Chaîne-Opératoire Analysis of a Northwest Coast Lithic Assemblage

Angela E. Close
Department of Anthropology
University of Washington
Seattle, WA 98195
aeclose@u.washington.edu

Paper presented at the 69th Annual Meeting of the Society for American Archaeology, April 2004, Montreal

Abstract

The crystalline volcanic rock assemblage is from a late prehistoric (ca. AD 600) site (45-SJ-24) on San Juan Island, Washington. The *chaîne-opératoire* analysis follows the life-histories of artifacts from material procurement to final discard. Unworked pebbles were brought to the site. They had little or no preparation before serving as cores, flaked by hard-hammer direct percussion. Some preferred flakes with cortical backs were used in various ways, resulting in 'scaled pieces'; others were probably used for cutting. Other flakes were minimally retouched by direct percussion into triangles (points). Scaled pieces and triangles occur in different areas of the site.

This paper deals with the analysis of an assemblage of flaked stone from part ("OpD") of a late prehistoric (AD 600) site (English Camp, 45-SJ-24) on San Juan Island, Washington.. Almost all of the assemblage is crystalline volcanic rock, dark grey to black in colour and usually quite coarse-grained. Other raw materials, including chert, quartz, sandstone, granite and slate, occur in very small numbers and are not considered here.

Figure 1 presents a simplified *chaîne opératoire* for the crystalline volcanic rock. The stone-working aspects of the *chaîne* have been analysed in depth and are quite well understood. It still remains, however, to integrate this with aspects of social organization, economy and mobility. There are three mainstages in the *chaîne-opératoire*: raw material procurement, tool-production, and tool-kit management.

Raw Material Procurement

Crystalline volcanic rock was obtained in the form of small pebbles. In the entire assemblage (>5000 artifacts), there is only one piece that exceeds 80 mm in any dimension, so, within the context of English Camp, OpD, an artifact 50 mm long seems quite large. There are two clear varieties of pebbles: one variety has a smooth, evenly convex exterior surface, while the other is less smooth and is uneven, sometimes lumpy. This makes it likely that the pebbles were brought in from (at least) two different sources.

The locations of the sources are not known. However, since the sources are not on San Juan Island itself (J. K. Stein, pers. comm.), knowledge of their locations is not necessary. Wherever the sources, the pebbles of crystalline volcanic rock must have been transported to the island by boat. By A.D. 600, substantial canoes were part of the technological repertoire of the coastal peoples. It is thus likely that the largest parts of the cost of transporting the pebbles were throwing them into the canoe at the source and then throwing them out again at English Camp. That is, transportation-costs were very low.

Tool Production

Creation of Blanks

The pebbles were brought in with (very little or) no preparation, and all phases of the creation of blanks took place at English Camp.

Since the assemblage includes very few pebbles that are too small to have been cores, there must have been some selection for size and the source(s). At English Camp, there were also preferred orientations of the pebble-cores: the evenly convex pebbles tended to be oriented so that flaking would occur in the direction of the maximal dimension, and the uneven pebbles were oriented to that one of the flatter faces served as either the platform or the flaking-surface (or one flatter face for each, if possible).

A first flake (with a cortical platform and completely cortical dorsal face) was then removed from the pebble. On the evenly smooth pebbles, this was usually a quite thick, decapitation flake, removing one end of the pebble (perpendicular to the maximal dimension) and thus creating the platform. On the uneven pebbles, the first flake was a thinner flake that removed one side of the pebble; that side then became the flaking-surface, adjacent to a cortical striking-platform.

In the assemblage as a whole and in addition to the unavoidable first flake, there is approximately one primary or secondary flake per core. Since it is probable that the assemblage represents the output of more cores than were found (see below), the average number of "core-

preparation flakes" per core is unlikely to be more than two. Thus, there was only minimal preparation of the pebbles before entering into the main phase of flake-production.

Flakes were removed primarily from single-platform, opposed-platform and wedge-shaped cores (Figure 2). The flaking-technique was direct percussion with a hard hammer (this is, after all, crystalline volcanic rock).

Throughout the life of each core, there was a strong preference for cortical platforms (Figure 2: a-c). This meant that core-platforms were very rarely rejuvenated (a difficult process anyway on small cores). Such platform-rejuvenation as occurred involved no more than the trimming of an edge of the platform: the assemblage does not include core-tablets. However, when a core-platform became unusable for any reason, the knapper was more likely to rotate the core and begin again with a fresh, cortical platform than to attempt rejuvenation.

In the assemblage as a whole, there are about forty crystalline volcanic rock flakes per core (plus chips). Given the small size of the original pebbles and the nature of the cores themselves, this is an improbably high figure. Therefore, either some crystalline volcanic rock was brought in the form of flakes, or some of the cores used at the site are missing, or both.

