Extracting the "Proto" from the Aurignacian. Distinct Production Sequences of Blades and Bladelets in the Lower Aurignacian Phase of Siuren I, Units H and G (Crimea)

Guido Bataille
Universität Tübingen
Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters
Abteilung Ältere Urgeschichte und Quartärökologie
Schloss Hohentübingen, Burgsteige 11
D-72070 Tübingen
guido.bataille@ifu.uni-tuebingen.de

Abstract: *In this paper the author addresses the technological definition of the Protoaurignacian by examining the archaeological horizons of the lower section of the Aurignacian stratigraphy of Siuren I (Crimea). These horizons are associated with the Protoaurignacian ("Early Aurignacian of Krems-Dufour type industry"). A Working Stage Analysis was chosen to study the operational sequence and the reduction "history" of the artifact assemblage in order to attain high-resolution insight into bladelet production strategies. In a further step, these results were compared with results from a technological attribute analysis of the complete Aurignacian sequence. Accordingly, lamellar and laminar production strategies were investigated. The focus here is to examine whether the Protoaurignacian horizons of Siuren I are characterized by a succession of blades and bladelets within one single operational sequence, which is seen as a distinctive feature of the Protoaurignacian facies. The results clearly indicate two distinct, sometimes intercalated, production sequences for blades and bladelets, which coincide with recent technological investigations of the Protoaurignacian assemblages of Labeko Koba and Arbreda (Spain).*
The results highlight the problematic and sometimes contradictory criteria used for defining the different Aurignacian facies. Moreover, together with more recent absolute dates of Protoaurignacian and early Aurignacian assemblages, the meaning of the Protoaurignacian as isolated initial facies of the technocomplex, thought to indicate the initial spread of modern humans chronologically prior the early Aurignacian, is called into question. In this context, more respect should be paid to functional and regional peculiarities in current discussions on the topic.
Keywords: *Crimean Peninsula, Protoaurignacian, evolved Aurignacian, lithic technology, Working Stage Analysis*

Das „Proto" aus dem Aurignacien entfernen. Getrennte Herstellungsketten für Klingen und Lamellen in der unteren Aurignacienphase von Siuren I, Einheiten H und G (Krim)

Zusammenfassung: In dem vorliegenden Beitrag setzt sich der Autor mit der technologischen Definition des Protoaurignacien am Beispiel der Aurignacien-Stratigraphie von Siuren I auf der Krim-Halbinsel auseinander. Ausgangspunkt sind die unterschiedlichen typologischen und technologischen Definitionsansätze des Protoaurignacien, die sich zum Teil inhaltlich widersprechen. Die im letzten Jahrzehnt anhand südwestfranzösischer Inventare entwickelte technologische Definition sowie die Deutung des Protoaurignacien als Markerfazies der Einwanderung des modernen Menschen und somit Initialfazies des Aurignacien stehen dabei im Fokus des Interesses.
Siuren I ist ein verstürzter Abri innerhalb der zweiten Schichtstufe des Krim-Gebirges im Südwesten der Halbinsel. Die aus neun Horizonten bestehende Abfolge von Aurignacien-Schichten wurde von Y. E. Demidenko auf Basis techno-typologischer Untersuchungen zwei chronologischen Phasen des Technokomplexes zugewiesen: die Horizonte der unteren stratigraphischen Einheiten Units H und G dem Protoaurignacien (*„Early Aurignacian of Krems-Dufour type industry"*) und die der oberen stratigraphischen Einheit Unit F einem entwickelten Aurignacien (*„Late Aurignacian of Krems-Dufour type industry"*). Der Autor teilt die Meinung, dass es sich bei den vorliegenden Inventaren um zwei verschiedene technologische Varianten des Aurignacien handelt. Allerdings beschränkt sich diese Dichotomie weitestgehend auf die Produktion von lamellaren Grundformen und Mikrolithen, während die Produktion von Klingen

keinen nennenswerten Veränderungen unterworfen ist. Auch die nicht-mikrolithischen Geräteinventare ähneln einander. In den unteren Horizonten werden bevorzugt gerade und schwach gebogene Lamellen von Kernen mit gerader Reduktionsfläche produziert, während in den oberen Horizonten, besonders im zahlenmäßig umfangreichsten Horizont Fb1-2, bevorzugt kleinere gebogene und *off-axis* tordierte lamellare Grundformen von Kernen mit kleiner und schmaler Reduktionsfläche gewonnen werden. Trotzdem gibt es einen nennenswerten technologischen Überschneidungsbereich auch im Lamellenproduktionssystem beider techno-typologischen Einheiten, was sich insbesondere im Vorhandensein sub-pyramidaler und sub-zylindrischer Kernformen in Unit F ausdrückt.

Zur Beantwortung der Forschungsfragen führte der Autor detaillierte Analysen der Reduktionshistorie ausgewählter Lamellenkerne durch. Ziel war es herauszufinden, ob lamellare Grundformen analog der neueren technologischen Definition des Protoaurignacien innerhalb einer gemeinsamen Sequenz mit Klingen produziert wurden, wobei Lamellen/Microblades Endprodukte der Sukzession wären. Die Arbeitsschrittanalysen wurden in einem nächsten Schritt mit den Ergebnissen einer technologischen Merkmalsanalyse der gesamten Aurignacien-Sequenz abgeglichen.

Die Analysen zeigen, dass eine Produktion von Klingen und Lamellen innerhalb einer gemeinsamen sukzessiven Operationskette kein spezifisches Charakteristikum der unteren Horizonte von Siuren I ist. In der Regel wurden Lamellenkerne von Beginn an als solche konzipiert und sorgfältig präpariert. Es gibt demnach zwei getrennte Operationsketten zur Produktion von laminaren und lamellaren Grundformen. In diesem Zusammenhang können trotzdem Klingen in der Phase der Präparation der Reduktionsfläche anfallen. Dafür spricht ebenfalls der höhere Anteil von Kortexresten auf Klingen. In einigen Fällen wurden Klingen und Lamellen alternierend innerhalb einer gemeinsamen Sequenz produziert, wobei vorzugsweise eher schmale Klingen und großformatige lamellare Grundformen hergestellt werden.

Die trotz der grundsätzlichen technologischen Dichotomie vorhandenen Übereinstimmungen im lamellaren Produktionssystem zwischen beiden regionalen Fazies sowie das Vorhandensein weniger als typisch für das frühe Aurignacien angesehener Kernformen wie Kielkratzer, kielkratzerartige Kerne sowie dicke Nasenkratzer/Schulterkratzer in den Protoaurignacien-Horizonten indizieren eine qualitative Überschneidung zwischen den verschiedenen chronologischen Stufen des Aurignacien. Entsprechende techno-typologische Gemeinsamkeiten wurden jüngst in Zusammenhang mit Inventaren des Protoaurignacien und des frühen Aurignacien im spanischen Baskenland und in Katalonien nachgewiesen. Vor dem Hintergrund der oben umrissenen Ergebnisse sowie in Anbetracht der in jüngerer Zeit publizierten absoluten Datierungen von Inventaren beider Fazies mit teils jungen Altern von Protoaurignacien-Horizonten (z. B. Siuren I) und besonders früh-datierenden Inventaren des frühen Aurignacien in Mitteleuropa müssen sowohl aktuelle Modelle der Ausbreitung des modernen Menschen als auch die Rolle des Protoaurignacien als Initialphase des Aurignacien kritisch hinterfragt werden. In diesem Zusammenhang schlägt der Autor eine eher funktionale Interpretation der Fazies des frühen Aurignacien vor, welche regionale Besonderheiten berücksichtigt.

Schlagwörter: Krim-Halbinsel, Protoaurignacien, entwickeltes Aurignacien, Steintechnologie, Arbeitsschrittanalyse

Introduction

The collapsed rockshelter site Siuren I is situated on the right bank of the small Belbek River within the Western part of the internal ridge of the Crimean Mountains near the provincial capital Simferopol (Demidenko et al. 1998, 367 ff.) (Fig. 1). It yields the only undisputed Aurignacian sequence of the Crimean Peninsula. Altogether nine archaeological horizons exhibiting further sub-levels are embedded within geological horizons 10 to 17, consisting of fine-grained yellowish-brown sandy and silty sediments, often separated by brown clay sediments (Fig. 2) (Yevtushenko 2012, 28 ff.). Furthermore, the archaeological horizons are separated by several episodes of roof collapses. The debris of one episode of such collapses (geological horizon 13) separates archaeological horizons Ga and Fc from each other, which some researchers have suggested to belong to two different chronological phases of the Aurignacian (Demidenko and Noiret 2012, Tab. 1).

Fig. 1: *Siuren I (Western Crimea). Crimean Middle and early Upper Paleolithic sequences and important Eastern European sites with early Upper Paleolithic horizons.*

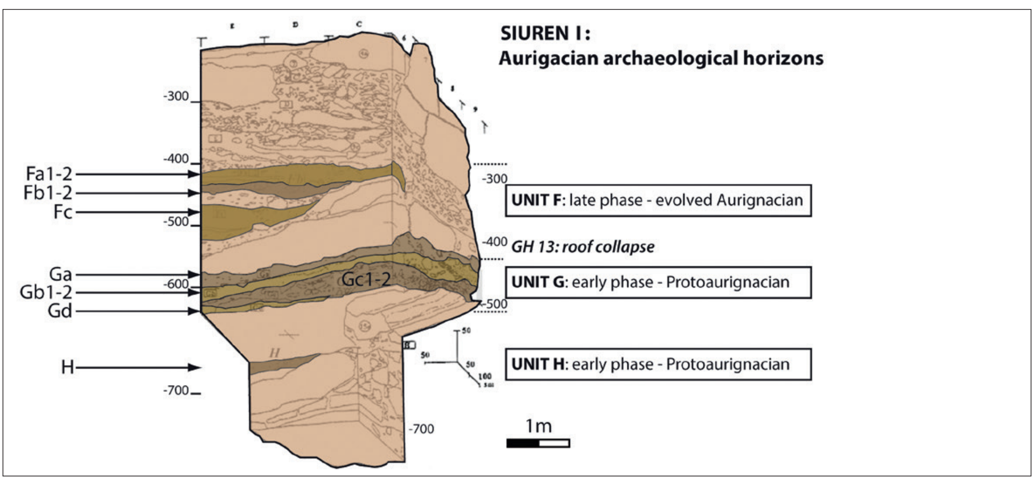

Fig. 2: *Siuren I. Stratigraphic sequence. Western and Northern profiles from the excavations of the 1990s. Aurignacian archaeological horizons: Level H, Gd, Gc1-2, Gb1-2, Ga, Fc, Fb1-2, Fa3 and Fa1-2. Modified after Demidenko et al. 1998. Full color version available online: mgfuopenaccess.org.*

The site was first discovered in 1879 and extensively excavated in the late 1920s under the direction of G. A. Bonch-Osmolowski (Fig. 3) (Demidenko et al. 1998). The two lowermost horizons were attributed to the Aurignacian by Bonch-Osmolowski (lower and middle horizon). A single molar found in the "lower horizon" of the excavations in the 1920s was taxonomically attributed to *Homo sapiens* (Chabai et al. 2004, 456). Between 1994 and 1997, a joint Ukrainian-Belgian team under the supervision of M. Otte (University of Liège) and V. P. Chabai (Ukrainian Academy of Science) conducted excavations near the main excavation area of the 1920s that helped to produce a more refined look at the older archaeological record.

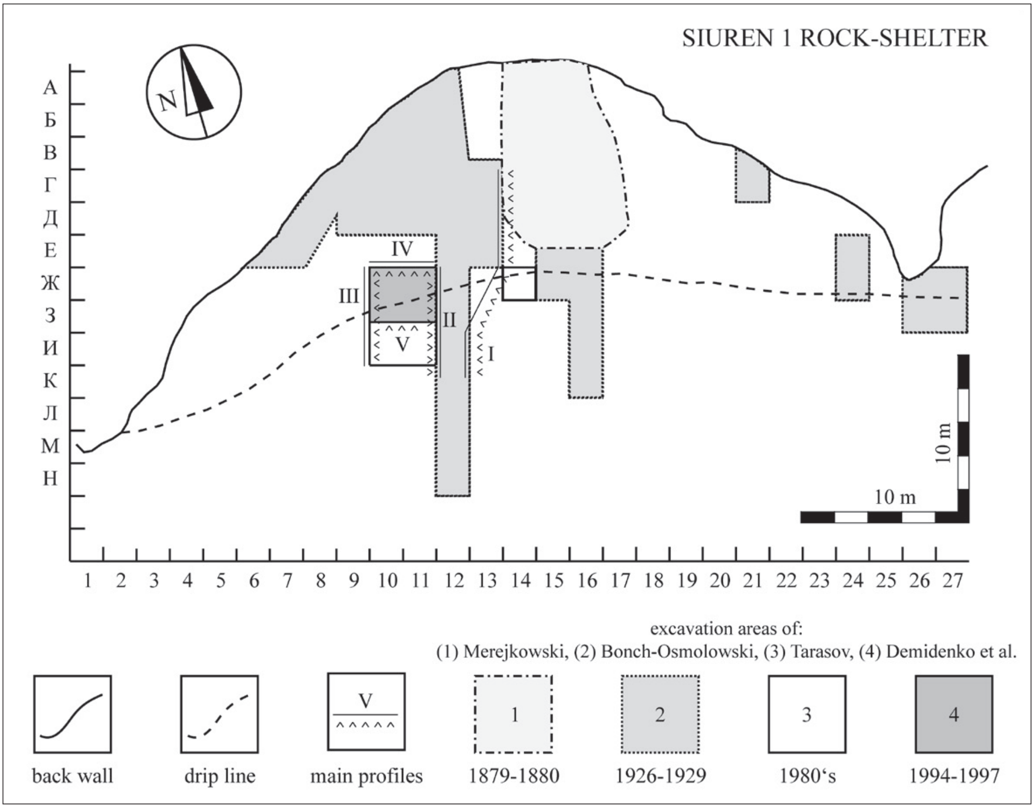

Fig. 3: *Siuren I. Excavation map. Excavation areas of all campaigns since 1879. From Bataille 2012, modified after Demidenko et al. 1998.*

In the course of the 1990s, researchers were able to link the sub-division of the archaeological horizons from the 1920s to further strata. Four Aurignacian horizons were associated with the "lower layer" (= Levels Ga, Gb1-2, Gc1-2 and Gd) and four more Aurignacian strata with the "middle layer" (= Levels Fa1-2, Fa3, Fb1-2 and Fc) of Bonch-Osmolowski (Demidenko et al. 2012). Moreover, the lowermost Aurignacian horizon H, which had not been reached in the course of excavations of the 1920s, was newly discovered. All horizons investigated during the fieldwork of the 1990s were recorded as horizontally deposited in primary position. The archaeological sequence commences with the Aurignacian horizon H directly situated on top of the bedrock. Absolute data indicate comparatively young ages around 36-34 ka calBP (Demidenko and Noiret 2012; Demidenko 2014; Bataille under review).

