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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

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Chapter
15

Operational Sequences of Bifacial Production in Kabazi II, Units V And VI

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The assemblages of Units V and VI contain 25 bifacial tools, including bifacial points, different types of bifacial scrapers, large proximal fragments (classified as either bifacial points or bifacial scrapers), as well as heavily exhausted bifacial tools and reutilised fragments of bifacial tools (Chabai, this volume, Chapter 6). In addition to these "fully" surface shaped tools, there are several artefacts in these assemblages which are only surface shaped on their dorsal side. This was achieved via a facial retouch using the soft hammer method, followed by the modification of the working edges. These tools are assigned to the surface shaped tools, which do not necessarily have to be bifacially retouched.

Former studies of surface shaped tools have shown that these often have a long biography (Boëda, 1995b). Pieces may undergo several changes in their volume and outline owing to reduction sequences, which include secondary surface shaping, rejuvenation, resharpening, etc. (Richter, 1995:203-206). Thus, any comparison of bifacial tools which is made simply on the basis of their shape is less informative.

An alternative method to study surface shaped tools is the so-called "work step analysis". Its aim is the reconstruction of the operational chain of production which is expressed in the rejuvenation and the reutilisation of these tools. In this method the genesis of the tools, as well as their shape and outline, is less important. The emphasis of analysis now lies more on the chronological order and comparison of the individual operational steps (work steps).

Work Step Analysis – The Main Principles

Work step analysis is a method used to reconstruct all visible processes of change through which a stone tool may pass. These processes include not only those connected with the production of the tool, but also encompass any changes in its use, thermal influences, modern damage, etc. (Richter, 2004).
These changes are represented by negatives, natural surfaces (including cortical surfaces), and - if the tool is made on a blank - the ventral surface also. During the analysis, the different types of surface shaping and modification of the working edges, use retouch, as well as splintering, breakage, resharpening spalls, thinning, etc. are noted.

Therefore, the main principle of the analysis is

to identify the various "work steps" involved in the continual change of the artefact in question. One work step, which is normally represented by one or several combined negatives, is classified according to the method of production (be this intentional or unintentional), and with regard to its position on the blank. Each work step involved is then compared and contrasted temporarily with its neighbours (i.e. work step A older/younger than work step B). Ideally, this results in the reconstruction of the chronological chain of all events leading to the formation of the artefact under consideration. Thus, work step analysis is a method which pays less attention to the actual form of the artefact, concentrating more on the processes (work steps) involved in its formation.

The Reconstruction of a Chronology Among Negatives

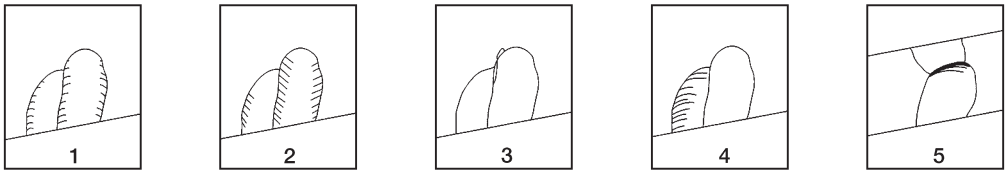


Fig.15-1 Time relations among negatives.

As mentioned above, connected negatives can be assigned to one work step. In such cases, the negatives involved must be located in the same chronological section of the tool, and the intention (e.g., edge retouching) as well as the direction from which they were struck must correlate. Only when these conditions are given, can negatives be considered to represent a single work step. In order that the whole surface be included in the analysis, traces of use and natural surfaces (fissures, cortex, etc.) are also interpreted as work steps.

The decision as to whether a particular work step is younger or older than its neighbour can be made upon five attributes, all of which can be macroscopically detected in the area of the separating ridge between two negatives (Fig. 15-1).

1. The younger negative is both more convex and is situated deeper than the older one.

2. The younger negative displays lateral lances. The majority of lances belonging to older negatives are completely cut off by the younger negative.

3. The lateral lances of the younger negative are often connected with lateral fissures.

4. The contour of the younger negative follows the contour of the older one.

5. If the two negatives oppose each other, the terminal end of the younger negative displays a concavity with clearly visible Wallner lines.

The dataset

The data compiled for each work step comprise a total of 6 features: 1. address; 2. contour line; 3. origin; 4. order; 5. stage of the edge; 6. microchronology.

1) Address (Fig. 15-2)

In order that each work step on the artefact surface is clearly distinguishable, each is allocated an individual address. To avoid any confusion, each address represents one single work step. The address contains information with regards to the side (upper/lower side of the artefact) and the direction from which it was struck. A comparative analysis of several artefacts is only possible when a standardised orientation of the pieces is observed. As such, the artefact must be oriented upon its longitudinal axis with the tip pointing upwards. Should the tool under examination display convergent working edges, then the assumed point of intersection should be oriented upwards. Pieces with a plane-convex cross section should be laid upon their plane surface, which is then defined as their lower side. Artefacts with a symmetrical cross section should be oriented with their longer working edge to the right. If an artefact shows a symmetrical cross section, as well as two equal working edges, orientation is arbitrary. The upper side of an artefact is indicated in the address with the letter "O"; the lower

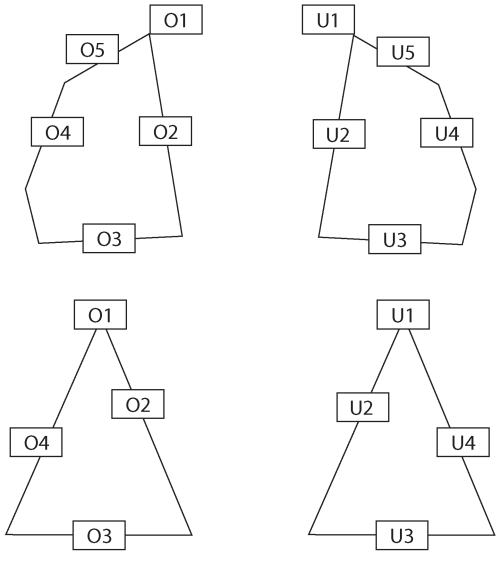


Fig.15-2 Different addresses of work steps on the surface of a bifacial tool, according to the number of edges.

Original state	11	cortical surface
	12	broken part
	13	exploitation edge of a core (non-Levallois)
	14	exploitation edge of a core (Levallois)
	15	ventral surface of the blank
	16	dorsal surface of the blank
Surface shaping	21	flat surface shaping
	22	convex surface shaping
Retouch of edges	31	flat retouch
	32	semi-steep retouch
	33	steep retouch
	34	Quina retouch
Preparation	40	preparation of exploitation face for thinning or for resharpening
Thinning	51	lateral thinning
	52	distal thining
Sharpening spall	61	lateral sharpening spall
	62	terminal sharpening spall
Use wear traces	71	traces of utilisation
	72	splintering edge
	73	small notch
	74	irregular denticulation
Fragmentation	81	latitudinal
	82	diagonal
	83	longitudinal
Thermic alteration	90	crackled

Table 15-1 Modes of origin of work steps.

side with the letter "U". The tip or the distal end of the artefact is addressed with the numeral "1". From this position all other edges of the artefact are numbered clockwise from "2" to "4", or, if there are 5 separate edges, from "2" to "5". Work steps that display no connection to an edge (e.g., cortical surface) are addressed with a "0". The work steps of the lower side are numbered anticlockwise, so that the same edges are assigned the same number. If more than one work step is observed in a particular area of the tool's edge, they are then designated a second number (e.g., O21, O22).

2) Contour line

With this feature the specific form of an edge within the area of the work step is categorised using a value between 1 and 5.

1) concave-convex
2) concave
3) straight
4) convex
5) convex-concave

This is not a strict scale, and it is perfectly legitimate to assign a slightly concave working edge with the value 3.5.

3) Origin

With this feature a work step's mode of origin is described and coded with a number as listed in Table 15-1.