When stone is imported into a site in the form of flakes, it is because the stone comes from a great distance (thus incurring significant transportation-costs), or because the flakes have some property (such as large size, or particularities of the stone itself) not to be found in more local raw materials. None of these is true of the crystalline volcanic rock flakes at OpD: as stone, they are indistinguishable from the cores, and none is too large to have been struck from the cores present in the site. Thus, some of the cores used at the site are missing. Given the small size of the initial pebbles and, consequently, of the cores, it is unlikely that partially exploited cores were taken away from English Camp for use elsewhere. It is much more likely that when a core reached the end of the main phase of production and, for whatever reason, acceptable flakes could not longer be obtained, the core was simply smashed on the off-chance that something useful might result.

The smashing of exhausted cores – and some tools – as the final stage of their individual *chaînes opératoires* is widely known in prehistory, and this seems to be where bipolar percussion was most usefully practised. However, artifacts subjected to this technique tend not to remain recognisable. This is probably why there are so few "bipolar flakes" in the assemblage and why I identified so few "bipolar cores" (Figure 3). Even those examples so classified might equally well be seen as regular cores which were reused as scaled or splintered pieces.

Selection of Blanks

The blanks that were selected for additional shaping by retouch can be identified because they are retouched. It is also possible to identify blanks selected for use without retouch when that use was so heavy as to be unmistakable (scaled pieces). Consideration of these two groups indicates that selected blanks tended to be regular in shape, to retain some cortex and to be rather large. In this context, "rather large" means at least 25 mm long (or wide), although, of course, some selected blanks were smaller.

Otherwise, it is difficult to identify blanks likely to have been selected for use, except for one group – that of "naturally backed" flakes. Some 20-30% of all flakes have cortex along one or more edges (lateral, proximal, or distal), the cortex usually being at such a high angle to the dorsal and ventral faces as to form a blunt "back". Naturally backed flakes were an actively desired end-product. Compared with other flakes, they are more standardised in size, they have

much less dorsal cortex (the natural back is an edge, rather than a face), and many more (>90%) have cortical platforms; all of these attributes were sought after by the makers of the assemblage. Some cores were deliberately set up to produce flakes with natural backs. The core shown as Figure 2: b was flaked around the entire perimeter of its cortical platform, until only a very small line of cortex remained on one edge of the core; flaking then ceased. Similarly, the core shown as Figure 2: c (in which the platform is at the base of the drawing) was flaked until the first and last flake-scars intersected, and the core itself resembles a naturally backed flake.

Shaping by Retouch

The assemblage includes some mundane types of retouched flake-tools, such as scrapers and perforators, but most of the pieces that were shaped by retouch are triangles, or points. In plan, they tend to be triangular (that is, three-sided); almost all of the edges are straight to convex (very rarely concave); they are usually quite symmetrical; and some are pointed and some are not (Figure 4).

At least most of them are made on flakes (the type of blank could not be determined for all). Only one triangle is >50 mm long, so producing the blanks for triangles was well within the capabilities of the knappers at OpD, and there is no reason to think that the blanks were struck anywhere else. The "pointed" end of the triangle is usually at the proximal end of the flake, which would be the thickest and strongest part (Figure 4, in which the locations of the proximal ends could not be identified for the first three triangles). However, this is not always the case, and some triangles are even made on side-struck flakes (Figure 5: a, d). Correspondingly, the base of the triangle is usually the feathered, distal end of the flake, where the dorsal and ventral surfaces converge to form a "naturally" thinned base.

Most of the triangles have bifacial retouch along both edges. I use the term "edges", rather than "faces", advisedly, since the retouch tends not to be very extensive (Figure 5). Of the 63 triangles that were not too fragmentary for analysis, only seven had bifacial, covering retouch (hence my ability to identify the blanks as flakes). Some of the retouch is flat and invasive, but more often it is semi-flat to semi-abrupt, and even abrupt. The negative bulbs on the retouch-scars are quite pronounced, and in some particularly obdurate cases, there are cascades of hinge-fractures (Figure 5: d, e). Overall, there are strong indications for retouching by direct percussion, and fewer indications of probable pressure-flaking.

Tool-Kit Management

Tool-Use

It is axiomatic that some of the flaked stone artifacts were used for something. However, crystalline volcanic rock is a poor candidate for high-power, microscopic, use-wear analysis, so the actual uses remain mysterious.

Some effort was expended upon the manufacture of triangles, so, presumably, they were intended for a purpose. Artifacts like these are usually referred to as "points", with the implication that they served as projectile-points – sometimes, specifically, as arrow-heads. This is entirely possible – some of them are sharply pointed (Figure 4). However, others are not sharply pointed (Figure 5: a), some are unpromisingly thick and irregular in cross-section (Figure 5: d), and others clearly broke during manufacture (Figure 5: b, c). In fact, it is likely that most of

them broke, or were abandoned, during manufacture, and it may be this which is reflected in their apparent unsuitableness to serve as projectile-points.

The most heavily used tools are the scaled pieces, or splintered pieces (*pièces esquillées*) (Figure 6). These were not shaped by retouch, but became scaled in the process of being used. Most of them are flakes and most are scaled on one edge or end, or on two opposed edges or ends. Almost all of the scaling or splintering is bifacial. More than half of the scaled pieces have one or more naturally backed edges (Figure 6: a, d, e). These are not bipolar cores: they show a pattern of repetitive removals of pieces much too small to have been of use and from angles far in excess of 90°. In general, the scaled pieces were involved in the application of considerable force to materials that were hard, or tough, or both. What materials were being worked, how and why remain unknown, but the planned (for summer 2004) attempt to extract residues may cast some light on this.

