Hummalian industry (El Kowm, Central Syria): Core reduction variability in the Levantine Early Middle Palaeolithic

Grundformen-Produktion im Hummalien (El Kowm, Zentral Syrien): Kernreduktion-Variabilität im frühen Mittelpaläolithikum der Levante

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Abstract - This paper presents the Hummalian industry uncovered during the 2001-2005 and 2009 excavations at Hummal (El Kowm), Syria from the stratified layers, mainly layer 6c-2. Blade industries were located in the stratigraphy between the Yabrudian and Levallois-Mousterian occupations and their complete sequence is dated to circa 200 ky. The main Hummalian core reduction strategy aimed to produce elongated and large-sized blanks of different morphology. Nonetheless the significance of on-site manufacturing of small implements from burin-cores and truncated-faceted pieces is also a remarkable feature. These end products, namely bladelets and small-sized flakes, also represent anticipated components complementary to the repertoire of various lithic specimens recovered from Hummalian layers and could suggest hand held cutting tools. The presence of three variable reduction strategies showing a great variety of core reduction methods seems to be related to the Hummal site function and its Early Middle Palaeolithic human occupation.

Zusammenfassung - *Die hier vorgelegten Untersuchungen der Hummalien-Industrie aus dem späten Mittelpleistozän beruhen im Wesentlichen auf dem Material aus Schicht 6c2 der Fundstelle von Hummal, das während der Grabungen von 2001-2005 und 2009 geborgen wurde. Charakteristische Klingenindustrien treten in der Stratigraphie von Hummal zwischen dem Yabrudien und dem Levalloiso-Mousterien auf und haben ein Alter von ca. 200 ka. Die zentrale Grundformenproduktion war auf die Herstellung von gestreckten und relativ massiven Produkten von beachtlicher Grösse ausgerichtet. Zusätzlich ist vor Ort die Produktion von kleinen Grundformen an stichelartigen Kernen und an endretuschierten Stücken nachgewiesen, ein weiteres Charakteristikum für diese Industrie. Bei den somit gewonnenen Produkten handelt es sich um gezielt produzierte Lamellen und kleine Abschläge deren spezifische Herstellungsweise das Spektrum, der für das Hummalien charakteristischen Kernreduktionen, ergänzt. Das gleichzeitige Bestehen von drei unterschiedlichen Produktionsschemata, die zu einer grossen Variabilität bei der Kernreduktion führte, dürfte wohl mit der Funktion der Siedlungsplätze in Hummal während dem frühen Mittelpaläolithikum zu sehen sein.*

Keywords - blade industry, bladelets, burin-cores, Nahr Ibrahim, truncated- faceted pieces, site function
Klingenproduktion, Lamellen, Kernstichel, Nahr Ibrahim, endretuschierte-facettierte Stücke, Fundstellenfunktion

Introduction

Today the Hummal Palaeolithic site is probably best known for the discovery of new Early Middle Palaeolithic blades (ca. 200 ky BP) in the early 1980's, and named after the site, Hummalian (Hours 1982; Copeland 1982; 1983; 1985; Bergman & Ohnuma 1983). The industry was originally identified through presence of numerous large-sized blade cores, blades among debitage and tools on blades with a significant share of pointed blades; so-called 'Hummalian points' (Copeland 1985). A first glance of actual Hummalian flint artefacts may lead some archaeologist to think that the industry could possibly be related to Transitional Period between Late Middle and Early Upper Palaeolithic, as the represented blade technology is so impressive. However, it was recognized that the artefacts are stratigraphically situated in between long sediment sequences of Levallois-Mousterian and Yabrudian, thus it is a special industry, geochronologically distant from the Late Middle Palaeolithic – Early Upper Palaeolithic Transitional Period of the Levantine Palaeolithic. The study here resulted from principal data on Hummal site, based not on artefacts

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coming from surface finds and sandy colluvial sediments, studied in the early 1980's, but originating from systematic excavation work on in situ archaeological layers uncovered at the site in between 1999 and 2010. Important techno-typological data are reported, particularly for the Hummalian industry itself with many details devoted to a small in situ assemblage from one Hummalian archaeological layer, 6c-2. It will be shown in some detail that the industry is not only characterized by an amazing, very early blade reduction, but also additional reduction strategies aiming for production of two further small-sized debitage types; bladelets and flakes. Accordingly, the Hummalian industry will lose its reputation for blade-only reduction and will gain significance for its core reduction variability of primary flaking for various small-sized debitage blank types.

Hummal site and its surrounding

The site of Hummal is situated in the El-Kowm area and is characterized by the presence of many artesian springs related to faults in the substratum and high quality Lower Eocene flint outcrops. The El-Kowm oasis is a 20 km depression located 450 m above sea level in the Syrian steppe between Rasafa, Palmyra, and Deir ez-Zor. It is in the mountainous chain which extends across Syria from the Anti-Lebanon Mountains in the west to the Euphrates River in the east and separates the Northern fertile zones and the Arabian Desert in the south (Fig. 1). The area attracted humans to return to the same places over long periods, accumulating cultural remains of many occupations. Currently 206 spot-finds and 142 archaeological sites containing Palaeolithic stone artefacts were found in the region of El-Kowm. Three major kinds of sites were recognised: flint knapping workshops related to natural outcrops of flint, open-air settlements in the hills or on the slopes of valleys, and sites related to the water holes, of which the latter may conserve thick stratigraphies (Le Tensorer et al. 2001). 20% of the sites known in the area of El-Kowm are spring sites showing excellent preservation for Palaeolithic open-air sites. The site of Hummal is in direct contact with the old artesian spring which supplied water to a pool of variable size. As a result the sediment formation of the site and the conservation of archaeological layers are highly influenced not only by the aeolian processes (the wind is a constant erosional agent in this region) but also by the degree of spring activity. The majority of the sediment contains micritic loam, directly precipitated from the water. The sediment built up not only during the high water levels but also during decreasing water levels. The depression of the dried pool with surrounding permanent plant cover caught the loose wind driven sand creating the considerable accumulations of aeolian sand, which was later displaced in to the centre of the water pool (Le Tensorer et al. 2007). The record from the geoarcheological (Le Tensorer et al. 2007), paleobotanical (Emery-Barbiès 2005; Renault-Miskovsky 1998: 26) and paleontological analysis of animal bones (Griggo 2005; Reynaud & Morel 2005; Frosdick 2010) indicate a dry climate with steppe vegetation during the various Pleistocene time periods. The humidity and pedological conditions were unfavourable for woodland cover but a few short periods with increasing precipitation were also noted. The soil formation in Hummal shows indications of dry periods without water cover, as evidenced by the presence of calcified roots, cells of plants containing calcium carbonate, the accumulation of aeolian sands, the traces of iron oxides, mud cracks and layers of debris (Le Tensorer et al. 2007; Ismail-Meyer 2009). Humans continuously settled in the immediate vicinity of the spring attracted by water, animals and raw material from Lower to Upper Palaeolithic as attested by the more than 20m long archaeological record within the site's stratigraphical sequence.

Hummalian layers and their flint assemblages: basic characteristics

The systematic excavations in Hummal began in 1999 under the direction of J.-M. Le Tensorer and S. Muhesen (Le Tensorer 2000). More than 20 archaeological layers from Lower Palaeolithic to Upper Palaeolithic were recognised and a few hundred artefacts gathered. This in situ sequence integrated the Hummalian containing layers 6a, 6b, 6c and 7a, 7b, 7c (Fig. 2). The blade industry was additionally discovered in a massive sand deposit of several metres thickness labelled αh, which collapsed into the centre of the dolina.

Between 2000 and 2004 the excavation of Hummalian sands αh continued and more than 3000 lithic items and hundreds of faunal remains were gathered in area of only 7 m^2. It was also recognised that sand αh appeared to have collapsed from between layers 7 (Hummalian) and 8 (Yabrudian) (Le Tensorer 2004). The sand is geologically perfectly in situ, does not present any mixing with other layers, is homogenous and shows all features identified in other Hummalian layers and is considered to be of the same technological tradition.

From 2001 to 2005 the systematic excavation of upper sequence of Hummalian (Layers 7c, 7a, and 6c-2, 6c-1, 6b, 6a) was undertaken under the direction of one of the authors (D. W.). By 2005 the excavation area reached 26 m^2 and more than 7000 lithic objects and 105 faunal remains were collected. The excavated area was divided into two distinct parts: West and East. In 2009 a new Sondage, S1, was opened in the Southern part of the site and a surface of 2 m^2 was excavated.

The stratigraphic sequences recorded in Eastern, Western and Southern sectors in the main are similar with one minor difference: the complex 6c-1 and 6c-2 appears only in the Eastern zone.

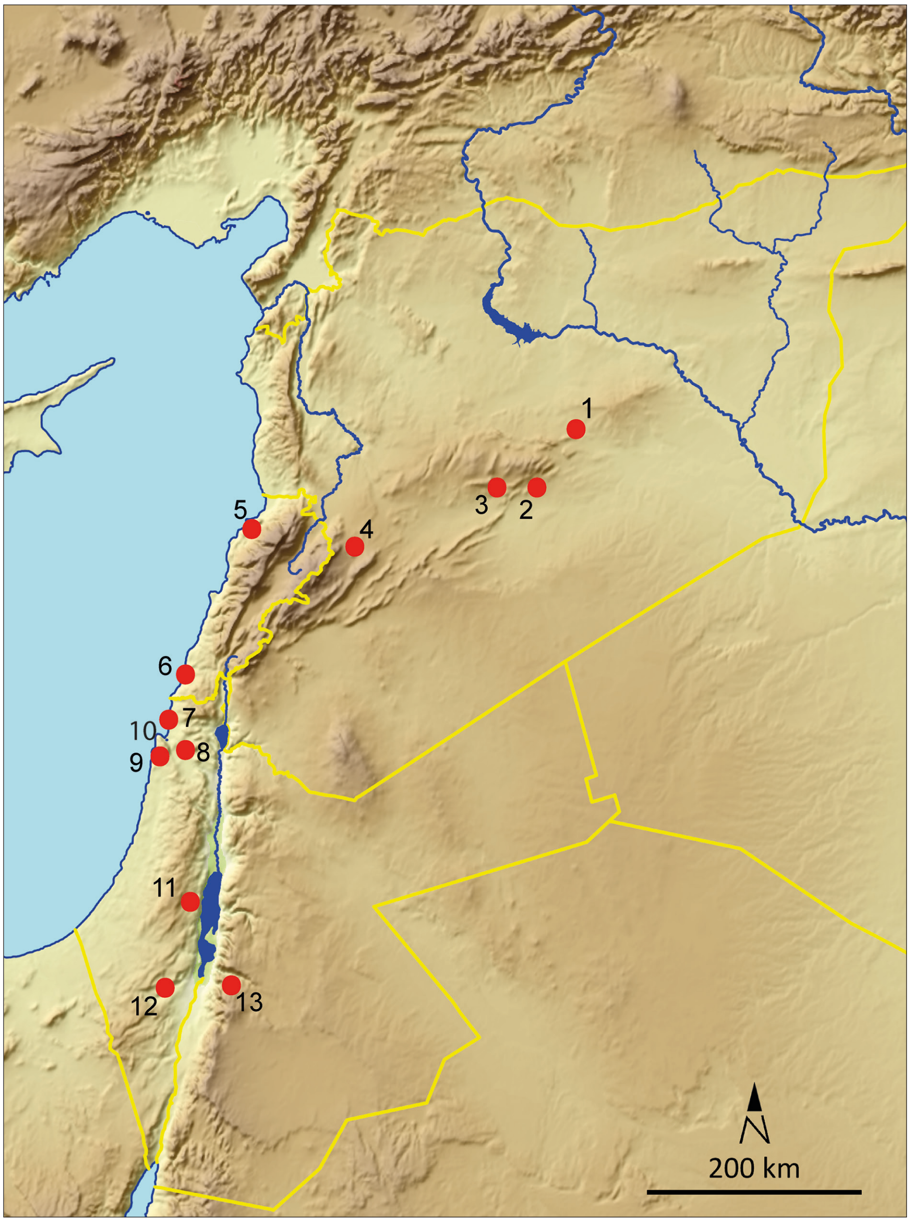

Fig. 1. Map showing the location of the Hummal site and other Palaeolithic sites with important blade components. 1 El Kowm (Hummal), 2 Jerf Ajla, 3 Duara Cave, 4 Yabrud, 5 Masloukh, 6 Adlun, 7 Hayonim, 8 Qesem, 9 Tabun, 10 Misliya Cave, 11 Abu Sif, 12 Rosh Ein Mor, 13 Ain Difla. Map by R. Jagher.

Abb. 1. *Karte des Nahen Ostens mit Lage der Fundstelle von Hummal und weiteren paläolithischen Fundstellen mit Klingenindustrien.*

The Hummalian blade industry excavated in all three sectors is subdivided into stratified archaeological layers and clearly positioned between the Yabrudian and Mousterian complexes. A detailed description of the stratigraphical sequences and techno-typological analysis has already been published (Wojtczak 2011, 2014a).

Taphonomic factors such as erosion, diagenesis and trampling, alongside the probable lack of sedimentation (some stratigraphical hiatuses) caused a destructive effect on a significant number of the archaeological remains from the stratified layers 6a and 6b.This makes some of the archaeological and archaeozoological analysis problematic. The faunal remains are very poorly preserved and it is difficult to draw conclusions due to the small identifiable samples. Post-depositional forces were the major influence on the destruction of the bones (Frosdick 2010). The stone artefacts are most numerous in the excavated samples and as such the lithic analysis has been undertaken (Le Tensorer et al. 2005; Wojtczak, 2011, 2014a), despite the fragmentation and damage to a portion of the sample from layers 6a and 6b.

