UNIFACIAL COBBLE-TOOLS FROM THE NORTHWEST CALIFORNIA COAST: EXPERIMENTAL AND WEAR PATTERN NOTES

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Archaeological sites along the northwest coast of California in the territory occupied at the opening of the historic period by the Yurok tribe have produced an interesting series of unifacially chipped basalt cobbles. These artifacts are known from both excavated and surface contexts in Humboldt County (Fig. 1). The specimens described here are from the following sites: CA-Hum-169; CA-Hum-120; CA-Hum-118; CA-Hum-125; and CA-Hum-129.

Site CA-Hum-169 is the historic Yurok site of Tsurai in Trinidad Bay (Waterman 1920: Map 34, p. 271; Heizer and Mills 1952; Elsasser and Heizer 1966). Site CA-Hum-120 is the historic Yurok village of Tsotkskwi (Waterman 1029: 265) where in 1948 a single test pit was excavated. Site CA-Hum-118 is now within the confines of Patrick's Point State Park. It was a hunting camp occupied into the historic period. It was excavated by the University of California Archaeological Survey in 1949 (Elsasser and Heizer 1966). Site CA-Hum-126 is the historic Yurok site of Keken (Waterman 1920: 266). It was pothunted by a Eureka relic collector whose other activity was dentistry. In the summer of 1948 a University of California Archaeological Survey party dug two test pits here. Site CA-Hum-125 is the historic village of Maats (Waterman 1920: 266). The specimens recovered there came from the surface during a brief visit in 1948. Site CA-Hum-129 is the historic Yurok village of Tsapekw. At the time of a 1948 visit, there was a single occupant, an old Yurok named John Kirk who was born at Gold Bluff and who was apparently living there in order to protect the graveyard from depredation. He was willing to allow the excavation of two small test pits, and from these the specimens described here were recorded.

Other materials found at the above listed sites all fall in the range of known Yurok material culture items. All the sites were presumably permanently occupied.

For the way of life of the coastal Yurok see Waterman (1920); Kroeber (1925). Neither of these refer to the unifacial cobble choppers such as described here, perhaps because they were so commonplace that more exotic items were more interesting.

THE ARTIFACTS

Forty-seven specimens were selected for study (see Table 1). All are in the collections of the Lowie Museum of Anthropology, University of California, Berkeley. In general, the artifacts are made on ovoid to elongate-oval cobbles of basalt (presumably secured from beaches in the area). On each, a unifacially chipped edge has been formed at one end by a series of percussion blows. The flaked ends of the cobbles exhibit working edges which range from oblique (Fig. 2, c), to straight or slightly convex (Fig. 4, b), to markedly convex (Fig. 3, b), or pointed (Fig. 7, b). The extent of flaking that went into the formation of the edge is also variable; in some instances (cf. Fig. 4, a), only a few flakes were detached. In other cases (cf. Fig. 3, a), specimens have been flaked over as much as half of one face.

We have illustrated 17 specimens in detailed line drawings prepared by Judith Ogden (Figs. 2-7); the only previous illustrations of which we are aware appear in Elsasser and Heizer (1966: Pl. 16, c-f). These will serve to provide additional descriptive detail. Table 1 summarizes the dimensions and weights of the specimens, and also provides data on site provenience, catalog number, and individual wear patterns. Edge angle data as measured with a goniometer are also found in Table 1.

Specimens with morphological and technological attributes similar to these California examples have been found in many parts of North America. In some regions, such as Alabama and the Southeast, somewhat smaller specimens are attributed to a "pebble tool industry" which some archaeologists believe to be of great antiquity. A recent reevaluation of these "pebble tools" is provided by Dragoo (1976: 7). In the Fraser Canyon of British Columbia, Borden (1968) found similar artifacts at sites thought to be of late Pleistocene age. He describes these Canadian specimens (illustrated in Borden 1968: Figs. 4-5) as "pebble tools" or "core tools made on well rounded river cobbles." Borden suggests a wide variety of functions for the implements, but notes that no wear pattern studies had been done, at that time, of his sample. Many of his specimens are closely similar in size and technique of manufacture to the Humboldt County artifacts.

AGE OF THE SPECIMENS

Three radiocarbon age determinations from Humboldt County sites are relevant. Charcoal from just above the clay subsoil at site Hum-118 (Patrick's Point) gave an age of 640 $\pm$ 90 years B. P. (1310 A. D. Elsasser and Heizer 1966). One age determination for Hum-67 peat which lies at the base of the Gunther Island site (Hum-67) gave an age of 900 A. D. (Heizer and Elsasser 1964: 35). This is sample M-938 (1050 $\pm$ 200 years B. P.).

