Stone in Metal Ages

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edited by

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FOREWORD TO THE XVIII UISPP CONGRESS PROCEEDINGS

UISPP has a long history, originating in 1865 in the International Congress of Prehistoric Anthropology and Archaeology (CIAAP). This organisation ran until 1931 when UISPP was founded in Bern. In 1955, UISPP became a member of the International Council of Philosophy and Human Sciences, a non-governmental organisation within UNESCO.

UISPP has a structure of more than thirty scientific commissions which form a very representative network of worldwide specialists in prehistory and protohistory. The commissions cover all archaeological specialisms: historiography; archaeological methods and theory; material culture by period (Palaeolithic, Neolithic, Bronze Age, Iron Age) and by continents (Europe, Asia, Africa, Pacific, America); palaeoenvironment and palaeoclimatology; archaeology in specific environments (mountain, desert, steppe, tropical); archaeometry; art and culture; technology and economy; biological anthropology; funerary archaeology; archaeology and society.

The UISPP XVIII World Congress of 2018 was hosted in Paris by the University Paris 1 Panthéon-Sorbonne with the strong support of all French institutions related to archaeology. It featured 122 sessions, and over 1800 papers were delivered by scientists from almost 60 countries and from all continents.

The proceedings published in this series, but also in issues of specialised scientific journals, will remain as the most important legacy of the congress.

L'UISPP a une longue histoire, à partir de 1865, avec le Congrès International d'Anthropologie et d'Archéologie Préhistorique (C.I.A.A.P.), jusqu'en 1931, date de la Fondation à Berne de l'UISPP. En 1955, l'UISPP est devenu membre du Conseil International de philosophie et de Sciences humaines, associée à l'UNESCO. L'UISPP repose sur plus de trente commissions scientifiques qui représentent un réseau représentatif des spécialistes mondiaux de la préhistoire et de la protohistoire, couvrant toutes les spécialités de l'archéologie : historiographie, théorie et méthodes de l'archéologie ; Culture matérielle par période (Paléolithique, néolithique, âge du bronze, âge du fer) et par continents (Europe, Asie, Afrique, Pacifique, Amérique), paléoenvironnement et paléoclimatologie ; Archéologie dans des environnements spécifiques (montagne, désert, steppes, zone tropicale), archéométrie ; Art et culture ; Technologie et économie ; anthropologie biologique ; archéologie funéraire ; archéologie et sociétés.

Le XVIII° Congrès mondial de l'UISPP en 2018, accueilli à Paris en France par l'université Paris 1 Panthéon-Sorbonne et avec le soutien de toutes les institutions françaises liées à l'archéologie, comportait 122 sessions, plus de 1800 communications de scientifiques venus de près de 60 pays et de tous les continents.

Les actes du congrès, édités par l'UISPP comme dans des numéros spéciaux de revues scientifiques spécialisées, constitueront un des résultats les plus importants du Congrès.

Marta Azarello

Secretary-General / Secrétaire général UISPP

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Going to the source: New perspectives in the study of the Canaanean blade technology from Iraqi Kurdistan

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Abstract:

This paper presents a preliminary overview of the outstanding evidence of chert mining and specialised lithic workshops found on the southern slopes of the Jebel Zawa, in the Dohuk Governorate, northern Iraqi Kurdistan. Technical features observed on lithic materials - such as cores and waste products – led to the identification of this mining complex as the source of raw materials used to produce the large standardised blades known in the literature as 'Canaanean'. According to northern Mesopotamian archaeological records, these blades were widespread from the late 5th to 3rd millennia BCE. However, little is known about the raw material provenance and no analysis has been attempted in order to identify the supply areas. Our research constitutes a unique opportunity to fill this gap, providing fresh data and a new regional perspective for investigating the phenomenon of large blades production and consumption in northern Mesopotamia, from the source to the settlements.

Key words:

CANAANEAN BLADES; RAW MATERIALS; CHERT MINING; LATE CHALCOLITHIC; EARLY BRONZE AGE; IRAQI KURDISTAN.

Résumé :

Cet article propose une analyse préliminaire de mines de silex et d'ateliers de taille découverts sur les flancs sud du Jebel Zawa, dans le gouvernorat de Dohuk dans le nord du Kurdistan irakien. Les caractéristiques techniques observées sur les matériaux lithiques - nucléus et déchets - ont permis d'identifier ce complexe comme une des sources de matières premières utilisées pour produire de grandes lames régulières, connue comme ' cananéennes '. Ces lames étaient répandues entre le 5ème et le 3ème millénaire av. J.-C. Cependant, peu d'informations concernant la provenance des matières premières sont disponibles, et aucune analyse n'a été tentée pour identifier les zones d'approvisionnement. Cette recherche représente une occasion unique de fournir des données et des perspectives nouvelles dans l'étude de la production de grandes lames en Mésopotamie du Nord : de l'origine et l'extraction des matières premières jusqu'à la distribution dans les sites à l'échelle régionale.