The site was repeatedly occupied, but the density of the archaeological remains between layers is variable. This is connected to the limited extent of the

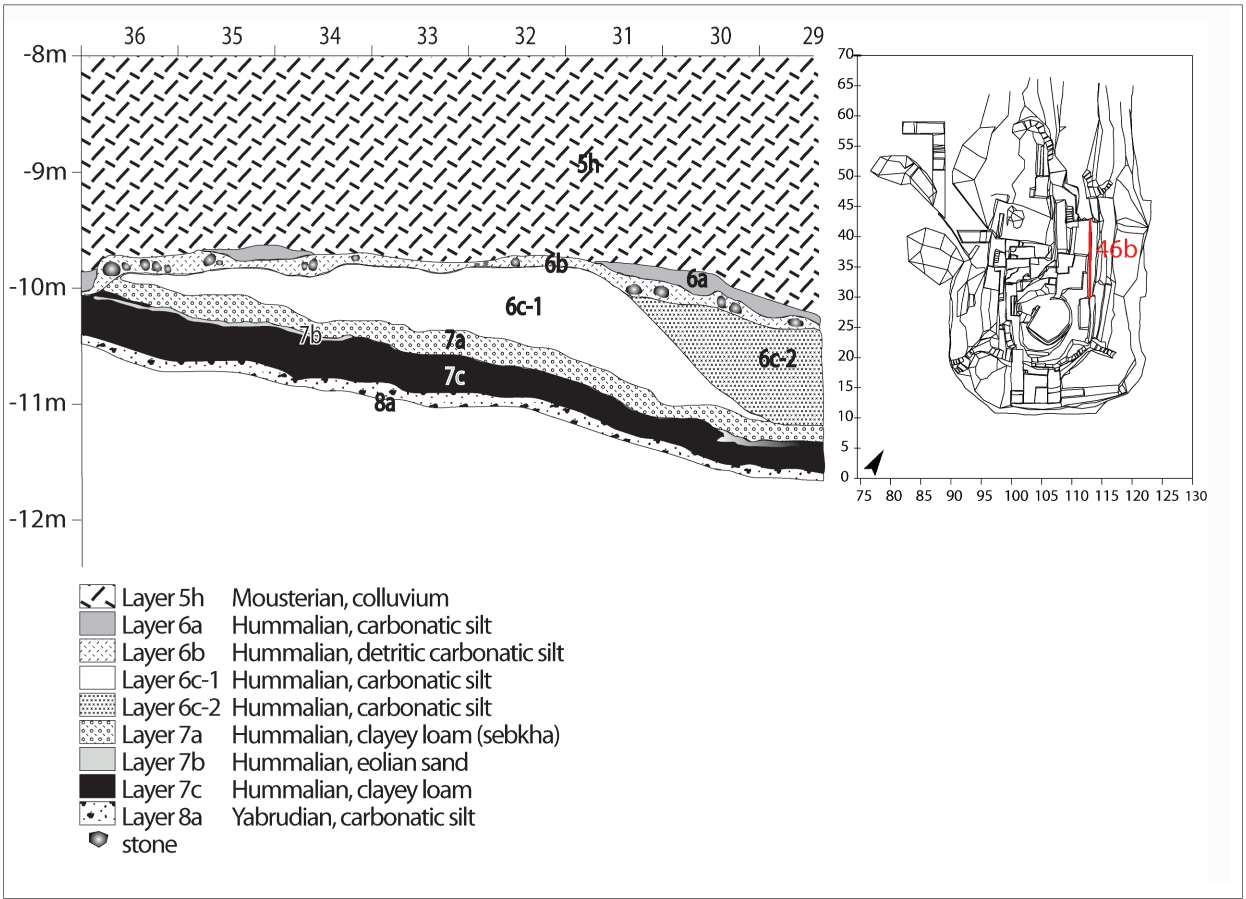

Fig. 2. Profile of the Hummalian sequence in the Eastern part of excavation; excavation surfaces covering the Hummalian deposits of Hummal (grey shading).

Abb. 2. *Schichtaufbau der Hummaliensequenz im östlichen Abschnitt der Grabung.*

excavation and possibly differing intensities of occupation. Additionally in layers 6c-2 and 7 nearly all the artefacts were well preserved; sharp edges remain and thus seem to be covered by sediment relatively quickly after deposition. The artefacts from sandy layer αh are also well preserved with fresh edges, despite a secondary silica cover. The lithic assemblages from all Hummalian layers seem to represent similar technological and typological features. The goal of production was elongated blanks regardless of their size, with greatest lengths ranging between 4 and 16 cm and the mean Length/Width ratio is from 2.7 to 3. The blank blades encompass a number of specimens with different morphologies. They can present high triangular or trapezoidal cross sections as well as flat, narrow or broad, thick or thin. The majority are convex longitudinally, but a number of pieces are also rectilinear. A high proportion of the butts are slightly faceted or plain, but several present a cautiously faceted platform.

The retouched tools produced from blades and rarely from flakes seem to be quite standardised in their metrical and non-metrical attributes both between the assemblages and tool categories. The most numerous categories of retouched items are the elongated end-point items fashioned by a rather heavy retouch, typologically regarded as points and convergent side-scrapers. Also parallel blades retouched regularly on one or both sides, typologically regarded as single or double side-scrapers on blades are prominent. The retouched blades are usually longer and broader than the secondary unmodified blades. This signifies a preference of bigger supports for shaping these implements, particularly if the original size has been reduced during repeated use and retouching (cf. Jelinek 1975; Dibble 1987). The thick blades with high cross section are often retouched whereas the elongated, rather flat cross sectioned products, which often resemble the Levallois products, are not modified.

The presence of recycling in Hummalian is demonstrated by the double patinated artefacts, the reuse of the broken flakes and debris for bladelet manufacturing, and the Yabrudian scrapers as cores (Wojtczak 2014b).

The common flaking technique is direct percussion with a hard hammer as demonstrated by a circular and well detectable impact point, bowed bulb and abundant radial default as described by J. Pelegrin (2000: 77-80). The unidirectional flaking system dominates in all layers, but bidirectional is also well represented especially in the sand αh and layers 6c-2 and 7c.

In all layers the majority of products present the preparation of the proximal part using a series of small removals coming from the edge of butt into the proximal part of their upper surface. It appears that this 'thinning' alongside the faceting of the platform was undertaken to correct the flaking angle allowing the production of long supports and prolonging the flaking.

As blank production was carried out until exhaustion of the core, the assemblage includes blanks with a size scale ranging from elongated blades to small bladelets, but there is also a separate production of bladelets from burin-cores and bladelet cores and small flakes from truncated-faceted and Janus-Kombewa pieces (Wojtczak 2014a; Wojtczak & Demidenko in preparation).

All these elements indicate a complexity of blank production and were also detected in the well preserved assemblage from layer 6c-2 which will be used to show more details concerning the above mentioned observations. This layer is present only on the eastern sequence and was revealed during the 2004 excavation season. Three hundred flint artefacts and scarce small bones, including a bone from a large felid, three fragments of ostrich shell and also Equid teeth, were collected from two square metres. The estimated thermoluminescence (TL) age for Hummalian is of approximately 200 ka (Richter 2006; Richter et al. 2011).

The Hummalian industry is not simply an Early Middle Palaeolithic industry with only large-sized blade primary flaking technology but it also demonstrates two more reductions directed toward production of different small-sized debitage items. In general, the three reductions can be summarized as follows taking into consideration all combined artefact data from six archaeological layers (6a, 6b, 6c-1, 6c-2, 7a, 7c), "αh" colluvial materials and even some the most technologically indicative finds of the site's modern backfill / déblais, as well as surface finds of the Qdeir "flint fields".

Hummalian blade reduction

The systematic blade production was based principally on primary flaking of single-platform unidirectional and double-platform bidirectional cores with one or sometimes two lateral supplementary striking platforms. Additionally a lateral supplementary platform together with a naturally steep lateral edge for creating a core flaking surface was also used. Such cores were initially highly elongated (up to 15-16 cm long), rather narrow (c. 4-5 cm wide) but convex to allow initialising of flaking. These primary core morphological and metrical characteristics almost inevitably led to an easy removal of mostly blades through a hard hammer technique. During initial reduction processes the cores' striking platforms were plain and semi-acute. When the alignment of an edge or the intersection between the core striking platform and flaking surface were more or less 'straight-convex', two blades with simple plain butts were usually removed. It was then technologically necessary to smooth out both concavities caused by the removal of these blades on the edge of the core's striking platform and the uppermost part of the intersection between the two detached blades on the core's flaking surface to avoid a hinging accident on the next removal from the flaking surface. This was accomplished by the removal of a few elongated chips/flakes from the striking platform edge onto the flaking surface. This is technologically similar to the 'core striking platform abrasion technique' in the Upper Palaeolithic, however in the Hummalian industry this technique was not always applied and of limited technological use. After this 'thinning process' a plain-butted blade could be removed from the prepared intersection of the striking platform and the proximal part of the flaking surface. However, occasionally a very precise hammer blow was required due to some peculiarities in the physical morphology of the striking platform and flaking surface, then the core striking platform was also faceted in addition to the thinning process. Thus for systematic blade production Hummalian flint-knappers would have been using faceted and/or plain striking platforms in conjunction with 'core striking platform thinning technique' as the need arose. In cases of rejuvenating the striking platform other than by faceting, plain striking platforms were rejuvenated by the removal of several small flakes; the 'core tablet technique' was used only very rarely. As a result, some blades with dihedral and crudely-prepared butts have been removed from such rejuvenated striking platforms. In understanding all the peculiarities of the different core striking reduction strategies presented above it is possible to identify bidirectional cores in which one platform was either plain or dihedral whilst the other platform was faceted. During the core reduction processes, some cores, both uni- and bidirectional, became semi-rotating. To continue blade production on the core's narrow flaking surface, sometimes a crested blade was removed from the intersectional ridge between the two flaking surfaces. Such a particular and restricted '*lame à crête* technique' (Demidenko & Usik 1993) application within the Hummalian blade reduction explains the limited presence of true crested blades in these assemblages. Furthermore, with the continuous blade production and permanent core striking platform rejuvenation, cores became reduced in size particularly in length and thickness. This meant that, during the last phases of primary flaking more reduction control was required, hence the necessity of further faceting, sometimes in conjunction with the 'core striking platform thinning technique.' Typologically these exhausted cores look very similar to Levallois cores. Additionally, although the first removals of elongated blades appear unlike Levallois products, often with a convergent shape and plain or crudely-prepared butts, the following shorter blades became more Lavallois-like as flaking progressed, with a convergent shape and more frequent finely faceted butts. This gives the appearance of both Levallois-like points and real Levallois products.

Accordingly, the aim of Hummalian blade primary flaking reduction was to achieve a variety of morphologically different large-sized end-products. Firstly, blades having plain or crudely-prepared butts often also bear removal negatives after use of the 'thinning technique' on their proximal dorsal part. Thus these Hummalian blades appear unlike Levallois blades and were sometimes called prismatic (Copeland 1983; Muhesen1992). Secondly, blades and elongated flakes with well faceted butts, morphologically similar to Levallois-like blanks with a few looking like Levallois points. Third and last, blades combining morphological features of the two previous debitage types, having both characteristic removal negatives after the 'thinning technique' and facetted butts (Wojtczak 2014).

Statistically, Levallois-like debitage is produced in higher proportions compared to the non-Levallois looking pieces as they are usually removed at a later stage of the reduction process whereas the non-Levallois artefacts are removed only during the first reduction stage. This evidence, core morphology, debitage results as well as the average artefact length give rise to a 'reduction order' (Wojtczak 2014a: 121-124). The third debitage type, combining Levallois-like and non-Levallois-like morphological features, is rarely observed as it requires technological circumstances that meant both the core's striking platform and the upper part of the flaking surface had to be re-prepared to obtain them.

The presence of bidirectional cores with one striking platform being plain or dihedral and second opposite and faceted and of three types of blades: prismatic, Levallois-like and with 'mixed morphological features' appear to be very significant in the interpretation of the Hummalian flaking scheme. This presents the Hummalian blade reduction as one uniform reduction strategy, where morphologically dissimilar, non-Levallois-like and Levallois-like, technological elements were involved in a single blade reduction system (Figs. 3 & 4). This is different from the previously held view of two separate reductions, Laminar and Levallois (Wojtczak 2011).

Although the blade reduction was certainly dominant within the Hummalian industry's primary flaking processes, two more additional, possibly supplementary reductions are also clearly identifiable.

Hummalian cores on debitage pieces: truncated-faceted pieces *versus* bladelet cores and burin-cores

The frequent core reduction processes aimed at producing, in the main, the large, elongated debitage pieces were accompanied by two more core-like reductions carried out on debitage pieces themselves. These debitage pieces acted as core blanks, usually referred to as 'cores on flakes. However, in Hummal it maybe more accurate to call them 'cores on debitage pieces' as aside from flakes and blades, also debris were often used as blanks for core reductions. The 'cores on debitage pieces' can be divided into two basic groups. Those that are aimed at producing mainly relatively shortened flakes and those that produced items metrically identified as bladelets.