As noted above, naturally backed flakes (flakes with cortical backs) were a desired product and some cores were set up in such a way as to maximise production of these flakes. They occur in a variety of forms, from fine bladelets (Figure 7: g, h) to classic orange-segments (Figure 7: e). Overall, they tend to be quite substantial flakes with a cortical back on one edge, which is opposite a thin, sharp edge (Figure 7). They are very rarely retouched; the illustrated piece with a truncated base (Figure 7: h) is exceptional. Bordes would not have hesitated to call them "naturally backed knives" and he might have been correct. The edge-damage on one illustrated example (Figure 7: b) is consistent with such an interpretation, but, in general, there are no clear indications of how they were used.

Tool-Maintenance

Tool-maintenance may not have been an entirely alien concept to the knappers of OpD, but neither did it play a noticeable role in tool-kit management.

There are triangles (but very few) which appear to have been reworked after an initial manufacturing failure. On both b and c of Figure 5, a major inverse blow to thin the tip (the proximal end of the blank) left a hinge-fracture about a third of the way down. One of these (Figure 5: c) was then abandoned, but, on the other, an attempt was made to reshape the tip (Figure 5: b). Since the tip broke yet again, this attempt may be regarded as a failure. On the triangle shown as Figure 5: f, a tip of the triangle was carefully pointed (the left basal angle in the main view), but the triangle was then reoriented and another point was made on a second angle; the second point broke. Examples such as these do involve the remaking of triangles; however, since they probably never got into actual use, this is not, strictly, "maintenance" of tools.

It is logically not possible to <u>maintain</u> a tool if the working-edge is not shaped by retouch. The working-edge may be reshaped by retouch, but doing so transforms it into another type of tool. Thus, neither the scaled pieces nor the naturally backed flakes could be maintained. In the case of the scaled pieces, they were either abandoned, or rotated to bring another edge into use (Figure 6: b), or continued to be battered until they fell apart (Figure 6: f) or until there was no longer a serviceable edge (this is probably the case for Figure 6: e). The naturally backed flakes were used until they were no longer appropriate for the task (which, whatever it might have been, did not result in obvious damage) and then they were discarded – and presumably replaced by another naturally backed flake.

Discard

The immediate impression is that tools were discarded throughout the site with no apparent pattern. Further investigation shows this to be essentially true, but excavation of OpD did not involve the opening of large horizontal areas, which makes patterning less likely to be detected.

There are perhaps two patterns of discard. The first is that the triangles tend to occur in the same areas as does the biface-related debitage. This indicates either that these areas are where triangles were shaped, or that triangles (including numbers of manufacturing failures) and their associated by-products were dumped in these areas. The second, less robust pattern is that scaled pieces are concentrated in areas where the triangles are not.

The latter pattern means that triangles and scaled pieces may have shared the same *chaîne opératoire* through raw material procurement and the creation of blanks (Figure 1), but thereafter, the two groups of tools follow different and spatially segregated chaînes.

The triangles and the scaled pieces are completely separate in shaping, in use and even in discard. This strongly suggests that they were the tools of two groups of people who were socially defined as different from each other. It is obvious and simplistic to suggest that they were the tools of women, on the one hand, and men on the other. The ethnohistorical records may shed additional light on this.

