

Qesem Cave: An Amudian Site in Central Israel

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INTRODUCTION

Qesem Cave was discovered in October 2000 east of Tel-Aviv (Fig. 1) in the course of road construction (Fig. 2). Surface lithic collection including a few handaxes, Quina and Demi-Quina scrapers Naturally-Backed Knives (NBK), blades, end-scrapers and burins was tentatively assigned to the Acheulo-Yabrudian complex of the late Lower Paleolithic (*e.g.*, Bar-Yosef 1994; Copeland 2000; Goren-Inbar 1995; Ronen 1982). The emphasis on blade production in all excavated assemblages led us to the conclusion that the site, as a whole, is to be assigned to the Amudian facies of the Acheulo-Yabrudian complex (Barkai *et al.* in press).

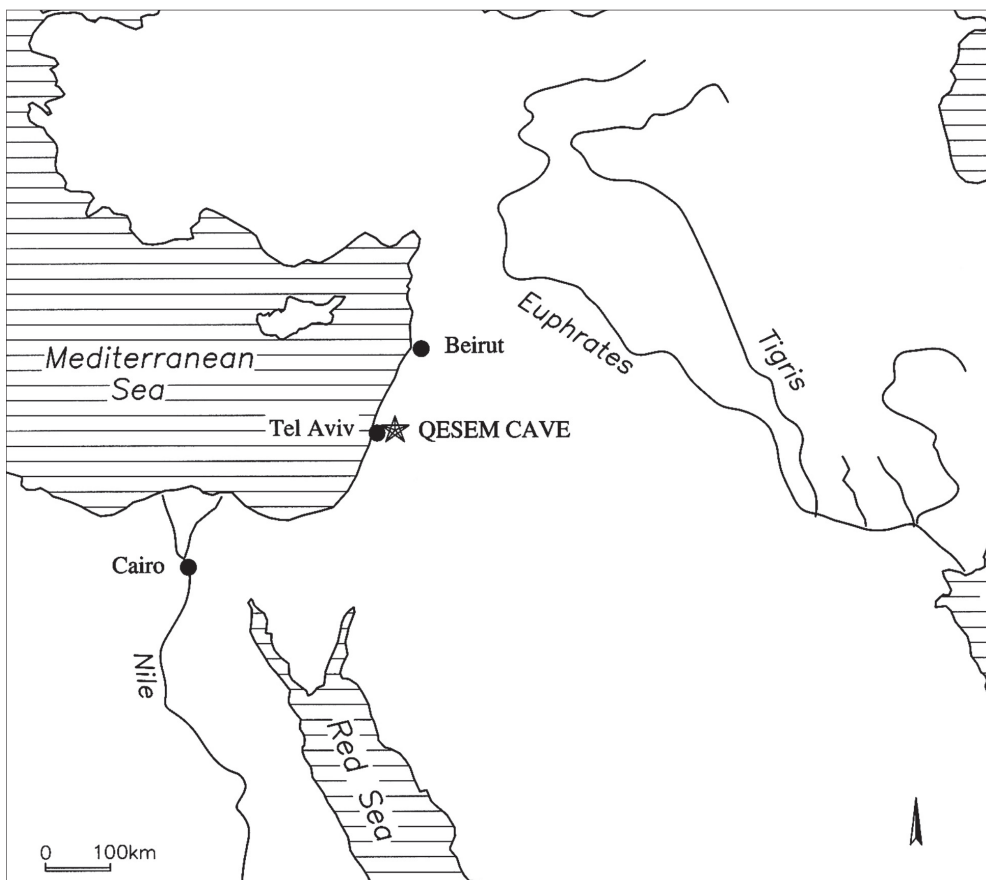


Figure 1: Location map of Qesem Cave.

Two short rescue seasons were conducted at Qesem Cave during 2001, one on behalf of the Institute of Archaeology, Tel Aviv University and one in collaboration with the Israel Antiquities Authority. A new, on-going series of field seasons started after the site was protected, covered and fenced, in summer 2004. We exposed major parts of the stratigraphy in a series of sections and started a horizontal, relatively large (12 m²) exposure in the upper part of the cave. The study of sediments and stratigraphy (micromorphology), inserting dosimeters for further dating by TL and ESR, sampling for more U/Th dating in the framework of climatic reconstruction (by stable isotope analysis), and attempting an as thorough speleological study as possible to reconstruct cave history are all currently under way.

A stratigraphic sequence of *ca.* 7.5m, from bedrock to the uppermost part of the cave was exposed showing overlying anthropogenic horizons each yielding lithic and faunal assemblages in fresh condition. The preliminary study of lithic technology and typology



Figure 2: Qesem Cave looking north (2001).

has shown that some of the assemblages are clearly dominated by blades and blade-tools, while in others, blades appear in lower numbers; sidescrapers appear in small numbers throughout the stratigraphic sequence; single handaxes appear both at the top and the bottom of the sequence (4.5 meters apart in elevation), but not in each assemblage; and, several polyhedrons, spheroids and chopping tools were found in the southern part of the cave. All assemblages seem to represent the complete *chaîne opératoire* of lithic manufacturing including raw material (flint nodules), cores, CTE, blanks, waste material, resharpening debitage and tools. Hammerstones were found in some of the assemblages.

This paper provides a preliminary presentation of the Amudian lithic industry from Qesem Cave with additional remarks on use-wear analysis, faunal remains and dating.

LITHIC ASSEMBLAGES

The assemblages of Qesem Cave include some 50,000 flint items excavated during the field seasons in 2001 and 2004. The assemblages of the 2001 seasons have been preliminarily analyzed ($N = ca. 29,000$ items) with some specific assemblages studied in depth (Barkai *et al.* in press).

Raw material procurement

The assemblages of Qesem Cave include raw material blocks and nodules in different stages of exploitation. Many of the cores in the cave retain enough cortex to enable a

reconstruction of the shape of the original nodules used. This is also the case with some of the CTE. Preliminary survey of the area in the vicinity of Qesem Cave indicates that rich high quality flint sources exist nearby. Analyzing procurement methods of Qesem Cave flints following the techniques described in Verri *et al.* (2004) indicates a variety of strategies including surface collection, extraction from subsurface contexts and quarrying from deep-underground contexts (Verri *et al.* 2005).

Blank production and selection

The production of ‘simple’ flakes includes the following trajectories:

1. Production of large flakes as blanks for bifaces – hand axes are notably rare in the Qesem

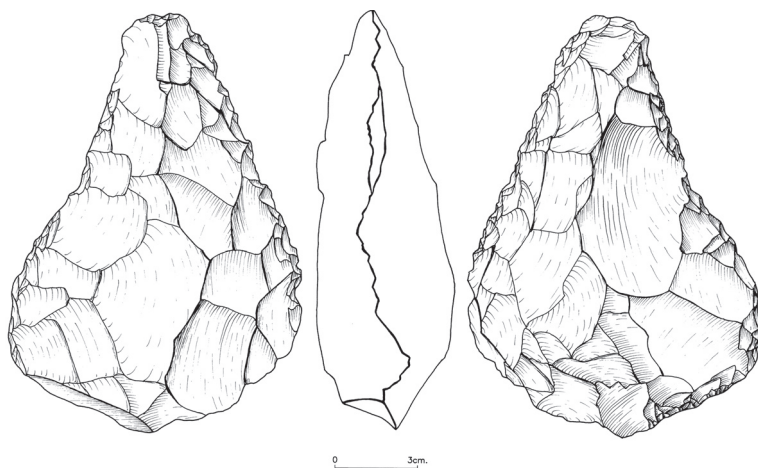


Figure 3: A hand axe.