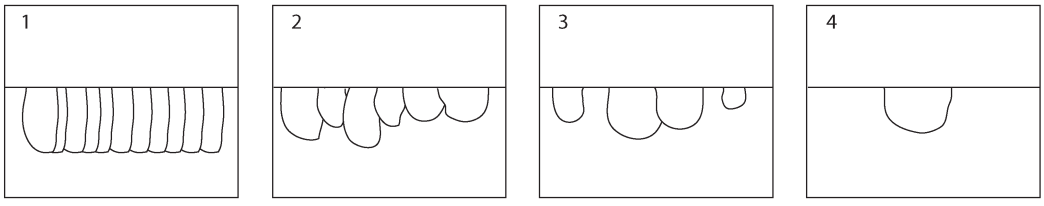


Fig.15-3 Different order among negatives.

4) Order (Fig. 15-3)

The attribute "order" describes the regularity observed among the negatives comprising one work step:

1) parallel order of adjoining negatives
2) regular but not parallel
3) irregularly adjoining negatives
4) isolated, disconnected negatives

5) State of the edge

With this attribute the functional value of the working edge is described:

1) sharp
2) still sharp, but used
3) heavily used or not intended for cutting

This attribute applies only to work steps which are directly connected to the working edge of the tool (e.g. edge retouching, resharpening)

6) Micro-chronology

A meaningful chronological sequence of all observed work steps of a tool can only be achieved when each is compared and contrasted temporarily with its neighbour. Thus, the temporal relation between work steps observed on the surface of the artefact is documented and indicated by logical functions > (older than) and < (younger than), e.g., O21 > O22 and O22 < U2. To reconstruct the whole operational chain, this data is compiled in a Harris-Matrix program (in this case: ArchEd). In this program all work steps are sorted chronologically and are presented in a graphic. This shows the work steps sorted vertically according to their "temporal position". The oldest work steps appear at the bottom of the chart, becoming increasingly younger towards the top, where the most recent work steps are charted. In most cases, these correspond to the usage of the tool in its present form (e.g., use retouch, splintering etc).

One problem encountered when considering the history of an artefact is that younger work steps have often removed fully any evidence of older steps. Consequently, as only visible work steps can be observed and analysed, the resulting diagram is always incomplete. Additionally, it is only possible to define the temporal relationship between neighbouring work steps. This means that a complete linear course of work steps can be rarely reconstructed. Often, several work steps are charted in contemporaneous positions in the diagram, but it must be stressed that these, although temporally very close to each other, are not contemporaneous. At this level of "high resolution" the work step analysis reaches its limit.

Work Step Analyses of 8 Selected Tools

Leaf shaped point from V/3, RMU 2 (Fig. 15-4)

This point shows no visible work steps from the original state of the tool. The oldest observable work steps comprise operational steps attributable to surface shaping. The sequence of surface shaping contains alternating work steps of convex surface shaping (O2, O4, O21, O22) and flat surface shaping (U2, U41, U21). The first operational step, which is attributed to edge modification, is a flat retouch of the right edge of the lower side of the point (U21). This work step is followed by a semi steep retouch (O42), the thinning of the basal end (O31) and lateral resharpening (U42). The preceeding edge modification is a semi steep retouch of the right edge (O23), followed by work steps which are attributed to the usage of the tool, a use retouch (U43) and splintering (O3). The following, younger operational steps – use retouch (O43, U1) and splintering (U23, U22) – were also caused by the usage of the point. The last work step in the chronological sequence is the medial breakage of the basal part (U3).

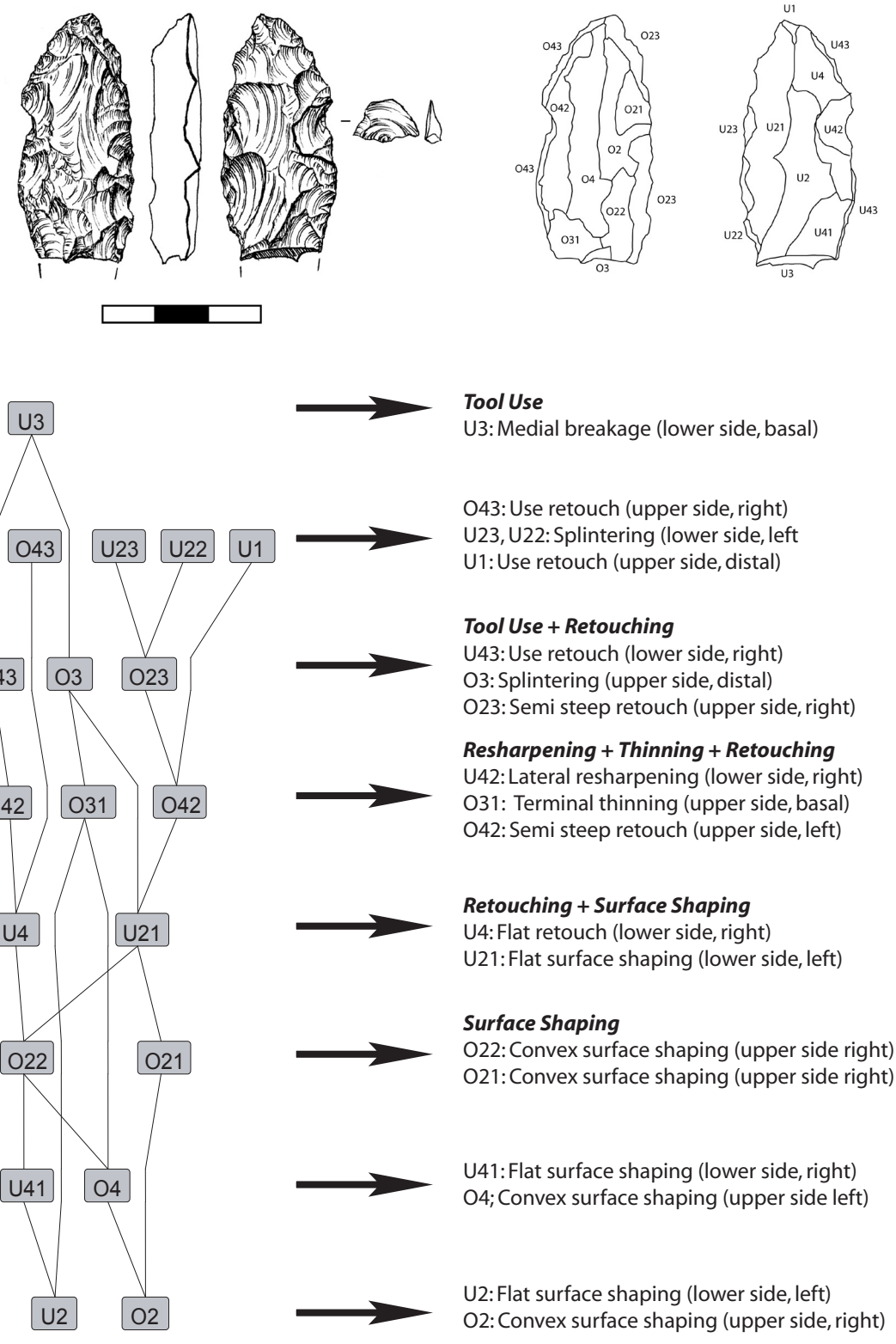


Fig.15-4 Result of the analysis of work steps for a plano-convex leaf shaped point (Level V/3, RMU 2).

Unifacial surface shaped scraper from V/3 RMU 3 (Fig. 15-5)

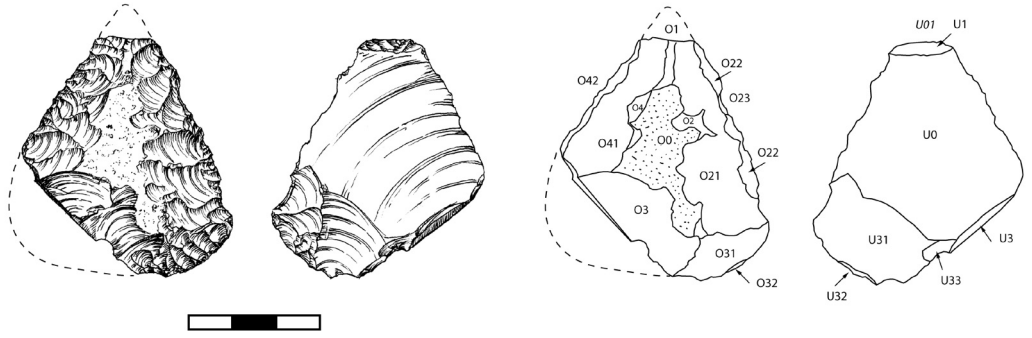
The oldest work steps O0 (cortex) and U0 (ventral surface) show that a flake, partially or fully covered with cortex, was used as a blank. The surface shaping of the flake began with three operational steps of convex surface shaping of its upper side, from the left edge (O4), the right edge (O2), and from the distal part (O1). The following three operational steps of convex surface shaping, from the right edge (O21), the left edge (O41), and the basal part (O3) gave the surface shaped blank its final form. After this sequence of surface shaping the tool was thinned at its base (U31) and its edges modified by means of semi steep retouching (O41, O22). The following work step (O31) comprised a further thinning of the basal part on the convex side of the artefact. After an indefinite period of usage the tip of the tool broke (this work step is marked with U01 in italic letters, as the fracture front is covered entirely by younger work steps). After the breakage of the distal part, the fracture front was semi steep retouched on the lower side of the artefact (U1). The further usage of the tool led to splintering on the lower (U23) and upper side (O32, O23). After a longitudinal breakage (U3) the tool was discarded.

