvin 1983).

Upper and Epipaleolithic sites have also been reported by members of the University of Tokyo team working in the area around Palmyra. Epipaleolithic levels have been found stratified in Douara Cave, and a number of open-air sites have also been found around the springs and the sabkha (Hanihara & Sakaguchi eds. 1978; Hanihara & Akazawa eds. 1979). Most of the Epipaleolithic sites are early and several have close affinities with the Geometric Kebaran, with assemblages characterised by high proportions of trapeze rectangles together with burins and core scrapers. No Natufian sites are reported.

De Contenson made soundings in a Natufian site at Qornet Rarrha, just to the north-east of Damascus. Of the small sample of tools recovered, 4 out of the 5 lunates had Helwan retouch, probably indicating that the site is early Natufian. Other tools included borers, notched and backed bladelets, burins and scrapers. There was some evidence for use of the microburin technique.

Henry has found a number of Upper and Epipaleolithic sites in the course of his surveys in the Ras en-Naqb area of southern Jordan (Henry 1982). Two Upper Paleolithic sites were found in the Jebel Qalkha area, both on broad terraces in front of shallow south-facing rock shelters. The industries are blade based and the toolkits are dominated by burins and simple endscrapers on blades. Henry suggests that they can be classed with the Levantine Aurignacian. About 40% of the sites recorded in his survey areas belonged to stages of the Epipaleolithic and Henry has shown that the terminal Pleistocene populations of southern Jordan had greater interaction with groups in the central and northern Levant than with neighbouring peoples in the Negev and Sinai. Despite this however, the early phases of the Epipaleolithic show marked regional diversity and it is only in the Natufian that sites in the south and north can be classed under the same cultural heading.

Henry has classed his earliest stage as Qalkhan, broadly similar to the Kebaran but with consistant use of the microburin technique and with Qalkhan points. Henry suggests that these might find parallels at Ain Juwal near el-Kowm (M.C. Cauvin 1981). The next stage is the Hamran, again showing broad similarities with the Kebaran and Geometric Kebaran but with distinct typological and technological variations. Both early and late Natufian are represented in the area. Wadi Judayid (J2) has C14 dates within the 11th millennium and high frequencies of Helwan lunates, and Site J406a has a predominance of small abruptly backed lunates, suggesting it belongs to the later part of the period. Soundings were made at J2. Environmental data recovered from the excavations suggested moister climatic conditions than today and a mixed forest/grassland setting. The assemblage was dominated by tools on rather broad bladelets struck from small globular and pyramidal cores with opposed and multiple platform orientations and the microburin technique was used quite consistantly. Lunates were the most common tool type together with notches and retouched pieces.

The late Natufian site of J406a was also sounded. Microburins were still quite common, indicating continued use of the technique for the production of geometrics, and the tool kit comprised abruptly retouched lunates together with some notches and double backed bladelets. Two of the most interesting aspects of this southern Natufian were the marked affinities with the preceding Final Hamran and the very early date obtained for J2.

There is very little evidence for the Upper Paleolithic and Epipaleolithic south of the survey area in northern Saudi Arabia (Gilmore et al.1982). A few sites have been tentatively assigned to this period (Parr et al. 1978:35; Zarins et al. 1980:16; Gilmore et al. 1982:12), but there is a marked scarcity of evidence for both Upper and Epiplaeolithic industries in the Arabian peninsula.

It is clear from the contrast with the following Neolithic stages that the period covered by the Upper and Epipaleolithic is poorly represented in the survey area. However it is equally clear from the extensive sequence at nearby Jilat that sites of this period certainly did exist in the eastern desert and some explanation must therefore be sought for their apparent rarity or absence in the basalt region. Scarcity of Upper Paleolithic sites probably does not require a special explanation with regard to the survey area as such sites are extremely rare in the Near East generally, but with regard to the later periods there are several possibilities. Despite the special care taken during the survey to look closely for Pre-Neolithic sites, there is unfortunately always a chance that some such sites were missed, even though the deliberate selection of diverse environmental zones for study was designed to restrict the likelihood of this happening.

It is of course quite possible that for any number of reasons relating to environmental factors or personal preference, peoples of these periods did not favour the rather harsh landscape of the basalt zone, prefering instead the open country and more abundant water supply to the west. Factors encouraging settlement and site location must be considered here. With increasing information on site distribution in the eastern desert, it not surprisingly becomes clear that one of the most important magnets for settlement is water. Thus the gorge at Wadi Jilat with its natural reservoirs has always attracted settlement while the epipaleolithic sites at Jebel Uweinid and Azraq are clustered near freshwater springs. Where Wadi Rajil is deeply incised, it has in places also acted in a similar fashion to the gorge at Jilat and so there is a concentration of settlement in the vicinity of Khallat 'Anaza near the natural pools. The advantages afforded by Wadi Rajil are emphasised by the series of scatters of Epipaleolithic material all along the rim of the gorge from 'Ain Jawa almost to the Shubeiqa mudflats, the highest concentration of Epipaleolithic scatters in the whole of the survey area. However there are a few other places in the basalt where water is retained in similar pools, although it may be only intermittantly available, and it might be this uncertain supply that deterred settlement in the periods in question. Climatic factors may also have affected the observable pattern of settlement in a number of ways. Washing out of terraces or infilling of small tributary wadis might account for the apparent absence of any sites close to the wadi beds, in fact some of the choicest locations in the survey area. It seems that the sites at Jilat have survived in part because the wadi is entrenched in its gorge and has been unable to affect the ancient sites along its banks, but it is possible that contemporary sites in the survey area have been lost, either buried or washed away.

Although the apparent absence of sites cannot be fully explained, the discovery of Khallat 'Anaza, a late Natufian site of at least moderate size, is not entirely unexpected. Most Natufian sites in the steppe belong to the later part of the period (see for example Henry 1981:428, Fig.2;429), a phenomenon explained by Henry as being caused by population pressure in the mediterranean hillzone, the optimum habitat for Natufian adaptive strategy.

Fig. 3.15 1611

1 bipolar blade core
2-3 single platform blade core

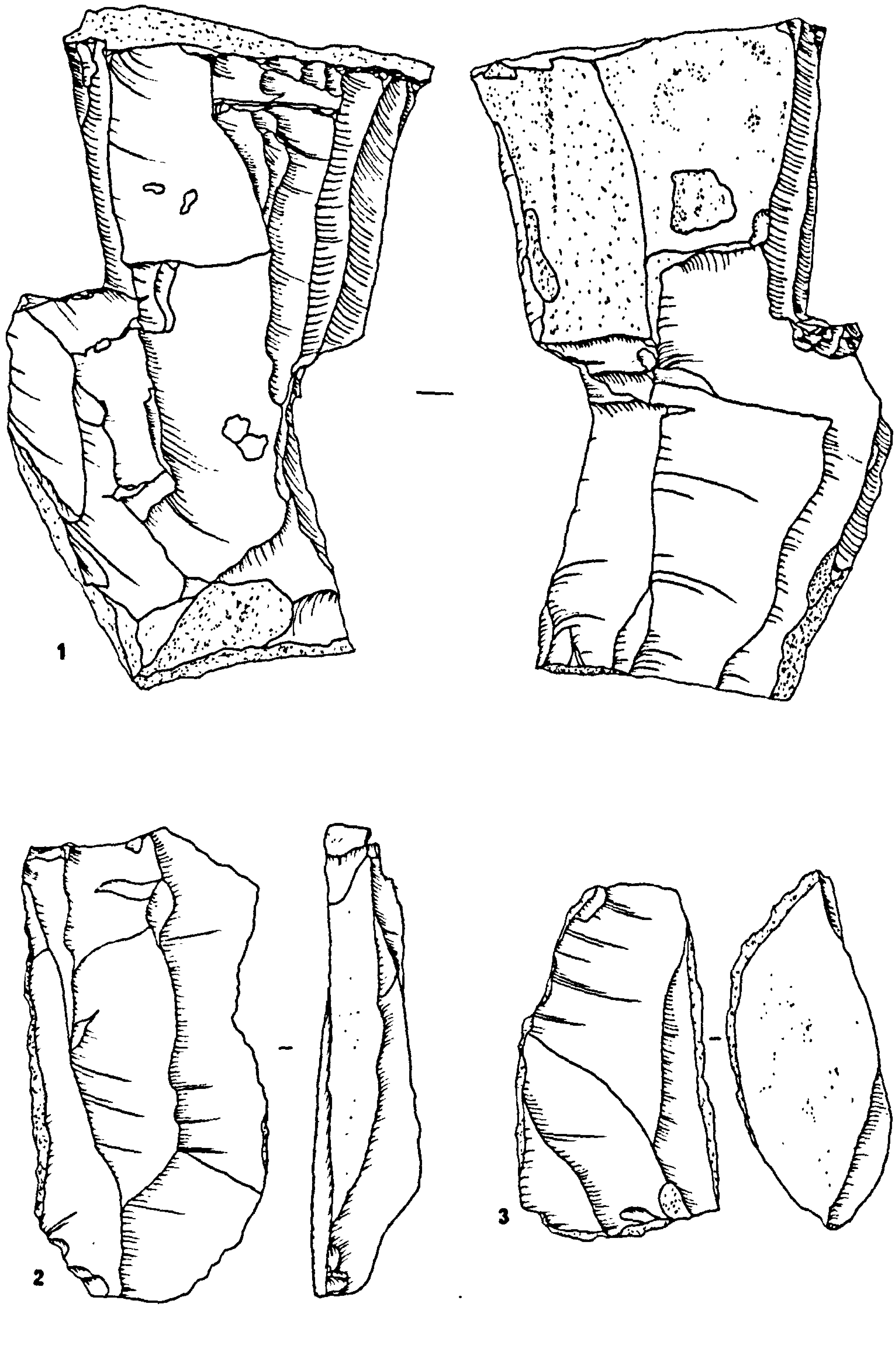

1
2
3
0 cm 5

Fig. 3.16 survey sites

1	1682	single platform blade core
2		single platform blade core
3	1654	single platform blade core
4		single platform balde core
5	1682	single platform blade core

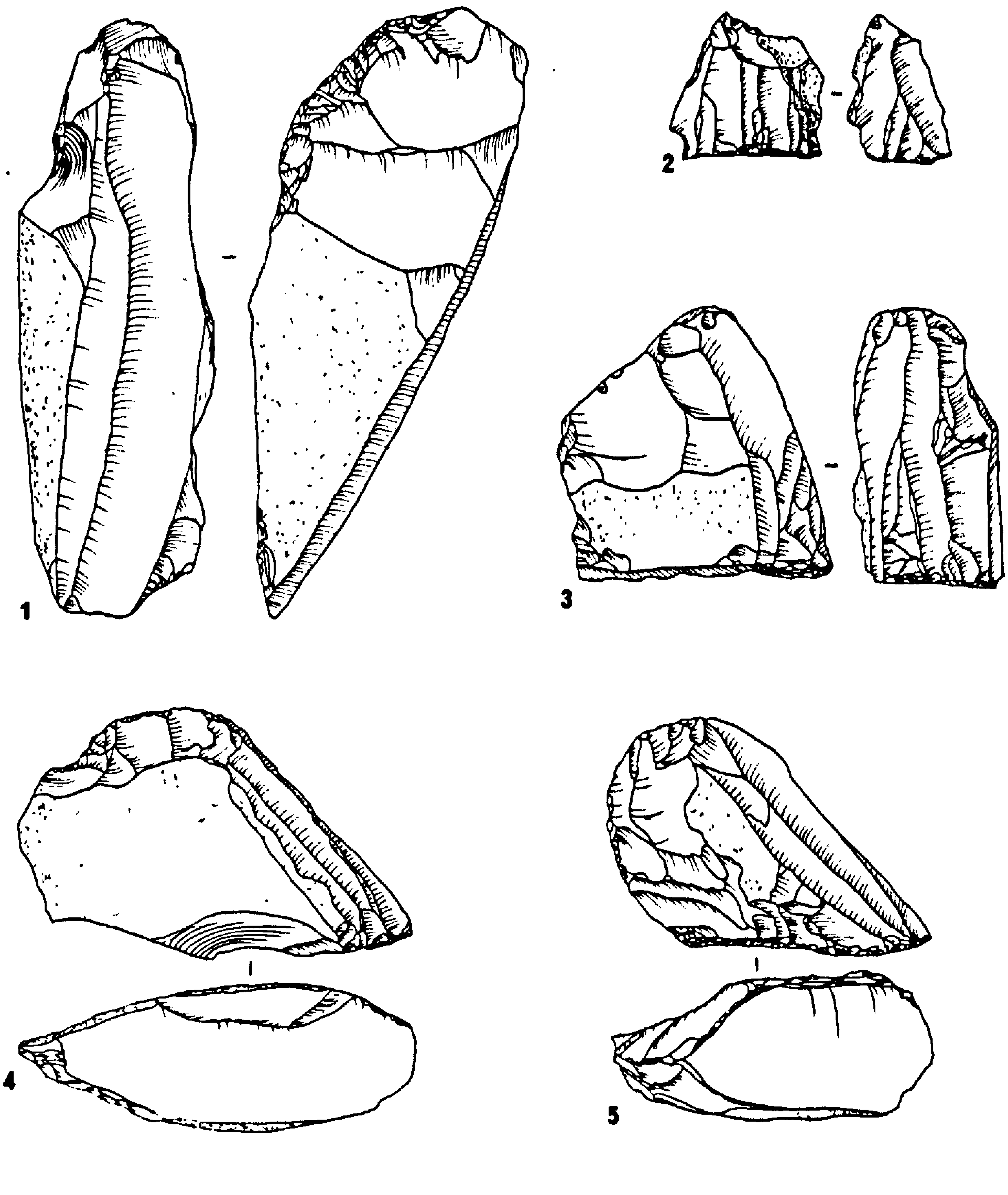

1
2
3
4
5
0 cm 5

Fig. 3.17 1623 tools

1-2 endscraper
3 multiple mixed piece
4 endscraper

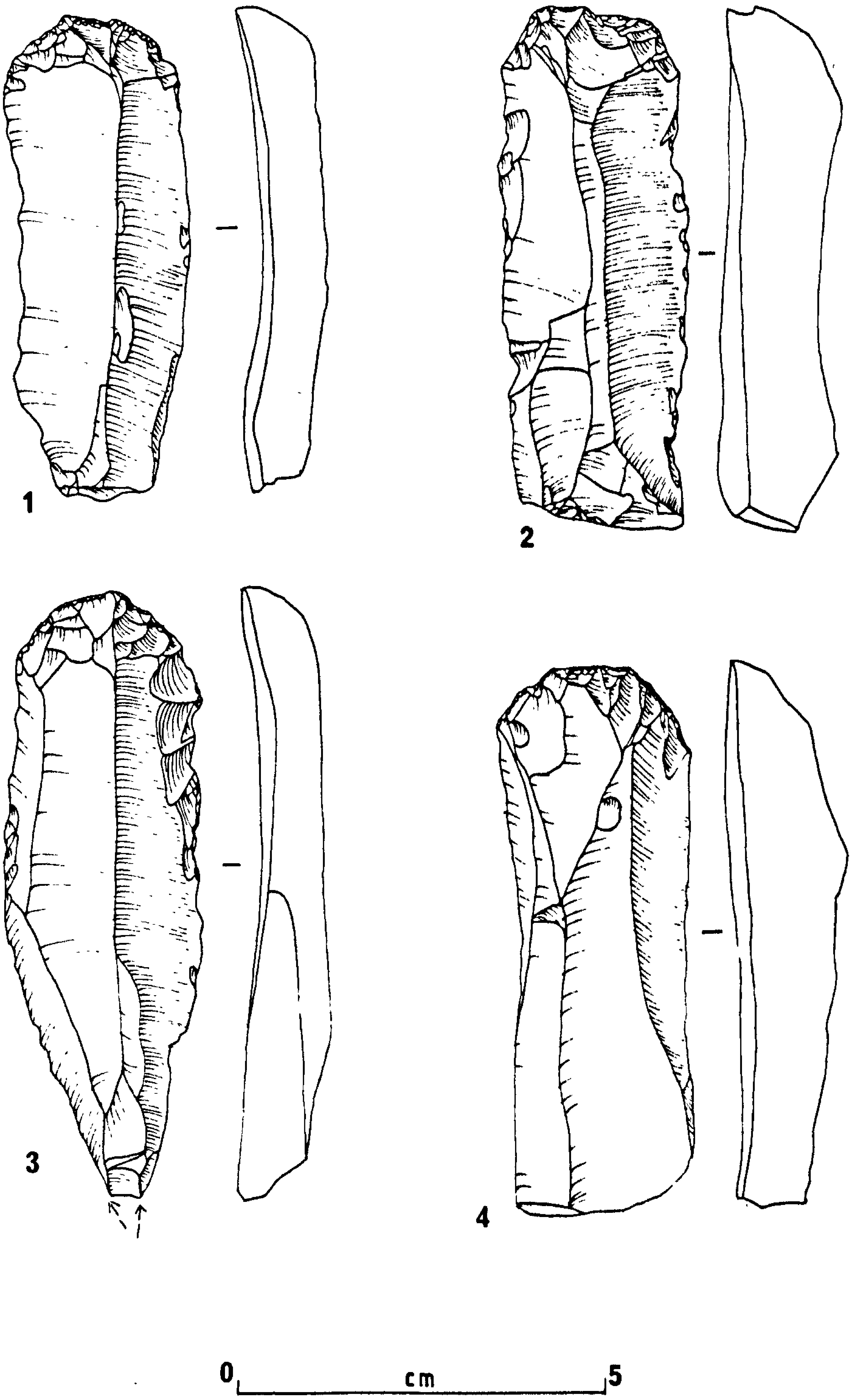
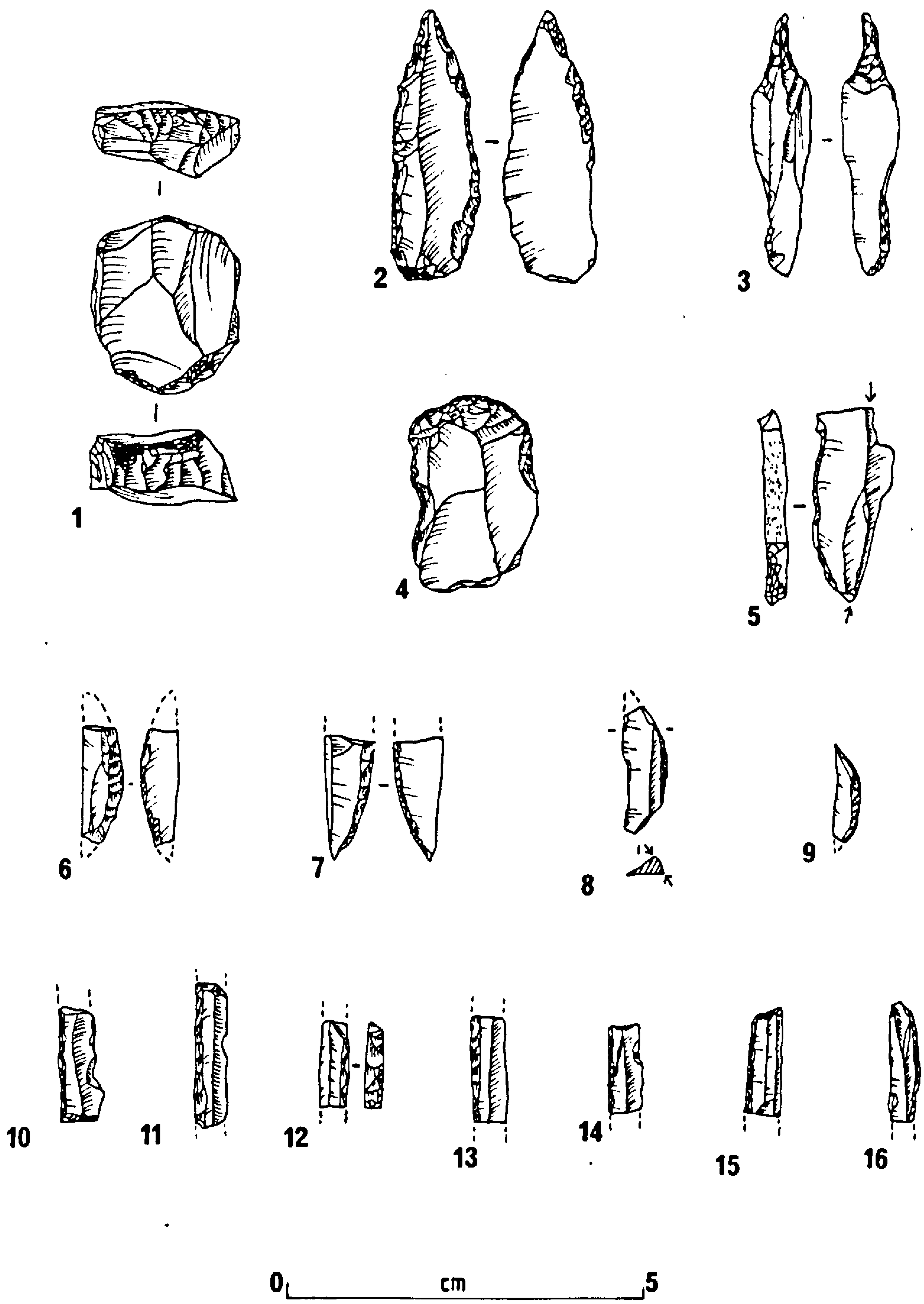

1
2
3
4
0
cm
5

Fig. 3.18 survey site tools

1	2107 endscraper on core tablet
2	2804 borer
3	2204 borer
4	1420 endscraper
5	1420 multiple mixed burin
6	1605 lunate, Helwan retouch
7	1605 lunate, Helwan retouch
8	2107 lunate, bipolar retouch
9	2103 lunate, abrupt retouch
10	1420 backed and truncated bladelet
11	1412 bladelet fragment, abrupt retouch
12	1420 bladelet fragment, abrupt retouch
13	1411 bladelet fragment, abrupt retouch
14	1420 backed and truncated bladelet
15	1420 backed and truncated bladelet
16	1420 bladelet, back curved by abrupt retouch


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
0
cm
5

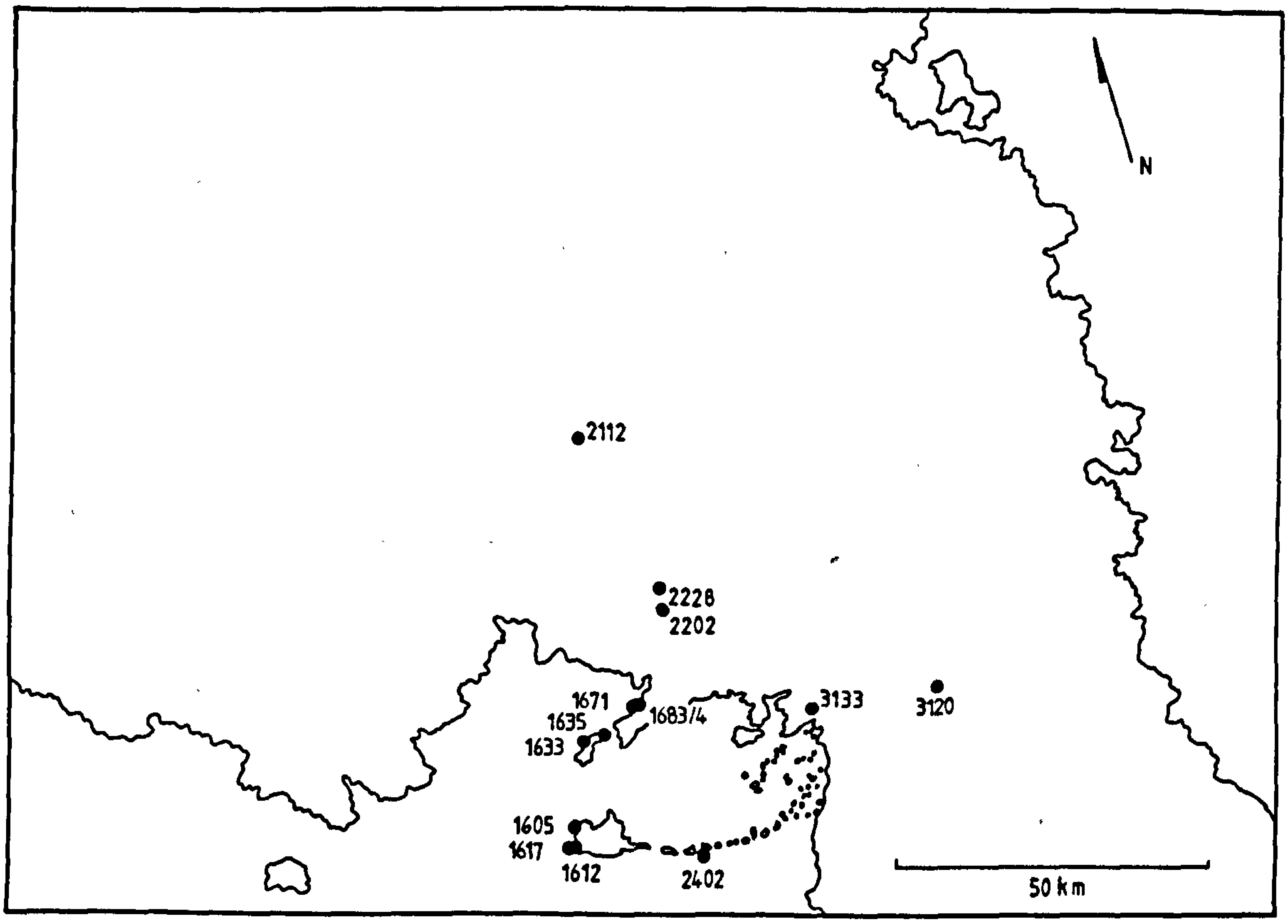


Fig 4.1 Black Desert, eastern Jordan:
major Pre-Pottery Neolithic B sites

Chapter 4

This chapter presents the evidence for Pre-Pottery Neolithic A/B occupation in the survey area, examines the extent and nature of man's activities in the Black Desert during this time and discusses how these relate to parallel developments elsewhere in the Levant. PPNA sites are virtually unknown in the desert areas of the Near East, but the PPNB is possibly the richest period, one of the times of greatest activity in the steppic regions in prehistory. PPNB sites are reported in substantial numbers from Sinai and the Negev (Bar-Yosef 1981, Bar-Yosef & Phillips 1977), from south-eastern Jordan (Rhotert 1938; Henry 1982) and from eastern Syria (Hanihara & Akazawa 1979; J. Cauvin 1983b). Garrard has found a number of PPNB sites in Wadi Jilat and around Azraq Oasis (Garrard & Stanley Price 1975; Garrard et al. 1985; Garrard et al. in press). This pattern is reflected in the survey area where a very high proportion of the sites relate in one way or another to this period. These include occupation sites, knapping sites, animal traps and isolated flint scatters. Soundings were made in two occupation sites, 2202 Dhuweila and 3133 Ibn el-Ghazzi which revealed an industry reflecting a hunting economy and a rich artistic element.

Typology.

In attempting to construct a typology for the PPNB, the difficulties discussed by J.Cauvin (1968) were borne in mind. Cauvin believes that the standard approach to Paleolithic typologies cannot, or rather should not, be applied to Neolithic industries. He suggests that by Neolithic times there had been a subtle change in the way man conceived and organised his activities, a change reflected in his tool kit. As his lifestyle changed from the age-old pattern of hunting and gathering to one where he was constantly under pressure to adapt to new circumstances - sedentarisation, cereal harvesting, livestock management - so his tool kit evolved also. Cauvin maintains that for the Neolithic, it is no longer sufficient to use terms derived from the morphology of a tool; it is also necessary to attempt to define the use of the piece. As he explains. "Une hache peut n'être techniquement qu'une "biface cordiforme"; on voit combien cette expression serait appauvrissante si l'on a la certitude que c'est bien une hache...". However he also concedes that at present it is not always possible to define precise uses. Unfortunately in the typology below, a number of his suggested rules have been broken, out of necessity and not because of a disagreement with his basic tenets. For example, it has proved necessary to revert to the blanket term "bifaces" to cover a group of tools which are undoubtedly of related morphology, but of possibly varying function. Although every attempt at consistancy has been made, the typology is, if not flawed, at least preliminary, since it is designed for sites in an area where little is yet known, and the discovery of new sites may call for significant revision.

Neolithic tools from all the survey sites have been categorized according to the typology presented schematically in

Fig. 4.2 Neolithic tools: schematic typology

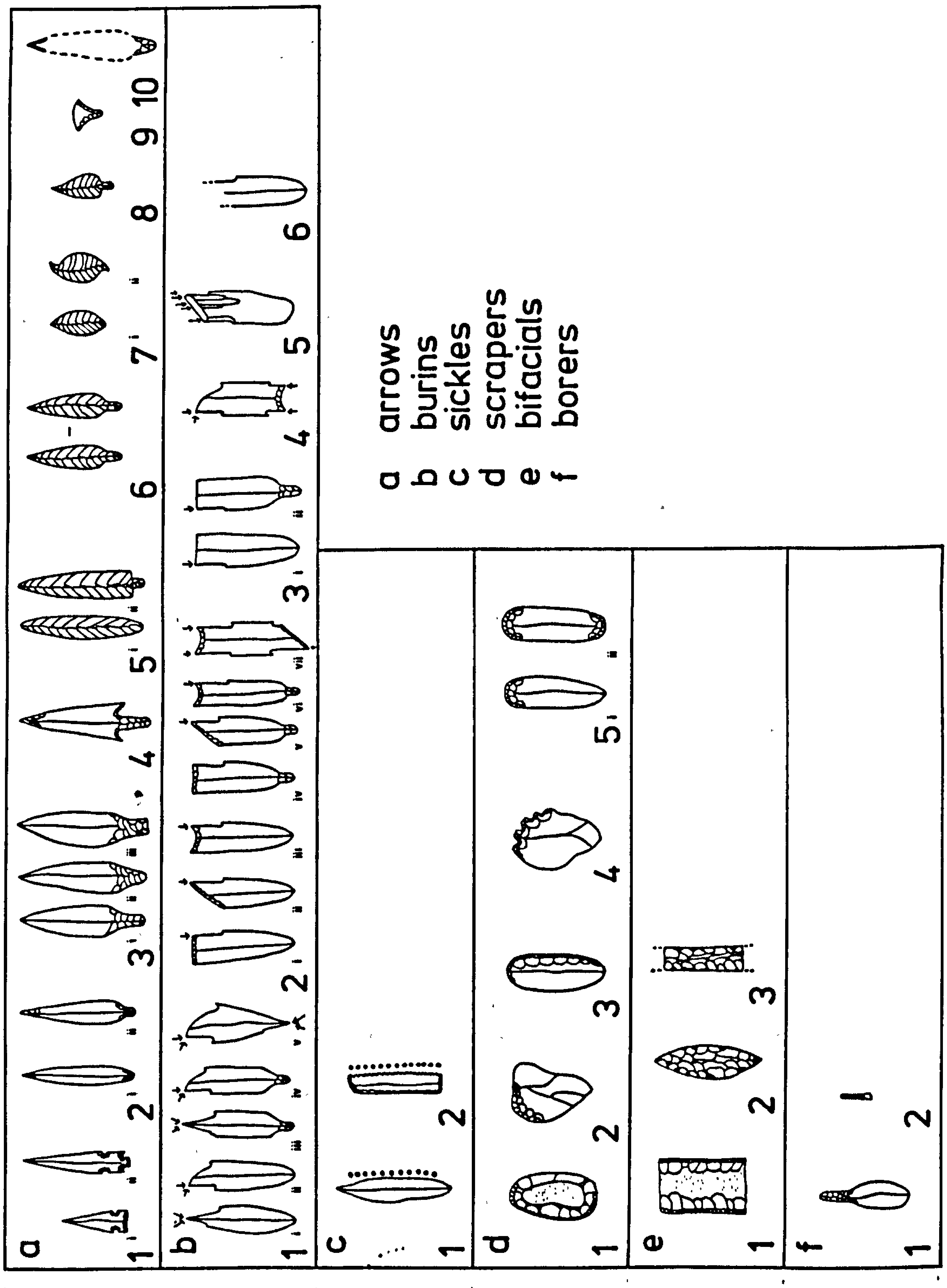


Fig.4.2. This is a three-tier system of major tool groups, individual tool types within these groups and subdivisions within individual tool types. This system permits a certain degree of flexibility in classification to allow for the problem of categorizing fragments as well as whole pieces. Pieces which cannot be assigned to specific subdivisions can possibly be classified at least as to tool type, or if not, then to the "broken" category. Only if a piece is very badly fragmented will it be put with "miscellaneous retouch".

arrows:

The term "arrow" is used here as a broad descriptive term. It is recognised that some of the pieces may have been used as projectiles other than arrows or even as quite different tools (see "burins" below). The term "points" has not been used since confusion can arise between projectiles and the borer/drill class, and also because not all of the types in the group are pointed (see Type 9).

1) Notched arrowheads have been found at one of the survey sites and also at Jilat 7 (Garrard et al.in press). The typology of notched arrowheads has been discussed in some detail by M.C. Cauvin (1974a). They fall into two groups, the early type of which the Khiamian point is the best known, and a later and more elaborate form found in large numbers on sites in the Damascus basin such as Tell Aswad (M.C.Cauvin 1974c). The earliest forms first appear in transitional pre-Neolithic levels such as Mureybet 1B (M.C Cauvin 1974a; M.C.Cauvin & Stordeur 1978) and

Nahal Oren IV (Noy, Legge & Higgs 1973) and become one of the type fossils of the PPNA. Typically they are made on a small blade or bladelet with two bilateral notches close to the base. They are occasionally retouched slightly around the tip of the point and the proximal end of the piece is shaped by fine retouch into a straight or concave base. Some examples have slight tangs and some more than one pair of notches.

The later version is made on a blade, often with more than one pair of bilateral notches. Most examples have a slight tang, usually defined by the lowest pair of notches. The base of the tang may be convex, rectilinear or concave. Flat semi-invasive retouch is used for the first time to shape the tang and sometimes to trim the tip of the point. They are usually larger than the earlier types and as they are primarily associated with PPNB assemblages, are normally made on the narrow pointed blades associated with the use of bipolar blade cores. These later types at Tell Aswad are from levels dated between 7790 ± 120 and 7320 ± 120 BC (de Contenson 1973) and occur at Ramad up until the end of the 7th millennium (M.C.Cauvin 1974 a,c; de Contenson 1967:20). They also occur at Jilat 7 in levels dated to 6860 ± 110 and 6570 ± 110 BC (Garrard et al. in press). Notched arrowheads of this later type are also found in early PPNB levels on sites in Palestine and southern Jordan, for example in the Beersheba region (Burian & Friedman 1979:13), at Jericho (Crowfoot Payne 1983:678 Fig.306) and at Beidha (Mortensen 1970: Type A3).

2) The second group of arrowheads is made on long blades with

tangs formed by abrupt or semi-abrupt retouch. They have little working on the body of the piece and are occasionally slightly retouched about the tip of the point. There are two subdivisions. The first includes pieces with a tang formed by minimal working of the proximal end of the blade to form a tang which slopes almost without a break into the body of the point. The second includes pieces with a more pronounced tang. A specific variant of the second subtype is a short point made on a broad blade with a tang formed by abrupt alternate retouch (Fig.4.13:2,3 and see also Garrard et al.in press:Fig.8d). An interesting parallel to this type has been reported by Mortensen (1982) in the collections from Umm Dabaghiyah (Mortensen 1982: Fig.3a-d). For general parallels of both subtypes at Beidha see Mortensen (1970) Types A4 and A6.

3) The third type is a tanged arrowhead made on a blade and formed by limited pressure flaking around the tang and occasionally the tip of the point. It is included, among others, in the category of arrowheads generally described as Byblos points (J. Cauvin 1968:55; M.C.Cauvin in prep.). The subtypes are based on a selection of those presented by M.C.Cauvin (in prep.). Subtype (i) corresponds to both D1a and D1b in her classification as the distinction between the two proved difficult to identify in the survey collections. Subtype (ii) corresponds to her D2 and (iii) to her types D3 and D4 as again it proved difficult to distinguish between the two types. Her other types, D5-9 were not encountered on any of the desert sites.

4) Type 4 is a tanged and pressure flaked point with pronounced

wings of the type known as a Jericho point (Crowfoot Payne 1983:679), a type found most commonly in Palestine and almost unknown further north. M.C. Cauvin defines the Syrian facies of the PPNB by the absence of points of this type (Aurenche & M.C. Cauvin 1982:56). They are very rare on the desert sites.

5) The typical form of the fifth group is a straight sided elongated point with much or all of the dorsal surface covered by fine regular pressure flaking. Most examples are oval (subtype (i)) but some have short tangs (subtype (ii)). There is confusion between this type of point which has a quite widespread distribution over Jordan, Palestine and Sinai and the true Amuq point which seems to be a more Syrian phenomenon. The Amuq point as defined by Cauvin (1968) is a "pointe allongée triédrique à retouche couvrante". The tanged version which has a tang sloping without shoulders into the body of the piece is a "pointe à pédoncule triédrique non détaché".

M.C. Cauvin (in prep.) distinguishes 4 subtypes of each version. The key element in each case is that the centre of the point is so thick that the cross-section forms more or less an equilateral triangle. The points from Dhuweila superficially resemble Amuq points but range greatly in thickness, and all fall below the standard W/T ratio for Amuq points based on the equilateral triangular cross section (Fig.4.3). Both the flat forms and the true Amuq point appear after the beginning of the PPNB sequence, being found typically with Byblos and Jericho points.

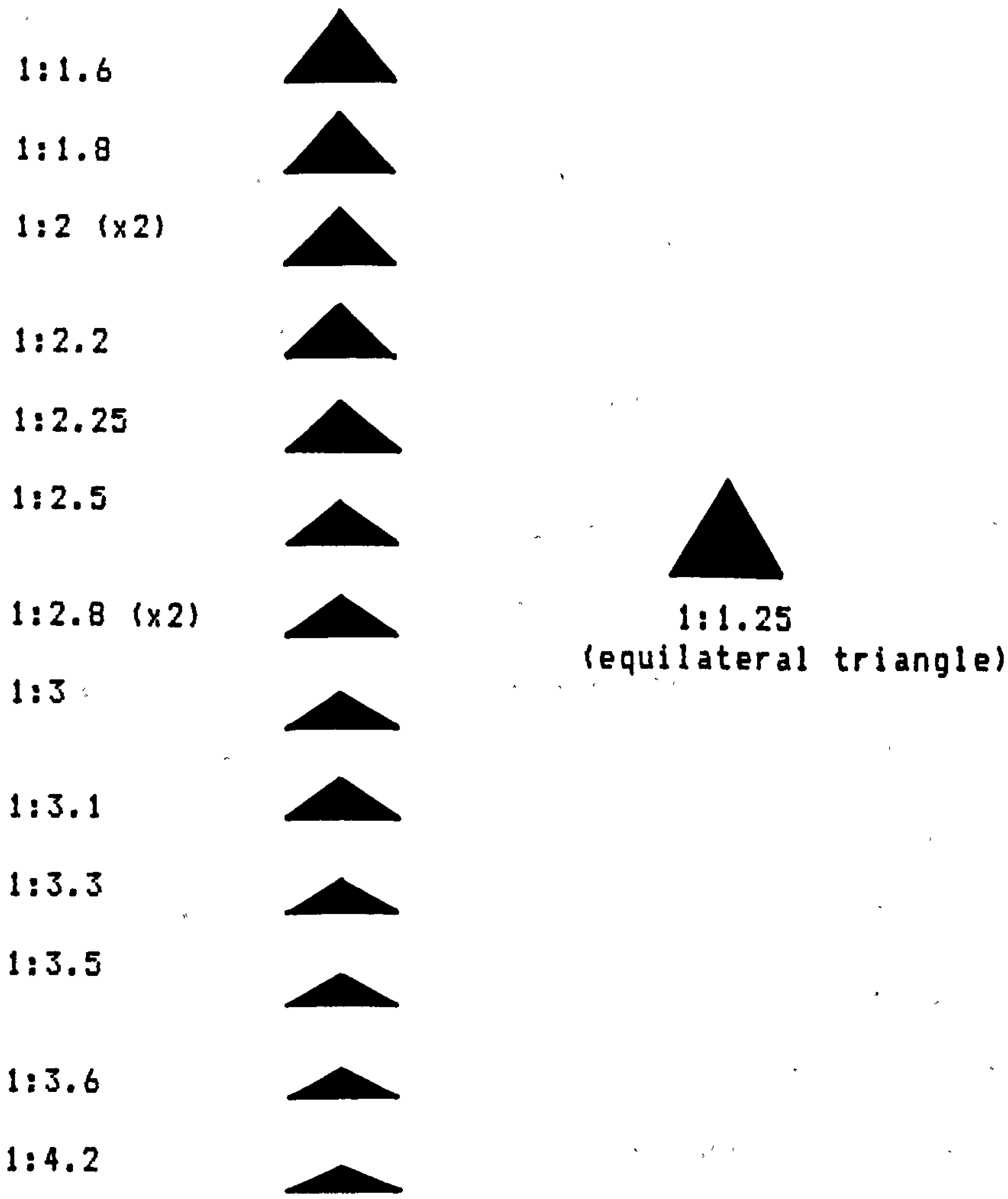


Fig.4.3 2202:absolute T/W ratios and schematic representation of Type 5 points (excavated)

One of the earliest occurances of the true Amuq point is in Tell Aswad II (M.C.Cauvin 1974c), the earliest levels of which are dated 7,300 BC. They are found at Byblos, in the Néolithique Ancien (J.Cauvin 1968) and at Ghoraifé C they first appear in IB (M.C.Cauvin 1975) at about 6,700 BC. They continue throughout the PPNB into the early ceramic Neolithic, for example in the upper levels of Abu Hureyra (Moore 1978).

Points of Amuq type but with varying thicknesses have a wide distribution corresponding to the later PPNB expansion into the deserts. They are extremely common on sites in Sinai and the Negev - Wadi Tbeik and Urjat el-Mehed (Bar Yosef 1981c), Nahal Issaron (Goring Morris & Gopher 1983) - and are found on contemporary sites in southern Jordan in moderate but significant numbers at Beidha (Mortensen 1970) and other sites in the Petra region (Gebel n.d.), and in high proportions at 'Ain Abu Nekheileh (Kirkbride 1978). They are also found on the sites in Wadi Fidan reported by Raikes (1980).

On the survey sites Type 5 is quite common, especially the oval form. Tanged examples are rare. Tanged points of this type seem in general to be rare. Although it is possible that they are included under the broad "Amuq point" description in the Sinai and Negev sites, it is only in Mortensen's exhaustive typology for Beidha that they are recognised as a specific type (Mortensen 1970: Type A16). Similar forms of the Amuq point also occur occasionally, for example at Tell Aswad (M.C. Cauvin 1974c: Fig.3,1).

6) This is a fairly short tanged point formed by fine bifacial

pressure flaking. It is a late type, belonging to the element of small bifacial points characteristic of transitional PPN/PN and especially PN sites (see for example Burian & Friedman n.d.). They correspond broadly to the Nizzanim point in Bar Yosef's interpretation of Burian and Friedman's types (Bar Yosef 1981b:561). They are found also in Layer B at Nahal Issaron (Goring Morris & Gopher 1983) as well as on settlement sites in Syria and Palestine, for example Sha'ar ha-Golan (Stekelis 1950: Fig.6,3) and Jericho (Crowfoot Payne 1983:707, 708,Fig 333).

7) The seventh type is a short leaf-shaped point formed by fine pressure flaking. Examples can be either unifacially or bifacially worked. There are two subtypes, an oval form where the proximal and distal points are aligned along the main axis of the tool and a twisted form where the points are alternately offset. It is also a late form, of the Herzeliya type (Bar Yosef 1981b:561), normally contemporary with points comparable to Type 6. Points of this type also occur in Layer B at Nahal Issaron (Goring Morris and Gopher 1983), Kvish Harif (Rosen 1984) and in Syria/Palestine.

8) This is a small pressure flaked point with a short, very thin tang. Examples can be either unifacially or bifacially worked. The latter is more common. These arrowheads are usually associated with "burin sites" (Fig.5.35,1-3) although 2 were found at Dhuweila, 1 in the soundings and 1 on the surface. One was found in the surface collection from the "burin site" of Jilat 23. There are no close parallels for this type although it

also falls into the general class of Late Neolithic points. The fine tang is similar to Haparsa points (Burian & Friedman n.d.:Pl.P; Bar Yosef 1981b:560) of which some were found in Layer B at Nahal Issaron (Goring Morris & Gopher 1983) but the examples from the survey sites lack the pronounced wings of the typical Haparsa pieces. They are also similar to the Nizzanim points from Kvish Harif (Rosen 1984).

9) This is a transverse arrowhead, made from a blade segment retouched into a triangular or slightly splayed shape. The transverse arrowhead is definitely a late type, normally associated with Late Neolithic and early Chalcolithic sites (Bar Yosef 1981b:561). There are a few examples from Nahal Issaron, Layer B and a large collection from Kvish Harif (Rosen 1984). They also occur in the Néolithique Récent of Byblos (J.Cauvin 1968:127) and at Arjoune near Homs (Copeland pers comm.).

10) Number 10 is the "broken" category. Any pieces which are identifiable as belonging to the "arrowhead" class but cannot be placed under a specific type have been included here. A number of these are broken tangs which could of course conceivably belong to the burin class (see discussion of tanged burins under "burins" below).

burins:

Burins have been divided into six basic classes: dihedral, truncation, break, multiple, nucleiform and broken - that is unidentifiable as to class. A detailed analysis of the morphology of burins and their various classifications has been presented by Newcomer (1972) and his work has been used as a guide to the analysis of the collections discussed in the following chapter.

1) There are five subdivisions within the category of dihedral burins - axial dihedral burins, offset dihedral burins, either of the above with tangs and multiple dihedral burins. The question of tanged burins is one that has only recently been touched on (Moss 1983), but is particularly relevant in collections such as that at Dhuweila where arrowheads form a large percentage of the tool kit (see also J. Cauvin 1983:265). Without microwear analysis, it can be difficult to distinguish between tanged points with spall removals caused by impact fracture and the deliberate preparation of a burin on a tanged blade (see Bergman & Newcomer 1983).

The difficulty is compounded by the number of combinations possible, for example a tanged burin designED for use as a burin, a tanged point with the tip deliberately pointed by dihedral burin blows, a broken point, a broken point used without further modification as a burin, a broken point re-sharpened by burin blows for re-use as a point or a broken point re-sharpened for use as a burin. Moss (1983) has shown in her study of tools from Abu Hureyra that some pieces were used as projectiles and then as burins. She also demonstrated that subjective macro-identification of impact fracture is unreliable. However as systematic wear analysis has not yet been undertaken on the Dhuweila tools, it has been necessary to make typological divisions based, inevitably, on subjective judgements. It is unlikely however that this would greatly influence the relative proportions of each tool type.

2) Truncation burins are relatively uncommon in the PPNB assemblages but are a major feature of the later Neolithic in the desert. There are 7 subtypes, burin on transverse truncation, burin on oblique truncation, burin on concave truncation , any of these with tangs and multiple truncation burins. The concave truncation burin, in both simple and multiple forms, is a highly diagnostic type fossil of the later Neolithic "burin sites" (see Chapter 5). Because of its importance and its very distinctive nature, the term "Mejalla Burin" is proposed in order to distinguish this particular tool in the literature.

3) Burins on a break are one of the most common burin types although the numbers may be slightly exaggerated through the problem of identifying spalling caused by impact fracture on projectiles (see burin type 1 above).

4) Multiple mixed burins are relatively rare on desert Neolithic sites.

5) Burins <u>nucléiform</u> are rare.

6) This is the "broken" category which includes all pieces which cannot be classed in any of the above categories because the part of the tool with the spall removal surface has been broken off, leaving only a truncated spall removal scar. It does not include intentionally resharpened burins which may also have a truncated

scar but it may, as with types 1-3 above, include some impact fractured projectiles.

sickles:

Sickles are rare on the desert Neolithic sites, presumably because of the relative unimportance of cereal harvesting in the economy of the mobile steppe dwellers of this period. In classifying sickles the presence of silica gloss takes precedence over the morphology of a piece, so that any artefact with even the slightest traces of polish will be classified in this group. Two types are recognised, a simple unmodified blade and a retouched blade, either backed, truncated or denticulated, or with any combination of the same.

1) This simple unmodified form is the type usually encountered on survey sites. Pieces with some irregular working are also included in this group.

2) Prepared sickle blades are very rare.

scrapers:

Scrapers are uncommon in the PPNB of the desert. They occur slightly more frequently on later Neolithic sites however.

1) Various types of tabular or cortical scrapers are common in Chalcolithic and Early Bronze Age industries in Palestine and Syria but rarer in the earlier periods. Their appearance in the desert industries is probably related to the use of local tabular cherts. They are mostly associated with the "burin site" assemblages, are typically oval or irregular in shape, rarely

have faceted platforms, and are usually on quite thick irregular chunks of tabular flint.

2) Flake scrapers are also mainly associated with later Neolithic assemblages. They are mostly very crude, with rough uneven working on irregular flakes.

3) Side scrapers occur occasionally but rarely.

4) Denticulated scrapers are rare.

5) Endscrapers are also uncommon but occur occasionally.

bifacial tools:

1) The three types of bifacial pieces included in the typology occur mostly on the later Neolithic sites (see chapter 5).

1) "Tile knives" are bifacially worked thin slabs of tabular flint. Their precise form varies with the raw material but they are often elongated with retouch along both edges. They occur regularly in small numbers in the assemblages of "burin sites" and seem to be somewhat more common on the Jilat sites of this period (see for example Waechter 1947).

2) Leaf-shaped bifacial pieces present a problem of typology which like the tanged burins, might be resolved by microwear analysis. Like the tile knives, they occur most commonly in the later Neolithic of the desert and only occasionally among PPNB collections. They are usually elongated pieces on thin tabular flint, covered over much of their surface with irregular invasive retouch and pointed at both ends. They are very rarely pressure

flaked, but it is impossible to be certain whether they functioned as projectiles, knives, both or even something quite different. Bordes mentioned this problem in his seminal typology (Bordes 1961:41) where he suggests that the term "pièce foliacée" is preferable to "pointe foliacée" because not all pieces of this type are points. The evidence for their use as projectiles is described later in this chapter. Crowfoot Payne in her discussion of the PNA industry at Jericho includes them in the broad category of bifacially flaked knives, together with tile knives (Crowfoot Payne 1983:710,711 Fig.338 No.5) (see also Noy 1975:69;Fig.58,No.4). Similar bifacial pieces have also been found at Kilwa but their context in relation to other tools is uncertain (Rhotert 1938:106,111).

