VI. A STUDY OF WEAR PATTERNS ON HAFTED AND UNHAFTED BIFACES FROM TWO NEVADA CAVES

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INTRODUCTION

The purpose of this brief paper is to present the results of a study of use-wear evidence on several hafted and unhafted chipped stone bifaces recovered from Nevada caves. Since no alteration of the stone has occurred in these pieces, they are ideal study examples.[1] They still retain organic residues which, when analyzed, may indicate the substance with which they were in contact. The specimens were obtained during excavations at two cave sites in the Humboldt basin of west-central Nevada. One hafted biface was found in 1912 by Loud at Lovelock Cave, and a brief description of it was published by Loud (Loud and Harrington, 1929:108, Pl. 55,b). During the investigations at nearby Humboldt Cave in 1936, Heizer and Krieger (1956:30, Pl. 15) discovered three hafted bifaces and two associated unhafted bifaces in a cache. All of these specimens are now in the collections of the Lowie Museum of Anthropology, Berkeley.

Both Loud and Heizer and Krieger described these artifacts as "knives". However, since no obvious superficial wear was apparent, it seemed desirable to subject the specimens to microscopic analysis in the hope of ascertaining their original function.

METHODS

All six artifacts were carefully examined, following analytical techniques suggested by Semenov (1964) and MacDonald and Sanger (1968). The primary tool employed was a binocular microscope, with magnification powers up to 75X. Initial microscopic examinations revealed the presence of various residues adhering to the bodies and lateral edges of all of the bifaces. In order not to alter these residues, it was decided not to opaque the study surfaces with any solutions, such as silver nitrate, methyl violet or India ink (see Semenov, 1964:24-26; Mirambell S., 1964:9).

RESULTS

The observations recorded during the study are presented here. Some additional descriptive data are also provided.

Specimen 1-19219 (Lovelock Cave; Fig. 1,d). Loud (Loud and Harrington, 1929:108) described this specimen as follows:

> ". . .a knife made of a material which, if obsidian, is of an unusually opaque quality. It is bound with sinew to a handle of wood. The dimensions of the knife blade are 80 mm. in length, 36 mm. in width and 11 mm. in thickness."

The material from which the biface is fashioned is a black flint. The wooden haft is 73 mm. in length, with a maximum diamter of 17 mm. It is polished, and the proximal end of the haft is pointed.[2] Overall weight of the specimen is 63 grams. The artifact was found in association with the skeletal remains of several individuals (Loud's Lot 32; see Loud and Harrington, 1929:172, 181). Other artifacts with the burial included basketry fragments, clay balls, and a large unhafted biface.[3]

The hafted biface has light dulling along both lateral edges. The protrusions (the convex projections along the sinuous lateral edge) along the edges show the most wear, in the form of dulling and blunting; a slight glossy sheen is also apparent. The heaviest dulling, with an accompanying slight crushed effect, is evident in the concavities between the protrusions. On both sides, there is heavy dulling on the areas of the edge near the haft (for approximately 14 mm. above the haft on one edge and 12 mm. above it on the other). Nibbling is present on a portion of one edge.[4]

Striations resulting from use (see Semenov, 1964; Wilmsen, 1968) were observed on one face near one lateral edge. One area (see Fig. 2,a) consists of light striations running almost perpendicular to the edge. The second area has a number of striations in a group parallel to the lateral edge (Fig. 2,b).

Specimens 1-42793, 1-42794, 1-42795 (Humboldt Cave; Fig. 1, a-c). These are three hafted specimens found in Cache 10 at Humboldt Cave. In each instance, a chipped stone biface has been set into a notch cut into a solid wooden haft; the bifaces are secured with resin (probably piñon pitch), and sinew is bound around the haft below the base of the biface. For a detailed description of these specimens, see Heizer and Krieger (1956:30). The dimensions of each artifact are presented in Table 1.