Mots-clés :

LAMES CANANÉENNES; MATIÈRES PREMIÈRES; MINES DE SILEX; CHALCOLITHIQUE; ÂGE DU BRONZE; KURDISTAN IRAKIEN.

1. Introduction

Raw material procurement and craft specialisation at the dawn of the urbanisation process are currently core issues in northern Mesopotamian archaeology. The development of large settlements along the Upper and Middle Euphrates valleys, as far as the Jezira desert and the Tigris valley, during the late 5th- 4th millennia BCE is strictly connected to growing social complexity and territorial re-organisation (Akkermans and Schwartz, 2003; Al Quntar, Khalidi and Ur, 2011). The establishment of large public and cult areas for administrative purposes and specialised

[1] C.C.B. designed and directed the research, D.M. performed the raw material characterisation and the lithic analysis. Both authors contributed to the writing of the manuscript.

activities within the settlements suggests the emergence of new needs and strategies of resource management in these communities (Frangipane, 2018).

Material culture, such as pottery and lithics, reflects these crucial social changes. The phenomenon is archaeologically more evident at the end of the Late Chalcolithic (LC) period. Indeed, an increasing demand for different raw materials through large-scale exchange systems is widely attested. Some raw materials were used to create prestige objects for the emerging *élites* (i.e., metals), while others were used to produce utilitarian items for subsistence activities, such as agriculture.

In this context, the material culture started to change not only its formal aspect but also its technological features, as in the case of the well-known in-series pottery production. With regard to lithic technology, the tool kits from northern Mesopotamian sites are characterised by the massive presence of standardised large blades that were exchanged on a region-wide basis, according to some scholars (Anderson and Inizan, 1994; Chabot and Eid, 2003), or within local district (Frahms, 2014; Helms, 2014). The development of a new technological system was then a necessary premise in order to increase tool productivity (Manclossi, Rosen and Boëda, 2019).

From a technical point of view, these blades feature a trapezoidal cross-section (created by in-series removals), parallel edges, an almost straight profile, and a well-developed bulb just under a carefully prepared butt (Rosen, 2018; Chabot and Pelegrin, 2012). As demonstrated by J. Pelegrin (2012), large blade production requires highly specialised techniques - such as the lever pressure system with a copper point - and methods for core-volume preparation and maintenance. Techno-functional analyses indicate that these blades were often intentionally broken in order to obtain segments used as sickle elements or threshing sledge inserts for agricultural purposes (Anderson and Inizan, 1994; Anderson and Chabot, 2001; Anderson, Chabot and Van Gijn, 2004; Lemorini, 2010), and were also used in pottery production (Anderson and al. 1989; Groman-Yaroslavski, Iserlis and Eisenberg, 2013).

Despite the wide distribution of Canaanean blades, the raw material procurement strategies linked to this craft production are not yet understood. Chert sources have been reported, but not extensively investigated, from the site of Pasar in the Kermanshah province of Iran (Müller-Neuhof, 2013) and from the territory of Titris Höyük in the Middle Euphrates region (Hartenberger, Rosen and Matney, 2000) (*fig.1*). This site provides evidence of *in situ* blade production, as testified by a large cache of cores located in an area dedicated to craft activities outside the Early Bronze Age (EBA) city walls. Some scholars assumed the existence of specialised workshops in the foothills of the Taurus mountains, where good quality Eocene chert outcrops are attested (Otte and Behm-Blancke, 1992), and in the Bingöl district of south-eastern Anatolia (Anderson, Chabot and Van Gijn, 2004; Chabot and Eid, 2009). So far, the primary source of information about the Canaanean blade production process is the presence of cores and waste products within dedicated areas in settlements, which allowed the identification of specialised workshops. At Hassek Höyük, 40 chert cores were stored in a room in a large LC building used for cereal storage and processing (Behm-Blancke, 1991-1992; Pelegrin and Otte, 1992). Moreover, at Hacinebi *in situ* blade production is testified by a number of cores in a layer dated to 4000-3300 cal. BCE (Edens, 1999). Moving to the Jazira desert, *in situ* production of large blades is attested at Tell Brak during the 5th – 4th millennia BCE (layers TW-20 and TW-12) (Oates and al. 2007; Oates and Oates, 1993).