3) This type is rare and no complete specimens have been found. They are oval in cross-section and form an elongated rod-like tool, shaped by irregular invasive retouch. Parallels for these occasionally occur in the PN of Palestine (see Noy 1975:Fig 58,Nos.5,7), and have also been found at Kilwa (Rhotert 1938:112).

4) Group 4 is the broken category. Fragments of bifacial tools which cannot be classified into types 1-3 have been placed in this group.

borers:

1) Borers on flakes or blades are uncommon in the Neolithic desert industries and tend to be atypical.

2) Drill bits on spalls are characteristic of the "burin sites" (see Chapter 5) although they are found very occasionally on PPNB sites. Some were found in the soundings at Jilat 7 (Garrard et al. in press) and 2 were recovered at Dhuweila, one on the surface and 1 in the soundings.

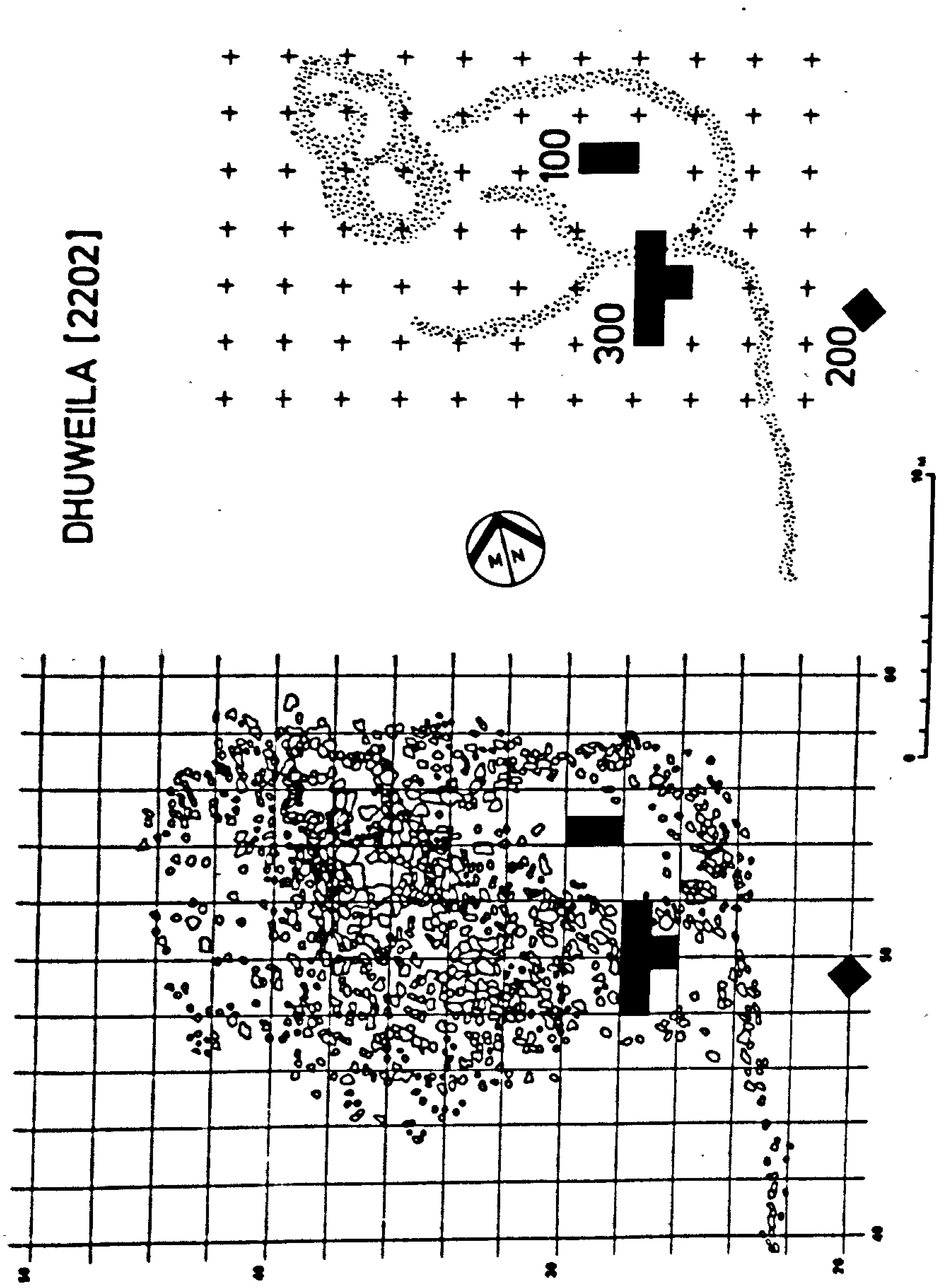


Fig. 4.4 2202: site plan

2202 Dhuweila

Dhuweila lies on a slight rise just east of Qa'a Dhuweila, the large mudflat which gives the site its name. Its visible remains are an elongated cluster of jumbled rocks about 240 square metres in extent with a collapsed cairn at the western end. The ground around the site is thickly strewn with fragments of flints including many broken arrowheads. An irregular enclosure can be distinguished at the eastern end of the site and from this a wall trails off southwards. Three soundings were made, one (100) inside the enclosure, one (300) across the enclosure wall and one (200) a few metres east of the enclosure to test the extent of the site. One third of all excavated soil was sieved through 3mm mesh and a total surface collection was made in 4 m^2 batches from the whole site and the area immediately around it.

Square 200, 1 m^2, proved to be beyond the main occupation area. It contained only sandy gravel with a few flints and no traces of ash or other occupational debris. Trench 100, a sounding of 2 m^2 proved quite rich with nearly a metre of dark ashy occupation deposit containing bone and flint interspersed with small stones and rocks. No structures could be distinguished but at the very bottom, cut into sterile soil, was a stone-lined fire pit or hearth.

Square 300, 5 m^2 in extent, provided evidence for four phases of construction, three of them relating to the Neolithic

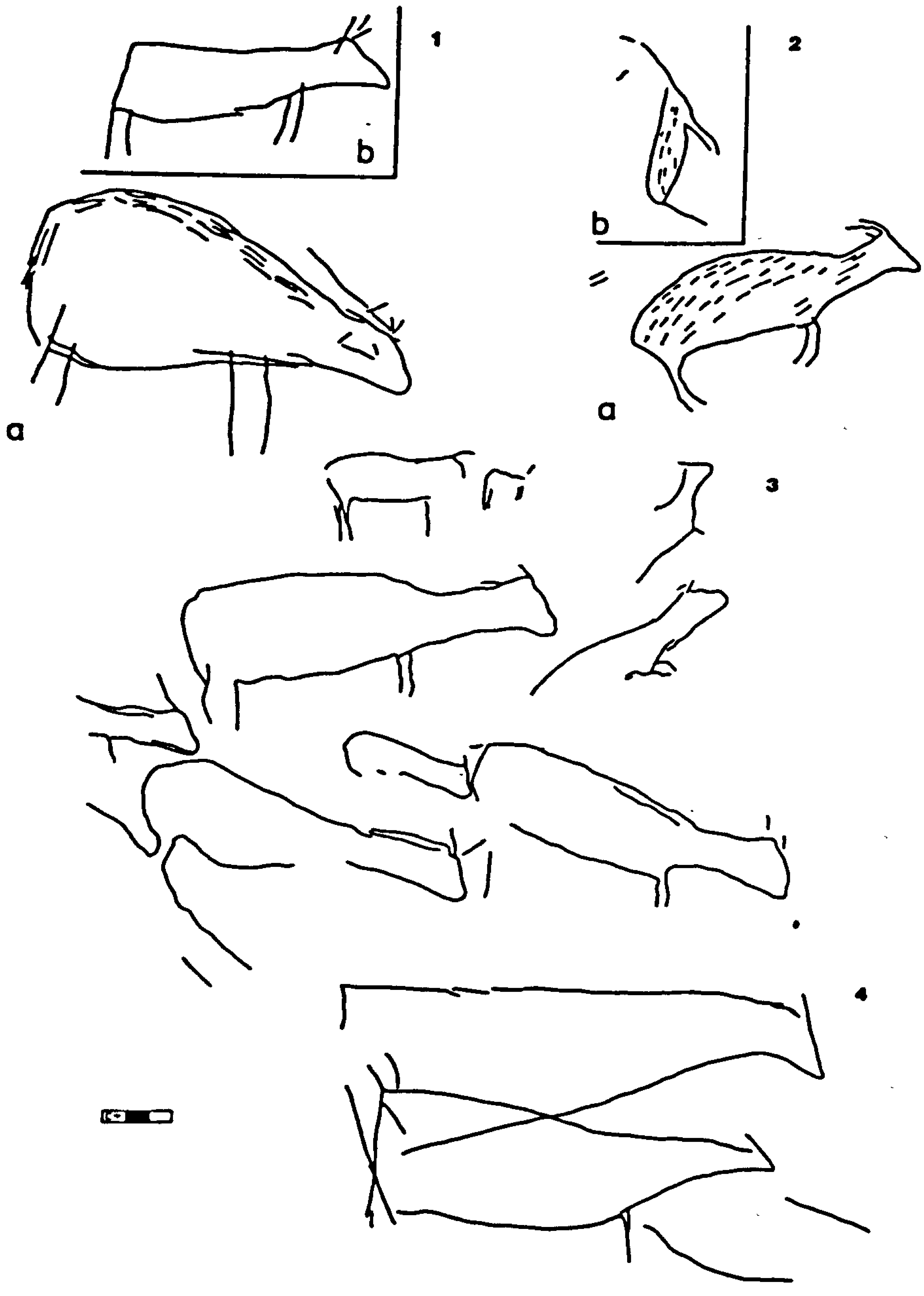


Fig. 4.5 2202: rock carvings

occupation at the site. Two further stone-lined hearths were found cut into sterile soil. These were sealed by 3-5 cm. of ashy occupation deposits on which rested a curving structure of basalt slabs, one group up-ended to form a low wall, the others laid flat against their bases. A jumble of rocks behind this feature may have been part of a more substantial wall of the same phase. These structures were covered by a thick layer of rich dark ashy soil with small stones, flint and bone and sealed by a rough pavement of flat basalt pebbles. A thin layer of ash and flint covered this pavement which gave way to sandy topsoil in which the surface enclosure wall was resting. Total depth of occupation deposit in this trench was over a metre. A C14 date of 8190±60 BP (BM-2349) (6240 BC) was obtained from one of the hearths at the base of the sounding.

Several carvings of horned animals were found engraved on the rocks around the surface of the site (Fig 4.5). The style of these engravings was quite inconsistant with that of the Safaitic carvings so commonly found in the area and the very dark patina suggested that they were more ancient. One such carving was found on the face of a flat rock in the stone pavement of Square 300 (Fig.4.5:1). When the stone was lifted a second fainter carving was found on the side, indicating it to be earlier than the pavement, itself stratified in Neolithic deposits. Another very faint carving was also found on one of the upright slabs of the curving wall below the platform. The soundings showed that the primary occupation of the site was during the late Pre-Pottery Neolithic B period (PPNB). The structures relating to the upper phases of this occupation had been disturbed and rebuilt at a later date, probably during the Safaitic period, to form the eastern enclosure and the cairn, the latter possibly intended as a grave. On the cairn were two flat kidney-shaped boulders, each with a series of deep parallel incisions a few centimetres in length forming a border around the edge of the rock. These may well have come from the Neolithic deposits. Engravings were also found on a number of pieces of flint cortex from the soundings. These formed deliberate patterns but all were broken and no complete design could be discerned (Fig.4.17:2,3,4). Some worked basalt pebbles were the only other small finds. Slight differences in the tool types from the surface collections, especially the arrowheads, also suggest a phantom phase in the Late Neolithic, represented now only by a deflated flint scatter.

An analysis of the faunal remains from the site (Garrard 1985) showed that the one hundred and two identifiable bone/tooth fragments recovered from the soundings were all gazelle (Gazella sp.), a result which shows remarkable specialization given the range of animals that might have been hunted.

	debitage	tools	total
cores	28	0	28
core elements	40	6	46
primary flakes	27	0	27
flakes	269	30	299
blades	390	137	527
spalls	39	2	41
chunks	77	6	83
chips	1323	7	1330
total	2193	188	2381

Fig.4.6 2202: absolute proportions of excavated debitage groups

A total of 2381 chipped stone artefacts was recovered from the soundings and 363 tools from the surface collections (Fig.4.6,4.10). Surface debitage and waste has not been included in the analysis. Of the artefacts from the soundings, 188 were retouched tools, 91 were cores or core preparation and trimming elements, 659 were blanks, 39 were burin spalls and the rest were waste pieces.

Platform types	flake	blade
plain	25	2
dihedral	7	1
multiple facet	15	2
punctate	48	69
absent	5	26

Directionality	blade
unidirectional	25
bidirectional	68
indeterminate	7

Natural backing	flake	blade
present	23	28
absent	77	72

Cortex% (cp: cortical platform)	flake	blade
0	58	68
0+cp	7	2
1-10	19	27
1-10+cp	5	1
10-50	4	2
10-50+cp	5	0
50-90	1	0
50-90+cp	1	0
100	0	0
100+cp	0	0

Fig.4.7 2202:analyis of 100 flakes and 100 blades semi-randomly selected from excavated batches (based on Rollefson & Abu Ghaneima 1983)

Among the collections from the soundings were a total of 28 cores, almost all heavily reduced or exhausted. Most of these were bipolar blade cores, some with flat backs and some with "naviform" preparation. Occasionally exhausted blade cores have been reused as irregular flake cores and on some very reduced bipolar cores, the latest blade removal has been concentrated on one end. The cores are mostly made on blocks of tabular flint with cortex remaining on one or both sides. This method of core manufacture probably accounts for the relatively high incidence of natural backing on blanks (Fig.4.7). Some roughouts and partially prepared cores were also found (Fig.4.12:1) and there was evidence that knapping was carried out on site. There is no source of flint in the immediate vicinity. The raw material used is a medium grained grey tabular chert typical of the limestone desert surrounding the basalt and was probably brought in from a source at least twenty kilometres away.

Comparative figures for natural backing from 'Ain Ghazal where different types of raw material are used are much lower (Rollefson & Ghaneima 1983). Only 7.4% of the blades analysed had natural backing. Contrastingly however, the overall percentage of cortex on sampled pieces is higher at 'Ain Ghazal. 22.7% of the flakes and 11.6% of the blades have 10-50% cortex while for Dhuweila figures are much lower - 4% of flakes and 2% of blades. The nature of the raw material at 'Ain Ghazal has not yet been fully determined (Rollefson & Ghaneima 1983) but it is possible that the difference between the two sets of figures might be explained by the use of nodular chert at 'Ain Ghazal. A chunk of tabular chert as used by the Dhuweila knappers only has cortex on two sides; all the rest of the block is exposed chert. Working a core from a cortex-covered nodule would in the initial stages produce a far higher proportion of cortical blanks than would one made on tabular chert.

Rollefson and Ghaneima also note that among the 'Ain Ghazal blades there is a high proportion of pieces exhibiting unidirectionality in respect to blade production and suggest that this is due, at least in part, to the use of single platform cores as well as the bipolar types. The Dhuweila figures in contrast show a marked preference for the use of bipolar cores, as evidenced also by the cores recovered.

The Dhuweila industry is heavily blade based; 73% of all tools are made on blades. The blanks are typically pointed with punctiform butts and the bidirectional scars of earlier removals are visible on the surface. Most of the unretouched flakes are probably byproducts of the core preparation process rather then intentionally formed blanks. They usually have either plain or punctate butts and more commonly have cortex on their surfaces than do the blades. Core tablets and crested blades are normal byproducts of the preparation and rejuvenation of bipolar blade cores and occur in sufficient numbers to reinforce the evidence for on-site core preparation and knapping.

The tools recovered from the site represent a variant of the later Pre-Pottery Neolithic B with high proportions of arrowheads and burins, some scrapers, borers and bifacial pieces and very few sickle blades.

mm	FW	BW	BT	CL
0-5	0	0	98	0
6-10	0	20	47	0
11-15	2	72	1	0
16-20	26	42	0	0
21-25	41	11	0	2
26-30	18	1	0	2
31-35	15	0	0	4
36-40	12	0	0	3
41-45	4	0	0	4
46-50	0	0	0	3
51-55	1	0	0	3
56-60	0	0	0	2
61-65	0	0	0	3
(98)				(1)
(114)				(1)
total	132	146	146	28
average	25.36	14.41	4.96	47.96

FW flake width
BW blade width
BT blade thickness
CL core (maximum dimension)

Fig.4.8 2202: absolute and average dimensions of excavated cores and blanks (based on semi-randomly selected sample of blanks)

mm	BW	BT	AW	AT
0-5	0	21	0	38
6-10	7	36	8	7
11-15	23	11	27	2
16-20	26	0	9	0
21-25	11	0	3	0
26-30	0	0	0	0
31-35	1	0	0	0
total	68	68	47	47
average	16.37	7.1	12.82	4.87

BW burin width
BT burin thickness
AW arrow width
AT arrow thickness

Fig.4.9 2202:absolute and average dimensions of excavated arrows and burins

	surface	excavated	total
arrows	157	61	218
burins	72	68	140
sickles	1	1	2
scrapers	18	1	19
bifacials	19	5	24
borers	2	5	7
other	0	0	0
retouch	94	47	141
	363	188	551

Fig.4.10 2202:absolute proportions of major tool groups

Tools.

arrows:

1) No notched arrowheads were found among the Dhuweila collections although they are found on other Neolithic sites in the desert, notably Jilat 7 (Garrard et al.in press).

2) Arrowheads of this type are not very common in the Dhuweila assemblage. Only 10 have been found, 6 from the surface and 4 from the soundings.

3) This form is one of the most common types of point in the Dhuweila assemblage, numbering 24% of all arrowheads and 9% of all tools. Of these, subtype (i) is strongly represented both in the surface collections and in the tools from the soundings. Subtypes (ii) and (iii) are rare. M.C.Cauvin has pointed out that it is interesting to note the lack of variety in this category of arrowheads, given the wide range of Byblos points found on sites elsewhere in Syria and Palestine (M.C. Cauvin pers. comm.).

4) Only 3 points of this type were found at Dhuweila, 2 on the surface and 1 in the soundings.

5) This is the most common arrowhead type at Dhuweila where it accounts for 27% of all arrowheads and 11% of all tools. The oval form is by far the commonest; only a few tanged examples were recovered.

6) This is a rare type at Dhuweila; 3 were found in the soundings and 5 on the surface.

7) 3 arrowheads of this type were found in the soundings at Dhuweila and 12 on the surface.

8) 2 arrowheads of Type 8 were found at Dhuweila, 1 in the soundings and 1 on the surface.

9) 2 transverse arrowheads were found at Dhuweila, both on the surface.

burins:

1) Dihedral burins are quite common in the Dhuweila assemblage, forming 23% of all the burins and 6% of all tools. There is however a discrepancy between the surface and excavated collections. 23 out of the 72 burins found on the surface are of this class while only 10 out of 68 burins in the excavated material are dihedral. Of the 10 burins in this class from the soundings, 1 was an axial dihedral burin on a tanged blade, 3 were ordinary axial dihedral burins, 2 offset dihedral and 3 multiple dihedral burins. The surface collections contained roughly equal proportions of axial and offset examples.

2) Truncation burins are relatively uncommon in the Dhuweila assemblage. Of the 9 burins from the soundings, 3 were on oblique truncations, 4 on concave truncations, one was a tanged oblique truncation burin and one a multiple truncation burin. The surface collections contained 5 concave truncation burins, 3 oblique truncation burins and one transverse truncation burin.

3) Burins on a break are the most common burin type in the

Dhuweila assemblage, although the numbers may be slightly exaggerated through the problem of identifying spalling caused by impact fracture on projectiles . They represent 44% of all the burins in the assemblage and 11% of all tools. Proportions are comparable for surface and excavated material. No tanged burins have been identified in this category for the Dhuweila assemblage.

4) 12 multiple mixed burins were found at Dhuweila, 10 of them in excavated contexts.

5) Burins nucléiform are rare. Only 3 were found, 2 of them on the surface.

6) 13 pieces from the Dhuweila collections were placed in the "broken" class.

sickles:

1) Sickles are extremely rare at Dhuweila. Only two pieces with silica gloss have been found, one on the surface and one from the soundings. Both are on very lightly retouched blades.

2) No truncated or denticulated sickles were found at Dhuweila.

scrapers:

Scrapers are uncommon in the Dhuweila assemblage. 19 were found in all, only 1 of them, a tabular scraper, in the soundings.

1) 7 tabular scrapers were found on the surface of the site and one in an excavated context.

2) 7 scrapers on flakes were found on the surface of the site.

3) 2 side scrapers were found on the surface of the site.

4) No denticulated scrapers were found at Dhuweila.

5) 2 single endscrapers were found among the surface collections.

bifacial tools:

1) 4 tile knife fragments were found in the soundings and 11 on the surface of the site. A close parallel for one of the Dhuweila pieces from the soundings (Fig.4.16:1) can be found in Crowfoot-Paynes report on the PNA levels at Jericho (Crowfoot Payne 1983: 711, Fig.338 No.6, and see also Stekelis 1950:Fig.5,15).

2) 7 leaf-shaped bifacial pieces were found on the surface at Dhuweila and 1 in the soundings.

3) 1 example of this type of bifacial piece was found on the surface of the site at Dhuweila.

4) There are no pieces from Dhuweila which fall into the broken category.

borers:

1) 5 borers of this type were found at Dhuweila, 4 in the soundings and 1 on the surface.

2) 2 drill bits on spalls were recovered at Dhuweila, 1 one the surface and 1 in the soundings.

S: surface
E: excavated

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	6	31	2	44	5	12	1	2	(54)	157
E	0	4	20	1	15	3	3	1	0	(14)	61
total	0	10	52	3	59	8	15	2	2	(68)	218

Burins

type	1	2	3	4	5	(6)	total
S	23	9	32	2	2	(4)	72
E	10	9	29	10	1	(9)	68
total	33	18	61	12	3	(13)	140

Sickles

type	1	2	total
S	1	0	1
E	1	0	1
total	2	0	2

Scrapers

type	1	2	3	4	5	total
S	7	7	2	0	2	18
E	1	0	0	0	0	1
total	8	7	2	0	2	19

Bifacials

type	1	2	3	(4)	total
S	11	7	1	(0)	19
E	4	1	0	(0)	5
total	15	8	1	(0)	24

Borers

type	1	2	total
S	1	1	2
E	4	1	5
total	5	2	7

Fig.4.11 2202:absolute proportions of tool groups

Fig: 4.12 2202

1   partially prepared core
2-4 bipolar blade cores

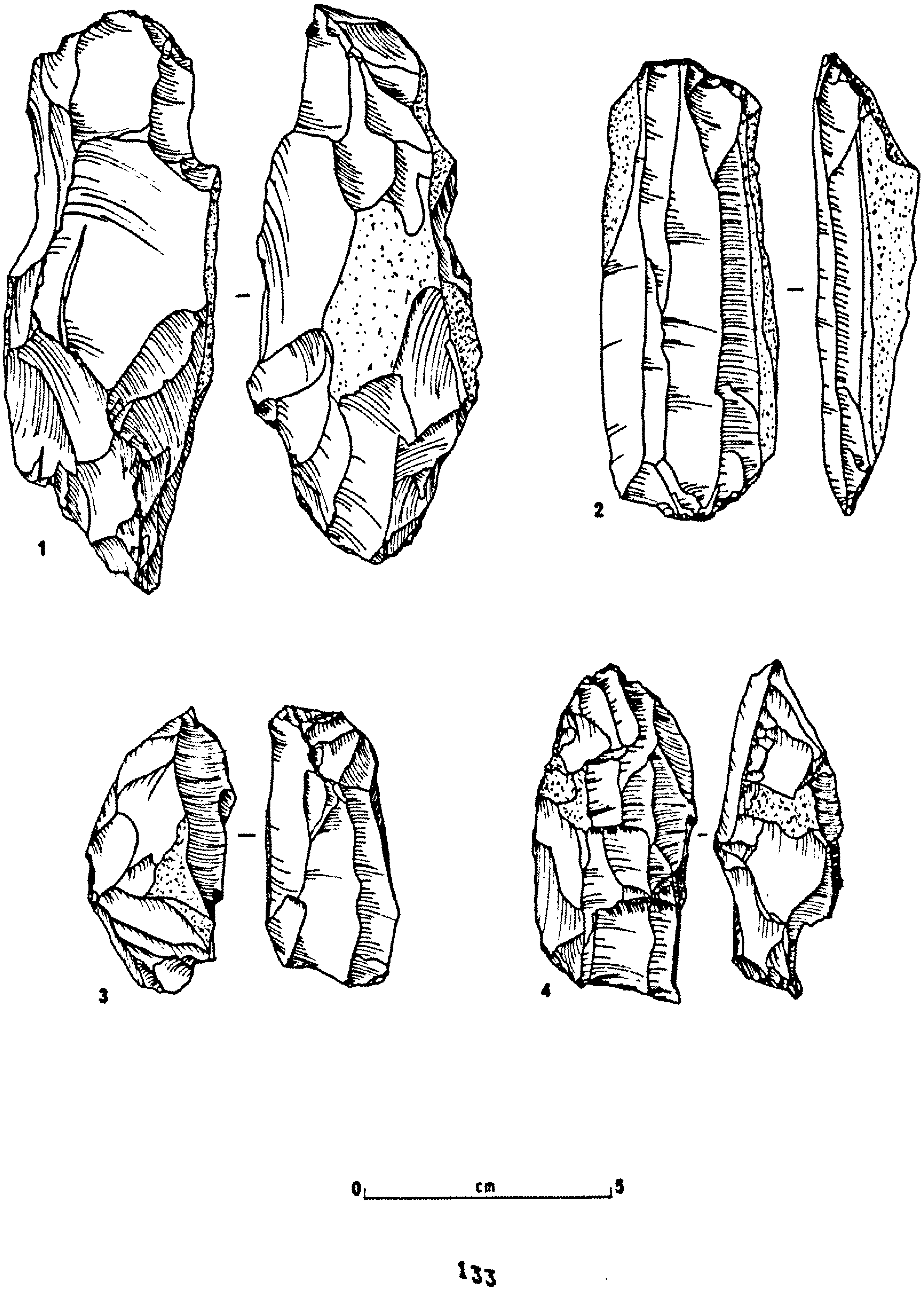

1
2
3
4
0
cm
5

Fig: 4.13 2202

1	arrowhead 2i
2-3	arrowhead 2ii
4-7	arrowhead 3i
8	arrowhead 3iii
9	arrowhead 4
10	arrowhead 5i
11-12	arrowhead 5ii

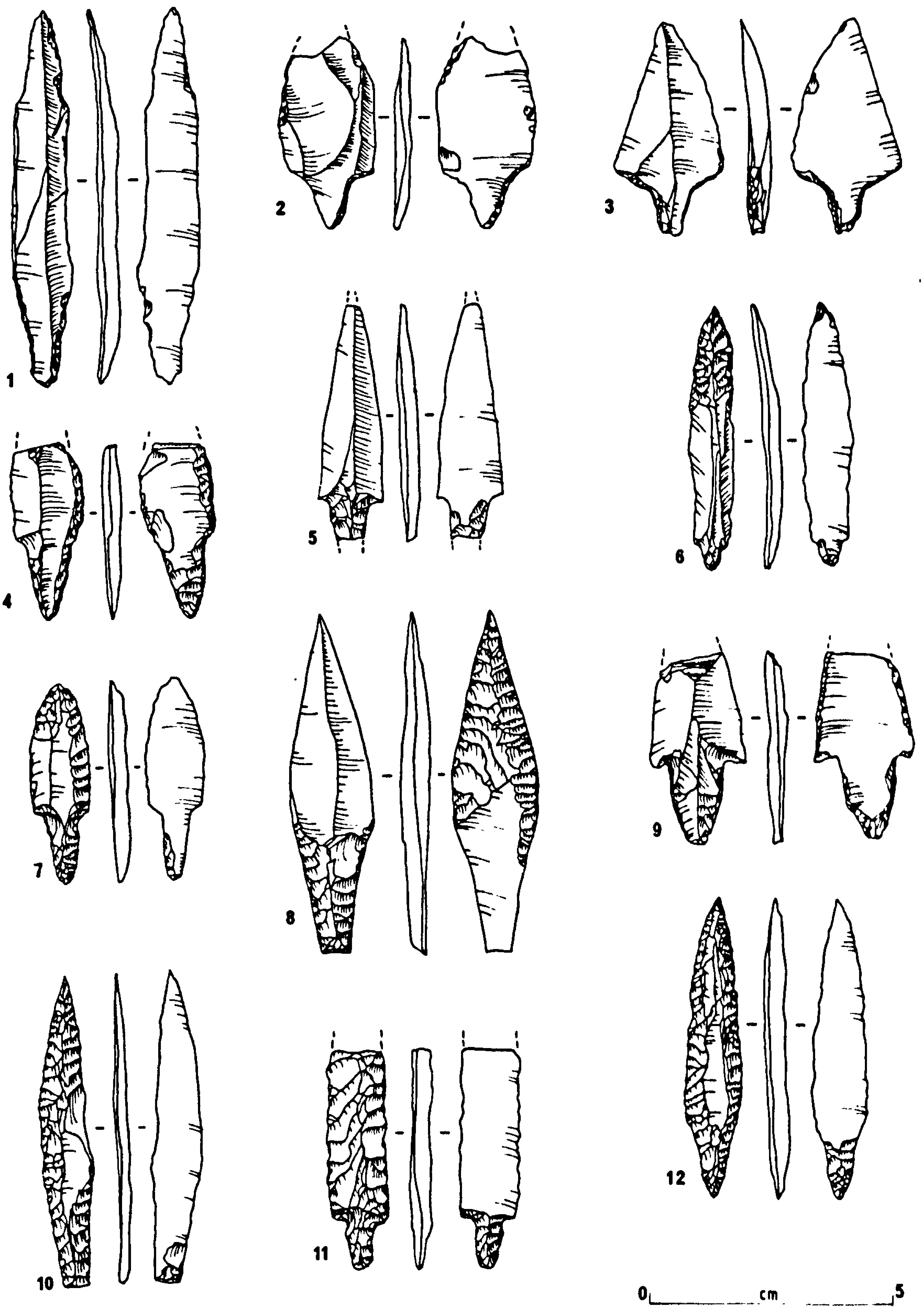

1
2
3
4
5
6
7
8
9
10
11
12
0 cm 5

Fig: 4.14 2202

1-3 arrowhead 6
4-5 arrowhead 7i
6,7,11 ~~6-8~~ arrowhead 7ii
8 ~~9~~ arrowhead 8
9,10 ~~10,11~~ arrowhead 9
12 burin iii
13-14 burin 5
15 burin iiii
16 burin 4

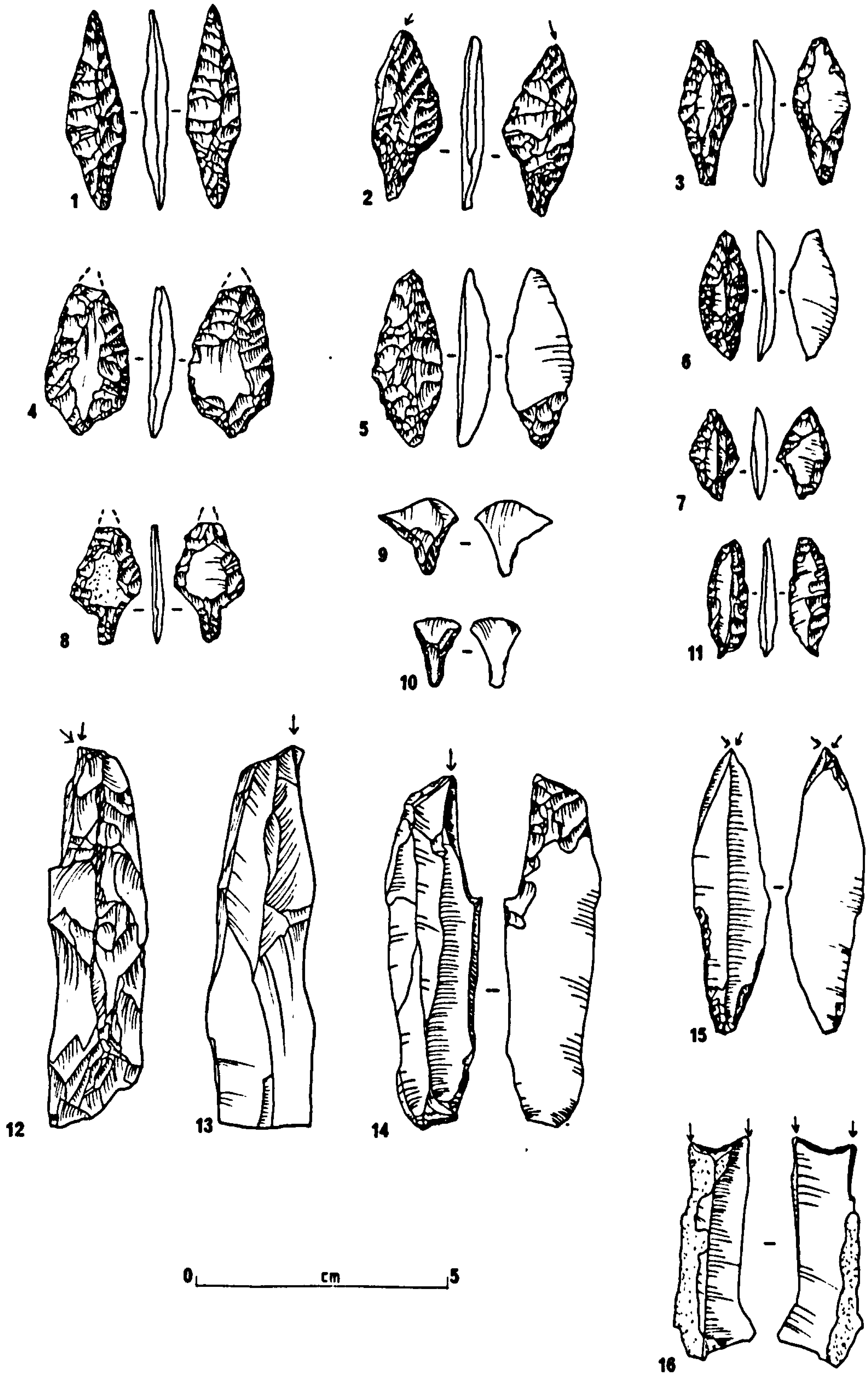

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
0 cm 5

Fig: 4.15 2202

1	burin iii
2	burin 7
3	burin 5i
4	burin 6
5	burin 3v
6-7	burin 6
8	scraper 1
9-10	borer 1
11	sickle 1
12	scraper 5i

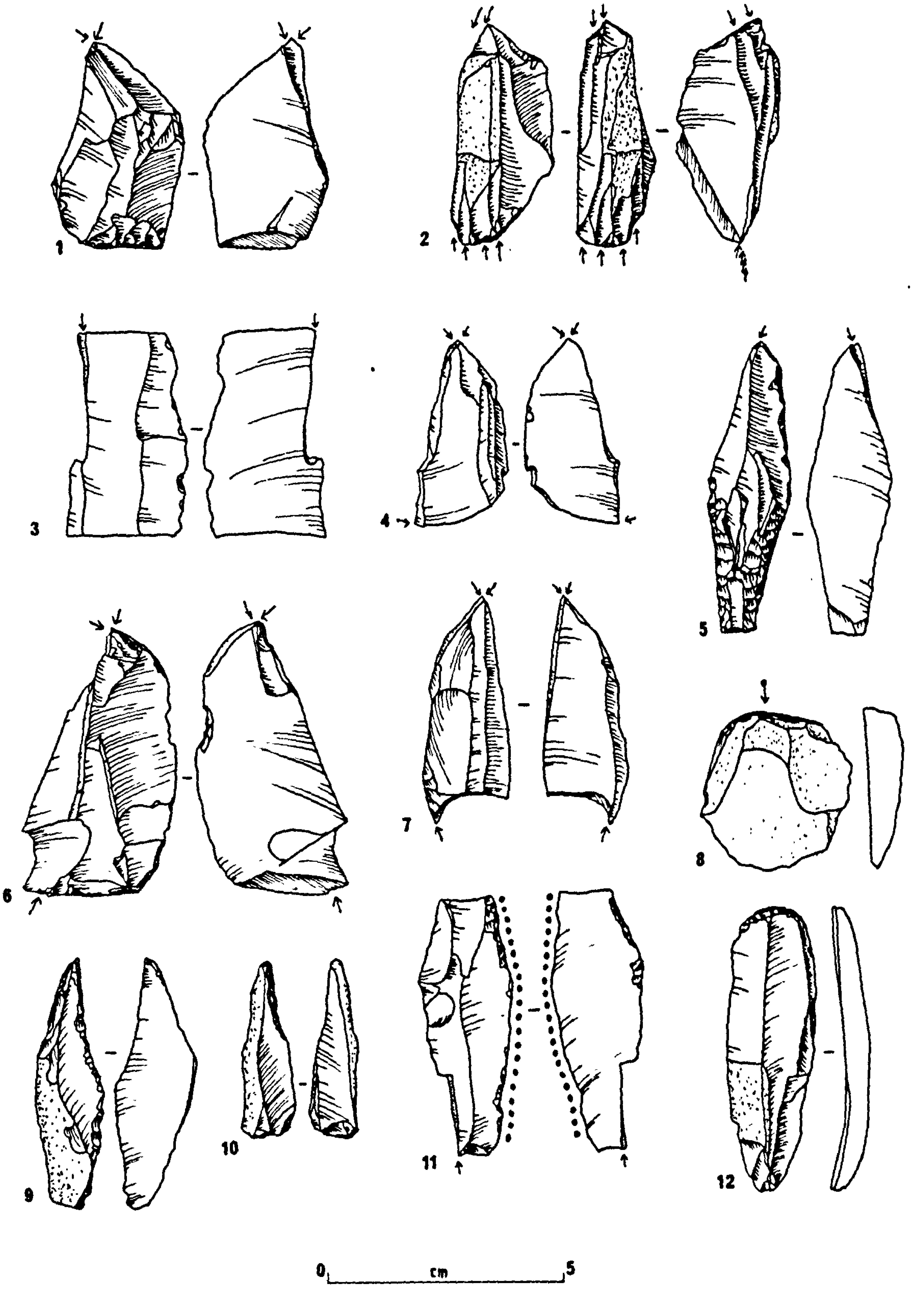
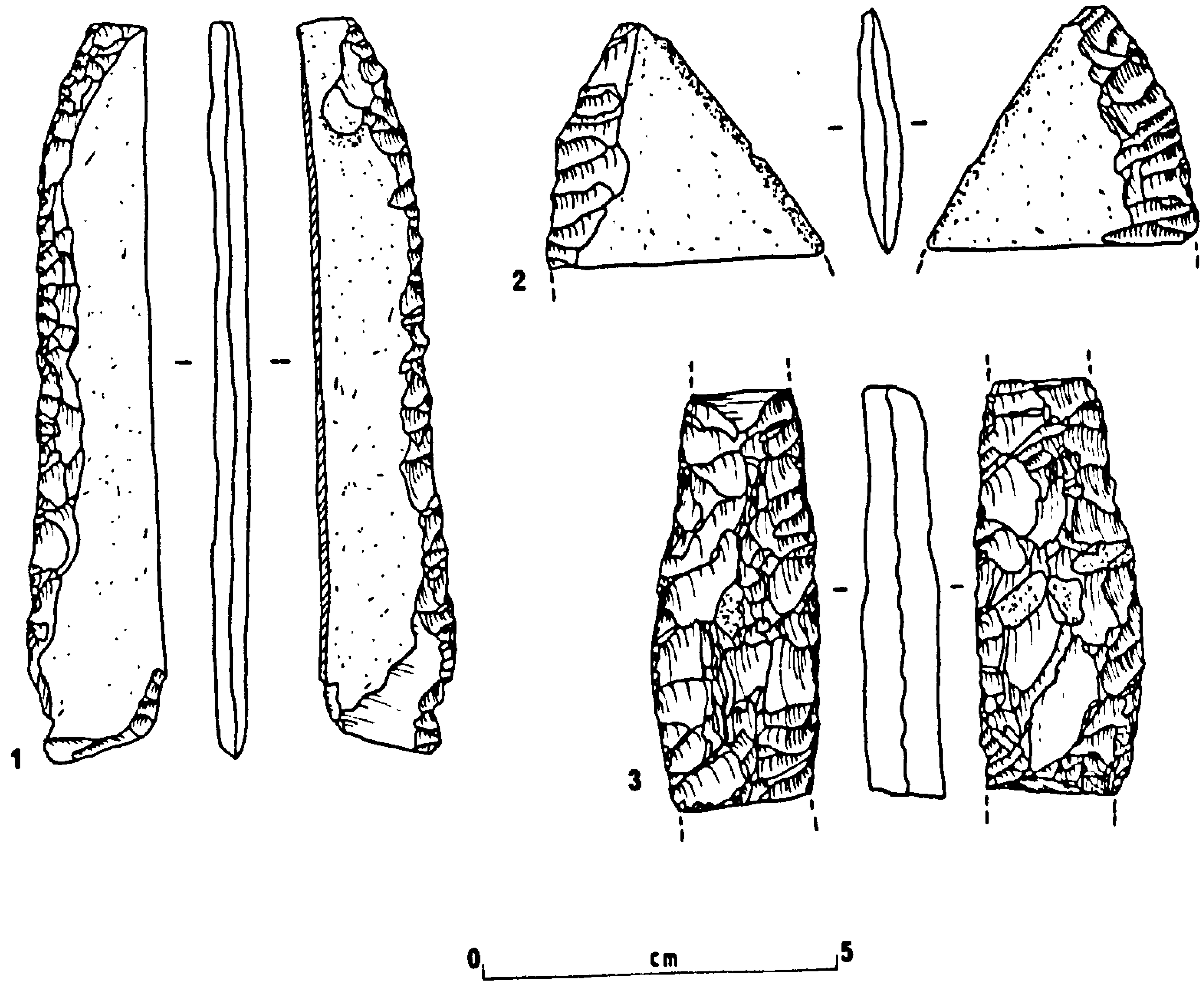

1
2
3
4
5
6
7
8
9
10
11
12
0 cm 5

Fig: 4.16 2202

1-2	biface 1
2	biface 1
3	biface 3


1
2
3
0
cm
5

Dhuweila belongs to the floruit of sites in the deserts in later Aceramic Neolithic times demonstrated elsewhere by sites such as those in Wadi Jilat (Garrard et al.1985, in press), at Kilwa, (Rhotert 1938), in southern Jordan (Kirkbride 1966,1978), in the Negev (Servello 1976;Goring Morris & Gopher 1983), in Sinai (Bar-Yosef 1981c; Bar-Yosef & Phillips 1977) and in central Syria (Hanihara & Akazawa 1979; CNRS 1982).

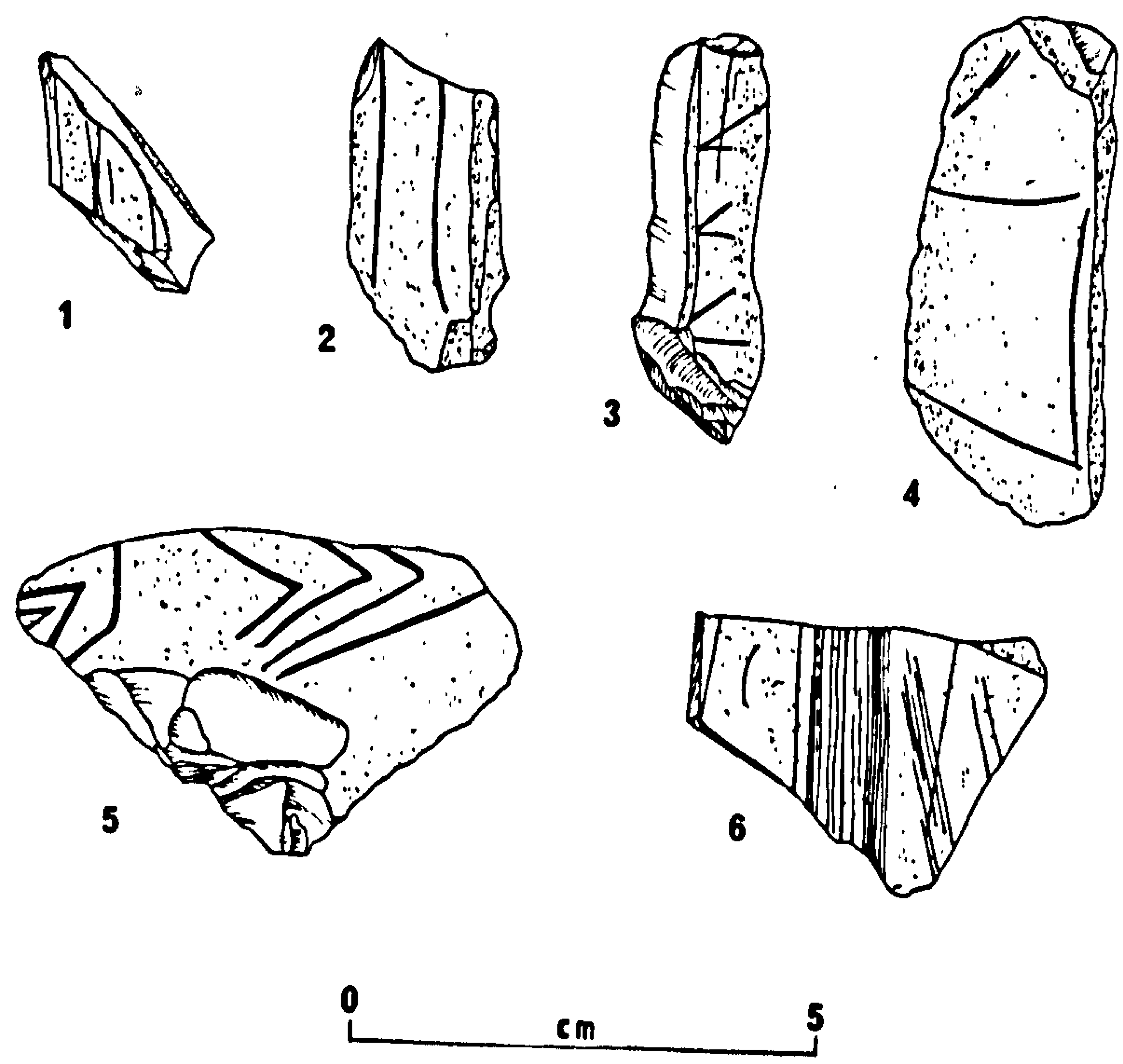
One of several interesting aspects about the site is the possibility of a phantom deflated phase of later Neolithic occupation suggested by the presence of Late Neolithic arrowhead types among the surface collections and in the upper levels of the soundings. Only further excavation (in progress) can fully clarify this point as the disturbed nature of the upper levels did not permit identification of two separate phases in the limited area of the soundings. However this phantom phase has a more clearly defined parallel at Nahal Issaron (Goring Morris & Gopher) where the main PPNB occupation levels, Layer C, are overlain by a thinner ashy layer,B, which the excavators tentatively date in the 5th millennium on the basis of its arrowheads; points of Nizzanim, Haparsa and Herzliya type.

Village sites of the PPNB are well known for their rich artistic element - animal figurines, anthropomorphic sculptures, plastered skulls and decorated walls and floors - but these aspects tend to be much less prominent on the desert sites, possibly not least because of the sporadic nature of their occupation. Dhuweila's rock carvings are therefore quite unusual, especially in that they are engraved on such an intractable medium as basalt, and yet no similar examples have been found on sites built in limestone areas. Their style too is unusual; only one other parallel has been found in the course of the survey, two horned animals engraved on a boulder forming the wall of a "kite" (animal trap) near Tuleilat el-Hisna in the very heart of the lava belt, at least fifty kilometres from Dhuweila. Incised flakes of cortex are slightly less unusual. Two pieces were found at Jilat 7 and one at Ibn el-Ghazzi (Fig.4.17). Crowfoot Payne also illustrates some from the PPNB levels at Jericho (Crowfoot Payne 1983:696,697 Fig.327).

Although preliminary botanical samples from Dhuweila unfortunately produced no useful data on plant exploitation, the faunal studies (Garrard 1985) give a very good indication of the economy of the site, which appears to have been based almost entirely on gazelle hunting. There is some evidence to suggest that the gazelle were slaughtered with the aid of hunting traps ("kites"). There are a great many of these traps in the basalt region and survey work on them has produced a number of broken arrowheads, mostly of type 5, and a set of leaf-shaped bifacial pieces, which suggest that at least some of the "kites" were in use at the time that Dhuweila was occupied. The fact that none of the other available species of game seem to have been hunted gives some strength to this hypothesis. The extremely low numbers of sickles and the absence of querns and grinders, together with lack of evidence for animal domesticates suggests also that the economy at the site was primarily based on hunting.