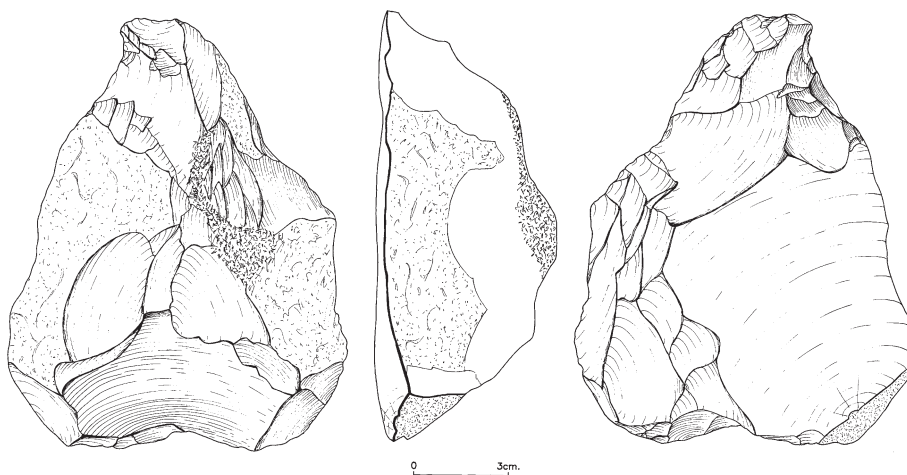


Figure 4: Hand axe roughout on a large flake.

Cave assemblages (*e.g.*, Fig. 3, and a roughout on a large flake, Fig. 4). Raw material used for handaxes was non-homogeneous, relatively low quality flint that differed from the materials used for any of the other production trajectories. It appears that the hand axes were made on large flakes, but apart from the single preform made on a large flake there are no traces of their production in the form of detached flakes or very large cores. The production of large flakes in the Lower Paleolithic is considered a conspicuous and characteristic cultural phenomenon (*e.g.*, Madsen and Goren-Inbar 2004). The use of large flakes for shaping handaxes at Qesem marks the end of this tradition.

2. Production of flakes for scrapers – Qesem Cave scrapers were made on thick flakes, some of which are *dejéte* and transversal. This seems to be an independent trajectory using high quality, homogeneous raw materials. Our preliminary observations and studies suggest that scraper blank production might have taken place outside the cave, since most of the cores found thus far do not accord with such production. It is of course possible that large cores were reduced at the cave and were discarded in an exhausted state, but the conspicuous selection of raw material for scraper production makes this option unlikely.
3. Production of tiny flakes from ‘cores on flakes’ – cores on flakes are common in the Qesem Cave assemblages, and seem to have had a significant role in the Amudian lithic industry. Some of these cores resemble the ‘Nahr Ibrahim’ technique (Solecki and Solecki 1970), while others display different characteristics. The production of tiny flakes and the use of flakes as a special type of cores is a unique Paleolithic phenomenon (*e.g.*, Goren-Inbar 1988; Hovers *in press*; Newcomer and Hivernel-Guerre 1974; Nishiaki 1985). The large number of cores-on-flakes recovered thus far at Qesem Cave (over 150) will enable a detailed study of this trajectory.
4. Radial and predetermined production of flakes (*e.g.*, Figs. 5:1, 6) – this is related to the issue of the possible presence of the Levallois technique in late Middle Pleistocene sites (De Bono and Goren-Inbar 2001; Ronen and Weinstein-Evron 2000:225-226). Radial flake production at Qesem Cave appears to have been limited and opportunistic and we are quite confident that the Levallois concept and method are not represented in the Qesem Cave assemblages. Most flakes were produced from simple amorphous cores. Laminar production is the central trajectory in the assemblages of Qesem Cave (Barkai *et al.* *in press*). Laminar items are made from a variety of high quality, homogeneous raw materials. The Qesem Cave assemblages include all components of blade reduction, including cores, CTE, primary elements, blades, Naturally Backed Knives and blade tools. Some results of the study on the technology of blade production in a few assemblages from different parts of the stratigraphic sequence of the cave indicate the following:
 1. The Qesem Cave knappers preferred relatively small, flat, thin nodules for blade production (See Fig. 5:2-5 for some examples of blade cores).

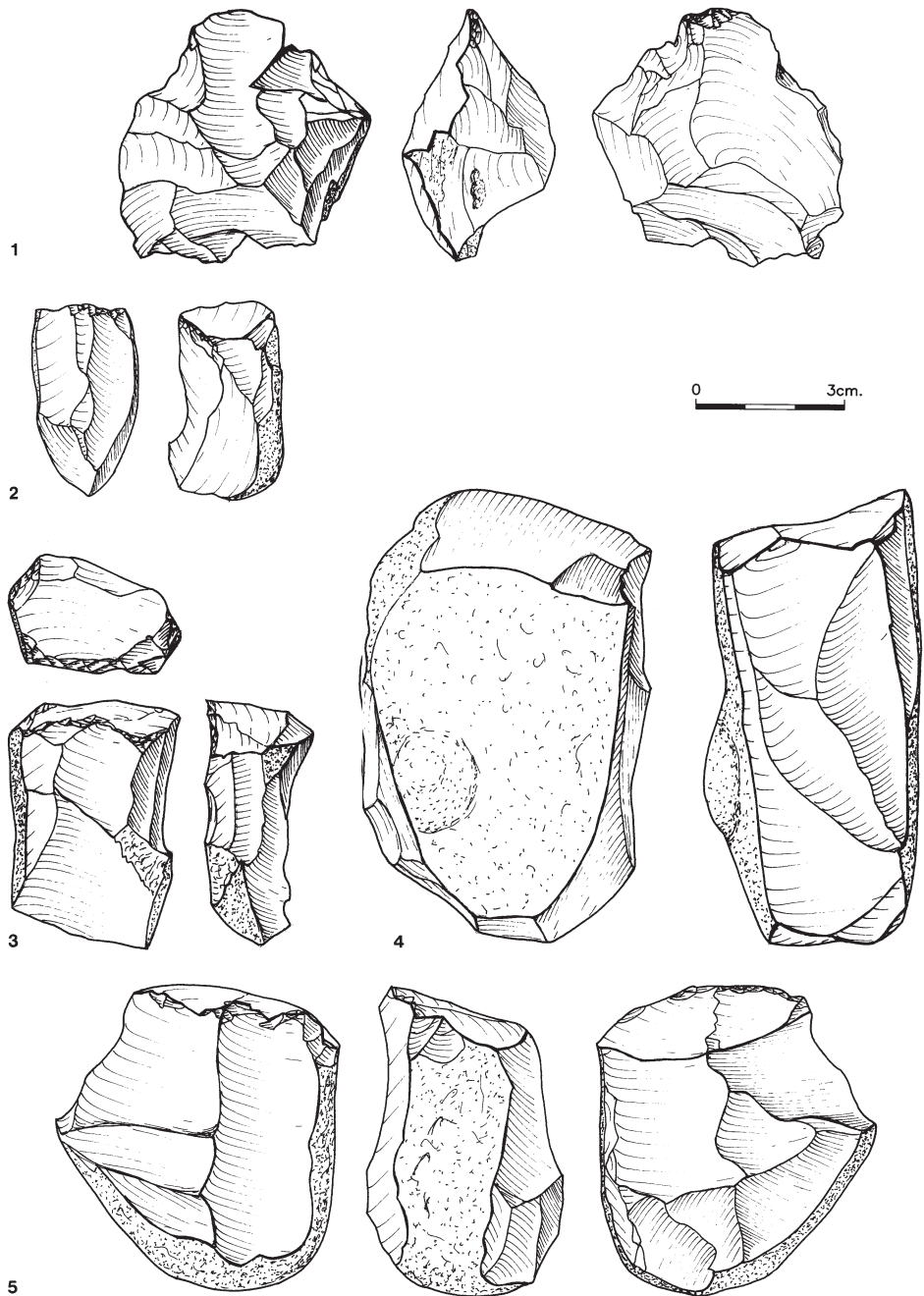


Figure 5: 1 - Radial core, 2-5 - Cores on small nodules.