Recent data on knapping techniques and equipment come from the EBA site of Tell Chuera (3100-2900 BCE), where hard-stone hammers, a cache with complete and unused blades and a chisel-like copper point - possibly the tip of a lever pressure device - have been found in close proximity to each other in a domestic and productive context of the upper town. Four large-blade cores were also found in area P (mid-3rd millennium BCE) (Helms, 2014). In the Tigris region, the archaeological evidence is less conspicuous. The well-known site of Tepe Gawra provided evidence of one core (Tobler, 1950) in phase IX, dated to the LC 3 (Rothman, 2002), while Tell Karrana 3, located on the eastern side of the River Tigris, yielded several cores dated to the LC 5 (Brautlecht, 1993).

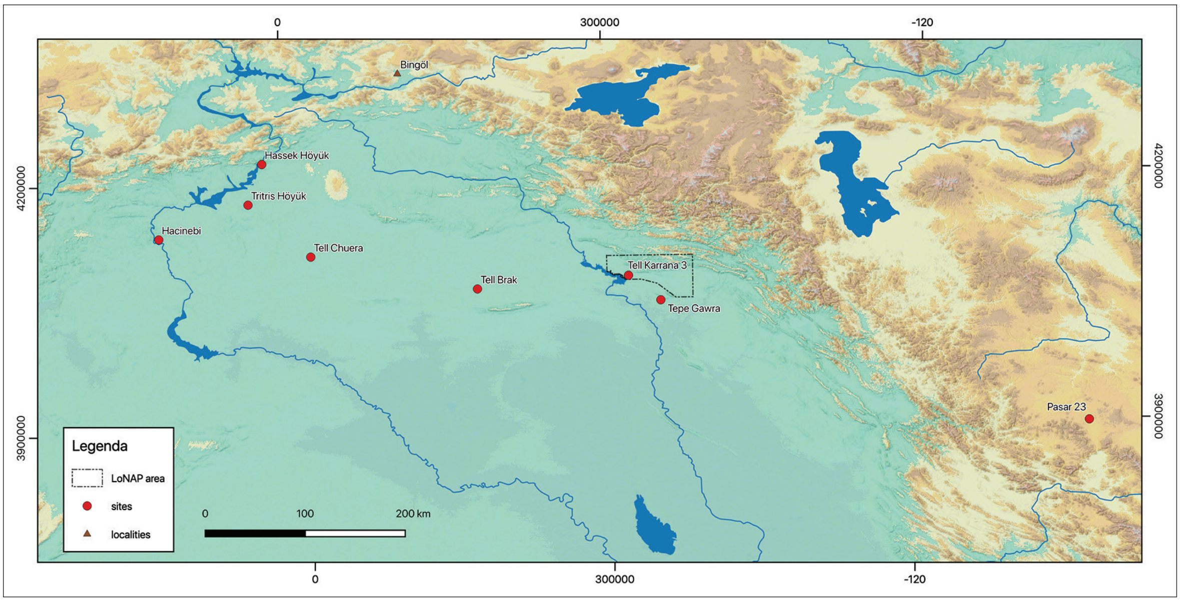

Fig. 1. Map of northern Mesopotamia and neighbouring regions showing sites and localities cited in the text (map by D. Moscone).

Despite the large number of settlements in which Canaanean blades were produced, the available documentation is not sufficient to support the hypothesis that these sites acted as redistribution centers, except perhaps the EBA site of Titris Höyük due to the large quantity of cores. At other sites, instead it seems more probable that the large Canaanean blades served to satisfy the demand of the local communities, fostering their production and exchange, possibly under the control of the emerging élites. Indeed, most of the Canaanean blades discovered in LC and EBA sites were not produced *in situ* but imported. From this perspective, the need to create datasets on chert availability and suitability at a regional scale is of crucial importance for a better understanding of these dynamics, not much considered in archaeological interpretation.

2. The Jebel Zawa mining district

The first complex of chert mines in the Jebel Zawa was identified during the 2015 survey campaign within the Land of Nineveh Archaeological Project (LoNAP). At the same time, analyses of large blades collected on the surface at sites featuring LC and EBA occupations spurred us to investigate possible links between the chert outcrops and the artefacts that were found on sites, in particular those located in close proximity to the Jebel. Thereafter, a three-year (2016-2018) intensive survey was carried out in the Jebel Zawa, one of the most promising procurement areas for good quality chert supplies (Conati Barbaro and al., 2016 ; Conati Barbaro and al., 2019).