Small mammal studies speak for a comparatively warm and mild climate and associate Unit G with the Huneborg stadial and Unit F with the equivalent of the Arcy interstadial and lowermost Unit H with a stadial that falls between the Hengelo and the Huneborg stadials (Markova 2012, 69-70; Demidenko 2014, 173 ff.). According to techno-typological studies, the horizons of the lower Units H and G were attributed to the Protoaurignacian ("*Early Aurignacian of Krems-Dufour type industry*"), while the upper levels of Unit F were associated with a "late" or "evolved" Aurignacian by Demidenko (2008-2009). The divergences between Units H, G and F are in fact restricted to technological variations of the bladelet production systems. In contrast, the blade production system is more static, and typological differences between the upper and lower units are mostly of a quantitative character (Bataille 2012, 2013). There is agreement that the lower archaeological horizons of Units H and G are characterized foremost by the production of comparatively long and straight or slightly curved bladelets and microblades of "Dufour sub-type" (according to the concept of Demars and Laurent 1989) from sub-pyramidal, sub-cylindrical and sub-prismatic cores (Demidenko 2008-2009; Zwyns 2012; Bataille 2013). Moreover, remarkably high numbers of alternately and inversely retouched Dufour bladelets and microblades delimit the lower Aurignacian horizons from Unit F. The latter assemblages exhibit greater quantities of small curved and off-axis twisted microblades comparable to a "Roc-de-Combe" Aurignacian (according to Demars and Laurent 1989). The focus of core reduction of both variants is the production of lamellar blanks (= bladelets: max. width >6.99-11.99 mm, microblades: max. width <7.00 mm and lamellar burin spalls). A characteristic feature of the lower horizons H and G is the regular retouch of right ventral edges and left dorsal edges of bladelet blanks in all lower horizons (Units H and G). The work here critically investigates the technological definition of the Protoaurignacian (Bon 2002; Teyssandier 2007) through the example of bladelet reduction sequences of the lower Aurignacian horizons of Siuren I (Units H and G). Detailed technological investigations of bladelet cores and related reduction strategies are included in the discussion.

Critique on the typological and technological definition of the Protoaurignacian

George Laplace originally described the Protoaurignacian as a facies chronologically distinct from the typical Aurignacian (Laplace 1966; for the history of research see also Hahn 1977). In this context, Laplace defined two different varieties of the Protoaurignacian: "à lamelles" and "à pièces à dos marginale." Nevertheless, chronological overlapping between what was assumed to be the succeeding chronological stages of the Protoaurignacian ("Aurignacian 0" / "*Aurignacien archaïque*") and the early Aurignacian ("Aurignacian 1" / "*Aurignacien ancien*") was noticed quite early (e.g., Sonneville-Bordes 1982) and reinforced recently (Higham et al. 2012). As a result of the vagueness of the Protoaurignacian definition, which is predominantly based on typological attributes, a techno-typological overlapping between Protoaurignacian and early Aurignacian assemblages is recognizable (e.g., Douka et al. 2012, 291; Sitlivy et al. 2012; Bataille 2013, 111-113). Due to the unclear techno-typological designation of Protoaurignacian horizons, Bon (2002, 160) proposed a technological definition of that facies in order to produce a more appropriate separation from the early Aurignacian. He could thereby identify an associate production of blades and bladelets in Arcy-sur-Cure, couche VII and, in contrast, a distinct production of blades and bladelets in Brassempouy and Tuto de Camalhot. Teyssandier, while extrapolating from the investigations by Bon (Teyssandier 2007, 238 ff. and 250 ff.), further outlined this technological division of both facies. According to him, the Protoaurignacian is defined by one associated reduction sequence for the production of blades and bladelets ("*productions intégrées*," according to Bon 2002, 162) in which bladelets are the result of decreasing core sizes. In contrast, the early Aurignacian is characterized by two distinct reduction sequences for the production of blades (unidirectional bladelet cores) and bladelets (e.g., carinated endscrapers) ("*productions dissociées*" according to Bon 2002, 162). This strict separation was recently rejected on the basis of technological investigations of Proto- and early Aurignacian lithic assemblages of Northern Iberia (Tafelmaier in press). Before the background of the reported contradictions between the composition of early Aurignacian assemblages (e.g., Bolus and Conard 2006; Sitlivy et al. 2012, 2014; Bataille 2013; Tafelmaier in press) and the widely shared Western European chronological system, it is worthwhile, especially from a multi-regional perspective, to reconsider Demars' investigations of the Aurignacian variability of the Périgord. He reported techno-typological overlapping between Proto- and early Aurignacian assemblages and proposed an integrated model of three early Aurignacian facies co-existing in southern France, among them the Protoaurignacian (Aurignacian 0) and two varieties of the early Aurignacian (Aurignacian 1): "*Quoi qu'il en soit, étant donné qu'aucune distinction marquée n'existe entre l'Aurignacien I de type Ferrassie et "l'Aurignacien 0", j'ai déjà proposé de modifier la terminologie pour cette période en regroupant ces industries sous le nom d'Aurignacien I (…)* (Demars 1992, 104-105).

Raw material units presented here, which exhibit blade and bladelet production within common reduction sequences, contradict the interpretation of Bon (2002) and Teyssandier (2007), who defined the successive production of blades and bladelets within one common reduction sequence as a unique characteristic feature of the Protoaurignacian. Different raw material units (RMUs) exemplify this, with small blades and comparatively large-sized bladelets produced within common operational sequences (Fig. 4). The relevant RMUs 4 and 11 indicate that small blades and big bladelets were produced within one continuum, but not necessarily within one successive operational chain, in which blades occur first, followed by bladelets (Bataille 2013). I will expand on this below.

Methodological approach: Reconstruction of technological properties through the Working Stage Analysis

The reconstruction of lithic reduction concepts has a long tradition within prehistoric archaeological research (e.g., Leroi-Gourhan 1964; Bosinski et al. 1966; Geneste 1985; Thieme 1983; Hahn and Owen 1985; Boëda et al. 1990; Sellet 1993). By applying the Working Stage Analysis (WSA), we can investigate the specific reduction biography of single lithic artifacts. The WSA, which was used as an analytical tool for this study, was developed by J. Richter (1997) and A. Pastoors (2001) in order to reconstruct production concepts and recurrent rejuvenation phases of bifacial tools. Pastoors broadened that

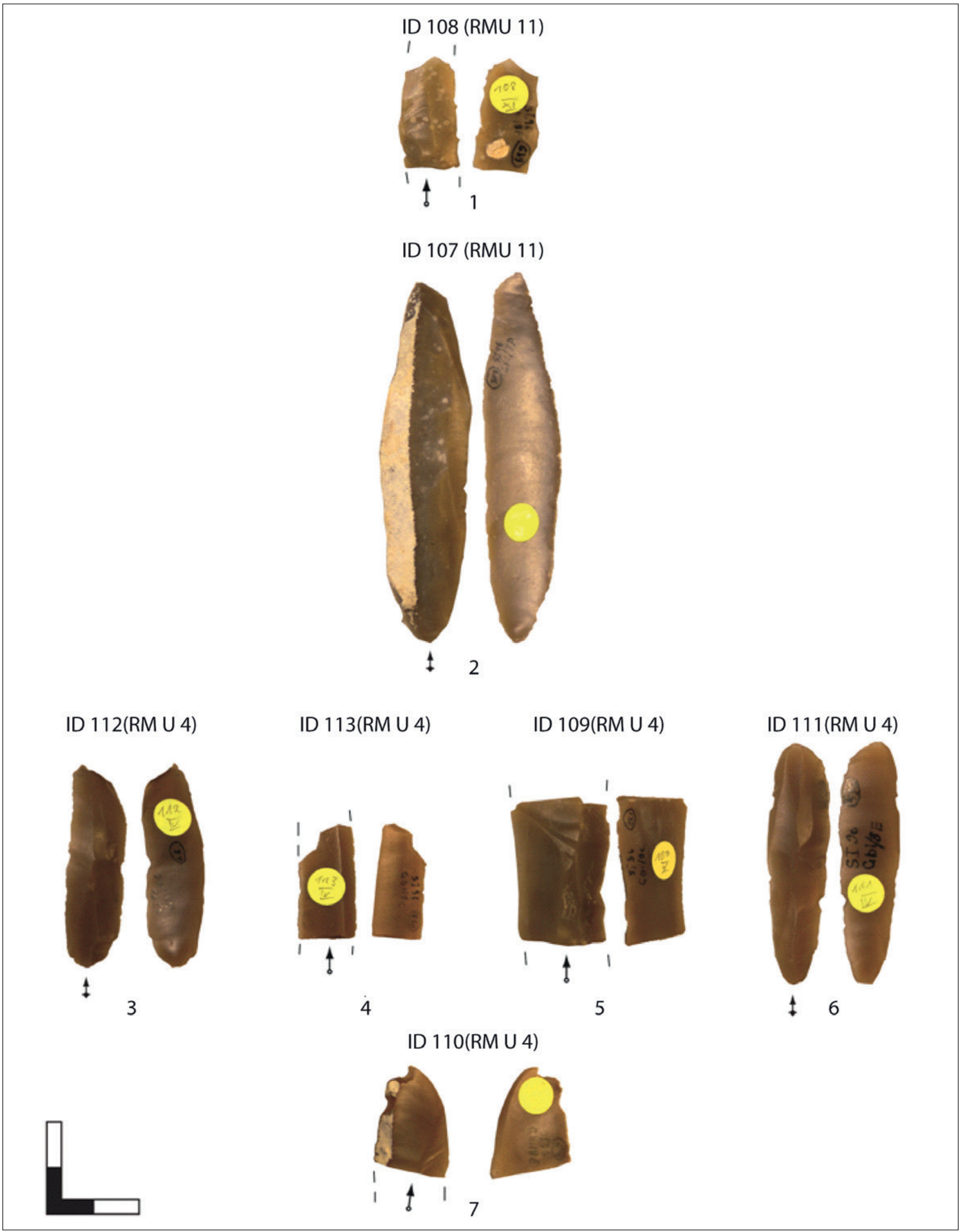

Fig. 4: *Siuren I, Level Gb1-2. Raw material units 4 and 11 indicate the intercalated production of large-sized lamellar blanks and small-sized blades within single reduction sequences, among them blades and bladelets with a maximum width around 12 mm. A succession from bigger blades to smaller bladelets and microblades is not apparent. Photos: G. Bataille.*

concept for the reconstruction of preparation and reduction phases of cores. Recently the WSA was applied in the context of efficiency in core configuration (Pastoors et al. 2015). In connection with technological investigations of blade and bladelet production concepts of Siuren I, I modified the WSA in order to describe the reduction sequences of, in some cases, complex multiple platform bladelet cores. The results are presented in this study for the first time.

Neighboring negatives struck from the identical direction within one operational chain are connected within one common "reduction step." This is indicated by the examples Aa11 and Ab5 in Fig. 5. Working stage Aa11 encodes the upper face (A), the reduction face (a), the striking direction (1), and the chronological order of the reduction step (11) in relation to the older reduction step (Aa1). Furthermore, the chronological order of adjacent negatives and combined reduction steps are indicated by: i) the more pronounced convexity of younger negatives, which cut in older ones, (ii) small featherings and cracks on the ridges of adjacent negatives, (iii) capping of Wallner lines of older negatives by younger ones.

The work below presents the detailed technological studies of cores in correlation with the research questions mentioned above. The results of these studies are compared with technological attributes obtained on blades and lamellar blanks of the Siuren Aurignacian sequence.

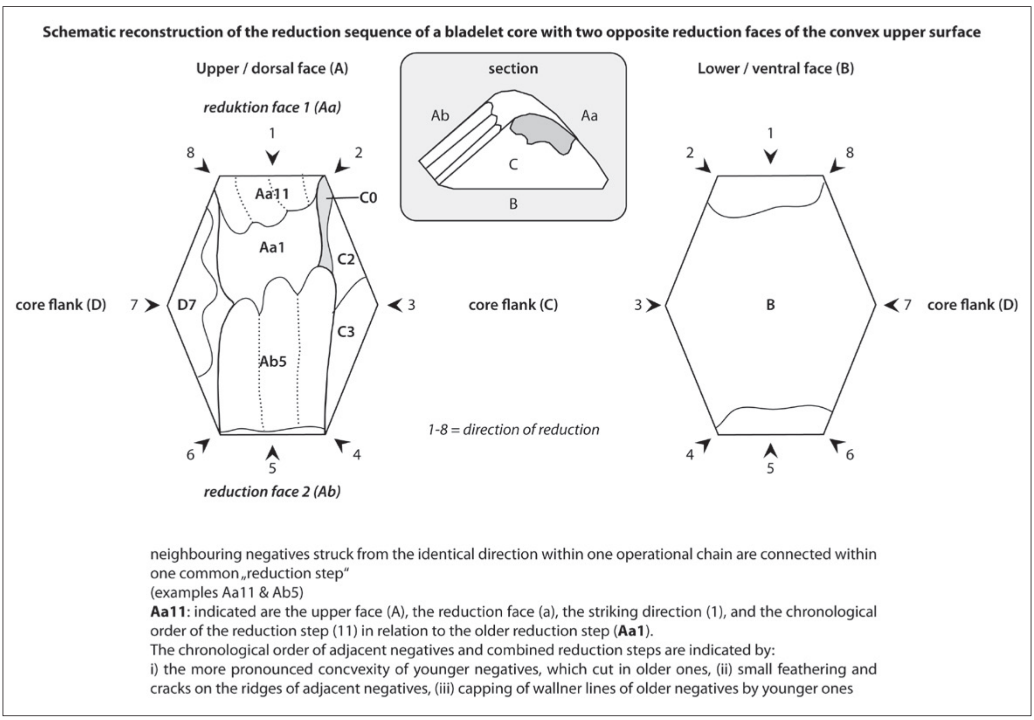

Fig. 5: *Working Stage Analysis (WSA). Explanation of the method.*

Results of the Working Stage Analysis

The technological properties of the bladelet cores reflect the important share of bladelets and microblades as the dominant blank category and as "*Trägerstück*" of retouched elements in all the Aurignacian horizons. This is furthermore indicated by the high share of lamellar blanks among the modified pieces (Fig. 6; Table 1). Moreover, the importance of bladelet production is mirrored in the careful preparation of bladelet cores on raw nodules as well as on thick blanks, as outlined in the following.