Backed knife from V/3 RMU 4 (Fig. 15-6)

This tool is made of a bifacial fragment which was reutilised for the production of a backed knife. The oldest work step in the observed chronological sequence is the remnant of cortical surface (O0). Further work steps which would have provided information as to the original state of the tool are lacking. Thus, the original state of the blank (whether flake, nodule or plaquette) is unknown. The operational chain of surface shaping comprises six work steps. The sequence began with the flat surface shaping of the tool (U43, U3 U21), followed by two work steps of convex surface shaping (O4, O2) and a further work step comprising flat surface shaping (U31). These operational steps are attributed to the bifacial production of an unknown tool. This biface, which was probably hafted, was used and broke into two or more pieces. After the breakage (O32) the basal fragment was reutilised. The recycling of the fragment began with the lateral and terminal thinning of the convex side (O43, O41, O3), followed by work steps of lateral and terminal thinning of the flat lower side (U1, U41). The next youngest operational step in the chronological sequence is the flat retouching of the left edge (O42). After another work step of lateral thinning (U4), an opposing working edge, on the left side of the lower side, was produced by means of semi steep retouching (U2). The following work steps of splintering (U42, O31), as well as use retouch (O45, U12) show a heavy usage of the tool, which also led to a longitudinal breakage (U22).

Bifacial scraper from VI/1 RMU 12 (Fig. 15-7)

The blank used for the production of this tool was a flake with a hinge fracture. Cortical remnants (O0) show the former coverage with cortex. Six work steps are attributed to the surface shaping of the blank. The work steps of convex surface shaping (O2, O4, O21) and those of flat surface shaping (U2, U4, U41) alternate, beginning with the convex surface shaping of the upper side from the right edge (O2) and completed with the flat surface shaping of the lower side from the right edge (U41). The operational chain of surface shaping did not affect the whole surface of the blank. Besides the remnants of the former ventral surface and cortex, some parts of the former dorsal surface are still visible (O1, O3). After the surface shaping of the blank, the right edge of the upper side was modified with a semi steep retouch (O22). The usage of this working edge is shown by a use retouch (O23), as well as by splintering (U21). The youngest six work steps are all attributed to the usage of the tool. Traces of splintering (O43, U3, O11), a little notch (O24), and finally the break of the basal part (U42, O31) show a heavy usage of the tool, with the main working edge located on the right side.



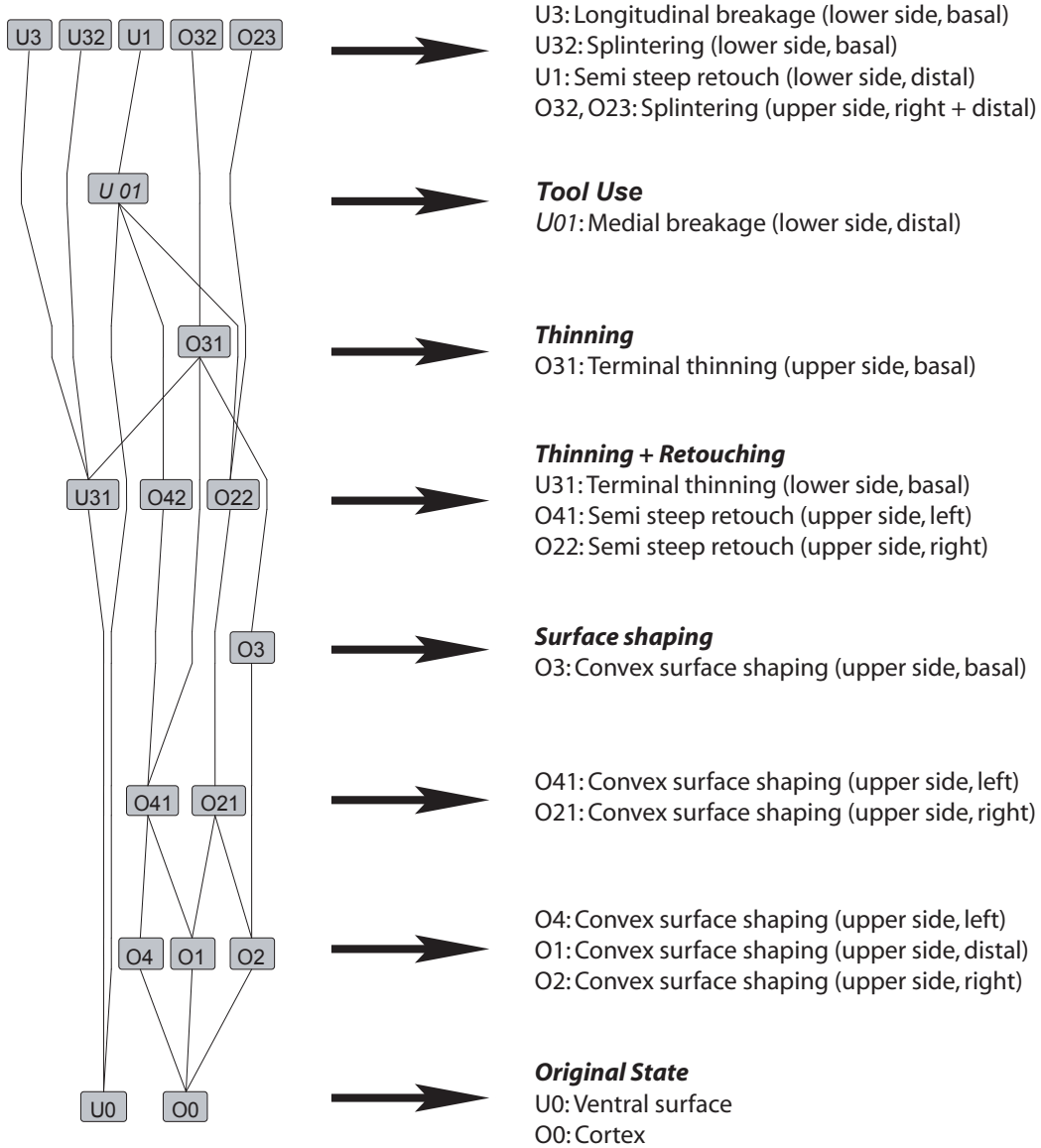


Fig.15-5 Result of the analysis of work steps for a unifacial surface shaped scraper (Level V/3, RMU 3).