Fig. 4.17 PPNB sites: incised flint cortex

1 Jilat 7
2 Dhuweila 2202
3 Dhuweila 2202
4 Dhuweila 2202
5 Jilat 7
6 Ibn el-Ghazzi 3133


1
2
3
4
5
6
0
cm
5

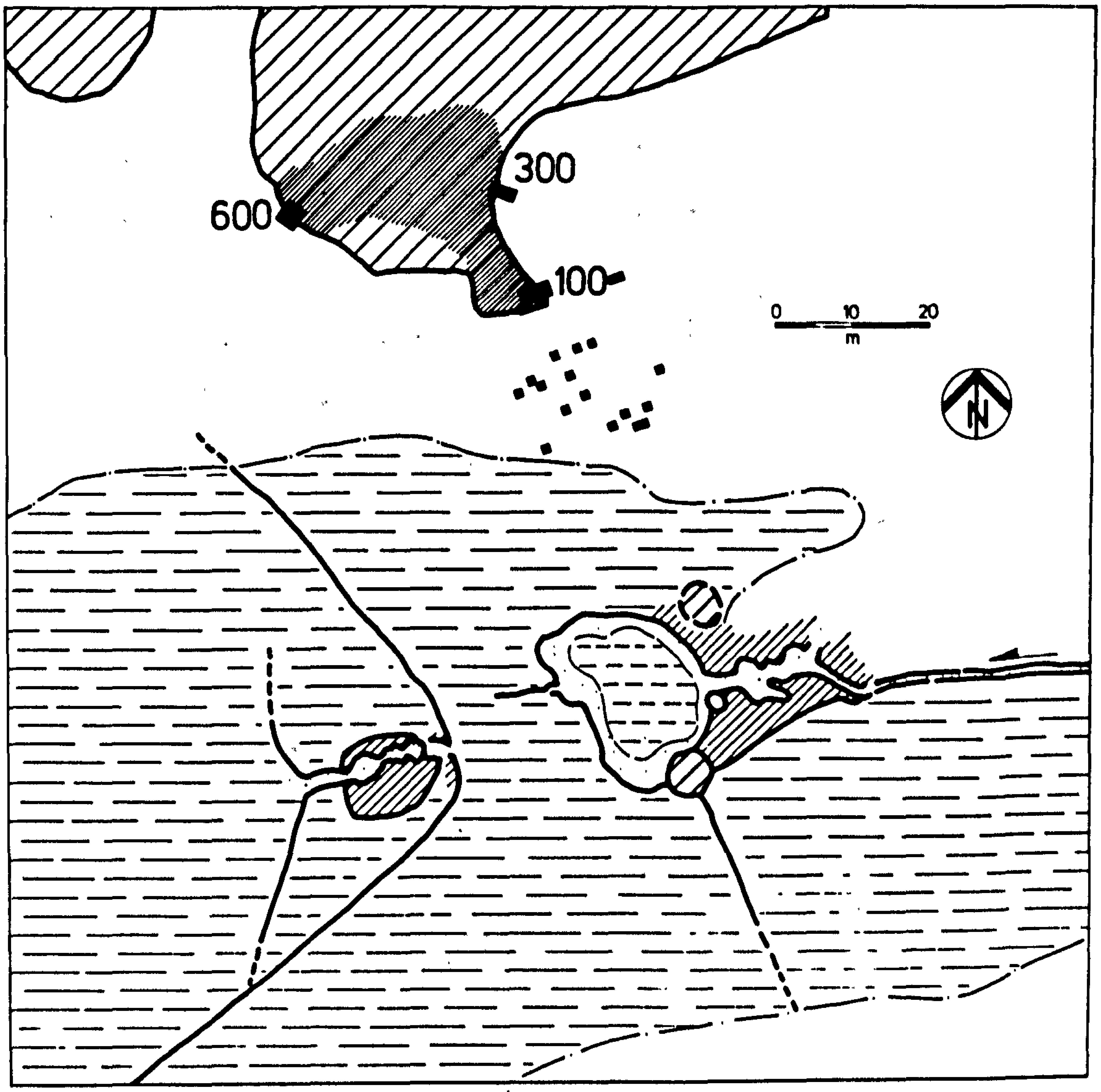


Fig. 4.18 3133: site plan

3133 Ibn el-Ghazzi

Ibn el-Ghazzi like Dhuweila is a PPNB site with later disturbance and re-use by beduin. It lies on an elevated plateau about ten kilometres east of Qattafi Wells and includes a number of separate groups of structures. The area with the greatest concentration of surface flints is on the north side of a shallow depression. In the centre of the depression a small mudflat has formed and has been adapted by the occupants of the site at some uncertain date to act as a reservoir. There are two rock-lined underground cisterns with roughly corbelled roofs to prevent evaporation, a pool and a system of shallow channels to guide water into the reservoirs. It is most likely that these reservoirs belong with the larger structures to the post-Neolithic occupation of the site. (Helms & Betts in prep).

Three soundings and three test pits were made at the site of which only two of the soundings revealed stratified Neolithic deposits. One third of all the soil recovered was sieved (3mm mesh). Controlled surface sampling was carried out over 20 randomly selected metre squares and the site was then purposively surveyed for retouched pieces. Square 300, 6 m^2 in extent, was cut against the massive wall of a later building. The Neolithic levels had possibly been disturbed by later activity as the trench was filled with an indecipherable jumble of rocks surrounded by rich dark ashy deposits with much flint and bone. Square 100, 8 m^2 in extent, was put down on more open ground across a corral wall south of 300. The wall proved to be post-Neolithic but under it lay several levels of sandy ash surrounding a thin curved wall of small stones. On one of these stones was a carving similar to those at Dhuweila. The Neolithic levels were shallow but produced much flint and bone and a few small finds. These included fragments of worked basalt, a piece of worked limestone and a flake of flint with an incised pattern on the cortex (see Fig.4.17). As with Dhuweila, no worked bone was found. Unfortunately insufficient charcoal was recovered to obtain a C14 date for the site.

Faunal remains from the site (Garrard 1985) indicate less specialization than at Dhuweila although gazelle (*Gazella sp.*) still very much predominates. The other finds included hare (*Lepus cf. capensis*) and sheep/goat (*Ovis/Capra sp.*).

	debitage	tools	total
cores	73	1	74
core elements	205	10	215
primary flakes	31	4	35
flakes	1155	83	1238
blades	545	383	928
spalls	112	11	123
pièces esquillées	9	0	9
chunks	156	19	175
chips	3207	5	3212
	5488	516	6004

Fig:4.19 3133:absolute proportions of excavated debitage groups

A total of 6004 chipped stone artefacts was recovered from the soundings and 442 tools from the surface collections. Surface debitage and waste has not been included in the analysis. Of the 6004 artefacts from the soundings, 516 were retouched tools, 313 were cores or core preparation and trimming elements, 1700 were blanks, 112 were burin spalls and the rest were waste pieces.

Platform types	flake	blade
plain	43	10
dihedral	5	3
multiple facet	10	2
punctate	36	49
absent	6	36

Directionality	blade
unidirectional	32
bidirectional	56
indeterminate	12

Natural backing	flake	blade
present	18	20
absent	82	80

Cortex% (cp: cortical platform)	flake	blade
0	60	72
0+cp	7	1
1-10	22	21
1-10+cp	2	4
10-50	6	2
10-50+cp	0	0
50-90	2	0
50-90+cp	0	0
100	1	0
100+cp	0	0

Fig.4.20 3133:analysis of 100 flakes and 100 blades semi-randomly selected from excavated batches (based on Rollefson & Abu Ghaneima 1983).

mm	FW	BW	BT	CL
0-5	0	0	115	0
6-10	3	32	65	0
11-15	10	83	5	0
16-20	36	54	3	0
21-25	82	13	0	2
26-30	74	2	0	0
31-35	61	0	0	9
36-40	47	2	0	13
41-45	15	0	0	9
46-50	9	0	0	11
51-55	11	0	0	7
56-60	6	0	0	10
61-65	4	0	0	5
66-70	1	0	0	4
71-75	0	0	0	2
76-80	0	0	0	1
total	359	186	188	73
average	30.43	14.86	6.02	48.04

FW flake width
BW blade width
BT blade thickness
CL core (maximum dimension)

Fig.4.21 3133:absolute and average dimensions of excavated cores and blanks (based on semi-randomly selected sample of blanks)

mm	BW	BT	AW	AT
0-5	0	35	0	63
6-10	13	43	19	10
11-15	37	22	43	2
16-20	32	0	12	0
21-25	17	0	2	0
26-30	1	0	0	0
31-35	0	0	0	0
total	100	100	75	75
average	15.43	7.35	12.97	3.93

BW burin width
BT burin thickness
AW arrow width
AT arrow thickness

Fig.4.22 3133:absolute and average dimensions of excavated arrows and burins

Technology at Ibn el-Ghazzi is very similar to that at Dhuweila. Raw material is more varied, possibly reflecting the greater variety of chert sources within quite close range of the site, although cores still tend to be heavily exploited. A good many of the blade cores found at the site were either more or less exhausted or reused for flake removal. The blade cores are predominantly bipolar with crested or flat backs, mostly rather roughly prepared. Both tabular and nodular cherts have been used, probably accounting for the slightly lower frequencies of natural backing on blanks and cortical platforms. There was evidence that some knapping took place on site and the core class included a few roughouts and partially prepared cores. Crested blades and a few core tablets were also found.

The Ibn el-Ghazzi assemblage is again very similar to that from Dhuweila. It includes high frequencies of arrowheads and burins with some scrapers and bifacial pieces and very few sickles.

	surface	excavated	total
arrows	172	153	325
burins	149	183	332
sickles	1	3	4
scrapers	9	6	15
bifacials	8	15	23
borers	4	8	12
other	3	3	6
retouch	86	145	231
	432	516	948

Fig.4.23 3133: absolute proportions of major tool groups

Tools

The tools from 3133 have been classified according to the typology described earlier in this chapter.

arrows:

1) 1 broken notched arrowhead was found in Square 300. It belongs to the second subtype and although broken and rather crude, can be paralleled by similar pieces at Jilat 7 (Garrard et al. 1986)(see also Site 2402 below).

2) Tanged points shaped by abrupt or semi-abrupt retouch constitute 12% of all arrowheads, in contrast with Dhuweila where they represent only 5% of the arrowhead class. Most of the 40 pieces in this group are of the second subtype, with a fairly pronounced tang.

3) This group, the Byblos Point type, is by far the most common arrowhead form. 27% of all the arrowheads fall into this group. As with Dhuweila, subtype (i) is most strongly represented, while subtypes (ii) and (iii) are comparatively rare.

4) Only one point of this type was found at Ibn el-Ghazzi. It came from an excavated context.

5) The fifth type of arrowhead is fairly common at Ibn el-Ghazzi, representing 10% of all arrowheads, but it does not occur in such large proportions as at Dhuweila where 27% of all arrowheads are of this type.

6) This later type is rare at Ibn el-Ghazzi. Only 6 were found, 3 on the surface and 3 in the soundings.

7) No examples of this type were found at Ibn el-Ghazzi.

8) No examples of this type were found at Ibn el-Ghazzi.

9) No examples of this type were found at Ibn el-Ghazzi.

10) 155 broken arrowheads were found, approximately half of them from the soundings.

burins:

1) Dihedral burins are quite common at Ibn el-Ghazzi. They represent 24% of all burins which compares closely with the equivalent figure of 23% at Dhuweila. Of the 38 pieces from the soundings, 1 was an axial dihedral burin on a tanged blade, 17 were axial dihedral burins on otherwise unmodified flakes or

blades, 11 were offset dihedral burins, also on otherwise unmodified blanks and 9 were multiple dihedral burins. The surface collection included 7 multiple dihedral burins, 16 axial dihedral burins and 15 offset dihedral burins.

2) Truncation burins represent only 10% of the burin class, a comparable figure to that of 13% at Dhuweila. Of the 34 examples recovered, 12 were burins on transverse truncations, 3 were on oblique truncations, one was a concave truncation burin on a tanged blade, 14 were concave truncation burins and 4 were multiple truncation burins.

3) Burins on a break are by far the most common type. Again the problem of distinguishing these pieces from points with impact fracture may have distorted the figures somewhat but nevertheless, clear examples of this type are common in the Ibn el-Ghazzi assemblage. 41% of all burins fall into this category.

4) 14 multiple mixed burins were found at the site, 8 from the surface and 6 from the soundings.

5) Only a single burin <u>nucléiform</u> was found, in an excavated context.

6) 62 broken or damaged burins were found at the site.

sickles:

1) As at Dhuweila, pieces with silica gloss are extremely rare. There were 3 examples on slightly modified flakes or blades, 1 from the surface and 2 from the soundings.

2) 1 truncated and denticulated sickle blade was found in an excavated context.

scrapers:

1) Scrapers are atypical and uncommon at Ibn el-Ghazzi. 2 tabular scrapers were found, 1 on the surface and 1 in the soundings.

2) 8 flake scrapers were found, 4 on the surface and 4 in excavated contexts.

3) Only 1 sidescraper was found, in the surface collections.

4) 1 denticulated scraper was found on the surface.

5) There were 3 endscrapers from the site, 2 from the surface and one from the soundings.

bifacials:

1) Bifacial pieces are rare at Ibn el-Ghazzi. 6 tile knives were found, 5 of them from the soundings.

2) 6 leaf-shaped bifacial pieces were found, 4 on the surface and 2 in the soundings.

3) Only 2 examples of the third bifacial type were recovered, both from the excavations.

4) There were 9 unclassifiable bifacial fragments.

borers:

1) There were 8 borers on flakes or blades among the collections, 7 of them from the soundings.

2) 4 drill bits on spalls were recovered, 3 of them from the surface of the site.

S: surface
E: excavated

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	23	54	0	15	3	0	0	0	(77)	172
E	1	17	35	1	18	3	0	0	0	(78)	153
total	1	40	89	1	33	6	0	0	0	(155)	325

Burins

type	1	2	3	4	5	(6)	total
S	38	19	54	8	0	(30)	149
E	38	15	91	6	1	(32)	183
total	76	34	145	14	1	(62)	332

Sickles

type	1	2	total
S	1	0	1
E	2	1	3
total	3	1	4

Scrapers

type	1	2	3	4	5	total
S	1	4	1	1	2	9
E	1	4	0	0	1	6
total	2	8	1	1	3	15

Bifacials

type	1	2	3	(4)	total
S	1	4	0	(3)	8
E	5	2	2	(6)	15
total	6	6	2	(9)	23

Borers

type	1	2	total
S	1	3	4
E	7	1	8
total	8	4	12

Fig.4.24 3133:absolute proportions of tool groups

Ibn el-Ghazzi is typologically very similar to Dhuweila although fine distinctions which appear in detailed comparisons of the two assemblages suggest that Ibn el-Ghazzi is slightly earlier in date. This suggestion is based mainly on subtle differences in the arrowhead classes. Ibn el-Ghazzi lacks the later forms, which occur not only on the surface but in small numbers in the soundings at Dhuweila. This could be due to disturbance of the upper levels of Dhuweila and would not in itself be significant if there were not other slight indications as well. Ibn el-Ghazzi has higher proportions of arrowhead types 2 and 3 but proportionally fewer examples of type 5, a form which begins later in the PPNB sequence and continues into the PN on a number of sites. The one notched point from Ibn el-Ghazzi is also an earlier form. On typological grounds it might therefore be possible to place the site somewhere between Jilat 7 (Garrard et al. in press) and Dhuweila, that is approximately mid 7th millennium.

Like many of the desert sites, Ibn el-Ghazzi probably saw repeated but intermittant occupation, acting as a base camp for hunters seeking game in the series of deep narrow wadis adjacent to the site leading down off the basalt onto the grazing on the alluvial fan of Wadi Qattafi a few kilometres to the west. The mouths of all these wadis are strung with "kites", some of which might be contemporary with the site. Judging from the lithic and faunal evidence from Ibn el-Ghazzi, the occupants lived by hunting, exploiting most of the game locally available, but principally gazelle.

Fig. 4.25

1 bipolar blade core
2 bipolar blade core

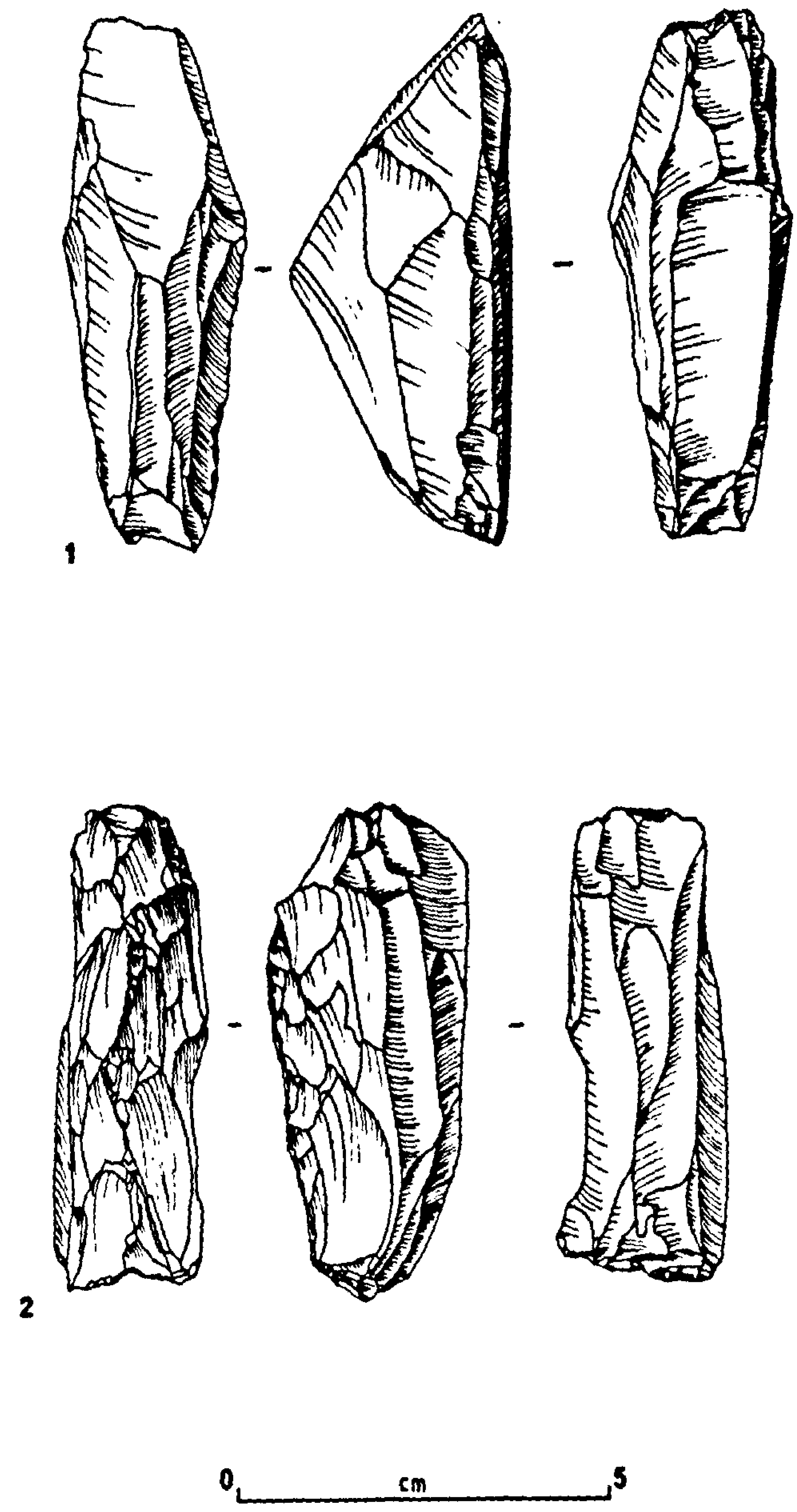

1
2
0
cm
5

Fig. 4.26 3133

1	arrowhead 2i
2-3	arrowhead 2ii
4-7	arrowhead 3i
8	arrowhead 3ii
9	arrowhead 3i
10	arrowhead 5ii
11-12	arrowhead 6

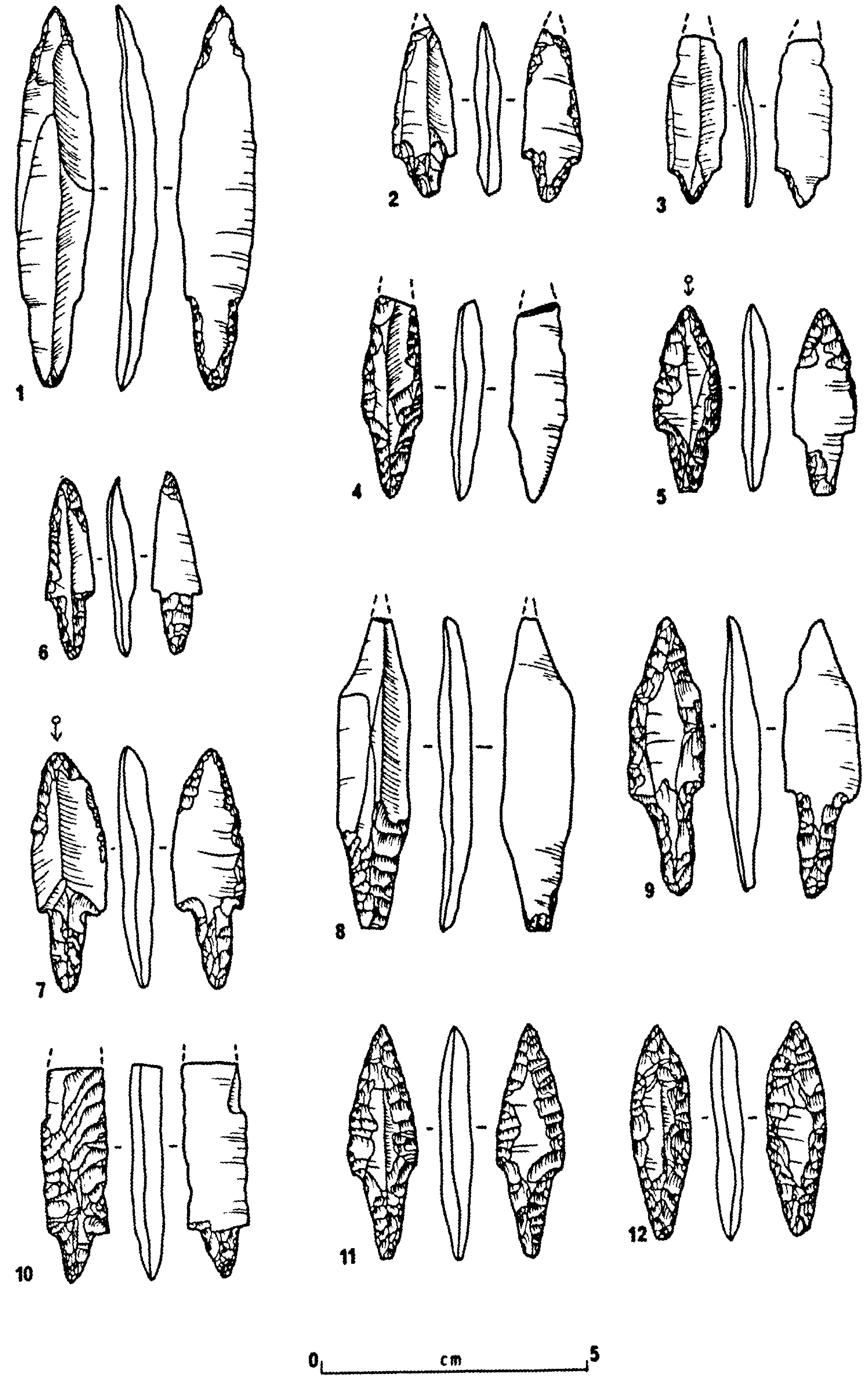

1
2
3
4
5
6
7
8
9
10
11
12
0
cm
5

Fig. 4.27 3133

1-2	burin 1i
3-7	burin 1ii
8	burin 2vii
9-10	burin 2iii
11	burin 2ii

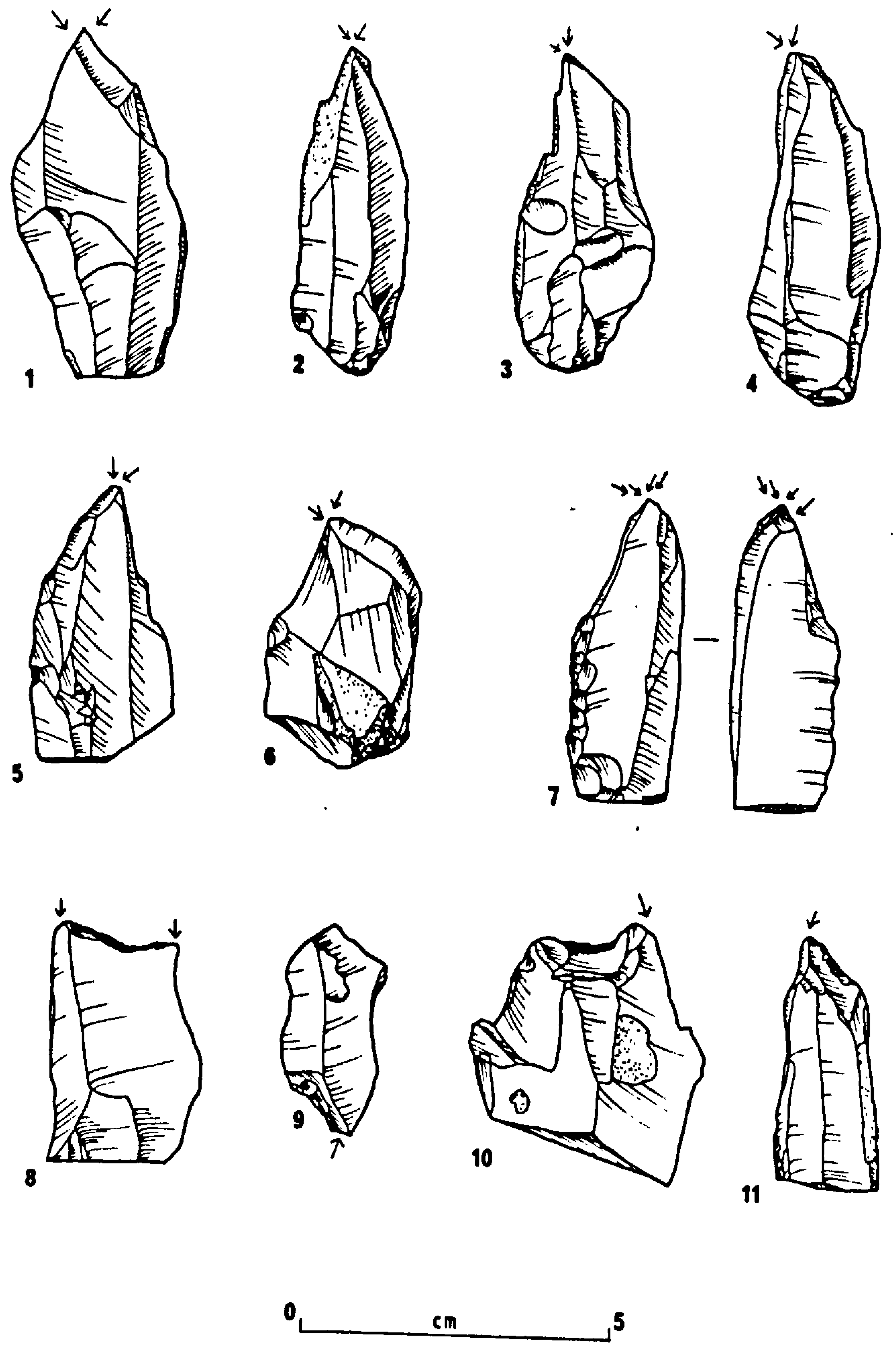

1
2
3
4
5
6
7
8
9
10
11
0 cm 5

Fig. 4.28 3133

1	burin 2ii
2	burin 2vii
3-4	burin 3i
5-7	burin 4
8-9	sickle 1
10	sickle 2
11-12	scraper 2

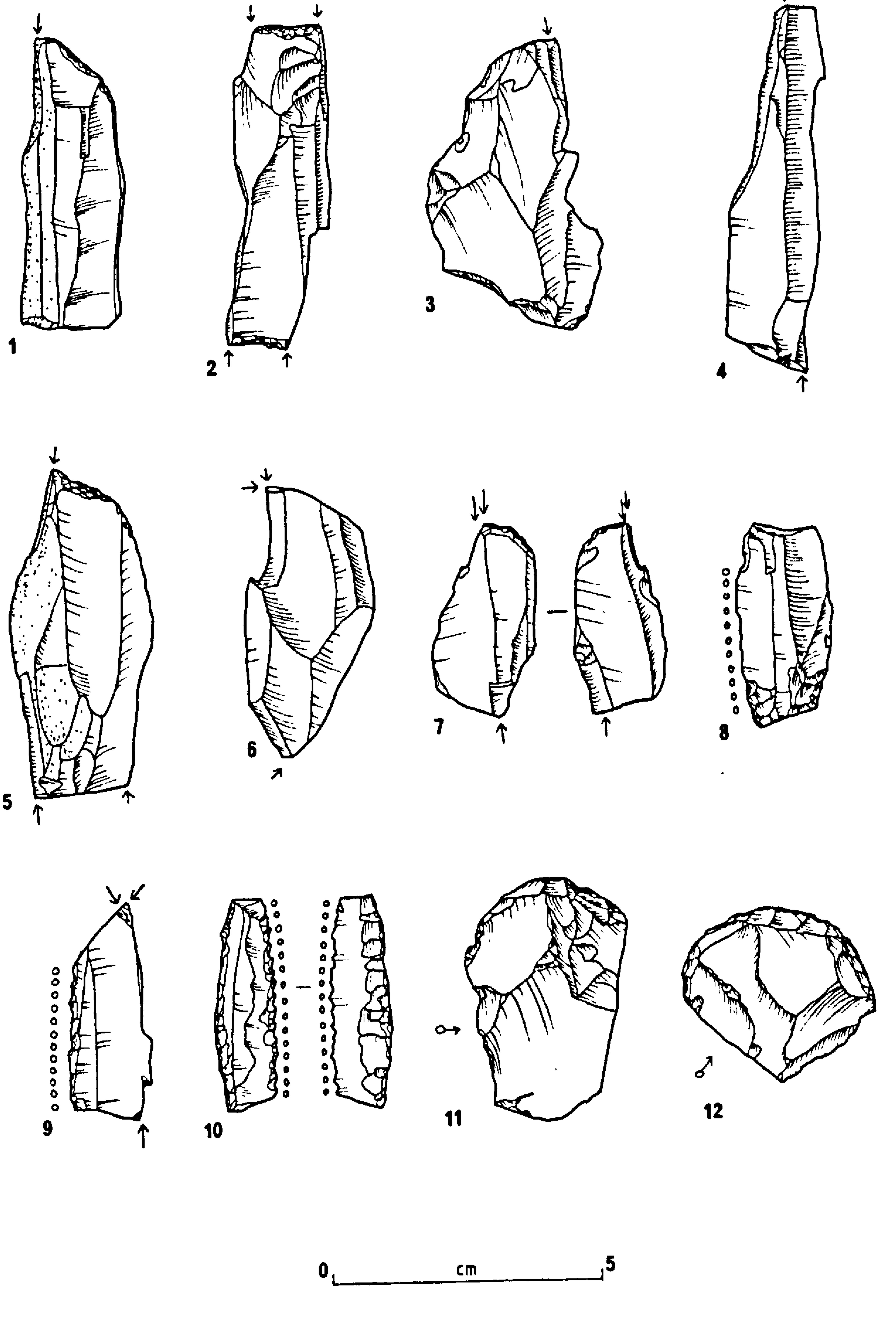
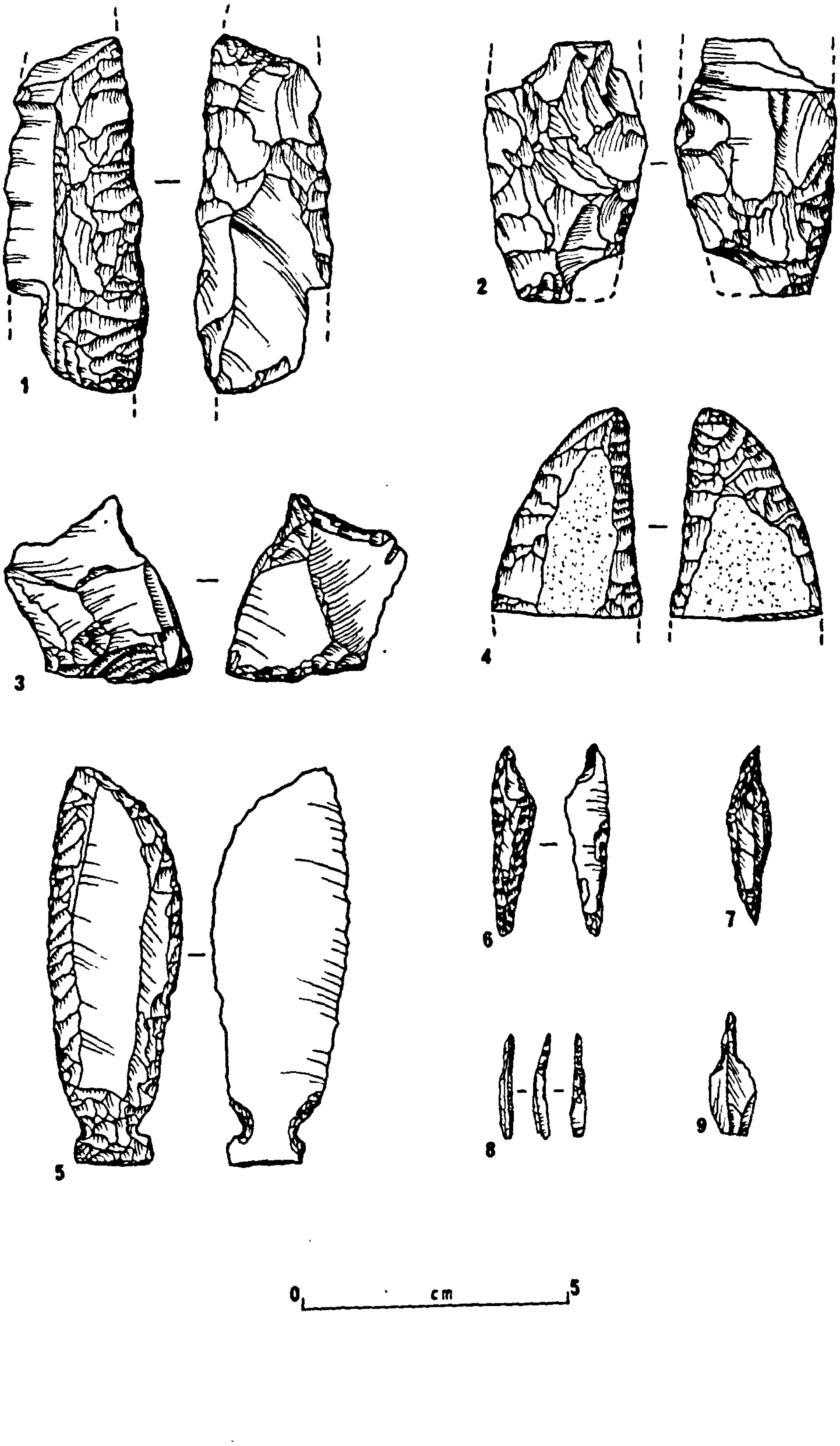

1
2
3
4
5
6
7
8
9
10
11
12
0 cm 5

Fig. 4.29 3133

1-2	bifacial 2
3	borer 1
4	bifacial 1
5	scraper 3 (atypical)
6-7	borer 1
8	borer 2
9	borer 1


1
2
3
4
5
6
7
8
9
0
cm
5

Survey sites

No PPNA sites were found during the survey. This was not altogether surprising as sites of this period are rare and are usually found at locations near permanent water sources in the more fertile regions, for example Jericho (Kenyon 1981) or Gilgal (Noy et al. 1980).

Sites of the PPNB period are common in the survey area. There are hunting camps such as Dhuweila and Ibn el-Ghazzi, scatters of tools, often mostly arrowheads, which may represent very short-lived camps, knapping sites, and "kites" with one or two broken points around the main enclosure. The more important of the survey sites are described below, but detailed tool lists have not been included because in many cases the date was established as much by the debitage as by the retouched tools.

1605

1605 is a large multi-period knapping site on a promontory jutting out from the Qurma massif and overlooking the lower reaches of Wadi Rajil as it cuts its way through a narrow gap out to the Azraq playa. It is an ideal situation to watch for game and the knapping site in its main period of use in the PPNB seems to have been used principally for the production of arrowheads. Several bipolar blade cores and a large number of blades, flakes, chips and other debitage were found on the site, together with some broken and partly formed arrowheads and some retouched pieces. Other tools included a sickle blade, a borer and two Helwan lunates. The flint was probably brought up to the top of the hill from exposed chert beds on the lower slopes.

1612

1612 is a slightly smaller knapping site on the summit of Jebel Qurma itself with clear views over the very mouth of Wadi Rajil and also the open plains to the south and west. The site seems to have been used only in the PPNB. In the collection were two bipolar blades cores, four broken points, some retouched blades, core trimming elements and miscellaneous debitage.

1617

This is a knapping site but instead of being on a hilltop, it lies on the lower slopes of Jebel Qurma below 1612. It consists of a small localised scatter of debitage and probably did not see regular or consistant use. The collections were mixed and contained tools which may be related to the series of irregular corrals and structures around the lower slopes of the hill. These included a few concave truncation burins and two broken bifacial pieces, probably of later Neolithic date. The cores, core trimming elements and blanks associated with the knapping floor were fresh and only very lightly patinated. There were no complete cores but several broken pieces of bipolar blade cores.

1633

1633 is a large knapping site on a low basalt promontory overlooking Qa'a Mejalla. It dates mainly to the PPNB but there is also a little later Neolithic occupational debris as well. The site produced a large number of bipolar blade cores, core trimming elements and blanks and was clearly reused consistantly. Two pressure flaked arrowheads of Type 5 and some retouched blades seemed to be associated with the knapping floor.

1635

This site is a large mixed period knapping site on a high, isolated hilltop. There is a scatter of truncation burins and two distinct groups of debitage, very fine thin blade/bladelets with punctiform platforms and more robust blades struck from bipolar blade cores. There were no cores which can be related to the first group but other cores included two bipolar blade cores, one roughout and two flake cores. Tools included three tanged arrowheads.

1671

1671, originally 14d (Betts 1982a), is a small knapping site on the top of a low promontory. Finds included several bipolar blade cores, a flake core and a scatter of debitage and waste.

1683

1683, originally 14p (Betts 1982a), is a thin scatter of debitage on a high promontory overlooking Wadi Rajil with two bipolar blade cores, a fragment of a tabular tool, two retouched blades and a truncation burin on a crested blade.

1684

1684, originally 14q (Betts 1982a), is an extensive knapping site on a hilltop overlooking Wadi Rajil. It probably saw intermittant use over some length of time and the finds are slightly mixed, although like most of the knapping sites, the largest proportion of artefacts seem to be PPNB. Finds included four bipolar blade cores, several crested blades, both dihedral and truncation burins, two fragments of bifacial tools and six broken tanged arrowheads.

2112

This is a small occupation site on a low mound a few kilometres north of the H4/H5 highway near Wadi es-Shahbah. There are a cluster of small corbelled huts on the same rise which almost certainly postdate the Neolithic occupation at the site. Finds from 2112 included tanged and pressure-flaked arrowheads, a few burins, mostly on breaks, one sickle blade, some debitage and a few retouched blanks. There are a number of "kites" near the site, their guiding walls running off the large playa to the south east. There are no flint outcrops in the immediate vicinity and the grey desert cherts used at 2112 must have been brought in from sources at least twenty to thirty kilometres away.

2228

2228 has been very heavily disturbed by later excavation and rebuilding, mostly for the construction of a large cairn which seemed to have originally marked two graves, now both robbed out. It lies beside a small tributary wadi draining into the northern end of Qa'a Dhuweila, about four kilometres north of the site of Dhuweila itself. The disturbed nature of the site makes it difficult to assess but it was probably a small knapping floor. It lies close to the chain of "kites" which runs down the eastern shore of Qa'a Dhuweila, and might possibly be connected with their use. Finds included mixed debitage and a large pressure-flaked point (Fig.4.32:3).

2402

2402 is an occupation site lying on a col between two table mountains east of Jebel Qurma. A series of small rounded huts lie in the lee of the northern peak. The slopes below these and the col itself are strewn with a thin scatter of worked flint of early PPNB date. Finds included one notched arrowhead of the later type (iii), a "T" shaped piece similar to those found by Field at Landing Ground J (Garrod in Field 1960:119) and some burins of various types. Blades tended to be fine with oval striking platforms and rather marked lipping.

3120

3120 is a thick scatter of arrowheads on the edge of a long playa in the heart of the basalt hammada. Most of the points are of Types 3 and 5 and there are very few other tools. There are a number of structures and cleared areas but it is impossible to say whether any of them are related to the flint scatter.

Fig. 4.30 Survey sites

1	1671 bipolar blade core
2	1684 bipolar blade core
3	1683 bipolar blade core
4	1684 bipolar blade core
5	1683 bipolar blade core

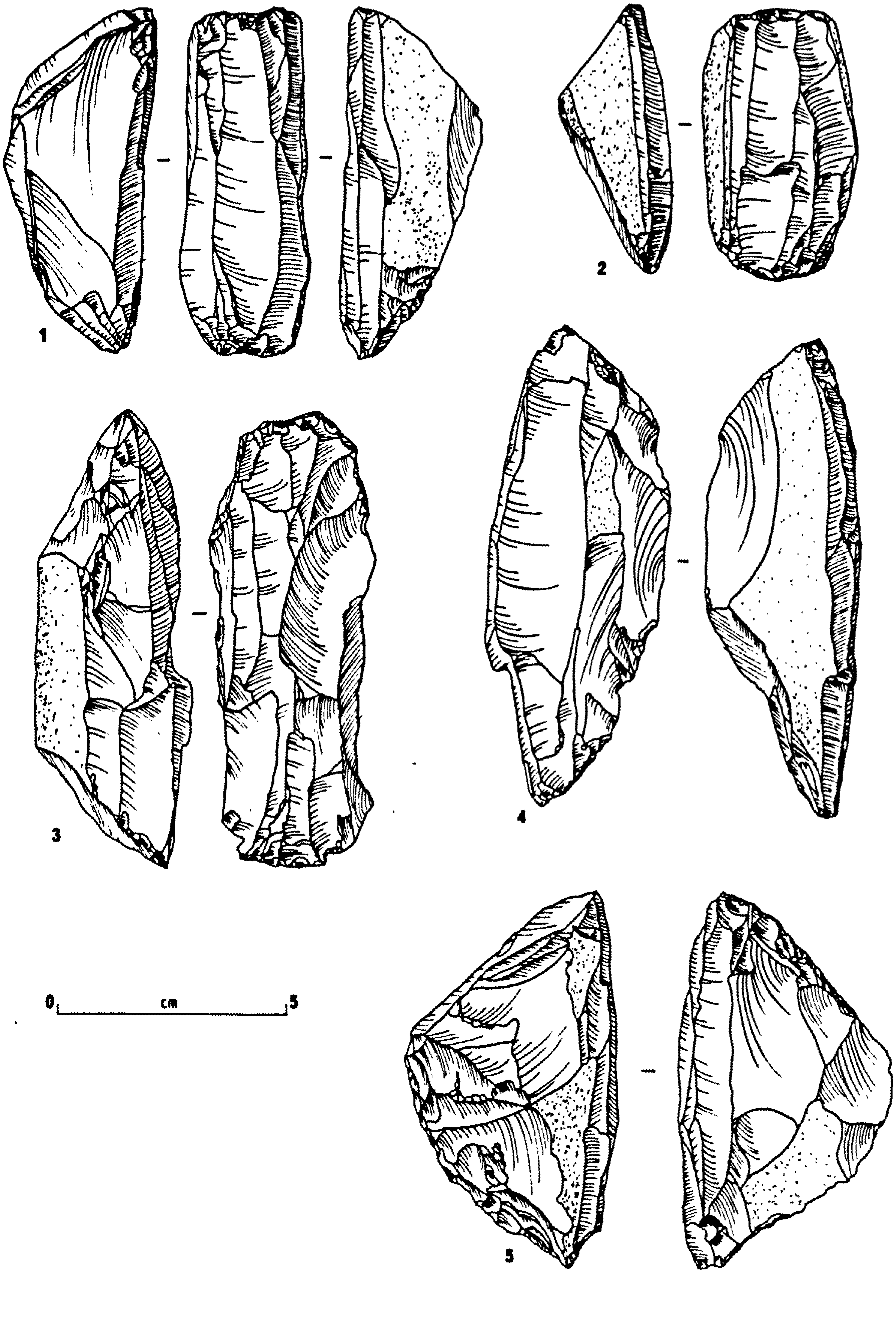

1
2
3
4
5
0 cm 5

Fig. 4.31 Survey sites

1	2402	arrow 1ii
2	1670	arrow 3i
3	1670	arrow 3i
4	1670	arrow 3i
5	1670	arrow 3i
6	1671	arrow 3i
7	1671	arrow 3ii
8	1684	arrow 3i
9	1684	arrow 3ii
10	1684	arrow 3ii
11	1635	arrow 3i
12	1635	arrow 3i
13	1605	arrow 3i
14	1605	arrow 5ii
15	3120	arrow 3i

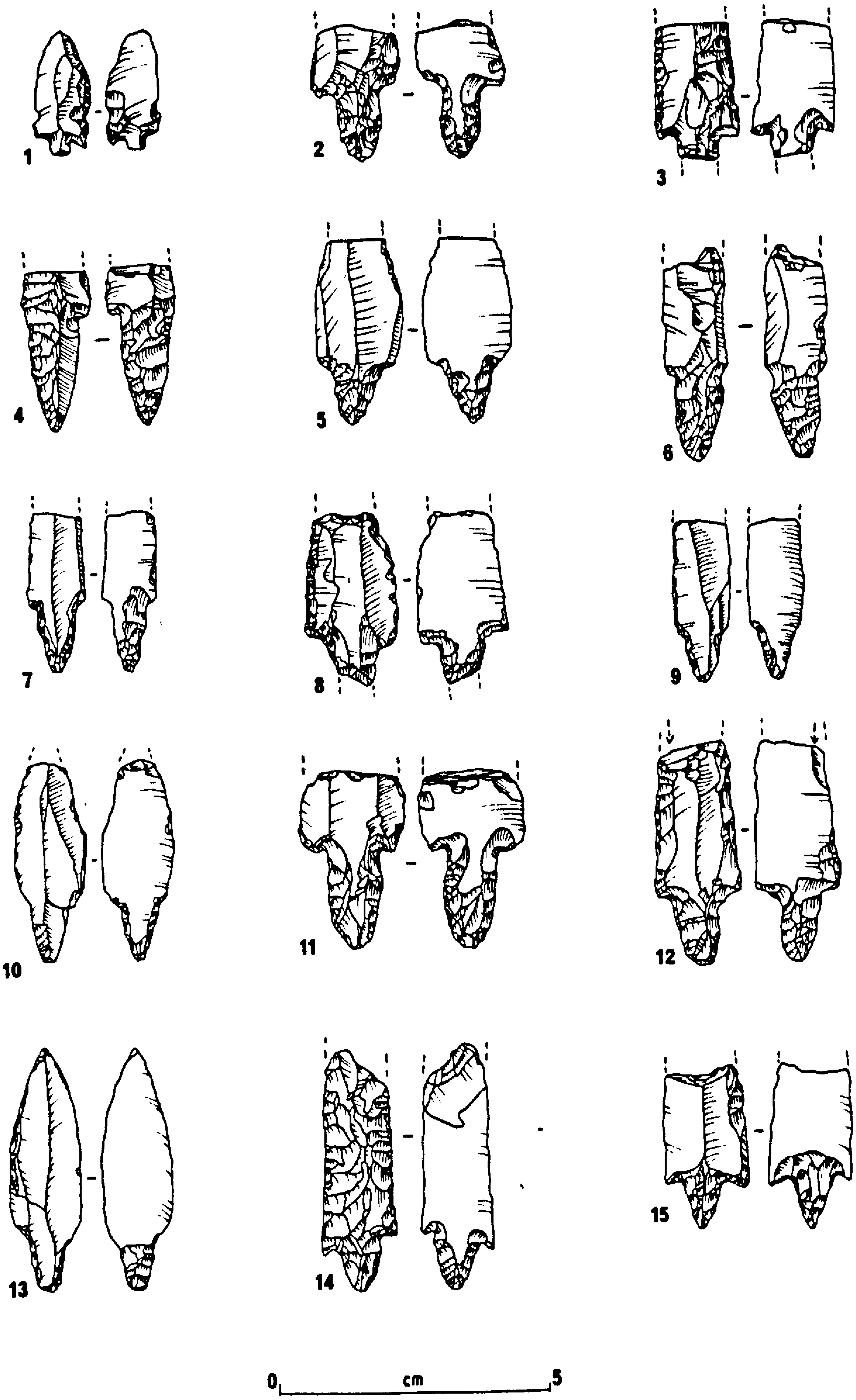

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0 cm 5

Fig. 4.32 Survey sites

1	3120	burin 2i
2	3120	burin 4
3	2228	arrow 5
4	2112	bifacial 1

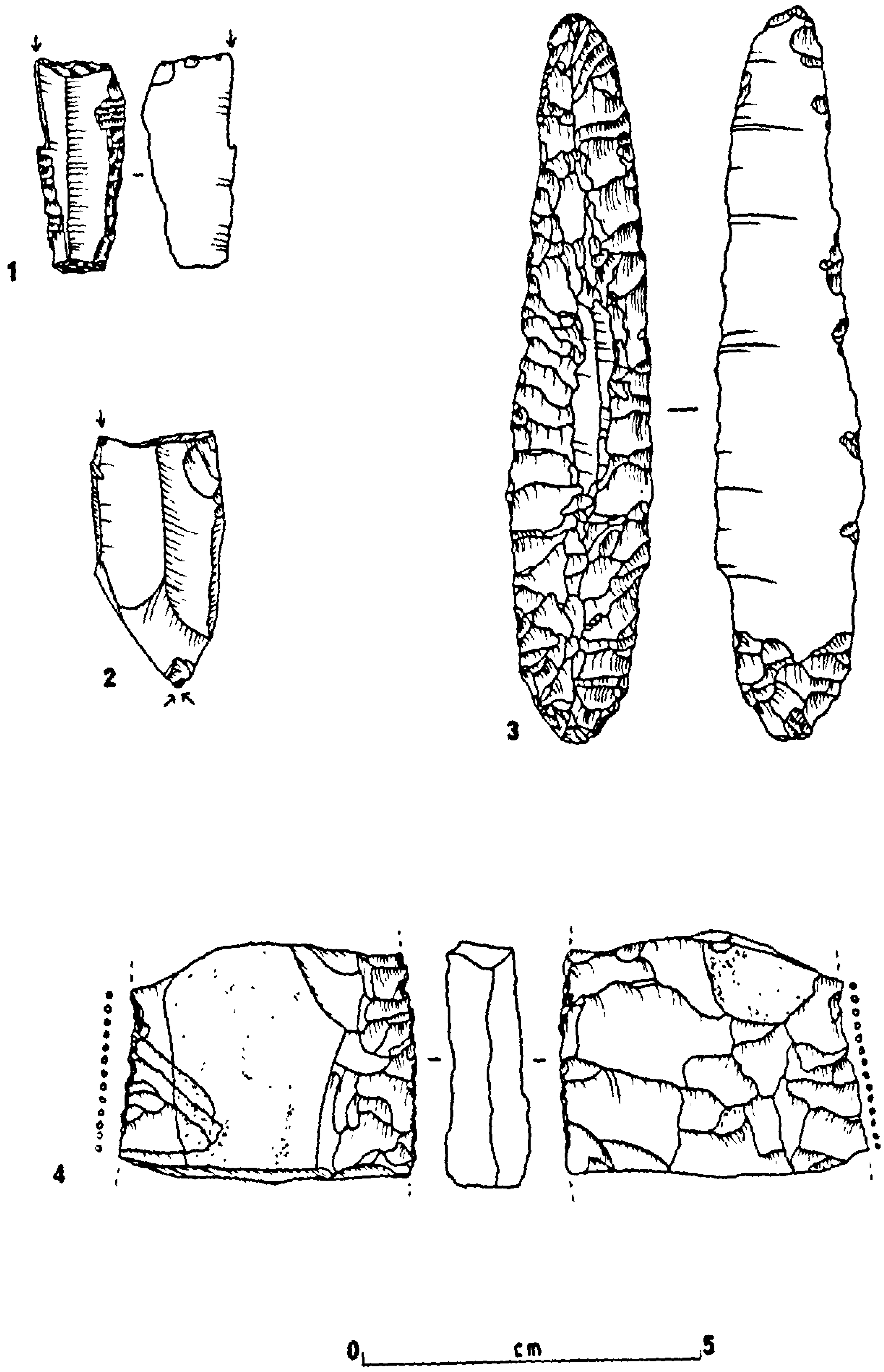

1
2
3
4
0 cm 5

Fig. 4.33 Survey sites

1	1612	arrow 5
2	1612	arrow 5
3	3120	arrow 5
4	3120	arrow 5i
5	3120	arrow 3i
6	3120	arrow 3i
7	1612	arrow 2ii
8	3120	sickle 1
9	3120	burin 1