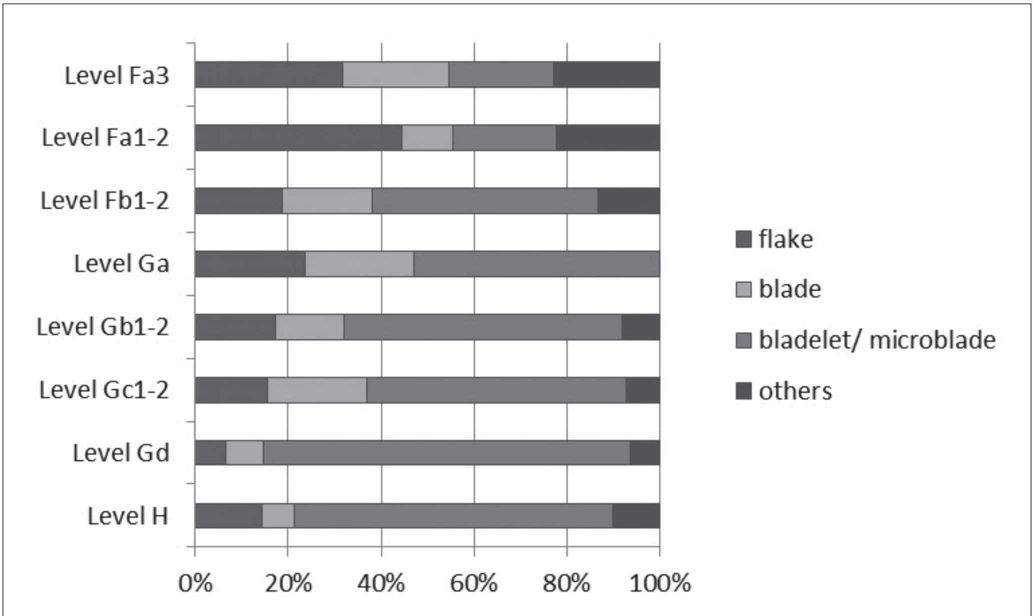

Fig. 6: *Siuren I, Units H, G and F. Share of modified blank categories. Tools with core function are included.*

Siuren I: modified blank categories	flake	blade	bladelet/ microblade	others
Level H	14,29	7,14	68,57	10
Level Gd	6,45	8,06	79,03	6,45
Level Gc1-2	15,64	21,33	55,92	7,11
Level Gb1-2	17,33	14,67	60	8
Level Ga	23,53	23,53	52,94	0
Level Fb1-2	18,67	19,33	48,67	13,33
Level Fa1-2	44,44	11,11	22,22	22,22
Level Fa3	31,82	22,73	22,73	22,73

Table 1: *Siuren I. Categories of modified blanks. Formal tools with core function are included.*

Bladelet production from small bladelet cores with multiple platforms

The blank production from a unidirectional bladelet core is represented in example 1 (Fig. 7). A second reduction surface was prepared at the opposite end, but remained unexploited. Stage 0 indicates the original state of the nodule and the initial core preparation phase. The oldest attestable negatives (working stages/ws c4 and c2) represent the decortication and initial preparation phases of the core. The core flank was then shaped in order to prepare the convexity of the reduction surface Aa, which was shaped in the subsequent step (stage 1: core preparation). The lower surface B was prepared as the striking surface by detaching it from the initial raw piece (ws B5) and by the subsequent removal of a few flakes (ws B3). Later, the second reduction surface Ab was formed and reduced by the detachment of straight bladelets by the unidirectional-parallel method. The carinated-like bladelet core was discarded prior to the exploitation of the first reduction surface Aa.

The preparation and reduction of a unidirectional opposed platform core is described in example 2 (Fig. 8). This core is, from a formal and technological point of view, identical to that of example 1. As opposed to example 1, this core exhibits two successively exploited reduction faces. After the decortication and preparation phases of the upper surface by laminar detachments, the piece was flaked from the original core, as indicated by the ventral face B. Face B was further thinned in order to prepare the striking angle of reduction surface Aa. Both opposed reduction faces were reduced successively: first surface Ab and then surface Aa. This observation reflects the chronological order of example 1, which indicates the preparation of both reduction faces prior to blank production from both reduction faces. The production of straight bladelets was thus applied in successive reduction sequences from each surface.

To conclude, both opposed platform cores were produced on thick flakes from edges of raw nodules or thick plaquettes. The ventral or the big lower surfaces were commonly used as a striking surface for both reduction faces, which were reduced successively.

Bladelet production from small bladelet cores on thick flakes

As outlined above, bladelet cores were usually initialized on thick flakes coming from edges of flat ovoid nodules or plaquettes (examples 1-3: Figs. 7-9). In other cases, cores were formed on raw pieces (example 4: Fig. 10). In virtually all investigated cases, bladelet cores were carefully prepared in order to shape appropriate reduction surfaces for the obtainment of bladelets and microblades (e.g., examples 3 and 4: Fig. 9, Fig. 10). The core flanks were then shaped in order to border and carefully configure the convexities of the reduction surfaces (example 5: Fig. 11).

Example 3 (Fig. 9) represents the reduction of a unidirectionally reduced multiple bladelet core. The initial preparation and the subsequent detachment of the blank from the raw piece is indicated by ws E72 and B1 (ventral surface). First the upper face and afterwards the core flank were prepared (ws E6). In the following step, lamellar blanks (bladelets and microblades) were detached from face E (ws E7, E71 & E72). Afterwards, the core flank D was reshaped by the detachment of one big flake (D5) in order to delimit reduction face A, which is oriented orthogonally to reduction face E. Furthermore, face D functioned as a striking surface for reduction face A. Subsequently, bladelets and

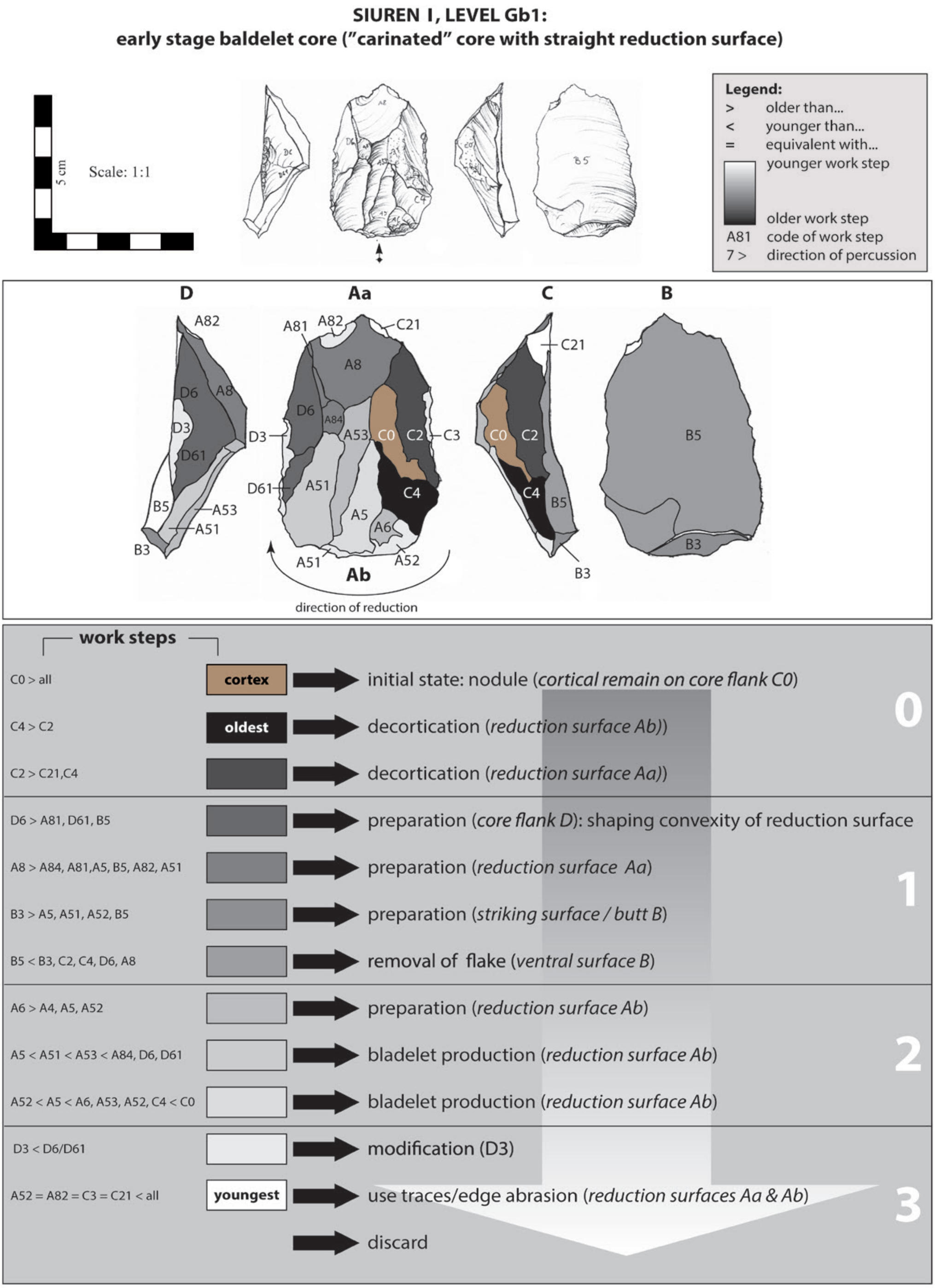

Fig. 7: *WSA, example 1: Siuren I, Level Gb1.*

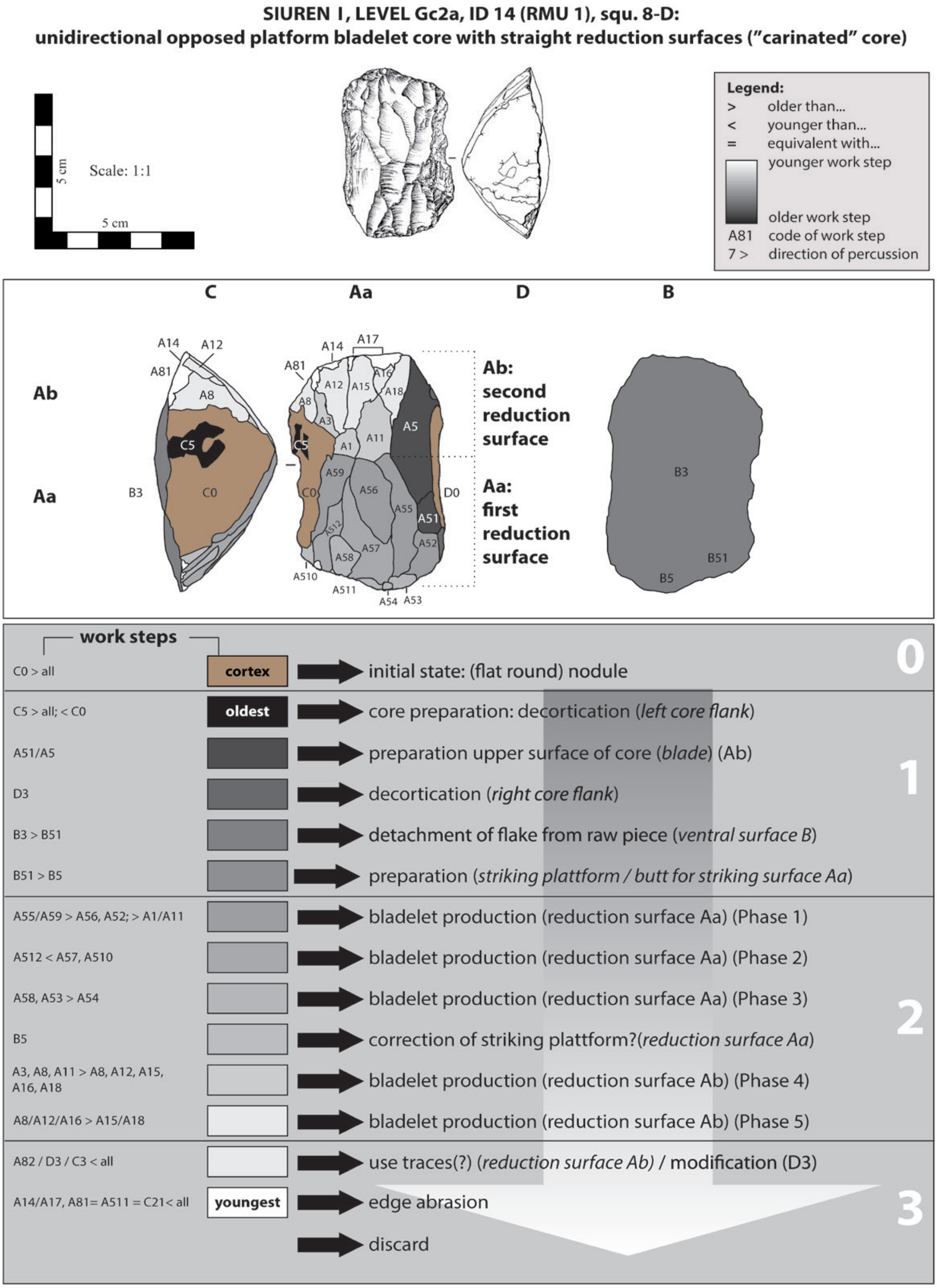

Fig. 8: *WSA, example 2: Siuren I, Level Gc2a.*

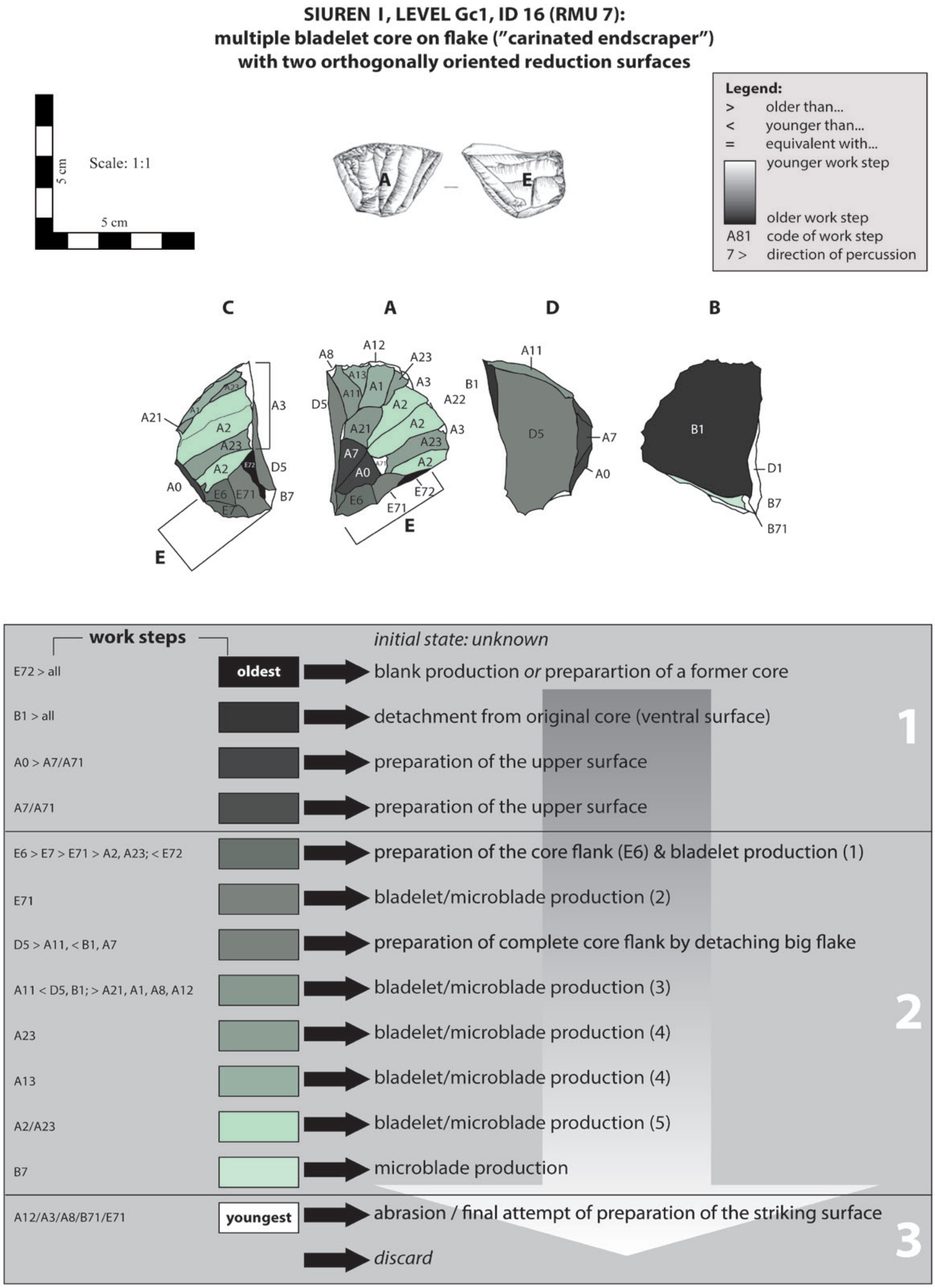

Fig. 9: *WSA, example 3: Siuren I, Level Gc1.*

microblades were produced mainly from face A, but also from face E. The youngest noticeable reduction steps are represented by small and partially abrasive negatives at the edges of faces A and E, which indicate potentially the final attempts of blank production.