All exhibit very similar wear patterns. The lateral edges have only very light dulling, with the protrusions along the edges blunted and more heavily dulled. Specimen 1-42793 has heavy dulling on the lower 1/3 of one lateral edge, as well as heavy dulling, nibbling, and crushing near the distal tip on the same edge. The opposite lateral edge has heavy dulling for 17 mm. above the base. Specimen 1-42794 has a heavily dulled area, with the protrusions blunted, near the base on one edge. Wear patterns are much the same on specimen 1-42795. At the tip of that specimen there are two proximally-directed fractures (neither over 2 mm. in length; see Fig. 2,d) which under the microscope resemble burins (Epstein, 1963). The tip where these two facets intersect is blunted and dulled.

Specimens 1-42796, 1-42797 (Humboldt Cave, Fig. 2, e,f). These two unhafted bifaces were also found in Cache 10 of Humboldt Cave and described by Heizer and Krieger (1956:30). Dimensions appear in Table 1. Specimen 1-42796 (Fig. 2,f) seems to be the most heavily used of all of the studied

examples. The lateral edges are extensively dulled, with the protrusions almost totally obliterated by blunting. One edge, somewhat less dulled than the other, has one area of very heavy dulling extending for 7 mm., at a point 34 mm. above the basal edge. The basal edge itself has little or no dulling, while the distal tip is blunted, with a light gloss.

Specimen 1-42797 (Fig. 2,e) has a heavily dulled area along one lateral edge near the tip. Both lateral edges are considerably more dulled than their hafted counterparts. The protrusions are blunted and polished; dulling extends into the concave recesses of the edge, and ridges of flake scars near the edge are sometimes dull and glossy. There is some light dulling and blunting along the basal edge. On both lateral edges near the base there are heavily dulled areas.

Specimen 1-42796 must have been used after the accumulation of certain of the residues still adhering to it, for there are two striations incised on one small patch of the soft substance. These striations are about 5 mm. in length (see Fig. 2,c) and run almost perpendicular to the edge. The lateral edge in this area is very heavily dulled.

SUMMARY AND INTERPRETATIONS

The most common form of wear revealed on all of the bifaces was dulling of the lateral edges. This dulling varied from uniform light dulling over the entire edge length to heavy dulling in restricted areas. Striations resulting from use were absent from all but two specimens. Where they occurred, the striations were either parallel or perpendicular to the lateral edge. Protrusions along the lateral edges were generally blunted and polished from wear; on one specimen they had been mostly worn away. The distal tips showed occasional blunting and polishing and one specimen there are two very small burin-like facets. Gloss occurs randomly, usually on the protrusions and in one instance on some flake scar ridges adjacent to a lateral edge. One trait which showed up on most specimens was heavy dulling and crushing on the lateral edges in the vicinity of the base. This type of wear may be the result of the hafting technique employed; perhaps the strongest part of these composite tools was the area of the biface nearest the haft, and thus this area was used for the more demanding tasks, resulting in heavier wear.

Several studies have described the types of stone tool wear which result from various aboriginal activities (Semenov, 1964; Witthoft, 1955, 1967; Frison, 1968; Wilmsen, 1968; Shafer and Hester, 1970). The more detailed studies of Semenov are the most applicable in the present discussion, especially his comments on wear patterns found on upper Paleolithic meat knives (pp. 101-107). The cutting of meat with knives (made on blades) resulted in dulling along the lateral edges of the specimens, as well as striations parallel to the blade edge or slightly inclined toward it. These striations (somewhat reminiscent of those present on the Humboldt basin specimens)

indicated to Semenov (p. 106) "...that the knife was deeply embedded in the material being worked, and operated with a one-way or two-way 'sawing' movement necessary for the cross-cutting of muscular fibre, tendons and sinews". However, he also notes that some "meat knives" have polishing which covers the "...hollows of the facets and could have been formed only if the working part of the tool had encountered resistance from a pliable but elastic mass which made contact at all points on its surface. Such material could only have been the muscles, adhesive tissues and internal organs of an animal's body" (p. 104). This type of extensive polish is absent from the Humboldt basin artifacts.

Witthoft (1955:20) describes wear patterns on knives which he believes were used in hide preparation. This wear takes the form of blunting and smoothing along the edge of the tool, with some nibbling, and "...many fine scratches" on the face of the tool adjacent to the lateral edges. Here again, only a portion of Witthoft's findings are applicable to the specimens under discussion. Smoothing and blunting are present along the edges, but nibbling and striations (fine scratches) are rare.