Most of the examples of unifacial cobble tools described here come from the surface of sites. A few from sites Hum-118 and Hum-67 show these to have been used sometime in the period of 1300 and 1400 A. D. and the abandonment of the site in the late nineteenth or early twentieth century. Cobble tools from the other sites are all named villages occupied into the twentieth century. So, these tools are recent, but we do not know how early they were used.

EXPERIMENTAL AND WEAR PATTERN DATA

In 1973, one of the authors (Wuertele) was a student in a seminar on experimental archaeology taught by Hester. Her research centered on the use of stone tools of various kinds which were presumably used in a variety of wood-working activities (Wuertele 1973). As a part of her experiments, Wuertele utilized two unifacially chipped basalt implements from Hum-67. These were both surface specimens and were resharpened and used for experimental purposes. The specimens were used on

redwood (Sequoia), the most common wood in the northwest coastal area. They were employed by her in scraping, adzing, and chopping tasks. One specimen (tool #16 of Wuertele 1973) was used for a total time of 110 minutes, the other (tool #17 of Wuertele 1973) for 70 minutes. Tool #16 had an edge angle of 65°, and tool #17 had one of 55°. The use of tool #16 on redwood as a multipurpose tool for scraping, adzing, and chopping activities produced wear patterns on the edge in the form of nibbling and dulling. Tool #17, used solely for the chopping of redwood, resulted in dulling wear along the edge. We wish to point out that these experiments were part of a much larger project, and we have extracted these data simply because they are the only experimental results which we have available at this time.

Also in 1973, Hester and Wuertele conducted a wear pattern and edge angle analysis of 47 of the unifacially-chipped cobbles. Wear pattern studies were done with the aid of a binocular microscope, with magnification powers up to 70X. During the recording of the wear pattern data, descriptive notations were made and measurements and weights for all specimens were recorded. This information is found in Table 1. We provide this detailed listing since we are unable to find any other published descriptions of this tool form in the California literature.

As Table 1 indicates, the primary wear pattern repeatedly observed on the archaeological Humboldt County tools was dulling. This was often accompanied by abrasion (varying from highly localized areas of fine scratches to a near-polish) adjacent to the working edge but sometimes extending onto the dorsal (or occasionally, the ventral) flake scars. The striations, or major scratches, noted on the implements generally ran perpendicular to the working edge. Nibbling (step-fracturing) is also a recurrent wear pattern seen on the tools. An examination of the pertinent literature reveals little comparative data on the experimental use or wear pattern analysis of similar tools, exceptions being reports by Crabtree and Davis (1968: 428) and Phillipson and Phillipson (1970). The limited experiments of Wuertele (1973) suggest to us that the tools could function as choppers or, at times, in a combination of chopping-scraping-adzing tasks during the wood-working process. The dulled and step-fractured edges, along with ventral and dorsal abrasions of the flake scars along the working edge, suggest repeated imbedding of the tool edge into a material like wood (cf. Crabtree and David 1968: 428). The ventral striations on the tool may reflect the use of the implement in preliminary shaping or roughing-out of wood, perhaps in an adz-like fashion.

A review of the edge angle data (Table 1) reveals a clustering (34%) of edge angle values in the 55°-64° range, although a substantial percentage of the tools (57.9%) have edge angle values that are fairly evenly distributed if one examines 10° increments between 56°-84°. The mean edge angle for the series of 47 specimens is 68.48°.

We have no evidence to indicate whether or not the Humboldt County tools were hand-held or were hafted, although we suspect it was the former. As noted above, the experimentally-used specimens were hand-held during the course of Wuertele's experiments.

During the life of the tool, there is ample evidence of a continuing process of rejuvenation or resharpening of the working edge. Once an edge became dulled, or had been step-fractured to the extent that it was no longer serviceable, the edge was resharpened (Crabtree and Davis 1968). This process involved the removal of flakes from the dorsal face of the edge, struck from the ventral surface (see Fig. 8, a). Occasionally, flakes were detached from the ventral face by blows struck perpendicular to the edge, similar to the "Retouch Method C" described by Shafer (1970: Fig. 2, e; compare with Fig. 8, b). A newly resharpened edge is sinuous and has pointed protrusions (e.g., Fig. 6, d). The tools were obviously valued and underwent a series of resharpening episodes, each sequence leading, of course, to a reduction in size. Specimens like those shown in Fig. 2 may represent nearly-exhausted implements, due to repeated resharpening.