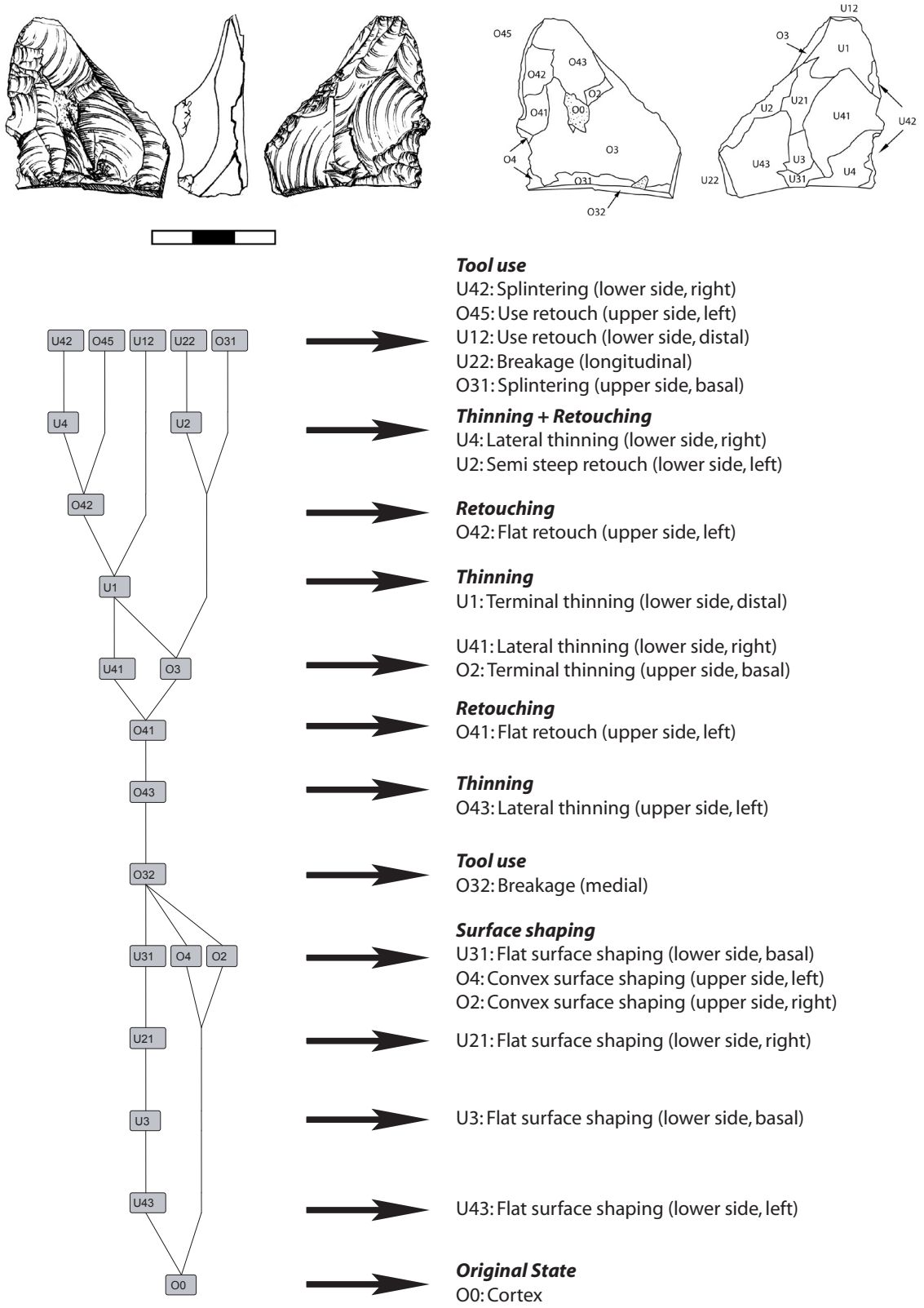
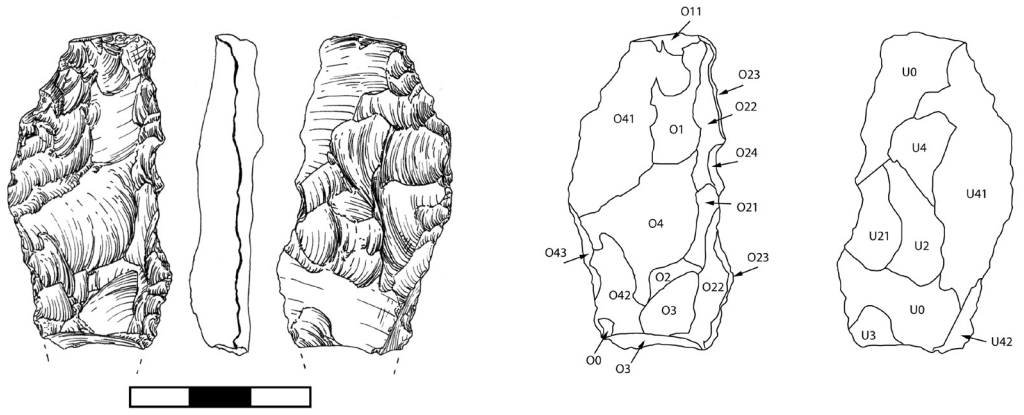


Fig.15-6 Result of the analysis of work steps for a plano-convex backed knife (Level V/3, RMU 4).



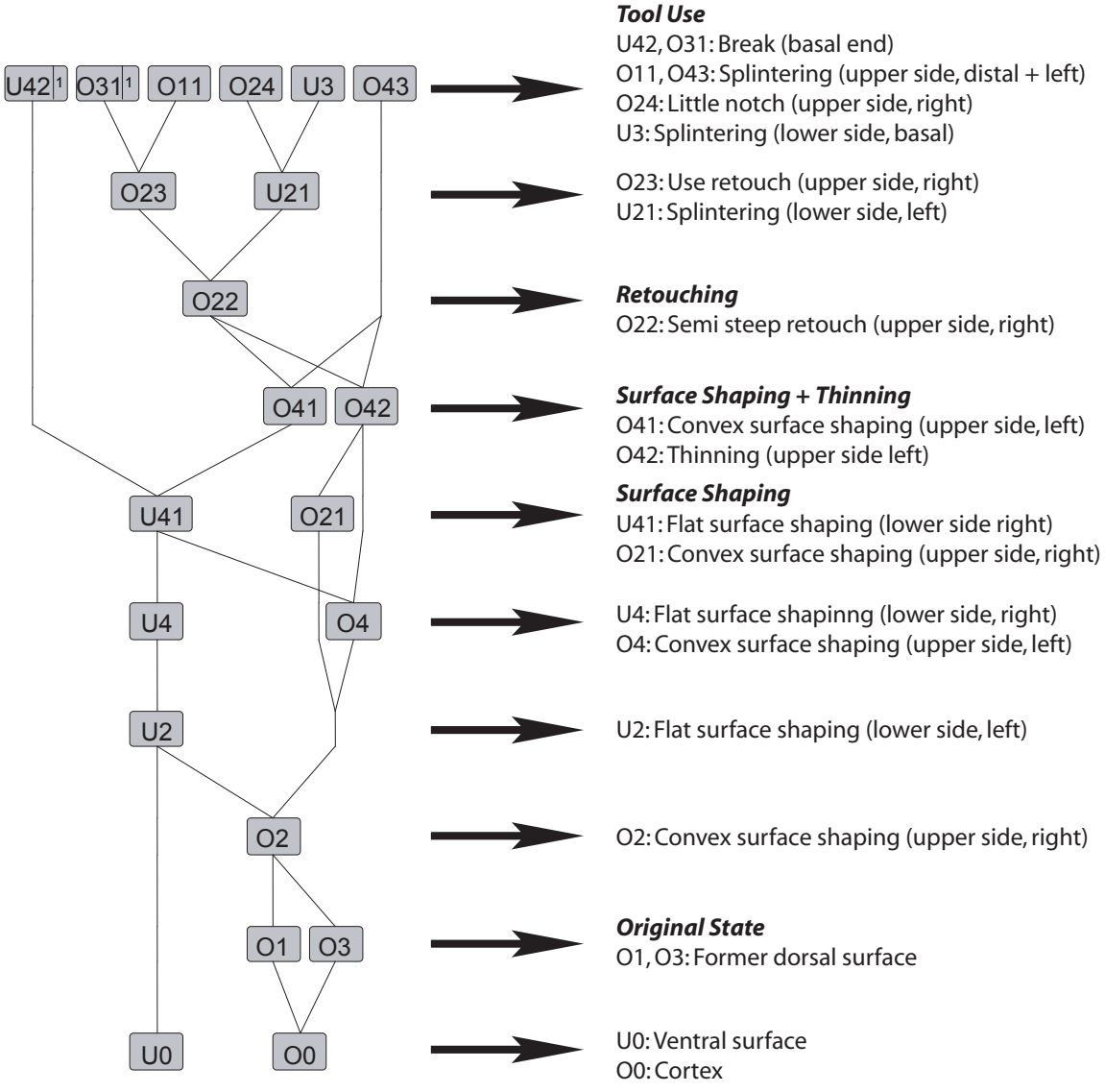


Fig.15-7 Result of the analysis of work steps for a plano-convex bifacial scraper (Level VI/1, RMU 12).