2.1. Geology and environment

The Jebel Zawa, Ciya Zawa in Kurdish, is an isolated relief standing to the south of the modern city of Dohuk, in the northern Kurdistan Region of Iraq (*fig. 2*). It lies a few kilometers from the former course of the Tigris, which today flows into the Mosul lake. This low mountain has a NW-SE orientation and reaches a maximum height of 1000 m asl ; it has an irregular profile which gradually increases in height in the easternmost part. The geology of the area is characterised by the Middle-Upper Eocene (40 Ma) Pila Spi limestone formation (Khadim and Hussein, 2016), deposited in suspended basins on a passive plate margin configured by an extensional tectonic regime during the Alpine orogeny (Numan, Hammoudi and Chorowicz, 1998). From the top downwards, this formation consists of a succession containing a series of lithified limestones to well-bedded chalky limestones and massive cherty limestones interbedded with marls (*fig. 3.a*). The overall carbonate content of the Pila Spi is extremely high, with dolomitisation (Numan,

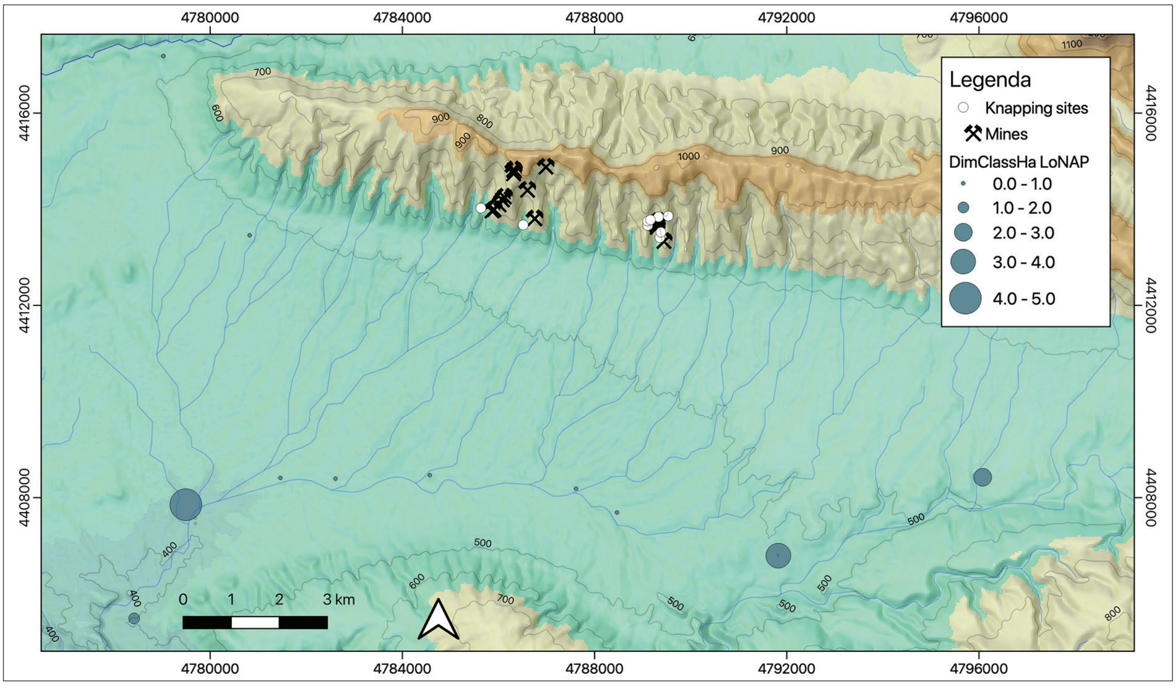

Fig. 2. Map of the Jebel Zawa chert mines, knapping areas and distribution of the sites in the Jebel Zawa plain divided according to size (map by D. Moscone).

Hammoudi and Chorowicz, 1998). The soluble nature of these rocks led to the development of strong karstification (Stevanović, Iurkiewicz and Maran, 2009), although not as intensive as that observed in the Zagros mountains. The karstic system consists of galleries, caves and springs, some of which are still seasonally active in the south-eastern part of the Jebel (*fig. 3.b*).

Due to uplifting and folding movements, the formation is very visible and accessible in the southern valleys; it is characterised by strong inclination. Moreover, the wadis flowing from the Jebel form steeply downcut valleys with eroded slopes, filled with rock debris and colluvial sediments transported by seasonal wadi floods to the foothills.