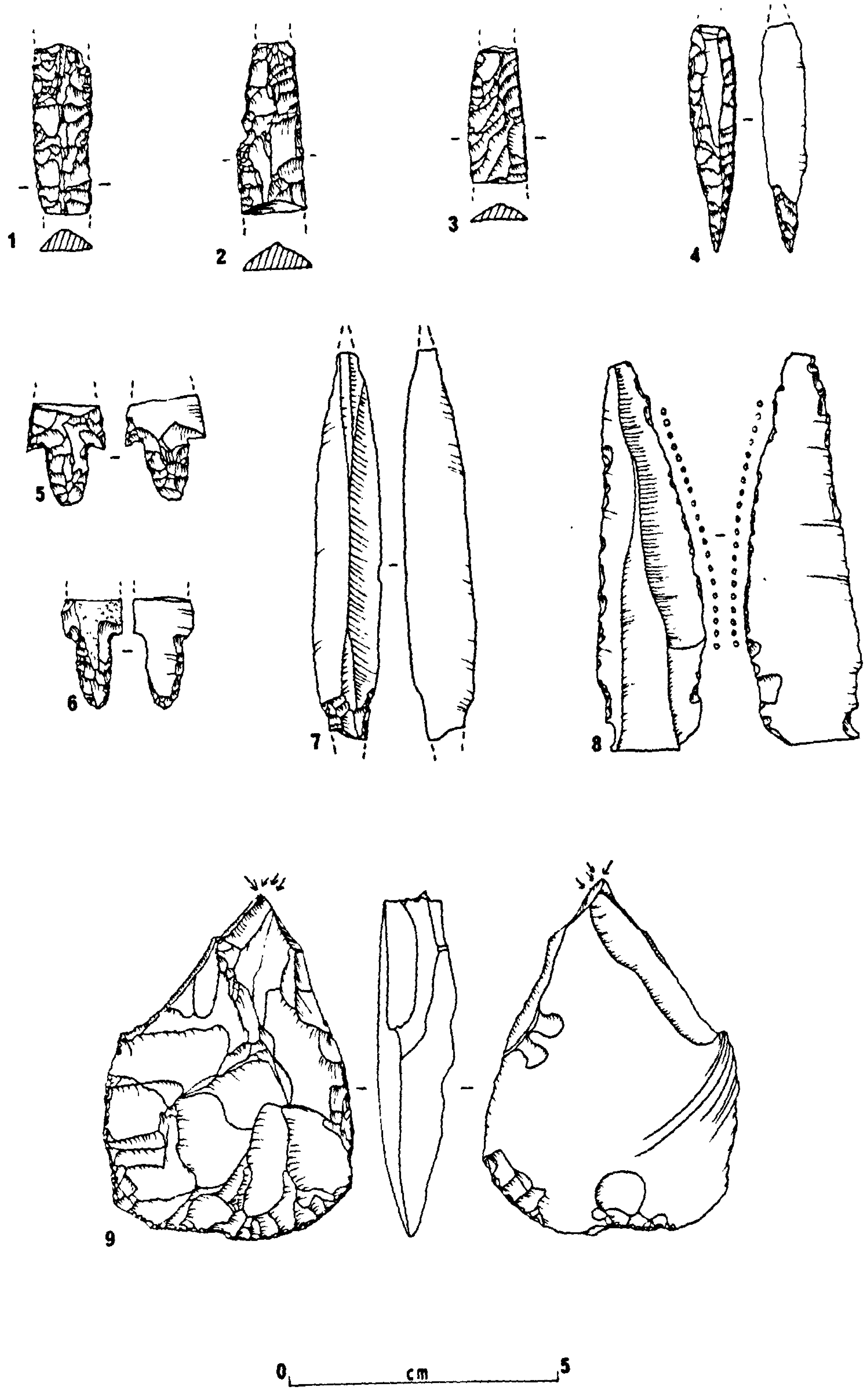

1
2
3
4
5
6
7
8
9
0
cm
5

Fig. 4.34 "Kites"

1	2232	arrow 5ii
2	2232	arrow 5
3	2233	arrow 5
4	1505	arrow 5
5	2233	arrow 5
6	2234	arrow 5
7	2235	arrow 5
8	1505	arrow 5
9	2108	arrow 5
10	2235	arrow 3i
11	2235	arrow 6
12	2306	arrow 3i
13	1655	biface 2

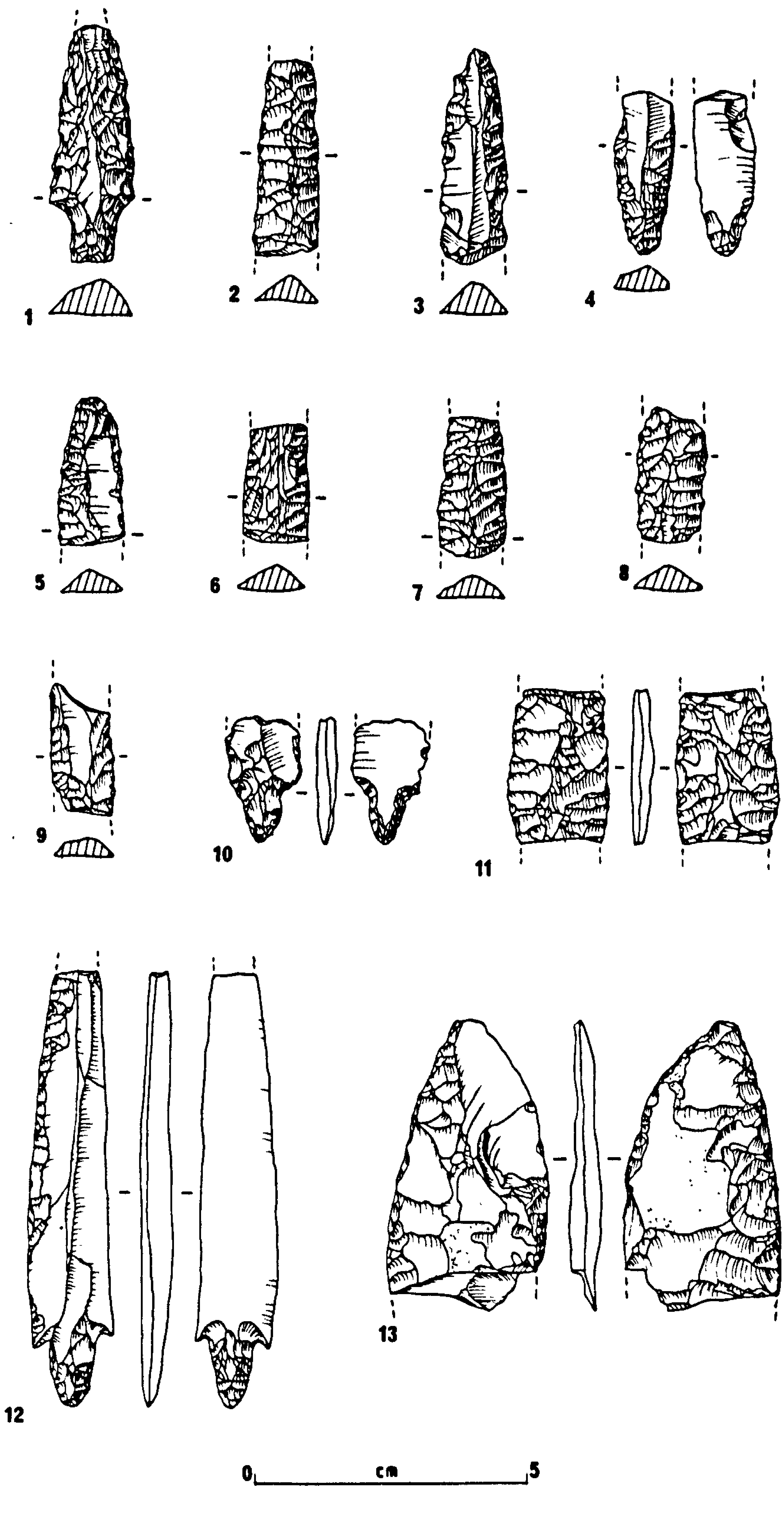
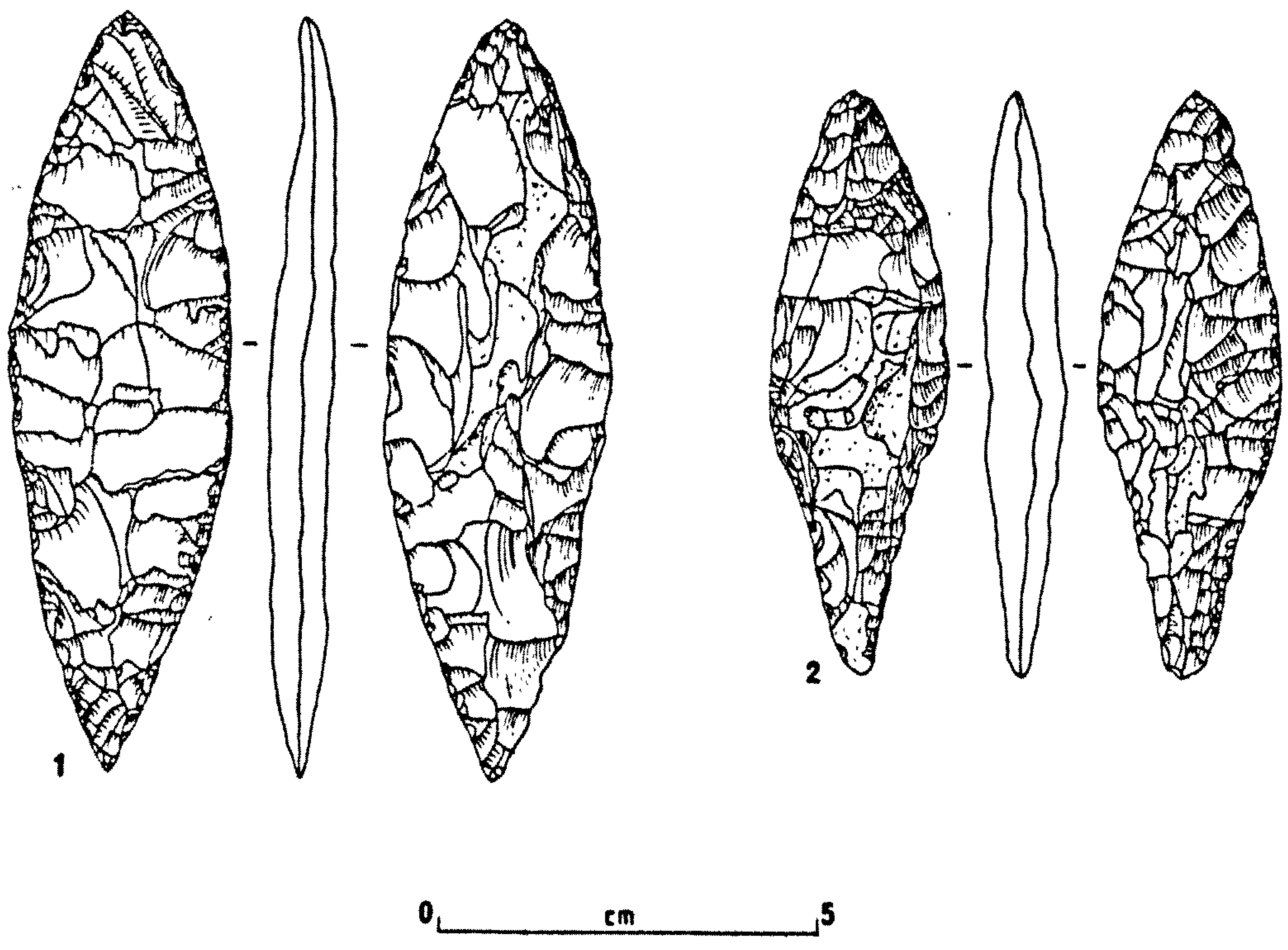

1
2
3
4
5
6
7
8
9
10
11
12
13
0 cm 5

Fig. 4.35

1	1655	biface 2
2	1655	biface 2



1
2
0
cm
5

Discussion

The general pattern of occupation in the survey area during the PPNB is one of numerous small camps, some in use for very limited periods, others clearly occupied for longer, or consistantly revisited. There is as yet no evidence to show whether these camps represent seasonal expansion into the basalt region or whether the area was occupied on a year-round basis. The economy of the sites seems to be based to a large extent on hunting, particularly the exploitation of gazelle, and the survey has shown that it is very likely that this exploitation was facilitated by the use of stone-walled animal traps ("kites"). These structures are found in large numbers all over the survey area, north into Syria around Jebel ed-Druze, and south into the northern part of the basalt region in Saudi Arabia (Fig.4.36) (Helms 1981:38 ff.).

They occur in a variety of forms, but the basic design consists of a series of low walls running off a mudflat and gradually converging on the summit of a low hill to meet in a narrow-mouthed enclosure concealed over the crest of the rise. Around the enclosure there are often small "hides" to conceal the hunters. A simpler variation on this consists merely of a low wall zigzagging between two summits to catch animals moving through the gap between. Almost all of the "kites" in the survey area are oriented NW/SE, with the enclosure at the northwestern end, and the more elaborate types usually form a part of long chains of interlinking traps.

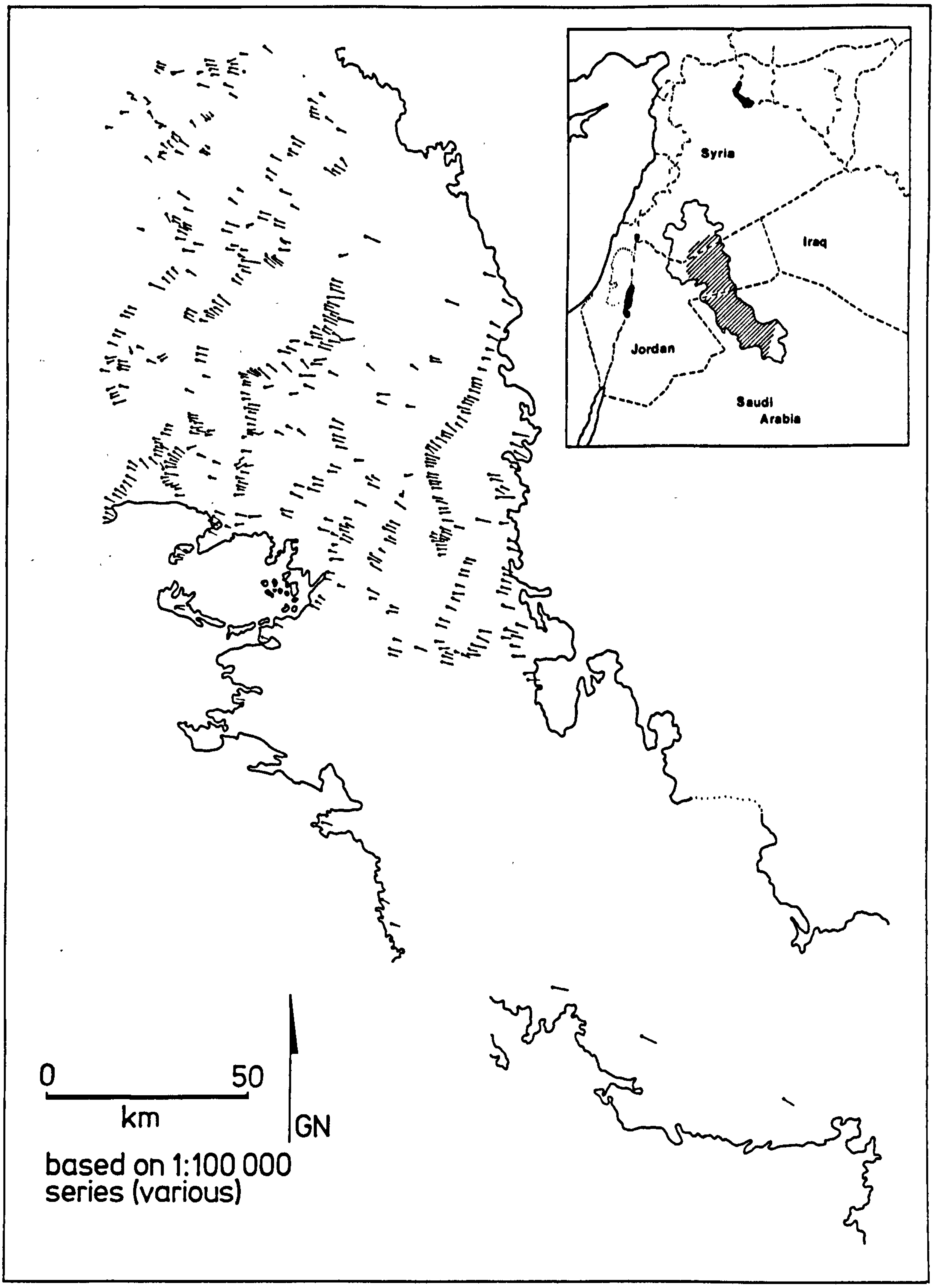


Fig.4.36 Black Desert: general distribution of 'kites'

It is of necessity difficult to date structures of this nature. They did not form part of a settlement and so have no stratified occupation deposits, and any isolated artefacts found near to them might well have arrived there quite fortuitously, without any connection to the "kite" itself. Datable structures which clearly interfere with the use of the "kite" as an animal trap might give some clues, but these are rare. Ethnographic records (Burkhardt 1831; Musil 1928) demonstrate that such traps were in use in the Near East at least up until the 19th century, so that a final date for one trap on the basis of disturbance by later occupation cannot really be applied to others with any reliability. However, extensive study of nearly 100 "kites" in the survey area produced evidence to suggest that at least some of the "kites" were in use in the 7th millennium. On a number of the surveyed "kites" were found arrowheads of various types (Fig. 4.34), all relating to arrowheads found on Neolithic sites in the survey area. These arrowheads were found in and around the "kite" enclosures and most of them were broken, the majority in such a way as to suggest impact fracture (see Bergman & Newcomer 1983). Since some of these "kites" formed part of a chain, it might be reasonable to assume that the rest of the interlinking system may have been in use at much the same time. One such system is the long chain running immediately west of the site of Dhuweila. Neolithic arrowheads were found on four of the "kites" within a five kilometre radius of the site.

Most of the arrowheads from surveyed "kites" were of Amuq type (Type 5). Only two were of Byblos type (Type 3). A set of

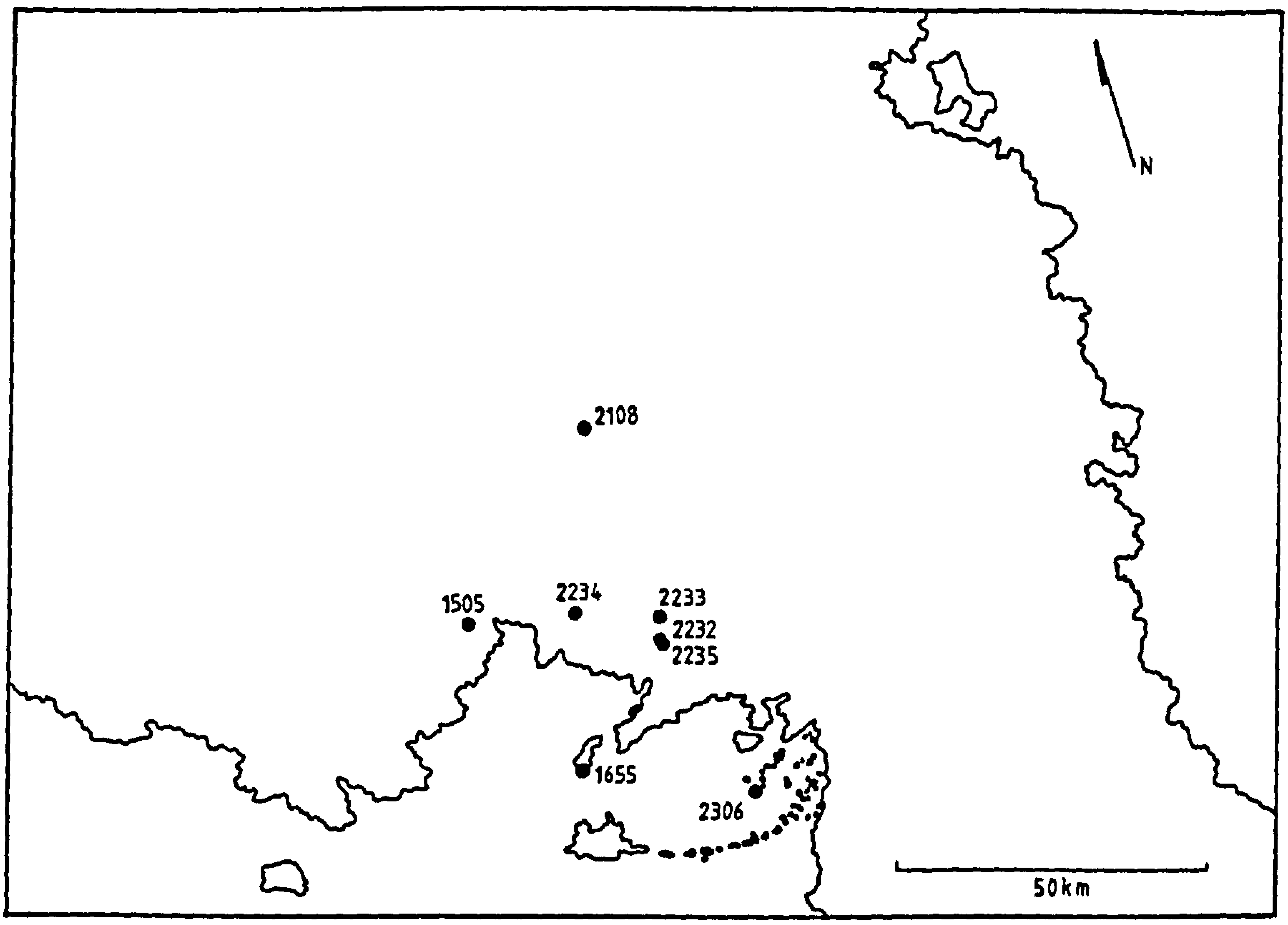


Fig. 4.37 Black Desert, eastern Jordan: "kites" with PPNB arrowheads

four bifacial leaf-shaped pieces all made of the rose-pink chert common near Qattaffi Wells were also found in a "hide" on an isolated "kite" near Qa'a Mejalla (Betts 1982a). In this instance it is likely that these tools were to be used as spears.

The high degree of specialization suggested by the evidence from Dhuweila is not echoed to such an extent on other Neolithic sites in the eastern desert, or even in the survey area itself. Prehistoric folk at Ibn el-Ghazzi, although also quite heavily dependant on gazelle, were exploiting other herbivores as well. PPNB sites studied by Garrard, particularly Jilat 7, show different adaptions again. The faunal remains at Jilat 7 are mixed, although gazelle is still important, and there is domestic grain from the site; two row hulled barley (Hordeum sativum) and wheat, probably domestic einkorn (Triticum monococcum) (Hillman and College pers. comm.). The eastern steppe provides a wide variety of localized ecologically individual areas. Conditions change dramatically from one side of a watershed to another. Seasonal change is also fairly dramatic, not only in terms of rainfall but also in terms of availability of game, in the prehistoric period possibly to a large extent dependant on major migration cycles. Given all these factors, the pattern of occupation in the eastern steppe in the 7th millennium must have been one of regular movement and seasonal adaption, but it is not yet possible to determine what this entailed in terms of social organisation and individual specialization at, say, extended family group level.

Several models might be presented here. It is theoretically possible that individual bands would, over the course of a year, move freely through several major ecozones; the fertile upper slopes of the Rift Valley, the open steppe of the limestone country and the narrow wadis of the basalt region with its rich hunting grounds. They might join into larger groups and then split again from time to time, or stay as small bands. This model postulates a relatively unified culture of steppic hunter/gatherer/proto-agriculturalists over much of eastern Transjordan.

A second possibility is that either at extended family level or at "tribal" level, there was quite a marked degree of territorialism, and consequently specialist adaption to the environmental peculiarities of the selected territory. One interpretation of this model might be a group of prehistoric peoples occupying a territory encompassing the basalt region, but only extending a short way beyond its margins. Specialist adaptions would include a heavy emphasis on gazelle exploitation, facilitated by the use of animal traps, and a social organisation which permitted the fairly high degree of collective industry required to build, use and maintain the "kite" systems.

Use of ethnographic analogies to aid in the reconstruction of demographic patterns is discussed elsewhere (see Chapter 7) but there are two points which should be noted here. Henry (1981) among others, has emphasised the dangers of using data based on studies of nomadic pastoralists to interpret the behavioural adaptions of hunter/gatherers. This very valid criticism, coupled with only the small amount of data yet available on PPNB economies in the eastern steppe makes it difficult to go further at present in attempting to analyse social organisation and group specialization for the PPNB in the survey area.

PPNB sites in the basalt region belong predominantly to the Mid to Late phases of this period (see Bar-Yosef 1981b:564). The flint industries of sites such as Dhuweila and Ibn el-Ghazzi have close affinities with other late PPNB desert sites. General features include the use of bipolar cores for blade production and high frequencies of Byblos and Amuq points in tool assemblages. More specifically, the presence of one or two arrowheads of Jericho Point type (Type 4) among the survey collections suggests closer affinities with Palestine than with southern Syria as this point is absent from Syrian desert PPNB industries (Aurenche & M.C.Cauvin 1982:56).

Techniques for construction of shelters seem to depend more on the nature of available raw material than cultural idiosyncracy. In the desert areas, structures are stone-built, rounded or irregular in plan. However the double-walled construction technique used at Jilat 7 (Garrard et al. in press) is much closer in basic design to the circular double-walled sandstone huts at Wadi Tbeiq in Sinai (Bar-Yosef 1981c:11) than it is to the irregular cobble walls at Dhuweila and Ibn el-Ghazzi. Evidence for direct contact in the form of trade between sites in the survey area and regions beyond is slight. There is one marine shell bead from Dhuweila (Reese 1985) which could have come from either a Red Sea or a Mediterranean source, and surface collections at Ibn el-Ghazzi and Dhuweila both produced small amounts of "Dhubba marble", a green pseudo-marble found in fossil springs on the Azraq/Jordan Valley watershed immediately to the west of Wadi Jilat. Interestingly, a few small fragments of obsidian were found at Jilat 7 (Garrard et al. in press) but none has so far been found on sites in the survey area. In contrast to the fairly universal PPNB traits, the rock art at Dhuweila and Ibn el-Ghazzi seems to be a unique feature of sites in the basalt region. There are no parallels either on the Azraq/Jilat sites or in Sinai and the Negev.

By the later 7th millennium, the dichotomy between desert sites and those in the less harsh Mediterranean climatic zones was well developed (Bar-Yosef 1980), and the Near East was evolving towards a system of "complex societies". Sites in the survey area belong quite clearly to the desert dwellers, with a survival strategy relating to the marginal Irano-Turanian climatic zone. Suggested approaches to the study of "complex societies" have been reviewed by Salzmann (1978) who maintains that one cannot study a group, community or tribe in isolation, without reference to external factors which may affect its behaviour. To overcome this difficulty, he presents three alternative research approaches: study of a group with particular reference to external factors, study of a large region and the interaction of groups within it, or study of the interfaces between two groups, the mechanisms of contact.

Although the Near East in the 7th millennium BC could not be described in terms of fully developed complex societies, the dichotomy between "desert and sown" must play an important part in the understanding of the adaptive strategies of Neolithic desert inhabitants. Clearly Salzmann's third approach, the study of socio/cultural interfaces would be of greatest use here, but it is unfortunately the one which is at present most difficult to examine. Quite a lot is known about sites in the Mediterranean zone, rather less about desert sites, and almost nothing about how the two groups interacted - which they must have done.

There is also insufficient evidence at present to take the first approach and comment further on groups within the survey area. This leaves only the regional approach. Since a full and detailed summary of the PPNB in the Near East is beyond the scope of this work, it seemed most relevant to take the steppe/desert as the "region" and summarize briefly the various adaptive strategies adopted by other desert dwellers in this period.

Work in Sinai has produced perhaps the most detailed information on localized adaptive strategies (Bar-Yosef 1981c;Tchernov & Bar-Yosef 1982). Here an annual cycle has been reconstructed in which Neolithic groups exploited all of the major ecozones of southern Sinai. In summer they moved up to the hills where they collected cereals and fruit, hunted and stored up supplies. In the colder winter months they moved to lower altitudes and down to the coast where they collected shellfish, hunted and worked hides. Two winter camps were investigated, Wadi Jibba I and Wadi Tbeik. The sites consisted of clusters of well-constructed circular or oval huts. They had rich lithic assemblages dominated by arrowheads of Byblos and Amuq type, some stone grinders, a few stone bowls and collections of marine shells. The faunal remains were dominated by ibex and hare, and there was some evidence that hunters were searching for game in places remote from their campsites.

Four sites in the hills, summer camps, were also excavated. All of them contained large lithic assemblages, small bone collections and a fair number of grinding stones, marine shells and bone tools. Structures were much flimsier than the winter camps and sheltered postions were not of high priority for site location. Several silos were found at the largest site, Urjat el-Mehed. In the lithic assemblages cores were rare and it is likely that preliminary knapping took place at the flint sources. Although this pattern represents a specialized local adaption, Bar-Yosef suggests that the Sinai groups also had some contacts with both Mediterranean and Transjordanian peoples.

Rather less is known about PPNB adaptive strategies in northern Sinai and the Negev. Sites at Gebel Maghara (Mintz & Ben-Ami 1977) are all ephemeral hunting camps, with no evidence for cultivation or intensive plant gathering. There is some evidence for specialized activities at different camps; one may ~~be~~ have been in use while the occupants were cleaning and preparing skins, another while they were making and hafting new arrows to replace damaged weapons.

Servello (1976) is only able to draw very general conclusions on the results of excavations at Nahal Divshon. He suggests that the site was a specialized hunting camp, seasonally occupied by groups who - at least while they were at the site - did not practice agriculture. Nahal Issaron, on the edge of the 'Arabah depression seems to have been occupied seasonally during winter and spring. Hunting was certainly important but there may also be evidence for animal husbandry. Nothing is yet known on plant remains from the site (Goring Morris & Gopher 1983).

Although PPNB sites have been found in Saudi Arabia (eg:Parr et al 1978) almost nothing is known about their economies, since all information is derived from surface collections made on large-scale multi-period reconnaissance expeditions. Henry found no late PPNB sites in the Ras en-Naqb region, although the site of 'Ain Abu Nekheileh is only a short distance away in Wadi Rumm (Kirkbride 1978). Again little information is available on the economy of 'Ain Abu Nekheileh, but the high numbers of arrowheads together with a good many mortars and grinders suggests a combination of hunting and either small-scale agricultural sytems or extensive collection of wild plants. No sickle blades were found. The excavator suggests that the site saw only seasonal occupation. On the basis of the flint industry she dates it roughly in the last quarter of the 7th millennium.

Sites in the Petra region (Kirkbride 1966; Gebel n.d.) fall more within the category of permanent villages. Beidha (Kirkbride 1966) had a primarily agricultural economy with some hunting and gathering. Cultivated wild barley (_Hordeum spontaneum_) was common as was cultivated emmer (_Triticum dicoccum_) (Haelbek in Kirkbride

1966). Perkins (in Kirkbride 1966) suggests also that goat was domesticated at Beidha although a number of wild animals were hunted as well. These include wild cattle (Bos primigenius), gazelle (Gazella cf. dorcas), equids (Equus sp.) and hare (Lepus sp.).

Sites in the flint reg west of Azraq have been described briefly above. The site of Jilat 7 (Garrard et al. in press) is interesting because although there is no evidence for domestic animals and all meat seems to have been obtained through hunting, domestic grain was recovered from the soundings (Hillman & College pers. comm.). The site seems to have seen repeated temporary occupation although it is impossible yet to determine if this was related to a seasonal pattern of movement. External and local trade connections are demonstrated by the presence of obsidian and "Dhubba marble" on the site.

There are many PPN sites in the Palmyra basin (Akazawa in Hanihara & Akazawa:201). Most of these seem to be factory sites with large numbers of naviform cores and waste. No hunting camps or occupation sites have been reported. It seems possible that these factory sites are similar to the knapping sites in the barra and may have been used by hunter/gatherer bands visiting the area to exploit available flint sources.

Although a number of Neolithic sites have been found in the sub-steppic region around el-Kowm (J.Cauvin 1981), not much is yet known about their economy. There are two basic types of site, permanent villages such as el-Kowm, and small scatters of artefacts in the vicinity of the springs which might represent hunting camps. Lack of further evidence for the latter makes it difficult to judge whether they represent hunting parties foraging for the village sites or whether they were used by steppe-dwelling hunter/gatherers like those at Dhuweila who came in to the oases from time to time to camp by the springs.

There is then a very marked contrast between the desert dwellers and the settled villagers in the PPNB. Inhabitants of the marginal zones were quite mobile, with resource procurement strategies oriented strongly towards local conditions, although the material cultures of the period display quite a high degree of uniformity throughout the steppe/desert region. In more amenable steppic areas such as Wadi Jilat, and possibly Wadi Rumm, exploitation of local resources may have been supplemented by low-level subsistance agriculture, but not to such a great extent as to encourage sedentism.

Common traits in material culture, particularly the chipped stone industry, indicate connections between mobile bands and settled villagers, but how far they otherwise interacted is difficult to deduce.

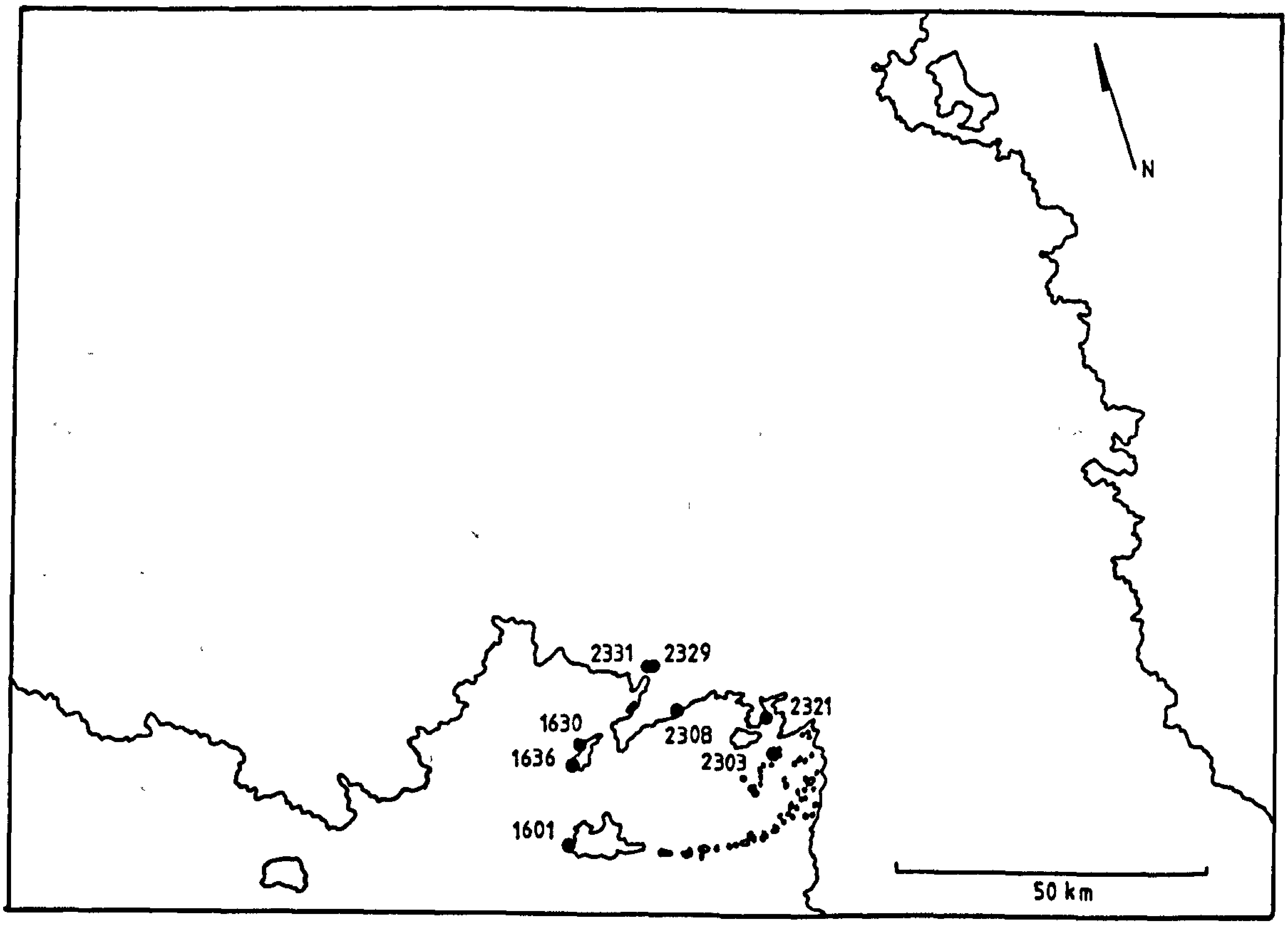


Fig. 5.1a Black Desert, eastern Jordan: major "burin sites"

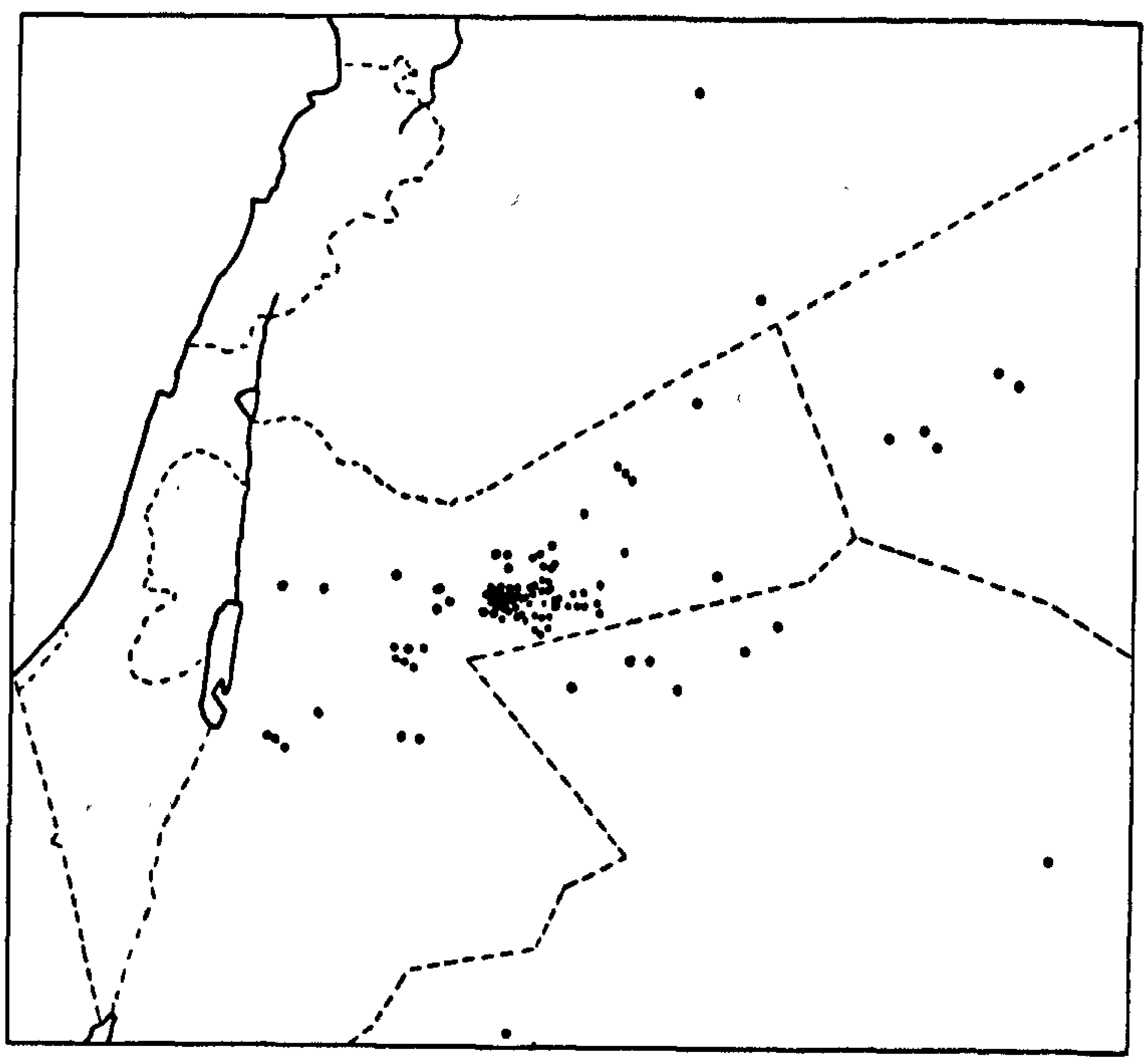


Fig. 5.1b Near East: "burin sites"

Chapter 5

The following chapter examines the evidence for later Neolithic activity in the survey area. The question of the later Neolithic in the desert regions is an interesting one. Arid regions in Sinai and the Negev have so far produced little evidence for sites of the late 6th and 5th millennia, and yet recent work in eastern Jordan, particularly the findings of the Black Desert Survey, seems to show that a very large number of the desert sites belong to this period. These sites have become known as "burin sites" because of their ubiquitous type-fossil, the concave truncation burin. In the discussion below, they are placed in the "Later Neolithic" since although they are apparently contemporary with Pottery Neolithic sites elsewhere, they would appear to be quite aceramic. Many sites of this type have been located in the course of survey work and soundings were made at one of the larger of these, 2321 Jebel Naja.

Sites in the desert areas with assemblages very strongly dominated by concave truncation burins have been known since the 1930's with the work of Waechter & Seton-Williams at Wadi Dhobai (1938) and Field's collections from sites along the Air Mail Route, (1960), but the lack of diagnostic elements and reliably stratified assemblages have left these sites floating in a temporal vaccum with speculation as to their date aimed mainly at the Neolithic period, but ranging broadly either side from the Upper Paleolithic to the Early Bronze Age. Extensive study of these sites during the course of the survey has resulted in a body of evidence which seems to suggest that they should be dated some time in the late 6th or early 5th millennium, post-dating the PPNB in the survey area.

2321 Jebel Naja

Jebel Naja lies on a steep eastfacing slope in the southern part of the survey area, sheltered from the prevailing wind by the rim of the basalt plateau and overlooking the alluvial fan of Wadi Qattafi where it debouches out of the lava country onto the open gravel plains north of Qattafi Wells.

The site itself consists of a dense scatter of flints in and around a cluster of corrals and cleared terraces. These structures almost certainly vary greatly in date. Some may relate to the Neolithic occupation of the hillside but the soundings failed to prove this conclusively. There has been extensive reuse and rebuilding of these structures up until modern times, a practice which is common throughout the area.

Four trenches were opened up in areas where the concentration of surface artefacts seemed to be the greatest. Purposive sampling was carried out over the whole site to try and recover artefacts other than burins. One third of all the earth recovered from the soundings was sieved (3 mm mesh) with the exception of the lower levels of 400 where all the soil was seived. There was very little soil cover, even at the downslope end of the terraces. The maximum depth at which bedrock was reached was just under 50 cm but was much less in most places.

Three of the soundings failed to reveal any occupation deposits, although every level was filled with thick chunks of roughly worked flint and concave truncation burins. The only trench to give any indication of the nature of the Neolithic deposits was 400. This encompassed the fill of a small hut and a trench laid out along the outside of the hut wall. Three hearths or fire pits were found set into levels of ashy sand containing a few splinters of bone, much badly fire-cracked flint and evidence for bead working in the form of raw material, partially formed and complete beads, and drill bits on burin spalls. A C14 date of 7430 ± 100 BP (OxA 375) (5480 BC) was obtained from one of the hearths.

The few fragmentary faunal remains from the site (Garrard 1985) included sheep/goat (*Ovis/Capra sp.*), hare (*Lepus cf. capensis*) and gazelle (*Gazella sp.*)
The condition of the specimens rendered it impossible to determine whether or not the *Ovis/Capra* pieces were from domesticated animals.

	debitage	tools	total
cores	140	5	145
core elements	16	0	16
primary flakes	76	62	138
flakes	1683	577	2260
blades	293	351	644
spalls	344	55	399
chunks	672	31	703
chips	3753	0	3753
total	6977	1081	8058

Fig.5.2 2321:absolute proportions of excavated debitage groups

A total of 8058 chipped stone artefacts was recovered from the soundings, and 204 tools from the surface collections (Figs. 5.2,5.5). Surface debitage and waste has not been included in the analysis. Of the 8058 artefacts from the soundings, 1081 were retouched tools, 232 were cores or core trimming and preparation elements, 1976 were blanks, 344 were burin spalls and the rest were waste pieces. The industry is essentially flake-based with 58% of all the tools made on flakes. The ideal blank for burin production seems to be an elongated flake or thick blade but there is little evidence of careful selection of blanks for tool production. Burins are found on a wide variety of oddly shaped pieces. Mean length/width measurements for burins from the soundings are 47.61/25.11 mm. Of a sample of 100 flakes and 100 blades (Fig.5.3) more than half of each group exhibited plain platforms, a marked contrast to the PPNB industry, although 36% of the blades had punctate platforms, probably from soft hammer blank removal. The virtual absence of bipolar cores is demonstrated by the directionality of the blades sample where 84% are unidirectional. Natural backing is more common than in the PPNB and an appreciable amount of the blanks have cortical platforms (34% of flakes, 17% of blades).

The blanks are made on irregular flake cores, ususally with little or no preparation as is demonstrated by the high proportions of natural backing and cortical platforms among both blanks and tools. Sometimes Levallois cores from a scatter adjacent to the site have been reused. The double patination is quite marked and easy to identify in these examples. There seems to be little attempt to influence blank production deliberately through core selection and preparation, although a very few core preparation elements were recovered from the sounding. The elongated flakes and short thick blades typical of the industry represent the first removals from a rough chunk of flint, usually using a flat cortical surface as a striking platform.

The tools recovered from the soundings (Fig.5.5) were typical of the "burin site" industry, an overwhelming proportion of burins on concave truncations (the distinctive Mejalla burins), some crude flake scrapers, bifacial pieces, borers and drills, the former on flakes or thick blades, the latter on burin spalls, and a very few small pressure-flaked arrowheads. The raw material used is a distinctive local variety of medium grain chert ranging in colour from brick red to pale rose with cream bands. It can be found in several places near the site, eroding out of beds in the limestone cliffs.

The raw material used for the beads was mostly a soft friable pinkish stone, possibly limestone partially altered by contact with molten lava . Some worked pieces of a light green stone were also found. This is a pseudo-marble formed by solutions in the local limestone (Garrard pers. comm.) It comes from a source just west of Wadi Jilat and is found in small quantities on a number of the desert sites, either as small chips or worked fragments.