Medial fragment of a bifacial scraper/point from VI/6 RMU 5 (Fig. 15-8)

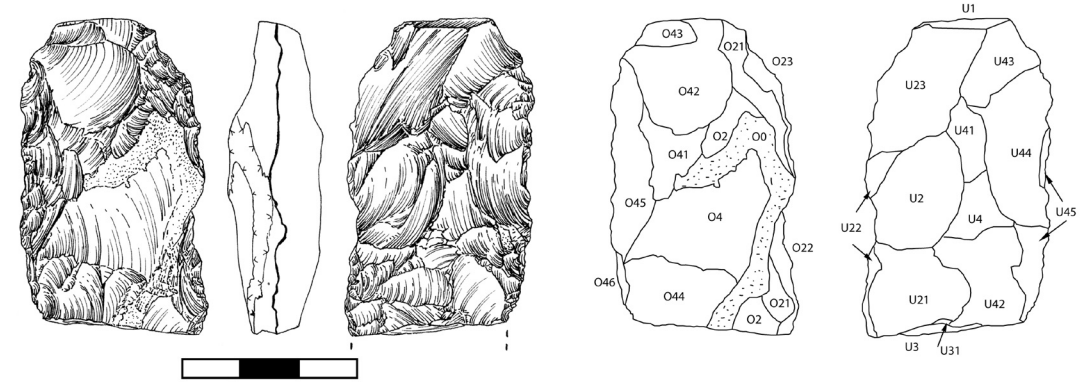
The work steps O0 and U23 define the original state of the piece. The cortical surface (O0) and the ventral surface (U23) show that the blank used for the bifacial production was a flake struck from a plaquette. The first work step in the operational chain was the convex surface shaping of the blank on the upper left side (O4), followed by a further 10 work steps comprising convex surface shaping. These operational steps occurred alternately from the lower and upper side of the piece, which resulted in a biconvex preform. After surface shaping, two operational steps of retouching occurred. The upper right side was semi-steep retouched (O23). This working edge, which seems to be the main one, is still sharp but shows signs of wear. The other work step of edge modification was a Quina retouch of the upper left side of the artefact (O45). This was necessary because the angle between the lower and upper side was too great. After its production, the tool was heavily used. This is documented by several work steps comprising splintering, which can be found on both the upper (O22, O46) and lower sides of the piece (U45, U22). Finally the tip (U1) and the basal part (U3) broke off, whereby splintering observed on the lower side (U31) is connected with the breakage of the proximal end. Although it is unclear whether the two breakages were simultaneous, the fact that there are no signs of a further usage of the tool after one of the breakages makes a simultaneous damage quite plausible. Working steps of rejuvenation/resharpening not being evident. Only the right working edge was reduced by use and further edge retouch. Upon being damaged, the piece was discarded without any attempt at reutilisation.

Leaf shaped point from VI/12 RMU 7 (Fig. 15-9)

The original state of the blank is represented by the work steps U4 (ventral surface) and O2 (remnants of the former dorsal surface): These indicate that a flake was chosen as a blank for the production of the point. The sequence of surface shaping contains 11 work steps of convex and flat surface shaping. These begin with the convex surface shaping of the flake (O4), followed by alternating work steps of flat (U1, U2, U41, U21) and convex surface shaping (O21, O41, O22, O3, O42, O23). The next youngest operational steps to be observed are attributed to the thinning of the tool – laterally (U42) as well as terminally (O26). Temporally very close to these work steps is the modification of the right edge, a semi steep retouch. The operational sequence ends with five work steps which resulted from the usage of the point. This led to an irregular denticulation (U43) and to splintering (U11, U44, O43, O25) on both edges of the point.

Leaf shaped point from VI/13 RMU 9 (Fig. 15-10)

The oldest work step (U0) is attributed to the original state of the tool. The remnant of the ventral surface shows that a flake was used as a blank for the production of the point. The following seven operational steps are all attributed to the surface shaping of the blank. In a first step, the blank was convex surface shaped on the upper side, alternately from the right edge (O2, O21), the basal end (O3) and the left edge (O4, O41). The last work step of convex surface shaping was applied to the distal end of the tool (O1). Temporally very close to this work step is the flat surface shaping of the lower side of the artefact from the right edge (U4). The next three operational steps are attributed to the basal thinning of the tool (U3, O31) and to the first edge modification – a semi steep retouch at the right edge of the upper side (O22). These work steps are followed by those of semi steep retouching of the upper right edge in the terminal area (O24) and by the lateral thinning of the lower, right side (U41). After a period of usage, the upper left edge shows evidences of use retouch (O43) and was resharpened by means of thinning the lower side of this part of the edge (U2). Finally, the usage of the tool led to the breakage of the tip (U1), and in several areas the edges show traces of splintering – both to the upper (O42, O23, O0) and lower sides (U42, U31).



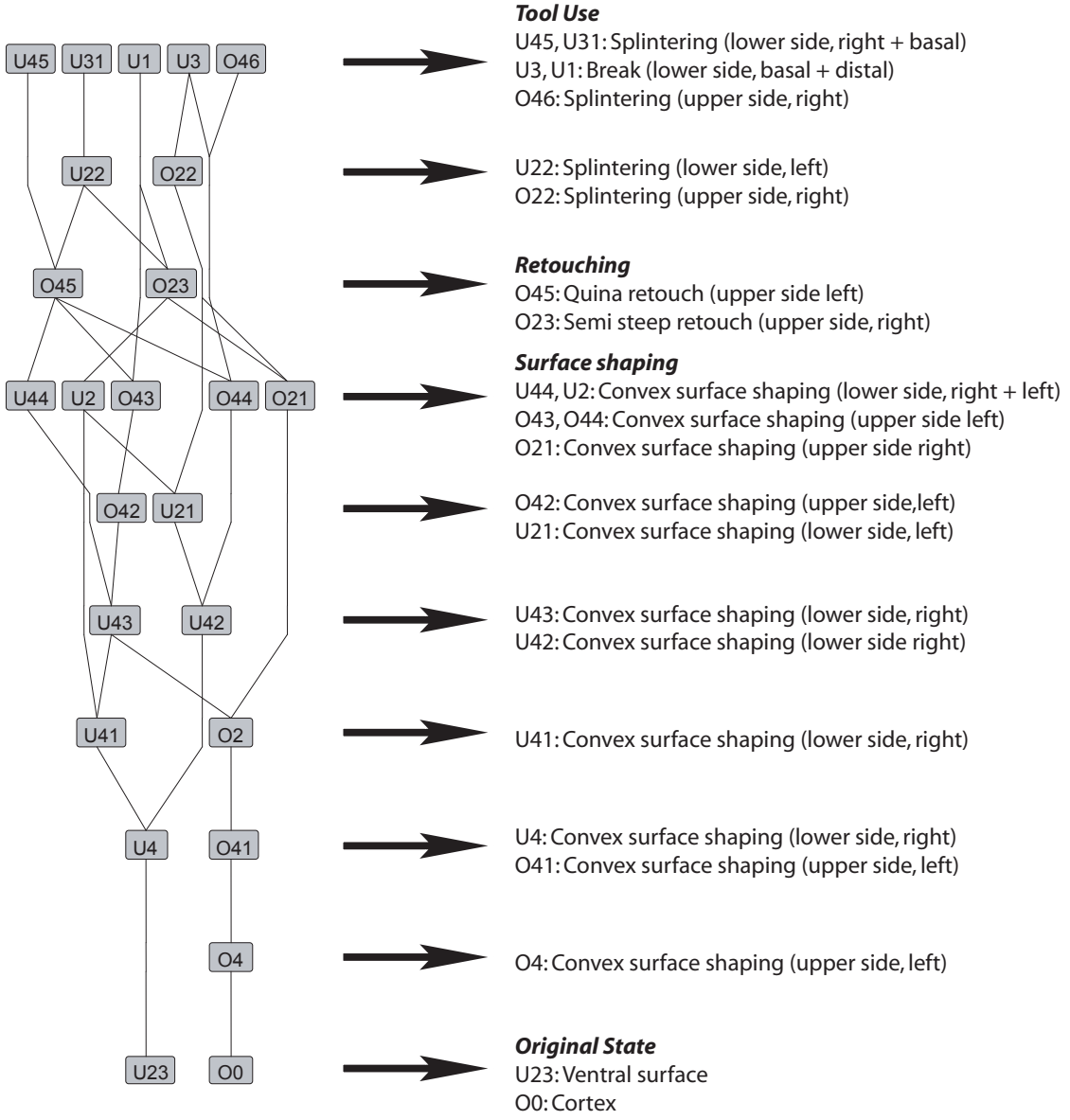


Fig.15-8 Result of the analysis of work steps for a medial fragment of a bi-convex bifacial scraper/point (Level VI/6, RMU 5).