2.2. Chert outcrops

The horizon containing chert nodules reaches a maximum thickness of 20 m towards the top of the Jebel. Chert veins can be easily recognised from the valley bottoms following the sloping geological strata from the base to the top of the mountain. Even today chert is still available in quantity, especially in the central valleys of the Jebel where the mountain reaches its greatest height, and

Fig. 3. The chert horizon of the Pila Spi formation in one of the Jebel Zawa valleys (a); detail of the karst forms inside the formation (b).

the chert-bearing layers are totally exposed. The raw material is thus easily accessible, following the limestone beds and the modern shepherds' paths along the cliffs.

The chert veins feature a large quantity of closely spaced nodules of various sizes. Large nodules up to 1 m across are sub-circular or lenticular in shape (*fig. 4. a-c*). Tabular chert, fractured and patinated, has been recorded at higher altitudes along eroded ridges. Macroscopically, the Jebel Zawa chert varies from light to dark grey in colour, with shaded and spotted structures. It sometimes exhibits black laminations under the cortex or mottled inclusions.

Despite their non-translucent and medium-textured features, these chert types are well suitable for knapping. Smaller and exposed nodules are mostly affected by post-genetic alterations that give rise to uneven fractures during knapping, while larger blocks may be of good quality after decortication. The systematic sampling of the outcrops along the valleys was performed in order to better understand the chert's variability by means of macroscopic descriptions, and petrographic and chemical analyses (Moscone and al., 2020). This work is still ongoing with the aim of building up an extensive dataset for future comparisons.

3. Mining evidence

Four out of the seven valleys explored so far revealed evidence of chert extraction (*fig. 2*). These valleys were selected on the basis of their accessibility and the nature of the chert outcrops. Chert occurs sporadically on the western part of the Jebel, along the small and less deeply cut valleys which correspond to the highest part of the Pila Spi formation. Conversely, chert layers are very well exposed in the central part of the Jebel along the deeply cut valleys.

Chert mining evidence relates to two different excavation strategies: open-air quarries in which limestone strata were directly excavated in order to isolate and extract the nodules, and natural

Fig. 4. A chert nodule visible inside one of the karstic galleries (a); large chert nodules bearing traces of extraction (b); large chert nodules inside a niche (c); detail of the artefact density in a knapping area (d).

karstic cavities which were exploited by following the inclination of the strata containing the nodules.

The exploitation of natural cavities containing good quality chert, less weathered than open-air outcrops, may be considered an opportunistic strategy, and has been documented in the Near East in other contexts (e.g., Gopher and Barkai, 2006). Given the frequent occurrences of both types of evidence, it appears that very intensive chert exploitation occurred in the Jebel Zawa.

3.1. Open-air quarries

Mining of open-air chert outcrops is very well documented in the Jebel Zawa. As the raw material is clearly visible and easy to approach, it seems likely that this kind of excavation was the first to be performed. The exploitation of vertical limestone walls has left distinguishable digging traces on the rock surface. Niches of various size in the limestone walls attest the nodules' removal: their dimensions might correspond to the size of single nodules or to multiple extractions (*fig. 4.c*). The horizontal excavation of nodules located on strata interfaces is also documented.

3.2. Karst cavity exploitation

The Jebel Zawa karst system is characterised by small openings and rock shelters in the limestone walls, in correspondence to a more permeable horizon consisting of massive cherty limestones interbedded with grey marls. These openings (mean length= 1-1.90 m; mean height= 0.80-0.90 m) are often present in clusters which create deep and convoluted galleries interconnected with each other. Karst forms are testified by traces left by flowing water on their rounded roofs and walls, and occasionally by the deposition of thick layers of white carbonates on the floors.

Human modifications of the natural cavities are indicated by the countless signs of excavation made for enlarging the galleries and extracting the chert nodules. Broken nodules, flakes and micro-debris have been found on the floors also in the innermost parts of the cavities.

4. Knapping-sites

The waste products of knapping activities are widely scattered along the valleys. The distribution, in most of the cases, is not of great significance and has been affected by rapid erosion processes. Nevertheless, eight major lithic concentrations of archaeological deposits were identified during the 2016-2017 surveys (*fig. 2*). These sites are often located either at the valley entrances on wide and flat open areas, or within the valleys at higher altitudes. These last sites are located close to the chert veins, unlike the knapping-sites recognised at the valley entrance, which lie several meters from the first visible nodule horizon.