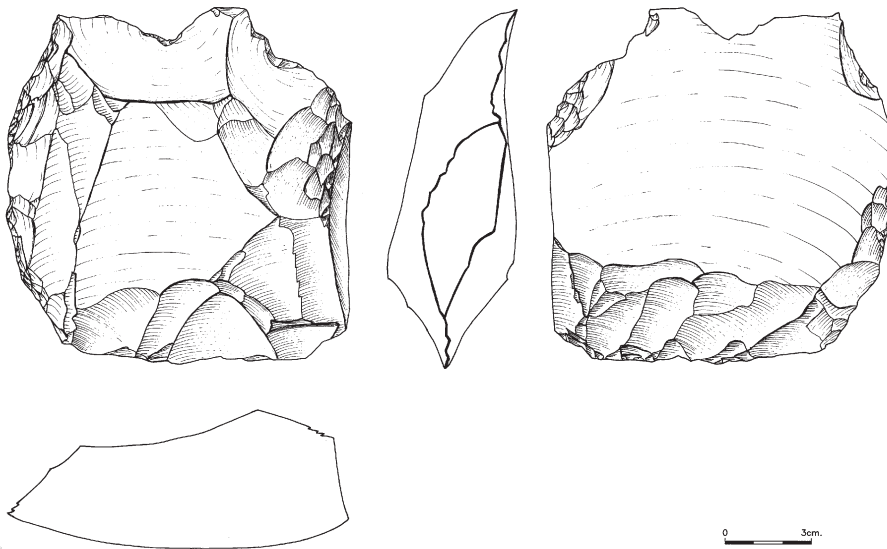


Figure 6: A large flake core.

2. The technique used was direct hard-hammer percussion.
3. Cores were not intensively prepared prior to blade production.
4. Core maintenance during blade production was minimal.
5. Core convexity was maintained by the removal of “over-passing” items.
6. Laminar items produced included primary blades, Naturally Backed Knives and common blades, all part of a single continuous production sequence (See Figs 7-9 for laminar items. Note that items in Fig. 8:7-10 are naturally backed flakes or flake-blades).

The analysis of blades and blade selection for tool shaping shows the following:

1. Laminar items are characteristically short and thick, striking platforms are usually plain and thick, bulbs of percussion are pronounced, and many laminar items bear over-passing distal terminations.
2. Laminar shaped tools were preferably made on longer blades.
3. Naturally Backed Knives are the most conspicuous laminar category in the assemblages.

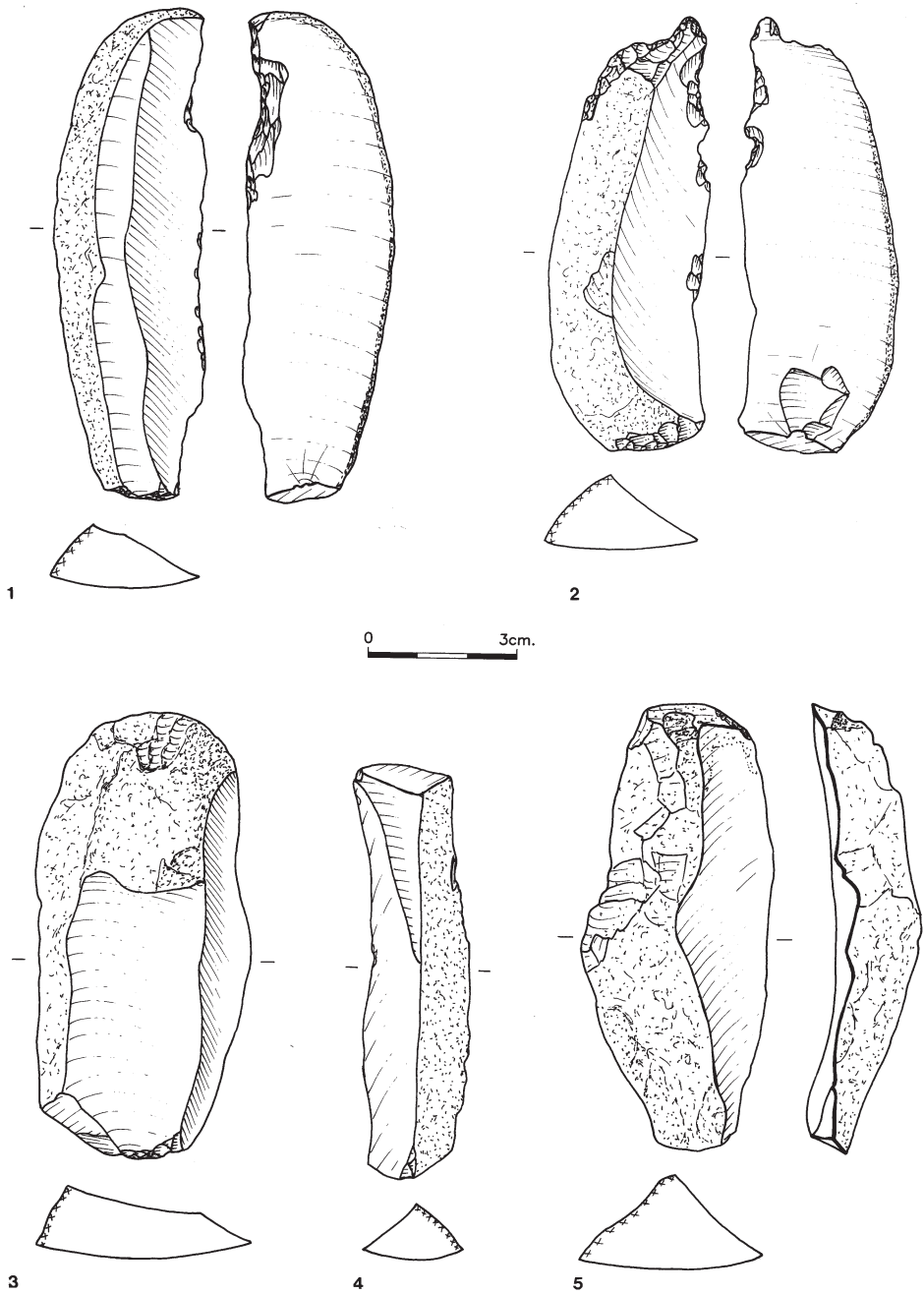


Figure 7: Naturally Backed Knives.