A unidirectional bladelet core at an early stage of reduction with one exploited reduction surface is presented in example 4 (Fig. 10). The oldest "negative" is a natural fracture plain (D) that represents the left core flank, which delimits the subsequently prepared reduction surface A. In the initial working stage, the pre-core was detached from the main raw plaquette orthogonally to the long-axis (ws E0). Furthermore, the lower surface C was decorticated. As next step, the left core flank (ws D51, D5) was adjusted along the natural plain D. In the following step, the right core flank E emerged, possibly by intentionally delimiting the adjacent reduction face (fracture plain). Straight bladelets were detached from reduction face A in the course of at least three succeeding reduction sequences.

Another kind of bladelet and microblade production is indicated in the carinated endscraper from which comparatively short, straight and curved microblades were struck (example 5; Fig. 11). Flat cortical remains indicate that a primary flake was struck from the edge of a thick plaquette (ws B6) posterior to the initial preparation and decortication of the piece (ws A52). In succeeding steps, the later reduction phase A and the core flanks C and D were reduced in order lastly to delimit the reduction face, which was reduced from the left to the right edge successively.

In examples 1 and 2, the latter working stage analyses also indicate the careful preparation of the core's flanks, and the striking and reduction surfaces in order to produce the required target products of bladelets and microblades.

The production of blades and bladelets within one common operational sequence does not necessarily indicate a successive production from blades to bladelets

As indicated in example 6 (Fig. 12), lamellar and laminar blanks were produced alternatively from one and the same core. Blade negatives from early phases of core production are most likely the by-products of the early preparation phases (e.g., ws C55). This early phase followed the detachment of the core (ws C0) from the original nodule and the subsequent preparation of the lower surface (ws B21 and B5) and the left core flank (ws B51). In the course of the first steps in reduction, blades, bladelets and microblades were produced parallel and alternatively from reduction face C (ws C5, C7, C52 and C52). According to this observation, the blade negatives from the earlier stages of reduction on the second reduction face A likely belong to the preparation phase of that reduction face (ws A17 and A14). In subsequent reduction steps, blades and bladelets were produced from the identical reduction face (A13, A12) and the striking surface was re-prepared (ws B22). The latest attempt of blank production is an unsuccessful attempt to detach blades (ws A1 and A11). To conclude, a successive blade and bladelet production is not reflected in the exploitation of that core.

Also, example 7 (Fig. 13) does not clearly indicate a succession from blades to bladelets, since lamellar negatives indicate the production of quite big and wide bladelets. Moreover, it remains unclear if, in the early reduction phases, small blades or big bladelets