Platform types	flake	blade
plain	77	50
dihedral	2	4
multiple facet	10	2
punctate	8	36
absent	3	8

Directionality	blade
unidirectional	84
bidirectional	6
indeterminate	10

Natural backing	flake	blade
present	14	37
absent	86	63

Cortex % (cp: cortical platform)	flake	blade
0	36	51
0 + cp	21	8
1-10	16	22
1-10 + cp	7	7
10-50	8	10
10-50 + cp	3	2
50-90	4	0
50-90 + cp	3	0
100	2	0
100 + cp	0	0

Fig.5.3 2321:analysis of 100 flakes and 100 blades semi-randomly selected from excavated batches (based on Rollefson & Abu Ghaneima 1983).

mm	FW	BLW	BUL	BUW	CL
0-5	1	1	0	0	0
6-10	0	24	0	2	0
11-15	10	58	0	54	0
16-20	55	76	1	129	0
21-25	104	50	3	179	1
26-30	138	19	32	169	1
31-35	119	13	37	125	7
36-40	76	1	102	66	10
41-45	38	1	171	41	19
46-50	18	0	164	19	18
51-55	19	0	102	7	27
56-60	4	0	106	5	16
61-65	1	0	42	1	17
66-70	0	0	19	1	12
71-75	2	0	15	1	7
76-80	0	0	3	0	2
81-85	0	0	1	0	1
86-90	0	0	0	0	1
91-95	0	0	1	0	1
total	585	243	799	799	140
average	30.92	18.5	47.61	25.11	53.88

FW flake width
BLW blade width
BUL burin length
BUW burin width
CL core (maximum dimension)

Fig.5.4 2321:absolute and average dimensions of cores, blanks and burins
(based on semi-randomly selected sample of excavated blanks)

	surface	excavated	total
arrows	1	3	4
burins	149	877	1026
sickles	0	0	0
scrapers	23	38	61
bifacials	16	16	32
borers	3	54	57
other	1	0	1
retouch	11	93	104
total	204	1081	1285

Fig. 5.5 2321:absolute proportions of major tool groups

Tools

Tools from the "burin sites" have been classified according to the typology for the Neolithic described in Chapter 4.

arrows:

Arrowheads are very rare on "burin sites". The early forms, Types 1 to 5, do not normally occur in "burin site" assemblages . Only 4 arrowheads were found at Jebel Naja, 1 from the soundings and 3 on the surface. Of these 4, 3 were Type 6 and 1 was a transverse arrowhead, Type 9.

burins:

As might be expected, the burin group was overwhelmingly dominated by concave truncation burins. Burins themselves constitute 81.1% of all excavated tools and of these, 91.3% belong to the truncation class. The rest of the total count of 1026 pieces was made up by 4 dihedral burins, 11 burins on a break, 5 burins nucléiform and 23 broken burins.

sickles:

No sickles were found at Jebel Naja.

scrapers:

61 scrapers were found at the site, 23 from the surface and 38 from the excavations. Of these, the first two types, the tabular and the flake scraper, are most common - 20 and 26 examples respectively. There were also 6 sidescrapers, 2 denticulated scrapers and 7 endscrapers. All types were more or less evenly divided between surface and excavated deposits.

bifacial tools:

Like the arrowheads, these are potentially useful cultural indicators. They occur in small numbers on most "burin sites". 32 were found at Jebel Naja, 16 from the surface and 16 from the soundings. Of these, 18 were tile knives, 13 foliate bifaces and 1 was an example of Type 3.

borers:

Type 2, the drill bit on a spall, is one of the hallmarks of the "burin site" industry. The size of the tool makes it more difficult to find on surface sites, although careful survey will recover quite a few, but the sieved deposits at Jebel Naja made it possible to collect a good sample of 52 pieces. 5 borers were also found, 2 on the surface and 3 in the soundings.

S: surface
E: excavated

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	1	0	0	0	(0)	1
E	0	0	0	0	0	2	0	0	1	(0)	3
total	0	0	0	0	0	3	0	0	1	(0)	4

Burins

type	1	2	3	4	5	(6)	total
S	0	138	3	2	4	(2)	149
E	4	799	43	9	1	(21)	877
total	4	937	46	11	5	(23)	1026

Sickles

type	1	2	total
S	0	0	0
E	0	0	0
total	0	0	0

Scrapers

type	1	2	3	4	5	total
S	7	10	3	1	2	23
E	13	16	3	1	5	38
total	20	26	6	2	7	61

Bifacials

type	1	2	3	total
S	9	7	0	16
E	9	6	1	16
total	18	13	1	32

Borers

type	1	2	total
S	2	1	3
E	3	51	54
total	5	52	57

Fig.5.6 2321:absolute proportions of tool groups

	S	E	total
dihedral burin	0	2	2
offset dihedral burin	0	1	1
tanged dihedral burin	0	0	0
multiple dihedral burin	0	1	1
transverse truncation burin	1	2	3
oblique truncation burin	1	3	4
concave truncation burin	77	532	609
tanged truncation burin	0	0	0
multiple truncation burin	59	262	321
burin on break	2	37	39
tanged burin on break	0	0	0
multiple burin on break	1	6	7
multiple mixed burin	2	9	11
burin nucleiform	4	1	5
(broken burin)	(2)	(21)	(23)
total	149	877	1026

Fig.5.7 2321: absolute proportions of burin types

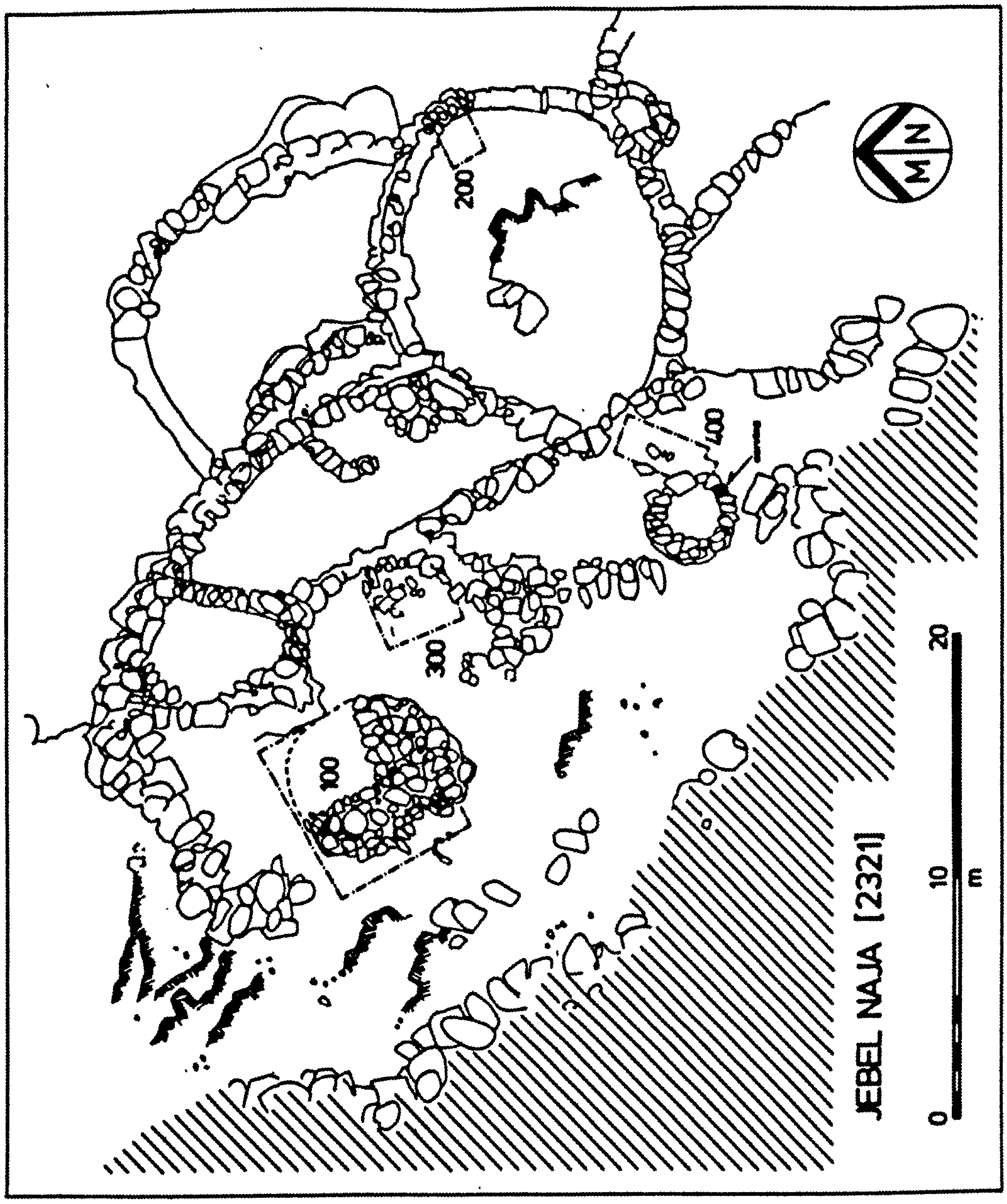


Fig. 5.8 2321: site plan

Figure 5.9 2321 Jebel Naja

1-3 cores

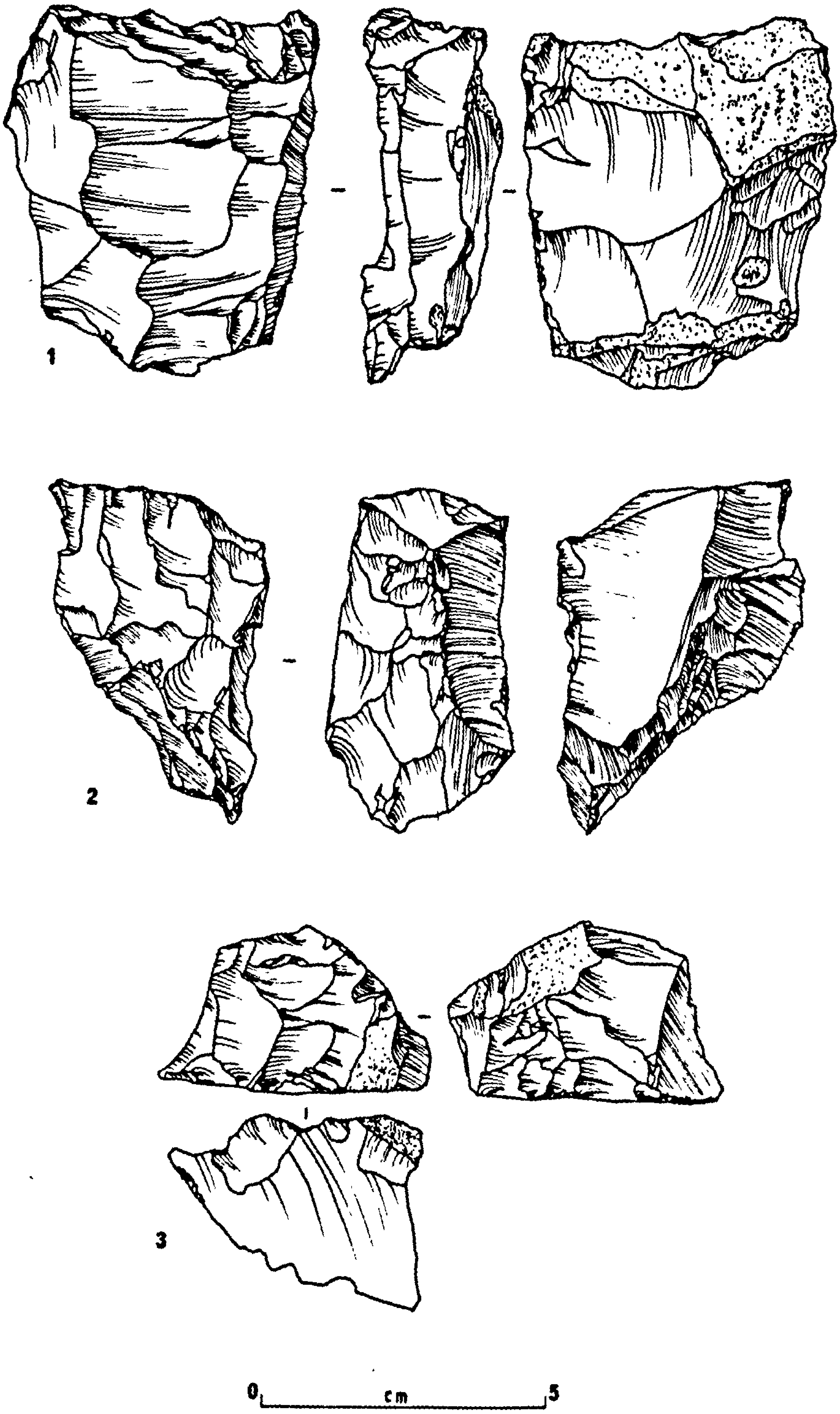

1
2
3
0 cm 5

Figure 5.10 2321 Jebel Naja

1	burin 2iii
2	burin 2vii
3	burin 2iii
4	burin 2vii
5	burin 2vii
6	burin 2iii
7	burin 2vii
8	burin 2vii
9	burin 2vii
10	burin 2i
11	burin 2vii

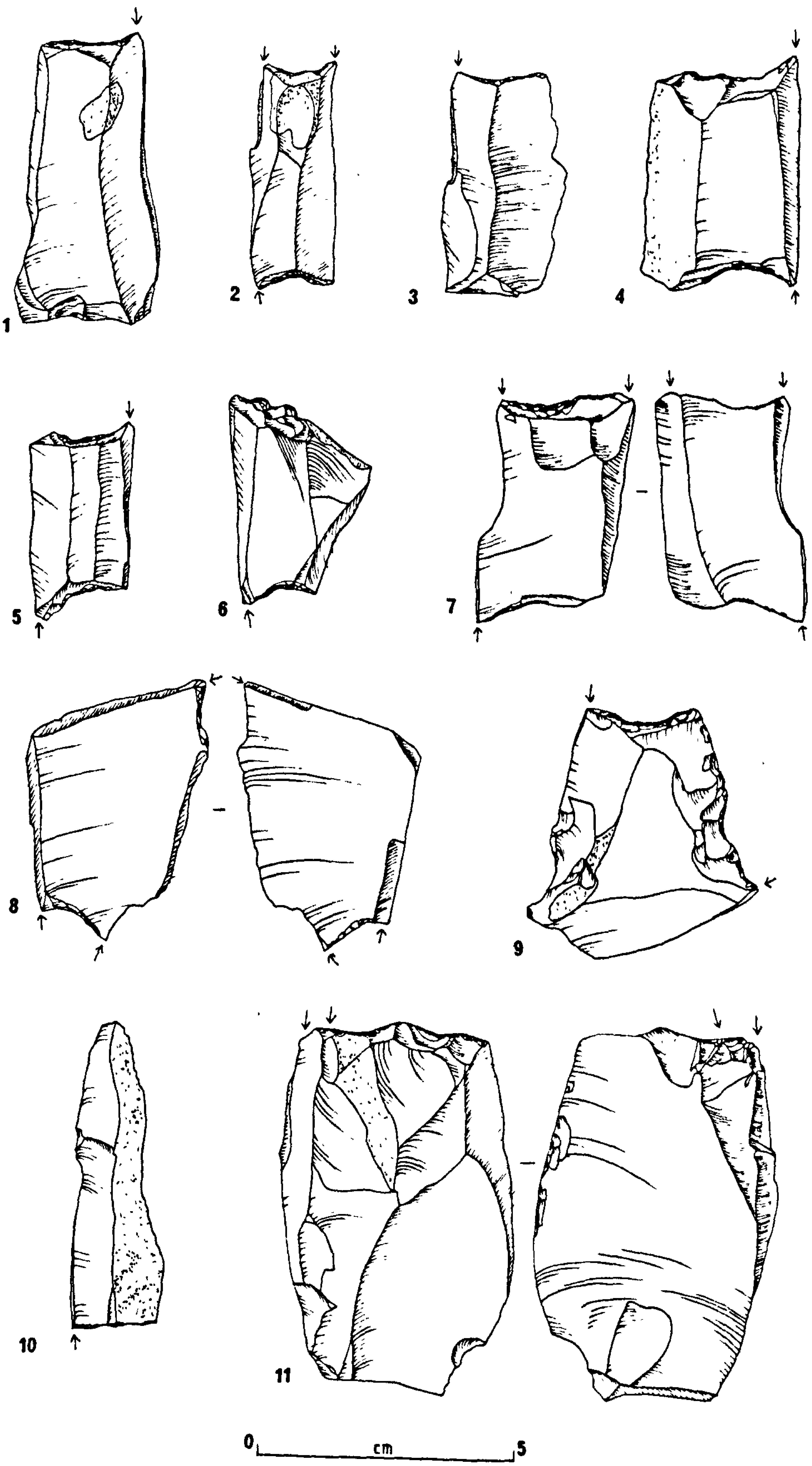

1
2
3
4
5
6
7
8
9
10
11
0 cm 5

Figure 5.11 2321 Jebel Naja

1 burin 2vii
2 burin 2iii
3 burin 2vii
4 scraper 1
5 scraper 4
6 scraper 5i
7 scraper 1
8 scraper 2
9 scraper 1

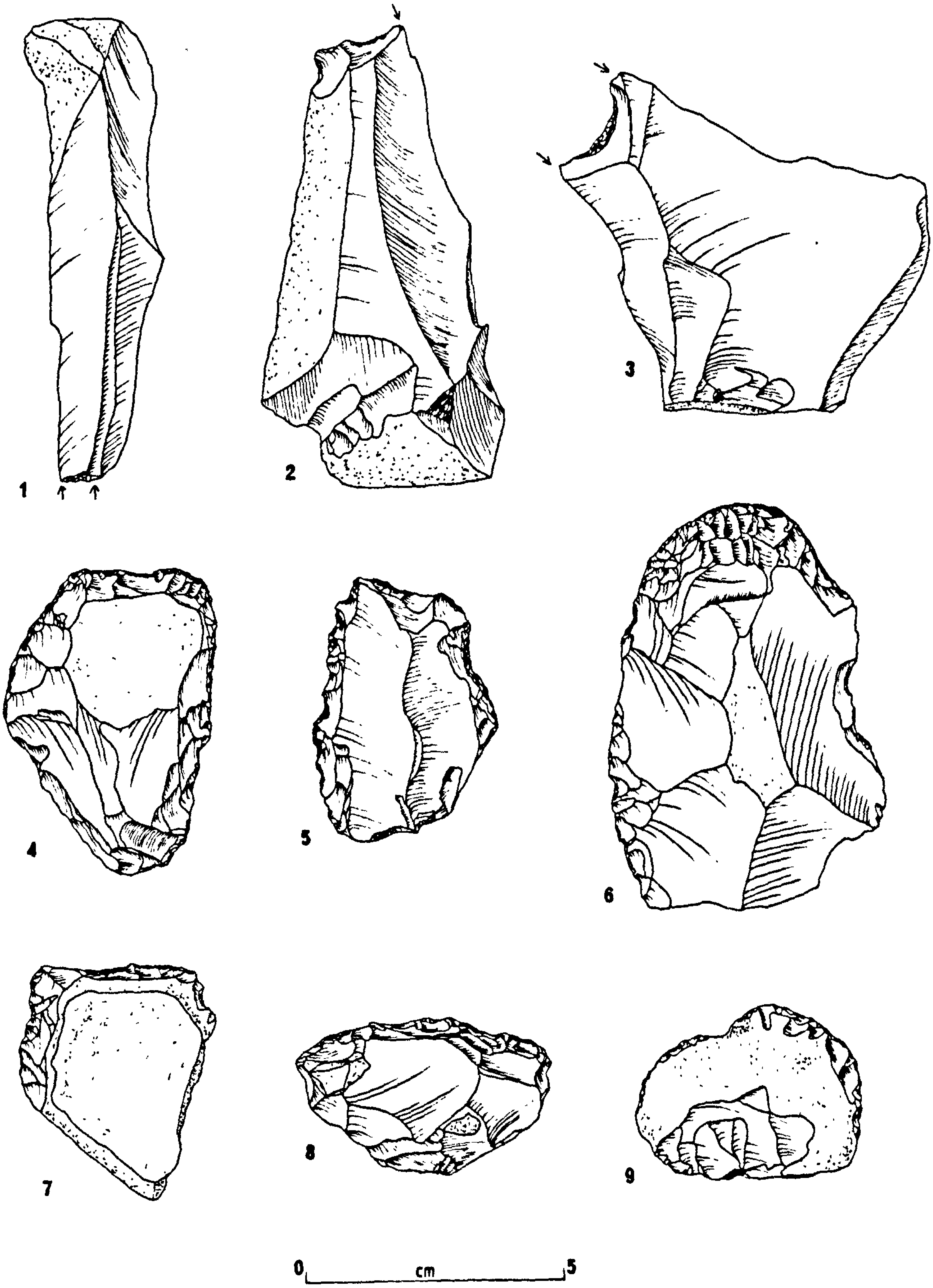
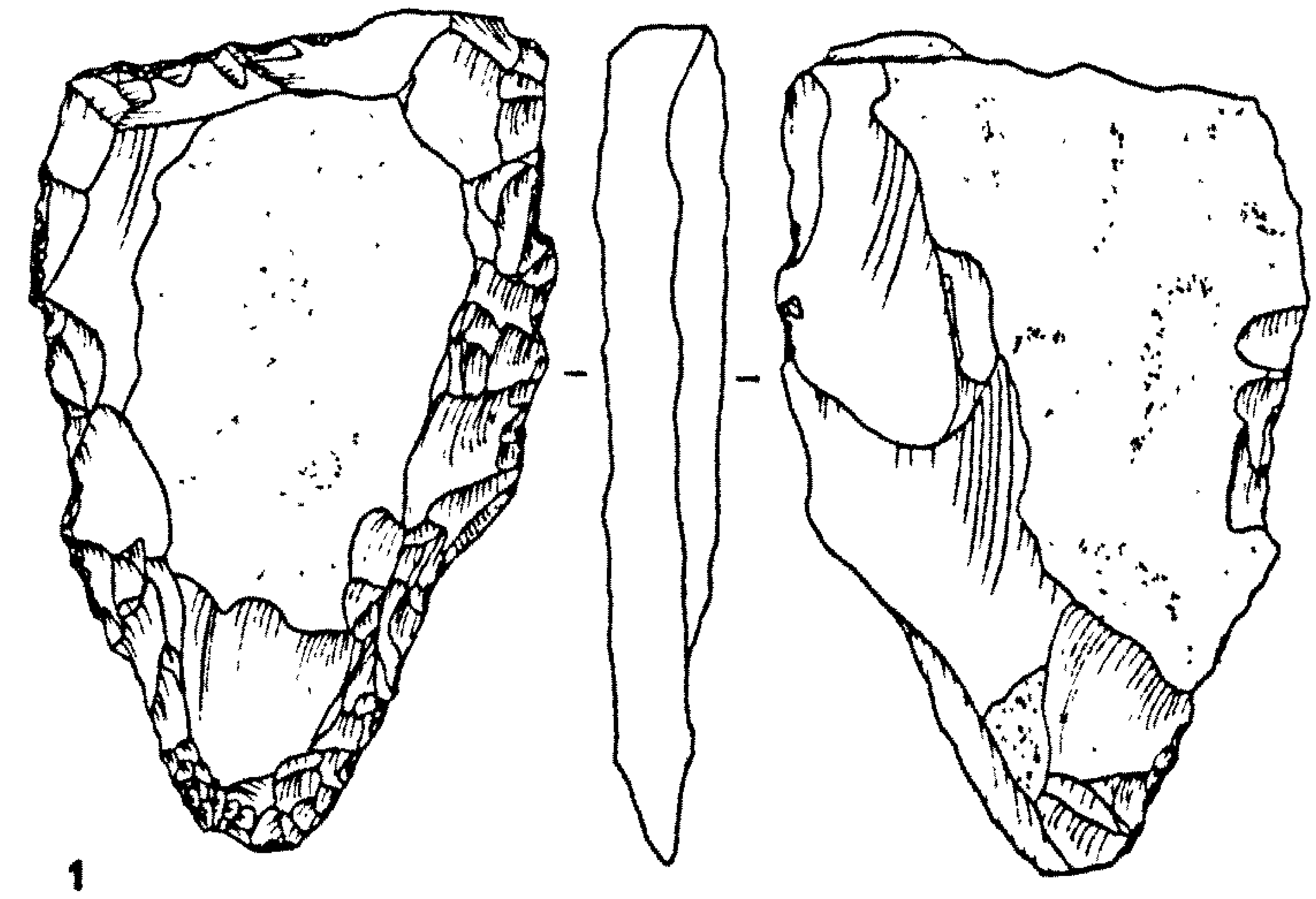
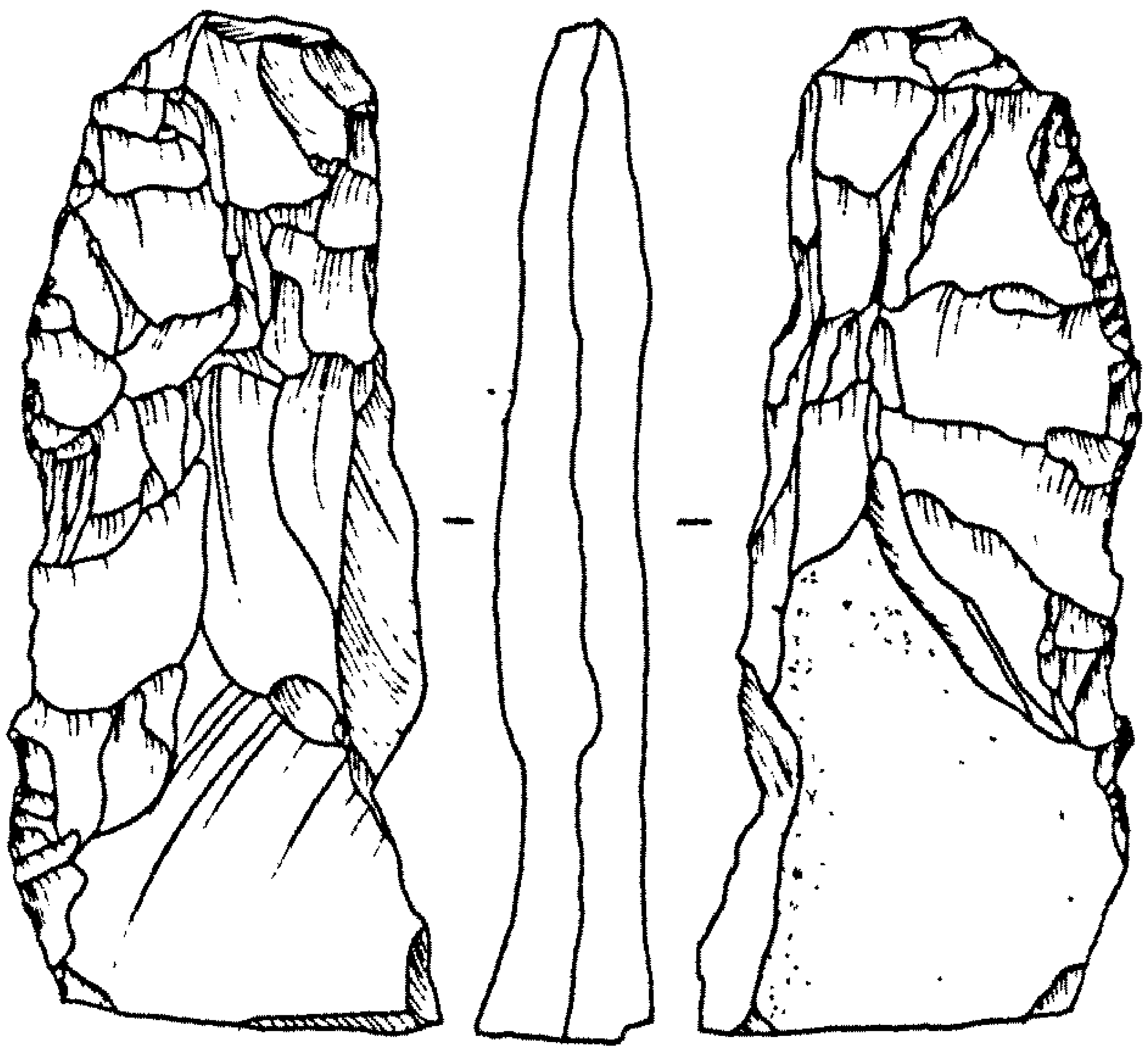

1
2
3
4
5
6
7
8
9
0 cm 5

Figure 5.12 2321 Jebel Naja

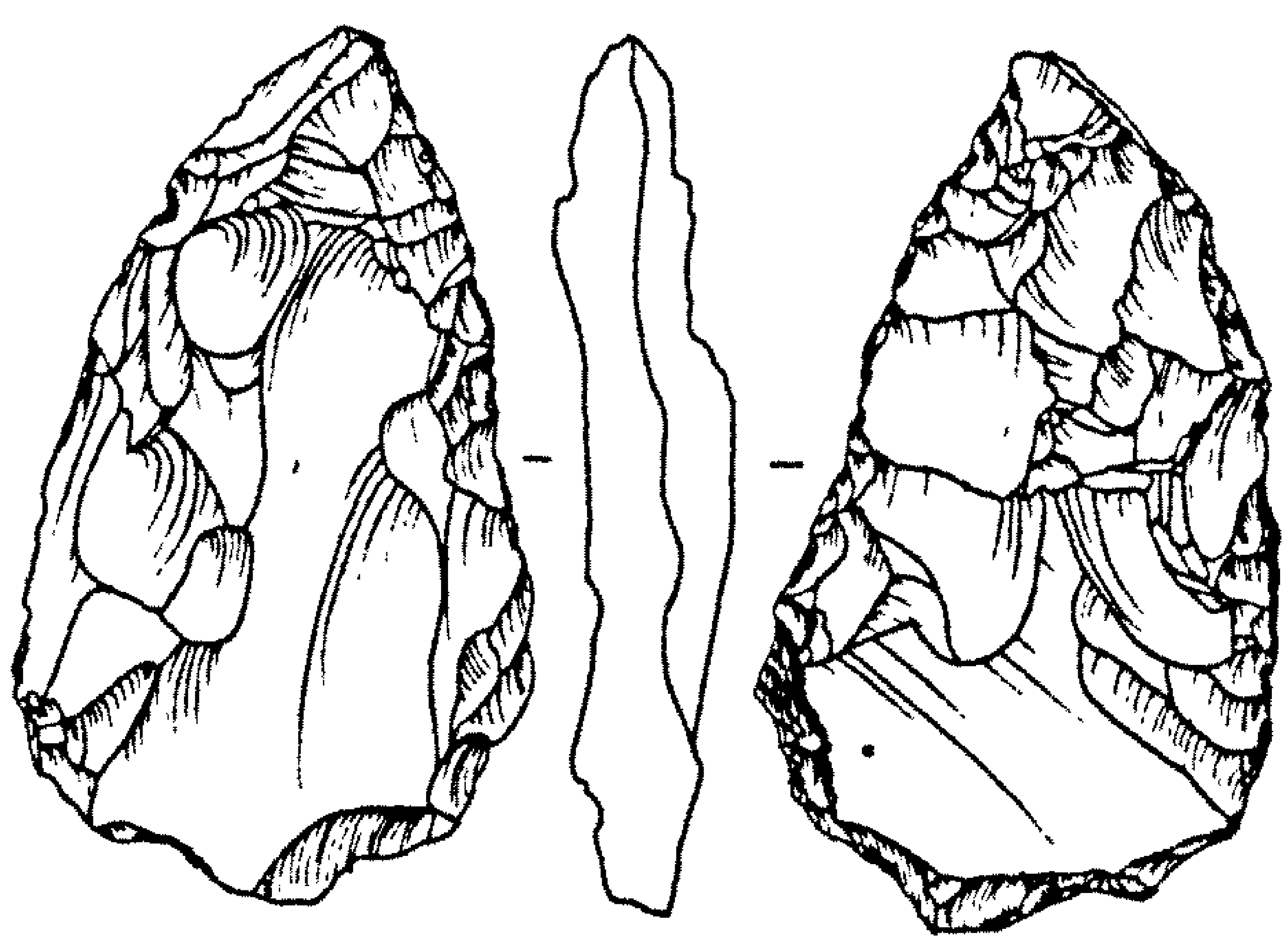
1 bifacial 1
2 bifacial 1
3 bifacial 2



1



2

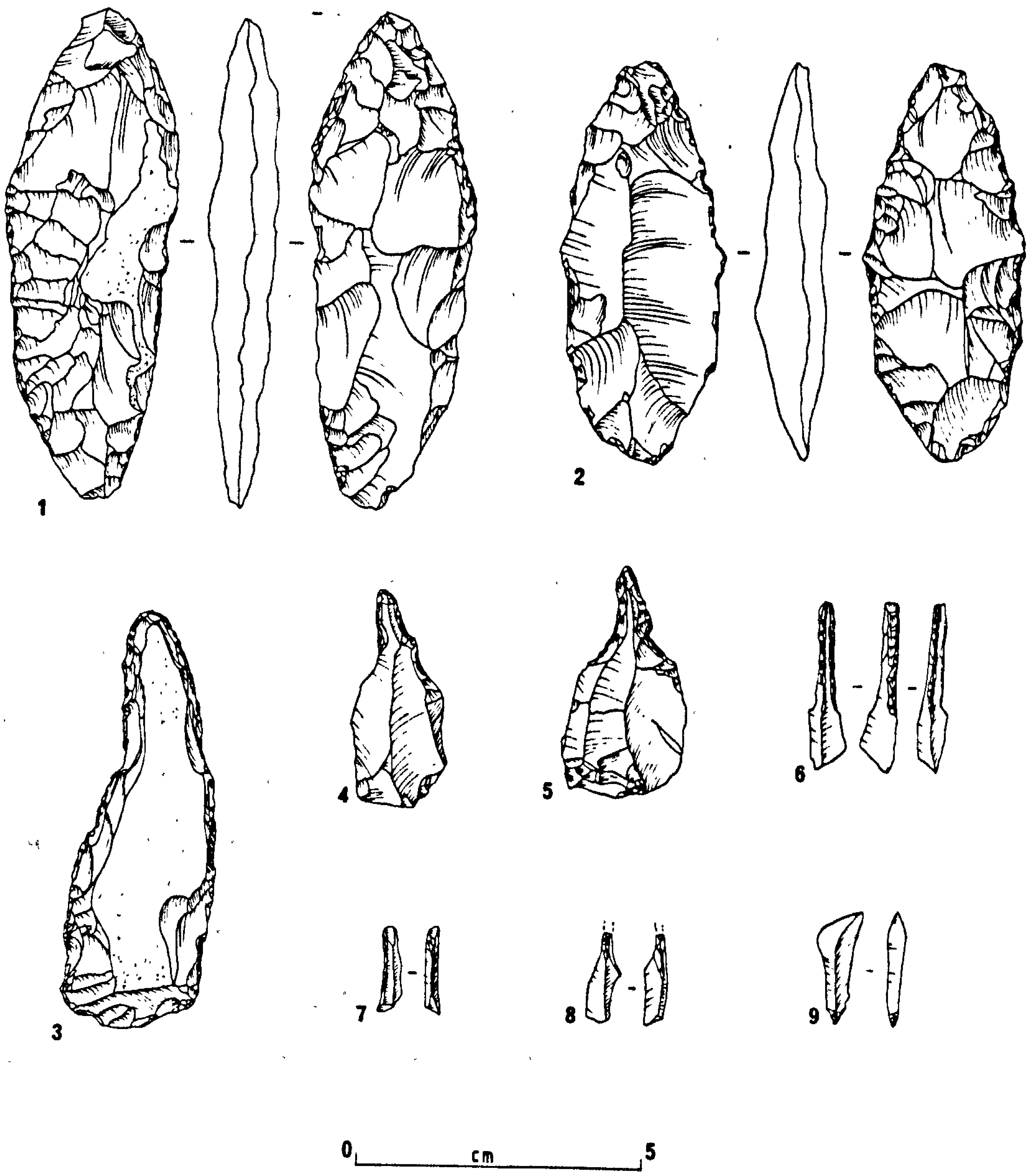


3

0 cm 5

Figure 5.13 2321 Jebel Naja

1 bifacial 2
2 bifacial 2
3 borer 1
4 borer 1
5 borer 1
6 borer 2
7 borer 2
8 borer 2
9 borer 2


1
2
3
4
5
6
7
8
9
0 cm 5

Survey sites

82 "burin sites" or scatters have been located in the course of the survey. It would be excessive to describe them all in detail here and so only those seven with more than 99 tools among the surface collections have been outlined below. They quite adequately represent the range of assemblages and site locations encountered among the complete sample of sites and scatters.

1601

1601 is an extensive scatter of huts and terraces lying on an east-facing slope on the north side of the Qurma massif, overlooking the south bank of Wadi Rajil. The structures have seen much re-use and rebuilding although they are rather too far up the slope to be used by the beduin today. There is an abundant supply of chert available locally, eroding out of the limestone beds exposed below the basalt cap of the massif.

The site is large and has probably seen several reoccupations even within the later Neolithic as the "burin site" debitage tends to be concentrated in three or four different places across the hillside. The assemblage is very similar to that of Jebel Naja (2321) discussed above. Cores are irregular and unprepared and blanks are typically short thick blades or irregular flakes with plain platforms and often natural backing. 85% of all tools are concave truncation burins and out of 312 of these, 160 were multiple pieces. The only other burins are 4 burins on a break and 1 multiple mixed burin. Scrapers are quite common but bifacial pieces are rare.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	0	0	0	0	(0)	0

Burins

type	1	2	3	4	5	(6)	total
S	1	307	4	0	0	(0)	312

Sickles

type	1	2	total
S	0	1	1

Scrapers

type	1	2	3	4	5	total
S	4	7	1	1	4	17

Bifacials

type	1	2	3	total
S	0	1	0	1

Borers

type	1	2	total
S	10	0	10

Fig.5.14 1601:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	0
6-10	0	1
11-15	0	33
16-20	0	78
21-25	2	104
26-30	9	52
31-35	16	23
36-40	38	11
41-45	54	3
46-50	54	0
51-55	42	0
56-60	40	0
61-65	18	0
66-70	14	0
71-75	13	0
76-80	2	0
81-85	1	0
86-90	0	0
91-95	1	0
96-100	1	0
total	305	305
average	49.67	22.93

Fig.5.15 1601: absolute and average dimensions of concave truncation burins

1630

This is an amorphous scatter of corrals and cleared areas straddling a low basalt promontory on the south side of Qa'a Mejalla, a few kilometres north-east of 1601. There is a "jellyfish" enclosure on the end of the promontory (see Helms 1981:Pl 9) and the scatter of "burin site" debitage lies around this and back down along the east facing side of the slope. As with 1601 above, local outcrops of limestone provide sources for the poor quality tabular chert used at the site. Because it lies only a little above the mudflat and immediately adjacent to the relatively rich grazing of Qa'a Mejalla, the site has been extensively re-used by beduin. Again the assemblage is similar to that of Jebel Naja, irregular unprepared cores and blanks with plain, often cortical platforms. 82.6% of all tools are concave truncation burins. The rest of the assemblage is made up of a few scrapers, bifacials and retouched pieces. 1 sickle blade and 1 transverse arrowhead were also found.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	0	0	0	1	(0)	1

Burins

type	1	2	3	4	5	(6)	total
S	1	87	0	0	0	(2)	90

Sickles

type	1	2	total
S	1	0	1

Scrapers

type	1	2	3	4	5	total
S	3	0	0	0	0	3

Bifacials

type	1	2	3	total
S	0	3	0	3

Borers

type	1	2	total
S	2	0	2

Fig.5.16 1630:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	0
6-10	0	1
11-15	0	7
16-20	1	26
21-25	1	29
26-30	9	16
31-35	8	5
36-40	14	1
41-45	24	2
46-50	10	0
51-55	6	0
56-60	11	0
61-65	1	0
66-70	1	0
71-75	1	0
76-80	0	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	87	87
average	43.22	22.66

Fig.5.17 1630: absolute and average dimensions of concave truncation burins

1636

This site was first located in 1979 on the preliminary survey and published as QMJ 1c (Betts 1982a). It lies between 1601 and 1630, on the downstream end of Qa'a Mejalla and consists of a small cluster of corrals on the east side of a low basalt ridge in a sheltered bay formed by the silted arm of a small tributary of Wadi Rajil. Again because of its proximity to the qa'a, it has been extensively re-used by beduin and many of the visible walls are recently constructed. Lines of earlier walls can also be made out below these.

The surface of the site was thickly strewn with flint, much of it with a whitish patina. Cores were irregular and unprepared and blanks mostly short thick blades and stubby flakes. 77% of all tools were concave truncation burins. Flake scrapers were quite common and there were a few bifacial pieces, 1 borer and 1 bifacially worked arrowhead.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	1	0	0	0	(0)	1

Burins

type	1	2	3	4	5	(6)	total
S	0	77	1	1	0	(2)	81

Sickles

type	1	2	total
S	0	0	0

Scrapers

type	1	2	3	4	5	total
S	2	10	0	0	2	14

Bifacials

type	1	2	3	total
S	1	2	1	4

Borers

type	1	2	total
S	1	0	0

Fig.5.18 1636:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	0
6-10	0	4
11-15	0	24
16-20	1	22
21-25	1	13
26-30	6	12
31-35	3	0
36-40	4	0
41-45	10	0
46-50	20	0
51-55	11	0
56-60	8	0
61-65	7	0
66-70	2	0
71-75	1	0
76-80	1	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	75	75
average	48.28	18.58

Fig.5.19 1636: absolute and average dimensions of concave truncation burins

2303

2303 lies on the edge of the mudflat below a low basalt peak, part of a series of rolling basalt hills immediately east of Wadi Qattafi a few kilometres from the modern wells. The site faces west and is somewhat exposed to the duststorms that sweep the local mudflats quite frequently, but is close to the fairly rich grazing afforded by Wadi Qattafi. It consists mainly of a scatter of darkly patinated flint with one or two irregular corrals. Flint is available about five kilometres to the north where the limestone beds are exposed at the edge of the main basalt plateau. Poorer outcrops can also be found on the slopes of the table mountains to the south-west.

The assemblage is very similar to those of the sites discussed above. Blanks tend to be slightly longer and the chert used is quite fine grained and dark grey in colour. Concave truncation burins constituted 88.5% of all tools, scrapers were rare and bifacials well represented.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	0	0	0	0	(0)	0

Burins

type	1	2	3	4	5	(6)	total
S	2	133	5	0	0	(7)	147

Sickles

type	1	2	total
S	0	0	0

Scrapers

type	1	2	3	4	5	total
S	0	4	0	0	0	0

Bifacials

type	1	2	3	total
S	6	5	0	11

Borers

type	1	2	total
S	1	0	1

Fig.5.20 2303:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	2
6-10	0	2
11-15	0	21
16-20	0	46
21-25	2	34
26-30	7	23
31-35	4	5
36-40	20	0
41-45	26	0
46-50	20	0
51-55	20	0
56-60	16	0
61-65	12	0
66-70	2	0
71-75	3	0
76-80	1	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	133	133
average	47.99	20.19

Fig.5.21 2303: absolute and average dimensions of concave truncation burins

2308

2308 lies on the southern fringes of the main lava massif overlooking a small wadi which drains into the open gravel plains of the "Qurma Gap". It consists of a series of corrals and open areas on a col between two basalt promontories overlooking a small qa'a which forms part of a chain on a minor internal route through the basalt to Wadi Rajil north of Qa'a Mejalla. This route is used by beduin today, but the site is slightly too high above the basalt margins to have been extensively re-occupied.

There is quite a dense scatter of grey flint over the col, probably obtained from sources at the edge of the plateau nearby. There was a large collection of flint from the site, with 85.% of the tool count made up of concave truncation burins. Other burin types were present in low quantities - 4 burins on a break, 3 dihedral burins and 8 broken burins. There were also one arrowhead, some scrapers and bifacial pieces, and a few borers.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	1	0	0	0	(0)	1

Burins

type	1	2	3	4	5	(6)	total
S	3	317	4	0	0	(8)	332

Sickles

type	1	2	total
S	0	0	0

Scrapers

type	1	2	3	4	5	total
S	0	13	0	0	0	13

Bifacials

type	1	2	3	total
S	2	4	0	6

Borers

type	1	2	total
S	0	4	4

Fig.5.22 2308:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	2
6-10	0	3
11-15	0	41
16-20	2	100
21-25	3	100
26-30	12	48
31-35	16	15
36-40	39	7
41-45	55	0
46-50	69	0
51-55	47	0
56-60	40	0
61-65	17	0
66-70	8	0
71-75	6	0
76-80	2	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	316	316
average	48.13	21.26

Fig.5.23 2308: absolute and average dimensions of concave truncation burins

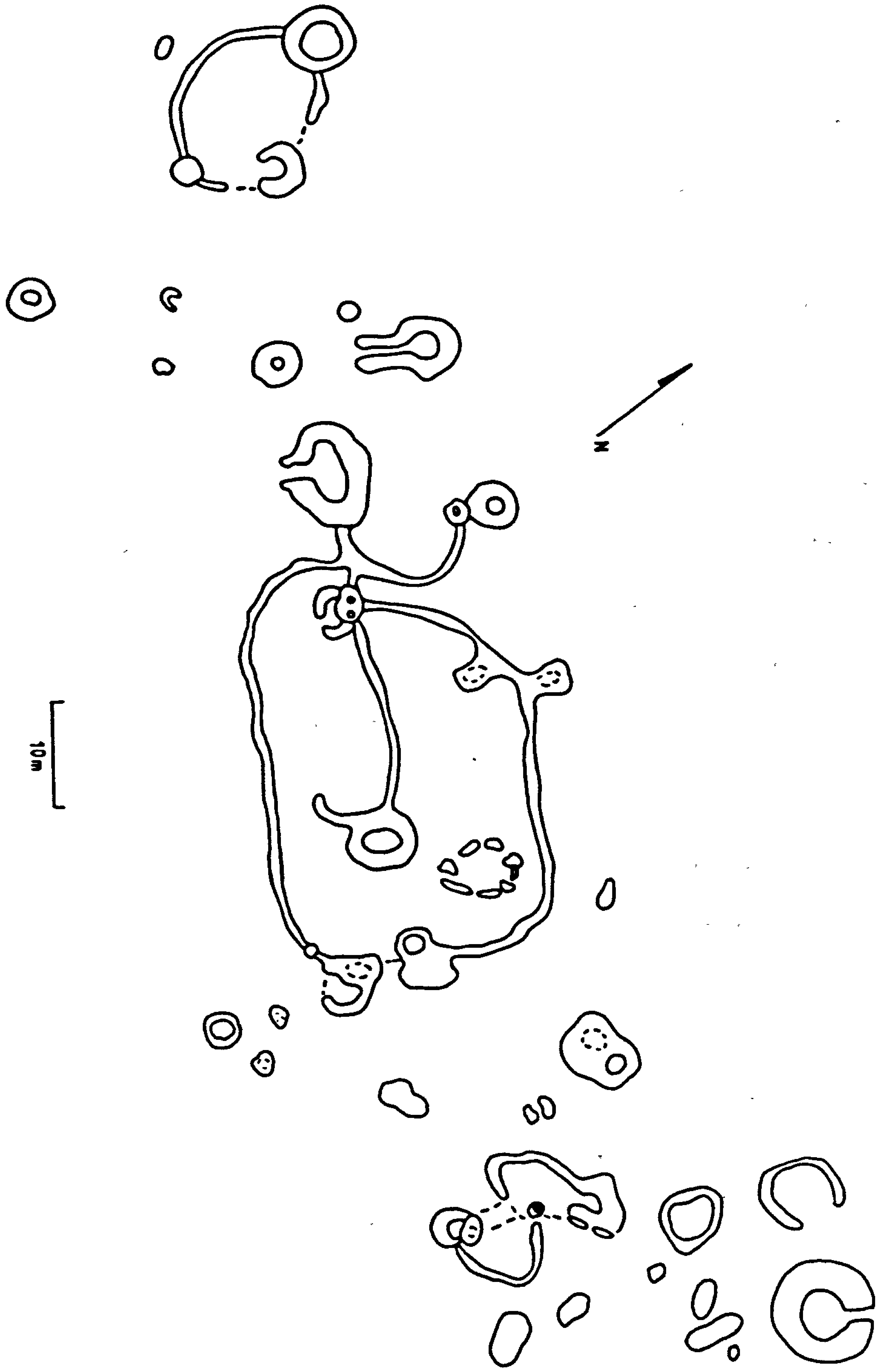


Fig. 5.24 2329: site plan

2329

This is one of a group of slightly different "burin sites". of which a number was found at the extreme southern end of Qa'a Dhuweila. They include extensive complexes of walls and cleared areas each lying about a kilometre apart. 2329 is the most easterly of the sites. It lies on a low basalt ridge with the land falling away northwards towards Qa'a Dhuweila and southwards across the basalt plateau towards the Qurma Gap. A number of structures seem to relate to the extensive flint scatter at the site. The construction methods are interesting; two curving parallel walls of upended basalt slabs in a rough horseshoe shape with further slabs of basalt laid across the top, used to build randomly scattered huts linked by low enclosure walls (Fig.5.24).

The assemblage belongs to the "burin site" industry but is subtly different. The burins tend to be smaller and finer, and there are greater numbers of worked spalls. The cores are smaller and although still quite irregular and unprepared, tend more towards blade production. Most of them have been extensively used, a practice which contrasts with that of 2321 and the other "burin sites" where often only a few blanks have been removed before the core is discarded. This may be due at least in part to the lack of local chert sources near 2329.

The wadi draining Qa'a Dhuweila has cut a series of deep pools near to this group of "burin sites" which seem to have provided a magnet for settlement as there is an unusual concentration of sites in the area.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	0	0	0	0	(0)	0

Burins

type	1	2	3	4	5	(6)	total
S	3	75	7	3	2	(11)	101

Sickles

type	1	2	total
S	0	0	0

Scrapers

type	1	2	3	4	5	total
S	0	2	0	0	0	2

Bifacials

type	1	2	3	total
S	2	2	0	2

Borers

type	1	2	total
S	0	8	8

Fig.5.25 2329:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	0
6-10	0	3
11-15	0	22
16-20	2	27
21-25	4	14
26-30	11	7
31-35	12	0
36-40	18	0
41-45	11	0
46-50	7	0
51-55	5	0
56-60	2	0
61-65	0	0
66-70	1	0
71-75	0	0
76-80	0	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	73	73
average	37.45	17.99

Fig.5.26 2329: absolute and average dimensions of concave truncation burins

2331

2331 is very similar to 2329. It lies a little to the west, just above one of the pools on a low level basalt rise. Like 2329 it has a complex of corbelled huts and circles of standing stones linked by irregular enclosure walls and a flint industry of "burin site" type but with smaller and finer burins than most of the other sites and a number of drills on spalls. Beads, both complete and partially worked, were also found at the site.