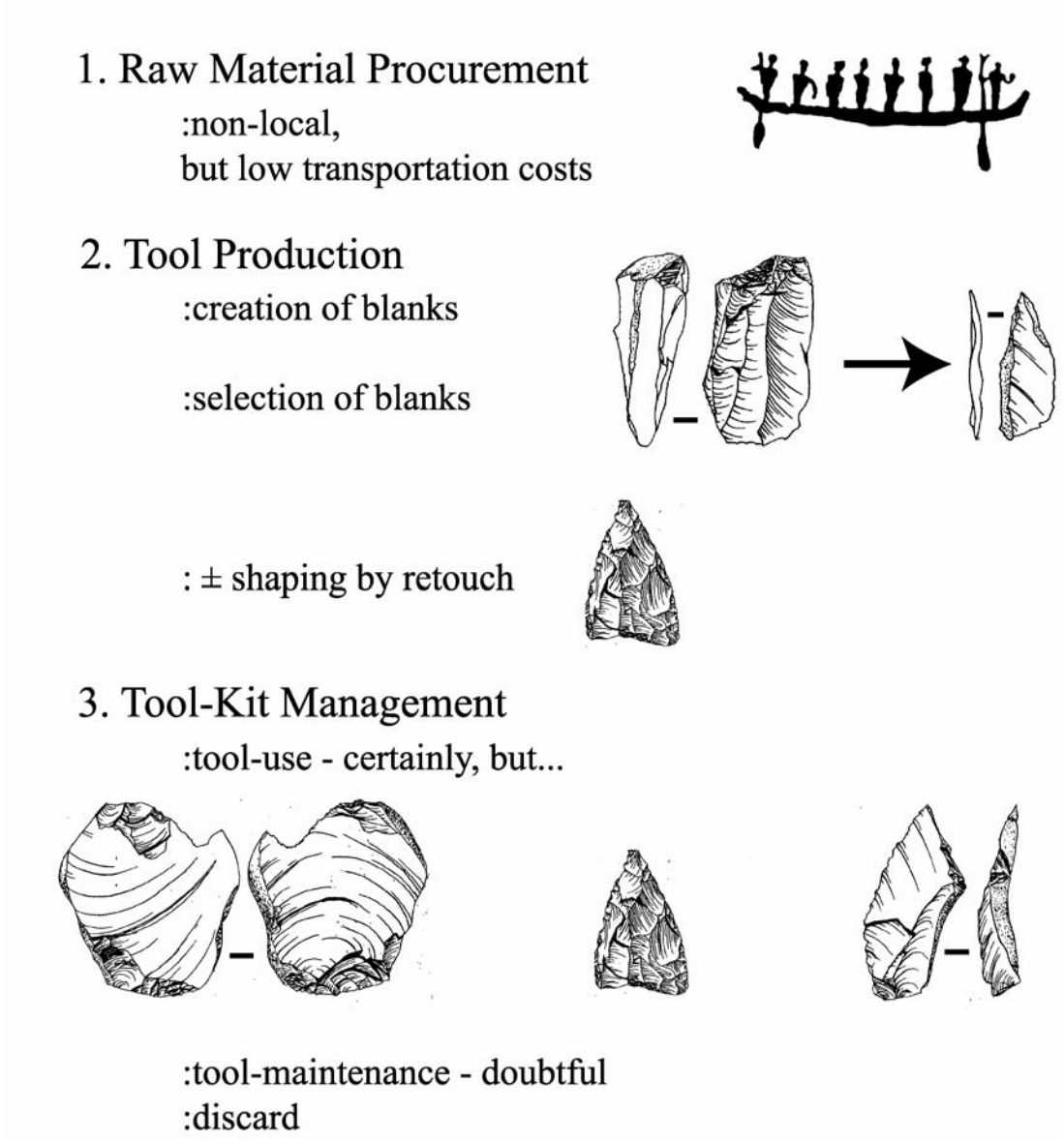

Figure 1. A simple *chaîne-opératoire* for the assemblage of crystalline volcanic rock from OpD, English Camp