The first group of cores on debitage pieces, producing shortened flake removals are well known in the Levantine Mousterian as Nahr Ibrahim technique pieces or truncated- faceted pieces (e.g. Schroeder 1969; Solecki & Solecki 1970; Nishiaki 1985; Goren-Inbar 1988; Demidenko & Usik 2003; Hovers 2007). These items are also relatively well represented in the Levantine Mousterian levels with Tabun-B type assemblages at Hummal (Hauck 2010; 2011a; 2011b) and in the opinion of one of us (Yu. D.) very similar to the assemblages at Kebara Cave, lower and middle Mousterian sequences (Units XII – XI and X – IX). Kebara is now the type site for Tabun-B type Levantine Mousterian industry (Bar-Yosef 1998; Bar-Yosef 2001, Bar-Yosef & Meignen 2001; Demidenko 2011: 152-154; Hauck 2011b: 317). The late Levantine Mousterian cores on flake produced two small sized detached pieces (Hauck 2010; 2011a; 2011b; Demidenko personal material studies in Syria in 2010). One group which were producing Levallois points (Hauck 2010: Fig. 86: 7, 11; Fig. 149: 1; 2011b: Pl. 2: 7-8) and a second that produced *ad hoc* simple flakes including Janus or Kombewa flakes (Hauck 2010: Fig. 86: 1-6, 8-10; Fig. 94: 4, 6-7; Fig. 139: 10; 2011a: Fig. 7: 16; 8: 15-16; 2011b: Pl. 2: 9). The Hummalian 'cores on debitage pieces' however do not show the small-sized Levallois flakes, only the opportunistic small flake and bladelet production (Figs. 5 & 6). Also the Hummalian truncated-faceted pieces for principally shortened flake reduction usually have a faceted striking platform which is technologically similar to the Levallois-like 'regular' cores.

The 'cores on debitage pieces' with narrow, elongated negatives created by bladelet removals are represented by two core-like types. First, the 'real' bladelet cores, with regular and successive bladelet removal negatives on flakes, blades or large fragments of them. These bladelet cores are very similar to almost all Western Eurasian Upper Palaeolithic assemblages with a bladelet reduction tradition. In fact it would be almost impossible to differentiate between those from Hummal and those from later Upper Palaeolithic assemblages (Figs. 6 & 7). The second type is

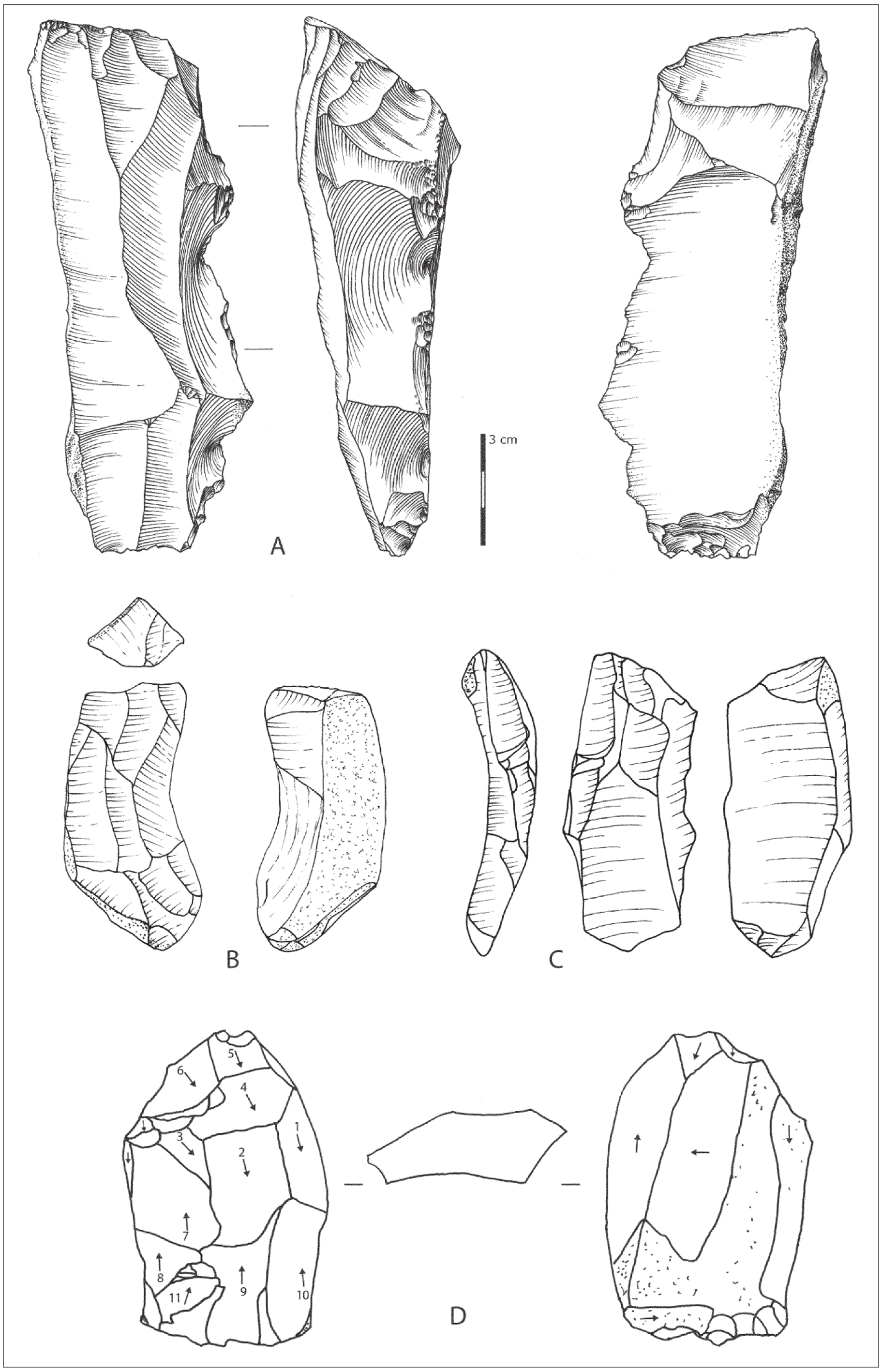

Fig. 3. Hummalian bidirectional cores; A, B, D made on block and C on flake.

Abb. 3. *Bidirektionelle Kerne aus dem Hummalien: A-D auf Blöcken und C an Abschlag.*

typologically recognizable as burins, which are multi-faceted and/or have relatively wide removal negatives (>c. 5mm). These, from a technological view point, are actually burin-cores, which are observed in many different Palaeolithic industries (e.g. Araujo Igreja et al. 2006; Zwyns 2012). Single core-like debitage pieces can contain both, bladelet and burin-core reduction, indicating an intentional and systematic method of bladelet production in the Hummalian industry.

It is also very interesting to note that the two groups of 'cores on debitage pieces' are rather similar technologically to 'regular' cores producing large-sized debitage. The truncated-faceted pieces, mentioned previously, have a faceted striking platform. This is very similar to the 'regular' Levallois-like cores during flaking of the final stages of the Hummalian core reduction. In contrast, bladelet cores and burin-cores for bladelet production have mainly

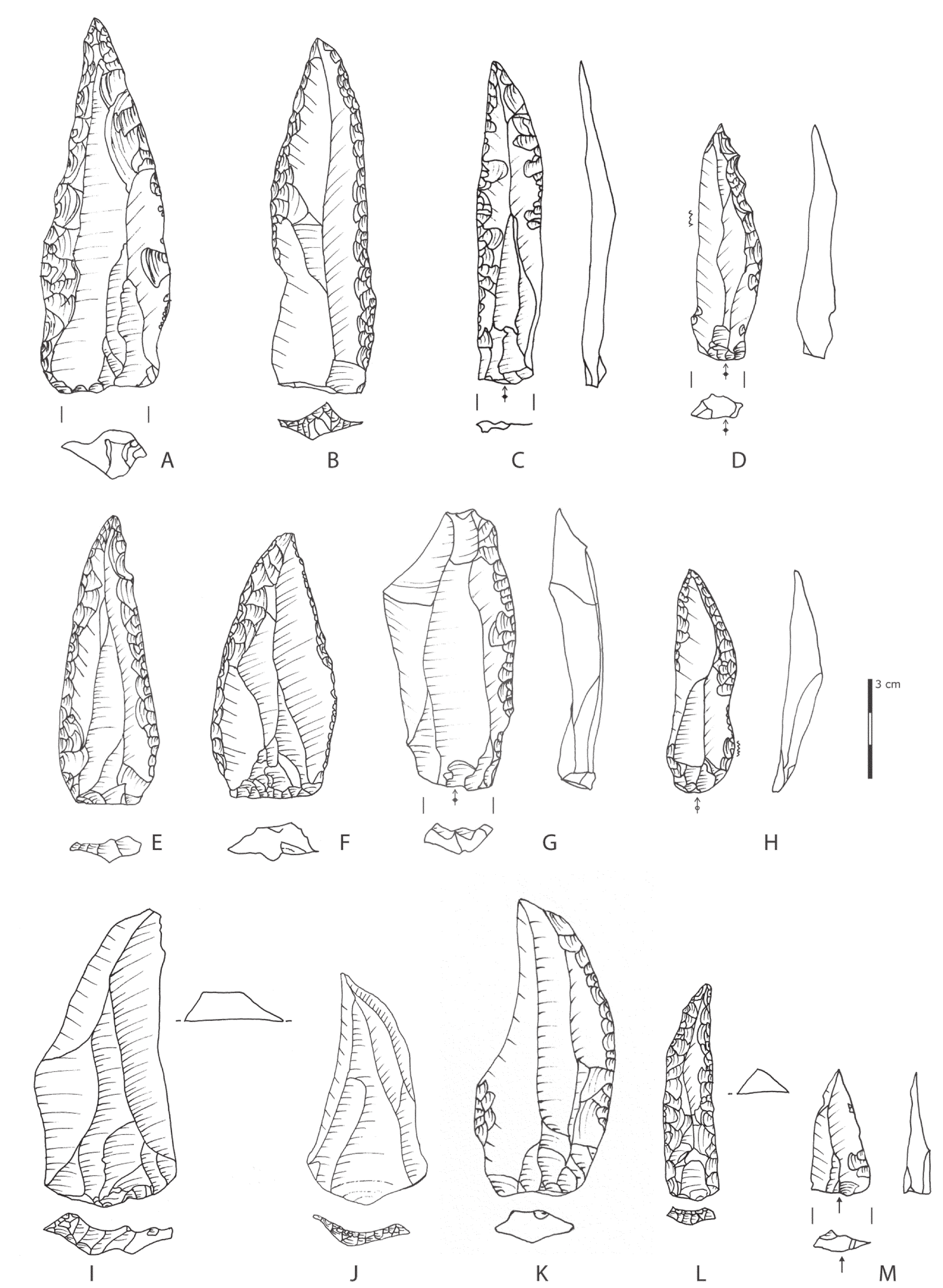

Fig. 4. Blades uncovered from layer 6b and αh; A, B, C, D- convergent blades retouched on both lateral sides; E and G -blades retouched on one lateral side; F and H points with no retouch;

Abb. 4. *Klingen aus Schicht 6b und αh; A-D, beidseitig konvergierend retuschierte Klingen; E und G, einseitig lateral retuschierte Klingen; F und H, unretuschierte Klingen.*

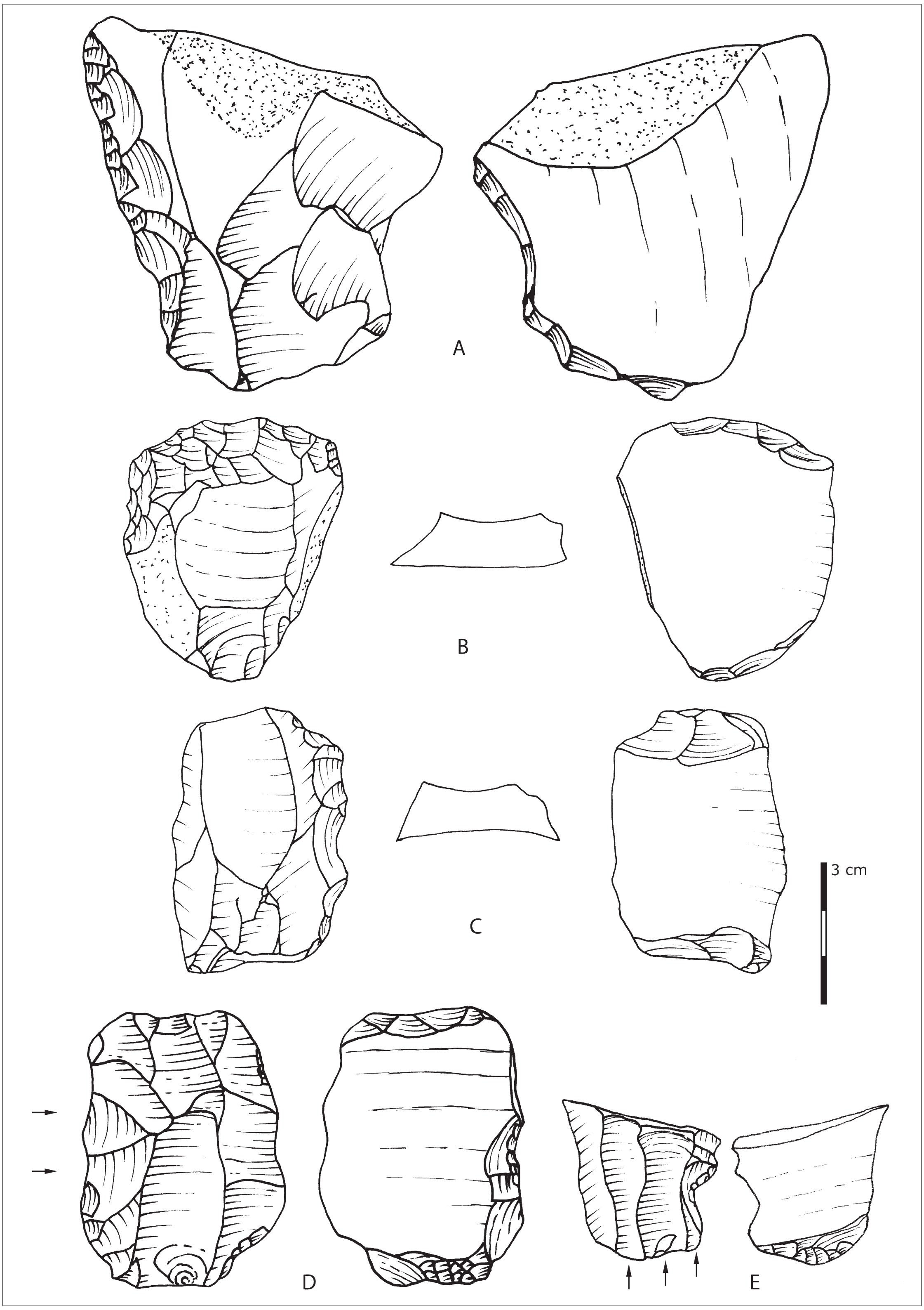

Fig. 5. Truncated-faceted pieces exploited on their upper surface; A, E - unidirectional, B, C, D - bidirectional.