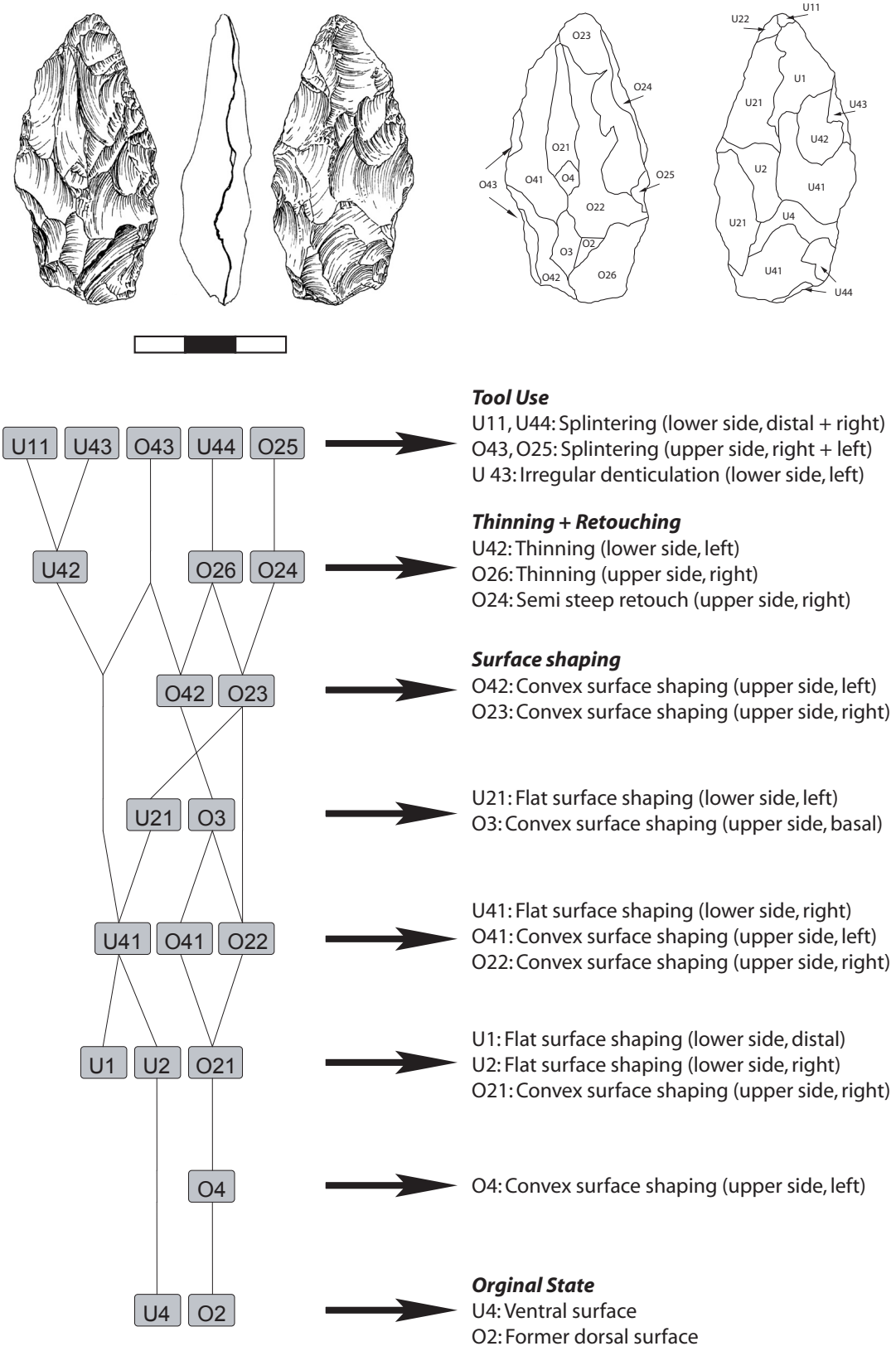
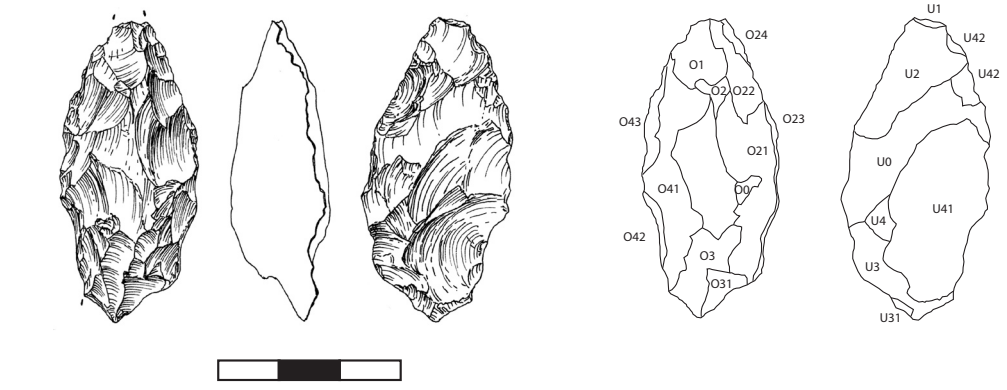


Fig.15-9 Result of the analysis of work steps for a plano-convex leaf shaped point (Level VI/12, RMU 7).