Moreover, during the 2018 field campaign, a large lithic workshop was identified and systematic investigations have been carried out, including the excavation of test pits. The collected data are currently under study.

The lithic assemblages consist of several hundreds of artefacts which testify the *in situ* reduction of nodules for the production of large blades (*fig. 4.d*). In most cases unworked nodules, rough-outs, and cores with large-blade removals have been recorded, spatially associated with the by-products of the knapping stages, such as tablets, crested or neo-crested items, and cortical and non-cortical flakes. Furthermore, blades coming from full-production stages of core exploitation are very rare and often represented only by some fragments. The lithic materials on the whole indicate that after extraction, chert nodules were transported to these places in order to start the knapping process.

Although the lithic assemblages reveal a clear reduction sequence, it is difficult to establish exactly which products were exported: whether these were finished products (blades) or even cores, or both.

4.1. By-products and blades

The technological analysis of knapping products has allowed a preliminary interpretation of their position and significance within the reduction sequence (*fig. 5*). Cortical items, such as flakes and laminar flakes, are the most attested class associated to the block decortication and core-shaping activities. The preparation of the core-volume took place by removing large elongated flakes from a platform following the axis of the block. Subsequently, the preparation of a crest allowed the initialisation of the blade production. The re-configuration of the lateral convexities is testified by neo-crests both in antero-lateral or postero-lateral positions. Full production blades are virtually absent. A few fragments and knapping accidents exhibit trapezoidal or triangular cross-sections, very regular dorsal ridges and parallel edges. Other blades, less regular, are difficult to interpret. Their morphology and technical attributes suggest the use of direct or indirect percussion.

4.2. Cores

Cores are sub-conical in shape, with a single platform and a flat or rounded base. In most cases they exhibit a large and straight knapping surface delineated by one or two lateral crests, which permit the enlargement of the production at their flanks. Cores featuring less developed and slightly curved surfaces are also attested. Platforms are often prepared, configuring a flaking angle of about 90-95 degrees. Only one flat platform is attested. Blade removal negatives are perfectly regular and wide (mean width of the last removals is 2-2.5 cm) and feature a well pronounced negative of the bulb just under the fracture initialisation point. These technical attributes are consistent with use of the lever pressure technique (Pelegrin, 2012).

5. The Canaanean blade phenomenon: a view from the mines

The first dataset deriving from the mining district of Jebel Zawa allows to consider the Canaanean blade phenomenon from a different perspective than the current approaches. The opportunity to investigate a specific lithic production strategy from the raw material procurement stage allows to tackle crucial topics, such as the organisation of production, the role of miners and knappers in resource access and control, and the territorial distribution of raw materials and/or finished products.

Angevin's recent overview of the northern Mesopotamian Canaanean blade phenomenon (2018) highlighted the variability of technical solutions in the production of large blades that may correspond either to different chronological periods, to regional traditions, or both. The analysis of the Jebel Zawa lithic workshops shows an evident variation in core architectures. At the present state of the research, it is difficult to assess whether this variability has a chronological explanation, or if it is linked to a different trajectory of technical development in the Tigris region.

However, despite these limitations, the cores and waste products found in workshops in proximity to mines and quarries clearly indicate that in the Jebel Zawa chert was processed on-site. It is therefore possible to hypothesise not only the local presence of specialist knappers, but also of the equipment required for blade production, such as the lever device. Consequently, the question arises as to whether the knappers were also miners, or whether two different specialised groups worked at the mines/quarries and lithic workshops. According to ethnographic data from Cyprus, the treshing-sledge elements were made by craftsmen from the timber-rich northern area, who used to produce blanks collecting good quality chert from the primary sources located in southern Cyprus (Whittaker, 2014). Until the first half of the last century at the Çakmak village in Turkey, chert-mining for the production of *tribulum* inserts was performed by teams of diggers and knappers (Whittaker, Kamp, and Yilmaz, 2009).