Abb. 5. *Auf der Dorsalseite abgebaute endretuschiert und facettierte Stücke; A, E - unidirektional, B, C, D - bidirektional.*

plain striking platforms and are technologically close to the 'regular' Hummalian blade cores. Again, there are observed cases of 'core-like on debitage pieces' that have a combination of a truncated-faceted piece and a burin-core (Fig. 7: E). This mirrors 'regular' bidirectional cores with Levallois-like faceted and non-Levallois plain striking platforms as was shown above with 'regular' Hummalian non-Levallois looking blade cores and "regular" Levallois looking flake cores. Thus, the occurrence of 'mixed and combined'

Layer	Bladelets cores	Burins-cores	Truncated-faceted pieces
6a	1		2
6b	8	41	17
6c-1		1	
6c-2	2	1	1
7a		2	
7c			1
αh		14	18
6A1-2		1	2
6B2		1	2

Fig. 6. Distribution of bladelets cores, burins-cores and truncated faceted pieces in Hummalian layers.

Abb. 6. *Verteilung der Lamellenkerne, stichelartigen Kerne und endretuschierte-facettierte Stücke auf die Fundschichten des Hummaliens.*

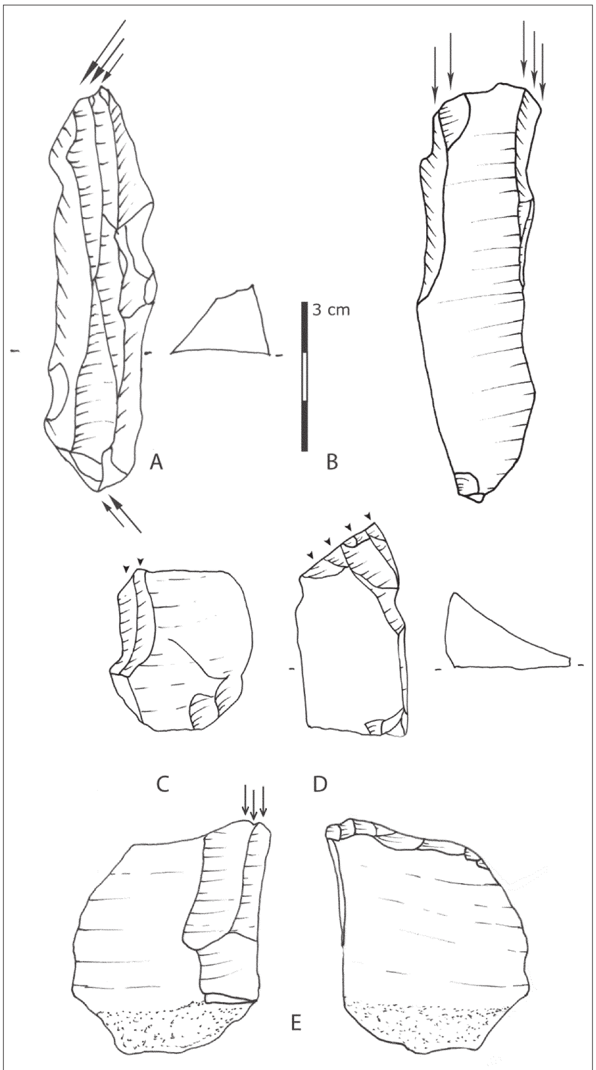

Fig. 7. Burins-cores from layer 6b and αh; A, B made on blades, and C, D, E on debitage pieces.

Abb. 7. *Stichelartige Kerne aus Schicht 6a und ah: A, B auf Klingen, C, D, E an Abschlägen.*

non-Levallois and Levallois morphological looking features for cores aimed at production of both large-sized and small-sized debitage on the same core clearly demonstrates the existence of a single but technologically variable Hummalian reduction method.

The Hummalian industry technological uniformity and variability: layer 6c-2 as an example

To demonstrate all the above technological peculiarities of the Hummalian industry, a single in situ layer will be used as a case study. Surprisingly, the statistically smallest flint assemblage, layer 6c-2 (300 pieces, inclusive of all fragments) has all the techno-typologically significant elements as well as having very good artefact preservation. All indicative cores, tools and debitage items and characteristics are observed in this layer.

Layer's stratigraphical and spatial characteristics. It is compact, carbonate silt, approximately 30 cm thick, partially eroded prior to the deposition of layer 6b, and is currently limited to one surface on the Eastern profile. The minute remains of layer 6c-1 were perceptible throughout the East profile, but were not identified in the Western and Southern parts of the excavation. A change to damper conditions led to the precipitation of layer 6c.The soil formation is indicated by the presence of mud cracks and calcified root remains. It is subdivided into two sub-levels: 6c-1 and 6c-2.

Layer 6c-1 is compact, white carbonate loam. It is almost sterile, only a few lithic items were collected in the upper part of layer which contacted with layer 6b above. Layer 6c-2, a brown grey carbonatic silt where the large majority of lithic material and small bones were collected. In Layer 6c-2 nearly all the artefacts were found in a sub-horizontal position which is concordant with the inclination of the layer, 20% of the lithic items present a grey patina (Fig. 8). All are well preserved; sharp edges remain and thus seem to be covered by sediment soon after deposition.

Flint artefacts assemblage
In total, 300 flints in an area ca. 2 m^2 were excavated in 2004 (Fig. 9). It is unlikely that the flints originating from this small area represent the cultural remains of a single Palaeolithic human occupational episode at Hummal. Possibly it is a 'flint aggregate' of human occupational palimpsests, as is common with archaeological layers at Palaeolithic sites. However, despite this the flint assemblage of layer 6c-2 is still very typically Hummalian, compared to all the Hummalian assemblages at Hummal. The above flint artefact categories are described in detail below to show their real technological and/or typological characteristics.

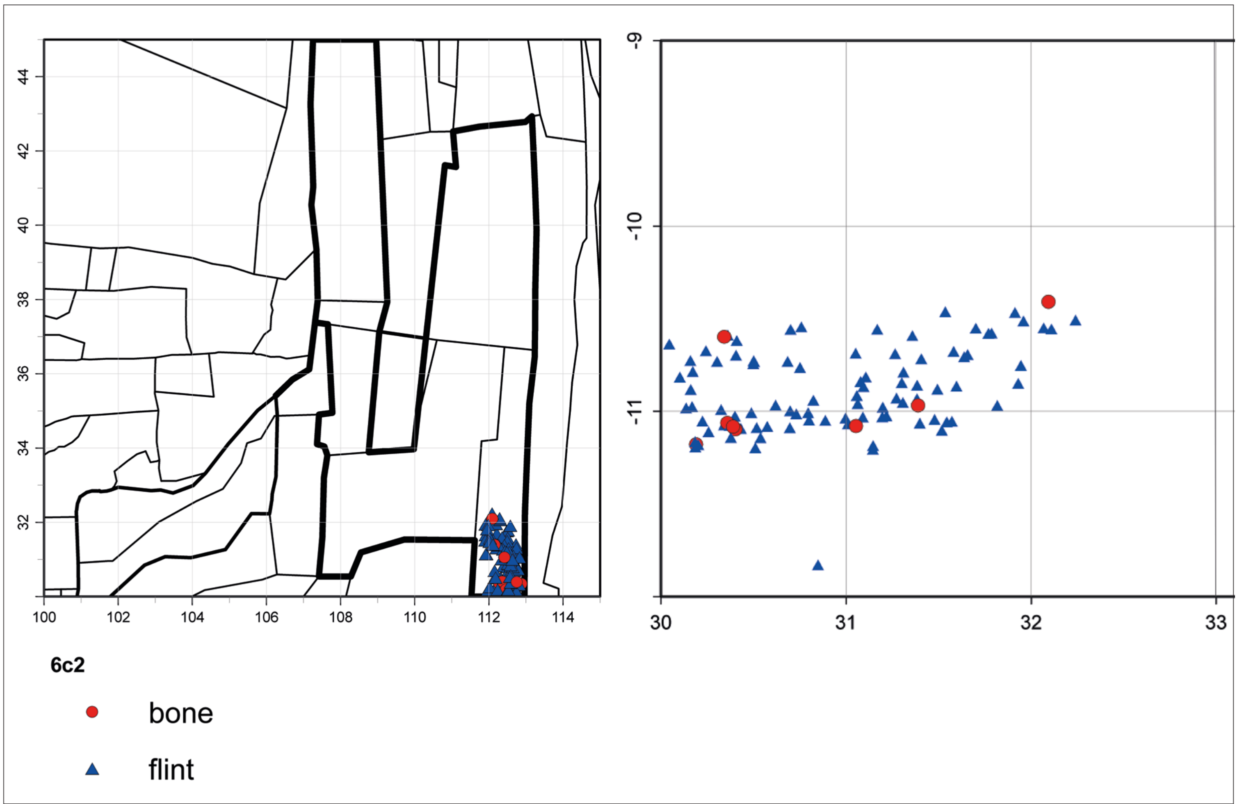

Fig. 8. Horizontal and vertical distribution of artefacts in Layer 6c-2.

Abb. 8. *Horizontale und vertikale Verteilung der Artefakte in Schicht 6c-2.*

Core-like pieces

The seven respective items are composed of three 'regular' cores on flint nodules, four bladelet reduction cores on various debitage pieces. Additionally, an example of a multifaceted burin-core from layer 6c-1 will be also presented. Each of these 'cores-like pieces' deserves to be described separately (Fig. 10).

The 'regular' cores on nodules: two blade cores and an unidentifiable.

1. Blade core (Fig. 11; Hu05 6c-2 E 1337) is a single-platform unidirectional sub-rectangular blade core with a partially flattened lower posterior surface covers by significant amount of neocortex. The core's only striking platform is crudely-faceted with a semi-acute angle. Both lateral edges of the core have rather steep edges formed by vertical-like removals from two supplementary striking platforms to create both a convexity for the core flaking surface and rather narrow parameters for blade reduction. Morphological features of the core's last reduction stage strongly suggest that there was a sort of bidirectional reduction. One of the last wide and long removals from the preserved striking platform reached the opposite end of the core covering previous negatives from the core's flaking surface and erasing the entire morphology of the opposite end. However, a small removal negative, of unknown type, remains on the opposite end and evidence the presence of a second striking platform. There are also some negatives of debitage removals applied before the final exclusively unidirectional phase of the core's primary flaking took place.
2. Blade core (Fig. 12; Hu05 6c-2 E 1330) is a double-platform, sub-rectangular blade core with an unprepared posterior lower surface and with a significant amount of primary cortex.

Layer 6c2	No.	%
Flakes	9	*3*
Retouched flakes	2	*1*
Unretouched blades	44	*15*
Retouched blades	19	*6*
Bladelets	11	*4*
CMP	70	*23*
Cores	7	*2*
Debris*	138	*46*
Total	**300**	***100***

Fig. 9. Inventory of analysed 6c-2 assemblage. *debris : chips, chunks and uncharacteristic debitage fragments.

Abb. 9. *Inventar der Schicht 6c-2.*

Cores	Length	Width	Thickness	Striking Platform 1 W/T	Striking Platform 2 W/T
First blade core (E 1337)	9.5	5.5	2.2	4.5/1.5	
Second blade core (E 1330)	5.1	3.0	1.6	3.3/1.1	1.6/1.0
An unidentifiable core (E 1923)	4.3	3.9	1.9	x	
Bladelet core	3.5	2.4	1.1	2.4/1.3	
Bladelet core & burin-core	2.3	2.5	0.7	2.5/0.9	
Multifaceted burin-core (N 37-1)	5.1	2.3	4.0	x	
Double mixed burin-core (E 0901)	5.2	2.4	0.9	x	x
Truncated-faceted piece (E 0904)	5.9	4.4	1.1	x	

Fig. 10. Metrical data of cores identified in Layer 6c (in cm).
Abb. 10. *Dimensionen der Kerne aus Schicht 6c (in cm).*

Morphologically it is very similar to the previous blade core, although this example does have a clear opposite striking platform and removal negatives coming from it. The two opposing striking platforms display the different morphologies. The first one is crudely-faceted with a semi-acute angle. The second platform is plain with a semi-acute angle. The faceted and plain striking platforms, which are also noted in the large bidirectional cores from surface finds and other Hummlian layers, demonstrates perfectly the uniformity and variability of the Hummalian reduction strategy discussed above. Any supplementary lateral striking platforms and removal negatives from them are missing on the core, probably due to its exhaustion.