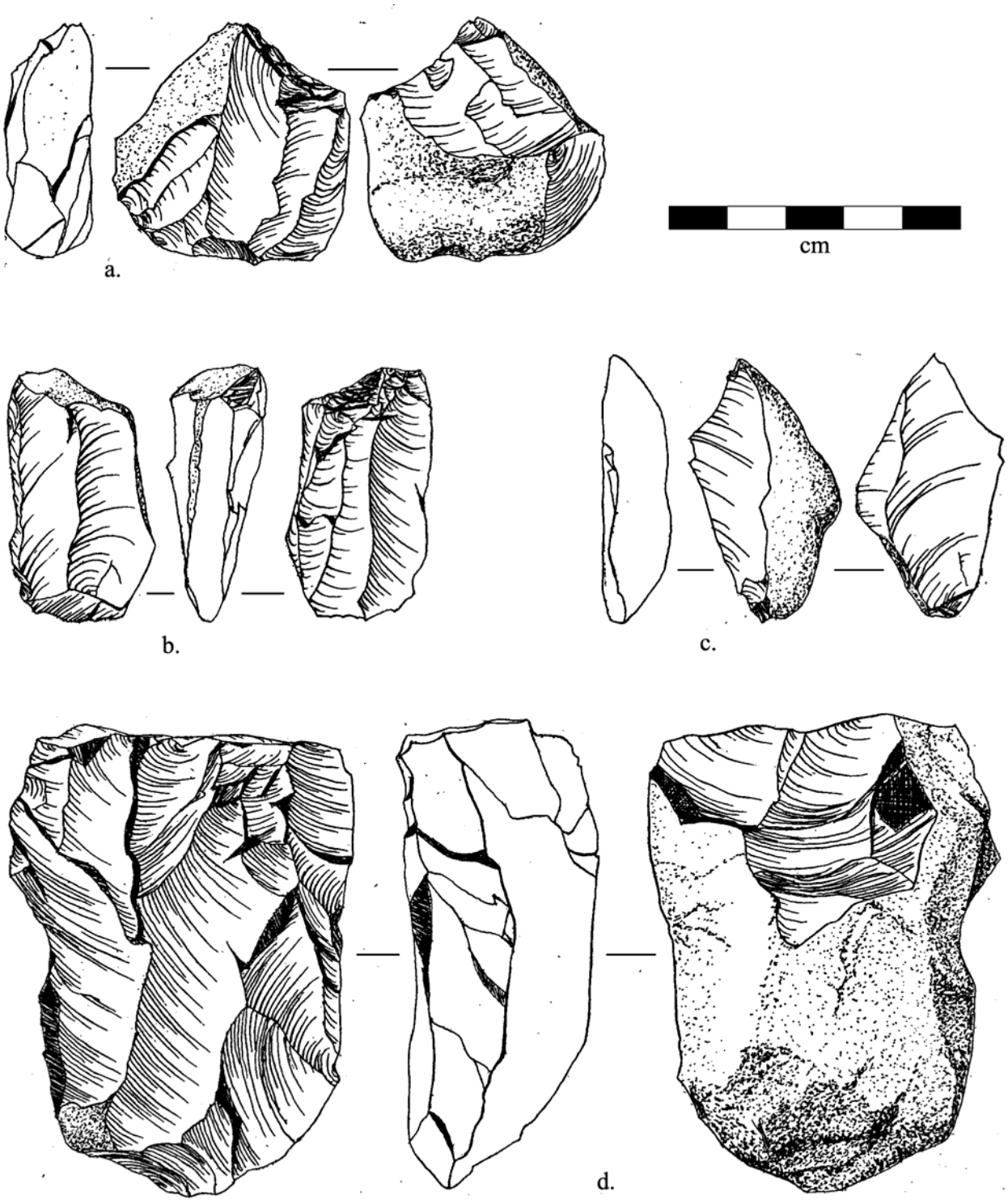

Figure 2. Cores from OpD, English Camp. a, Wedge-shaped core; b, opposed-plaform core; c, single-platform core (note: the striking-platform is at the base of the drawing); d, ninety-degree core.

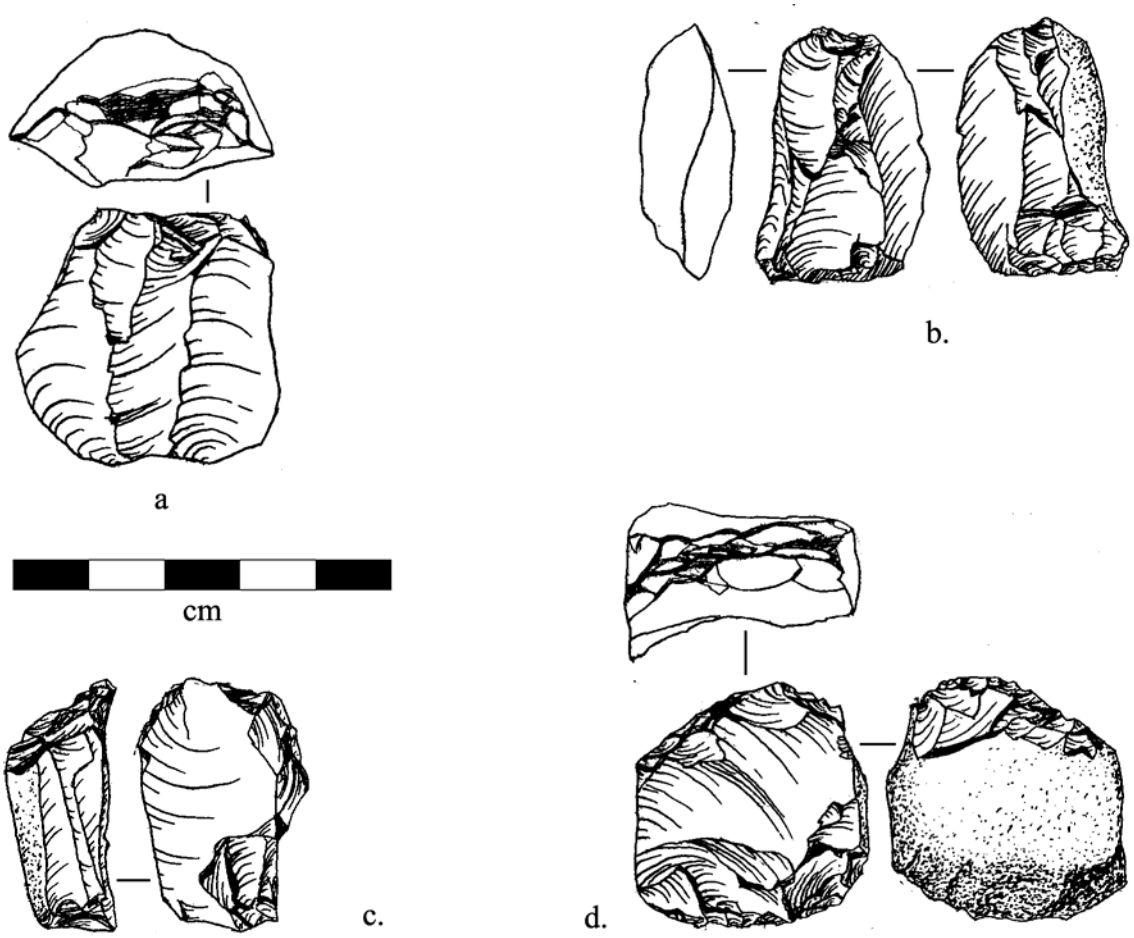

Figure 3. Possible bipolar cores from OpD, English Camp (or regular cores reused as scaled pieces).