The extensive dulling of the lateral edges of the Humboldt basin hafted and unhafted bifaces suggests that they functioned as knives. The parallel striations indicate (based on Semenov's data) that these tools could have been used in a "sawing" motion, perhaps in one-way or two-way movements. The perpendicular striations indicate that they also may have been used in a pulling or pushing motion, with the biface horizontal to the holder; a method in which the tool was vertical and used in up or down motions may have also been employed.

Some of the wear characteristics listed by Semenov and Witthoft for meat/hide processing tools are absent from the Humboldt basin specimens. This may indicate that they were not used as knives for these tasks. On the other hand, it is possible that they could have been used for those activities, but certain factors (such as the manner in which they were used) prevented the formation of some of the characteristic wear patterns. Various other uses for chipped stone tools, including wood and bone working, stone-working and various types of abrading all produce wear patterns which are not seen on the Humboldt basin tools, and we can assume that they did not function in any of these capacities (Semenov, 1964; Witthoft, 1955; Wheeler, 1965; Sonnenfeld, 1962). One possible function to which these tools could have been applied was the processing of plant materials found in the lacustrine environment exploited by the aborigines of the Humboldt basin (Napton, 1969). Hopefully, the analysis of the organic residues adhering to these knives will tell us what types of materials were being processed.

In summary, these microscopic studies have revealed dulling and other forms of wear which identify the hafted and unhafted bifaces from Lovelock and Humboldt Caves as knives.[5] Loud and Harrington (1929) and Heizer and Krieger (1956) had previously suggested that these specimens were knives,

but they presented no detailed evidence to support such functional identifications. Similar hafted specimens occur in the Southwest (Morris, 1919; Guernsey and Kidder, 1921; Nusbaum, 1922[6]) and northern Mexico (Aveleyra Arroyo de Anda and others, 1956), and it would be of interest if these artifacts were studied to see what types of wear are present or lacking.

NOTES

[1] Flint artifacts from the surface of open sites may bear surface alterations due to sand blasting or thermal fracture. Wear pattern studies should ideally be carried out with specimens which have been protected since the time they were in use. Pieces from dry caves are best suited for such studies; those from open sites (even though they have been buried) are possibly physically altered through ground-heaving due to alternate wetting and drying or through chemical alteration. Though these latter modifications may be minor, they could nevertheless obscure some of the very slight or barely detectable use-wear evidence.

[2] All of the wooden hafts (on specimens 1-19219, 1-42793, 1-42794 and 1-42795) have vestiges of polish on them, probably the result of having been hand-held.

[3] The large biface (1-19220) associated with the burials of Lot 32 was briefly examined. It is interesting to note that the residues present on the hafted biface (1-19219) from this lot and the residues on the body and lateral edges of this biface are quite similar. This specimen (Loud and Harrington, 1929: Pl. 55,a) is 265 mm. long, with a maximum width of 58 mm., and a maximum thickness of 8 mm. The lateral edges show very little wear, other than random light dulling. There is a heavily dulled area on one lateral edge near the base, and the tip of the artifact is heavily dulled.

[4] The term "nibbling" is applied to a series of tiny vertical step (or hinge) flakes which occur along the tool edge and are the result of use.

[5] In addition to the six study specimens and the biface mentioned in Note 3, I briefly examined two lanceolate bifaces from Humboldt basin caves. One specimen is a bipointed biface (2-26555) found at the bottom of Leonard Rockshelter (see Heizer, 1951: Fig. 42e). It shows very little wear. There are occasional dulled areas on both lateral edges, with one rather heavily dulled area (about 5 mm. long) occurring on one lateral edge near midsection. A few protrusions along the lateral edges are only very slightly blunted, with random gloss. No striations were observed. Another lanceolate biface (1-19228; Lovelock Cave; see Loud and Harrington, 1929:Pl. 56,i) was examined, but showed no significant wear.

[6] Nusbaum (1922:127) described the wear he observed on a hafted biface from Kane County, Utah: "The point of the blade is blunt and the edges are dull and slightly beveled from opposite sides. This implement was undoubtedly a knife."