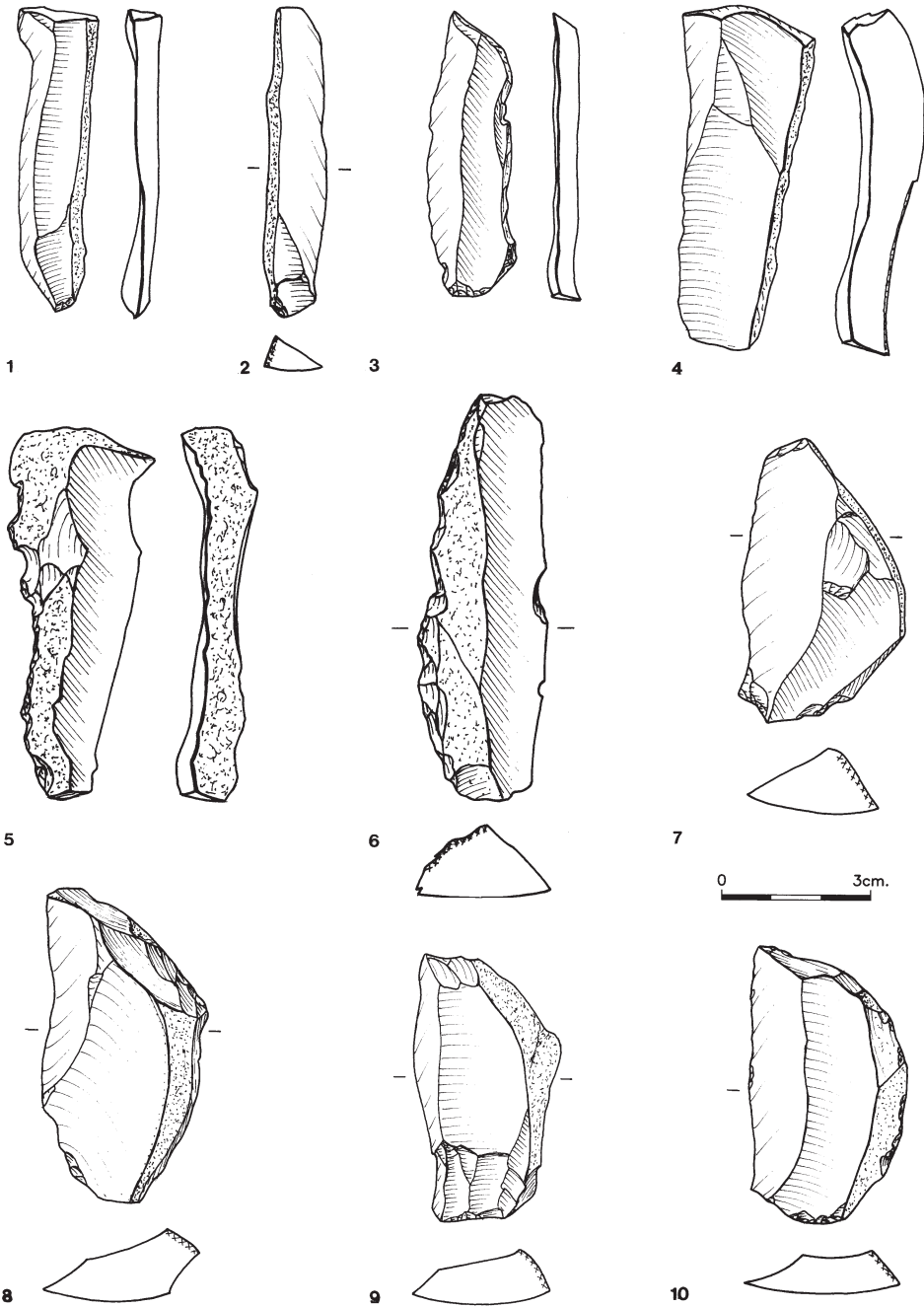


Figure 8: 1,2,4-6 - Naturally Backed Knives, 3 - Blade, 7-10 - Naturally Backed flakes-blades.

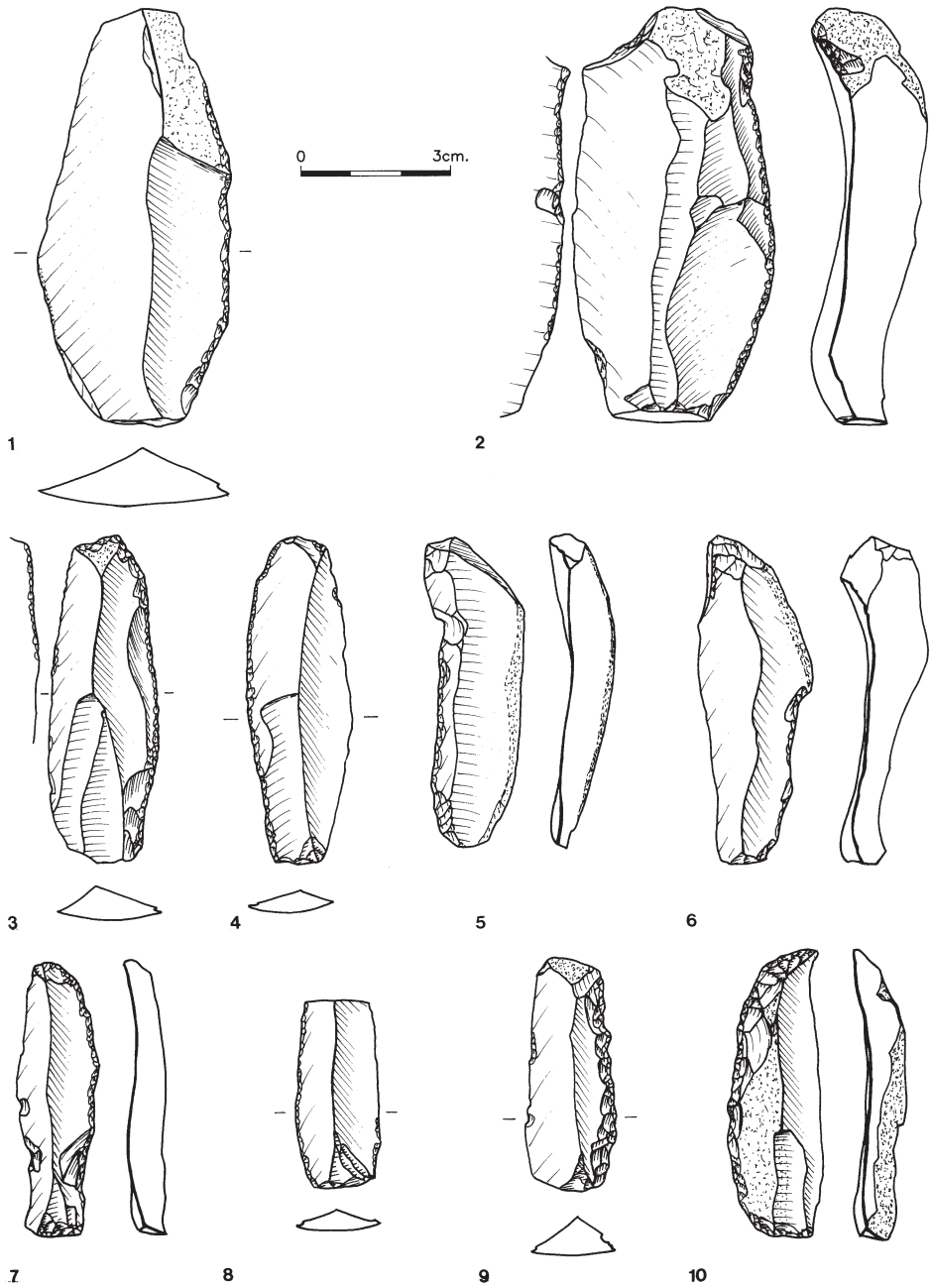


Figure 9: 1-8 - Retouched blades, 9-10 - Backed blades.

TPOLOGY

Hand-axes are rare at Qesem Cave. Only four hand-axes (*e.g.*, Fig. 3) and a single hand-axe preform (Fig. 4) were recovered thus far. Two large hand-axes are made of coarse, relatively non-homogeneous flint, unlike the rest of the tools in the assemblages, usually made of fine, high quality, homogeneous flint. The large hand-axes are rough and coarse and not meticulously shaped. A large flake was removed from one of them, suggesting it was transformed into a core. Such artifacts were recently described as “handaxe with preferential flake scar”, a common phenomenon in Late Acheulian assemblages and a possible link between Acheulian hand-axes and the Levallois technique (DeBono and Goren-Inbar 2001). A single hand-axe preform on a large and thick flake, made of coarse, non-homogeneous flint is a good indication for on-site hand-axe manufacture (Fig. 4). The ventral and dorsal faces of this flake are partly shaped by alternate bifacial blows, but it was discarded during early stages of manufacture, leaving the original bulb of percussion intact. In terms of raw material properties and size, this preform is similar to the two large hand-axes, and it seems reasonable to suggest that large flakes were used as blanks for both these handaxes. Other artifacts partially shaped by bifacial flaking were found at the site, but these could not be classified as handaxes.