Arrows

type	1	2	3	4	5	6	7	8	9	(10)	total
S	0	0	0	0	0	0	1	2	1	(0)	4

Burins

type	1	2	3	4	5	(6)	total
S	2	226	16	2	2	(5)	253

Sickles

type	1	2	total
S	0	0	0

Scrapers

type	1	2	3	4	5	total
S	1	4	0	0	2	7

Bifacials

type	1	2	3	total
S	6	0	0	6

Borers

type	1	2	total
S	0	40	40

Fig.5.27 2331:absolute proportions of tool groups

mm	BUL	BUW
0-5	0	0
6-10	0	13
11-15	2	84
16-20	14	73
21-25	34	40
26-30	37	7
31-35	51	2
36-40	35	1
41-45	24	0
46-50	11	0
51-55	9	0
56-60	2	0
61-65	1	0
66-70	0	0
71-75	0	0
76-80	0	0
81-85	0	0
86-90	0	0
91-95	0	0
96-100	0	0
total	220	220
average	33.34	17.00

Fig.5. 28 2331: absolute and average dimensions of concave truncation burins

site	sickles	arrows	bifaces	borers	scrapers	burins	other
1502 +	0	0	0	0	1	3	0
1514 +	1	1	1	0	1	5	0
1519 +	0	0	0	0	0	45	0
1601 *	1	0	1	10	17	312	0
1605 +	1	0	2	1	2	8	0
1609 +	0	0	1	1	12	1	0
1613 +	0	0	0	0	0	1	0
1615 +	0	0	0	0	1	24	0
1618 +	0	0	0	0	1	35	0
1622 x	0	0	4	2	5	58	0
1630 *	1	1	3	2	3	90	0
1634 +	0	0	0	0	1	15	0
1636 *	0	1	4	1	14	81	0
1640 x	0	0	0	2	0	70	0
1641 +	0	0	2	1	2	6	0
1645 +	0	0	0	2	1	39	0
1647 +	0	0	0	1	3	12	0
1648 +	0	0	0	1	1	21	0
1650 +	0	0	0	0	1	2	0
1651 +	0	0	1	0	1	4	0
1655 +	0	0	0	0	0	7	0
1657 x	0	0	1	1	1	60	0
1658 +	0	0	1	0	1	10	0
1661 +	0	0	0	0	0	6	0
1664 +	0	0	0	0	0	7	0
1667 +	0	1	0	5	1	5	0
1668 +	0	0	1	0	0	42	0
1669 +	0	0	0	0	0	5	0
1670 +	0	0	2	0	1	6	0
1673 +	0	0	2	1	3	9	0
1675 +	0	0	1	0	1	13	0
1676 +	0	0	0	1	0	26	0
1684 +	0	0	3	0	2	5	0
1691 +	0	0	0	0	0	8	0
1694 +	0	0	1	1	0	7	0
2206 +	0	0	0	0	1	4	0
2216 +	0	0	1	0	1	11	0
2217 +	0	0	0	0	1	3	0
2226 +	0	0	0	2	0	1	0
2229 +	0	2	1	6	0	25	0
2302 +	0	0	0	1	0	43	0
2303 *	0	0	11	1	4	177	0
2304 +	0	0	0	0	0	10	0
2305 +	0	0	0	0	0	16	0
2308 *	0	1	6	4	13	334	2
2309 x	0	0	1	0	1	61	0
2310 +	0	0	0	0	3	10	0
2313 x	0	0	3	1	10	40	0
2314 +	0	0	1	1	4	2	0
2315 +	0	0	2	3	5	20	0
2316 +	0	0	0	0	0	1	0
2321 $	0	3	16	54	38	877	0
2322 +	0	0	1	0	0	18	0

2323 +	0	0	0	0	0	10	0
2325 +	0	0	0	0	0	1	0
2329 *	0	0	4	8	2	101	0
2330 +	0	0	1	1	0	3	0
2331 *	0	4	6	40	7	253	0
2332 +	0	1	2	1	1	3	0
2333 +	0	0	1	0	8	10	0
2334 +	1	0	0	0	1	27	0
2338 +	0	0	0	0	2	4	0
2340 +	0	0	1	1	1	5	0
2341 +	0	0	1	0	0	8	0
2342 x	0	0	4	2	0	86	0
2343 +	0	0	4	1	1	37	0
2402 +	0	0	0	0	0	7	0
2404 +	0	0	0	0	0	13	0
2410 +	0	2	2	0	1	23	0
2910 +	0	1	1	4	2	1	0
3121 +	0	0	1	0	1	4	0
3125 +	0	0	0	0	3	7	0
3126 +	0	0	0	0	3	4	0
3128 +	0	0	0	0	0	18	0
3129 +	0	0	1	0	1	1	0
3134 +	0	0	0	0	0	4	0
3139 +	0	0	0	0	0	3	0
3140 +	0	0	0	0	0	3	0
3406 +	0	0	0	0	0	1	0
3414 +	0	0	3	1	2	37	0
3417 +	0	0	3	1	2	3	0
4206 +	0	0	0	0	2	3	0

+ survey surface collections <50 tools
x survey surface collections 50-99 tools
* survey surface collections >99 tools
/ all survey surface collections
$ 2321:excavated tools

Fig.5.29 Survey Burin Sites: absolute proportions of major tool groups

---

The chart above gives absolute figures for the proportions of tools at each survey site. Given such a large sample, it becomes clear how uniform the industry is, at least within the survey area.

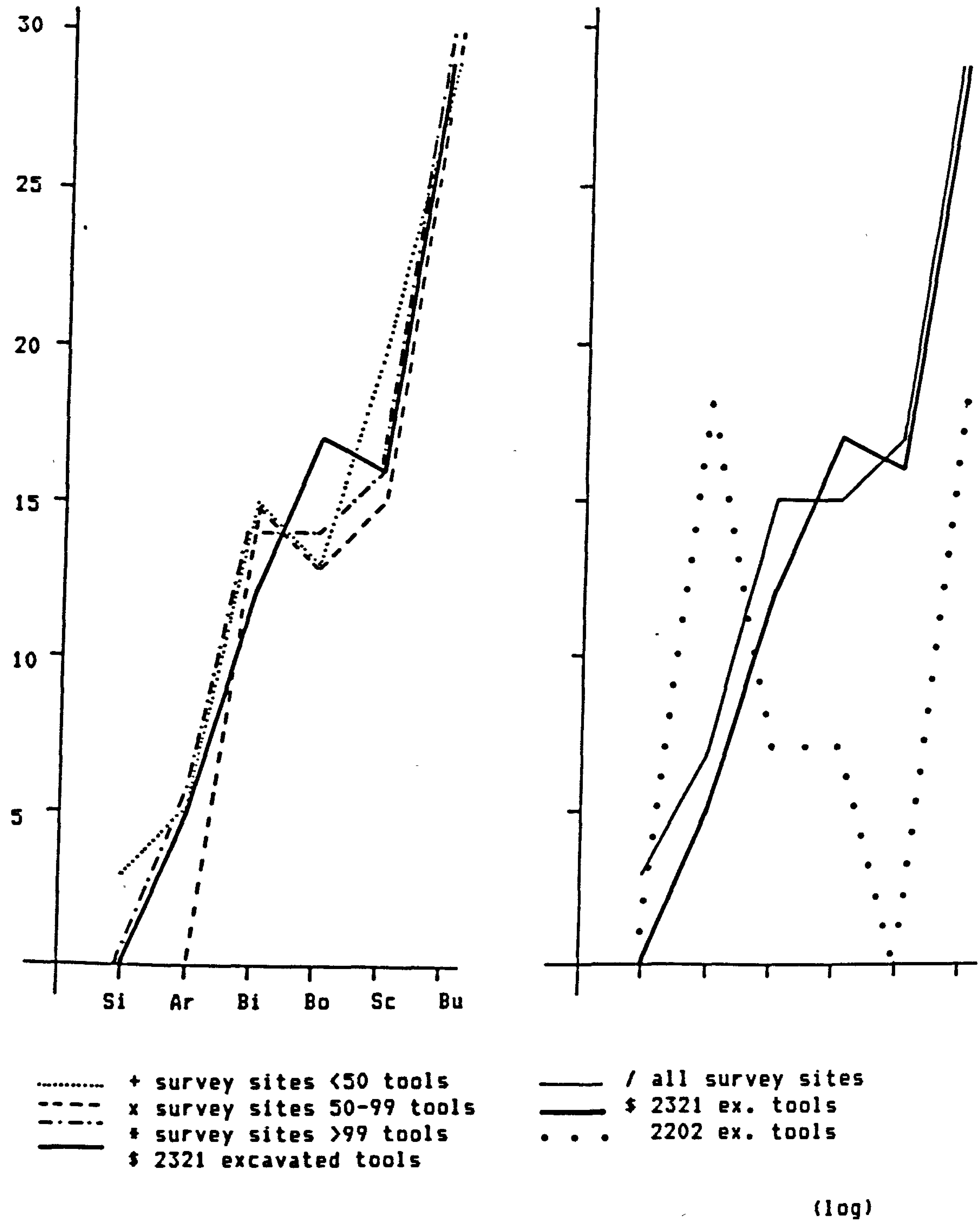


Fig.5.30 Neolithic sites:relative proportions of major tool groups

	sickles	arrows	bifaces	borers	scrapers	burins
+	3	5	15	13	20	29
x	0	0	15	13	15	30
*	0	6	14	14	16	30
/	3	7	15	15	17	29
$	0	5	12	17	16	29

Fig.5.31 Survey Burin Sites:relative proportions of major tool groups (log)

%	Si	Ar	Bi	Bo	Sc	Bu	Ot
1601	0.3	000	0.3	2.9	4.9	91.6	000
1630	1.0	1.0	3.0	2.0	3.0	90.0	000
1636	000	1.0	4.0	1.0	13.9	80.1	000
2303	000	000	5.7	0.5	2.0	91.7	000
2308	000	0.3	1.7	1.1	3.6	93.3	000
2329	000	000	3.5	7.0	1.7	87.8	000
2331	000	1.3	1.9	12.9	2.3	81.6	000

Fig.5.32 Relative proportions of major tool groups from survey sites with >99 tools.

%	Si	Ar	Bi	Bo	Sc	Bu	Ot
surface	000	0.5	7.8	1.5	11.2	73.0	000
excavated	000	0.3	1.5	5.0	3.5	81.1	000
total	000	0.3	2.5	4.4	4.7	79.8	000

Si sickle
Ar arrow
Bi bifacial
Bo borer
Sc scraper
Bu burin
Ot other

Fig.5.33 2321 relative proportions of major tool types

	Si	Ar	Bi	Bo	Sc	Bu	Ot
a)	0	0	1	0	1	113	5
b)	0	0	0	3	2	12	0
c)	0	2	3	2	6	84	4
d)	0	0	0	0	5	10	5
e)	0	0	2	0	5	24	3
f)	0	0	0	0	8	59	0
g)	0	0	0	1	3	103	2
h)	0	0	0	0	0	43	0
i)	0	0	0	1	0	15	0
j)	0	0	0	0	5	12	0
k)	0	0	0	0	0	63	5

a: Jebel Uweinid (Rollefson & Fröhlich 1982)
b: Umm Utheina (Rollefson et al. 1982)
c: Jilat 23 (Garrard et al. in prep.)
d: Jilat 14 (Garrard et al. 1985)
e: Jilat 15 (" " " ")
f: Jilat 20 (" " " ")
g: Azraq 25 (" " " ")
h: Azraq 26 (" " " ")
i: Azraq 27 (" " " ")
j: Azraq 30 (" " " ")
k: Palmyra 79 (Hanihara & Akazawa 1979)

Fig.5.34 Other Burin Sites:absolute totals of major tool groups

Fig. 5.35 Survey sites

1	2331	arrow 8
2	2331	arrow 8
3	2910	arrow 8
4	2332	arrow 9
5	2410	arrow 9
6	2331	arrow 8
7	2329	burin 4
8	2229	burin 2iii
9	2229	burin 2vii
10	2329	burin 2vii
11	1636	burin 2vii
12	1647	burin 4
13	2308	burin 2vii
14	1640	burin 2vii
15	1657	burin 2vii

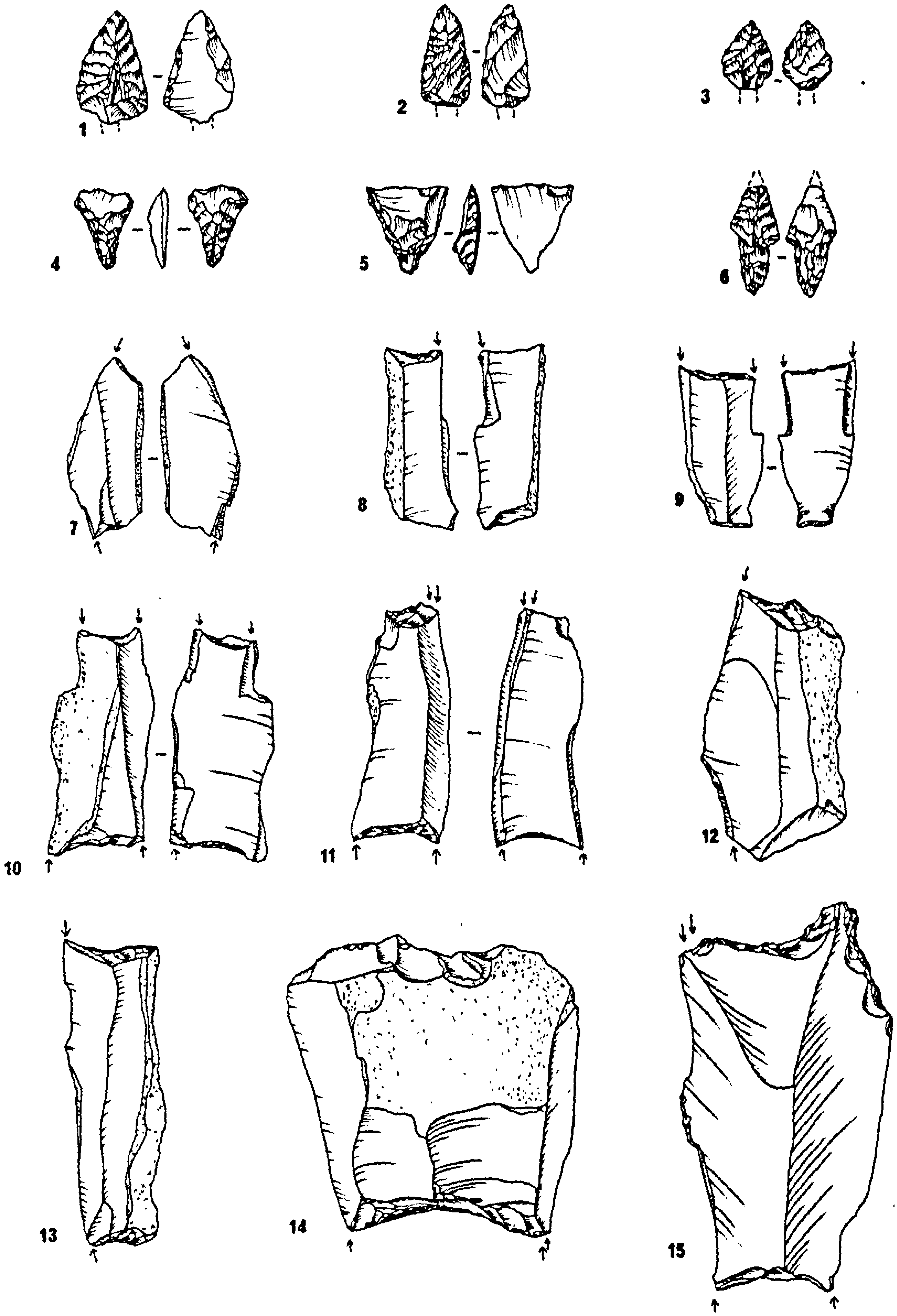

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0
cm
5

Fig. 5.36 Survey sites

1	1640	burin 2vii
2	1640	burin 2iii
3	2302	burin 5
4	1694	burin 5
5	1658	burin 2vii
6	1601	sickle 2
7	1605	sickle 1
8	1636	scraper 1
9	1673	scraper 1

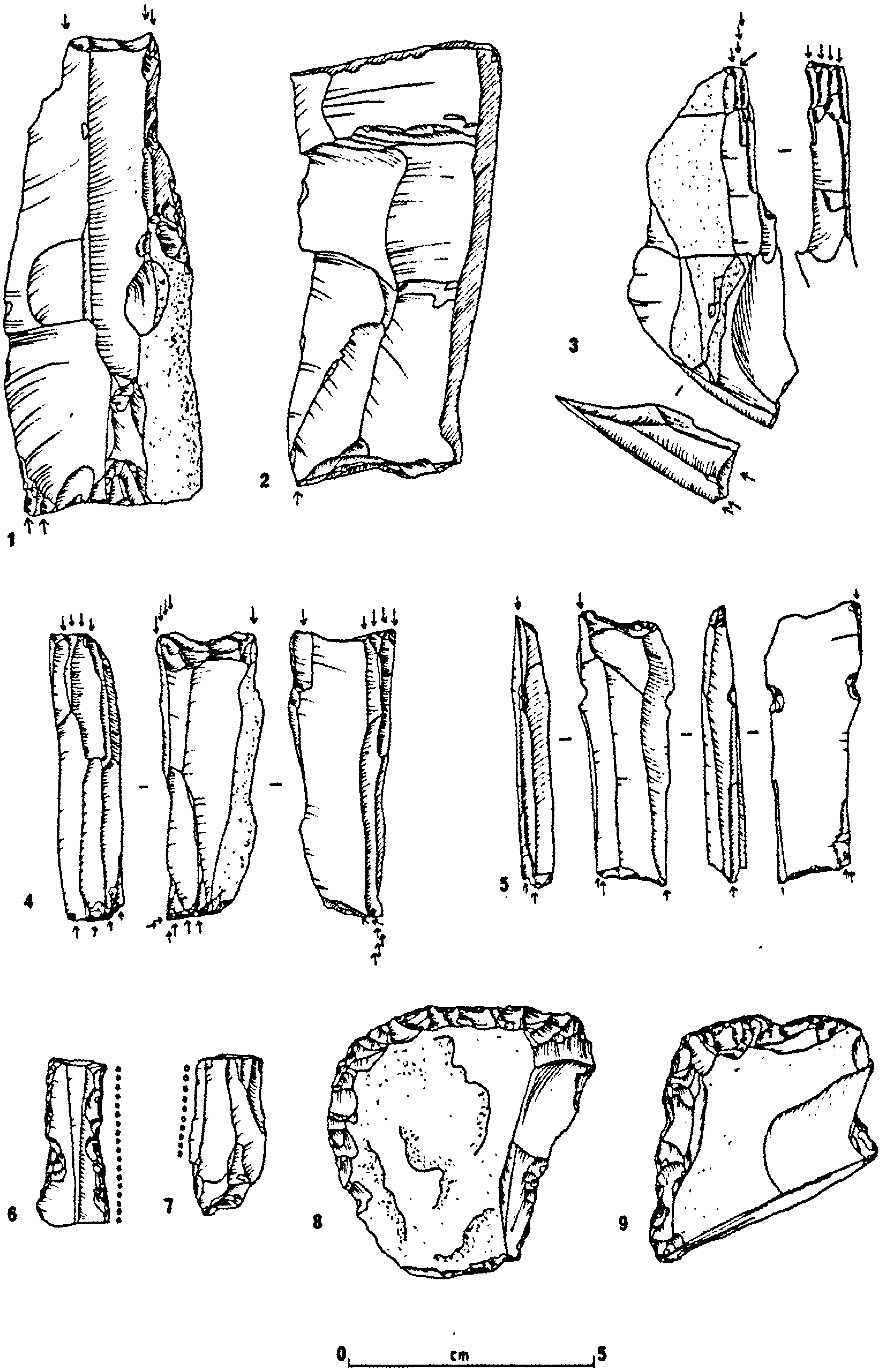

1
2
3
4
5
6
7
8
9
0 cm 5

Fig. 5.37 Survey sites

1	1636	scraper 1
2	1645	scraper 1
3	1636	scraper 5i
4	1641	scraper 3
5	1636	bifacial 1

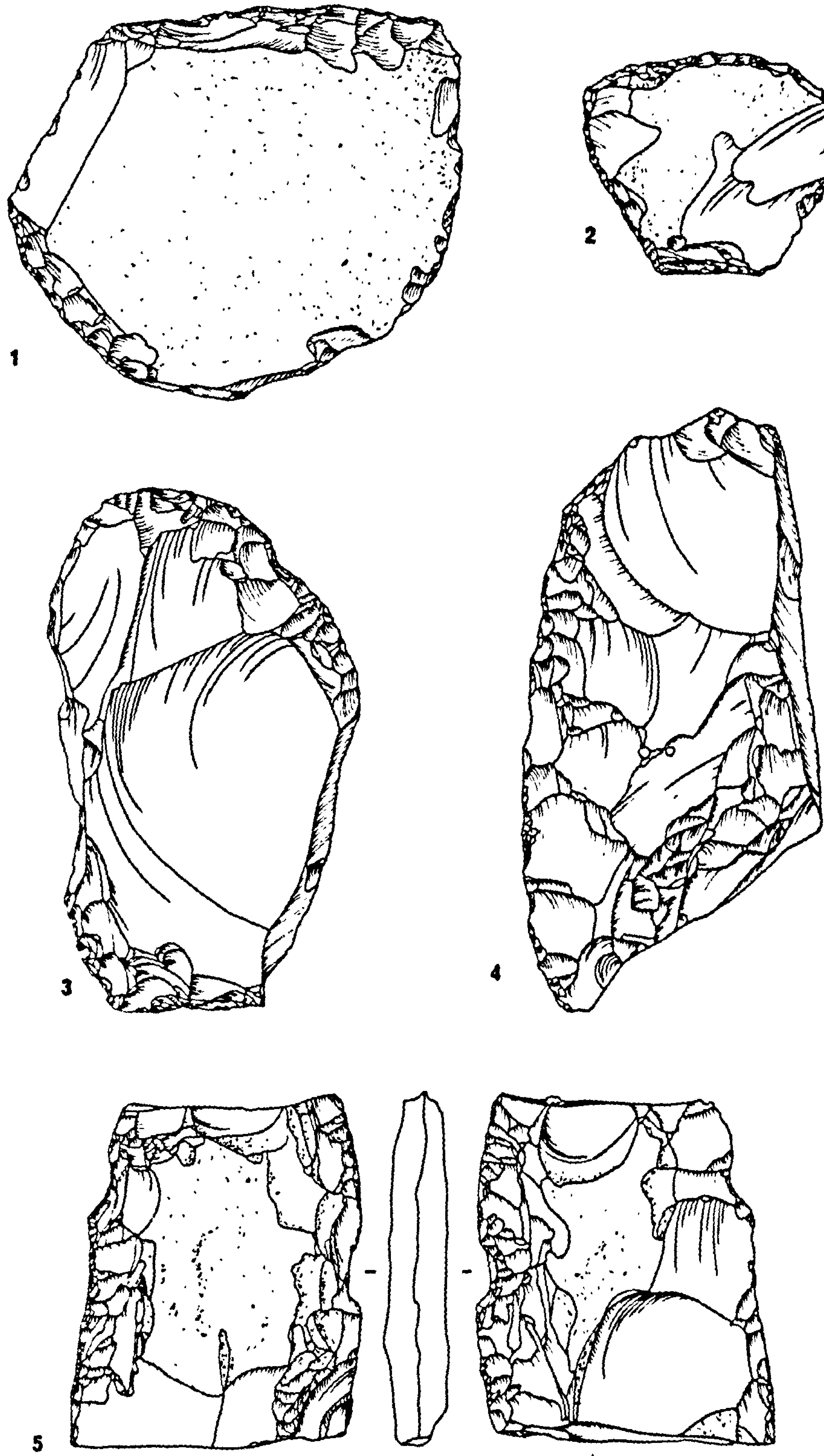
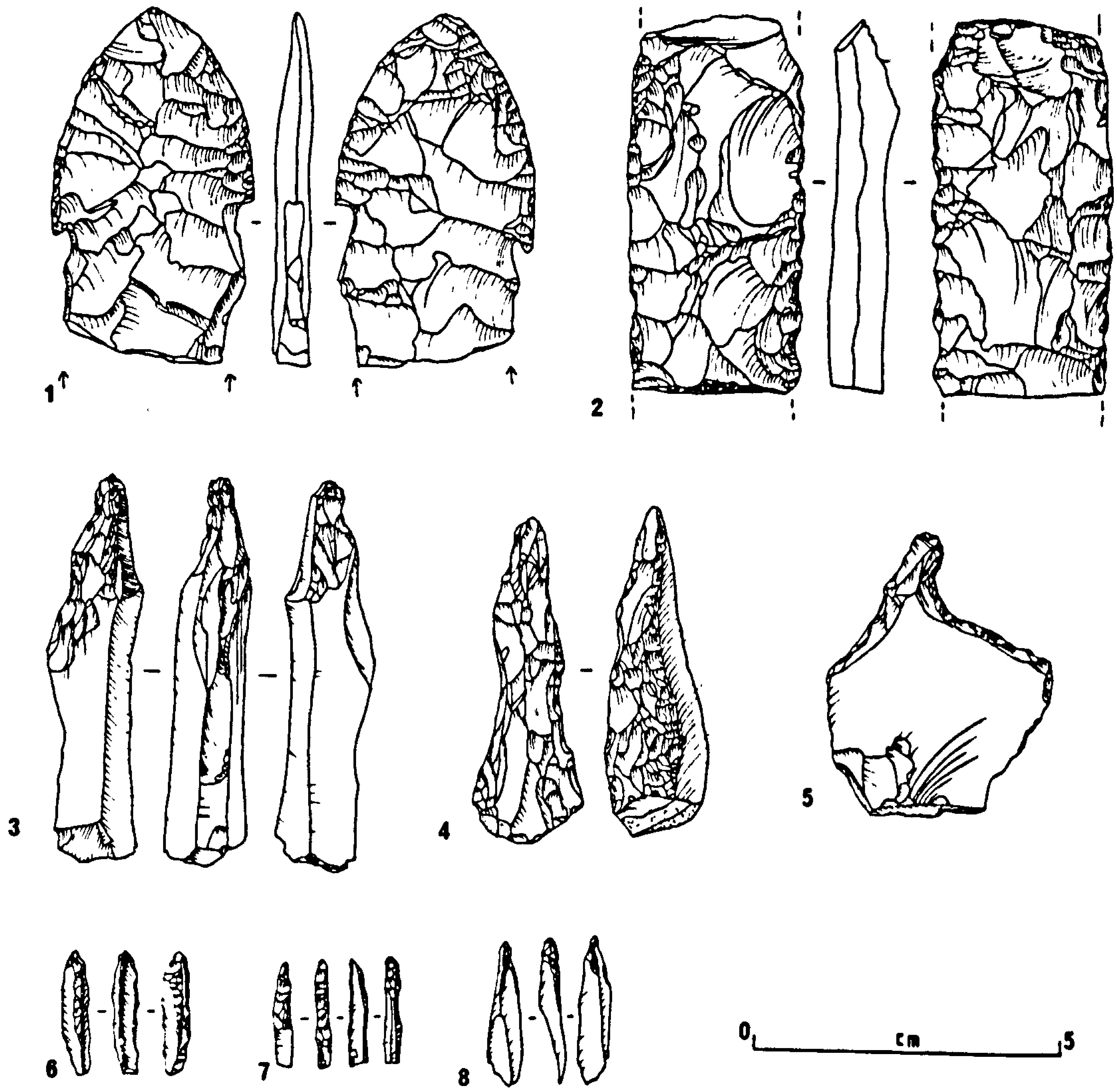

1
2
3
4
5
0 cm 5

Fig. 5.38 Survey sites

1	1675	bifacial 2
2	1636	bifacial 3
3	1601	borer 1
4	1667	borer 1
5	1648	borer 1
6	1694	borer 2
7	1676	borer 2
8	3417	borer 2



1
2
3
4
5
6
7
8
0
cm
5

Discussion

A total of eighty two "burin sites" and scatters has been located on the survey, all of which conform closely to the excavated assemblage from Jebel Naja (Figs 5.29;5.30). The main difference lies in the greater proportion of drill bits obtained in the excavated sample from sieved deposits. "Burin sites" are easy to identify because of the ubiquitous type fossil, the concave truncation or Mejalla burin. Survey work in the basalt region has produced the largest sample of these sites ever to be studied as a single corpus, and it is through this detailed analysis that the rather fragile dating evidence from Jebel Naja can be reinforced by typological data. This accumulated wealth of information has also made it possible to present preliminary hypotheses on changing patterns of subsistance within the desert Neolithic.

The first "burin site" to be reported was Wadi Dhobai B (Waechter & Seton Williams 1938), a site in what is now more properly refered to as Wadi Jilat (Garrard et al. 1985), just to the north of Jilat 7 (Garrard et al. in press) on the south side of the wadi on a promontory immediately overlooking the gorge. There were remains of a circular limestone structure and an industry containing a mixture of PPNB elements such as bipolar cores and tanged arrowheads of Byblos type together with an extremely high proportion of burins on concave truncations. Because of the PPNB element, the industry became known as the Dhobaian, a desert variant of the early Neolithic.

Field in his surveys recorded a number of sites with very high proportions of concave truncation burins, especially in the vicinity of Jebel Umm Wual in northern Saudi Arabia. Garrod in her discussion of the flint collections (Garrod in Field 1960) pointed out the similarities between these sites and the Dhobaian industry, the main difference being the lack of arrowheads in the Umm Wual collections. With reservations as to the precise connection between the two industries, she refered to Field's collections as Wualian.

Since then survey reports have noted these sites in profusion all over the Syro/Arabian desert. They have been recorded from Rutbah in Iraq (Field 1960) up to the very rim of the Jordan Rift Valley (Rollefson et al 1982; Macdonald et al. 1982,1983) and from Palmyra (Akazawa in Hanihara & Akazawa eds. 1979) down to Jauf and Sakaka south of the basalt in Saudi Arabia (McC Adams et al. 1977;Parr et al. 1978; Ingraham et al. 1981). To date, only a few detailed reports of specific assemblages are available (Akazawa in Hanihara & Akazawa eds. 1979; Rollefson & Fröhlich 1982; Rollefson et al. 1982; Garrard et al. 1985; Garrard et al. in prep.), but even these illustrate the uniformity of the industry over large areas (see Fig.5.34).

Site 79 at Palmyra (Akazawa in Hanihara & Akazawa eds. 1979) out of a total of 281 pieces collected, had 63 burins and 5 modified flakes. The rest of the collection was made up of cores, blanks and waste. The concave truncation burin was predominant among the burin types. All of the cores were unprepared except for the production of the striking platform which was plain and flat, produced by a single blow without secondary facetting. Single platform, opposed platform and changed orientation cores were all represented. The industry was flake oriented, striking platforms were predominantly unfacetted and quite a high proportion were cortical. Several of the burins were also made on cortex flakes.

The "burin site" at Jebel Unweinid reported by Rollefson and Fröhlich (1982) had a blade based industry, with blanks struck from tabular cores. They included a high proportion with natural backing - 54.2% of blades and 16.2% of flakes. This contrasts slightly with the comparative figures from 2321 of 37% and 14% respectively, but may merely be a reflection of the available raw material. Use of thin tabular flint is not common at 2321. Of 121 tools from Jebel Uweinid (Sqs 1-5) 113 were burins, and of these 99 were on concave truncations. The only other tools were one atypical grattoir, a tile knife and five truncated pieces.

Rollefson also reported on a smaller collection obtained from rescue work in Amman (Rollefson et al.1982). 7 out of the 11 burins in the Umm Utheina collection were on concave truncations. Quite a high proportion of the striking platforms on the blanks were cortical but the incidence of natural backing was significantly lower than that of the Jebel Uweinid assemblage. Rollefson suggests that this is due to differences in raw material. Out of 23 tools in the collection, 11 were burins, 3 borers, 1 a scraper, 5 notched or denticulated, 1 a truncated piece and 2 were battered.

Garrard has located several "burin sites" in Wadi Jilat and around Azraq (Garrard & Stanley Price 1977; Garrard et al. 1985; Garrard et al. in prep.) Eight sites for which data is available all show the same pattern of high incidences of burins, especially concave truncation types, together with a few scrapers, borers and bifaces. Production of flakes and blades varies, with neither class dominating strongly.

With the large amount of data now available, it has become possible to define the industry of the "burin sites" quite closely and it becomes apparent that the evidence from Wadi Dhobai B on which the tentative dating for the industry is based must be considered anomalous. The relationship between arrowheads of Byblos point type and elements characteristic of the "burin site" industry on which this dating rests is only to be found at Wadi Dhobai B, and, to a certain extent on sites in the el-Kowm area - Qdeir 1, Nadaouiyeh 3, Umm el-Tlel 2 and basal el-Kowm 1 (J.Cauvin 1981). No other sites out of nearly 100 analysed examples and the numerous others described in general reports appear to echo this feature. Recent study of other Neolithic sites in Wadi Jilat (Garrard et al. in press, in prep.) now suggests that the site of Wadi Dhobai B probably dates primarily to the PPNB and may have a deflated level in topsoil relating to a later stage of occupation contemporary with the other "burin sites" nearby.

The question of the date of these sites has always been subject to discussion and uncertainty as the extraordinary nature of the assemblages renders it difficult to relate them to the familiar Syro/Palestinian chronology. One major stumbling block has been the extremely low proportion of tools other than burins, tools which might, in acceptable quantities, provide closer parallels with known industries, and it is only now with the large sample of collections obtained from recent surveys that a consistant pattern of small numbers of other tools can be seen to occur on all of the larger sites. Of these tools, the scrapers and borers cannot be considered very diagnostic. They are often crudely made on irregular chunks and cannot be closely paralleled to specific types elsewhere. The drill bits on spalls are unique in the Levant. The only other known occurrance of this tool type is in the Saharan Neolithic (Gaussen & Gaussen 1965; Close 1984) and the odd isolated example (Glory 1943). However the bifacial pieces and the very rare arrowheads can afford some clues. As discussed in the previous chapter, tile knives and foliate bifaces are generally associated in Palestine with Pottery Neolithic assemblages (see for example Crowfoot Payne 1983:710; Stekelis 1950:6; Anati 1963:Pl.XI,1-3; Olami, Burian & Friedman 1977:45, Fig.14,3-4). The small bifacial points and transverse arrowheads are also late types (see previous chapter) and attest to the essentially post-PPNB character of the "burin site" industry. The single C14 date of 7430 ± 100 BP (OxA 375) (5480 BC) obtained from the hearth in 2321 should, as an isolated date, be treated with a certain degree of caution, but it does not clash with the mid sixth to fifth millennium date suggested by the more diagnostic tools.

Little is known so far about the economy of these sites.

Nothing is known about plant remains as the samples from Jebel Naja only yielded a few tiny fragments of unidentifiable charcoal (S. College pers comm.). Faunal remains from Jebel Naja are also very scanty. Garrard (Garrard 1985) reports 4 bone fragments of sheep/goat (*Ovis/Capra sp.*), 2 of hare (*Lepus cf. capensis*) and 3 of gazelle (*Gazella sp.*). Garrard was unable to determine whether the Ovis/capra specimens were from domestic animals or not. From Wadi Dhobai B, Bate (1938) reports fox (*Vulpes sp.*), badger (*cf. Meles sp.*), hare (*Lepus sp.*), gazelle (*Gazella sp.*), rock partridge (*Alectoris cf.graeca*) and tortoise (*Testudo sp.*) but these findings probably relate to mixed PPNB/late Neolithic contexts. Tortoise seems to have been common on most Wadi Jilat sites including the pre-Neolithic ones (Garrard pers. comm.).

The very low incidence of sickle blades might suggest that exploitation of cereals was not a dominant aspect of the economy of these groups. Likewise the low numbers of arrowheads, especially in comparison with the PPNB, might suggest that hunting had declined sharply from its prominent position in the subsistance pattern of earlier peoples. Caution must again be expressed here as hunting methods might have changed. Possibly the use of the sling became popular, as it did in Mesopotamia (see for example Korfmann 1972), or use was made of pitfalls, bolas or other close-quarters killing methods. No evidence is available to suggest any of these possibilities, but they cannot be entirely discounted.

One interesting point to note is that there is a marked change of site location between the PPNB sites and the "burin sites". PPNB sites, and also Epipaleolithic sites, are normally located on high points - on summits overlooking wadis or on small hillocks in the basalt hammada. By contrast, the "burin sites" are almost all on basalt/wadi margins, lying on the lower slopes of east-facing hills, protected from the prevailing wind and overlooking mudflats or major wadis. This pattern is so marked that many of the "burin sites" have been consistantly reused by nomad groups up to the present day when they are still favoured as camps by the modern beduin. However whether this choice of location reflects the adoption of a pastoral economy is still open to speculation until adequate faunal data become available.

Very recent work in the Azraq Basin has provided a little more evidence to support the possibility that sheep/goat pastoralism was being adopted by desert peoples towards the end of the 7th millennium. Excavations at Azraq 31, a site right on the edge of the modern lake, produced a flint industry which seems on typological grounds to be transitional between the PPNB and the "burin sites" (Garrard et al. in prep.). Preliminary examination of the fauna (Garrard pers. comm.) shows that sheep/goat bones were present in significant numbers in an environment where they would be quite unlikely to exist in the wild.

Another interesting aspect of these sites has also emerged only very recently. Excavation of early Neolithic desert sites dating to the PPNB period normally reveals a fairly substantial depth of occupation deposits, including a fair amount of ash, charcoal and bone as well as chipped stone. Sites such as Dhuweila and Ibn el-Ghazzi in the basalt region, and Jilat 7 (Garrard et al. in press) and Wadi Dhobai B (Waechter & Seton Williams 1938) in the flint steppe all have at least 50 cms of ashy soil and mixed cultural debris. This seems to be in marked contrast to the "burin sites" where the depth of occupation is very shallow with almost no ash, charcoal or bone. Two "burin sites", Jilat 23 and Jilat 24, have been sounded recently (Garrard et al. in prep.). The flint scatter is related in each case to roughly circular low-walled structures built of upright limestone slabs, yet careful sampling failed to reveal any trace of ashy levels either inside or outside the walls. This seems to agree with the findings at Jebel Naja, where quite extensive clearance located only one or two small hearths, despite a prolific scatter of chipped stone.

It seems possible therefore that the pattern of subsistance changed fairly substanially between the mid 7th millennium and the beginning of the 6th millennium. Sites began to be used either for shorter periods of time, or visited less often, or the economy of the people changed in such a way that the nature of their occupation was radically altered. The virtual absence of ash seems to imply a more intermittant pattern of occupation, but the absence of bone might also imply a dependance on live animals rather than on meat.

The later Neolithic period in the desert regions seems to be a poorly understood phenomenon in most areas of the Levant.

"Burin sites" are well documented in the barra south of the Saudi/Jordanian border (McC Adams et al. 1977; Parr et al. 1978; Ingraham et al. 1978) but there are also apparently related sites classified by Gilmore (Gilmore et al. 1982:13) as later Neolithic with bifacial pieces, tabular scrapers and possibly transverse arrowheads but no burins. The structures associated with some of these sites are reminiscent of the "burin sites" at the southern end of Qa'a Dhuweila (compare Fig.5.24 and Gilmore et al. 1982:Pl.4). Crude pottery is reported from three of these sites.

In Sinai and the Negev there is very little information on this period and it has been suggested that the Negev was abandoned or only very sparsely occupied at this time (Marks & Friedel 1977; Baron 1981). There is one site however which is particularly interesting in view of the newly established typology for the "burin sites", the site of Kvish Harif in the central Negev (Rosen 1984). Although a single date from the site is given as 4100 BC (calibrated) Rosen suggests that the lithic industry seems to reflect a somewhat earlier date. There are certainly a number of parallels with the "burin sites", despite the apparent total absence of burins from the assemblage. Among the stone tools are transverse arrowheads and arrowheads of Herzliya and Nizzanim types which are very reminiscent of the forms found on "burin sites" in the survey area. Other tools include borers and drill bits on bladelets, scrapers, and knives on cortical flakes. Cores are varied but none are of the bipolar naviform type. It also seems likely that the site was essentially aceramic.

In the semi-arid steppe of Syria, apart from site 79 at Palmyra, there are also two sites at el-Kowm dated in the mid-sixth millennium. Qdeir 1 is a small tell with traces of mudbrick buildings (Aurenche & M.C.Cauvin 1982). It has external "ateliers" with small hearths and heavy concentrations of flint including cores, debitage and a tool assemblage dominated by burins, a high proportion of them concave truncation burins. A date of 7560 ± 340 BP (Ly-2578) (5620 BC) was obtained for the site. This date however contrasts somewhat with Qdeir's characteristic aspects which include bipolar blade cores, Byblos points and fragments of "vaisselle blanche". There were some sickle blades, but no pottery was found. The excavators conclude that Qdeir 1 represents a new facies of the final PPNB in the northern sector of the Syrian desert and suggest one possible interpretation might be that it supported a small, predominantly sedentary community, visisted from time to time by more mobile groups who came, among other reasons, to exploit the flint source adjacent to the site.

El-Kowm 2, with a date of 7680 ± 200 BP (Ly-2520) (5730 BC) is by contrast a flourishing village with large and elaborate mudbrick houses, plastered walls and floors and a similar lithic assemblage to that of Qdeir 1 (Stordeur et al. 1982; J.Cauvin 1983b). The lithic industry is dominated by burins, with some arrowheads, scrapers and a few sickles. Also in the el-Kowm basin are a number of surface stations, Umm el-Tlel 2, Nadaouiyeh 7 and Nadaouiyeh 4 (J. Cauvin 1983b), which Cauvin suggests relate to nomadic groups like those of Qdeir 1. It is difficult to judge how closely these sites relate to the "burin site" tradition. The presence of high proportions of burins, a number of them of the "Mejalla" type (eg: Aurenche & M.C.Cauvin 1982:Fig. 17,2-4; J. Cauvin 1982:Fig. 3, 3-5.) suggests some connections, but the PPNB nature of the el-Kowm sites is undoubtedly different from the standard "burin site" assemblage. It may be that the "burin sites", essentially a steppic phenomenon, begin to thin out in the regions closer to the village cultures of the Euphrates Valley.

Connections between the "burin sites" and presumably contemporary sites in the fertile areas such as Munhata (Perrot 1966), Sha'ar ha-Golan (Stekelis 1950) or Ramad III (de Contenson & van Liére 1964) are very slight. With the exception of the arrows and bifaces mentioned above, the lithic industries are quite dissimilar. The desert sites lack sickles and axes, and sites in the fertile areas lack the massive preponderance of burins that characterise the "burin sites". It is possibly significant however that a great abundance of burins in the tool kit is common on Syrian sites at the end of the PPNB and that this abundance is particularly marked at all the tells of the period in the region of el-Kowm (J.Cauvin 1981).

The incidence of burins on sites in the fertile area declines in the Pottery Neolithic. At Jericho for example, Crowfoot Payne (1983) reports numerous "gravers" in the PPNB but gives no mention of them at all in her discussion of the PNA assemblage, although the charts record a few in PN levels.

Specific comparisons are hampered by the relative lack of quantatitive data available for the later Neolithic industries, but general descriptions of Syrian and Palestinian assemblages indicate very little evidence for related traits. There are also marked differences in technology. The crude knapping techniques employed at Jebel Naja contrast considerably with the controlled production of blades from pyramidal cores common among PN knappers on the village sites.

Rollefson in his most recent excavations at Ain Ghazal (Rollefson in press) has apparently uncovered levels in a sequence continuing from the PPNB through into the Yarmukian phase of the PN. It is interesting to note that side by side with the settled village economy of 'Ain Ghazal, he has also found nearby (Um Utheina, Rollefson et al. 1982) a "burin site" with no evidence of structures or longterm occupation.

Although the "burin sites" are widely distributed over the Syrian/Arabian steppe, they are apparently absent in southern Jordan (Henry 1982), and equivalent sites in Sinai and the Negev are rare. Levy (1983) says that late Neolithic sites are found only on the Negev coastal plain and never in the inland valleys to the east, and that they tend to cluster around natural springs. However he bases his identification of late Neolithic sites on the presence of sherds with large quantities of chopped straw observed in the matrix (Levy 1983:18) and it may be that he is only observing one portion of late Neolithic society in the Negev, that portion corresponding to the settled or semi-settled pottery-using societies in Palestine/western Syria. Evidence of at least some more or less aceramic groups present in the dryer regions at this time is suggested by the site of Kvish Harif (Rosen 1984). Layer B at Nahal Issaron indicates some 5th or late 6th millennium occupation in the eastern Negev, and there is also the evidence from Kvish Harif (Rosen 1984), but surveys of other areas have not reported sites that might equate with the "burin industries" in northern Arabia (see Marks 1976; Kozloff 1972; Bar Yosef 1982 & Phillips 1977). The farthest west that the "burin sites" have been found is the edge of the Jordanian plateau at Wadi el-Hasa and Um Utheina, Amman.

The delicate framework on which the date and nature of these sites rests makes further speculation hazardous. It seems feasible that they represent a nomadic element in the later Neolithic of northern Arabia, with an economy based on some hunting and possibly herding. Their relationship to contemporary Neolithic village settlements is unclear.

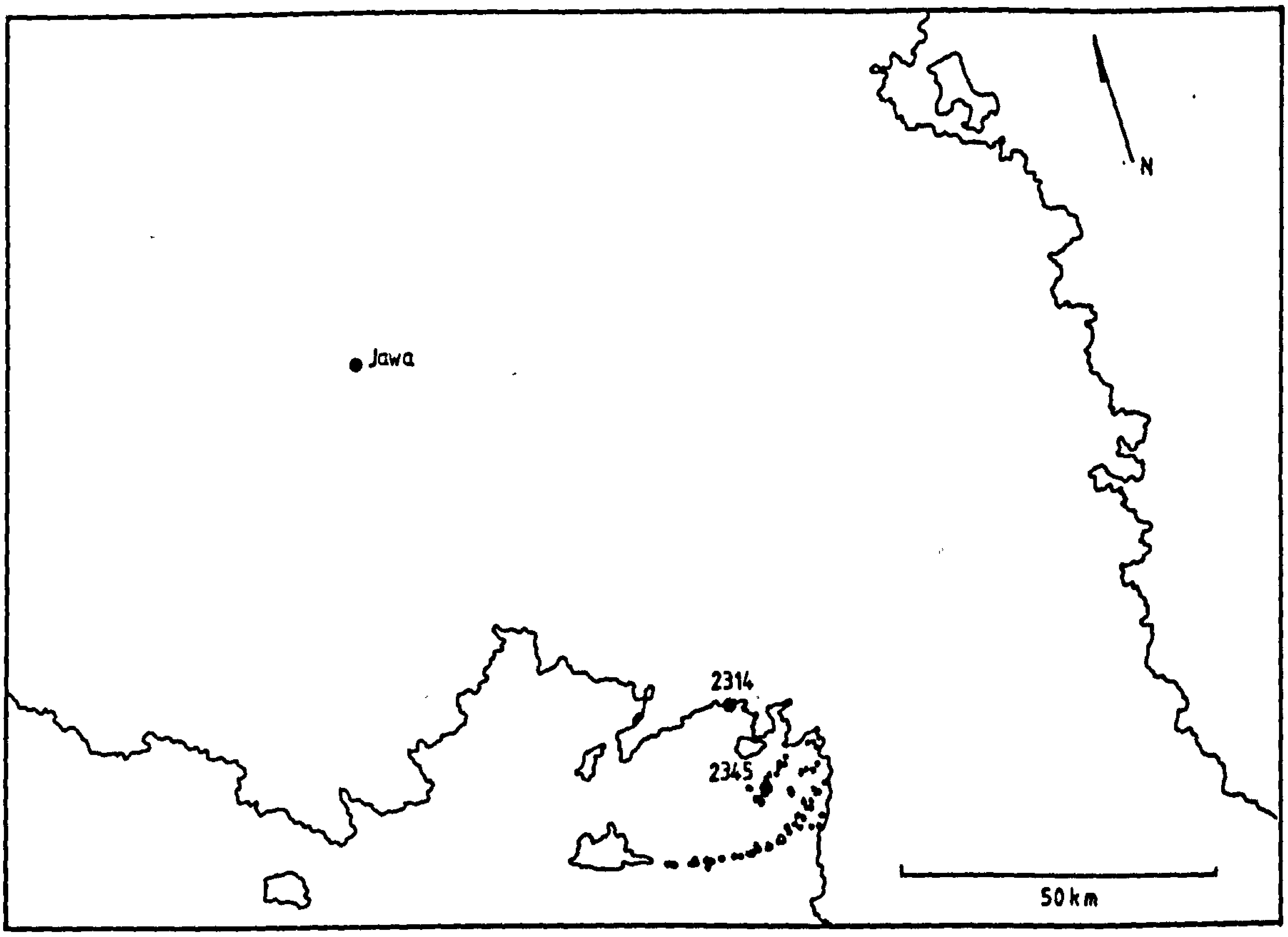


Fig. 6.1 Black Desert, eastern Jordan:
Late Chalcolithic/Early Bronze Age sites

Chapter 6

This chapter examines the sparse evidence for Chalcolithic and Early Bronze Age sites in the survey area. This apparent scarcity of sites of these periods is in marked contrast to the large number of Neolithic sites identified on the survey, and may in the end prove to be a result of failure to recognise these later cultural assemblages rather than evidence of a decrease in population.

The only site in the survey area which can be clearly attributed to this period is the 4th millennium fortified settlement of Jawa. The site itself has been described in detail elsewhere (Helms 1981; in prep.; also for discussion of date see Helms 1984) but the lithic industry has been included here as an integral part of the discussion of Chalcolithic and Early Bronze Age flint industries in the desert areas.

Jawa

Jawa is a large fortified 4th millennium settlement with elaborate water systems, sited on a rocky island overlooking the upper reaches of Wadi Rajil, only a few kilometres from the modern Syrian/Jordanian border. It was occupied for a fairly limited period in the late Chalcolithic/Early Bronze Age I and then briefly reused in the early Middle Bronze Age. The chipped stone industry described below relates to the earlier, 4th millennium settlement. The Jawa assemblage is similar to those from late Chalcolithic and Early Bronze Age sites in Syria and Palestine. It is an intrusive assemblage and bears no close relationships to earlier industries in the desert regions. Unfortunately, despite adequate recovery during excavation, logistic factors prevented a full study of the material, and consequently the assemblage is discussed here without direct reference to quantatitive data.