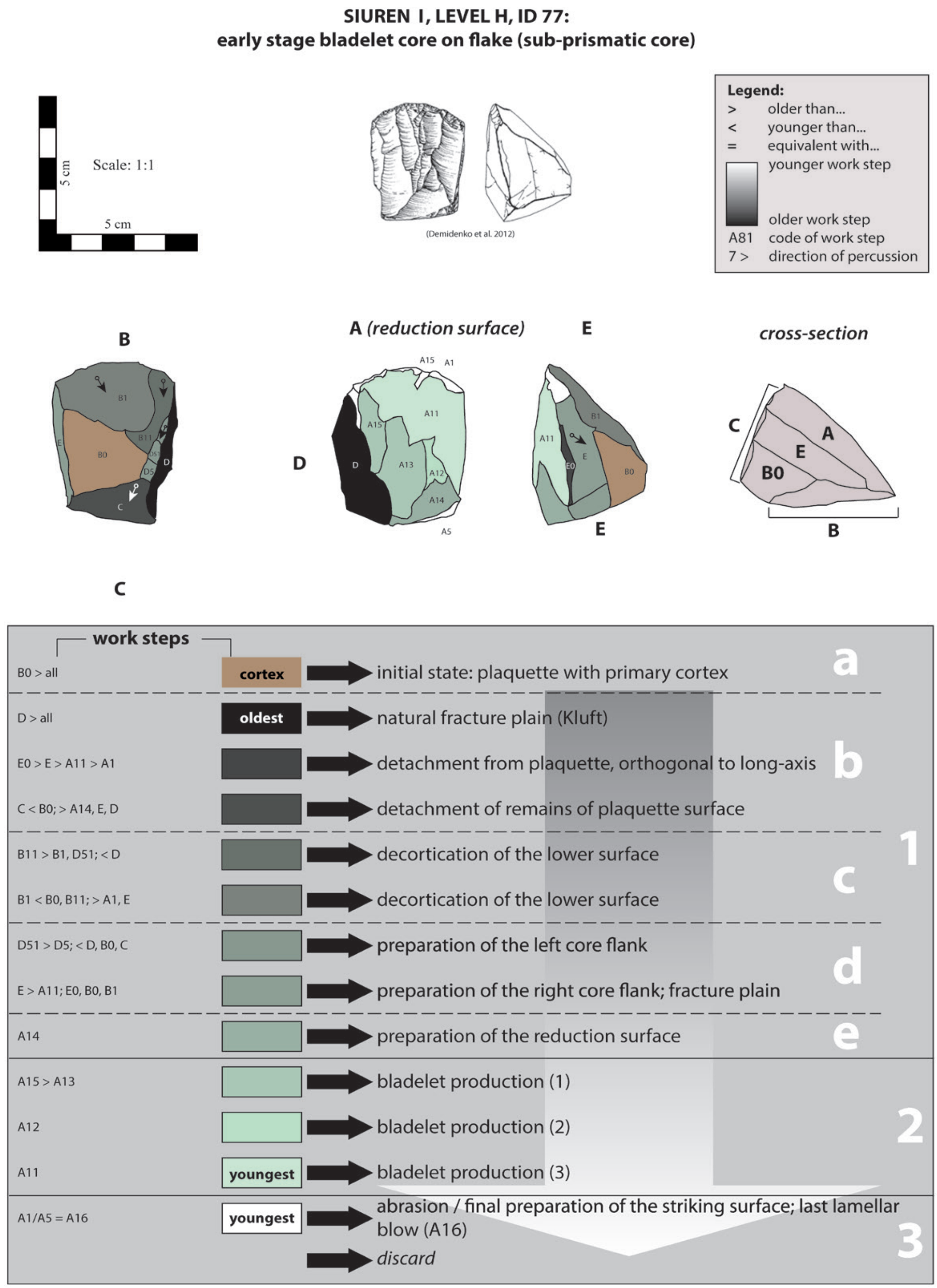

Fig. 10: *WSA, example 4: Siuren I, Level H.*

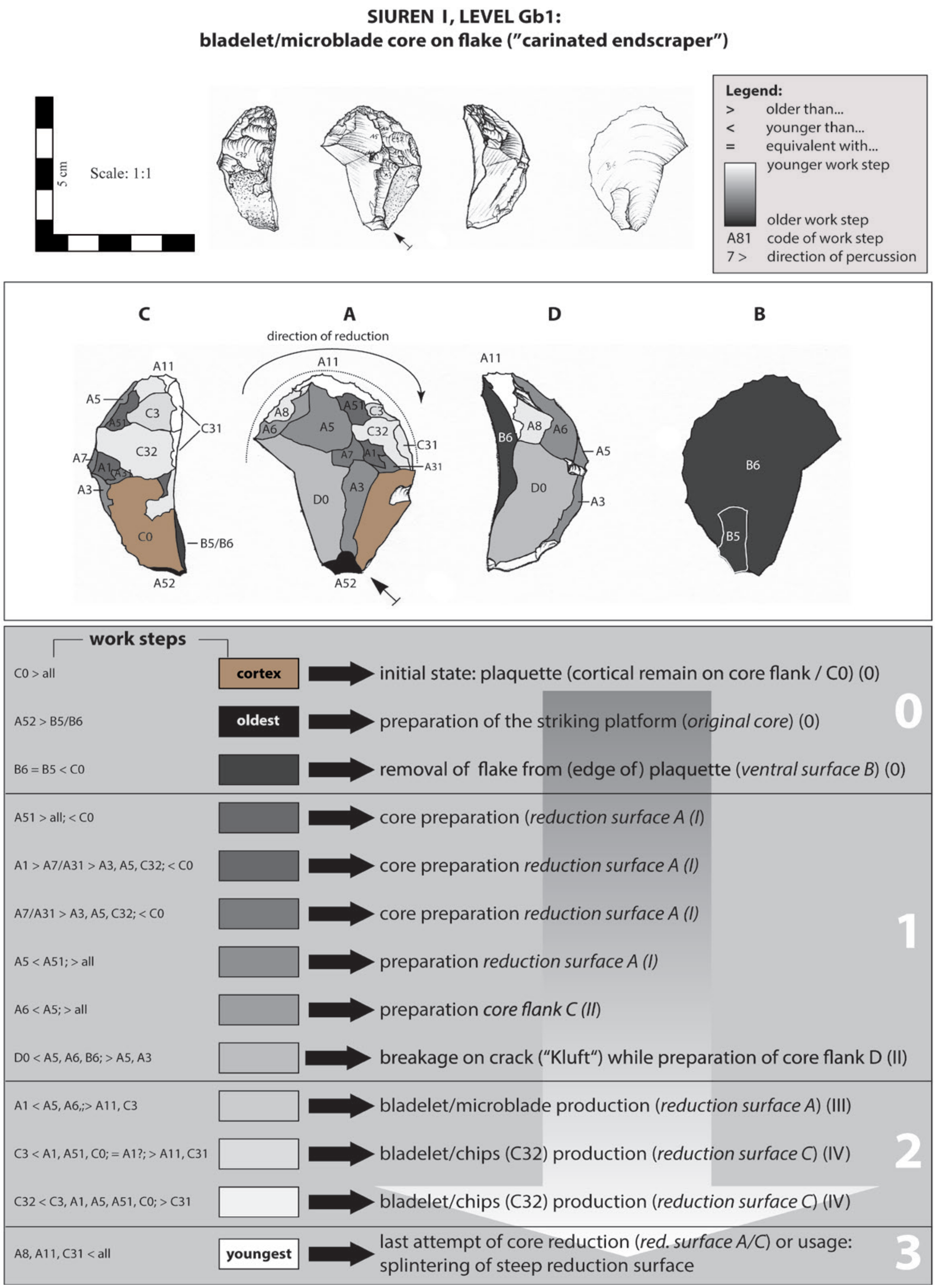

Fig. 11: *WSA, example 5: Siuren I, Level Gb1.*

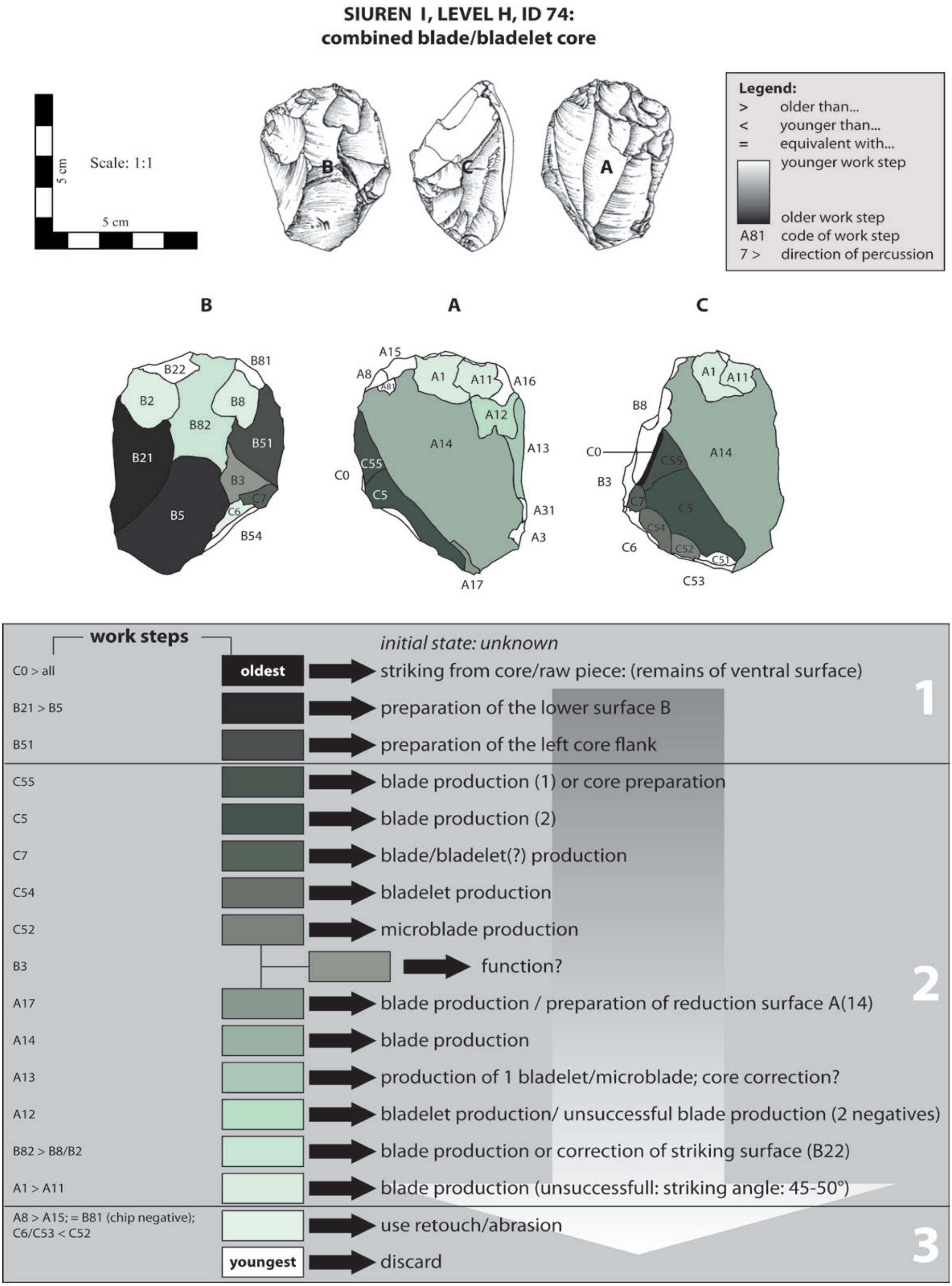

Fig. 12: *WSA, example 6: Siuren I, Level H.*

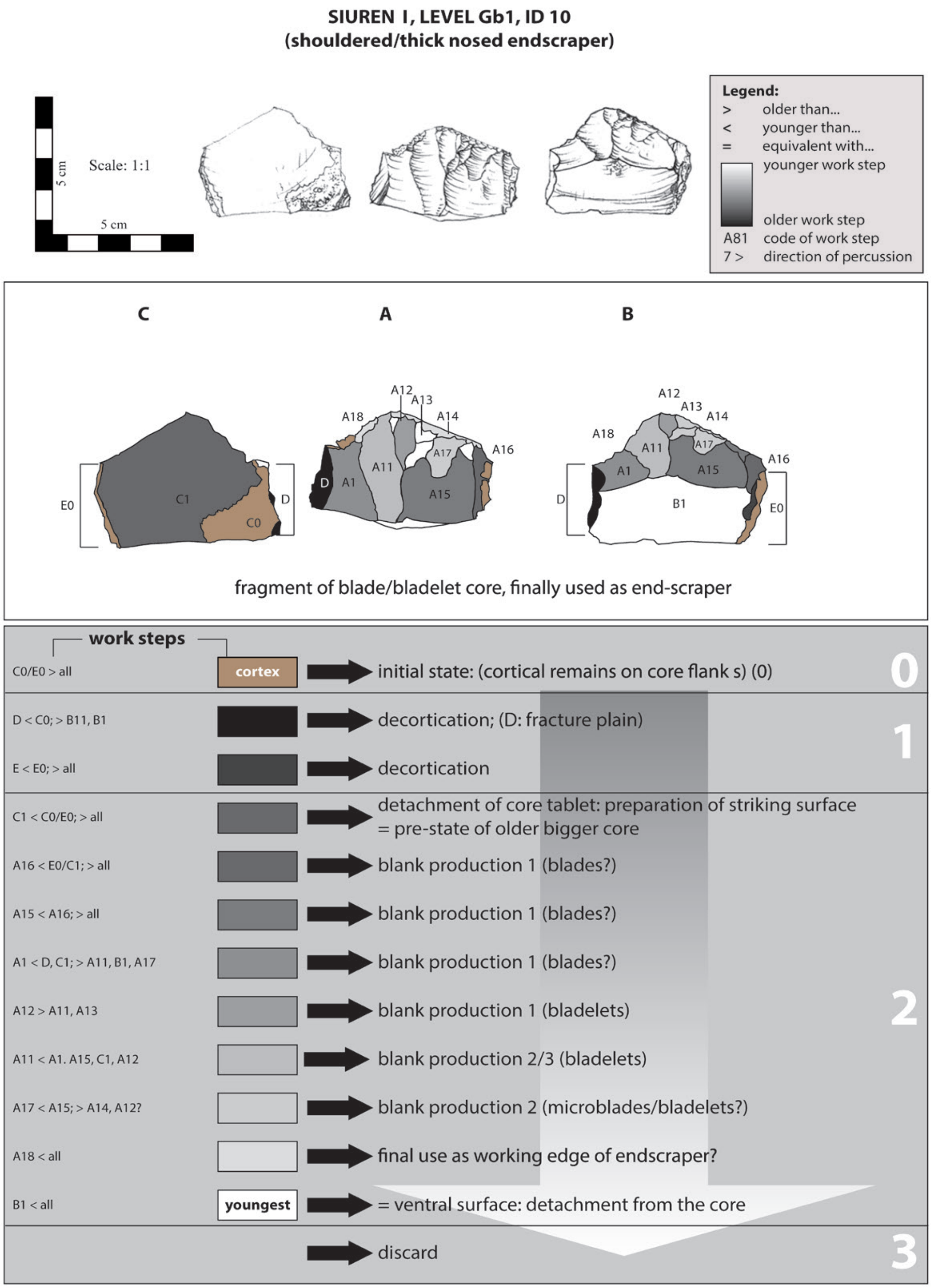

Fig. 13: *WSA, example 7: Siuren I, Level Gb1.*

were in the scope of blank production. Regarding further bladelet cores and the bladelet assemblage of Level Gb1-2, from which this core originates, the latter is more likely. This issue will be discussed further below.

Examples 6 and 7 and Raw Material Units 4 and 11 suggest the following:

a) An alternating production of blades and bladelets in intercalated steps but not a successive production in subsequent steps is observed in examples 6 and 7.

b) There are clear indications of successive steps for the reorganization of the core structure (example 6).

c) Early stage laminar negatives are likely to indicate the preparation of reduction faces and core flanks of bladelet cores. Many more flakes and blades come from the decortication and preparation phases of core production, as deducible in the higher degree of cortical remains in comparison to lamellar blanks, which more or less lack cortical remains (Bataille 2012, Fig. 10) (Figs. 14a and 14b; Tables 2a and 2b). This pattern is apparent in the early and late phases of the Aurignacian sequence as exemplified on Levels Gc1-2 (early) and Fb1-2 (late). The general rarity of cortical flakes and blades in the Aurignacian horizons of Siuren I reflects the on-site reduction of raw material imported in a (partially) decorticated state.

d) Lamellar end-products (bladelets and microblades) are the central scope of blank production, as indicated by the high share of modified lamellar blanks in all Aurignacian horizons of Siuren I. Also, the careful preparation and configuration of such cores, of the similar striking and reduction faces, as well as the maintenance of steep reduction angles, all indicate that bladelet production was intended from the beginning of core preparation. Striking surfaces are often prepared on ventral faces or in the preparation of plain striking platforms by detaching core tablets and flakes. Moreover, on multiplatform bladelet cores, older reduction faces are used as striking platforms for younger ones in combination with a change of the striking direction (Fig. 15). Also, bladelets and microblades with the remains of the core crest, and including lamellar burin spalls, indicate the careful preparation of bladelet cores prior to blank production (Fig. 16; Table 3).

To conclude, there are indications of an intercalated production (according to Bon 2002) of small blades and big bladelets within single production sequences as observed in RMUs 4 and 11. They suggest the production of comparatively small and slim blades together with quite big bladelets; nevertheless, such RMUs do not indicate the successive decrease of blank sizes from blades to bladelets and microblades. Moreover, the presence of carinated and thick nosed endscrapers as well as carinated cores contradict the strict technological division of the "archaic" and the "early" Aurignacian by Teyssandier (2007).

Conclusions

As outlined above, the production of blades and bladelets within a common reduction sequence does not necessarily imply the succession of blades and subsequent bladelets as a consequence of decreasing core sizes, as proposed by Teyssandier (2007). The technological analysis presented here indicates that, in the case of laminar and lamellar production within one common sequence, the evidence represents a continuum consisting of big bladelets and small blades. An intercalated but not successive production is

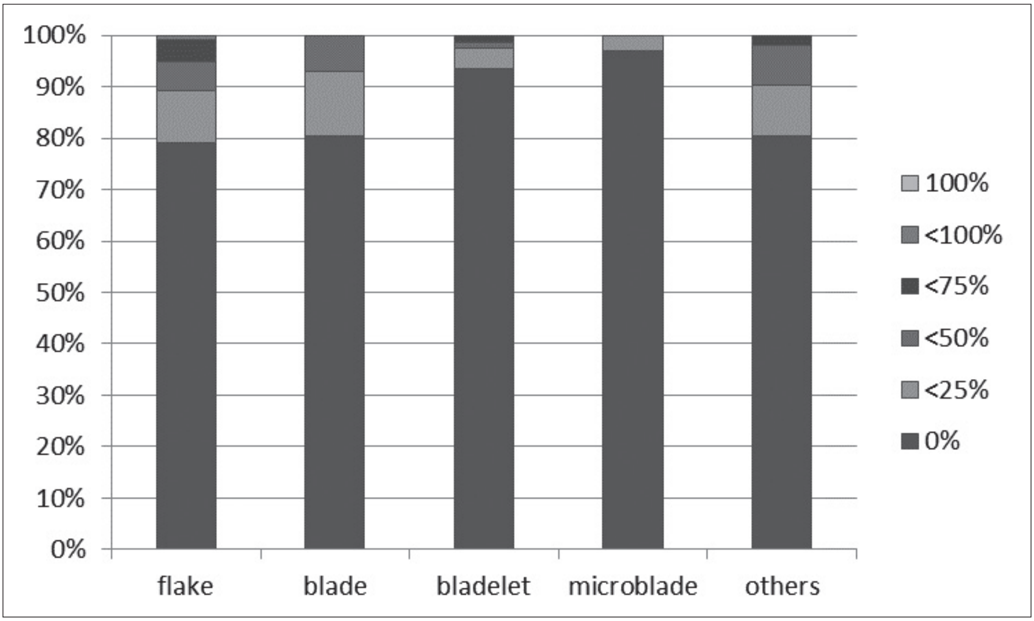

Fig. 14a: *Siuren I. Cortical remains of blank categories from Level Gc1-2.*

Siuren I: Level Gc1-2: cortical remains - blank categories	0%	<25%	<50%	<75%	<100%	100%	missing value	total n
flake	79,12	10,1	5,72	4,04	1,01	0	0	297
blade	80,33	12,7	6,97	0	0	0	0	244
bladelet	93	4	1	1,5	0	0	0,5	200
microblade	97	3	0	0	0	0	0	100
others	41	5	4	1	0	0	0	51
total N	755	77	40	16	3	0	1	892

Table 2a: *Siuren I. Cortical remains of blank categories from Level Gc1-2.*

apparent (*sensu* Tafelmaier in press). Moreover, blade negatives on bladelet cores representing early stage exploitation are most likely the remains of core preparation. This is also indicated in the higher share of cortical remains on laminar than on lamellar blanks. Bladelet cores were, in all cases, carefully prepared prior to the exploitation phase in order to obtain suitable reduction faces. Moreover, divergences seen in the technological attributes clearly indicate two distinct reduction sequences for blades and bladelets (Bataille 2013). While blades regularly exhibit straight or slightly curved profiles in all horizons, bladelets and microblades exhibit more slightly curved and on-axis twisted profiles (Units H & G) as well as curved and off-axis twisted profiles (Unit F) (Figs. 17a and 17b; Tables 4a and 4b).

These quantitative divergences between the upper and the lower Aurignacian horizons are the consequence of the higher share of regular bladelet cores with straight reduction faces (sub-prismatic, -cylindric and -prismatic) in the lower layers and a higher share of core categories with smaller reduction faces in the upper horizons (Fig. 18; Table 5).

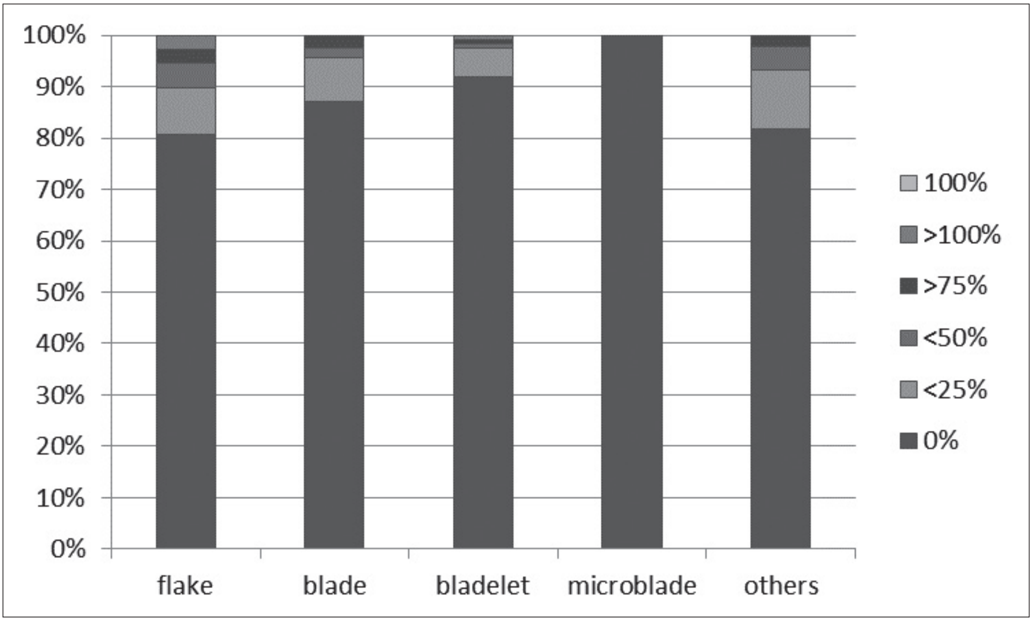

Fig. 14b: *Siuren I. Cortical remains of blank categories from Level Fb1-2.*

Siuren I: Level Fb1-2: cortical remains - blank categories	0%	<25%	<50%	>75%	>100%	100%	total n
flake	80,73	8,97	4,98	2,66	2,66	0	301
blade	87,07	8,62	1,72	2,59	0	0	116
bladelet	91,8	5,74	0,82	0,82	0,82	0	244
microblade	99,79	0	0	0,21	0	0	470
others	36	5	2	1	0	0	44
total N	1073	56	21	15	10	0	1175

Table 2b: *Siuren I. Cortical remains of blank categories from Level Fb1-2.*

As a consequence, bladelet cores of the lower horizons produce bigger-sized lamellar blanks than the smaller reduction faces of the bladelet cores of upper horizon Level Fb1-2 (Fig. 19). Technological differences between blade and bladelet production might as well be indicated in a dominance of variable butt types.

Moderate butts dominate lamellar blanks (predominately pointed and linear butts), while bigger plain butts are more common among laminar blanks (Figs. 20a and 20b; Tables 6a and 6b). Furthermore, the two-fold striking technique is demonstrated by the higher share of bulbar scars among laminar blanks.

On the other hand, both blank categories share the combination of moderately pronounced bulbs and moderate lips (Figs. 21a and 21b; Tables 7a and 7b). In the case of the fairly thick blades, the application of direct percussion using an orthogonal gesture seems the best explanation, while lamellar blanks were produced in tangential gesture.