3. A single-platform unidentifiable core (Hu05 6c-2, E-1923). More than half of its flaking surface is

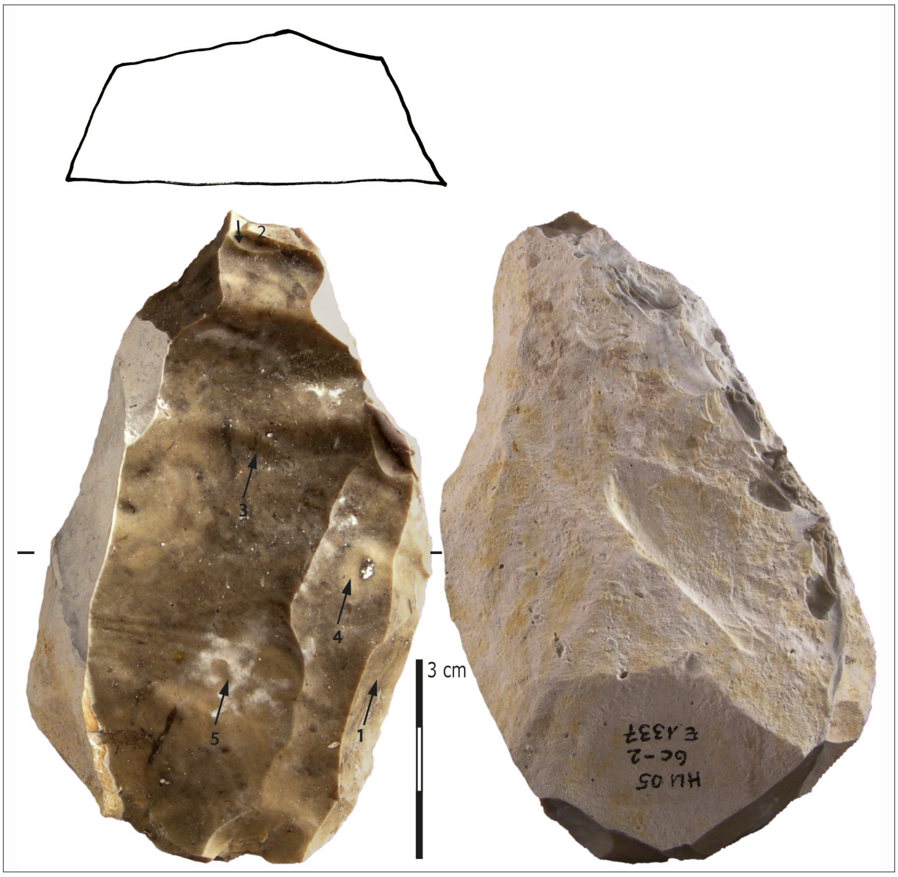

Fig. 11. Unidirectional blade core from layer 6c-2.
Abb. 11. *Unidirektioneller Klingenkern aus Schicht 6c-2.*

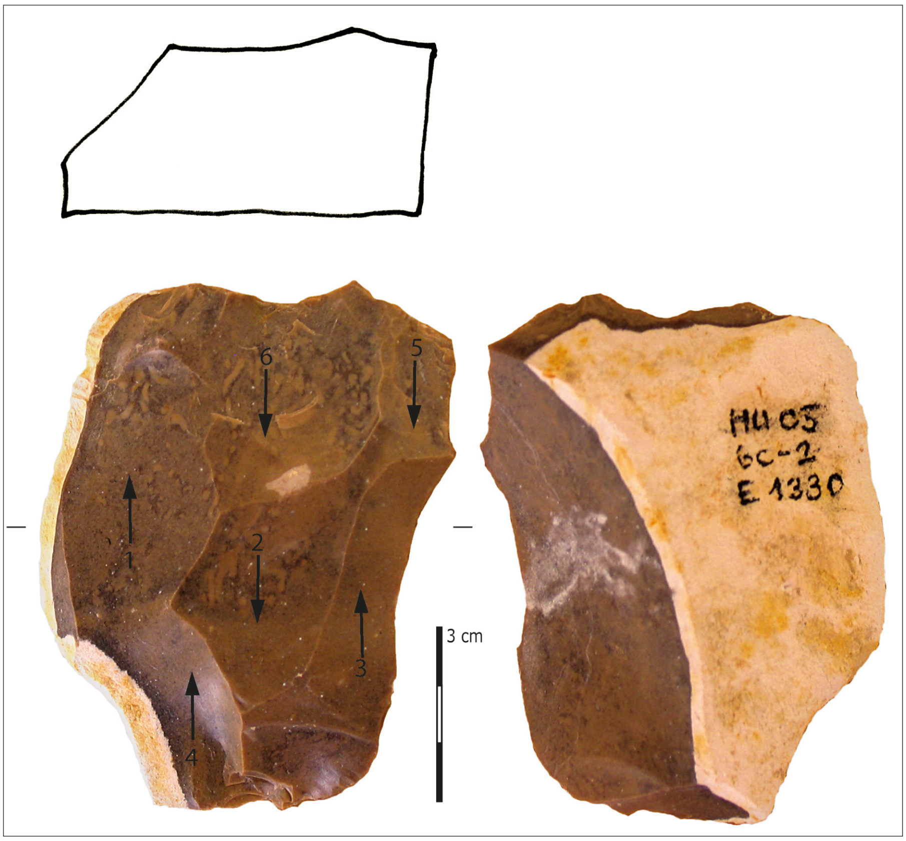

Fig. 12. Bidirectional core from layer 6c-2.
Abb. 12. *Bidirektioneller Kern aus Schicht 6c-2.*

occupied by the last removal, a large and overpassed flake negative. Accordingly, any parallel reduction could have been performed before the last unsuccessfully removed flake. The core's striking platform is plain and almost right angled, but its width and thickness measurements cannot be correctly taken due to the presence of primary cortex which also occupies almost the whole lower surface. The core is exhausted and doesn't add anything to the technological discussion.

One specific technological note should be made about these three 'regular' cores. The special 'thinning treatment' observed on the upper parts of the dorsal surfaces of some Hummalian blades, especially those that are plain butted was not noted in the three cores from layer 6c-2. This is the most probably due to the fact that this technique was applied before a blade detachment from a core, thus a discarded core needed no such treatment. Subsequently no exhausted core will exhibit such 'thinning' treatment.

Bladelet reduction cores show single examples of each of the following: a bladelet core, a combination of bladelet core & burin-core, a blade and bladelet core or multifaceted burin-core, a double mixed burin-core.

1. Bladelet core (Fig. 13A; Hu05 6c-2,) is a single-platform unidirectional sub-triangular core arranged on the distal part of a large-sized debitage piece (either flake or blade). The primary reduction was conducted on the debitage piece's dorsal surface. The core's striking platform is plain with a semi-acute angle. The striking platform is also the widest and thickest part of the core. The core's striking platform has a denticulate-like edge at its intersection with flaking surface, which indicates the absence of the core thinning technique here. At the same time, the core's flaking surface is regular with no hinge and/or overpassed features, having five bladelet removal negatives, the widest being 1.1 cm. Also, the three longest removals on the core flaking surface regularly reached the very end of this surface. The core's inferior-posterior surface is the natural convex surface of the debitage piece's hinged distal end. The above-described morphological features and metrical data clearly indicate a true bladelet core.
2. The combination of bladelet core and burin-core (Fig. 13B; Hu05 6c-2,) made on the distal part of a large-sized debitage piece (either flake or blade) with the reduction performed, as with the previous bladelet core, on the blank's dorsal surface. This core-like piece presents a distal

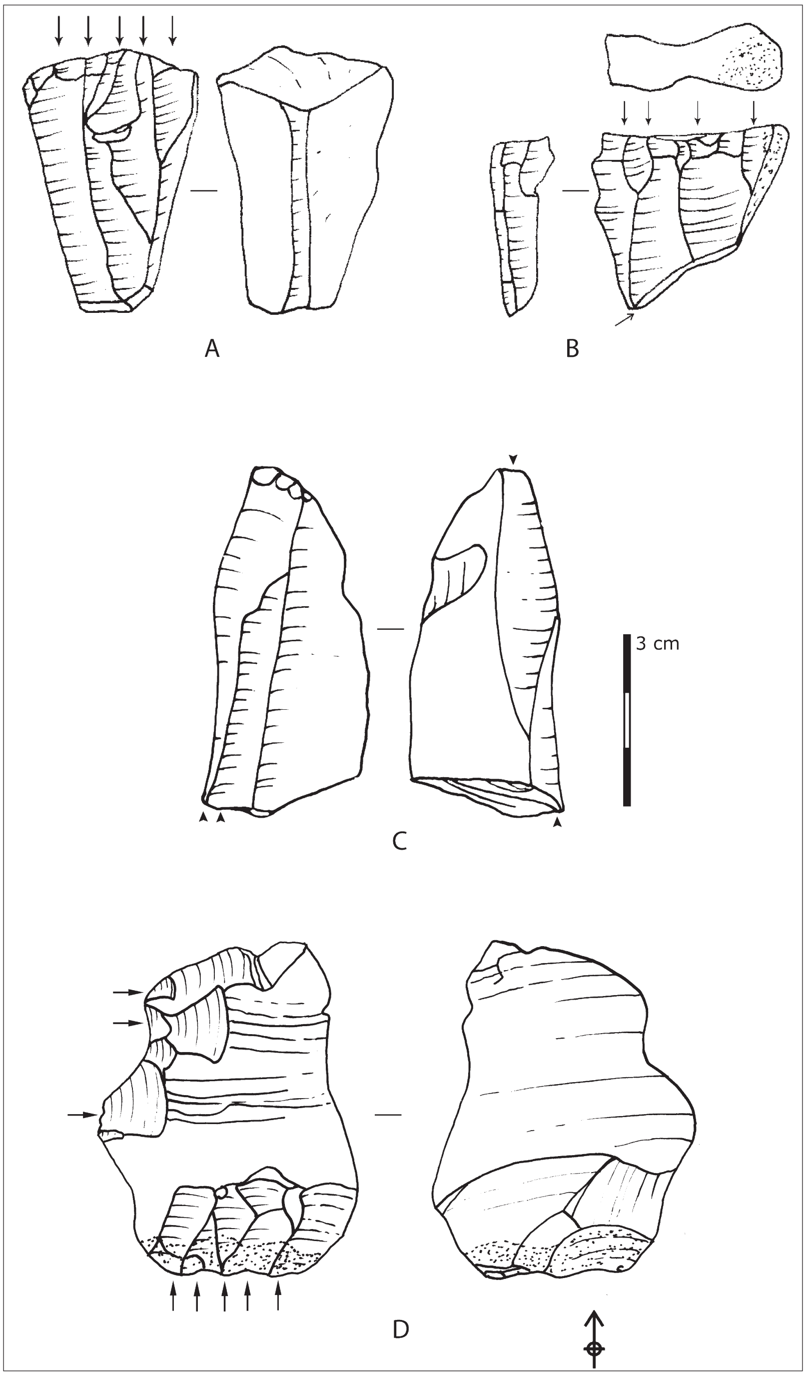

Fig. 13. Lithic artefacts from layer 6c-2; A-bladelet core, B-bladelet core with burin-core, C-burin-core, D- truncated-faceted piece (Nahr Ibrahim piece).

Abb. 13. *Artefakte aus Schicht 6c-2; A-Lamellenkern, B-Lamellenkern in Kombination mit stichelartigem Kern, C-stichelartiger Kern, D-endretuschiertes und facettiertes Stück (Nahr-Ibrahim piece).*

posterior surface that is a naturally flat surface at the debitage piece's hinged distal end. This unusual combination necessitates that the two core-like reductions on the piece are described separately. The bladelet core occupies a significant part of the 'core-like piece' with its striking platform located on the widest portion along the blank's left lateral edge. This core is unidirectional and sub-pyramidal in shape. The shape is formed by bladelet removal negatives on both wide and narrow sides of the core. The core's striking platform is plain and almost right angled. The flaking surface of the core is regular with six bladelet removal negatives, the widest being 0.8 cm, and no less than three removals occupy the whole length of the core's flaking surface. The burin-core termination is located at the core blank's right lateral edge and the medial break.

Typologically, it is a dihedral burin with a single hinged burin spall negative (0.2 cm wide) on the blank's right lateral edge, the 'burin verge' and with three regular burin spall negatives at the blank's medial breakage with a total width of 0.4 cm. The order of the negative removals for the burin-core indicates that the burin-like reduction occurred after the bladelet core reduction. In summary, a double bladelet core reduction was conducted on just one core blank with, firstly, bladelet (≥ 0.7 cm-width-<1.2 cm) and microblade (width <0.7 cm) flaking followed by solely microblade removal. This combination of bladelet core and burin-core represents a two stage primary flaking process.