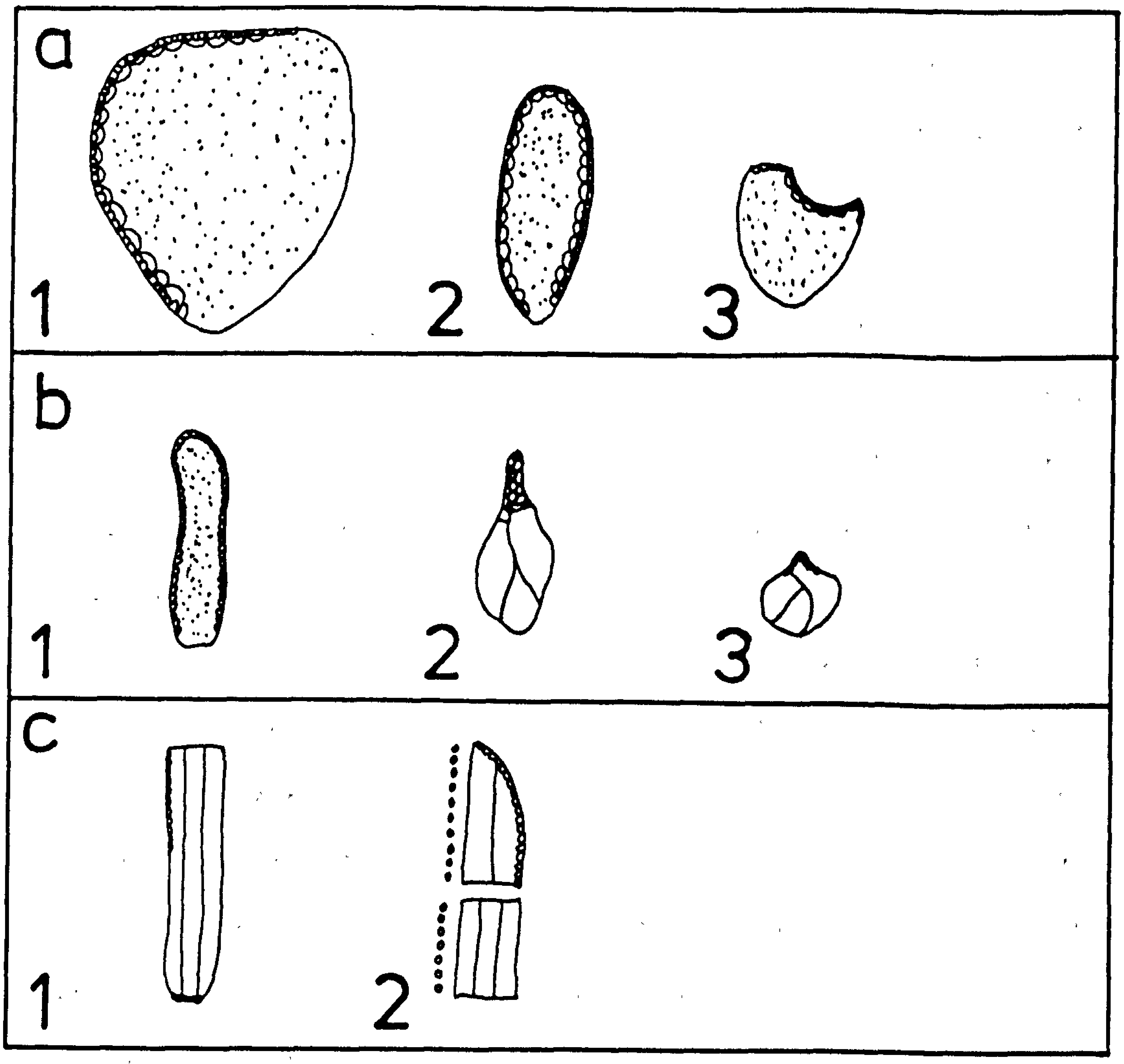
The industry is characterised by elongated cortical scrapers and broad blades produced using the Cananean method of blade production (see Hours 1979:59). These blades are either used as knives or broken into segments and hafted as composite sickles. Raw material for the Jawa assemblage comes from two sources. Most of the fine olive coloured flint used for the scrapers and the Cananean blades is imported from an unknown source. It is visually very similar however to flint associated with this industry in Palestine, and may well have been obtained through the same trade networks. Some use is also made of the coarser local cherts, mostly for sickle blades, and chert pebbles were collected from the wadi bed to chip into drill bits. Cores are very rare on the site. No cores of the fine olive flint were recovered, suggesting that the material was traded in either as blanks or as finished pieces. The former is more likely as there are a fair amount of chips of this material in the collections.

A detailed study of the late Chalcolithic/Early Bronze Age industries of Palestine has been made by Rosen (1983a). Although his typology has been refered to below, it has been adapted slightly to accommodate the specific characteristics of the Jawa assemblage. Tools have been divided into three broad groups (see Fig.6.2), scrapers, points and knives. The second group is a loosely defined category including a variety of piercing tools, some of them possibly multi-purpose. The third group encompasses all blade tools including sickles.

Tools

scrapers:

1) These are large sub-circular or ovoid cortical flakes of fine olive flint with faceted striking platforms. They have semi-abrupt or semi-invasive retouch around much of the working edge and are usually heavily smoothed and polished with a high silica gloss. They form a low proportion of the tabular tool class. Measured examples range from 12 to 17.5 cm in length and 9 to 13 cm in width. These would fall into Rosen's category of round tabular scrapers, although their size clearly distinguishes them from the other scrapers in his "Tabular" class. As he points out (Rosen 1983a:104), although these tools are commonly refered to as tabular scrapers, they are in fact struck mostly from the level surfaces of large flat nodules and not from true veined or tabular flint. Since the source of the raw material used for the Jawa tools is not known, it is impossible to say whether this applies to these pieces or not (see also Rosen 1983d).



a scrapers

b points

c knives

Figure 6.2 Jawa: schematic typology

The extensive polish and high gloss on the edges of these tools suggests a special function of some kind. Microwear analyis indicates that they might have been used to work either reed or wood (Unger-Hamilton in prep).

2) These are cortical flakes of fine olive flint ranging in shape from rectangular to oval with semi-abrupt or semi-invasive retouch around almost all of the edge. Striking platforms are usually faceted. Several have flakes removed from the proximal end of the dorsal surface, clearly done after the original flake was struck as on most pieces the secondary blow has produced slight flaking on the ventral surface as well. Several pieces have scratch marks on the cortex and some have silica gloss around part of the edge. Sizes vary from 4 to 9 cm in length and 2.5 to 8.5 cm in width. They form the largest group of the tabular class. In Rosen's typology, these tools would correspond to his elongate and oval tabular scrapers (Rosen 1983a:105).

3) There are a very few hollow scrapers. They are made on cortical flakes with abrupt scalar retouch forming a shallow concavity usually about 1.5 cm across. Rosen recognises notches as an integral form within his typology. The hollow scrapers from Jawa are probably similar to forms which he describes as "more elaborate concavities with internal retouch" (compare Fig.6.5 Nos.4,5 with Rosen 1983a:Pl II No.7). McConaughy also mentions notch/spokeshaves at Bab ed-Dhra (McConaughy 1979:316) which he suggests were wood or bone working tools.

points:

1) There are a number of elongated pieces, roughly rectangular in cross-section with curved or slightly pointed ends, gently curved or sinuous in plan with the sides shaped by abrupt scalar retouch. Some have irregular invasive retouch on the ventral surface. Their use is unclear. Some might have been used as chisels, some as reamers or for other specialized tasks.

2) Borers are rare and mostly atypical. Two pieces are made on cortical flakes and two have the point formed by alternate retouch. Rosen notes the "ad hoc" nature of borers in the Cananean industry, a description which might also be usefully applied to the Jawa assemblage.

3) Drill bits are common at the site. They are made from small roughly flaked pebbles and chips worked to a short crude point with a triangular cross-section. Many of them are heavily worn at the tip. They range from 2 to 3.5 cm in length. For this class, Rosen only describes drill bits on blades. He has no equivalent for the typical pebble drill bits of the Jawa assemblage. A number of the pebbles used for these tools are heavily waterworn and were probably collected locally from the wadi bed.

knives:

1) Rosen has a division into Blade Tools (non-Sickles), including both blades of Cananean type with trapezoidal cross-sections and others, sub-divided into macrolunates, backed blades

and other retouched blades, and Sickles, a group with twelve subdivisions, some relating to later Bronze Age tool types (see also Rosen 1982;1983c).

The division used here is much simpler and recognises only two classes, large "knives" on trapezoidal blades and truncated or snapped sickle segments. In the first group are the blades made by the Cananean method, large elongated blade segments of fine olive flint with faceted striking platforms and a trapezoidal cross-section. Some are snapped and some truncated and most have sickle gloss along one edge. They correspond broadly to the reaping knife mentioned by Rosen in his discussion on sickles (Rosen 1983a:110) although they do not always have traces of sickle gloss and were possibly used more as generally purpose cutting tools than as specific harvesting implements. There are no "knives" on large blades with triangular cross sections although blades of this type are sometimes produced from a Cananean core.

2) The second group comprises short blade segments with silica gloss along one or both edges. Most are snapped although one or two are retouched at the ends. They have both triangular and trapezoidal cross-sections and are mostly of olive flint although some local raw material is also used. Some pieces are backed and curved, probably to form the terminal segment in a composite sickle. Lengths range from 2.5 to 6 cm. The gloss tends to run parallel to the side of the blade, suggesting that they were hafted parallel to the handle of the sickle.

Figure 6.3 Jawa

1 scraper 1

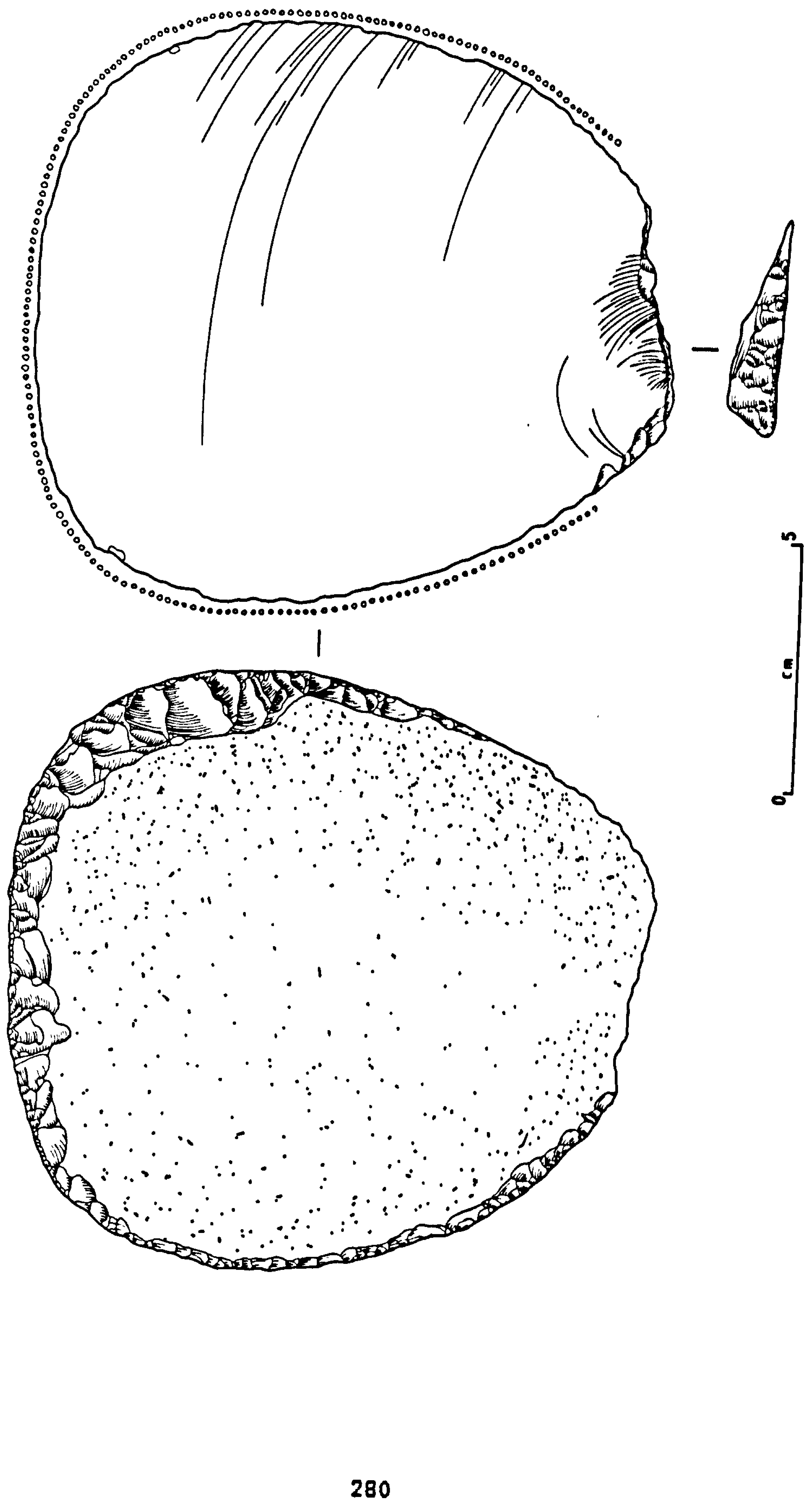

0
cm
5

Figure 6.4 Jawa

1 scraper 1

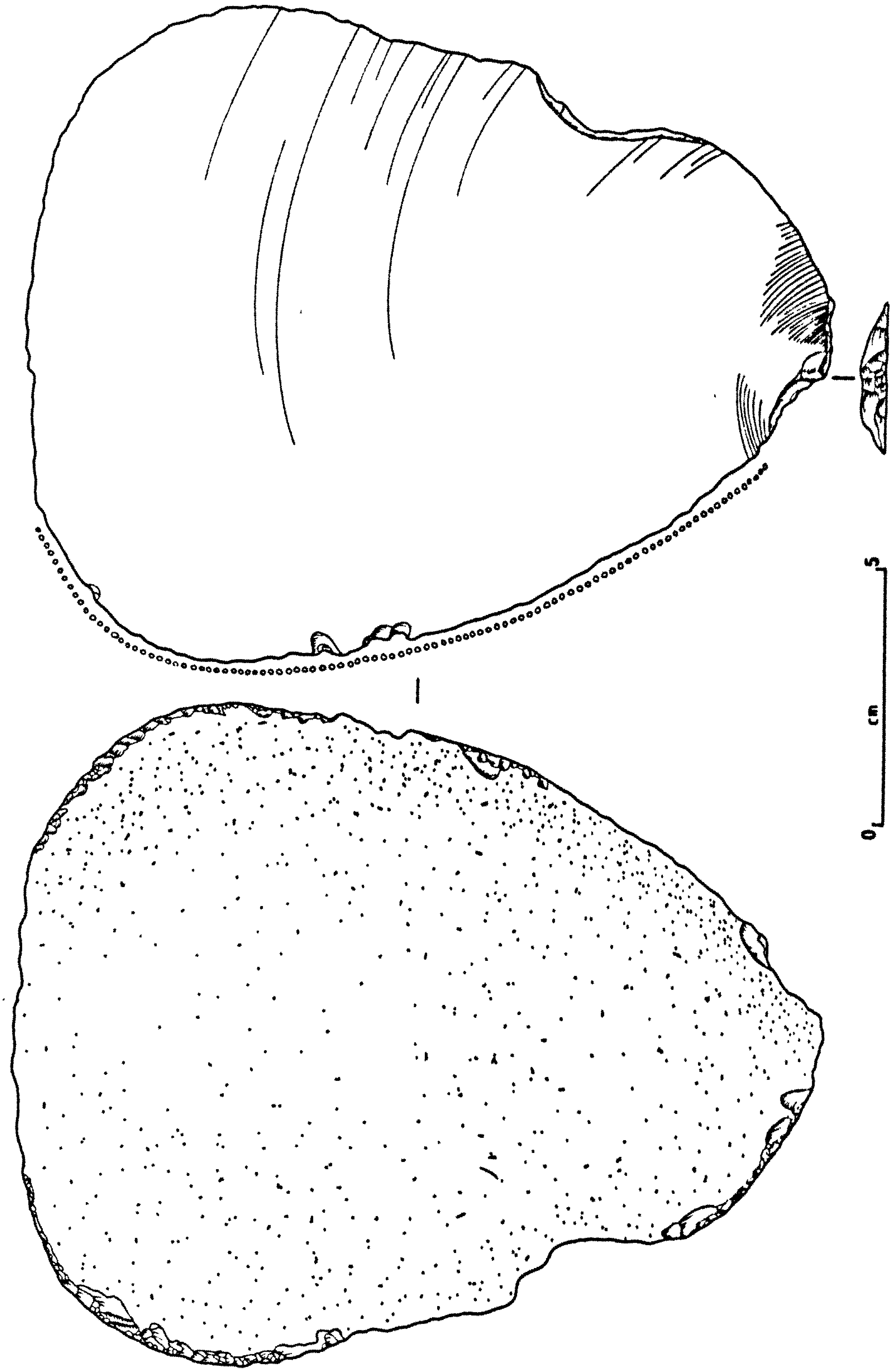

0
cm
5

Figure 6.5 Jawa

1	scraper 2
2	scraper 2
3	scraper 2
4	scraper 3
5	scraper 3
6	point 2
7	point 1
8	point 3
9	point 3
10	point 3
11	point 3

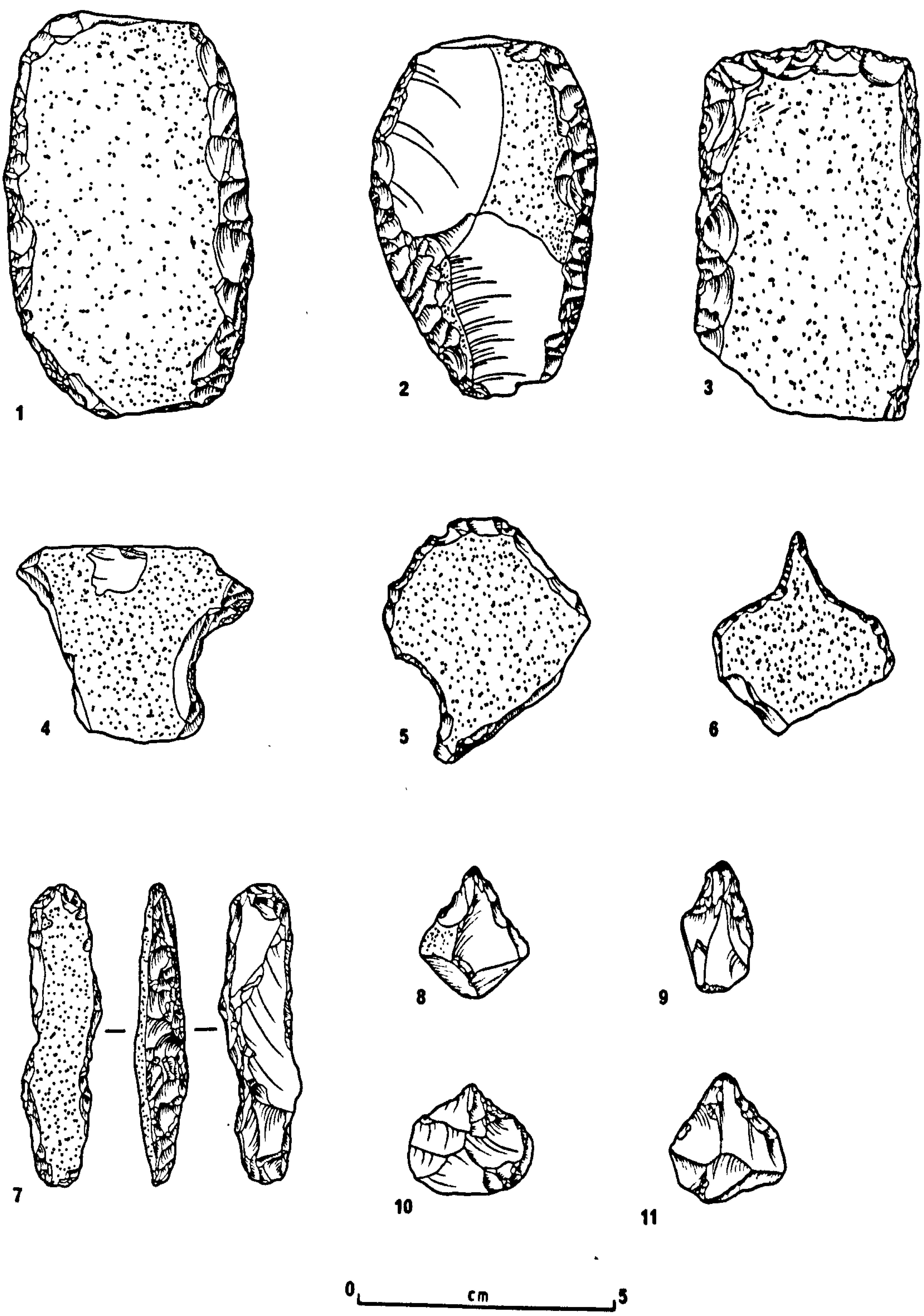
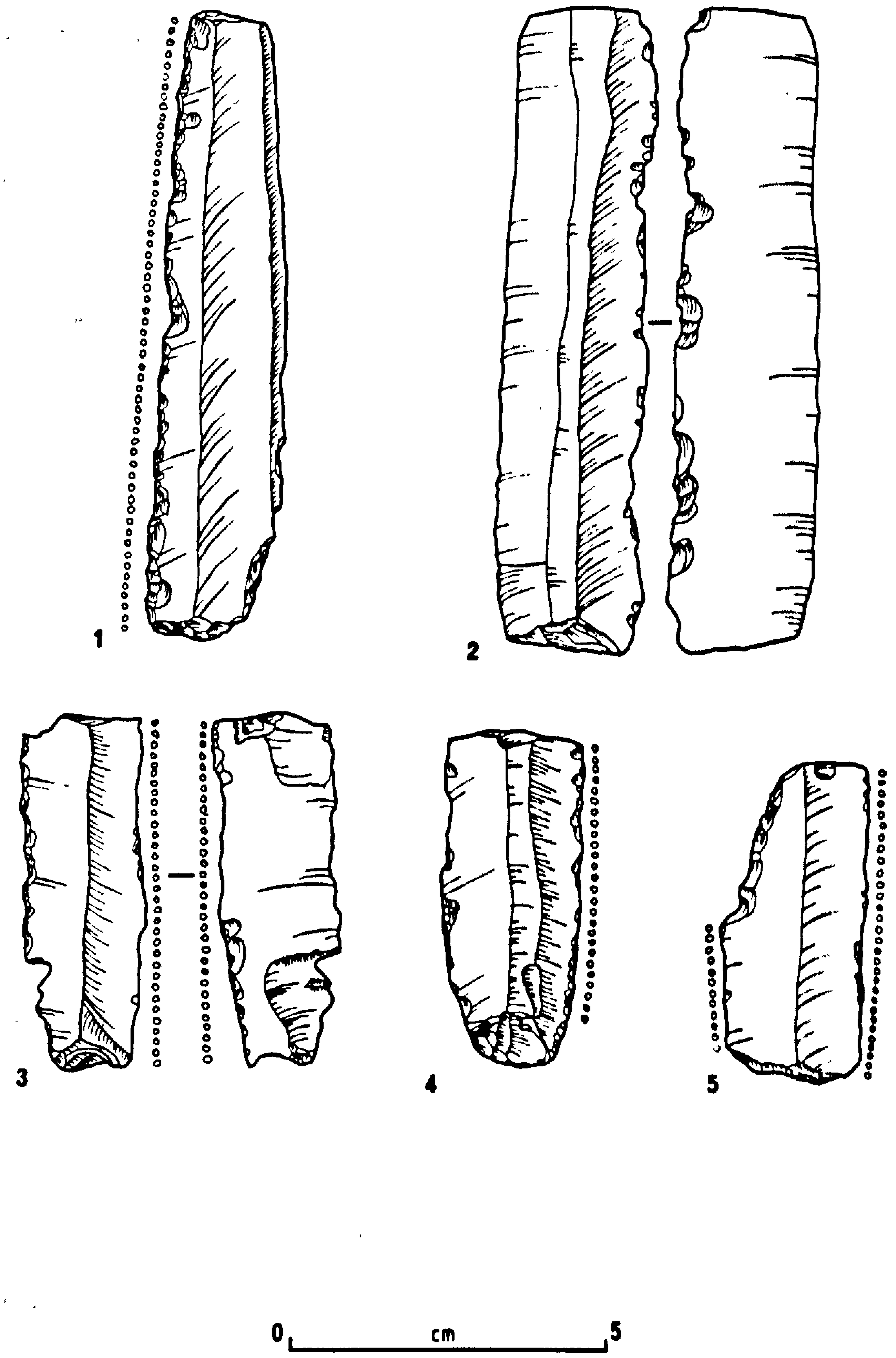

1
2
3
4
5
6
7
8
9
10
11
0 cm 5

Figure 6.6 Jawa

1	knife 1
2	knife 1
3	knife 2
4	knife 2
5	knife 2


1
2
3
4
5
0 cm 5

Discussion

A number of tool types listed by Rosen are not found in the Jawa assemblage. Arrowheads which are rare in the Chalcolithic and Early Bronze Age of Palestine and virtually absent on sites in northern and central Palestine, appear also to be absent from the Jawa assemblage. Rosen (1983a:128) suggests that the general scarcity of arrowheads in the Chalcolithic might be interpreted as a decline in the use of bows and arrows in hunting and cites McConaughy (1979:172) who considers that it is indicative of peaceful conditions and a decline in warfare. Such interpretations must be qualified to some extent however as the trend towards walled towns in the Early Bronze Age without a corresponding increase in the number of arrowheads found on the sites might also suggest the use of other weapons of some kind, possibly small copper points which have not survived or even unretouched flint chips instead of the traditional point. At Jawa where faunal evidence shows that hunting was practised at least to a limited degree and the heavy fortifications suggest that warfare was likewise a reality of life, one might assume that there were some weapons used which have so far eluded recognition in the archaeological record.

There is a certain degree of dissention in the literature on the subject of the flint industries of Syria/Palestine from the later Chalcolithic onwards. Crowfoot Payne writes of "the Cananean industry" (1983:722). She describes it as very simple, characterised by sickle blades made on Cananean blades and tabular scrapers of various forms, including the fan. Hours, on the other hand, sees the term "Cananean" as applicable only to the specific knapping technique used to produce the large parallel-sided blanks commonly recognized as "Cananean blades" (Hours 1979:61). One important aspect of this knapping technique is the preparation of the striking platform. "Le profil est plutôt rectiligne et les bordes sont parallèles, grâce à une préparation spéciale du talon. Ce dernier est presque aussi large que le corps de la lame, et toujours facetté, soit plan, soit convexe." (Hours 1979:61).

Crowfoot Payne (1983) states that the Cananean blade was brought into Palestine at the beginning of the "Proto-Urban" (EBI) and is widely known in Syria and Iraq. This view is also supported by Rosen (1983c:23). Hennessy (1967:44) has gone a step further and suggests that the "Cananean industry" spread out into Syria/Palestine from Mesopotamia. Both Hennessy and Crowfoot Payne have recognised the similarity between the large blades found in Mesopotamia, for example at Tepe Gawra (Tobler 1950:200), and the Cananean blade of Palestine. Cores for producing these blades are also very similar (compare Tobler 1950:Pl.XCIVb and Anati 1963:321). However these similarities may not be quite as close as they appear and there is some evidence for caution in drawing close parallels between the Mesopotamian knapping techniques and those of contemporary Palestine, as personal observation has shown that many of the Mesopotamian blades are produced using a technique which creates a blade of similar form to that of the Cananean but with a small plain punctiform butt, and not the faceted, often quite broad platform of the "true Cananean blade".

True Cananean blades certainly occur in western Syria as far north as the Amuq Plain (see for example Braidwood & Braidwood 1960:248, Figs.8-10; Crowfoot Payne 1960), and even well into Anatolia (Caneva 1973:187,189 Fig.2:6), but it is perhaps less certain that this precise technique for blade production is used consistantly further to the east, and thus the suggestion that the Cananean tradition is derived from Mesapotamian sources must be treated with caution.

There is little doubt however that the Jawa assemblage belongs to the tradition of flint assemblages found in late Chalcolithic/Proto-Urban/Early Bronze Age levels on sites in Syria and Palestine, and specifically to the industry described by Crowfoot Payne as "Cananean". At Arad the industry is found in Strata IV-I (EBI-II). Here there are few tool types, the main ones being sickle blades of triangular or more commonly trapezoidal cross-section, and tabular "fan scrapers" of various sizes, shapes and probably various functions as well. The other implements, mainly flakes and blades, are very inferior to the sickle blades and "fan scrapers" in shape, raw material and technique (Schick 1978). The flint from Lachish studied by Waechter (1958) was very mixed. It came from both the mound and the caves but consisted mostly of unstratified surface material. However Waechter says that much of it can be dated to the Early Bronze Age. Characteristic implements are Cananean blades and tabular scrapers. Waechter suggests that the scrapers were struck from a large block, probably in situ. Hinge fracture is common and he suggests also that this is a direct result of the technique of knapping used. The tabular scrapers are often long and parallel-sided, and the sickle elements average about 5 cm. in length.

Site H in Wadi Ghazzeh (Macdonald 1932:11) is also of similar date although there are some anomalous aspects to the assemblage, possibly due to poorly stratified collections. Macdonald states that there were no fan scrapers, but tabular flint was used for oval, round and elongated scrapers. Sickle elements were backed and denticulated, and sometimes both sides had been used. No cores of sufficient size to provide the blades were found on the site and Macdonald concludes that their manufacture was carried out elsewhere. An examination of some of the material (collections in the Institute of Archaeology, London University) showed that although the flat oval scapers were identical to those found in typical "Cananean" assemblages, there was also an abundance of thicker, round scrapers not commonly associated with this industry. Two other points made by Macdonald, in reference to Chalcolithic material from Site B, are also relevant. He describes one fan scraper as being "highly polished round the working edge, as in the case of sickle flints", and also echoes Waechter in suggesting that the fan scrapers were bed-struck (Macdonald 1932:9).

At Megiddo elements of the "Cananean" industry are found in Stages III-VII, but it is best represented in Stages V and VI. Sickle elements are on trapezoidal and triangular blades. A few are backed and/or denticulated. There are some large tabular flakes, mostly irregular in shape with retouch around the edges, and both faceted and plain striking platforms. In addition to these, there are one or two borers and two burins in Stage VI.

At Jericho the Proto-Urban and Early Bronze Age flint assemblages are unfortunately somewhat mixed with flints derived from earlier periods (Crowfoot Payne 1983:718). The assemblage is dominated by sickles on segments of Cananean blades and scrapers on tabular flint, some of true fan shape and others of a more elongated oval form. The only other tools apparently associated with these are a few borers made on fragments of Cananean blades and some retouched pieces. In an earlier report on Garstang's excavations at Jericho, Crowfoot Payne also mentions small rough flakes with plain platforms struck from heavily rolled chunks of flint (Crowfoot 1937:39) which seem reminiscent of the drill bits on water-rolled pebbles from Jawa.

Other sites with "Cananean" assemblages include the Enéolithique Superieur of Tell Farah North which has Cananean blades and "fan scrapers"(De Vaux 1947-62), Beth Shan with Cananean blades and denticulated sickle segments (Fitzgerald 1934), and Tell Moustah (Neuville 1930). Tell Moustah has "racloirs en éventail", two of which Neuville describes as characteristic Cananean types. At least one is "légèrement poli par l'usage". That this is a description of sickle gloss seems to be confirmed by "poli de l'usage" on trapezoidal and triangular backed blade segments. The only other tools are some borers and unworked blades. Cananean blades, a blade core and cortical scrapers were recovered from 'En Besor (Yeivin 1976), and a similar assemblage was found at Tell Umm Hammad (Betts 1984b), although there was no evidence of knapping of Cananean blades at the latter site.

Looking further north, the "Cananean" industry occurs at Hama in Phase L and especially Phase K (Ingholt 1940; Fugmann 1958). Neither report covers the flint industry in any detail, but Fugmann illustrates large tabular scrapers, some of them oval, and trapezoidal blades in K9 and 10, with similar pieces throughout the later levels of K, including some possible chisel/gouges in 6 and 5. Ingholt mentions blades with both triangular and trapezoidal cross-section, specifically "à arête centrale enlevée", sickle elements and fan scrapers.

On the coast, both Byblos and Saida-Dakerman have related flint assemblages. At Byblos (J. Cauvin 1968:177) Cananean blades are classed with more Chalcolithic tool types such as polished axes and chisels under the blanket term "Enéolithique". No Cananean blade cores were found at Byblos, and Cauvin concluded that the blades were imported from an unknown source outside the Lebanon. He also identifies poorer quality local imitations of the imported blades, a phenomenon possibly paralleled at Jawa. Saida-Dakerman on the other hand produced Cananean blade cores, and the raw material used came from a local source (Hours 1979). Tools from the site comprised a high proportion of sickle blades, several borers, a few scrapers, burins, denticulates and various miscellaneous retouched pieces. Only one cortical scraper was reported.

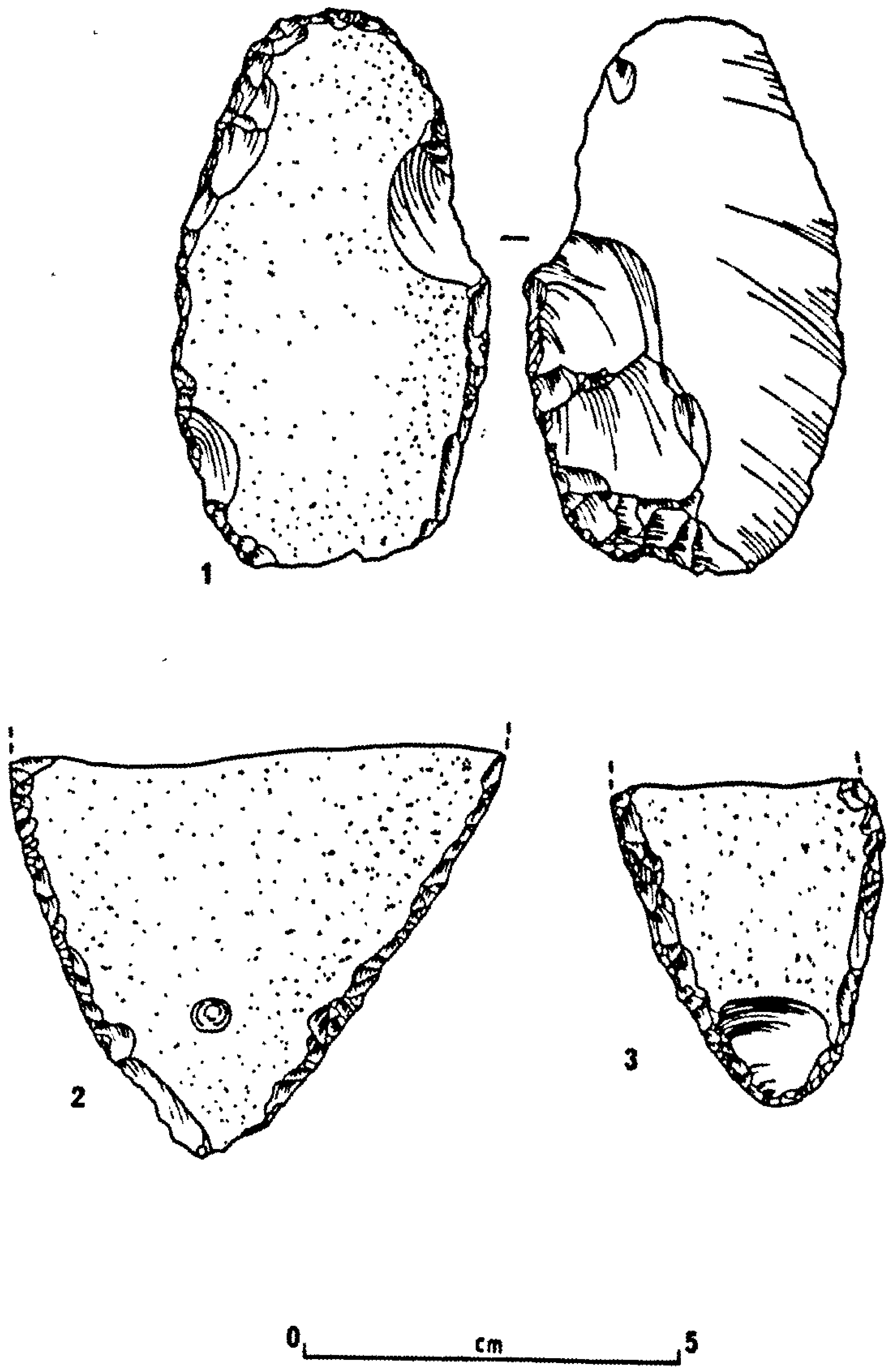
At Tabara el-Akrad near the curve of the Orontes north west of Aleppo, fragments of large three-faceted sickle blades occur from level V onwards. Some have denticulation and some have gloss on both sides (Hood 1951) The evidence from Ras Shamra is very slight, but level III of the "sondage inférieur" produced trapezoidal blades and at least one tabular scraper (Schaeffer 1962:384-397, Figs.45:1,46:1).

At Tell al-Judaidah the "Cananean" industry appears in Phases F-H of the Amuq sequence (Crowfoot Payne 1960). Trapezoidal blades are found in all three phases, becoming slightly larger in G and H. Only one fragment of tabular scraper was found, in Phase G. Crowfoot suggests that this could either be due to an absence of local tabular flint or, more probably, that the tabular scraper is more of a Palestinian phenomenon, being derived out of the Ghassulian fan scrapers. The flint assemblage from Arslantepe (Caneva 1973), with the exception of the blades of Cananean type, is typologically very different from contemporary Syro/Palestinian assemblages, but the presence of large parallel-sided blades with trapezoidal cross-sections and faceted butts could lend weight to McConaughy's suggestion (McConaughy 1979:226) that the origin of this blade technique lies in Asia Minor rather than Mesopotamia.

There is very little evidence of man's presence in the survey area during the Chalcolithic and Early Bronze Age periods, Jawa being the one notable exception. One or two flint implements

Figure 6.7 Survey sites

1	2345	scraper	2
2	2314	scraper	2
3	2345	scraper	2


1
2
3
0
cm
5

which might possibly relate to this period have been found elsewhere in the desert but these can be only extremely tenuously associated with other artefacts or structures. Two sites which should be mentioned in this context are 2314 just north west of Qattafi Wells (Betts 1984a) and 2345, Maitland's "hill-fort" (Maitland 1927;Betts 1983), which lies just a little to the south of the Wells. 2314, a cluster of both ancient and recent corrals at the edge of an extensive qa'a yielded a broken tabular scraper and a fragment of folded ledge handle of EBIII/IV date. Maitland's site is a cluster of corrals on the summit of a table mountain, naturally fortified by the crumbling basalt cliffs that cap the peak. It is the only known site of its kind in the table mountain area of the southern region although many other similar hills have been surveyed both on the ground and through study of aerial photographs. The only artefacts collected from its summit were a handful of crumbling sherds of coarse basalt tempered pot, some fragments of broken tabular scrapers and a few Middle Paleolithic flakes (see Chapter 2).

Other recorded occurances of desert sites in surrounding areas during this period are also rare. Surveys of the Azraq Basin (Garrard & Stanley Price 1975; Garrard et al.1985) produced some material which could be Chalcolithic (Copeland in Garrard & Stanley Price 1975),but the site is only tentatively assigned to this period. Exploration at Kilwa before the Second World War revealed rich prehistoric remains, including some tabular scrapers from Zentralfundplatz 19 (Rhotert 1938,116) suggested to have parallels with the Ghassulian. Judging by the illustrations there still seems to be grounds for tentatively postulating such a date, if not quite a direct link with the Ghassulian itself. Archaeological reconnaissance in the northern province of Saudi Arabia (McCAdams et al. 1977; Parr et al.1978; Ingraham et al.1981) located a number of possibly Chalcolithic sites with tabular side and end scrapers. Some of these sites also produced coarse sand-blasted sherds which could be Chalcolithic. This Arabian industry is described as "a stone industry in the Levantine Chalcolithic tradition, marked especially by tabular flint side- and end-scrapers, awls and micro-awls, and choppers" (Parr et al.1978:37). Considerable numbers of presumably 4th millennium sites with similar stone industries of this type were found at "stone circle sites" in the northern province. These include 201-15 at Wadi 'Ar'ar and 201-54 and 201-56 west of al-Jawf, all three "veritable villages of stone enclosures" with hilltop locations described by the authors as similar to that of Maitland's hill-fort. One of the most interesting sites apparently relating to this period is Rajajil, the stone pillar site (Parr et al. 1978:41; Zarins 1979). Survey and excavation produced a stone industry with awls and tabular scrapers as well as coarse-ware pottery which seems to be the same as the other assemblages assigned to the 4th millennium, although the direct connection between this material and the standing monuments at the site still seems very tentative.

Sites of this period are also known from the Aqaba and Wadi Rum areas of southern Jordan (Henry 1982; Henry & Turnbull 1985; Jobling 1981). Henry describes Chalcolithic sites in the region of Ras en-Naqb with stone tools, undecorated thick plain-ware pottery, bone tools, ground stone implements and associated structures. The stone tool kit consist mostly of scrapers, about half of them tabular, and retouched pieces with some notches, lunates and non-geometric microliths. Henry suggests that the closest affinities are with the Timnian in Sinai (Kosloff 1972/3).

The industries of the Sinai peninsula appear to be peculiar to the region - Elatian, Timnian, Feiran, East Coast and Nabi Saleh (Kosloff 1972/3). The last mentioned is EBII and corresponds more directly to other contemporary industries. Large tabular scrapers are common, Cananean blades occur rarely and characteristic knapping techniques include bulb removal and faceting of platforms. The reappearance of lunates in this period is discussed by Rosen (1983b). The lunates are usually backed by bipolar retouch and there is no apparent evidence for use of the microburin technique. No sites of Chalcolithic/EBI date are yet recorded for the Syrian steppe although some possible parallels to the Jawa flint industry are mentioned by Beaulieu (1944).

Perhaps the most difficult thing to explain is the apparent absence of occupation in the survey area during this period when areas such as the Hisma, Wadi Rum, Sinai and Saudi Arabia seem to have sites relating to the late Chalcolithic/Early Bronze Age with stone tools and occasionally coarse-ware pottery. It seems quite unlikely that the basalt region was entirely uninhabited at this or any other time in prehistory, and yet the evidence for this period is very scant indeed. If there were people in the basalt region at this time then it must be concluded either that the traces of their occupation have not yet been correctly identified, or that, like many nomads in historic periods, their material culture revolved entirely around perishable artefacts which have left little or no trace in the archaeological record.

There is some evidence for a north/south cultural division at this time. Sites in Southern Jordan (Henry 1982) show affinities with those in Sinai (Rosen 1983b), but to date there is no reliable evidence for this desert Chalcolithic north of the Ras en-Naqb escarpment. Similarly, there is almost no evidence for sites of this period in the Syrian steppe. Henry suggests that the sites in the Judayid Basin south of Ras en-Naqb represent an expansion of pastoral nomads out of Sinai onto the southern flanks of the Jordanian Plateau (Henry 1982:443; Henry & Turnbull 1985:61), and so it seems likely that desert peoples of this period on the Syro/Jordanian plateau itself were practising a subsistance economy, the traces of which have either not yet been recognised, or were too ephemeral to survive, except perhaps as small scatters of undiagnostic artefacts.

Chapter 7

One of the most marked characteristics of the Near East is the range of environmental zones it encompasses. The coast, the hills, the Rift Valley and the steppe/desert areas all contain even within themselves a vast number of subtly individual zones, each with its unique advantages and disadvantages for human occupation. In general terms however, a broad division can be drawn between "the desert and the sown", the land where dry farming is possible and the land where it is not. In practice this line falls somewhere about the 200 millimetre isohyet.

For the peoples of the fertile, well-watered lands there are a good many choices of lifestyle, but for those in the marginal areas the choices are much fewer. The division is not as simple as that however. In prehistoric times peoples of the fertile areas may have moved out into the steppe under generally favourable conditions to exploit some aspect of the area not available to them in their normal habitat, and inevitably steppe dwellers reciprocated by moving from time to time into the lusher regions. The study of this fundamental division is the study of the development of what McG. Adams refers to as the "deep-rooted antipathy between the steppe and the sown" (1974). Examination of the nature of this divide is perhaps as important as that of the development of mixed farming in understanding cultural developments in the pre- and proto-history of the Near East. In order to document this, we have to look at the gradual changes in lifestyle and social organisation that begin to develop sometime in the Epipaleolithic.

The initial stages of this development are quite well charted (see for example Henry 1985). There is a noticable change from simple hunting and gathering in the Geometric Kebaran to a more complex adaption in the Natufian involving selection of particular items for exploitation. These items, notably wild cereals and nuts, are storable resources and their increased consumption may thus have encouraged a greater degree of sedentism. Further than this, groups dependent to a large extent on such items were restricted to the Mediterranean hill zone, the area of oak/pistachio woodland and the area where there was sufficient rainfall for the growth of wild cereals. It is also argued that the reasons for this change in resource procurement strategy came about because of a slight climatic amelioration at the end of the Pleistocene which permitted the expansion of cereals and oak/pistachio forest from limited low-lying habitats in places such as the Rift Valley and the Mediterranean coast up into the hill country, thus greatly increasing the availability of these wild plant foods.

If these arguments are correct then one can perhaps see here the beginning of the divide. The steppe was almost certainly always populated to some extent throughout the prehistoric period, but clearly this new adaption to increased dependance on storable plant foods played a much lesser part in more marginal areas, and the emphasis on the older, simpler hunting and gathering strategy would have been greater. It is possible that the Natufian of the survey area reflects this. It could be argued that sites such as Khallat 'Anaza, showing some degree of permanency but lacking several of Bar-Yosef's criteria for base camps, were used by groups who combined increased dependence on specific plant foods with the traditional simple hunter-gatherer lifestyle of earlier times. Certainly what little evidence there is suggests that site location selection did not seem to alter appreciably throughout the Epipaleolithic period. Principal concerns seem to have been availability of water and a good view, presumably to watch for game.

By the Pre-Pottery Neolithic, the divide is very clearly evident. In the Mediterranean hillzones large permanent villages have grown up. The economy of their inhabitants is based on mixed farming. Out in the steppe however, the pattern is one where again some of the new practices are combined with traditional subsistance strategies. At Jilat 7 the cultivation of domestic cereal crops is combined with a seasonally mobile lifestyle and the hunting of wild game, while in the survey area the sites of Dhuweila and Ibn el-Ghazzi reflect an economy based to a very large extent on hunting. Nevertheless the situation in the eastern desert by the 7th millenium was complex. Availability of water was presumably one of the considerations in the choice of location for the Jilat sites, but good vantage points govern the selection of sites in the survey area, apparently with very little regard for water supply. This suggests that sites such as Dhuweila which were presumably occupied for several days, if not weeks at a time, were only visited during periods when there was standing water in the qa'a and wadis. The qa'a at Ibn el-Ghazzi would have acted as a natural reservoir, trapping water for some weeks after the last rains, but a site in such a location, on a high steep-sided hill, is unlikely to have seen occupation under very dry conditions.

Another important aspect of these sites is the preoccupation of their inhabitants with the hunting of gazelle, under some circumstances a migratory animal. If the gazelle were moving across the lava belt in large numbers at one particular time of year, presumably during or immediately after the rainy season when grazing was adequate, it is likely that this is the time when the basalt hammada saw the greatest amount of human activity. During the drier seasons the steppe dwellers may have moved within closer range of permanent water sources.

By the later Neolithic, although the evidence is still fragile, it seems that a new stage in steppic adaption has been reached. If it is true that the "burin sites" represent camps of nomadic pastoralist/hunters, then the pattern is now one not of the borrowing of practices suitable to a steppic existance combined with traditional lifestyles, but a completely new lifestyle based on practically wholesale adoption of an innovation, almost to the exclusion of traditional steppic subsistance strategies.

This pattern of development, the growing differences between the two regions, can also be observed in the material culture. In the Natufian, cultural asemblages from sites in the steppic areas are in most respects identical to those from sites in the Mediterranean hill country, although the latter tend generally to be richer. By the PPNB, although tool kits are broadly the same in both regions, relative proportions of tools are markedly different, and the steppe dwellers have developed some unique aspects of material culture, for example the rock art at Dhuweila. By the 6th millennium differences between sites in the eastern desert and the Early Pottery Neolithic sites of the Levant are so great that they have almost nothing left in common.

Although it seems unlikely that the steppe was ever totally abandoned at any time in the prehistoric period, evidence from the survey has not proven this. There are gaps. This might be the result of a number of factors: failure of the survey to locate or identify sites of these periods, abandonment of the basalt hammada (although not of the whole steppic region), or the destruction or burial of sites in the course of the erosion cycle. The basalt hammada with its rather special geomorphological character may not always have attracted people living in the eastern desert. They may at times have preferred the marshes around Azraq or the open gravel plains. Short-term local changes too may have temporarily altered the pattern of environmental exploitation, for example animal disease or the destruction of wells or waterholes through changes in drainage patterns, perhaps caused by localised tectonic disturbance.

Gaps occur in the sequence during the Lower Paleolithic, the Upper Paleolithic, the PPNA and the transition between the PPNB and the "burin sites". Lower Paleolithic sites are most probably absent because they have been either buried or washed away. Upper Paleolithic sites are generally extremely rare, and it is not perhaps surprising that area survey has failed to identify any. At least one - Enoqiyyah - has been found in the basalt however, and thus it is possible that there may be more. Sites of the PPNA period again are generally rare, although a desert variant, the Harifian, has been found in the Negev (Scott 1977). The Harifian has dates in the very late 9th millennium and a lithic industry containing both Natufian/Moshabian and Early Neolithic elements. No equivalent to this is known from Transjordan, either from the basalt region or from Garrard's surveys around Azraq, Kharaneh and Jilat, nor has Henry found any in the Ras en-Naqb region.

The last gap, the transition from the PPNB to the "burin sites" is less clear-cut. There is a very obvious distinction between the two, but it is possible that there was little or no gap between the end of one and the beginning of the next. There is only one site, Azraq 31 (Garrard et al. in prep.), which seems to fall into the "transitional" category. It has a blade-based industry with both bipolar and rather crude single platform cores, Amuq and Byblos type points and also the small later forms, a relatively high proportion of bifacial pieces and a higher freuqency of concave truncation burins than is usually found on the desert PPNB sites. However the eroded upper levels at Dhuweila have high proportions of Late Neolithic types of arrowhead without other attendant "burin site" elements. One hypothesis might be therefore that there was no clear-cut sequential development out of the PPNB through a transitional stage into the fully developed "burin site" lifestyle, but perhaps instead a pattern of irregular change where some groups began to adopt a pastoralist/hunter lifestyle while others maintained the traditional subsistance pattern based on hunting and gathering. When these relic groups finally did relinquish their old lifestyle for the new one, it is likely that the transitional stage would be too brief to be traceable in the archaeological record.