Data concerning this issue are provided by the preliminary results of the LoNAP survey. Several settlements featuring continuous occupation during 4th and 3rd millennia BCE have been

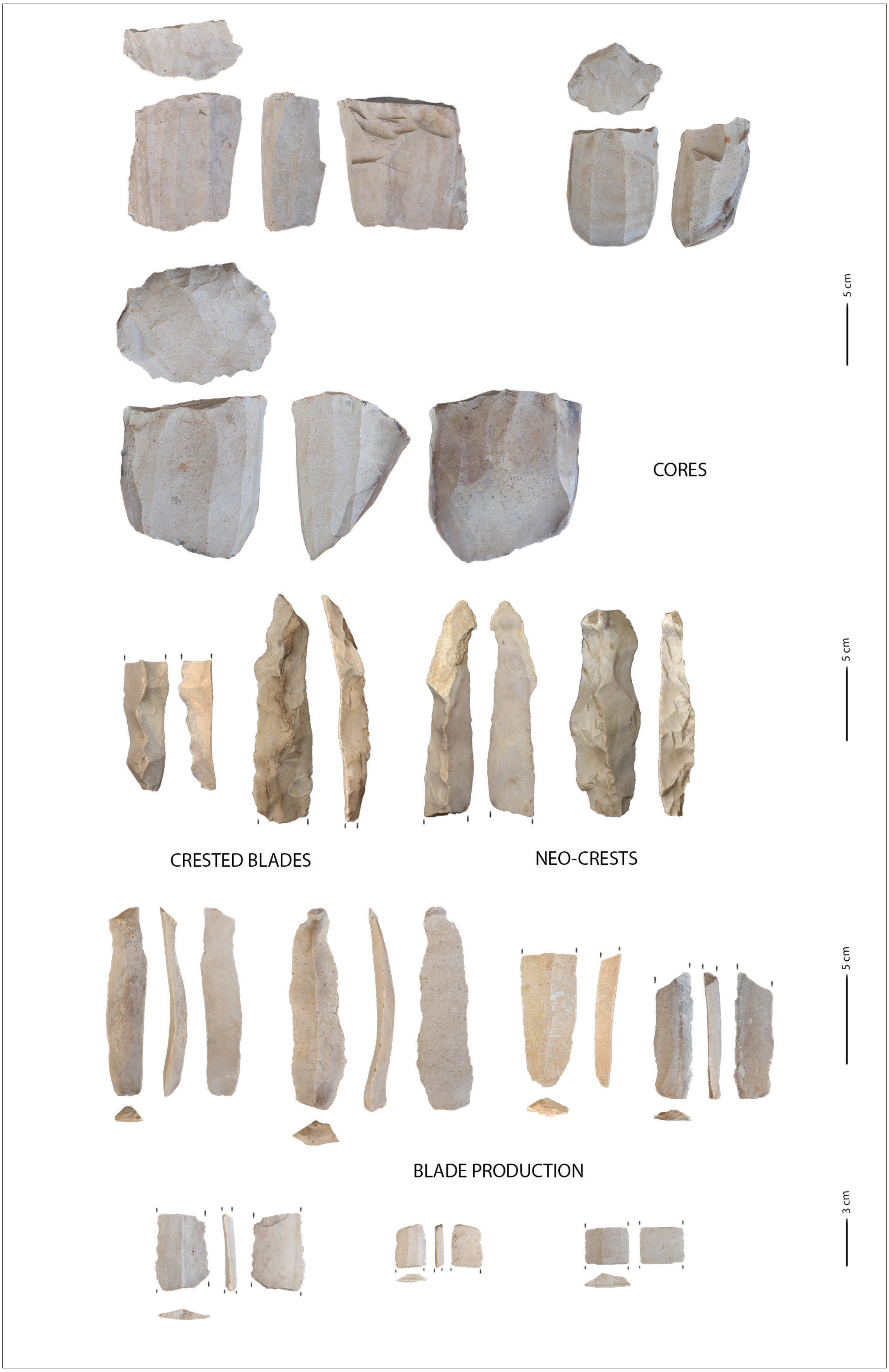

Fig. 5. Lithic materials collected at the knapping sites according to the identified reduction sequence.

identified in the valley at the foot of the Jebel Zawa. These sites are located along the course of a Tigris tributary, a few kilometers away from the slopes of the Jebel (*fig. 2*). This seems to correspond to a territorial choice, in which the following factors played a substantial role: the proximity to a watercourse, the distance from the unstable slopes of the Jebel and from the wadi floods, the availability of land for crops and above all, a perfect view of the Jebel. Moreover, the largest sites are located in strategic positions in the eastern Tigris plain, control of access to the Jebel Zawa valleys. It is also worth noting the high site density in the valley at the foot of the Jebel Zawa (Iamoni, 2018). This pattern seems to differ from that observed, for example, in the Navkur plain, where — during the LC — a shift in settlement position closer to perennial springs (Iamoni, 2018). If we admit that the settlement pattern of the Jebel Zawa and surrounding areas is strictly connected to the chert mines, can we assume that some of these sites controlled the access to the mines? Can the smaller sites be interpreted as specialized settlements connected to the mining system? The evidence of large blades, crests and waste products among the surface lithic collections from these sites could support these hypotheses (*fig. 5*). Furthermore, the proximal blade fragments from these lithic assemblages show diagnostic features, such as the dihedral-acute or facetted-convex preparation of the butts associated with prominent bulbs, that could be linked to the use of the lever pressure technique and that have been recognized by Pelegrin and Chabot (2012) as distinctive features of Canaanean blades in northern Mesopotamia. Moreover, on the dihedral preparation of the butt of one specimen has been observed a 'V' crack, which according to the literature (Chabot and Pelegrin, 2012) could indicate the use of a copper-tipped tool (*fig. 6*).