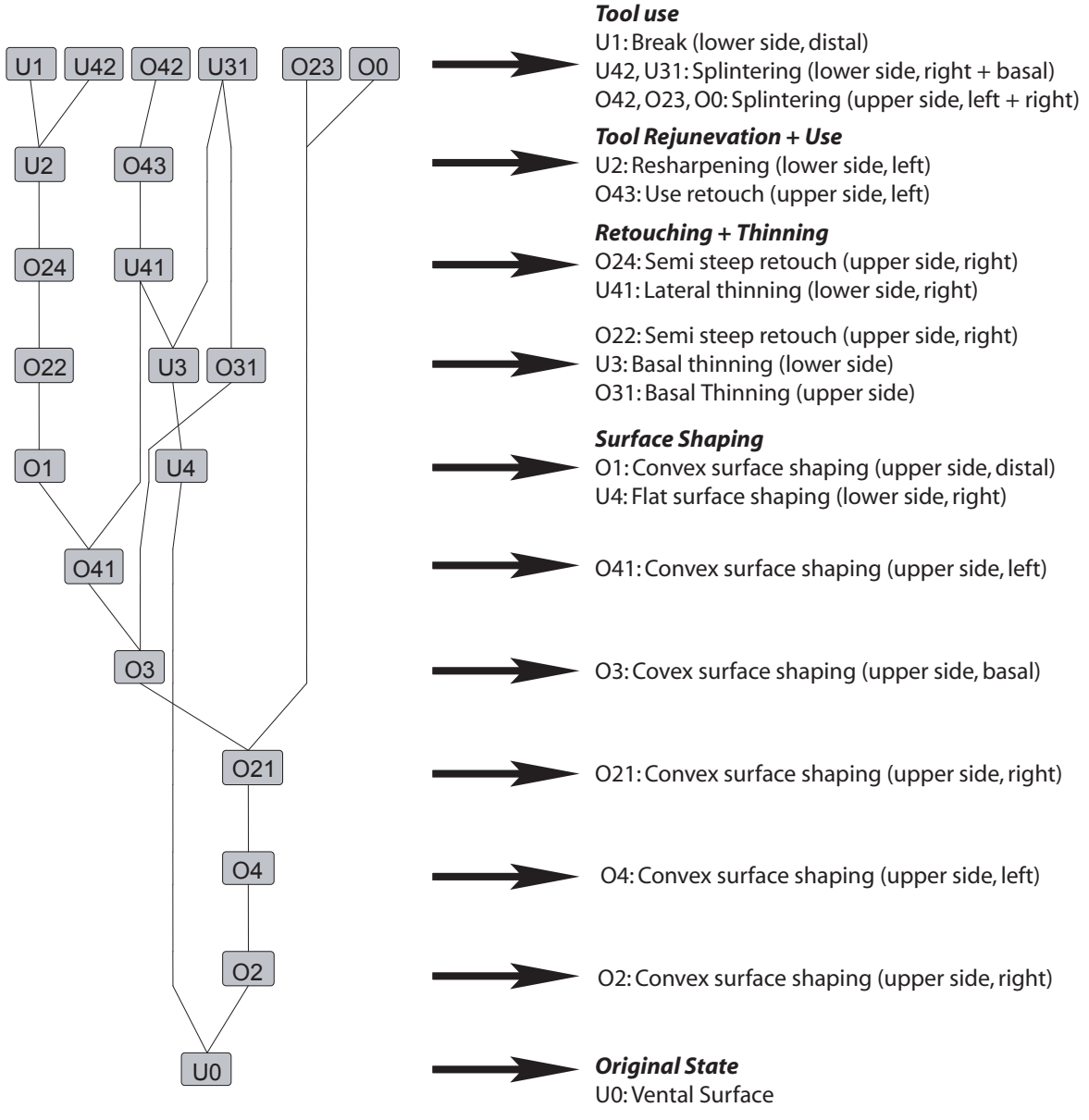


Fig.15-10 Result of the analysis of work steps for a plano-convex leaf shaped point (Level VI/13, RMU 9).

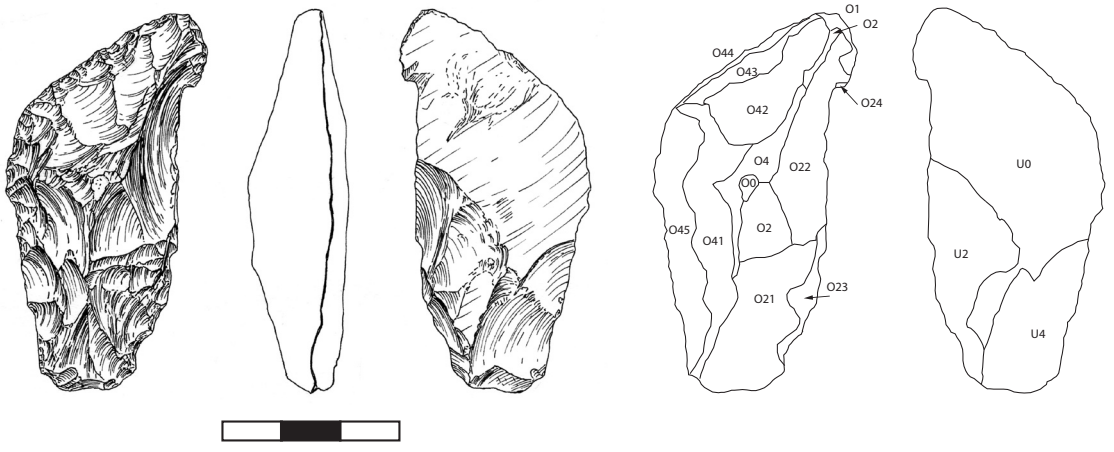
Unifacial surface shaped scraper from VI/13 RMU 19 (Fig. 15-11)

This tool was produced on a flake. The work step O0 indicates that the flake was formally covered with cortex (fully or partially). The following 4 work steps comprised the surface shaping of the upper side of the blank. The first of these work steps was applied from the left side (O4), and was followed by two work steps from the left and right (O41, O2). The fourth and final step came once again from the left side (O42). After the completion of the convex surface shaping, thinning (three work steps) occurred, with one intervening work step of secondary convex surface shaping (O21). Primarily, the tool was thinned at its base on its ventral side. This was achieved in it first being worked from its left (U2) and then right side (U4). After these steps, the artefact was laterally thinned on its convex side (O45). The first visible operational step belonging to an edge modification, was a flat retouching of the upper left edge of the tool (O43), which was followed by two work steps of semi steep retouching of the same edge and of the terminal end (O44, O1). Additionally, the right edge of the artefact also appears to have been retouched, though any evidence of these work steps was fully removed by work step O22, which represents the rejuvenation of the tool by means of lateral resharpening. The two youngest operational steps are attributed to the usage of the tool, which led to a splintering of the right edge (O24, O23).

Production and Reduction of Surface Shaped Tools from Unit V And VI

The conception of the production of surface shaped tools in Unit V - which were all produced in the plano-convex manner – displays no clear characteristics. In many cases, production can be attributed to unsuccessful attempts of surface shaping. This resulted in the edges of the tools being often wavy and splintered. Besides flakes, nodules were also chosen as blanks. The sequences of surface shaping differ between those where alternating work steps of flat and convex surface shaping occur, as is the case of the bifacial point (RMU 2), and sequences where the work steps of convex surface shaping until after the completion of the flat surface shaping (RMU 4) (Fig. 15-12). In some cases the sequence of surface shaping is restricted to the convex side (RMU 3). The differences in these sequences can be explained by the different manner and the degree of reduction of the tools. In the case of the bifacial point (RMU 2), the alternating of flat and convex surface shaping, as shown in the Harris diagram, is a result of secondary surface shaping, which totally removed any evidence of intervening work steps of edge retouch. The tool formed by the reduction process, which affects predominantly the width of the tool and not its length, is a rather narrow leaf shape point. In most of cases, the final edge modification (one or two working edges) of the tools is a semi steep retouch of the upper convex side. In the case of the unifacial surface shaped tool of RMU 3, a retouching on the lower side of the tool was conducted after the tip of the artefact had broken off. One extreme example of reduction and recycling is a backed knife (V/3 RMU 4), which was produced from a bifacial fragment. After the thinning of this fragment, two opposing working edges were retouched. In sum, the degree of reduction, fragmentation and recycling of the surface shaped tools of Unit V is rather high.

The production of surface shaped tools in Unit VI is more homogeneous, with a focus on leaf shape scrapers/points. In most cases, flakes were used as blanks. The surface shaping is sometimes limited to work steps comprising convex surface shaping (VI/13 RMU 9, VI/13 RMU 19). Operational steps of thinning of the lower side, and secondary edge retouching of the convex side lead to a reduction in width (VI 13 RMU 9). The examples VI/1 RMU 12 and VI/12 RMU 7 show alternating work steps of flat/convex surface shaping. In these cases, work steps of flat surface shaping (instead of thinning), with a following secondary edge retouch, lead to a reduction of the tools. One tool – a bifacial scraper (VI/6 RMU 5) - is the only bifacial tool which was produced in a convex/convex manner. As a blank for the production, a small flat nodule was chosen which was then convex surface shaped on both sides. A small preform (Chapter 6, Fig. 6-16, 3), also from this level (VI/6 RMU 15), shows the early stage of this method of bifacial production: The treatment of a small elongated nodule began on the narrow "ends" with a preparation on the end of the upper side, and a further preparation on the opposing end on the lower side. The following surface shaping of the preform occurred alternating in a convex manner. This resulted in a bi-convex cross section of the tool with s-shaped edges (VI/6 RMU 5). This