Area study of the Black Desert has then highlighted patterns of change in settlement throughout the prehistoric periods. Changes in the type, location and density of settlement are sometimes explained by theories of climatic fluctuation, a hypothesis which cannot be dismissed here as study of the environment around the basalt region in prehistoric times is still in progress (Garrard pers. comm.). However it is also possible that less extreme explanations may be equally plausible. Choice of site is governed in the Middle Paleolithic by the proximity of high hills to open country. In the Epipaleolithic, vantage points are still important but sites are often deeper in the basalt hammada and tend to be near to water sources. PPNB sites are also on high ground in the hammada, but not necessarily close to water supplies. Later Neolithic sites are on sheltered slopes close to grazing grounds. Taking the study region as a whole, sites of all periods are generally commoner in the slightly more favourable areas to the west; around the basalt margins, the large mudflats and up the wadis draining from the Ashaqif range into the Azraq Basin. Sites here tend to be larger than those to the east. Settlement is noticably sparser east of the Ashaqif range and the sites are generally more impoverished, even in better areas around the pools at Qasr Burqu', the wells at Bir al-Ghusain and the eastern margins of the basalt hammada.

These general trends seem to reflect a pattern based chiefly on the resource procurement strategies of particular groups throughout prehistory, and it seems quite plausible to suggest that choice of site on, around or off the basalt hammada was governed more by the habitat requirements of prehistoric groups than by climatic fluctuation.

Survey Area

General Site Distribution Maps

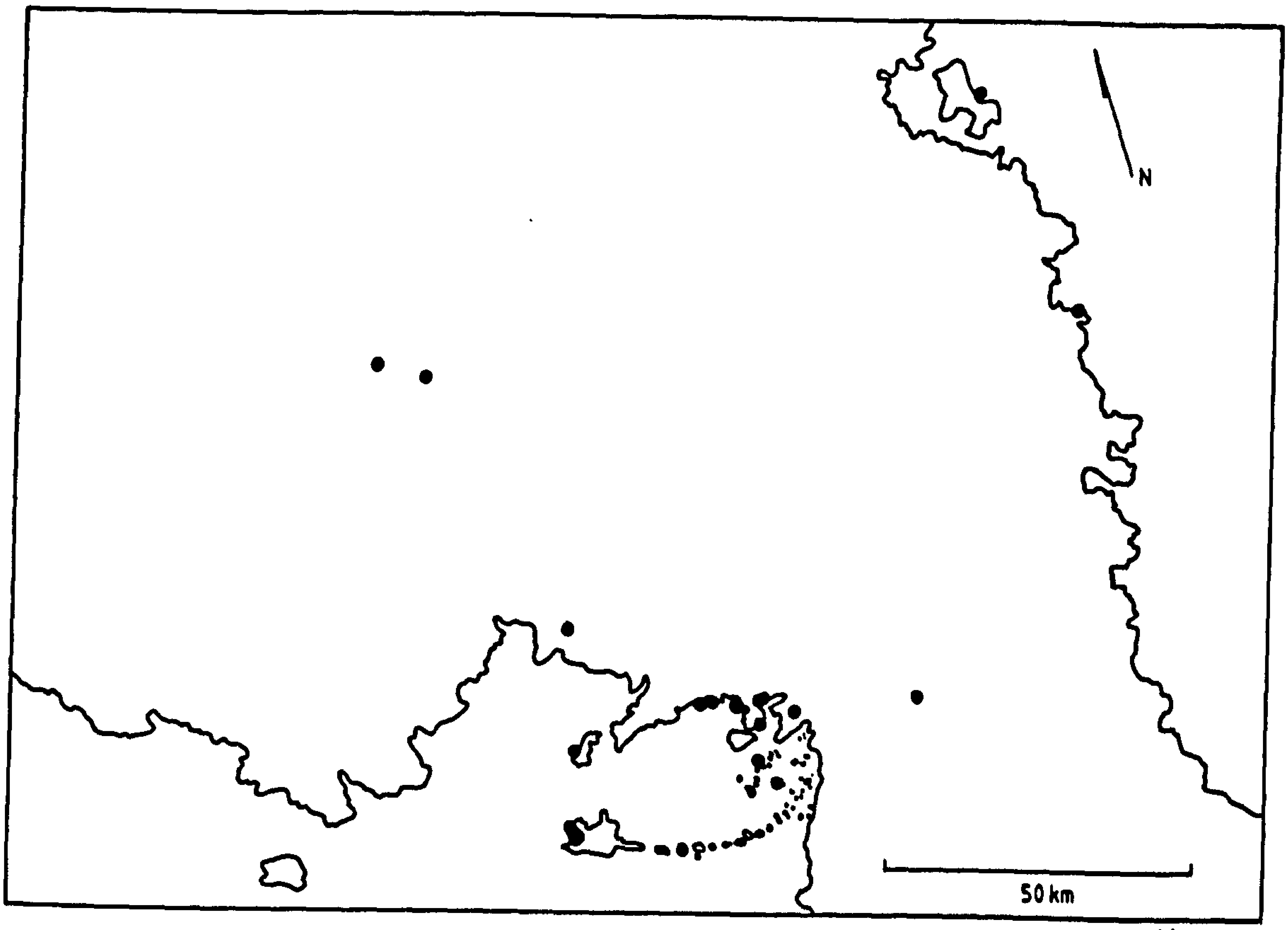


Fig. 7.1 Black Desert, eastern Jordan: location of Middle Paleolithic sites

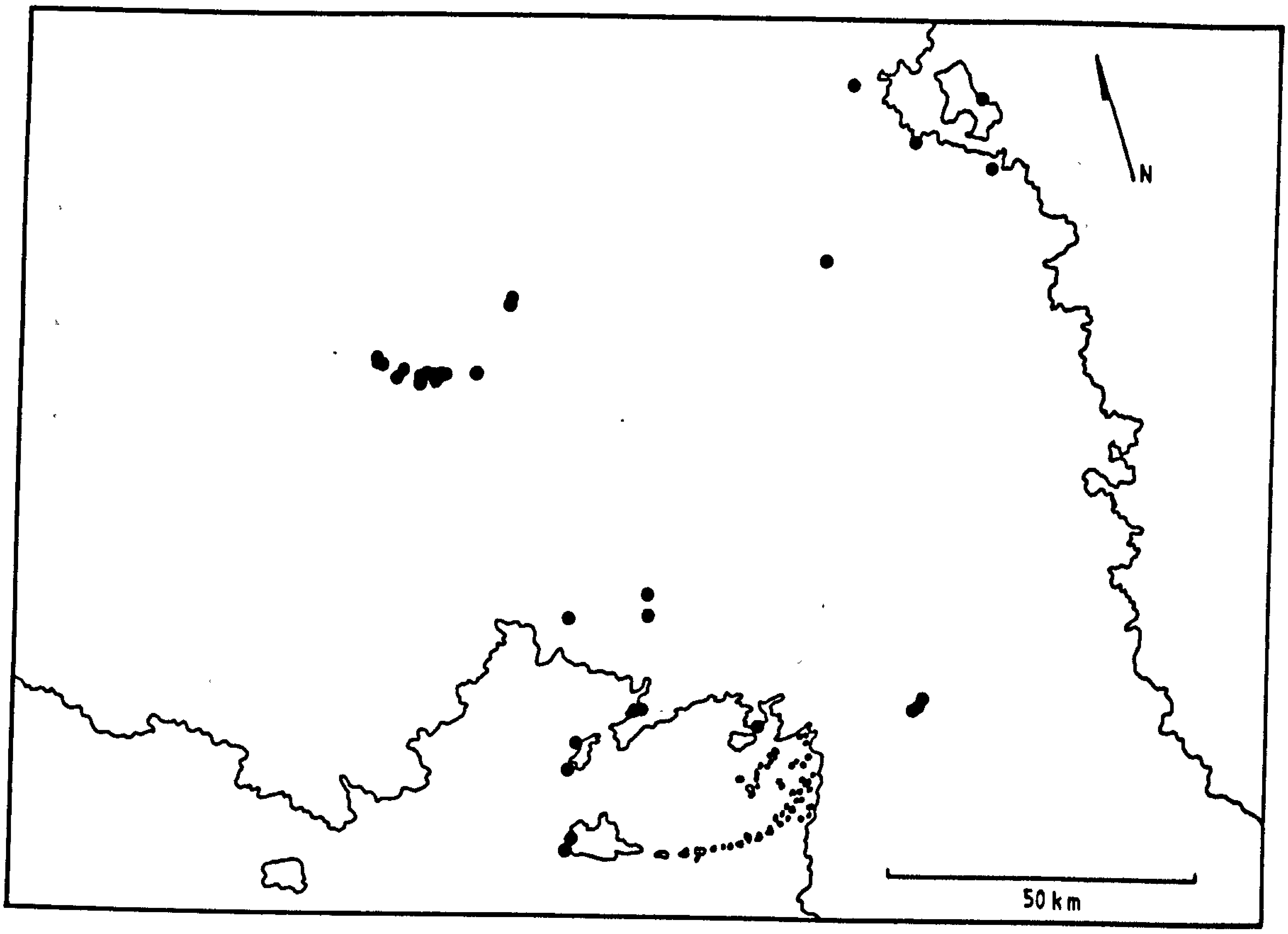


Fig. 7.2 Black Desert, eastern Jordan: location of Epipaleolithic sites

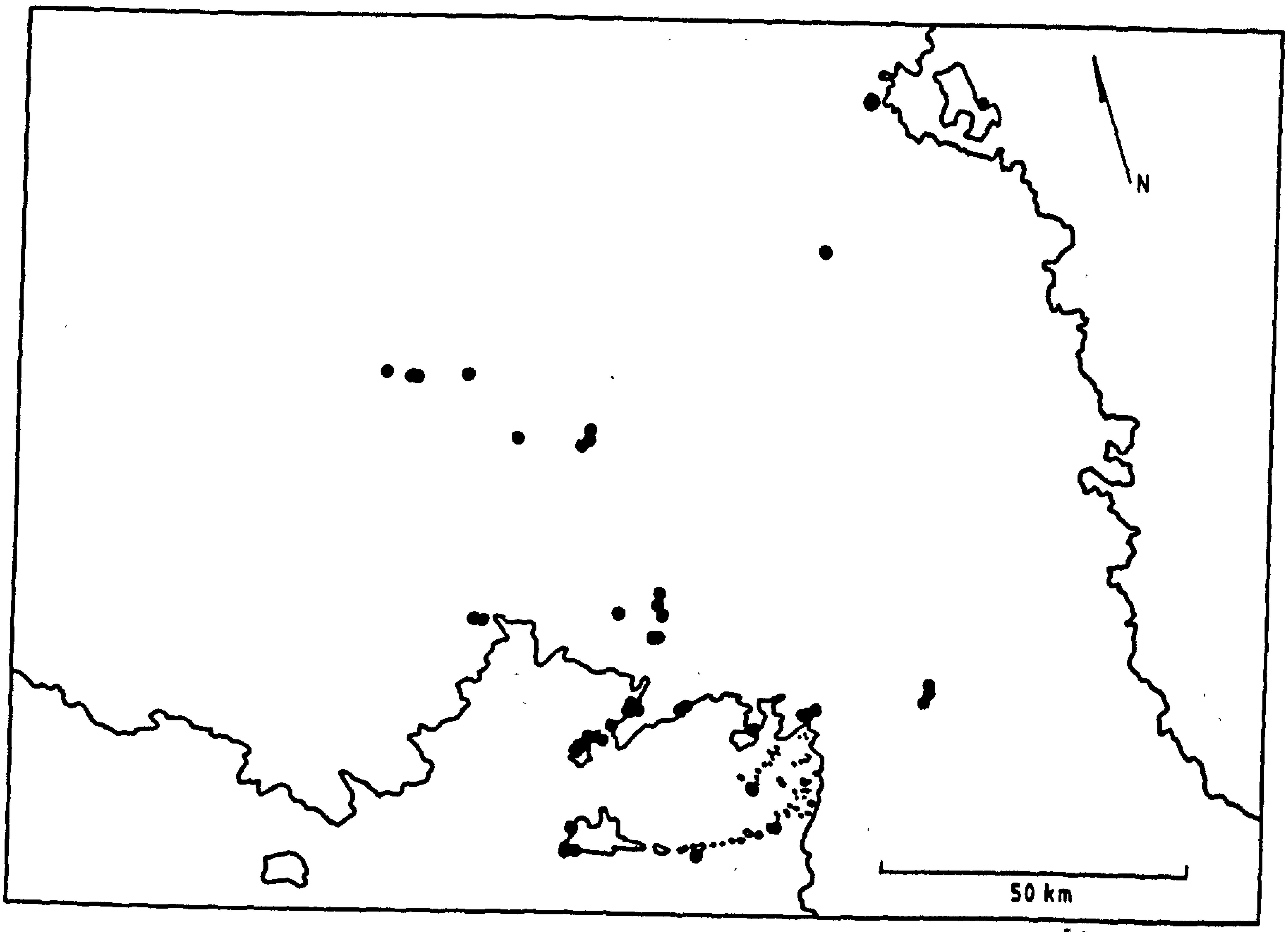


Fig. 7.3 Black Desert, eastern Jordan: location of PPNB sites

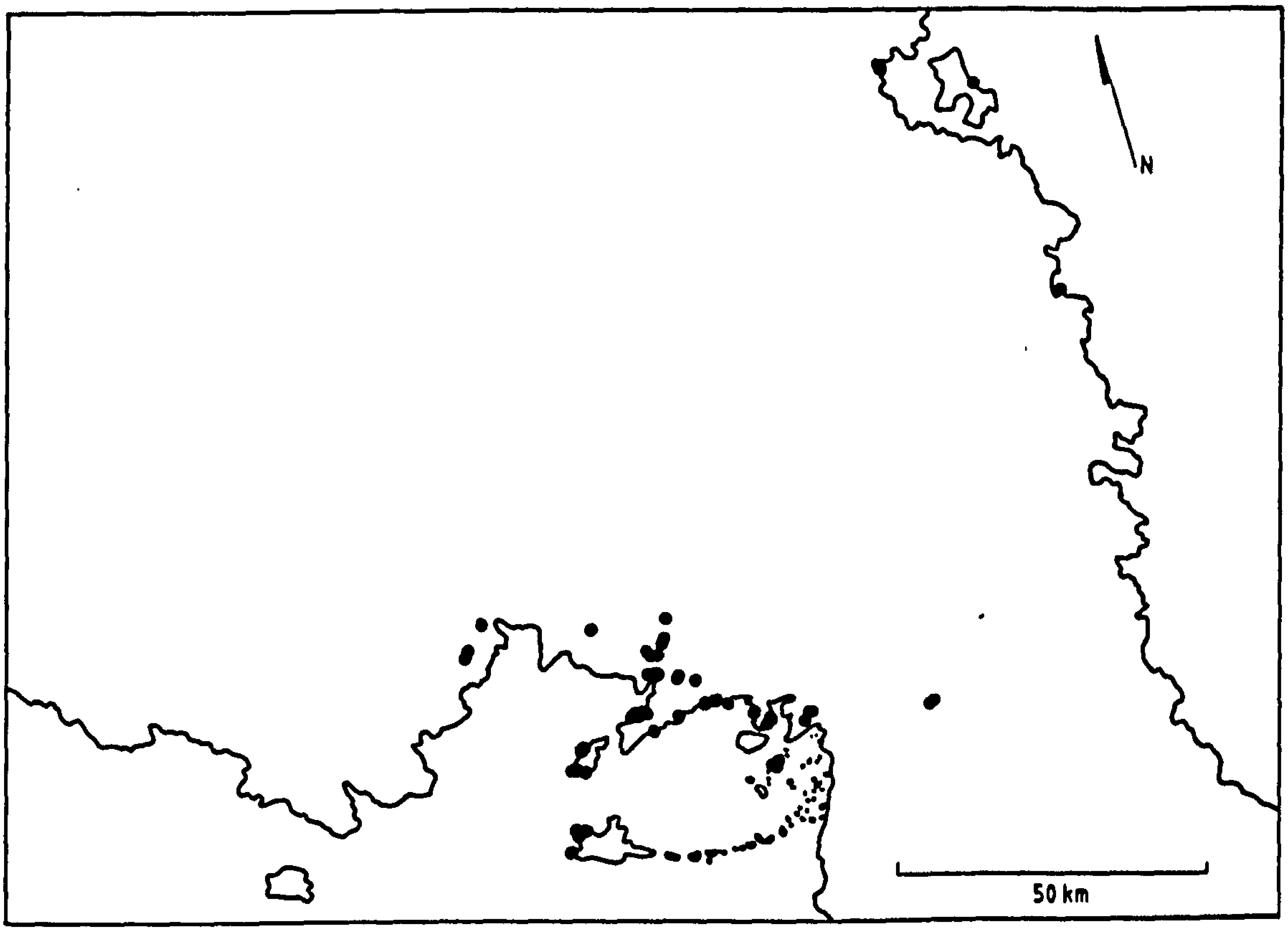


Fig. 7.4 Black Desert, eastern Jordan: location of "burin sites"

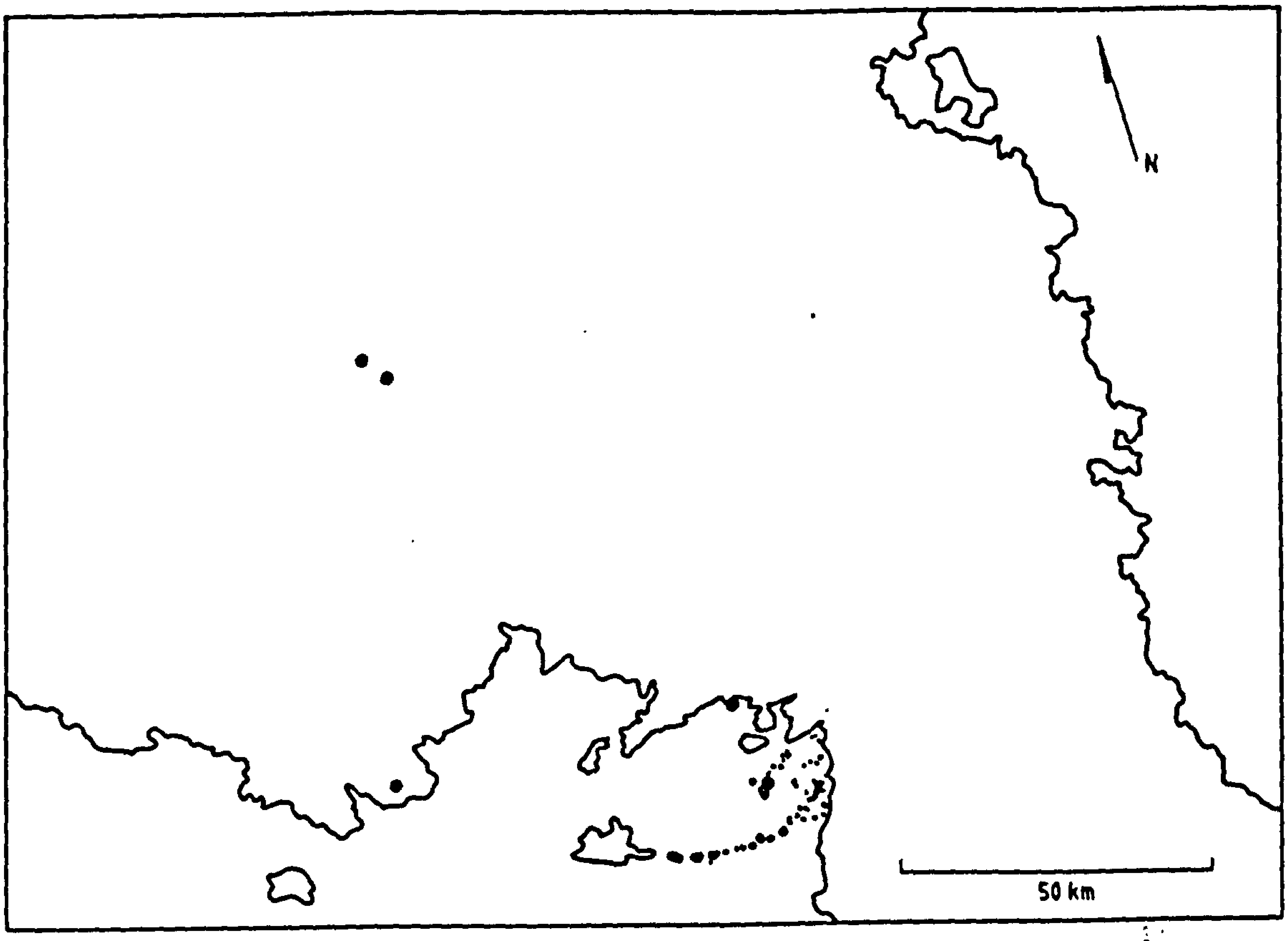


Fig. 7.5 Black Desert, eastern Jordan:
location of Chalcolithic/EB sites

Almagro M., Caballero L., Zozaya J. & Almagro A. (1975)
Qusayr Amra. Residencia y baños omeyas en el desierto de Jordania
Madrid

Anati E. (1963)
Palestine before the Hebrews
London

Aurenche O. & Cauvin M.C. (1982)
"Qdeir 1, campagne 1980: une installation néolithique du VII millénaire" 51-78
Cahiers de l'Euphrate 3 :~~79-92~~ CNRS

Baron A.G. (1981)
"Adaptive Strategies in the Archaeology of the Negev"
BASOR 242:51-81

Bar-Yosef O. (1970)
The Epi-Paleolithic Cultures of Palestine
PhD thesis Jerusalem

Bar-Yosef O. (1981a)
"The Epi-Paleolithic Complexes in the Southern Levant"
in *Préhistoire du Levant* :389-408 CNRS

Bar Yosef O. (1981b)
"The "Pre-Pottery Neolithic" period in the Southern Levant"
in *Préhistoire du Levant* :551-570 CNRS

Bar-Yosef O. (1981c)
"Pre-Pottery Neolithic Sites in Southern Sinai"
BA 45/1:9-12

Bar-Yosef O. (1982)
"The Natufian in the Southern Levant"
in R.J. Braidwood *The Hilly Flanks* Chicago:11-42

Bar-Yosef O. & Goren N. (1980)
"Afterthoughts following Prehistoric Surveys in the Levant"
IEJ 30/3-4:1-16

Bar-Yosef O. & Phillips J. eds. (1977)
Prehistoric Investigations in Gebel Maghara, northern Sinai
Qedem 7

Bar-Yosef O. & Valla F.R. (1979)
"L'évolution du Natoufien. Nouvelles suggestions"
Paléorient 5:145-152

Bate D.M.A. (1938)
Vertebrate Remains from Wadi Dhobai, 1938
in Waechter & Seton Williams 1938:17-21

Bender F. (1968)
Geologie von Jordanien
Berlin

Bergman C.A. & Newcomer M.H. (1983)
"Flint Arrowhead Breakage: examples from Ksar Akil, Lebanon"
JFA 10:238-243

Besançon J, Copeland L., Hours F., Macaire J.J. & Sanlaville P.
(in prep) "The "Desert Wadi Acheulean" of the Azraq Basin, Jordan: Survey results 1982-1985"

Besançon J. & Hours F. (1985)
"Prehistory and Geomorphology in Northern Jordan: a Preliminary Outline"
in A. Hadidi ed. Studies in the History and Archaeology of Jordan II :59-66 Amman

Betts A.V.G. (1982a)
"Prehistoric Sites at Qa'a Mejalla, Eastern Jordan"
Levant XIV:1-34

Betts A.V.G. (1982b)
"A Natufian Site in the Black Desert, Eastern Jordan"
Paléorient 8/2:79-82

Betts A.V.G. (1983)
"Black Desert Survey, Jordan: first preliminary report"
Levant XV:1-10

Betts A.V.G. (1984a)
"Black Desert Survey, Jordan: second preliminary report"
Levant XVI:25-34

Betts A.V.G. (1984b)
"Chipped Stone Tools"
Appendix I in Helms S.W. "Excavations at Tell Umm Hammad esh-Sharqiya in the Jordan Valley, 1982"
Levant XVI:35-54

Betts A.V.G. (1985)
"Black Desert Survey, Jordan: third preliminary report"
Levant XVII:29-52

Bintliff J. & Van Zeist W. eds. (1982)
Paleoclimates, Paleoenvironments and Human Communities in the Eastern Mediterranean Region in Later Prehistory
BAR International Series 133

Beaulieu R.P.A. (1944)
"La première civilisation du Djebel Druze"
Syria 24: 232-250

Bordes F. (1950)
"Principes d'une méthode d'étude des techniques de debitage et de la typologie du Paléolithique ancien et moyen"
L'Anthropologie 54 1/2:19-34

Bordes F. (1961)
Typologie du Paléolithique
Bordeaux

Boulos L., Jallad, W. & Lahham J. (1977)
"Studies on the flora of Jordan 7. On the Desert flora of the area of H-4 H-5 Pumping Stations"
Candollea 32,2:255-268

Braidwood R.J. (Presented to) (1983)
The Hilly Flanks and Beyond
Chicago

Braidwood R.J. & Braidwood L.S. (1960)
Excavations in the Plain of Antioch
University of Chicago Oriental Institute Publications LXI

Brezillon M.N. (1968)
La dénomination des Objêts de Pierre Taillée
IV Supplement à Gallia Préhistoire CNRS

Burckhardt J.L. (1831)
Notes on the Beduins and Wahabys
London

Burian F. & Friedman E. (n.d.)
In the Footsteps of Early Hunters
Israel Museum Cat. 151

Burian F. & Friedman E. (1979)
"A Typology of Arrowheads and Sickle Blades and its Chronological Implications"
Mitekufat Haeven 16:16-6

Caneva I. (1973)
"Note sull'industria litica di Arslantepe"
in Palmieri A. "Scavi nell'area sud-occidentale di Arslantepe" Origini VII:55-228

Cauvin J. (1968)
Les outillages néolithiques de Byblos et du littoral Libanais
Fouilles de Byblos IV Paris

Cauvin J. (1980)
"L'Occupation Néolithique de la Région d'el Kowm: Résultats 1978-1979 "
Préhistoire du Levant:471-483 CNRS

Cauvin J. (1982)
"Nouvelles stations Néolithiques dans la cuvette d'el-Kowm"
Cahiers de l'Euphrate 3:79-92 CNRS

Cauvin J. (1983a)
"Typologie et fonctions des outils préhistoriques: apports de la tracéologie à un vieux débat"
Traces d'Utilization Travaux de la Maison de l'Orient 5:259 Lyons

Cauvin J. (1983b)
"Travaux de la mission permanente à El Kowm (Syrie): 1978-1083 "
Chronique Archéologique Syria LX:271-273

Cauvin J., Cauvin M.C. & Stordeur D. (1979)
"Recherches préhistoriques à el-Kowm (Syrie). Première campagne 1978"
Cahiers de l'Euphrate 2:80-117

Cauvin M.C. (1973)
"Une Station de Tradition Natoufienne dans le Hauran (Syrie): Taibé, près de Deraa"
AAAS/ 23 :105-110

Cauvin M.C. (1974a)
"Flèches à encoches de Syrie: essai de classification et d'interprétation culturelle"
Paléorient 2/2:311-322

Cauvin M.C. (1974b)
"L'industrie natoufienne de Taibé dans le Hauran (Syrie)"
BSPF 71:469-478

Cauvin M.C. (1974c)
"Outillage Lithique et Chronologie à Tell Aswad"
Paléorient 2/2:429-436

Cauvin M.C. (1975)
"Outillage Lithique et Chronologie de Tell Ghoraifé C"
Paléorient 3:295-301

Cauvin M.C. (1981)
"L'Epipaléolithique de Syrie d'après les premièrs recherches dans la cuvette d'el-Kowm (1978-1979)"
Préhistoire du Levant CNRS 375-388

Cauvin M.C. (1983)
"Les sites épipaléolithiques de Mallat-Jayroud (Syrie)"
Syria LX:297-299

Cauvin M.C. (in prep)
MS consulted through the kindness of the author, March 1985

Cauvin M.C. & Stordeur D. (1978)
Les Outillages Lithiques et osseux de Mureybet, Syrie
CNRS Paris CAHIERS DE L'EUPHRATE 1

Close A. (1984)
"Report on Site E-80-3"
in Close A. ed. Cattle Keepers of the Eastern Sahara
SMU Dallas 307-324

Clutton-Brock J. (1970)
"The fossil Fauna from an Upper Pleistocene site in Jordan"
Journal of Zoology, London 162:19-29

Contenson H. de (1966)
"La station préhistorique de Qornet Rarrha"
AAAS 16 197-200

Contenson H. de (1967)
"Troisième Campagne à Tell Ramad 1966
Rapport Preliminaire"
AAAS 17:17-23

Contenson H. de (1973)
"Chronologie absolue de Tell Aswad (Damascène, Syrie)"
Comptes Rendus des Séances Mensuelles de la Societé Préhistorique Française 70/8:253-6

Contenson H. de & van Lière W. (1964)
"Sondages à Tell Ramad en 1963"
AAAS XIV:109-124

Copeland L. (1975)
"Comments on Flint Artifacts from 1975 Azraq Survey"
in Garrard & Stanley Price 1975:114-122

Copeland L. (1981)
"Chronology and Distribution of the Middle Paleolithic, as known in 1980, in Lebanon and Syria"
Préhistoire du Levant:239-263 CNRS

Crowfoot J. (1937)
"Notes on the Flint Implements of Jericho, 1936"
AAAL XXIV:35-52

Crowfoot Payne J. (1960)
"Flint Implements from Tell al-Judaidah"
Appendix I in Braidwood & Braidwood 1960:525-539

Crowfoot Payne J. (1976)
"The terminology of the Aceramic Neolithic period in the Levant"
UISPP Congress Nice

Crowfoot Payne J. (1983)
"The flint industries of Jericho"
Appendix C in Kenyon K.M. & Holland T.A. Excavations at Jericho Vol.V:622-759

CNRS (1982)
Cahiers de l'Euphrate 3 Paris

Ducos P. (1968)
L'Origine des Animaux Domestiques en Palestine
Bordeaux

Dubertret L. & Dunand M. (1954)
"Les gisements ossiferes de Khirbet el-Umbachi et de Hebariyé (Safa)"
AAAS IV/V:59-76

Field H. (1960)
North Arabian Desert Archaeological Survey 1925-1950
Papers of the Peabody Museum, Harvard 45/2

Fitzgerald G.M. (1934)
"Excavations at Beth Shan 1933"
PESQS LXVI:123-34

Fugmann E. (1958)
Hama. Fouilles et Recherches 1931-1938
Copenhagen

Garrard A.N. (1984)
"The Selection of South-West Asian Animal Domesticates" in: J. Clutton-Brock & C. Grigson (eds.)
Animals and Archaeology: 3.Early Herders and their Flocks :117-132 B.A.R. Int.Ser. 202 Oxford

Garrard A.N. (1985)
"Faunal Remains"
Appendix I in Betts 1985:39-49

Garrard A.N. & Stanley Price N.P. (1975)
"A survey of Prehistoric sites in the Azraq Basin, Eastern Jordan"
Paléorient 3:109-123

Garrard A.N., Byrd B., Harvey P. & Hivernel F. (1985)
"Prehistoric Environment and Settlement in the Azraq Basin: a report on the 1982 survey season"
Levant XVII:1-28

Garrard A.N., Byrd B. & Betts A.V.G. (in press)
"Prehistoric Environment and Settlement in the Azraq Basin: a report on the 1984 survey season"
Levant

Garrard et al. (in prep)
"Prehistoric Environment and Settlement in the Azraq Basin: a report on the 1985 survey season"
Levant

Garrod D. & Bate D. (1937)
The Stone Age of Mount Carmel
Oxford

Garrod D. (1960)
"The Flint Implements"
Chap.VIII in Field H. "North Arabian Archaeological Survey 1925-50"
Papers of the Peabody Museum XLV No 2:111-124

Gaussen M. & Gaussen J. (1965)
"Un atelier de burins à Lagreich- Neo 1, Oued Tilemsi"
L'Anthropologie 69:237-248

Gebel H.G. (n.d.)
TAVO Palaeoenvironmental Investigations in the Greater Petra Area
Unpub. Report, Dept. of Antiquities of Jordan

Gilmore M., al-Ibrahim M. & Murad A.S. (1982)
"Preliminary Report on the Northwestern and Northern Regions Survey 1981 (1401)"
Atlal6:9-24

Glory A. (1943)
"L'emploi du foret en silex à l'époque néolithique"
BSPF 40:36-40

Glueck N. (1951)
Explorations in Eastern Palestine
AASOR 25/8
New Haven

Goldberg P. (1981)
"Late Quaternary Stratigraphy of Israel: an eclectic view"
Préhistoire du Levant CNRS 55-66

Goring-Morris A.N. & Gopher A. (1983)
"Nahal Issaron: A neolithic settlement in the Southern Negev"
IEJ 33:149-162

Hanihara K. & Akazawa T. eds. (1979)
Paleolithic Site of Douara Cave and Paleogeography of Palmyra Basin in Syria II
Tokyo

Hanihara K. & Akazawa T. eds. (1983)
Paleolithic Site of Douara Cave and Paleogeography of Palmyra Basin in Syria III
Tokyo

Hanihara K. & Sakaguchi eds. (1978)
Paleolithic Site of Douara Cave and Paleogeography of Palmyra Basin in Syria I
Tokyo

Harding G. (1953)
"The Cairn of Hani"
ADAJ 2:8-56

Harrison D.L. (1964)
The Mammals of Arabia Vol.I
London

Harrison D.L. (1968)
The Mammals of Arabia Vol.II
London

Harrison D.L. (1972)
The Mammals of Arabia Vol.III
London

Helms S.W. (1981)
Jawa : Lost City of the Black Desert
London

Helms S.W. (1984)
"Excavations at Tell Umm Hammad esh-Sharqiya in the Jordan Valley 1982"
Levant XVI:35-54

Helms S.W. (in prep.)
Excavations at Jawa 1972-1976: technical studies I

Helms S.W. & Betts A.V.G. (in prep.)
"Ibn el-Ghazzi: a pre-Islamic agricultural station in eastern Jordan"

Hennessy J.B. (1967)
The Foreign relations of Palestine during the Early Bronze Age
London

Henry D.O. (1973)
The Natufian of Palestine:its material culture and ecology
PhD thesis S.M.U.

Henry D.O. (1974)
"The Utilization of the Microburin Technique in the Levant"
Paléorient 2/2:389-398

Henry D.O.(1977)
"An examination of artifact variability in the Natufian of Palestine"
Eretz Israel 13:229-40

Henry D.O. (1981)
"An analysis of settlement patterns and adaptive strategies of the Natufian"
in: Préhistoire du Levant CNRS:421-432

Henry D.O. (1982)
"The Prehistory of Southern Jordan and relationships with the Levant"
JFA 9/4:417-444

Henry D.O. (1983)
"Adaptive Evolution within the Epipaleolithic of the Near East"
Chapter 3 in Advances in World Archaeology
Vol 2:99-160 Academic Press

Henry D.O. (1985)
"Preagricultural Sedentism: The Natufian Example"
Prehistoric Hunter-Gatherers Chapter 14
Academic Press

Henry D.O. & Turnbull P.F. (1985)
"Archaeological and Faunal Evidence from Natufian and Timnian Sites in Southern Jordan"
BASOR 257:45-64

Hole F. (1973)
"Questions of theory in the explanation of culture change in prehistory"
in: C. Renfrew (ed.) The Explanation of Culture Change :19-34 London

Hole F. (1977)
Studies in the Archaeological History of the Deh Luran Plain
Ann Arbor, Michigan

Hole F., Flannery K.V. & Neely J.A. (1969)
Prehistory and Human ecology of the Deh Luran Plain
Ann Arbor, Michigan

Hood S. (1951)
" Excavations at Tabara el-Akrad"
Anatolian Studies I I:144

Horsfield A. (1943)
"Journey to Kilwa, Transjordan"
The Geographical Journal CII/2:71-77

Hours F. (1974)
"Remarques sur l'utilization de Liste-Types pour l'Étude du Paléolithique Supérieur et de l'Epipaléolithique du Levant"
Paléorient 2:3-18

Hours F. (1979)
"L'industrie lithique de Saida-Dakerman"
Berytus XXVII:57-76

Huckriede R. & Wieseman G. (1968)
"Der jungpliestozäne Pluvial- See von El Jafr und weitere Daten zum Quartär Jordaniens"
Geologica et Palaeontologica 2:73-95

Ingholt H. (1940)
Rapport Préliminaire sur sept campagnes de fouilles à Hama en Syrie 1932-1938
Copenhagen

Ingraham M., Johnson T., Rihani B. & Shatta I. (1981)
"Preliminary Report on a Reconnaissance Survey of the Northwestern Province"
Atlal 5:59-84

Jelinek A.J. (1981a)
"The Middle Paleolithic in the Southern Levant from the perspective of the Tabun Cave"
Préhistoire du Levant CNRS :265-280

Jelinek A.J. (1981b)
"The Middle Paleolithic of the Levant:Synthesis"
Préhistoire du Levant CNRS :299-302

Jobling W.J. (1981)
"Preliminary Report on the Archaeological Survey between Ma'an and 'Aqaba"
ADAJ XXV 105-112

Kenyon K. (1981)
Jericho III
London

Kirkaldy J.F. (1963)
Minerals and Rocks
London

Kirkbride D. (1966)
"Five Seasons at the Pre-Pottery Neolithic Village of Beidha in Jordan"
PEQ:8-72

Kirkbride D. (1978)
"The Neolithic in Wadi Rumm: 'Ain Abu Nekheileh"
in: R. Moorey & P. Parr (eds. _Archaeology in the Levant_ :1-10 Warminster, England

Klejn L.S. (1973)
"Marxism, the systemic approach, and archaeology"
in: C. Renfrew (ed.) _The Explanation of Culture Change_ :691-710 London

Köhler I. (1981)
"Animal Remains" Appendix E in Helms (1981):249-252

Korfmann M. (1972)
Schleuder und Bogen in Südwestasien
Bonn

Kozloff B. (1974)
"A Brief Note on the Lithic Industries of Sinai"
Museum Ha'aretz Bull. 15/16:35-49

Lamb H.H. (1972)
Climate, Past, Present and Future
London

Lechevallier M. & Dollfus G. (1973)
"Nouveaux sites du VI millénaire en Haute-Galilée"
Eretz-Israel 11:9-21

Levy T. (1983)
"The Emergence of Specialized Pastoralism in the Southern Levant"
World Archaeology XV/1:15-36

Loud G. (1948)
Megiddo II
Chicago

Macdonald B., Rollefson G.O. & Roller D. (1982)
"The Wadi el-Hasa Survey 1981: A Preliminary Report"
ADAJ XXVI:117-132

Macdonald B., Rollefson G.O., Banning E.B., Byrd B.F. & d'Annibale C. (1983)
"The Wadi el-Hasa Archaeological Survey 1982: A Preliminary Report"
ADAJ XXVII:311-324

Macdonald E. (1932)
Beth-Pelet II
London

Maitland R.A. (1927)
"The Works of the "Old Men" in Arabia"
Antiquity 1:197-203

Marks A.E. ed. (1976)
Prehistory and Paleoenvironments in the Central Negev, Israel Vol I
Dallas

Marks A.E. ed. (1977)
Prehistory and Paleoenvironments in the Central Negev, Israel Vol II
Dallas

Marks A.E. (1981)
"The Middle Paleolithic of the Negev, Israel"
Préhistoire du Levant:287-298 CNRS

Marks A.E. ed. (1983)
Prehistory and Paleoenvironments in the Central Negev, Israel Vol III
Dallas

Marks A.E. & Friedel D.A. (1977)
"Prehistoric Settlement Patterns in the Avdat/Aqev area"
in Marks ed. 1977:131-158

McC Adams R. (1974)
"The Mesopotamian Social Landscape: A View from the Frontier"
in C.B. Moore ed. *Reconstructing Complex Societies*:
1-12 BASOR Supplement 20

McC Adams R., Parr P.J., Ibrahim M. & Mughannum A.S. (1977)
"Saudi Arabian Archaeological Reconnaissance 1976. Preliminary Report on the First Phase of the Comprehensive Archaeological Survey Program"
*Atlal*1:21-40

McConaughy M. (1979)
Formal and Functional Analyses of Chipped Stone Tools from Bab edh-Dhra
PhD thesis Ann Arbor

Minz E. & Ben-Ami D. (1977)
"Neolithic Occurrances" in Bar-Yosef & Phillips eds.(1977):219-244

Minzoni-Deroche, A (1985)
"Lithic artefacts interpretation: an empirical approach"
World Archaeology 17/1:20-31

Moore A.M.T. (1978)
The Neolithic of the Levant
PhD thesis Oxford

Mortensen P. (1970)
"A preliminary study of the chipped stone industry from Beidha"
Acta Archaeologica XLI:1-53

Mortensen P. (1983)
"Patterns of interaction between Seasonal Settlements and Early Villages in Mesopotamia" in Braidwood 1983

Moss E.H. (1983)
"A Microwear Analysis of Burins and Points from Tell Abu Hureyra, Syria" in *Traces d'Utilization*
CNRS Lyon

Mouterde P. (1952)
La Flore du Djebel Druze
Beirut

Mouterde P. (1966)
Nouvelle Flore du Liban et de la Syrie
Beirut

Mueller J.W. ed. (1975)
Sampling in Archaeology
Tucson, Arizona

Muheisen M. (1983)
La Préhistoire en Jordanie. Recherches sur l'Epipaléolithique. L'example du gisement de Kharaneh IV
PhD thesis Bordeaux

Musil A. (1928)
The Manners and Customs of the Rwala Beduin
New York

Nasrallah J. (1966) "Notes de Préhistoire Syrienne Qatana"
AAAS 15:51-64

National Water Master Plan. Hashemite Kingdom of Jordan (1977)
Federal Republic of Germany GTZ

Nelson B. (1973)
Azraq, desert oasis
London

Newcomer M.H. (1972)
An analysis of a series of burins from Ksar Akil (Lebanon)
PhD thesis London

Neuville E. (1930)
"Notes de préhistoire Palestinienne II - Tell Moustah"
JPOS 10:193-198

Neuville E. (1934)
"Le préhistorique de Palestine"
RB XLIII:237

Noy T. (1975)
Six Neolithic Sites, a sample from different geographical zones of Israel
PhD thesis Jerusalem

Noy T., Legge A.J. & Higgs E.S. (1973)
"Excavations at Nahal Oren, Israel"
PPS 39:75-99

Noy T. Schuldenrein J. & Tchernov E. (1980)
"Gigal, A Pre-Pottery Neolithic A Site in the Lower Jordan Valley" IEJ:63-82 Vol.30

Olami Y., Burian F. & Friedman E. (1977)
"Givat Ha-Parsa - A Neolithic Site in the coastal region"
Eretz Israel 13:34-47

Parr P.J., Zarins J., Ibrahim M., Waechter J., Garrard A.N., Clarke C., Bidmead M. & al-Badr H. (1978)
"Preliminary Report on the Second Phase of the Northern Province Survey 1397/1977" Atlal 2:29-50

Perrot J. (1966)
"La Troisième Campagne de Fouilles à Munhata (1964)"
Syria XLIII 49-63

Raikes T.D. (1980)
"Notes on some Neolithic and Later sites in Wadi Araba in Wadi Araba and the Dead Sea Valley"
Levant XII:40-60

Reese D. (1985)
"Marine Shells" Appendix IV in Betts (1985)

Rees L.W.B. (1929)
"The Transjordan Desert"
Antiquity III:389-407

Rhotert H. (1938)
Transjordanien: Vorgeschichtliche Forschungen
Stuttgart

Roe D.A. ed. (1983)
Adlun in the Stone Age
BAR Int Series 159 Oxford

Rollefson G.O. (1980)
"The Paleolithic Industries of 'Ain el-Assad (Lion's Spring), near Azraq, Eastern Jordan"
ADAJ XXIV:129-144

Rollefson G.O. (1982)
"Preliminary Report on the 1980 Excavations at 'Ain el-Assad"
ADAJ XXVI:5-35

Rollefson G.O. (1984)
"'Ain Ghazal: An early Neolithic community in Highland Jordan, near Amman"
BASOR 255:3-14

Rollefson G.O. (in press)
"The Neolithic Village of 'Ain Ghazal, Jordan:Preliminary Report on the 1984 season"
BASOR

Rollefson G.O. & Abu Ghaneima K. (1983)
"Technological Analysis of Blades and Flakes from 'Ain Ghazal"
ADAJ XXVII:461-470

Rollefson G.O. & Frölich B. (1982)
"A PPNB Burin Site on Jebel Uweinid, Eastern Jordan"
ADAJ XXVI:189-198

Rollefson G.O., Kaechele Z. & Kaechele J. (1982)
"A Burin Site in the Umm Utheina district, Jabal Amman"
ADAJ XXVI:243-248

Rosen S.A. (1982)
"Flint Sickle-blades of the Late Protohistoric and Early Historic Periods in Israel"
Tel Aviv 9:139-145

Rosen S.A. (1983a)
Lithics in the Bronze and Iron Ages in Israel
PhD thesis Chicago

Rosen S.A. (1983b)
"The Microlithic Lunate: an old-new tool type from the Negev, Israel"
Paléorient 9/2:81-83

Rosen S.A. (1983c)
"The Cananean Blade and the Early Bronze Age"
IEJ 33:15-29

Rosen S.A. (1983d)
"Tabular Scraper Trade: a Model of Material Cultural Dispersion"
BASOR 249:79-86

Rosen S.A. (1984)
"Kvish Harif:Preliminary investigations at a late Neolithic site in the Central Negev"
Paléorient 10/2:111-121

Rothenburg B. (1972)
"Archaeological Survey in Sinai, 1967-1972"
Museum Ha-Aretz Bulletin 14:89-100 (Hebrew),31-42 (English)

Salzman P.C. (1978)
"The study of 'complex society' in the Middle East: a review essay"
Int. Journ. of Mid.East Studies 9:539-557

Schaeffer C.F.A. (1962)
Ugaritica IV Mission de Ras Shamra XV
Paris

Schick T. (1978)
"Flint Implements, Strata V-I"
in R. Amiran Early Arad:58-62
Jerusalem

Schiffer M.B., Sullivan A.P. & Klinger T.C. (1978)
"The design of Archaeological Surveys"
World Archaeology 10/1:1-28

Scott T.R. (1977)
"The Harifian of the Cantral Negev"
in Marks ed. 1977:271-322

Servello A.F. (1976)
"Nahal Divshon: A Pre-Pottery Neolithic B Hunting Camp" in Marks ed. (1976):349-370

Sonneville-Bordes D. de & Perrot J. (1953)
"Essai d'adaption des méthodes statistiques au Paléolithique Supérieur. Premiers résultats"
BSPF 50:323-333

Stekelis M. (1950) "A New Neolithic Industry: The Yarmukian of Palestine" IEJ 1:1-19

Stordeur D., Maréchal C. & Moliste M. (1982)
"El Kowm 2-Caracol:campagnes 1978,1979 and 1980. Stratigraphie et architectures "
CNRS:33-50

Tchernov E. & Bar-Yosef O. (1982)
"Animal Exploitation in the Pre-Pottery Neolithic B period at Wadi Tbeik, southern Sinai"
Paléorient VIII/2:17-38

Tixier J. (1963)
Typologie de l'épipaléolithique du Maghreb
Paris

Tobler A.J. (1950)
Excavations at Tepe Gawra
Philadelphia

Unger-Hamilton R. (in prep.)
"Microwear Analysis of Lustered Scrapers and "Sickle-Blades"

United Nations Development Programme (1966)
General Report on the groundwater investigations of the Azraq Basin
New York

Valla F. (1984)
Les Industries de Silex de Mallaha (Eynan)
CRFJ. 3 Assoc. Paléorient, Paris

Vaux R. de (1951)
"La troisième campagne de fouilles à Tell el Farah, près Naplouse"
RB LVIII:566-593

Vaux R. de (1952)
"La quatrième campagne de fouilles à Tell el Farah, près Naplouse"
RB LIX:551-583

Vaux R. de (1955)
"La cinqième campagne de fouilles à Tell el Farah, près Naplouse"
RB LXII:541-589

Vaux R. de (1957)
"La sixième campagne de fouilles à Tell el Farah, près Naplouse"
RB LXIV:552-588

Vaux R. de (1961)
"Les fouilles de Tell el-Farah, rapport préliminaire sur les 7eme, 8eme, 9eme campagnes 1958-1960"
RB LXVIII:557-592

Vaux R. de & Steve A.M. (1947)
"La premiére campagne de fouilles à Tell el Farah, près Naplouse"
RB LIV:394-433

Vaux R. de & Steve A.M. (1948)
"La seconde campagne de fouilles à Tell el Farah, près Naplouse"
RB LV:544-580

Vaux R. de & Steve A.M. (1949)
"La deuxième campagne de fouilles à Tell el Farah, près Naplouse"
RB LVI:102-138

Vries H.L. de & Barendsen G.W. (1954)
"Measurements of Age by the Carbon 14 technique"
Nature 174:1138 London

Waechter J d'A (1947)
"Some Surface Implements from Transjordan"
PPS:178-180 Vol 13

Waechter J.d'A (1958)
"Flint Implements"
in O.Tufnell Lachish IV:325-327
Oxford

Waechter J. d'A. & Seton Williams V. (1938)
"The Excavations at Wadi Dhobai 1937-1938 and the Dhobaian Industry "
JPOS XVIII:1-23

Watson P.J., Le Blanc S.A. & Redman C.L. (1984)
Archeological Explanation
New York

Willcox G. (1981)
Appendix D in Helms 1981:247-248

Yeivin E. (1976)
"Note on the Flint Implements from 'En Besor"
'Atiqot XI:10-12

Zarins J. (1979)
"Rajajil: A Unique Arabian Site from the Fourth Millennium B.C."
Atlal 3:73-78

Zeuner F.E., Kirkbride D. & Park B.C. (1957)
"Stone Age Exploration in Jordan,I"
PEQ:17-54