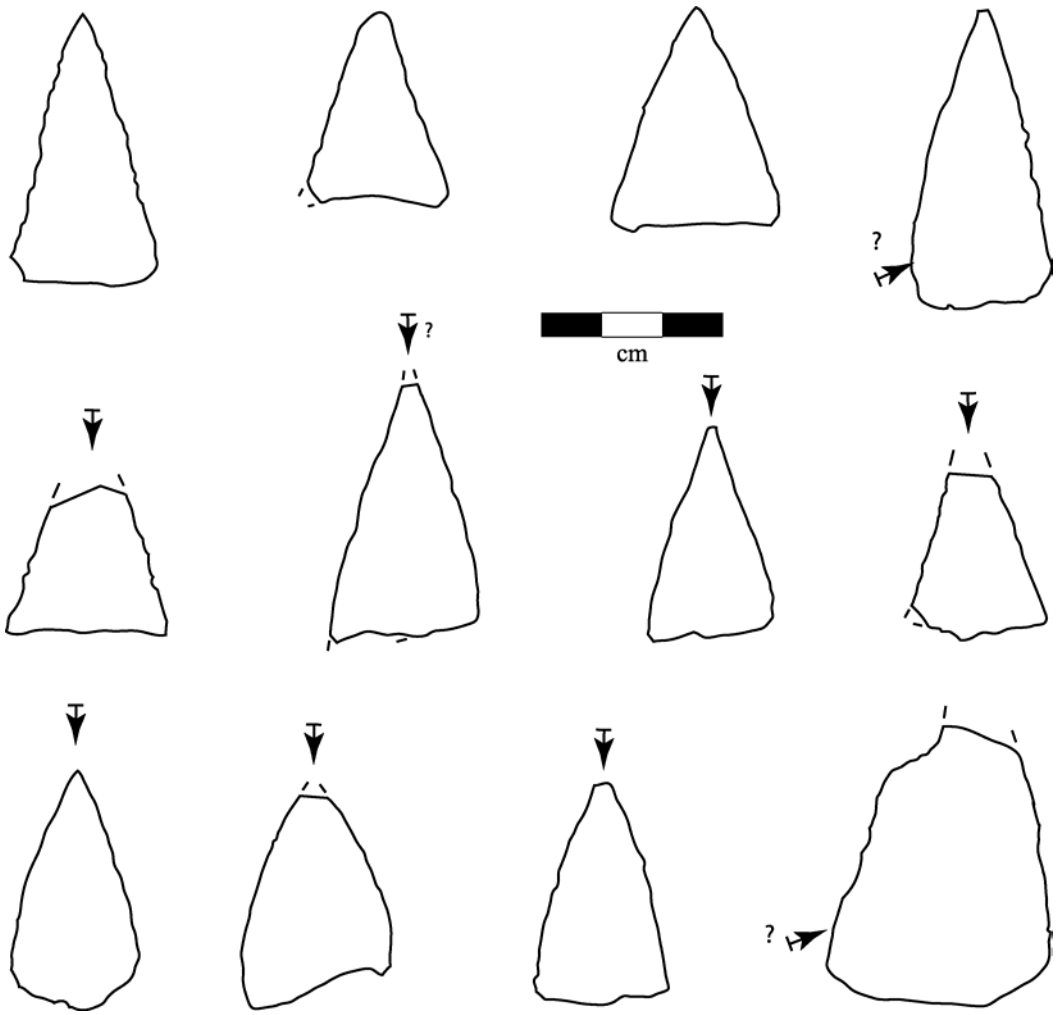

Figure 4. Outlines of some triangles (points) from OpD, English Camp.