Backed knives (Fig. 9:9-10) shaped by abrupt retouch are a significant tool category in the assemblages. These shaped tools have one sharp and plain lateral edge (“cutting edge”) and another lateral edge shaped by abrupt or semi-abrupt retouch (back). Most of these backed items are made on blades, either primary (cortical) or central blades. In some cases naturally backed items are also retouched at the cortical lateral edge. Thus NBKs and retouched backed items are categories that grade into one another.

Burins and endscrapers are two notable tool-types usually associated with the Amudian and pre-Aurignacian industries of the Acheulo-Yabrudian complex (Copeland 2000; Rust 1950).

Burins (Fig. 10) were found in several stratigraphically distinct archaeological assemblages at Qesem Cave, but it is not yet known whether burins are represented throughout the stratigraphic sequence. Burins include burins on break or scar, diheadral burins and burins on truncation. In several cases it seems that scrapers were transformed into burins and double tools such as scraper-burin (*e.g.*, Fig. 10:1). Some of the burins have multiple burinated facets, and in other cases it is clear that several burin spalls were removed sequentially. Burin spalls were also recovered at Qesem Cave, indicating on-site burin manufacture and resharpening.

Endscrapers (Fig. 11:1-4, 6-7) are not common at Qesem Cave and are made both on blades and flakes. Some of these, with an abruptly retouched distal end are also retouched along the lateral edge, and thus they can be classified as backed knives rather than

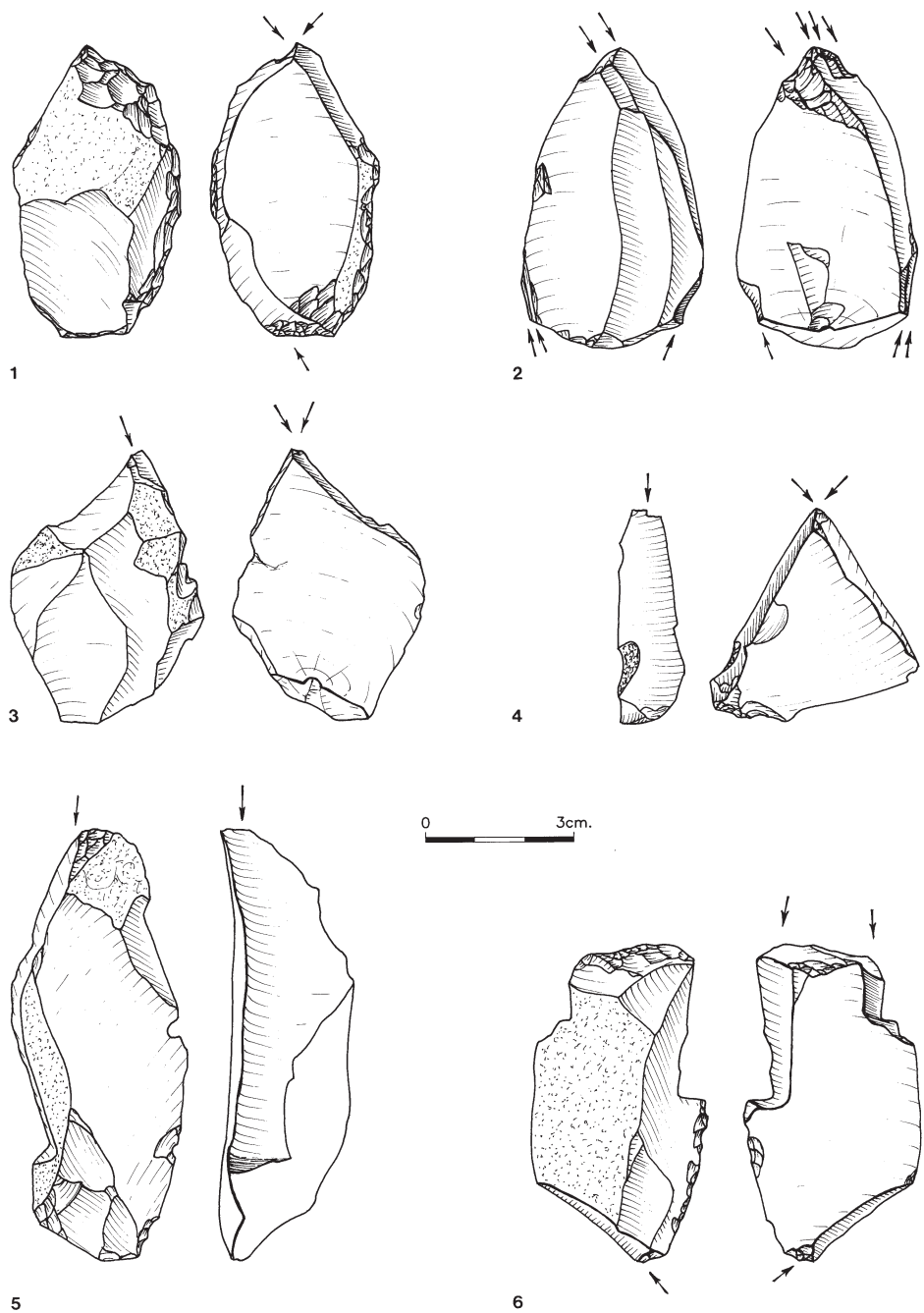


Figure 10: 1-Scraper/(dihedral) burin, 2-6 - Burins.