3. The blade and bladelet core or multifaceted burin-core (Fig. 14; Hu02 c. 6c-1: N 37-1) is actually a blade or bladelet, narrow-sided core with a single-platform that also typologically looks like a dihedral multifaceted burin. The core is made on a core tablet and shows two subsequent, mainly bladelet reduction stages. The first reduction stage was performed along the widest (2.3 cm) of two narrow sides of the debitage blank. At least four narrow blades and bladelets were removed. The widest item was possibly 1.4 cm and the two first removals were overpassed. The length of this flaking surface is bigger than the whole length of the core (5.6 cm v 5.1 cm). Two more removals were detached to the length of approximately 4.6 cm. The striking platform for this reduction stage is unidentifiable because after the first reduction stage the striking platform was reused as a second flaking surface for bladelet production, where the first flaking surface became the striking platform. The second reduction stage was realized along the narrower side (1.2 cm wide) of two narrow sides of the debitage blank, where only bladelets have been detached. Here approximately half of flaking surface's length has bladelet negative removals, while the rest of its length has regular negatives of the previous blade or bladelet reduction on the proximal part of the flaking surface. The core tablet's upper surface is actually a previous 'regular' core's plain striking platform. At least four bladelets were flaked from this surface, the widest being 1.1 cm. All bladelet removal negatives are hinged at 3.2 cm, meaning that none reached the end of the flaking surface's length (5.1 cm). The core tablet's edge served as a crested ridge for the second bladelet reduction stage as well. Thus, again the intentional two stage bladelet reduction on one core is observed.

4. The double mixed burin-core (Fig. 13C; Hu05 6c-2 E 0901) is typologically a combination of angle (on snap) burin and burin on oblique truncation. The burin-core is made on peculiar blank. This is actually a proximal part of a 'Janus/ Kombewa' blade removed from a large debitage piece's ventral surface that probably previously served as a blank for a blade reduction. Accordingly, there is the so-called succession of two 'core on debitage piece' reduction events. First, a large-sized debitage piece was used for blade production followed by a second, in which one of the blades produced was used for bladelet production. The proximal part of the blade was also used for a two-staged burin-core bladelet reduction. During the first stage the plain butt was used to remove at least three bladelets along the blade's one lateral edge. Two of the removals cover the whole length of the lateral edge, while one removal was shorter (although not hinged) reaching only 4.2 cm of the total length of the piece (5.2 cm). As a result, the first burin-core reduction stage looks like an angle burin

Fig. 14. Burin-core from layer 6c-2.
Abb. 14. *Stichelartiger Kern aus Schicht 6c-2.*

production. The second stage is associated with the use of the medial breakage of the blade. That was partially and obliquely retouched and from this newly prepared faceted striking platform, a hinged but long bladelet was detached. This occurred along the same blank's lateral edge which was used for the three previous bladelet removals from the plain striking platform. Its removal negative measured 3.7 cm whilst the whole length of the lateral edge is 5.2 cm. This second stage looks like the manufacturing of burin on truncation. The burin-core two stage reductions repeats the technological properties of the Hummalian 'regular' bidirectional cores for large-sized blade production by having both faceted and plain striking platforms. The widest bladelet removal negative shows 1.2 cm, the rest are narrower.

Summarising from the four various bladelet reduction core-like pieces; it is possible to underline the following basic features:

- Three of the four core-like pieces are characterized by two stages of bladelet production, whilst the one remaining, a typologically clear bladelet core, still shows intensive bladelet production.

The recognized bladelet cores, burin-cores and their combinations represent a separate bladelet production at the site that was regularly carried out by the Hummalian inhabitants. Moreover, statistically the bladelet reduction 'core-like pieces' compose an important part of all cores from the layer 6c-2. They are also well represented in the other rich Hummalian layers 6b and sand αh, 25% and 16% of all cores respectively (Wojtczak 2014a, b). This shows that these items played an important and significant role for the humans occupying Hummal. Thus, the bladelet production aspect within the Hummalian certainly deserves a great deal of attention.

5. Truncated-faceted piece (Fig. 13D; Hu05 6c-2: E 0904) is a cortical flake with orthogonal or unidirectional-crossed scar pattern having some clear secondary flaking treatment represented by a series of short removal negatives on its proximal and lateral part. A single negative on the ventral surface that probably formed a striking platform and additionally at least four others on the dorsal surface. Such secondary flaking treatment of the piece can also be considered as an adaptation element of the tool but as the piece lacks retouch it was decided to treat it as a 'core on debitage piece.'

The recorded tripartite 'core-like piece' structure is further supported by the three-part debitage piece structure, within items detached from 'regular' cores and from 'cores on debitage pieces' including various bladelet core-like pieces and truncated-faceted pieces.

Debitage

In total, debitage not including retouched tools and core maintenance products (CMP) is composed of 9 flakes, 44 blades and 11 bladelets. Usually, a description of each debitage class is carried out separately, and only then different parts of the pieces are connected to various core reductions. In this particular case, it is proposed to reverse the order for a much better technological illustration of the different direct associations of core-like pieces and debitage pieces. Only complete pieces were used for this analysis.

<u>Debitage pieces linked to 'regular' cores.</u>
This assemblage consists of seven flakes and forty blades.

<u>Flakes</u>: There were just seven complete non-cortical flakes with well-preserved butt and other identifiable morphological features (Fig. 15). The seven described

	Levallois/ non Levallois	Length	Width	Thickness	Striking Platform W-T	Dorsal Scar pattern	Shape	Removal direction	General Profile	Distal end	Cross section at midpoint	Butt	Thinning
L1	Lev. point	5.5	3.4	0.5	2.5-0.4	conv.	trian.	off-axis	inc.med	feath.	trap.	con.f-f	no
L2	Lev. flake	5.8	3.1	0.6	2.3-0.4	bid.	rect.	on-axis	inc.med	feath.	trap.	con.f-f	no
L3	Lev. flake	4.2	2.7	1.0	1.4-1.6	bid.	rect.	on-axis	inc.dis.	feath.	irr.	str.f-f	no
L4	Lev. flake	3.8	2.3	0.5		con.	trian.	on-axis	inc.med	blunt	trap.	irr.	no
L5	non Lev.	3.4	3.8	0.3		unid.	ovoid	on-axis	inc.med	feath.	multif.	irr.	yes
L6	Lev./non Lev.	3.9	2.1	0.5	0.9-0.5	conv.	exp.	on-axis	inc.dis.	blunt	multif.	str.f-f	yes
L7	Lev./non Lev. point	8.9	4.6	0.9	2.2-1.1	bid.	trian.	on-axis	inc.med	feath.	multif.	con.f-f	yes

Fig. 15. Metrical data of debitage items identified in Layer 6c-2 (in cm). Abbreviations used: bid.-bidirectional, con.-convex, conv.-convergent, dis.-distal, exp.-expanding, feath.-feathering, f-f- finely faceted, irr.-irregular, inc.-incurvate, lat.-lateral, Lev.-Levallois, med.-medial, multif.-multifaceted, rect.-rectangular, ret.-retouched, str.-straight, trap.-trapezoidal, trian.-triangular, trid.-tridirectional, unid.-unidirectional, unident.-unidentifiable.
Abb. 15. Dimensionen der Abschläge aus Schicht 6c-2 (in cm).

flakes can be distributed into five morphologically different groups. The four pieces with Levallois-like morphology are slightly more numerous (57%) than the other flake types, and they present convergent or bidirectional scar patterns and are average in length. The single flake with non-Levallois features (14%) is the only item in the flake sample with a unidirectional scar pattern also it is the shortest piece. The two morphologically mixed pieces combining Levallois and non-Levallois features (29%) are similar to the Levallois-like items, bearing convergent and bidirectional scar patterns, one being the longest piece, whilst the other is among the shortest pieces. Thus, there is a real mixture of Levallois-like and non-Levallois-like morphological and metrical features (average length is 5.1 cm) within the flake sample, which strongly supports the idea of the existence of a single Hummalian reduction method with significant technological variability within the Hummalian industry.

Blades	Butt mean width	Butt mean height	Length range	Length mean	Width range	Width mean	Thickness range	Thickness mean
9 Levallois blades	1.7	0.6	4.8-10.4	7.4	1.4-4.6	2.8	0.5-0.9	0.7
6 non-Levallois blades	1.3	0.5	4.4-11.0	6.7	1.4-4.6	2.4	0.4-1.3	0.7
4 mixed blades	1.4	0.5	5.5-7.5	6.4	1.6-3.2	2.3	0.4-0.8	0.6

Fig. 16. Metrical data of complete blades collected in Layer 6c-2 (in cm).

Abb. 16. *Dimensionen der vollständigen Klingen aus Schicht 6c-2.*

Blades: Just nineteen of the 40 blades were complete pieces with well-preserved butt and presence of 'thinning'. Using the same criteria as applied above, these could are also be morphologically subdivided into three groups (Figs. 16 & 17).

1. Nine Levallois-like blades (47%) with prepared butts showing no 'thinning' are considered to be morphologically from Levallois-like cores.
2. Six non-Levallois-like blades (32%) are morphologically suggestive of non-Levallois items; five have 'thinning'.
3. Four morphologically mixed pieces combining some Levallois and non-Levallois features (21%). They have prepared butts and three also present 'thinning 'of its proximal part.

The three subdivisions of blades reveal interesting technological and metrical information. The Levallois-like pieces are the longest, widest and thickest blades. The non-Levallois-like pieces are intermediate and the morphologically mixed pieces are the smallest blades in length, width and thickness. These data show that in contrast to the previously described general morphological trend of non-Levallois-like blades being the longest and, as a rule, removed from cores first, the blades from layer 6c-2 indicate that the Levallois-like items were longest, widest and thickest blades. This means that there was nuanced variation in

Blades	Dorsal Scar pattern	Shape	Removal direction	General Profile	Distal end	Cross section at midpoint	Butt	Lateral primary cortex area	Thinning
9 Lev.-like blades	1 unid.	4 rect.	6 on-axis	1 flat	9 feath.	2 trian.	1 str., c-f	7 non-cortical	non
	2 conv.	2 trian.	3 off-axis	3 inc. med.	1 irr.	6 trap.	3 str., f-f	2 non-significant (≤ 25%)	
	5 bid.	1 exp.		2 twisted		1 multif.	3 con., f-f		
	1 trid.	1 irr.					1 chdg		
							1 demi-chdg		
6 non-Lev. blades	1 unid.	1 rect.	4 on-axis	2 flat	6 feath.	1 trian.	6 plain	6 non-cortical	yes
	2 conv.	3 trian.	2 off-axis	4 inc. med.		5 trap.			
	3 bid.	1 exp.							
		1 irr.							
4 mixed blades	1 unid.	1 rect.	3 on-axis	2 flat	3 feath.	1 trian.	1 con., c-f	3 non-cortical	yes
	1 conv.	1 exp.	1 off-axis	1 inc. med.	1 irr.	2 trap.	3 con., f-f	1 non-significant (≤ 25%)	
	2 bid.	2 irr.				1 multif.			

Fig. 17. Morphological data for complete blades collected in Layer 6c-2. Abbreviations see legend of Fig. 15.

Abb. 17. *Morphologische Daten der vollständigen Klingen aus Schicht 6c-2.*

Debitage pieces	Length	Width	Thickness	Striking Platform W-T
First blade-proximal part	4.8	1.3	1.7	0.5-0.5
Second blade-distal part	3.9	1.5	1.1	broken
First complete blade	5.0	2.0	0.4	1.4-0.5
Second complete blade	3.5	1.7	0.3	crushed
Bladelets 1	2.8	1.0	0.3	crushed
Bladelets 2	3.6	1.0	0.2	0.4-0.2
Bladelets 3	2.4	0.7	0.2	0.2-0.2
Bladelets 4	2.6	1.1	0.3	0.7-0.1
Bladelets 5	4.3	1.2	0.3	0.9-0.2
Bladelet medial part 1	2.3	0.9	0.3	
Bladelet medial part 2	2.1	0.9	0.2	
Bladelet distal part 1	2.4	1.1	0.4	
Bladelet distal part 2	1.8	1.1	0.3	
Bladelet distal part 3	1.2	0.6	0.3	
Bladelet distal part 4	2.5	0.6	0.2	

Fig. 18. Metrical data of debitage pieces connected to bladelet reduction core identified in Layer 6c-2 (in cm).

Abb. 18. *Dimensionen in cm der verschiedenen Grundformen aus der Kernreduktion in Schicht 6c-2 (in cm).*

the primary flaking reduction method for some human occupation events, whilst still being in the same technological range. This is proven by the dorsal scar pattern for example, where all three blade types are very similar to one another, there is a dominance of bidirectional scar pattern: 56% for Levallois-like pieces and 50% for both non-Levallois and morphologically mixed items.

Debitage pieces connected to bladelet reduction cores.

There are four blades and eleven bladelets *sensu lato* (Figs. 18 & 19).

Blades: two complete and two fragmented. It is highly likely that the four blades were the initial removals performed before the bladelet reductions. It is also possible that blades were removed together with bladelets during blade/bladelet reductions that were observed, for example, in the previously described blade and bladelet core or multifaceted burin-core.

The first complete blade is a lateral debordante with non-significant (≤25%) lateral primary cortex area. The second complete item is non-cortical. The two fragmented blades are secondary non-cortical lateral debordante blades removed from the narrow edges of blade/bladelet cores on debitage pieces or burin-cores. The first is a proximal part with plain butt and the second is a distal part.