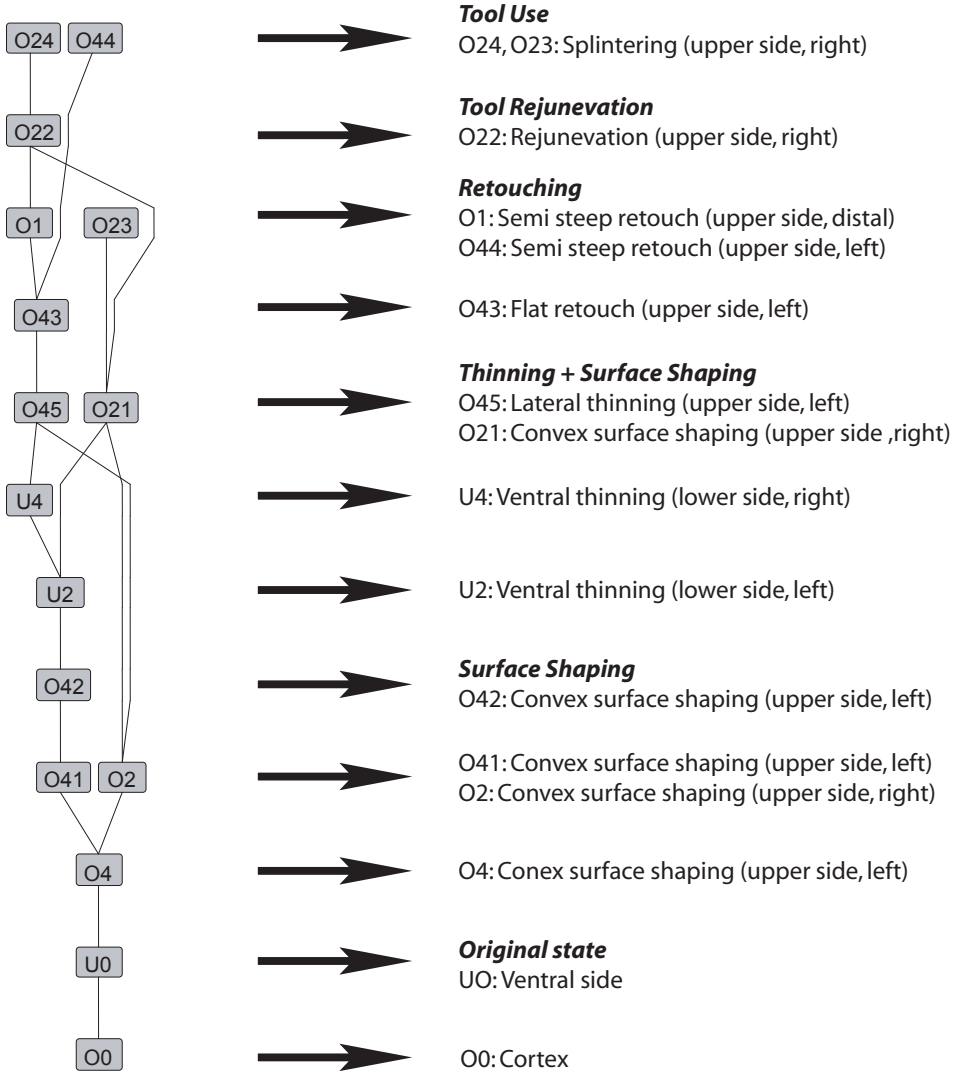


Fig.15-11 Result of the analysis of work steps for a unifacial surface shaped scraper (Level VI/13, RMU 19).

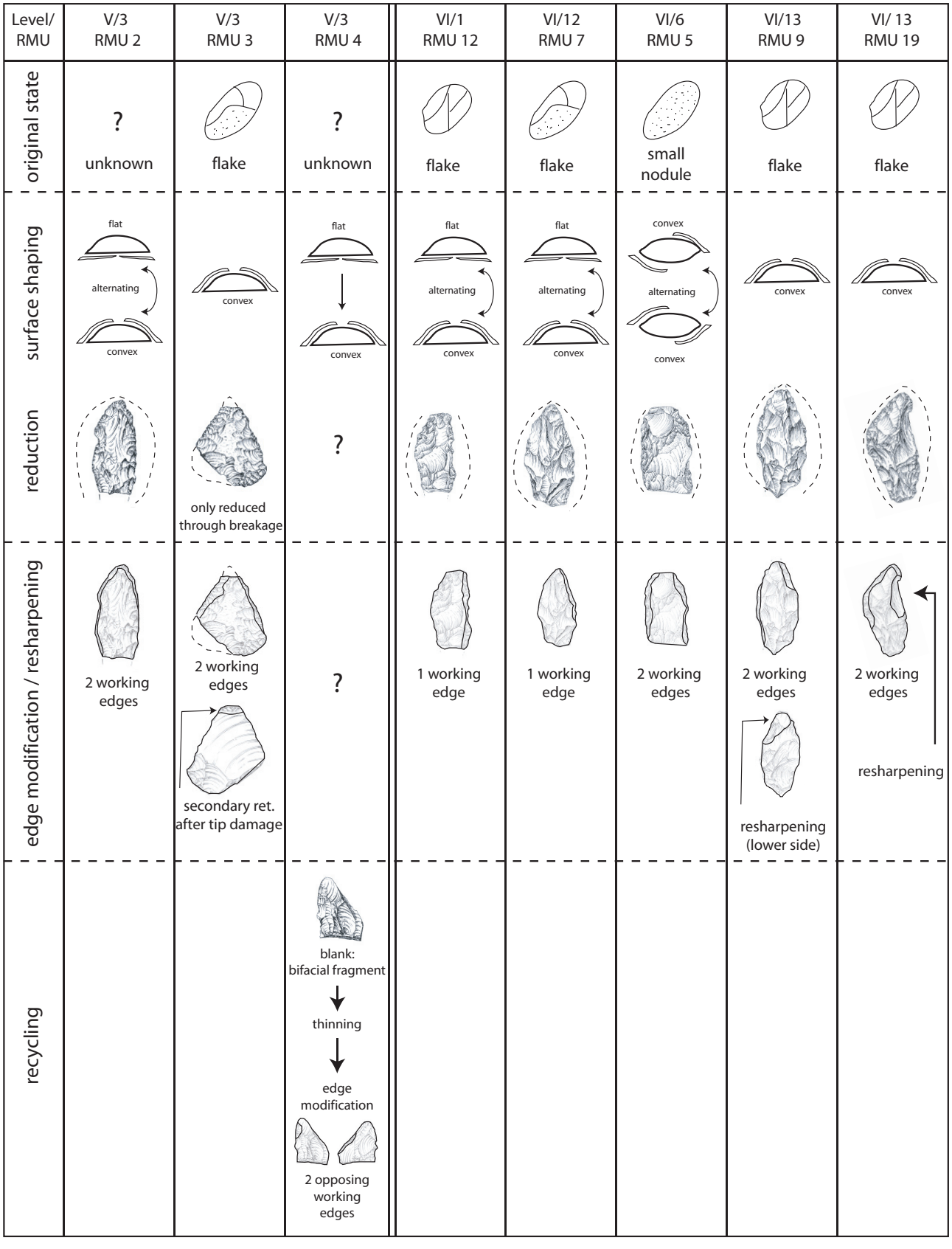


Fig.15-12 Surface shaped tools of Unit V and VI. Production and reduction sequences.

concept of bifacial production, which only occurs in level VI/6, show similarities with the "wechselseitig-gleichgerichteten" method of surface shaping which is well known from inventories of the Western Micoquian. In the assemblages of the Crimean Micoquian, this bi-convex treatment, which also occurs in Kabazi V (Yevtushenko, 1998), is rather rare.

Abstract

КАБАЗИ II, КУЛЬТУРНО-ХРОНОЛОГИЧЕСКИЕ СЛОИ V И VI: ПОСЛЕДОВАТЕЛЬНОСТЬ ОПЕРАЦИЙ ПО ИЗГОТОВЛЕНИЮ ДВУСТОРОННИХ ОРУДИЙ

М. КУРБЮН

Восемь двусторонних орудий было отобрано из коллекций V и VI культурно-хронологических слоев для анализа этапов их изготовления *"work step analysis"*. Этот метод призван описать все изменения морфологии орудий, которые произошли в ходе утилизации, для того, чтобы реконструировать цепь операций по их оформлению, переоформлению и реутилизации. Концепция производства двусторонних орудий V культурно-хронологического слоя – необычна. Во многих случаях попытки снятий с поверхностей орудий были неудачными, что приводило к получению волнистых по форме рабочих лезвий с многочисленными заломами. При этом каждое лезвие изготовлено в плоско-выпуклой манере. Такой характер обработки приводил к получению узких, массивных и относительно длинных листовидных форм.

Двусторонние скребла и острия VI культурно-хронологического слоя изготовлены на отщепах. Основным типом обработки являлся двусторонний плоско-выпуклый метод. Только в одном случае отмечено применение двояковыпуклой манеры изготовления двустороннего орудия.