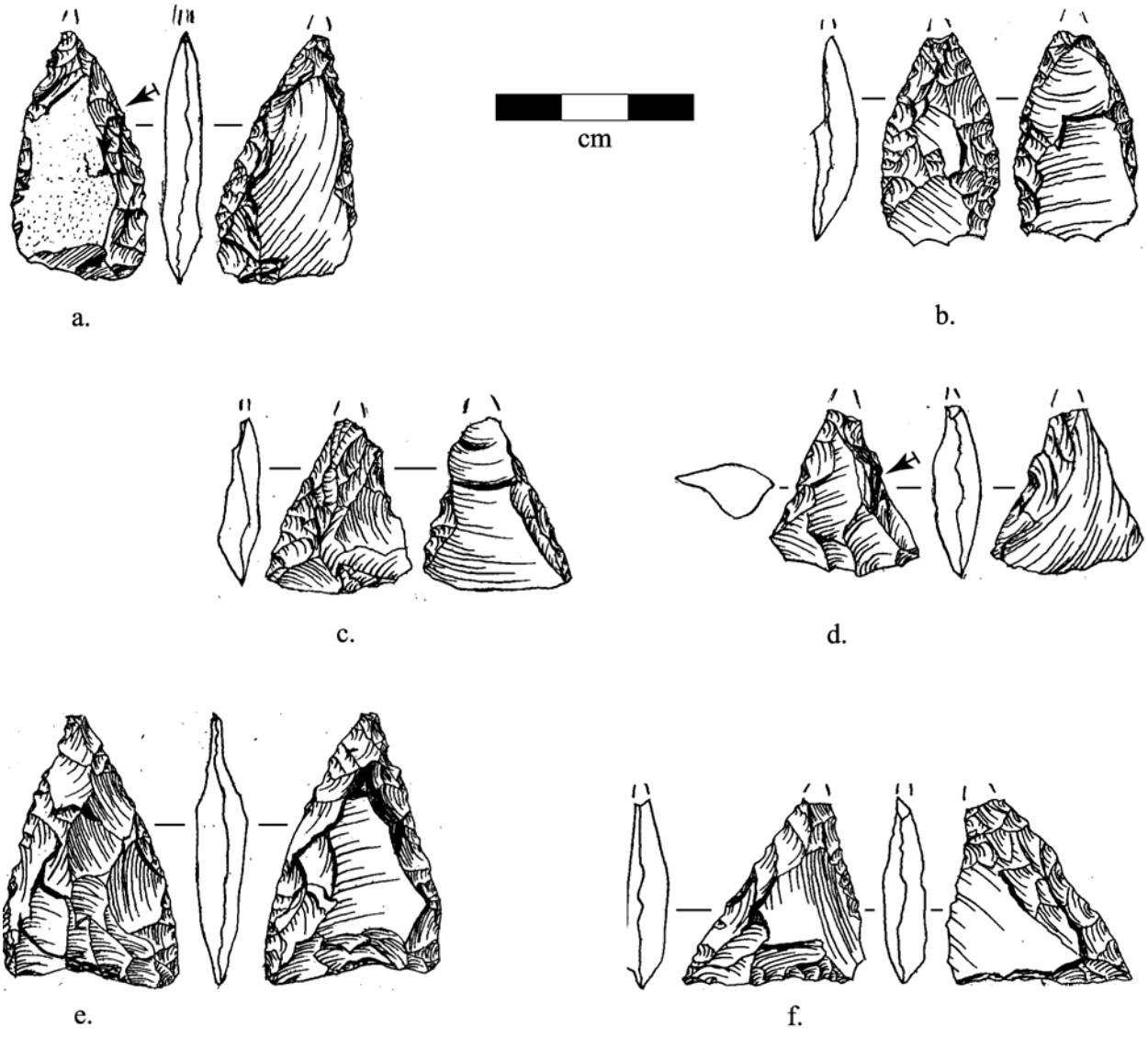

Figure 5. Triangles from OpD, English Camp.