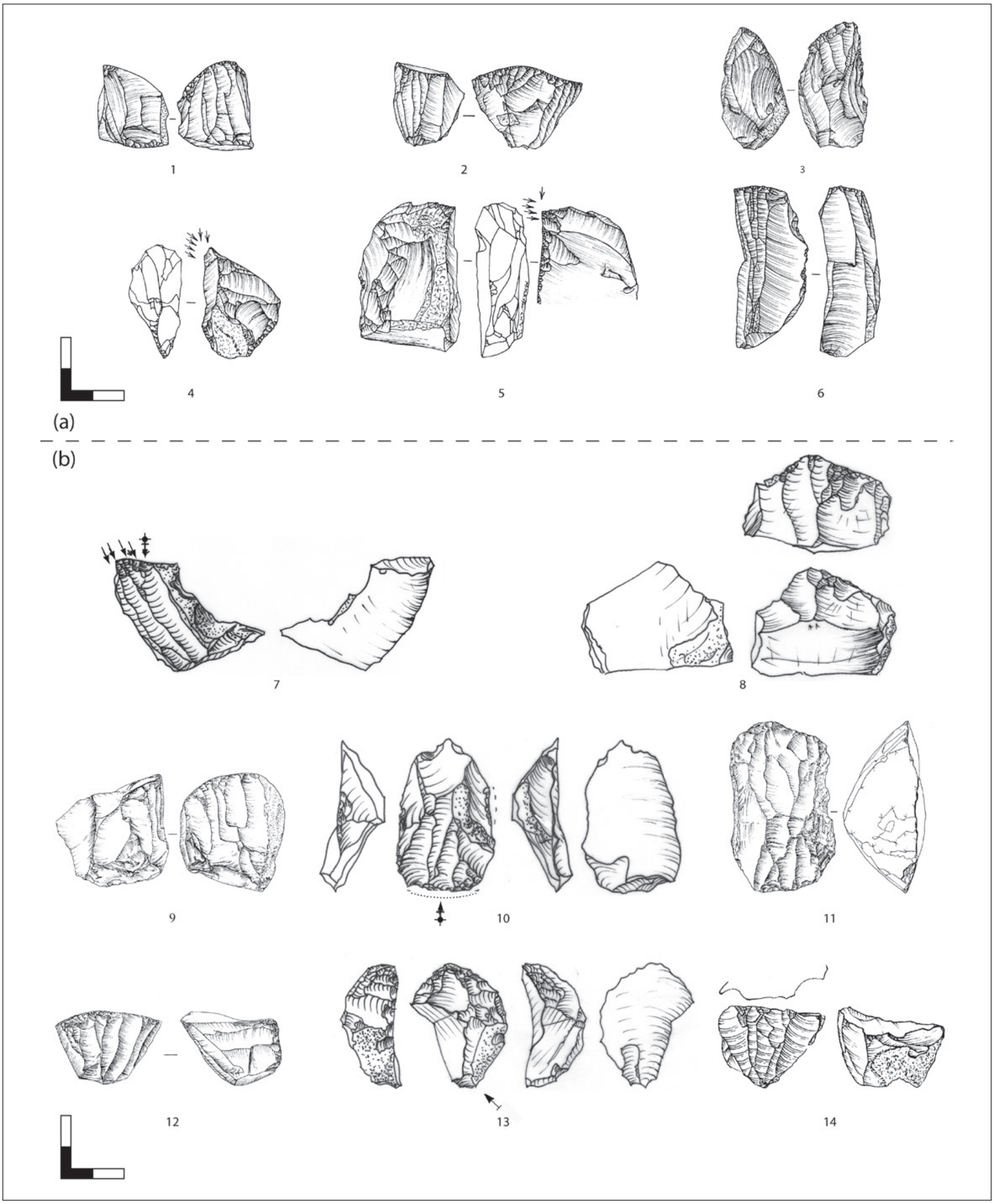

Fig. 15: *Siuren I. Unidirectional bladelet and microblade cores of the late (a) and the early (b) Aurignacian stage. "Carinated endscraper" – bladelet and microblade core (13), carinated sub-pyramidal and -prismatic bladelet cores (1, 2, 9, 12, 14), "thick nosed endscraper" – bladelet core (8), carinated burins – bladelet and microblade cores (4, 5), sub-cylindrical bladelet cores (6, 7), unidirectional opposed platform bladelet core (10), unidirectional bladelet core with a second unfinished opposed platform (11). Levels Fa3 (3), Fb1-2 (1-4, 6), Gb1-2 (7, 8, 11, 13), Gc1-2 (10, 12, 14) and Gd (9). Modified after Demidenko and Chabai 2012a, b (1-6, 9, 11, 12, 14). Drawings: G. Bataille (7-8, 10, 13).*

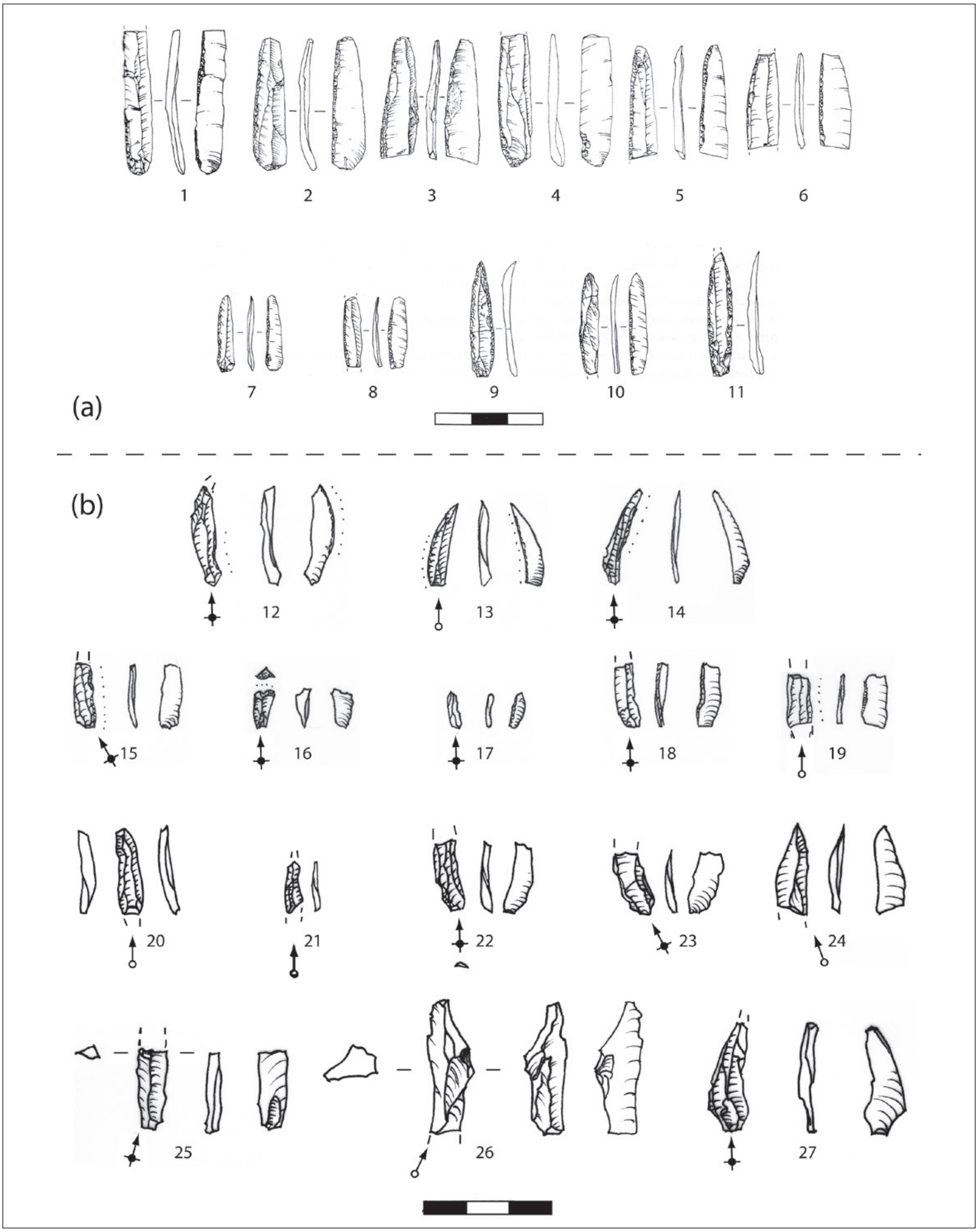

Fig. 16: Siuren I. Lamellar blanks and microliths of the early (a) and the late (b) Aurignacian period. Alternate and inversely modified Dufour bladelets (1-8, 10, 12, 13, 17, 19), Krems points (9, 11), unilateral dorsal modified Dufour bladelets (14, 15), truncated microblade (16), backed microblade (18). Levels H (7-11), Gc1-2 (1-6), Fb1-2 (13-14, 16-19), Fa3 (15, 20-27) and Fa2 (12). Modified after Demidenko and Chabai 2012a (1-11). Drawings: G. Bataille (12-27).

According to Pelegrin (2000, 77 ff.), this combination is a typical feature of the use of soft mineral retouchers. This view has been critically revised (Roussel et al. 2009, 235 ff.). Nevertheless, sand stone pebbles with impact marks are among the artifacts of the Siuren I Aurignacian sequence. Moreover, the presence of splintered bulbs ("*esquillement du bulbe*") on flakes and blades in the Siuren I Aurignacian assemblages might point in the same direction. The combination of weak lips and weak or moderate bulbs is a regular technological feature of the Siuren I and Aurignacian assemblages of other regions (Bataille 2013; Bataille and Conard in prep.). These technological features clearly separate the Siuren I blank assemblages from Middle Paleolithic blank assemblages of Crimea, which usually exhibit pronounced bulbs and lack lips. Lamellar blanks of Siuren I lack pronounced bulbs and regularly show tiny lips. It is obvious that the lamellar blanks were produced by soft hammer percussion in tangential gesture, probably through the use of organic retouchers (Fig. 22).

Siuren I: blank types (%)	**Level H**	**Level Gd**	**Level Gc1-2**	**Level Gb1-2**	**Level Ga**	**Level Fb1-2**	**Level Fa3**	**Level Fa1-2**
flake, simple	7,31	8,68	13,68	18,24	19,51	22,25	27,78	32,18
flake, transversal	1,37	0,83	1,79	1,29	1,22	1,62	3,89	3,45
preparatory flake: crested	2,28	0,41	0,67	0,64	0,00	0,17	0,00	3,45
preparatory flake: crested remnant	0,46	2,07	1,12	1,72	0,00	0,09	1,11	0
preparatory flake: cortical edge	0,46	0,00	0,56	1,29	0,00	0,17	0,56	0
flake, surface shaping	3,20	1,65	1,01	0,64	0,00	0,17	0,00	0
flake, resharpening	0,00	0,00	0,00	0,00	0,00	0,17	0,00	0
blade simple	10,50	9,09	21,86	14,38	19,51	9,46	12,78	13,79
preparatory blade: crested	2,74	3,31	2,47	1,07	0,00	0,09	2,78	3,45
preparatory blade: crested remnant	1,83	0,00	1,12	1,07	0,00	0,09	2,22	2,30
preparatory blade: cortical edge	1,83	1,24	1,91	0,86	0,00	0,43	0,56	0
bladelet, simple	***26,03***	***17,36***	***18,61***	***22,75***	***21,95***	***14,92***	***16,67***	***26,44***
preparatory bladelet: crested	***3,65***	***0,83***	***1,91***	***0,43***	***1,22***	***1,45***	***2,78***	***0***
preparatory bladelet: cortical edge	***0,00***	***0,83***	***0,34***	***1,50***	***0,00***	***0,17***	***0,00***	***0***
microblade	***15,53***	***31,40***	***11,21***	***22,96***	***17,07***	***40,07***	***18,89***	***2,30***
lamellar burin spall	***3,20***	***0,41***	***1,23***	***2,15***	***0,00***	***4,09***	***1,11***	***2,30***
flake <3 cm	8,22	14,88	14,46	4,08	15,85	1,02	0,00	0
chip, modification-	2,74	0,41	0,56	0,00	0,00	0,00	0,00	0
burin waste	0,00	0,00	0,34	0,00	0,00	0,00	0,00	0
core tablet	2,28	2,07	0,67	1,07	0,00	0,00	3,89	2,3
preform, bifacial	0,00	0,00	0,22	0,00	0,00	0,00	0,00	0
chunk	0,46	1,65	0,56	0,64	0,00	0,09	0,56	0
not recognizable	3,20	2,48	2,69	1,72	3,66	3,50	4,44	3,45
Total N	***206***	***235***	***859***	***451***	***79***	***1132***	***172***	***84***

Table 3: *Siuren I. Types of blanks from the Aurignacian horizons (in percent). Blade: >/= 12 mm width, bladelets: 7-11.99 mm width, microblades: <7 mm width.*

To conclude, while the technical properties for laminar production stay stabile throughout the complete Siuren I Aurignacian sequence, the lamellar production varies between Units H/G (early stage) and Unit F (late stage) as best visible in the varying lamellar blank profiles (Fig. 17b). Nevertheless, this dichotomy is not that strict when comparing the metric values of the lower horizons of Units H and G with the smaller assemblages of Unit F (Levels Fa1-3) (Fig. 19a). In this context, the presence of sub-prismatic and sub-cylindrical bladelet cores also in Unit F indicates the technological overlap between both chronological phases (Fig. 15), a pattern which is less articulated in the upper Aurignacian horizons (Unit F). The techno-typological analogies between both of the assumed regional stages, such as a technological continuity in the blade production, a moderate qualitative technological overlap in the bladelet production as well as in the typological repertoire (non-microlithic tools), suggest continuity throughout both regional stages (Bataille 2012, 2013, under review).

In summary, a succession of blades and bladelets within one single operational sequence (*sensu* Teyssandier 2007) is not characteristic for the early stage of the Siuren I Aurignacian, which was defined as Protoaurignacian by Demidenko (2008-2009). On the contrary, bladelet cores of Siuren I were commonly prepared to produce lamellar blanks from the beginning. Thus, lamellar microliths, which are seen as the central feature of the Protoaurignacian, are usually not the end-products of reduced blade cores in Siuren I. In fact, there are striking similarities with bladelet production systems known from Protoaurignacian assemblages such as Fumane Cave (Broglio et al. 2005) and Riparo Mochi (Douka et al. 2012) in northern Italy. This is evident in the dominance of regular bladelet cores for the production of straight and slightly curved blanks and a high share of alternate and inverse retouched lamellar blanks of the Dufour sub-type. The occurrence of carinated cores as well as "carinated" and "thick nosed endscrapers" from a technological point of view indicates a qualitative overlapping with early Aurignacian assemblages. Tafelmaier (in press) could show that within the Northern Iberian Aurignacian sequences the differences between Protoaurignacian and early Aurignacian assemblages are of a quantitative and not qualitative character. A co-occurrence of Protoaurignacian and early Aurignacian technological features within identical horizons was also described for the Aurignacian of the Romanian Banat (Sitlivy et al. 2014). The Siuren I example underscores these important observations. Moreover, it challenges the current technological definition and the assumed nature of the Protoaurignacian as an isolated Aurignacian founder facies prior to the early Aurignacian occurrence.