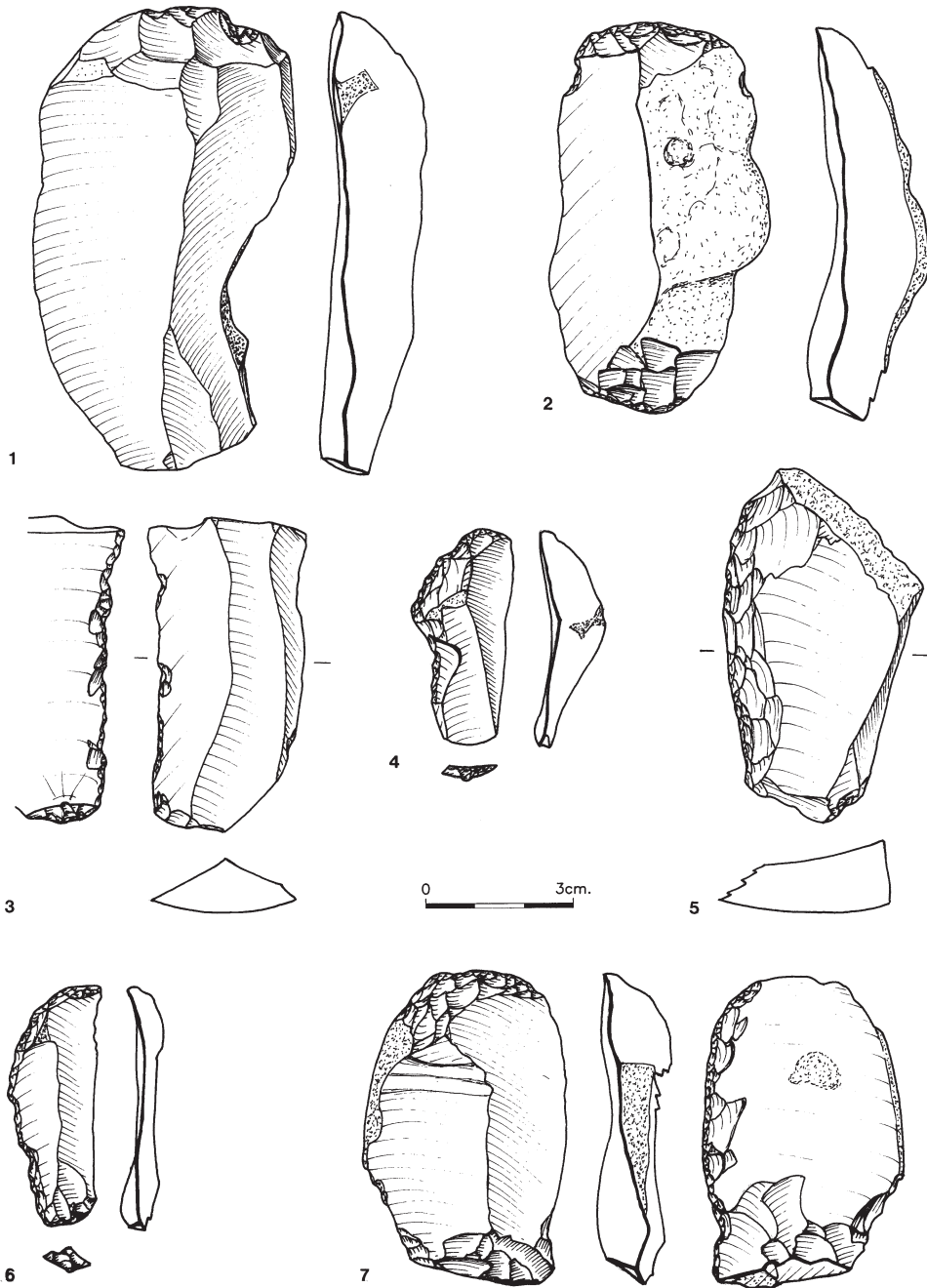


Figure 11: 1,2,4,6 - End scrapers, 3 - Butt scraper, 5 - Side scraper, 7 - Double scraper.

endscrapers (*e.g.*, Fig. 11:4, 6). We hope to resolve this issue with the aid of use-wear studies. Few butt scrapers (Fig. 11:3, *racloir sur talon*, [*e.g.*, Barkai and Gopher 1998]) were identified. Double tools with an endscraper at the distal end and a scraper at the lateral edge appear as well (*e.g.*, Fig. 11:7).

Side scrapers, and most specifically thick scrapers with a working edge shaped by demi-Quina or Quina retouch, are an important hallmark of Acheulo-Yabrudian assemblages and more specifically a marker of Yabrudian industries (Copeland 2000; Rust 1950). Scrapers appear in most of the assemblages at Qesem Cave, with a variety of scraper types in addition to demi-Quina and *déjeté* scrapers. In some cases, it is difficult to differentiate a scraper from a denticulate (*e.g.*, Fig. 12:2). In other cases, where one lateral edge is shaped by abrupt retouch and the other is plain and sharp, it is not clear whether to classify these as scrapers or as backed knives (*e.g.*, Fig. 12:4-5). Again, we hope that use-wear analysis will determine whether the retouched lateral edges were working edges, a scraper's edge, or shaped in order to provide comfortable grip or enhance hafting (and thus backed knives). The preliminary results of a detailed attribute-analysis on the Qesem Cave scrapers indicate the following:

1. Scrapers were made on thick flakes (including transversal and *déjeté* flakes).
2. Convex and straight scrapers are dominant.
3. The use of demi-Quina retouch is conspicuous in the assemblages.
4. There was no clear selection of specific blank size for scrapers shaped by demi-Quina retouch.

Retouched blades (Fig. 9:1-8) appear quite frequently in different parts of the cave, in most cases with one lateral edge of the blade finely retouched. In several cases, overpassing items removed in the course of blade production were later retouched.

Spheroids are a specific trajectory of production in limestone. Spheroids appear in small numbers (N=10) in a specific layer at Qesem Cave. We have no evidence for the production of these core tools on-site.

Recycling of flint items at Qesem Cave

Some lithic artifacts were recycled, in some cases clearly long after having been abandoned by an initial user. The assemblages of Qesem Cave include three categories of recycled items indicating specific modes of flint exploitation:

1. Patinated items showing evidence of post-patination knapping, indicate recycling of old flint artifacts. These are usually flakes or core tools of either early Amudian industries in the cave or a collection of older artifacts imported to the cave and reused (*e.g.*, a patinated hand axe transformed into a core for blade production).
2. 'Cores on flakes' mostly on fresh, unpatinated flint (see above).
3. 'Double bulb' items, with two bulbs of percussion and two ventral faces, also known as

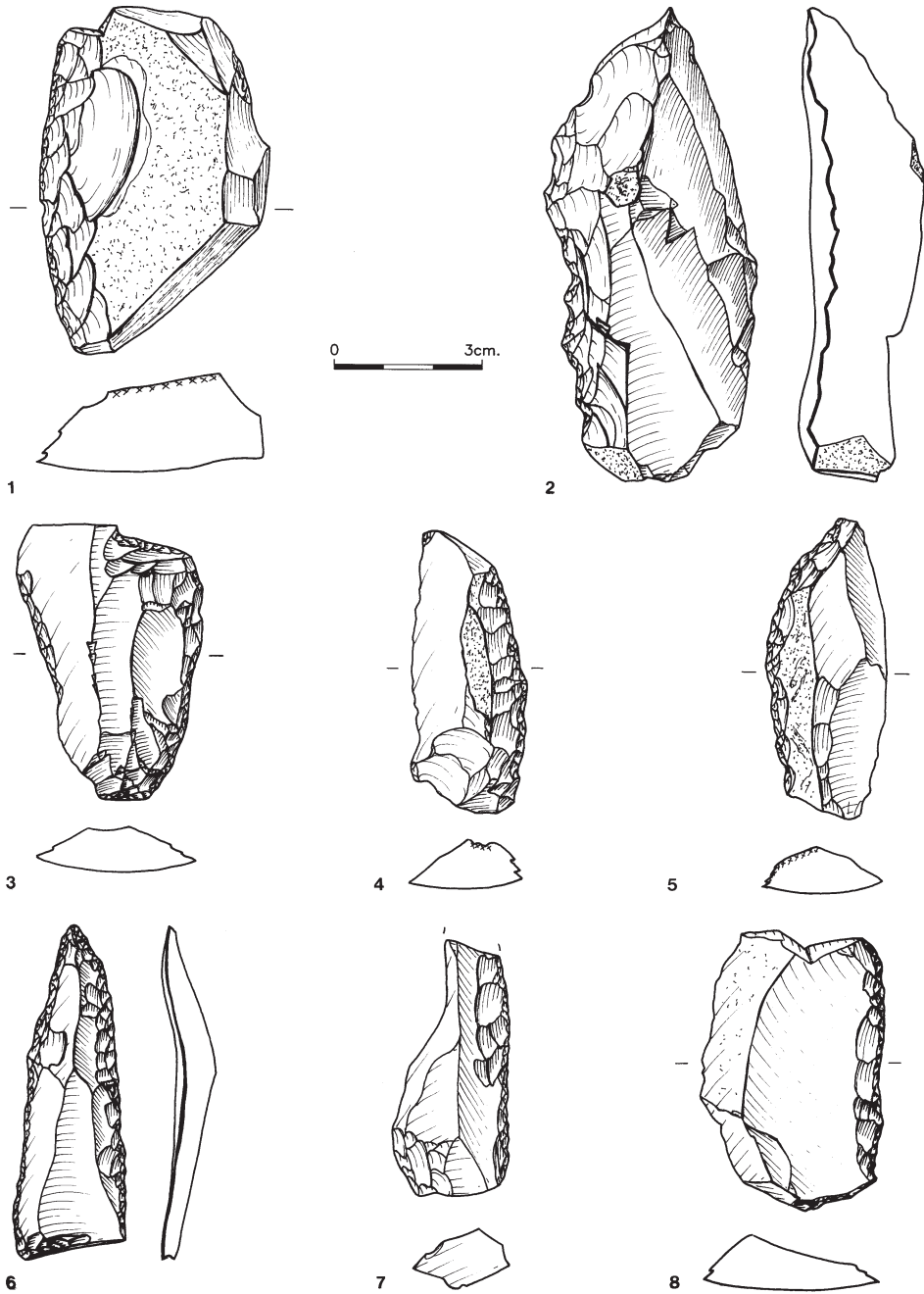


Figure 12: 1,4-8 - Side scrapers, 2 - Denticulate.