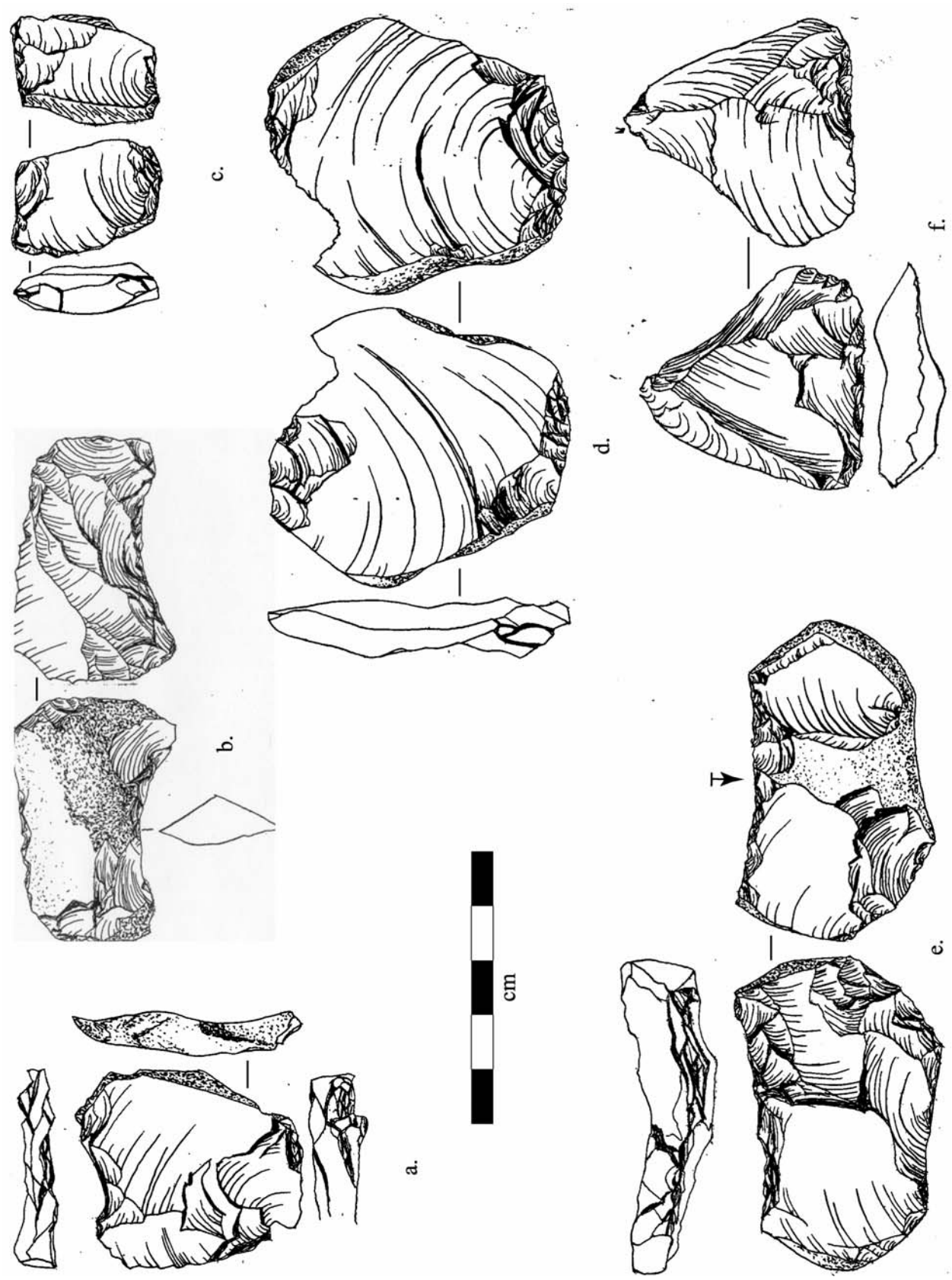

Figure 6. Scaled pieces from OpD, English Camp.

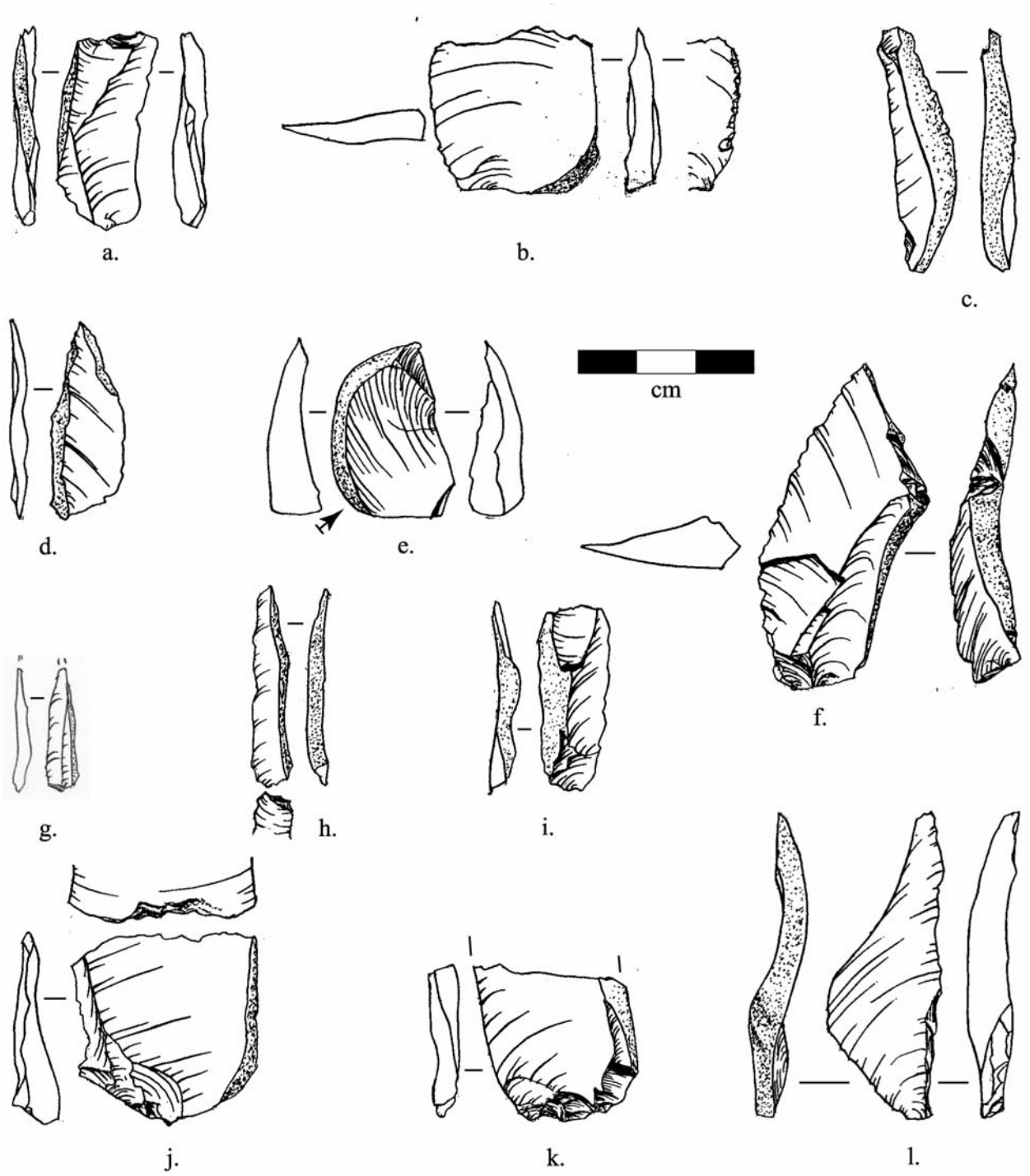

Figure 7. Flakes with cortical backs ("naturally backed") from OpD, English Camp.