Regarding technological and typological attributes, which researchers have emphasized as typical for the Protoaurignacian, the work presented here demonstrates that there is not one feature solely restricted to that chronological stage. The singularly distinctive formal attribute of the Protoaurignacian facies remains the high number of inversely and alternatively retouched straight lamellar blanks, which are designated Dufour bladelets of Dufour sub-type often co-occurring with pointed lamellar microliths such as Krems points and Font Yves points (Bataille 2013, 113-114). Typically, but not exclusively, lamellar blanks are struck from regular cores with sub-prismatic, sub-pyramidal and sub-cylindrical reduction faces. But the Siuren I example shows that the latter core categories persist in the upper horizons which share technological attributes of an evolved Aurignacian (Roc-de-Combe sub-type, according to Demars and Laurent 1989). Despite the technological variabilities in bladelet production in both of the assumed

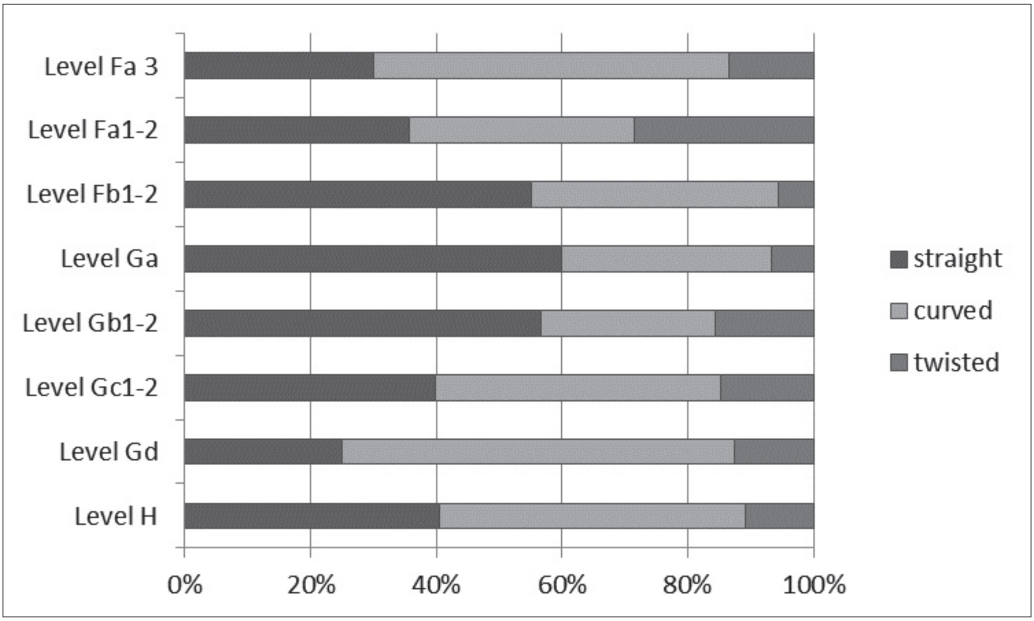

Fig. 17a: *Siuren I. Profiles of laminar blanks.*

Siuren I: laminar blanks - profiles	Level H	Level Gd	Level Gc1-2	Level Gb1-2	Level Ga	Level Fb1-2	Level Fa1-2	Level Fa 3
straight	39,47	24,24	50,26	56,63	56,25	50,86	29,41	27,27
curved	47,37	60,61	57,44	27,71	31,25	36,21	29,41	51,52
twisted	10,53	12,12	18,46	15,66	6,25	5,17	23,53	12,12
total	100	100	100	100	100	100	100	100

Table 4a: *Siuren I. Blank profiles of blades.*

regional stages, the described techno-typological analogies suggest a qualitative continuity throughout the whole Aurignacian sequence (Bataille 2012, 2013, under review). Therefore, emphasizing two different migration events as responsible for both regional facies (Demidenko 2014, 178 ff.) does not seem to be the only or valid interpretation. In this context, a model of a general multilinear transfer of ideas and innovations between early Upper Paleolithic mobile networks might have been an important factor in what has come to be stressed as Aurignacian conformity (Bataille 2013). Innovations might be exchanged, transformed and re-distributed recurrently without leaving clear archaeological traces of potential founder regions.

In general, there is poor evidence for qualitative criteria to define, on a techno-typological level, a clear cultural differentiation from the early Aurignacian. In Siuren I the presence of an isolated bladelet production including the reduction of few carinated bladelet cores ("carinated" and "shouldered end scrapers") contradicts the more recent technological definition of the Protoaurignacian (Teyssandier 2007) and indicates qualitative technological overlap with the early Aurignacian. Regular bladelet cores with straight reduction faces typical for the Protoaurignacian co-occur in the upper horizons

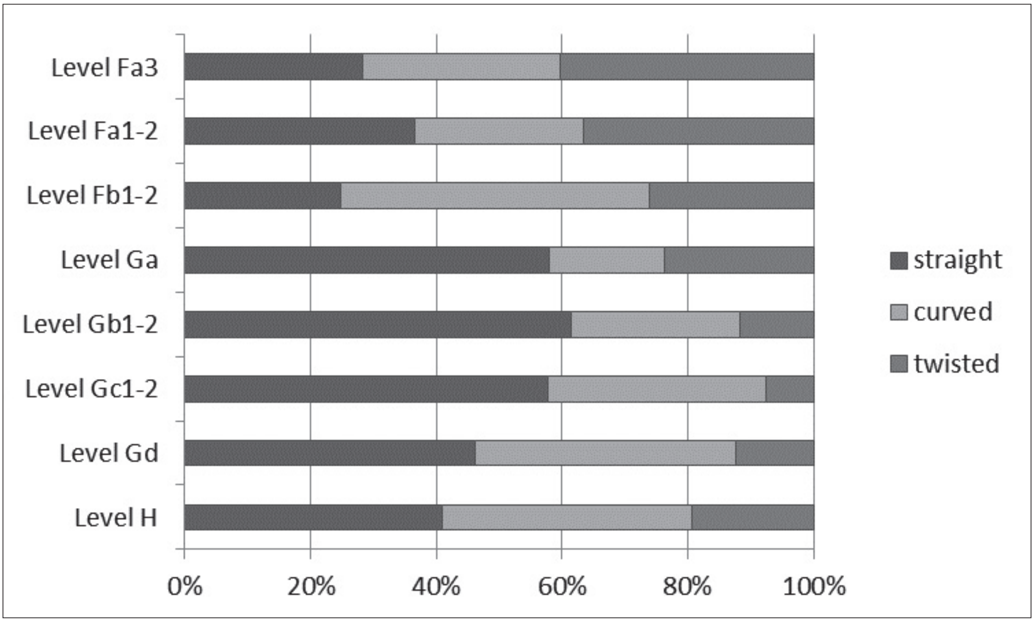

Fig. 17b: *Siuren I. Profiles of lamellar blanks.*

Siuren I: lamellar blanks - profiles	Level H	Level Gd	Level Gc1-2	Level Gb1-2	Level Ga	Level Fb1-2	Level Fa1-2	Level Fa3
straight	40,86	46,23	57,68	61,54	57,89	24,82	36,67	28,36
curved	39,78	41,51	34,85	26,67	18,42	49,04	26,67	31,34
twisted	19,35	12,26	7,47	11,79	23,68	26,14	36,67	40,30
total	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

Table 4b: *Siuren I. Blank profiles of lamellar blanks.*

of Siuren I (Unit F) with bladelet cores exhibiting small and curved reduction faces. Both core categories produce different end-products: straight and slightly curved lamellar blanks ("Dufour sub-type") and curved and off-axis twisted lamellar blanks ("Roc-de-Combe sub-type"). Moreover, the late chronological position of the lower Siuren I Aurignacian horizons (Units H and G) as well as chronological information of other European Proto- and early Aurignacian assemblages are not in agreement with the chronological succession from Protoaurignacian ("Aurignacian 0") to early Aurignacian ("Aurignacian 1") supported by many researchers (e.g., Zilhao 2006, 187). The presence of an Aurignacian proto-phase prior to the "classical Aurignacian" (Zilhão 2006; Banks et al. 2013; Hublin 2015) is not supported by absolute data at the moment and has to be critically re-evaluated. Therefore, a model focusing on a more functional interpretation than one emphasizing a group-specific distinction of assumed Proto- and early Aurignacian populations is needed.

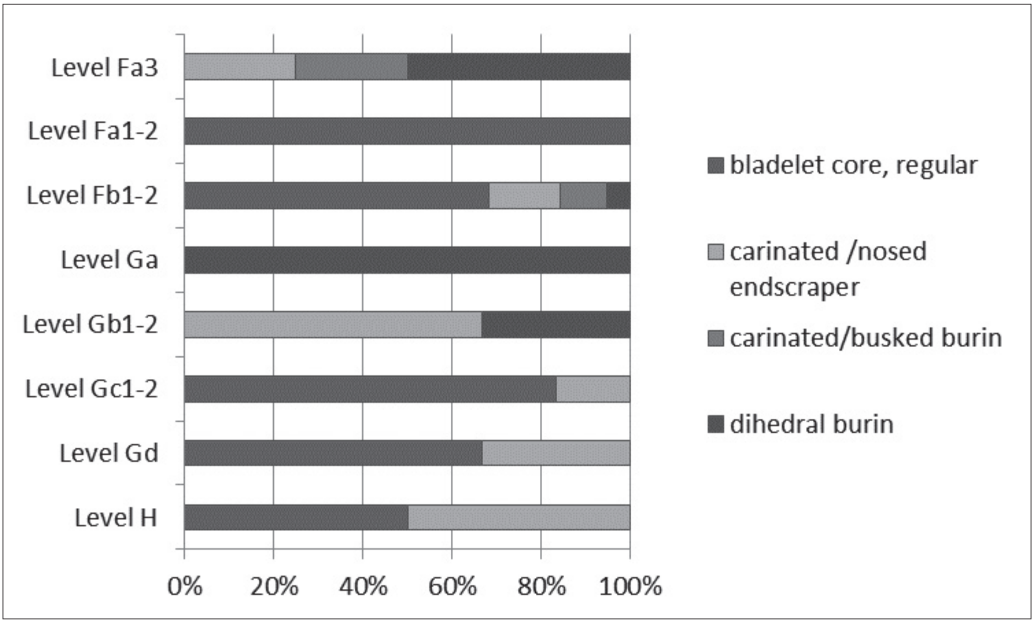

Fig. 18: *Siuren I. Categories of bladelet cores.*

Siuren I: categories of bladelet cores (%)	bladelet core, regular	carinated /nosed endscraper	carinated/busked burin	dihedral burin	other burin
Level H	50	50	0	0	0
Level Gd	66,67	33,33	0	0	0
Level Gc1-2	83,33	16,67	0	0	0
Level Gb1-2	0	66,67	0	33,33	0
Level Ga	0	0	0	100	0
Level Fb1-2	65	15	10	5	0
Level Fa1-2	100	0	0	0	0
Level Fa3	0	25	25	50	0

Table 5: *Siuren I. Categories of bladelet cores.*

In light of the results of the technological investigations presented in this paper, and before the background of the ambiguous and contradictory definitions of the Protoaurignacian (Laplace 1966; Demars 1992; Bon 2002; Teyssandier 2007), the assumed role of that facies as indicator for the early intrusion of modern humans into Europe prior to the early/typical Aurignacian occurrence (e.g., Zilhão 2006; Demidenko 2008-2009; Banks et al. 2013) needs to be critically re-evaluated. Moreover, the chronological position of Protoaurignacian and early Ahmarian assemblages relative to the early dating of Aurignacian horizons in Central Europe (e.g., Uthmeier 2004; Higham et al. 2012, 2013; Nigst et al. 2014) further challenges the notion that they represent an isolated Aurignacian founder facies.

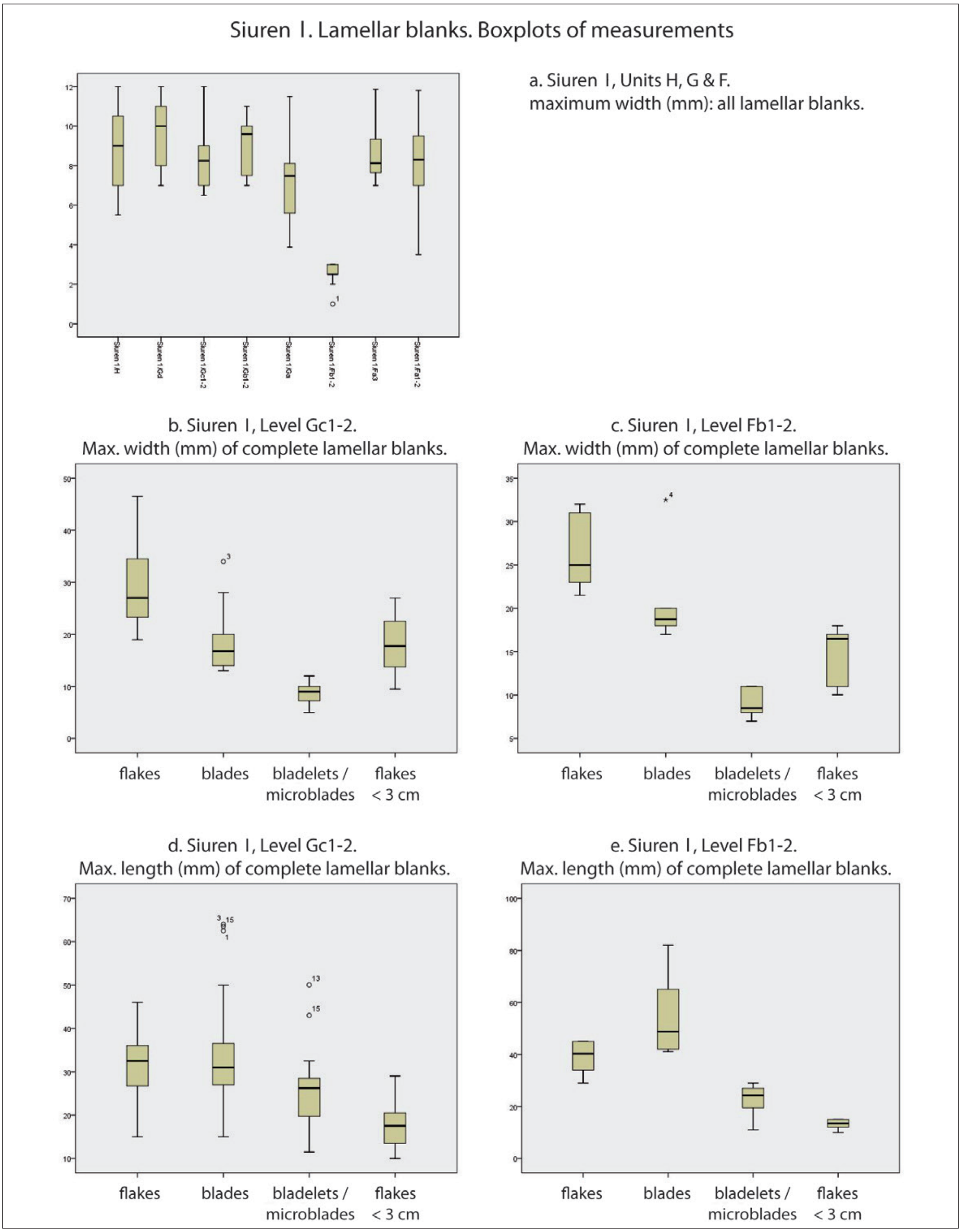

Fig. 19: *Siuren I. Metric measurements. Max. width (mm) of all lamellar blanks (a), max. width (mm) of complete lamellar blanks of Level Gc1-2 (b), Level Fb1-2 (c), max. length (mm) of complete lamellar blanks of Level Gc1-2 (d) and Level Fb1-2 (e). While sizes of lamellar blanks decrease, sizes of blades increase from the lower to the upper Aurignacian horizons.*