‘Janush flakes’ (Newcommer and Hivernei-Guerre 1974) or the ‘Tabun snap’ (Shifroni and Ronen 2000).

Use wear signs on flint tools

A first survey of use wear signs on flint tools from Qesem Cave showed a high level of preservation in all strata and a high interpretative potential of use wear analysis. One specific Amudian sample was studied in detail and has shown a high correlation between the type of blank and the function it was used for (Lemorini *et al.* in press). Generally this sample shows a high frequency of butchering activities. Contact with bone, hide and fleshy tissues suggests that skinning and disarticulation were carried out on-site. The preferred tools for these activities were laminar. The preliminary results of the use-wear study are summarized below:

1. Considering the age of the site, the state of preservation is outstandingly high and permits a detailed functional reconstruction.
2. The major use of laminar items in the assemblage studied was in butchering large animals.
3. The use wear signs are mainly related to cutting and defleshing of soft tissues.
4. There is a correlation between working edge morphology (straight edge) and cutting activities.
5. The use of laminar items for cutting tasks seems to have been short, as indicated by the nature of wear traces on used edges and the scarcity of resharpening.
6. Cut marks observed on animal bones seem to correlate with the results of the use wear analysis.

FAUNAL ASSEMBLAGES

The faunal associations of the Acheulo-Yabrudian complex are largely unknown. Very few faunal remains were found in layer E of Tabun Cave (Garrod and Bate 1937), and the scarce bones reported at Jabrud I were lost during World War II (Rust 1950:138).

Luckily, the Acheulo-Yabrudian layers of Qesem Cave contain well preserved faunal remains, mostly in soft sediments. Based on a partial sample of 1780 identified specimens (NISP) obtained from the 2001 excavation of Qesem Cave, it is clear that nearly all of the faunal remains are from larger vertebrates (Stiner *et al.* 2004). A few microfaunal remains (*e.g.*, rodents) have also been recovered and more can be expected when the excavation advances toward cave walls.

The faunal remains from Qesem Cave bear many indications of hominid activity. Cut marks and other kinds of tool damage are common throughout the site, as is evidence of burning on bones and lithic artifacts. Cut marks occur on 10-19% of vertebrate NISP,

and cone fractures indicative of marrow extraction from limb bones and mandibles occur at 23-38% of NISP. The prevalence of cone fractures in this site is consistent with the high incidence of major limb bones (see below). The orientations and anatomical placements of cut marks (mostly short, scattered, diagonal scars on bones associated with substantial muscle masses) indicate redundant, simple flesh cutting and removal activities. Only one possible case of carnivore gnawing damage was found in the 1780 specimens examined thus far, and rodent gnawing damage is absent. Weathering damage, associated with long surface exposure times, is rare (0-2% of NISP) and quite mild in the cases in which it occurs, suggesting consistent protection by the cave roof and/or relatively rapid burial.

Burning damage occurs on 10-36% of NISP, but is most prevalent in the upper part of the stratigraphic sequence (36%). Such damage is even more common on unidentified bone fragments (NUSP), as is usually the case in Paleolithic cave sites (Stiner 1994; Stiner *et al.* 1995), and in Qesem Cave ranges between 11-84%, again with highest frequencies occurring in the upper part of the stratigraphic sequence (48-84%). Evidence of fire activity throughout the 7.5 m deposit in the forms of burned bones, lithic artifacts, and sediments promises new information on the early evolution of fire technology in the Acheulo-Yabrudian and Lower Paleolithic.

Hominid diets at the cave were narrowly focused on fallow deer (*Dama*, large-bodied form), along with some aurochs (*Bos*), horse (*Equus*, caballine type), wild pig (*Sus*), tortoise (*Testudo*), and rarely red deer (*Cervus*). The clear dominance of fallow deer (70-89%) in these faunas is striking, and no substantive variation is found in taxonomic composition through the 7.5 m stratigraphic sequence. The faunas are distinctly Holarctic in origin throughout, with no Afro-Arabian types; gazelles were important in later faunal series of the central and southern Levant, including the early Mousterian of Hayonim Cave (Stiner in press), but no gazelle remains have been found in the Acheulo-Yabrudian faunas of Qesem Cave.

Many aspects of the faunas examined thus far do not vary much throughout the sequence, with the notable exception of ungulate body part representation. Deer remains in the upper part of the stratigraphic sequence are confined to head parts (without antlers) and limb bones almost exclusively; there are almost no vertebrae, ribs, pelvises, or foot bones. In the lower part of the stratigraphic sequence the situation is somewhat different in that modest numbers of latter suite of elements are represented, although they still are under-represented relative to head and limb segments. The dominance of head parts in particular is not explained by differential preservation of tooth enamel versus bone tissues, since the MNE and MAU determinations for head parts were based on bony features only. In light of the very good preservation encountered in the Qesem faunal assemblages, and the use of methods designed to maximize element counts from highly fragmented material

(Stiner 1994, 2002), the anatomical patterns observed for medium-sized ungulates in Qesem Cave indicate that hominids were selective about the body parts they transported to the cave, presumably following field processing of the carcasses elsewhere.

U-SERIES DATES FROM QESEM CAVE

Samples for U/Th dating were extracted by A. Frumkin from speleothems in the eastern section within the archaeological horizons at the upper part of the cave. $^{230}\text{Th}/^{234}\text{U}$ dates were measured by Thermal Ionization Mass Spectrometry (TIMS) at the U-series laboratory of Bergen University (Barkai *et al.* 2003).

The major Acheulo-Yabrudian occupations of the cave began before 382 kyr, probably during Oxygen Isotope Stage 11. It ended before 152 kyr BP, possibly around 200 kyr. Between *ca.* 382 and 200 kyr, human occupation could have taken place coeval with speleothem deposition, or during drier intermediate periods.

DISCUSSION

The Acheulo-Yabrudian and Qesem Cave

The Acheulo-Yabrudian complex following Rust (1950) comprises four major facies – Acheulian, Acheulo-Yabrudian, Yabrudian and Pre-Aurignacian/Amudian (Bar-Yosef 1994; Copeland 2000; Garrod 1956, 1970; Goren-Inbar 1995; Jelinek 1982, 1990; Ronen and Weinstein-Evron 2000).

While the stratigraphy of the Acheulo-Yabrudian (above Acheulian and below Mousterian) repeats itself, the absolute chronology needs fortification and refinement. Summaries of the available radiometric dates were presented by Bar-Yosef (1998), Copeland (2000) and Mercier and Valladas (1994). Of note are dates recently summarized from Tabun cave (Mercier and Valladas 2003). U/Th, TL and ESR dates indicate that the earliest dates for the Acheulo-Yabrudian are *ca.* 400 kyr while the latest dates are up to 150 kyr (Grün *et al.* 1991; Mercier *et al.* 1995 and summary in Bar-Yosef 1998). Since early Mousterian deposits produced dates as early as *ca.* 200 kyr at sites such as Tabun and Hayonim caves and Rosh Ein Mor (Mercier *et al.* 1995; Schwarcz and Rink 1998; Rink *et al.* 2002, 2004 and a summary in Bar-Yosef 1998), the dates for the later part of the Acheulo-Yabrudian seem to overlap the early Mousterian.