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BIBLIOGRAPHY

Abbreviations Used

A Ant	American Antiquity
AMNH	American Museum of Natural History
-AP	Anthropological Papers
KASP	Kroeber Anthropological Society Papers
MAIHF	Museum of the American Indian, Heye Foundation
-INM	Indian Notes and Monographs
PM	Peabody Museum
-P	Papers
UC	University of California
-PAAE	Publications in American Archaeology and Ethnology

Aveleyra Arroyo de Anda, L., M. Maldonado-Koerdell, and P. Martinez del Rio.
1956 Cueva de la Candelaria. Volumen I. Memorias del Instituto Nacional de Antropologia e Historia, V. Mexico, D. F.

Epstein, J. F.
1963 The Burin-Faceted Projectile Point. A Ant, Vol. 29, No. 2, pp. 187-201. Salt Lake City.

Frison, G. C.
1968 A Functional Analysis of Certain Chipped Stone Tools. A Ant, Vol. 33, No. 2, pp. 149-155. Salt Lake City.

Guernsey, S. J., and A. V. Kidder
1921 Basket-Maker Caves of Northeastern Arizona. PM-P, Vol. 8, No.2. Cambridge.

Heizer, R. F.
1951 Preliminary Report on the Leonard Rockshelter Site, Pershing County, Nevada. A Ant, Vol. 17, No. 3, pp. 89-97. Salt Lake City.

Heizer, R. F., and A. D. Krieger
1956 The Archaeology of Humboldt Cave, Churchill County, Nevada. UC-PAAE, Vol. 47, No. 1, pp. 1-190. Berkeley.

Loud, L. L. and M. R. Harrington
1929 Lovelock Cave. UC-PAAE, Vol. 25, No. 1, pp. 1-183, Berkeley.

MacDonald, G. F., and D. Sanger
1968 Some Aspects of Microscope Analysis and Photomicrography of Lithic Artifacts. A Ant, Vol. 33, No. 2, pp. 237-240. Salt Lake City.

Mirambell S., L.
1964 Estudio Microfotografico de Artefactos Liticos. Instituto Nacional de Antropologia e Historia, Departamento de Prehistoria, No. 14, Mexico.

Morris, E. H.
1919 The Aztec Ruin. AMNH-AP, Vol. 26, No. 1. New York.

Napton, L. K.
1969 The Lacustrine Subsistence Pattern in the Desert West. In Archaeological and Paleobiological Investigations in Lovelock Cave, Nevada. KASP, Special Publi. No. 2, pp. 28-97, Berkeley.

Nusbaum, J. L.
1922 A Basket-Maker Cave in Kane County, Utah. MAIHF-INM Vol. 29, New York.

Semenov, S. A.
1964 Prehistoric Technology. Translated by M. W. Thompson. Cory, Adams and Mackay, London.

Shafer, H. J., and T. R. Hester
1970 A Technological Study of Certain Bifacial Tools from Southern Texas. Manuscript accepted for publication, Texas State Historical Survey Committee, Austin.

Sonnenfeld, J.
1962 Interpreting the Function of Primitive Implements. A Ant, Vol. 28, No. 1, pp. 56-65, Salt Lake City.

Wheeler, R. P.
1965 Edge-Abraded Flakes, Blades and Cores in the Puebloan Tool Assemblage. Contributions of the Wetherill Mesa Archaeological Project. Memoirs, Soc. for Amer. Arch., No. 19, Salt Lake City.

Wilmsen, E. N.
1968 Functional Analysis of Flaked Stone Artifacts. A Ant, Vol. 33, No. 2, pp. 156-161, Salt Lake City.

Witthoft, J.

1955 Worn Stone Tools from Southeastern Pennsylvania. Pennsylvania Archeologist, Vol. 25, No. 1, pp. 16-31, Milton.

1967 Glazed Polish on Flint Tools. A Ant, Vol. 32, No. 3, pp. 383-388, Salt Lake City.

Specimen	Overall Length	Length of Biface	Width of Biface	Thickness	Length of Haft	Diameter of Haft	Depth of Notch	Weight
1-47293	224	92	30	6	145	16	17	32
1-42794	238	95	38	6	143	17	22	41
1-42795	213	87	36	5	126	15	19	28
1-42796	-	106	41	7	-	-	-	36
1-42797	-	116	41	7	-	-	-	31

TABLE 1. Dimensions of Hafted and Unhafted Bifaces from Cache 10, Humboldt Cave. Measurements are in millimeters, and weights are in grams.