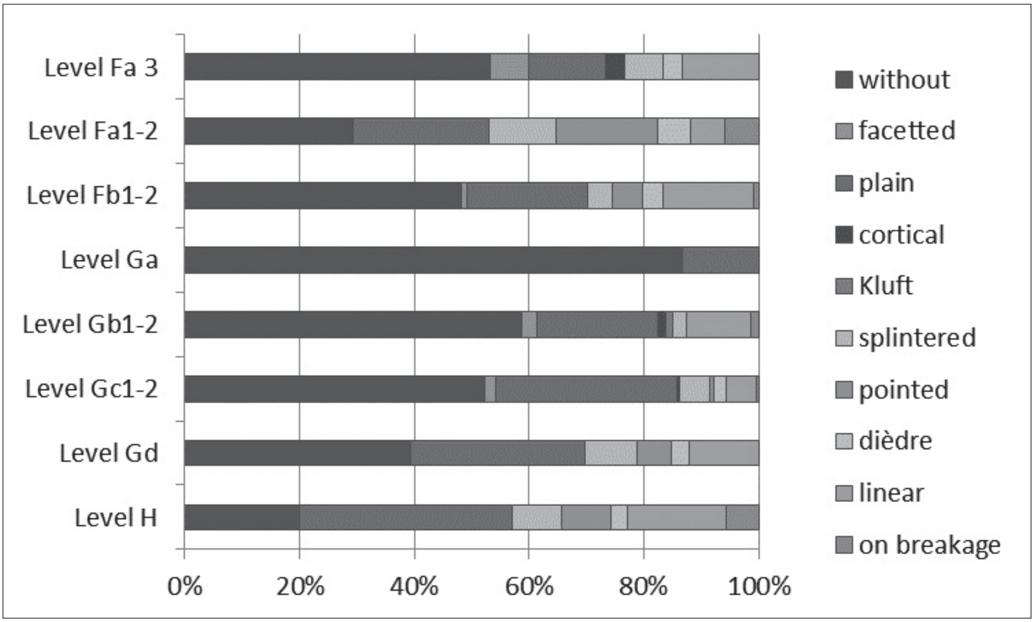

Fig. 20a: *Siuren I. Butt categories of blades.*

Siuren I: blades	Level H	Level Gd	Level Gc1-2	Level Gb1-2	Level Ga	Level Fb1-2	Level Fa1-2	Level Fa 3
without	18,92	39,39	50,00	56,63	81,25	47,41	29,41	48,48
facetted	0,00	0,00	1,64	2,41	0,00	0,86	0,00	6,06
plain	35,14	30,30	30,33	20,48	12,50	20,69	23,53	12,12
cortical	0,00	0,00	0,41	1,20	0,00	0,00	0,00	3,03
Kluft	0,00	0,00	0,00	1,20	0,00	0,00	0,00	0,00
splintered	8,11	9,09	4,92	2,41	0,00	4,31	11,76	6,06
pointed	8,11	6,06	0,82	0,00	0,00	5,17	17,65	0,00
dièdre	2,70	3,03	2,05	0,00	0,00	3,45	5,88	3,03
linear	16,22	12,12	4,92	10,84	0,00	15,52	5,88	12,12
on breakage	5,41	0,00	0,41	1,20	0,00	0,86	5,88	0,00
others/no indication	5,41	0,00	4,51	3,61	6,25	1,72	0,00	9,09
total	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

Table 6a: *Siuren I. Butt categories of blades.*

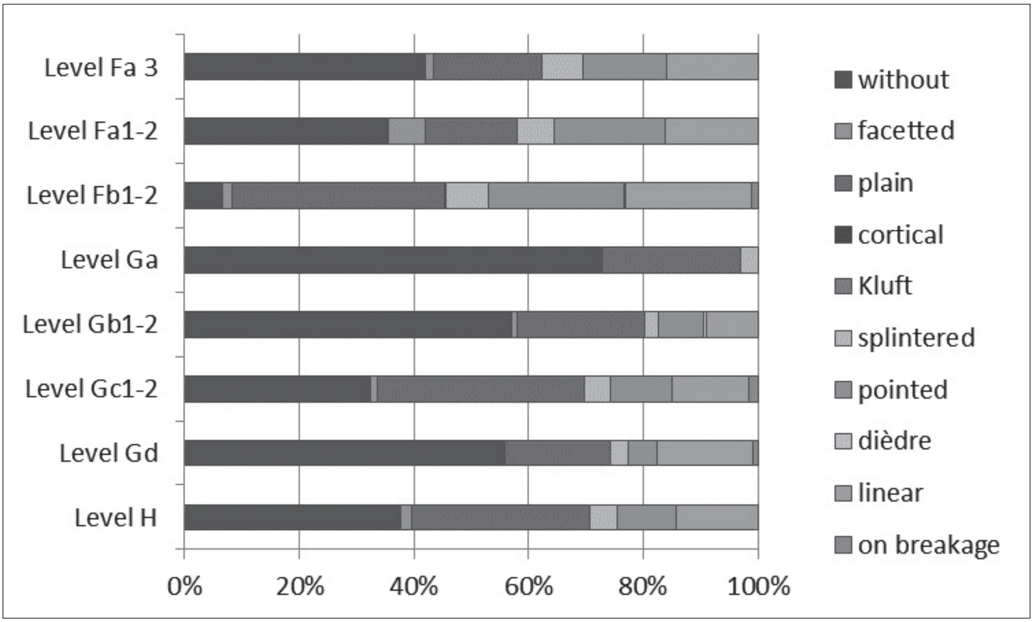

Fig. 20b: *Siuren I. Butt categories of lamellar blanks.*

Siuren I: butt catego-ries - lamellar blanks	**Level H**	**Level Gd**	**Level Gc1-2**	**Level Gb1-2**	**Level Ga**	**Level Fb1-2**	**Level Fa1-2**	**Level Fa 3**
without	37,74	54,47	32,33	56,14	72,73	6,60	35,48	40,85
facetted	1,89	0,00	1,33	0,88	0,00	1,69	6,45	1,41
plain	31,13	17,89	36,00	21,93	24,24	36,52	16,13	18,31
cortical	0,00	0,00	0,00	0,00	0,00	0,28	0,00	0,00
Kluft	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
splintered	4,72	3,25	4,67	2,19	3,03	7,30	6,45	7,04
pointed	10,38	4,88	10,67	7,89	0,00	23,31	19,35	14,08
dièdre	0,00	0,00	0,00	0,44	0,00	0,42	0,00	0,00
linear	14,15	16,26	13,33	8,77	0,00	21,77	16,13	15,49
on breakage	0,00	0,81	1,67	0,00	0,00	0,98	0,00	0,00
others/no indocation	0,00	2,44	0,00	1,75	0,00	1,12	0,00	2,82
total	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

Table 6b: *Siuren I. Butt categories of lamellar blanks.*

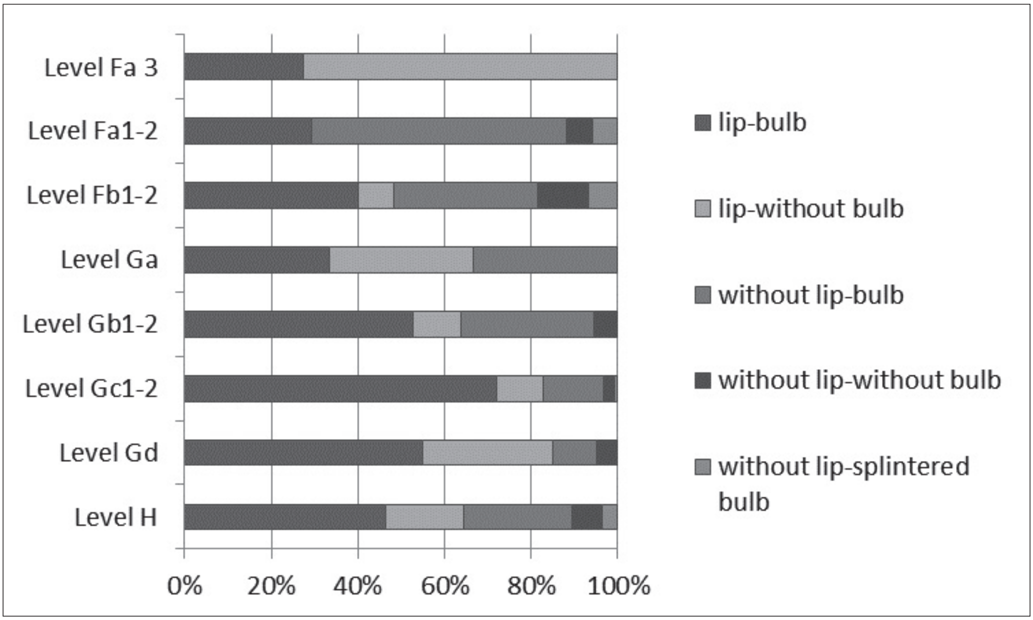

Fig. 21a: *Siuren I. Lips and bulbs of blades.*

Siuren I: laminar blanks	Level H	Level Gd	Level Gc1-2	Level Gb1-2	Level Ga	Level Fb1-2	Level Fa1-2	Level Fa 3
lip-bulb	40,63	33,33	35,66	23,17	6,25	20,87	15,15	17,65
lip-without bulb	15,63	18,18	5,33	4,88	6,25	4,35	0,00	47,06
without lip-bulb	21,88	6,06	6,97	13,41	6,25	17,39	30,30	0,00
without lip-without bulb	6,25	3,03	1,23	2,44	0	6,09	3,03	0,00
without lip-splintered bulb	3,13	0,00	0,41	0,00	0	3,48	3,03	0,00
not recognizable	12,50	39,39	50,41	56,10	81,25	47,83	48,48	35,29
total	100	100	100	100	100	100,00	100	100

Table 7a: *Siuren I. Lips and bulbs of blades.*

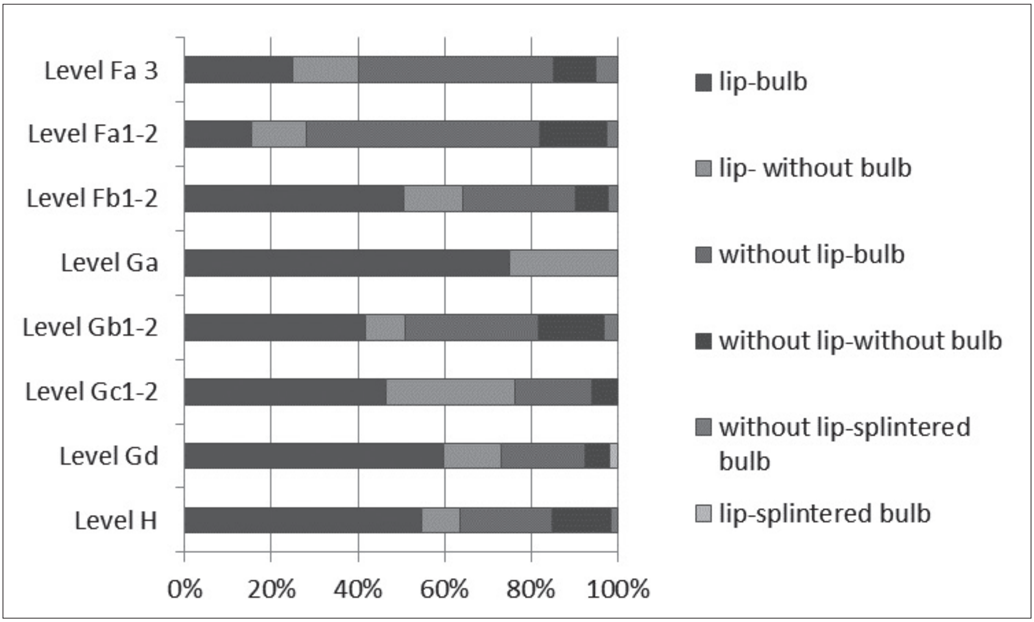

Fig. 21b: *Siuren I. Lips and bulbs of lamellar blanks.*

Siuren I: lamellar blanks	Level H	Level Gd	Level Gc1-2	Level Gb1-2	Level Ga	Level Fb1-2	Level Fa1-2	Level Fa 3
lip-bulb	33,96	25,20	32,52	18,06	18,18	47,19	8,45	16,13
lip- without bulb	5,66	5,69	20,86	3,96	6,06	12,50	7,04	9,68
without lip-bulb	13,21	8,13	12,27	13,22	0,00	24,16	29,58	29,03
without lip-without bulb	8,49	2,44	4,29	6,61	0,00	7,16	8,45	6,45
without lip-splintered bulb	0,94	0,00	0,00	1,32	0,00	2,11	1,41	3,23
lip-splintered bulb	0,00	0,81	0,00	0,00	0,00	0,00	0,00	0,00
not recognizable	37,74	57,72	30,06	56,83	75,76	6,88	45,07	35,48
total	100	100	100	100	100	100	100,00	100

Table 7b: *Siuren I. Lips and bulbs of lamellar blanks.*

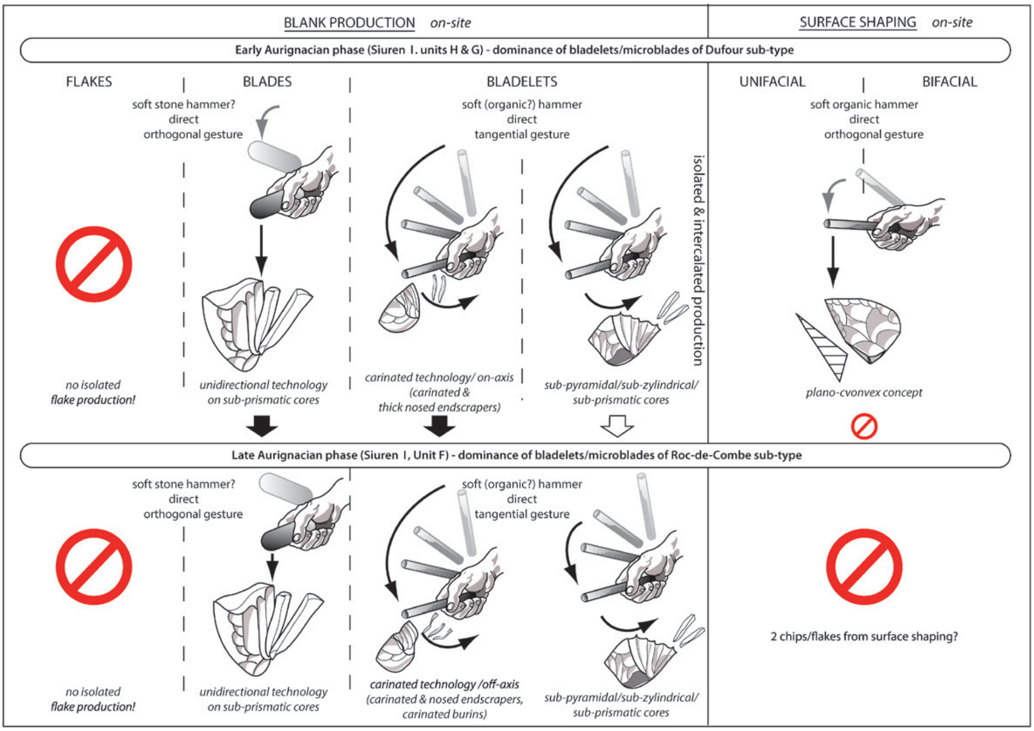

Fig. 22: *Siuren I. Technological properties and applied striking techniques for laminar and lamellar production during the early Aurignacian phase (Protoaurignacian of Units H and G, upper row) and late Aurignacian phase (evolved Aurignacian of Unit F, lower row) indicate a clear difference in blade and bladelet production. Moreover, technological overlapping between both Aurignacian facies indicates techno-typological continuity and contradicts arguments for different populations as bearers of both facies (Demidenko 2012, 2014). The recurrent multilineal transfer of ideas and technological concepts via multi-directional contacts between regional networks might be a better explanation for existing large-scale similarities among the different European Aurignacian regional facies (Bataille 2013, 485 ff., under review).*

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