Debitage	Dorsal Scar pattern	Shape	Removal direction	General Profile	Distal end	Cross section at midpoint	Butt	Thinning
First blade-proximal part							plain	
Second blade-distal part								
First complete blade	unid.	exp.	off-axis	inc.med	blunt	trap.	plain	
Second complete blade	trid.	irr.	on-axis	inc.med	feath.	multif.	crushed	yes
Bladelets 1	bid.	irr.	off-axis	flat	feath.	triang.	linear	
Bladelets 2	unid.	trian.	on-axis	inc.med	feath.	trap.	plain	yes
Bladelets 3	unid.	trian.	on-axis	inc.med	hinge	triang.	plain	yes
Bladelets 4	unid.	rect.	on-axis	inc.med	feath.	trap.	plain	
Bladelets 5	unid.	trian.	on-axis	inc.med	feath.	trap.	f-f	yes
Bladelet medial part 1						triang.		
Bladelet medial part 2						triang.		
Bladelet distal part 1	unid.	feath.	on-axis	flat		triang.		
Bladelet distal part 2	conv.	irr.	on-axis	flat		trap.		
Bladelet distal part 3	unid.	feath.	off-axis	flat		triang.		
Bladelet distal part 4	unid.	irr.	on-axis	inc..med		triang.		

Fig. 19. Morphological data of debitage pieces connected to bladelet reduction core identified in Layer 6c-2. Abbreviations see Fig. 15.
Abb. 19. Morphologischen Daten der verschiedenen Grundformen aus der Kernreduktion in Schicht 6c-2.

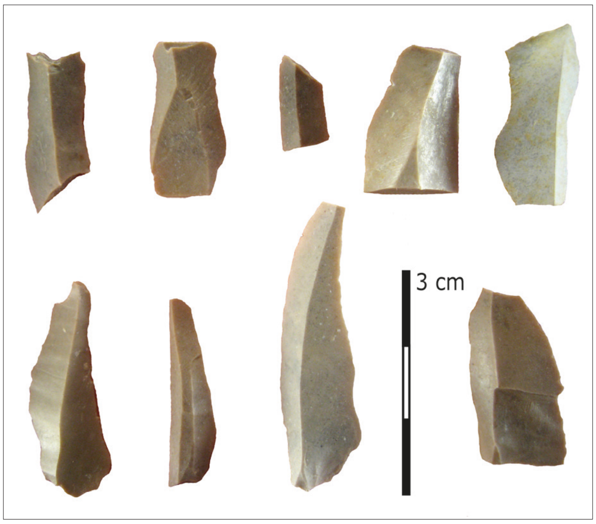

Fig. 20. Bladelets from layer 6c-2.
Abb. 20. *Lamellen aus Schicht 6c-2.*

Bladelets are composed of five complete pieces, two medial and four distal parts. Interestingly, no proximal fragments were recognized (Figs. 18, 19, 20 & 21A). One of the complete bladelets (Bladelet1) has been most likely removed from a burin-core as indicated by its morphology, irregularity in shape and metrical features (narrow and thin). This core-burin was made on the distal end of a debitage 'Janus/Kombewa piece.' The other ten bladelets seem to be products of more intensive and regular bladelet reductions from typologically identifiable bladelet cores. Observed characteristics among the bladelets included a few presenting trapezoidal midpoint profiles and four abraded butts testify to a systematic bladelet reduction.

Two medial sections from bladelets are identified with triangular profiles at the midpoint. The lack of more morphological data does not help in the interpretation of the reduction of two bladelets, but length-width measurements are suggestive of bladelet core reduction processes rather than from burin-cores.

There are four distal fragments which can be subdivided into two bladelets *sensu stricto* (width ≥ 0.7 cm < 1.2 cm) and two microblades (width < 0.7 cm). Two distal parts of bladelets and two distal parts of microblades were recognised.

The microblades are not morphologically different from bladelets, thus it can be suggested that both bladelets and microblades were removed from the same bladelet cores. However the figure showing the bladelets and microblades clearly displays the morphological heterogeneity between bladelets *sensu lato* indicating an absence of any clear bladelet reduction system.

Debitage pieces connected to truncated-faceted piece reduction (Fig. 22)

There are only two of these items, both flakes. They are clearly 'Janus/Kombewa' complete, partially-cortical (with non-significant (≤ 25%) lateral primary cortex areas on lateral edge) pieces. These two 'Janus/Kombewa' flakes not only support the rare presence of cores on debitage pieces for small flake production, but also their on-site reduction at Hummal.

The data recorded and analysed from layer 6c-2 debitage and their technological connections to various core-like pieces shows a rather significant variability. But at the same time, the predominance of blades and fewer flakes from so-called 'regular' cores on nodules still constitutes the most characteristic feature of the Hummalian industry. This feature is also

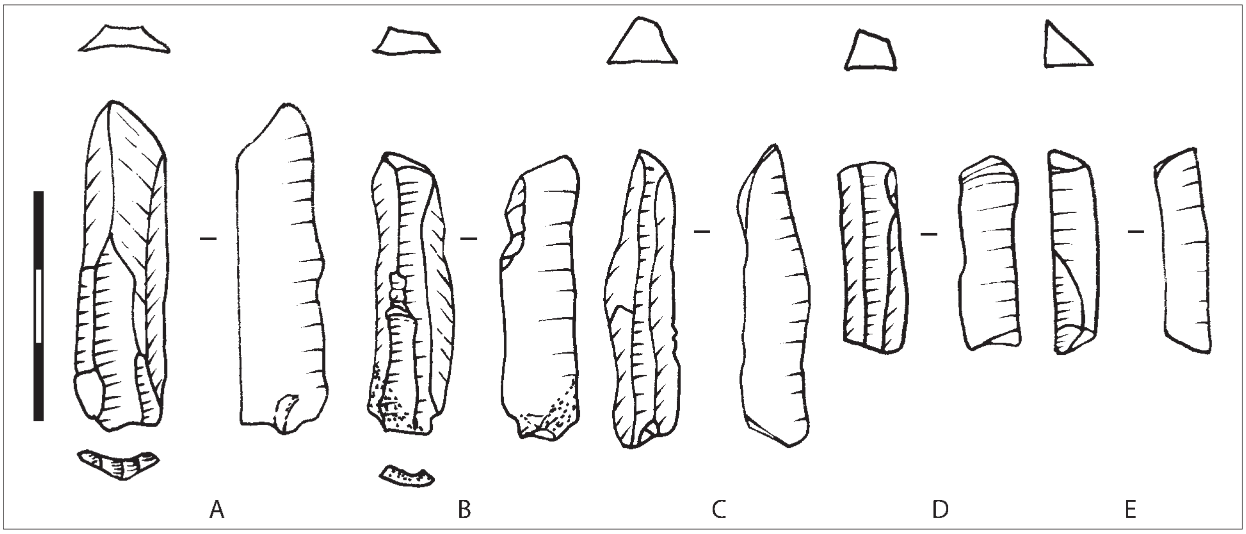

Fig. 21. Bladelets from Hummalian layers: A- bladelet from Layer 6c-; B,C- bladelets from Layer 6a, D, E-bladelets (distal parts) from Layer 6b.
Abb. 21. *Lamellen aus den Hummalien-Schichten: A- Lamelle aus Schicht 6c-2; B, C-Lamellen aus Schicht 6a; D, E-Lamellen aus Schicht 6b.*

Flakes	Length	Width	Thickness	Striking Platform W-T	Dorsal Scar pattern	Shape	Removal direction	General Profile	Distal end	Cross section at midpoint	Butt	Thinning
Janus flake 1	4.0	3.4	0.6	1.1-0.4	plain	exp.	off-axis	inc. distal	blunt	lat.steep	cortical	no
Janus flake 2	3.8	2.2	0.5	0.2-0.2	plain	ovoid	on-axis	inc. med.	blunt	flat	plain	no

Fig. 22. Metrical data of flakes connected to truncated-faceted piece reduction (Nahr Ibrahim) identified in Layer 6c-2 (in cm). Abbreviations see legend of Fig. 15.

Abb. 22. *Dimensionen der endretuschierten-facettierten (resp. Nahr-Ibrahim) Abschläge aus Schicht 6c-2 (in cm).*

further heavily supported by debitage data for tool blanks.

Core Maintenance Products (CMP)

This abundant artefact category is composed of a series of different flakes and blades (n = 70) in this assemblage. Aside of the above-described three lateral debordante blades connected to bladelet reduction cores, the remaining 66 pieces are associated with primary flaking reduction processes of 'regular' cores.

- Lateral debordante items;
- A single crested blade;
- Primary decortification items;
- Core flaking surface re-preparation, lateral uplifting & 'thinning' items;
- Core faceted platform's rejuvenation items.

The presence of these CMPs clearly demonstrates some on-site core reduction processes. Simultaneously, it is important to mention the occurrence of just a single large-sized crested blade (6.6 cm long, 2.5 cm wide and 1.2 cm thick). This is actually the medial part of non-cortical piece with two-sided partial crested treatment. It is highly likely, a re-crested blade detached during a core flaking surface re-preparation process. Accordingly, the layer 6c-2 CMPs data confirms the minor role of the true "*lame à crête* technique" in the Hummalian blade production.

Retouched tools and their blank debitage.

Overall, 27 pieces with secondary retouch treatment have been recognized in the layer 6c-2 assemblage and only debitage pieces connected to 'regular' core reduction have been used as tool blanks. Accordingly, the small-sized debitage items produced from bladelet related core-like pieces and truncated-faceted pieces have been not retouched even with marginal or irregular retouch. This fact will be discussed in more detail later as it is very important to the whole Hummalian industry.

Among the 27 tool blanks there are 26 blades and just a single flake, a point. This again clearly shows the predominant blade characteristic of the Hummalian industry. They all bear only dorsal retouch. Typologically they represent (Fig. 23):

1. 9 side-scrapers (33%), all made on complete blades. The semi-crescent side-scraper is formed by a conjunction of straight and convex retouched edges.
2. 11 points (41%) all made on complete blades but one on flake.
   - Lateral point (1 item) is well retouched on one lateral edge whilst the other lateral edge shows only a very sharp tip with no retouch.
   - Terminal point (1 item). The piece with retouch noticeable only near the distal pointed tip was classified as a terminal point.
   - Sub-triangular points (2 items) are on two complete blades.
   - Semi-crescent points (4 items) are on three complete blades and a single flake.
   - Leaf shaped points (3 items) all are on complete blades.
3. 1 truncated piece (4%). The only tool of this type is on a complete blade.
4. 6 retouched pieces (22%) with random lateral retouch, all made on blades.

The tools' blank and retouch data for so-called well-retouched tools (excluding 6 retouched pieces) do demonstrate very exponential tendencies (Fig. 23). By blank types, all ten typologically identifiable points have been produced on 'non-Levallois-like' debitage items, nine blades and a single flake. Furthermore, the single truncated piece was also produced on a 'non-Levallois-like' blade. However, the six typologically identifiable side-scrapers are shared equally between 'Levallois-like' and 'non-Levallois-like' blades. There is a notable presence of a single convergent (semi-crescent) side-scraper on a 'Levallois-like' blade. This is similar production to the simple side-scrapers yet in contrast to the semi-crescent points. Thus, there is an exclusive production of points on 'non-Levallois-like' pieces, whilst side-scrapers appear to be shaped on both blank types.

By retouch type, the side-scrapers and points are also different. The light scalar retouching on points is considerably less represented than for side-scrapers. Scalar and intensive scalar retouch are similar between points and side-scrapers in both groups, whilst stepped and sub-parallel retouch occurs in points but

Tool class	Blank	Retouche on edges	
		angle	morphology
1 Simple str. side-scraper	Lev.-like	flat	scalar
1 Simple con. side-scrapers	Lev.-like	flat	ligth scalar
1 Simple con. side-scrapers	non-Lev.	flat	scalar
1 Simple con. side-scrapers	non-Lev.	flat	scalar
1 Simple con. side-scrapers	non-Lev.	semi-steep	scalar
1 Simple con. side-scrapers	unident.	semi-steep	scalar
1 Simple con. side-scrapers	unident.	semi-steep	invasive scalar
1 Simple con. side-scrapers	unident.	semi-steep	invasive scalar
1 Semi-crescent side-scraper	Lev.-like	two semi-steep	two invasive scalar
1 Lateral point	unident.	semi-steep	invasive scalar
1 Terminal point	non-Lev.	1 flat, 1 semi-steep	2 scalar
1 Sub-trian. point	non-Lev.	2 semi-steep	2 invasive scalar
1 Sub-trian. point	non-Lev.	2 semi-steep	1 invasive scalar, 1 stepped
1 Semi-crescent point	non-Lev.	1 flat, 1 semi-steep	2 scalar and burin like spall
2 Semi-crescent point	non-Lev.	1 flat, 1 semi-steep	2 invasive scalar
3 Semi-crescent point	non-Lev.	2 semi-steep	1 invasive scalar, 1 stepped
4 Semi-crescent point	non-Lev.	1 flat, 1 semi-steep	2 scalar
1 Leaf shaped point	non-Lev.	1 flat, 1 semi-steep	2 invasive scalar
2 Leaf shaped point	non-Lev.	1 flat, 1 semi-steep	1 ligth scalar, 1 scalar
3 Leaf shaped point	non-Lev.	2 semi-steep	1 invasive scalar, 1 subparallel
Truncated Blade	non-Lev.	semi-steep/steep	scalar
1 Blade with lateral retouch	Lev.-like	semi-steep	1 irr. scalar
2 Blade with lateral retouch	Lev.-like	semi-steep	1 irr. scalar
3 Blade with lateral retouch	Lev.-like	semi-steep	1 irr. scalar
4 Blade with lateral retouch	non-Lev.	semi-steep	1 irr. scalar
5 Blade with lateral retouch	unident.	semi-steep	1 irr. scalar
6 Blade with lateral retouch	unident.	two semi-steep	2 irr. scalar

Fig. 23. Retouched blades; classes and retouch characteristics.
Abb. 23. *Charakteristika der modifizierten Klingen und der entsprechenden Retuschierung.*

not on side-scrapers. These retouch type results certainly testify to a greater degree of retouching for points than for side-scrapers. Three attributes might help to understand more about these differences; retouch types, length and thickness. Comparing these attributes individually on the three side-scrapers made on 'Levallois-like' blades, three side-scrapers made on 'non-Levallois' blades and the nine points produced on 'non-Levallois-like' blades shows clear and interesting results. The side-scrapers on 'Levallois-like' blades have two scalar and two invasive scalar retouch types on four retouched edges; an average length of 8.2 cm and are 0.6 cm thick. The side-scrapers on 'non-Levallois-like' blades have two scalar and one invasive scalar retouch types for three retouched edges; an average length of 7 cm and are 0.9 cm thick. The points on 'non-Levallois-like' blades with 18 retouched edges exhibit mostly invasive scalar retouching and have an average length of 8 cm and are 0.9 cm thick.