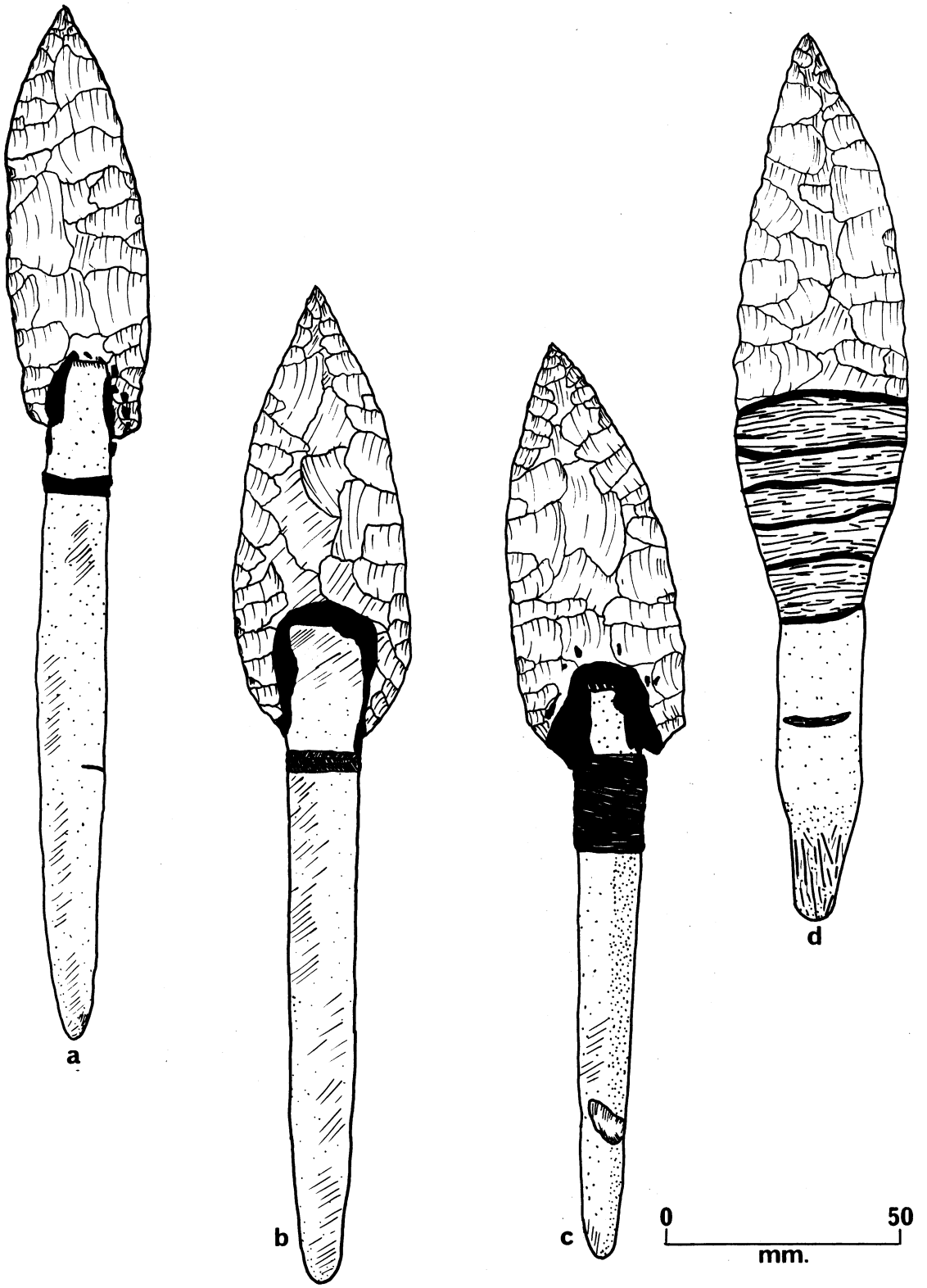

Figure 1. Hafted Bifaces from Humboldt and Lovelock Caves.
a, 1-42793; b, 1-42794; c, 1-42795; d, 1-19219.