The U/Th dates for the Acheulo-Yabrudian horizons at Qesem Cave suggest a range of *ca.* 380-200 kyr (Barkai *et al.* 2003) and are in agreement with Bar-Yosef (1998). Further U/Th dating is underway now as well as TL and ESR enjoying the abundance of animal teeth in each and every layer and the presence of burnt material (including flint items). Preliminary results of U/Th dates from the 2004 season confirm the general 400-200 kyr

range for Qesem Cave. Dating Qesem Cave may contribute towards a better understanding of the chronology of the different Acheulo-Yabrudian facies and a refined chronology of the Lower-Middle Paleolithic transition.

One of the major aspects of the Paleolithic complex called the Acheulo-Yabrudian or Mugharan is blade production, actually the earliest in the Middle East (Garrod and Bate 1937; Rust 1950; Turville Petre 1927). In the sites of Zuttiyeh, Yabrud I and Tabun Layer E, the laminar industries were a minor component first referred to as 'Pre-Aurignacian' (Rust 1950) and later termed 'Amudian' (Garrod 1956, 1970; Garrod and Kirkbride 1961). These laminar industries were found in relatively thin stratigraphic units in Tabun and Yabrud I that could, with difficulty, be separated from overlying and underlying Yabrudian and Acheulian layers (Garrod 1970; Rust 1950:28-34). Laminar Amudian industries remained a minor component of the Mugharan tradition (Jelinek 1990) despite efforts to expand sample sizes in the renewed excavation at Tabun.

Middle Pleistocene blade production was always considered a major technological innovation, possibly indicating the emergence of new human cultural and economic adaptation (Bar-Yosef and Kuhn 1999; Jelinek 1990; Meignen 2000; Ronen 1992; Vishnyatsky 1994). These blade industries were sufficiently unique and surprising ('ahead of their time') that both Rust and Garrod suggested that they were made by a distinct immigrating population interacting with the local flake-producing groups (Garrod 1970; Rust 1950:129-130). Jelinek (1990), on the other hand, suggested that this industry be viewed as an evolutionary stage within the local Mugharan Tradition. Some researchers have pointed out typological differences between the Pre-Aurignacian and the Amudian, mainly the presence of end scrapers of Aurignacian types and dihedral burins in the former and backed knives, retouched blades and fewer end scrapers and burins in the Amudian (Copeland 2000; Garrod 1970; Garrod and Kirkbride 1961; Monigal 2002:270-271). Since the early recognition of the Pre-Aurignacian, it has been suggested that blade production resurfaces a number of times in the evolution of Paleolithic technologies (Bar-Yosef and Kuhn 1999).

Amudian assemblages have been recovered in a few sites in the Levant such as at Zuttiyeh, Yabrud I, Tabun layer E, Abri Zumoffen/Adlun, and Masloukh (Garrod and Bate 1937; Garrod and Kirkbride 1961; Gissis and Bar-Yosef 1974; Rust 1950; Skinner 1970; Turville Petre 1927).

Studies of the Amudian industry were however sparse due to the relatively small samples obtained from complex stratigraphic sequences, usually small assemblages occurring within alternating lithic industries. Thorough studies of Amudian lithics have been undertaken for Tabun (Jelinek 1990; Monigal 2001, 2002; Wiseman 1993), Yabrud (Vishnyatsky 2000), Abri Zumoffen (Copeland 1983), and Masloukh (Shmookler 1983). Mention should also be made of the blade industry termed 'Humalian' found in Syria, a

non-Levallois laminar industry and possibly another independent pre-Mousterian facies (Bergman and Ohnuma 1983; Cauvin *et al.* 1979; Copeland 1985; Le Tensorer *et al.* 2001; Muhesen 1992).

The Amudian industry is characterized by systematic blade production and a major component of tools made on blades, including backed and retouched blades, end scrapers, burins and NBKs. Alongside blade production, a significant component of flakes also appears in the Amudian, and side scrapers and hand axes appear in variable frequencies (Copeland 2000; Jelinek 1982, 1990; Monigal 2001, 2002:270-271).

Qesem Cave is a significant addition to the above list with large Amudian assemblages recovered from a thick, well-dated stratigraphic sequence. The analysis of the Amudian Qesem Cave assemblages conducted thus far demonstrates that the whole sequence is Amudian in nature. Qesem Cave is distinctive in that the lithic assemblages are blade-dominated throughout and the samples are very large and well-preserved. The dates of Qesem Cave suggest that the Amudian represents a major facies of the Acheuleo-Yabrudian complex, equivalent in time scale to other known facies.

A recent suggestion, mainly on the basis of ESR dates from several sites offers a rapid Lower-Middle Paleolithic transition around 215+/-30 kyr BP (Porat *et al.* 2002). The dates were however measured long after the excavations, with no appropriate on-site dosimetry and it seems that they are too young (Rink *et al.* 2004). Compiling the available dates from Tabun and Qesem Caves indicate a long cultural phase covering some 200 kyr between the two major Palaeolithic complexes – the Lower Palaeolithic Acheulian and the Middle Paleolithic Mousterian.

The transition from Lower to Middle Palaeolithic is considered to be crucial in human evolution. It is hoped that studying the different lithic and faunal assemblages from Qesem Cave will provide insights regarding human behavior and adaptation at the terminal Lower Paleolithic which proves to be a phase lasting some 200 kyr. The location of Qesem Cave within the 'out-of-Africa corridor' and the fact that human activities at the cave took place starting *ca.* 400 kyr ago indicate the potential of this site for understanding the origin and dispersal of hominid populations. The Levantine Acheulian assemblages were most probably made by *Homo erectus (sensu lato)*, and the Middle and Late Mousterian assemblages (Tabun C, B) of the Levant by both Anatomically Modern Humans (AMH) and *Homo Neanderthalensis*. Middle Pleistocene human skeletal remains in the Levant are scarce (apart from the 'Galilee Man' of Zuttiyeh Cave). It will be interesting to find out if Acheuleo-Yabrudian assemblages were manufactured by *Homo erectus* or ancient Modern Humans (*e.g.*, Dean *et al.* 1998; Kramer *et al.* 2001; Rightmire 1998, 2001; Stringer 2001) or maybe some as yet unrecognized hominid.

SUMMARY

The Amudian is a remarkable archaeological entity that appears toward the close of the Levantine Lower Paleolithic sequence. It merits the independent status given to it by some researchers in the past. As such it remains poorly understood, and the Qesem Cave Amudian, with its long stratigraphic sequence and dates provides an opportunity for concerted research on this entity. Our results indicate that the Amudian lithic industry of Qesem Cave displays a distinct manner of raw material selection, knapping, shaping, and use of flint tools, especially blades and tools made on blades. The Amudian industry of Qesem Cave illuminates issues related to the technological choices of Amudian artisans and their subsistence activities.

Systematic blade production is considered an advanced technological skill that was once erroneously related only to AMH. The analysis of Amudian blade production at Qesem Cave seems to indicate that such technological and cognitive capabilities were also demonstrated by Middle Pleistocene hominids, although as part of a much different technological system.

The Amudian blade production and use may be related to specific modes of resource exploitation and subsistence, possibly quite different to those reflected by other Late Lower Paleolithic entities/industries within the broader Acheuleo-Yabrudian complex. The lithic analysis bears out the uniqueness of the Amudian life-ways and its adaptation to the Middle Pleistocene environment.

ACKNOWLEDGEMENTS

The Qesem cave research project is supported by the Israel Science Foundation (grant No. 820/02), the L.S.B. Leakey Foundation and the Irene Levi Sala CARE Archeological Foundation. The Lithics were drawn by R. Pinhas.

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