Another key issue that can be addressed, combining data from the chert mines with data from stratigraphic excavations in the nearby settlements, is the role played by central authorities in controlling this specialized craft production. Some authors (Manclossi, Rosen and de Miroschedji, 2016; Zutovski and Bar, 2017) have claimed that the production of Canaanean blades in the Levant was run by independent specialized knappers, who procured, worked and traded raw materials and finished products.

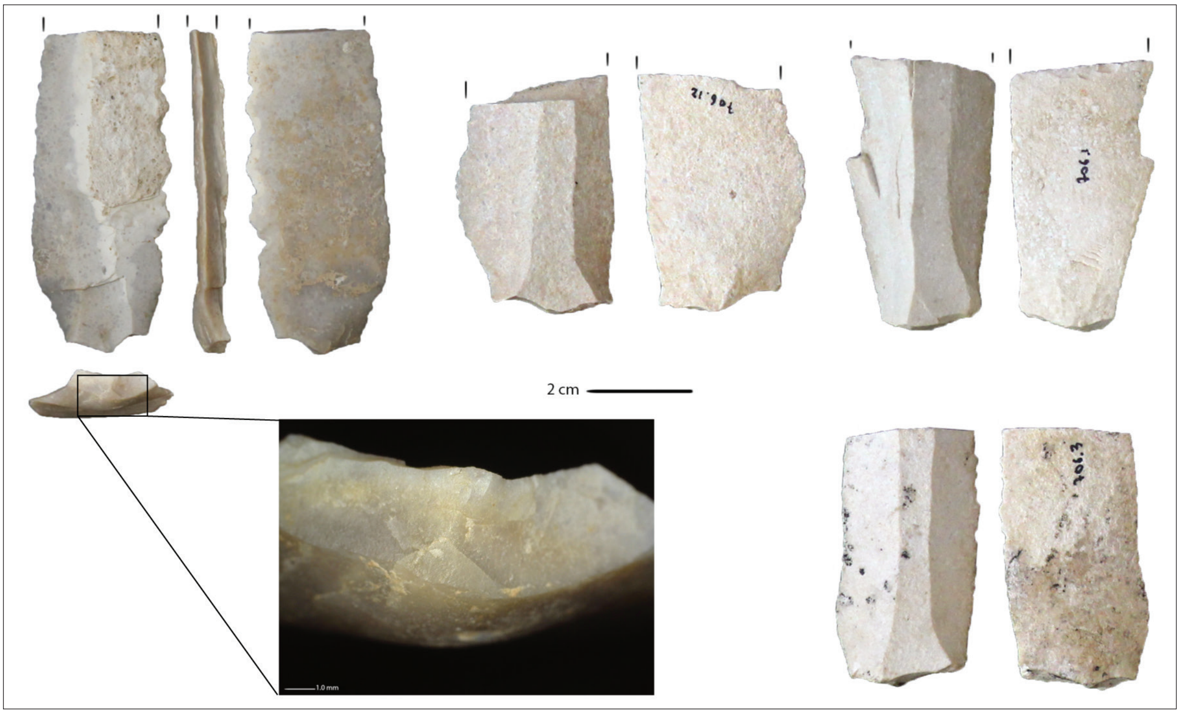

Fig. 6. Large blades collected at the sites in the Jebel Zawa plain and detail of a V-shaped crack on the butt of a large blade.

The ongoing research shows the high potential of the primary sources of lithic raw materials for understanding the urbanization process in the Tigris area. The study of this complex system of interactions between the sources and settlements needs to be addressed with further research in key sites, combined with the characterization of the chert raw materials. This integrated methodology will help to understand time, space and actors - independent versus controlled specialized knappers – with regard to these lithic productions and their role within a hierarchical and centralized social system at the onset of state formation in northern Mesopotamia.

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