These debitage blank results for the three tool types have a two-fold meaning. Firstly, the similar average lengths (range: 7 – 8.2 cm) again demonstrates the flaking of both Levallois-like and non-Levallois blades in the course of the same core reduction processes on the same core. Secondly, the difference in thickness measurements, 0.6 cm for 'Levallois-like' blades, against 0.9 cm for the two 'non-Levallois-like' blade groups, is indeed striking. All three 'Levallois-like' blades are 0.6 cm thick, whilst the eleven 'non-Levallois-like' blades are all thicker than 0.6 cm with the exception of a single point that is 0.6 cm. Thus, it seems that the more heavily retouched pieces tend to be shaped on thicker blades which have been produced from a core with unprepared (cortical or plain) striking platforms. The production of thicker blades and heavily retouched tools shows a degree of forward planning both before and during the core reduction processes. Apparently human inhabitants of Hummal choose thinner 'Levallois-like' and thicker 'non-Levallois-like' blades for different retouching and probably different tasks (see also Meignen 2011: 93).

Further morphological attributes of retouched 'Levallois-like' and 'non-Levallois-like' blades are not dissimilar especially when such small sample sizes are considered, three and thirteen pieces respectively. Although it is worth noting the clear dominance of trapezoidal and multifaceted profiles at midpoint (n=11) and thinning of proximal part for 'non-Levallois-like' blades suggesting their intensive flaking as well as systematic use of thinning during their production (Fig. 24).

Finally, six retouched pieces, all of which are blades, three 'Levallois-like,' one 'non-Levallois-like' (Figs. 23 & 25) and two technologically unidentifiable blades. This seemingly random selection may suggest a situational use of blades that are to hand. The evidently shorter length of the 'non-Levallois-like' retouched blade compared to the 'Levallois-like' retouched blades corresponds well with the average length data for both debitage blades. Furthermore technologically unidentifiable blades served as blanks for well-retouched tools. These results, where 'Levallois-like' blades are longer than 'non-Levallois-like' blades, contradicts the general metrical observations for the Hummalian materials at Hummal (Wojtczak 2014a: 121-122, Fig. 73-75). This means that sometimes, such as in layer 6c-2, Hummalian flintknappers were initially removing blades from faceted striking platforms of cores and then, with decreasing core length, blades were more often flaked from a plain striking platform of the same core. This very important observation needs further study of the material to fully understand the variability within Hummalian blade reduction.

Discussion

The estimated TL age for Hummlian assmblages is of approximately 200 ka (minimum model 190 ± 35 ka and maximum model 210 ± 40 ka) and seems to compare favourably with age estimations for similar Early Middle Palaeolithic blade industries as: Hayonim Layer 'F top' and 'F base' with mean TL dates on heated flint of 210 ± 28 ka and 221 ± 21 ka, respectively (Mercier et al., 2007), or at Tabun for unit IX (Tabun D-type) from 256 ± 26 ka and Rosh Ein Mor, dated 200 ka (Rink et al. 2003) and Misliya Cave with an age estimated between 250 to 160 ka ago (Valladas et al., 2013, Zaidner & Weinstein-Evron, 2014) . These assemblages were discovered at different site types that varied in the use of reduction strategies and in the production of diverse tools. In contrast to the

Blades	Dorsal Scar pattern	Shape	Removal direction	General Profile	Distal end	Cross section at midpoint	Butt	Lateral primary cortex area	Thinning
Heavily retouched									
3 Lev. -like blades	2 unid.	2 parallel	2 on-axis	1 flat	2 feath.	1 trian.	1 str., f-f	2 non-cortical	no
	1 unident.	1 unident.	1 off-axis	2 med.inc.	1 unident.	1 trap.	2 con., f-f	1 non-significant (< 25%)	
						1 irr.			
13 non-Lev. blades	5 unid.	2 trian.	8 on-axis	1 flat	4 feath.	2 trian.	1 cortical	11 non-cortical	13
	4 conv.	6 leaf shape	5 off-axis	12 inc.med.	7 ret.	7 trap.	9 plain	2 non-significant (< 25%)	
	3 bid.	4 unident.			2 unident.	4 multif.	3 dihedral		
	1 unident.	1 irr.							
Randomly retouched									
3 Lev. -like blades	1 conv.	2 rect.	2 on-axis	1 flat	2 feath.	2 trap.	1 str., f-f		no
	1 bid.	1 unident.	1off-axis	2 med.inc.	1 unident.	1 multif.	2 con., f-f		
	1 trid.								
1 non-lev. blade	conv.	exp.	on-axis	inc.med.	blunt	trian.	plain	non-significant (< 25%)	1

Fig. 24. Morphological data of retouched blades identified in Layer 6c-2. Abbreviations see legend of Fig. 15.

Abb. 24. *Morphologische Daten der retuschierten Klingen aus Schicht 6c-2.*

Blades	Length	Width	Thickness
1 Lev.-like blade	11.2	4.0	0.9
2 Lev.-like blade	8.2	2.2	0.9
3 Lev.-like blade	8.1	2.1	0.5
1 non-Lev. blade	5.7	1.7	0.9

Fig. 25. Metrical data of classifiable Levallois-like (Lev.) and non-Levallois retouched blades collected in Layer 6c-2 (in cm).

Abb. 25. *Dimensionen von retuschierten Klingen aus Schicht 6c-2, die als Levallois- (Lev.) oder Nicht-Levallois-Klingen klassifiziert werden können (in cm).*

Hummalian, the collections from Tabun and Rosh Ein Mor seem to be dominated by the Levallois method (Meignen 1994:143, Marks & Monigal 1995). They are comprised of a considerable number of Upper Palaeolithic tools and a small percentage of elongated, slightly modified blades. At present, it seems that the lithic industries from Hayonim layers F and E (Meignen 1998, 2000) and the undated Abu Sif layers B and C (Neuville 1951), Misliya Cave (Zaidner & Weinstein-Evron, 2014) and Nadaouiyeh Ain Askar show the greatest resemblance to the Hummalian industries presented above (Wojtczak 2014a). These assemblages, precisely like the Hummalian, seem to contain the predominating Laminar (non-Levallois) and fewer Levallois-like elements, whilst showing a tendency to produce elongated blanks. The tool-kit comprises numerous retouched blades and, less frequently, Mousterian and Upper Palaeolithic tools. Furthermore, in blade assemblages from Hummal and Hayonim, the production of bladelets from core-burins has also been documented (Meignen 2011). However, any direct comparison with assemblages from Hayonim Cave is not yet possible as no qualitative data have been published to date.

The Hummalian blade reduction method is well shown by its 'regular' cores, large-sized blades and tools produced on such large-sized blades. But the small-sized debitage pieces produced from bladelet reduction core-like pieces and possibly truncated-faceted pieces have not been used in any tool manufacture processes. The systematic reduction of small-sized debitage items such as bladelets and tiny flakes should resolve a pattern of tool production. However, these were not transformed by secondary treatment into any formally recognizable tool class or type.

Tiny flakes and bladelets and their possible function. The possible answer to the function of these small-sized implements may be found firstly in the recent excellent use-wear and experimental data of the Amudian 'miniscule flakes' at Qesem cave, and secondly reference to specific settlement data for the Hummal site.

The Qesem cave data (Barkai et al. 2010) points to a cutlery function for the small 'Janus/Kombewa' flakes. The study deserves some detailed citation to further elucidate the results:

"…*examination of these minuscule flakes revealed that most were used to cut soft materials such as meat. Some showed traces of contact with fleshy tissues and bone, suggesting disarticulation or the separation of flesh or muscle tissues from bones...*"

(Barkai et al. 2010: 4)

The small flake function with no additional retouching or secondary modification was associated with the following basic subsistence activity by the Qesem cave human group:

"*They hunted cooperatively, bringing body-parts of fallow deer back to the cave, which were then butchered, shared, and — as suggested by fire usage throughout the cave's 7.5m-deep stratigraphy — eventually barbecued.*"

(Barkai et al. 2010: 1)

Additionally, numerous Amudian blades were also serving as basic cutlery tools at Qesem cave (Barkai et al. 2010: 2). Furthermore the recent functional analysis of a large sample of Amudian parent flakes and their products shows that they have been used in a range of on-the-spot activities. Many of them, some bladelet sized, have been used, probably hafted, and represent a functional specialization in the processing of plants and other soft material (Lemorini et al. 2014).

Accordingly, the small-sized 'Janus/Kombewa' and other minute specimens served as an additional implement for the Qesem Cave Amudian inhabitants, probably connected to some specific butchering and/or plants processing tasks.

The Hummalian layer 6c-2 'Janus/Kombewa' flakes are exactly the same morphologically as the above-discussed Amudian small flakes. Thus it can be hypothesised that they shared the same cutlery function (see also Agam et al. 2014). Moreover, the Hummalian layer 6c-2 bladelets can also be considered as another 'supporting tool class,' being a small-sized twin to the Hummalian large-sized blades. This suggestion gets additional and fundamental support with the consideration of the Hummal site settlement specificity. Many of Levallois-Mousterian and Hummalian levels at Hummal demonstrate the same distinctive settlement characteristics and flint exploitation mode. Middle Palaeolithic humans had been visiting the variably sized waterhole at Hummal and dependent on the water supply, they chose to settle down or just passed by (Hauck et al. 2010). They came to hunt assorted ungulates and sometimes were bringing many large-sized, previously manufactured flint tools and debitage pieces. These were then used during hunting, slaughtering and dismembering of the prey. Some flint primary flaking processes were also carried out close to the site and many debitage pieces were used as blanks for core reduction. As a result, some cores on flakes with Nahr Ibrahim preparation were used for an *ad hoc* production of small-sized flake at Levallois-Mousterian (traditionally Levantine Mousterian Tabun C and B types) and some of Hummalian human occupation levels (Layer 6c-2 and 7c). At the same time, some other cores on flakes or truncated-faceted pieces were also used for small Levallois point production at Levantine Mousterian B industry type levels, whereas bladelet cores and burin-cores additionally served as a different, but again an opportunistic small-sized bladelet production in Hummalian levels. Accordingly, flint treatment processes at the site were technologically different from those performed elsewhere to prepare both the large-sized tools and debitage pieces that were brought to the site. Moreover, if the flint reduction processes of the Lower Palaeolithic human visitors to Hummal were using Cretaceous flints from exclusively local secondary outcrops, then Hummalian and Mousterian humans coming to the well at Hummal were mainly using Lower Eocene flints from distant primary outcrops at Qdeir, located approximately 14 km away. The use of these distant flint outcrops at Hummal was probably due to, among other reasons, metres of thick sediment covering the local secondary flint outcrops during Hummalian and Mousterian periods. Thus, the Hummal site function, basically a hunting site that then served as a special transient living camp, and the availability of flint for the site's human visitors almost probably led to the appearance of the two particular core-like reductions aimed at producing small-sized flakes and bladelets, possibly used for cutlery purposes and other activities, as at Qesem Cave.

As a concluding comment regarding the Hummalian bladelet reduction and projectiles, recently it has become popular in many Early Upper Palaeolithic industries to define bladelets, often reasonably argued, as inserts for hunting projectile weapons in these industries. In the case of the Hummalian bladelets there are no indications of any projectile function, adding weight to the hypothesis of a cutlery utility. The Hummalian bladelets should not be considered as any form of 'proto-projectile bladelets' , unlike Early Upper Palaeolithic industries with real projectile bladelets, for example, Southern European Proto-Aurignacian and Levantine Early Ahmarian. Instead their development should be considered as one more small-sized implement type caused probably by site specific functions and particular geographic dynamics. These reasons also drove the Hummalian humans to diversify their core reduction methods and technologies. The core and burin-core blade and bladelet reductions are unexpected and striking for an industry dated to around 200.000 BP (Richter et al. 2011).

Conclusions

The Hummalian industry from the Hummal type site (Central Syria) has presented the assemblages basic features, whilst examining more deeply the lithic material from Layer 6c-2. The Hummalian industry, in Middle Palaeolithic terms, is not only a very early and amazing blade industry but also shows two supportive or supplementary small-sized flake and bladelet reductions. The Hummalian large-sized debitage and tools from layer 6c-2 can be considered as curated pieces for transportation from a flint outcrop to a site and/or one site to another for their use and re-use and secondary reduction, while small-sized specimens could be putatively considered as opportunistic pieces produced serially only at particular sites in a cutlery or another function.

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