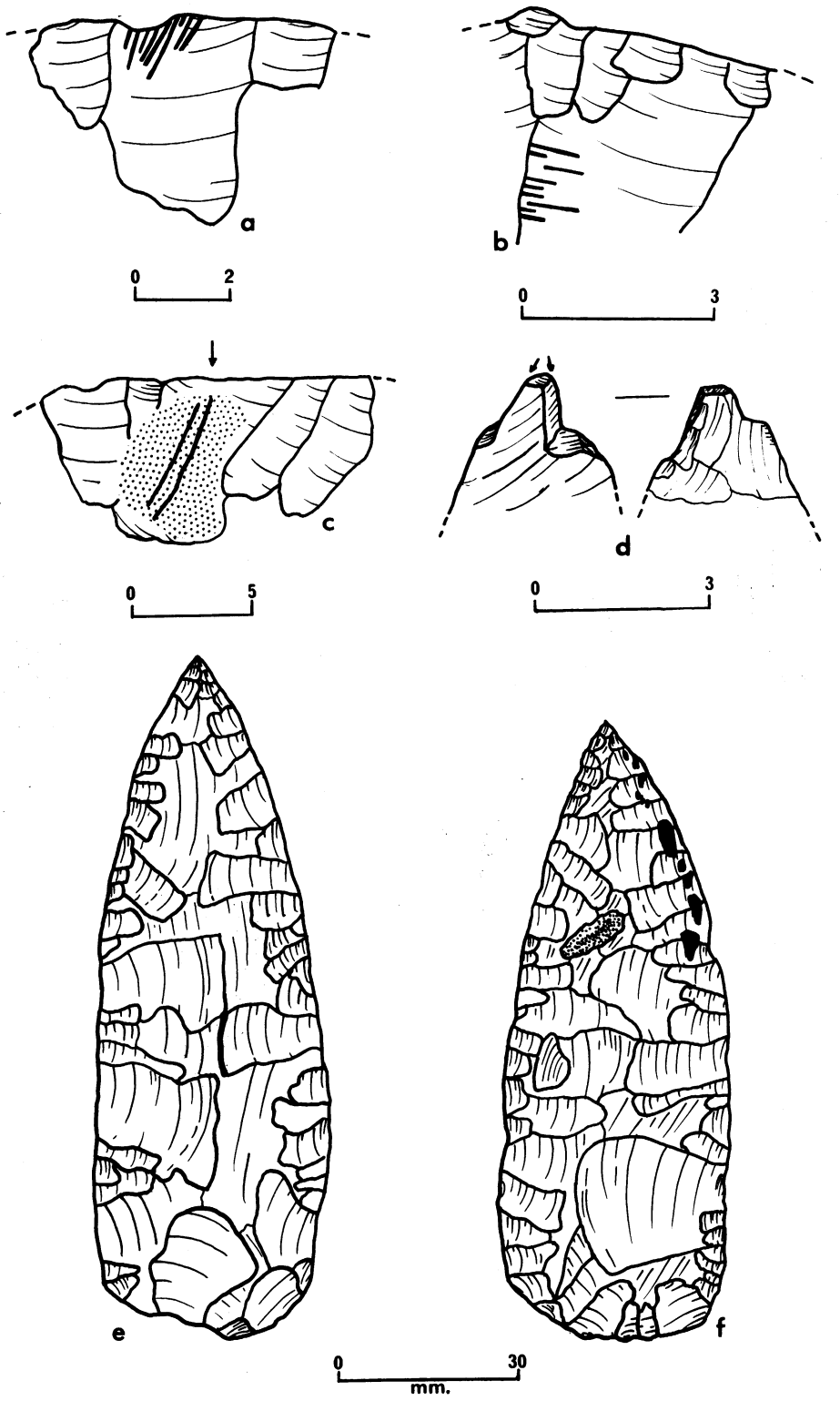

Figure 2. (scales are in millimeters). a, striations along one lateral edge of 1-19219; b, striations on 1-19219; c, striations across residue on 1-42796 (arrow indicates dulling on lateral edge); d, faceted tip of 1-42795 (arrows indicate direction of fractures); e, specimen 1-42797; f, specimen 1-42796.