ETHNOGRAPHIC COMPARISONS

One interesting ethnographic observation regarding the use of similar cobble tools is provided by Mitchell (1958: 192). Among the Australian aboriginal groups on the New South Wales coast, the mainland of South Australia, and several other Australian localities, Mitchell notes the occurrence of "crude chopping and cleaving tools..." and describes them as follows:

> "These comprise pebble choppers, either unifacial or bifacial types, used as hand axes and not made to be finished off by grinding. They are made from flattish pebbles of varying sizes by carefully flaking on one end, or on one or both lateral margins to obtain acute-angled working edges..." (Mitchell 1958: 192).

The following functional observations on these pebble choppers is also provided by Mitchell:

> "Utilizing a pebble chopper, a sapling eleven inches in circumference was cut down in four minutes".

Tindale (1941) has also recorded the use of crude hand axed by the natives of Western Australia. These tools, made by flaking an edge on a large flat boulder were used for cutting down trees. Tindale notes that a sapling six inches in diameter could be cut down in two minutes. The tools were retrimmed as they became dull through continued use.

SUMMARY

In this paper we have described a distinctive series of unifacially flaked basalt artifacts from the northwest coast of California. Although numbers of these

tools have been collected from sites in the region (particularly in Humboldt County), they have not previously been the subject of detailed description.

A sample of 47 specimens from the collections of the Lowie Museum of Anthropology was scrutinized for wear pattern evidence. Characteristic use-wear included dulling of the working edge, nibbling or step-fracturing resulting from use, and abrasions of flake surfaces caused by repeated contact with the material(s) being worked. Edge angle measurements suggest that a steep working edge was preferred by the aboriginal tool-user. This observation is borne out by evidence of repeated resharpening of the working edge during the life of the tool. As a part of the overall study of these artifacts, brief experiments were conducted. While these were too limited in scope to be conclusive, the use-wear found on the tools after the experimental working of redwood were found to be quite similar to that occurring on the archaeological specimens.

We cannot, with such preliminary data, offer any substantive interpretations as to the function of this tool form. However, the combined analytical and experimental data, when supplemented by published studies, such as that of Crabtree and Davis (1968), lead us to suggest that these implements were used as choppers or some functionally-related task (such as occasional scraping or adzing) in the wood-working process. We do not know whether they were used in certain specific acitvities or whether they might have indeed seen use as multi-purpose implements. The uniformity of the wear pattern data would seem to be indicative of the former. We can only hope that the publication of the descriptions and wear pattern data in this paper will spur others to carry out more sophisticated experimental studies involving this tool form. Certainly a more careful examination of the context of these tools in future archaeological investigations in the northwest coastal area will aid in a more meaningful functional interpretation.

TABLE I: DESCRIPTIVE DATA, UNIFACIAL COBBLE TOOLS, HUMBOLDT COUNTY, CALIFORNIA

Site No.	Catalog No.	Weight (g)	Length (cm)	Maximum Width	Maximum Thickness	Edge Angle	Wear
HUM 126	1-72181	476.4	9.6	8.5	5.1	56°	dulling; polish of flake scars
HUM 125	1-72139	339.0	9.6	8.3	3.2	50°	dulling; ventral flake scar
HUM 118	1-93412	342.3	9.0	7.4	4.1	60°	dulling; abrasion of flake scars
HUM 169	1-116116	149.6	7.3	6.8	2.7	56°	reworked; ventral abrasion
HUM 118	1-93411	384.5	9.3	9.2	3.3	80°	retouch, dulling; abrasion of ventral edge
HUM 126	1-72089	187.6	7.8	6.4	3.0	54°	heavily dulled; nibbling
HUM 169	1-99142	427.9	8.8	8.1	4.1	80°	resharpened; no wear
HUM 126	1-90386-1	242.7	7.4	7.7	3.0	70°	dulling; abrasion; ventral striations perpendicular to edge
HUM 126	1-72095	89.6	4.6	6.5	2.1	80°	nibbling
HUM 169	1-98668	172.5	8.7	6.8	2.1	60°	heavy dulling, flake scar abrasion
HUM 169	1-99152	251.5	9.2	6.3	3.0	46°	heavily dulled beveled edge (1 mm. wide)
HUM 126	1-72088	141.1	7.5	6.6	2.1	63°	slight dulling
HUM 129	1-90422	792.6	15.4	15.4	10.0	31°	abrasion of flake scars
HUM 126	1-73180	560.7	9.6	9.9	4.1	75°	resharpened; no wear
HUM 126	1-90363	642.9	11.1	9.7	4.1	55°	light dulling; flake abrasion
HUM 120	1-90427	318.1	9.0	7.4	3.5	60°	ventral flake scars
HUM 126	1-72185	500.7	11.6	8.9	3.2	65°	heavy dulling; ventral abrasion
HUM 118	1-90386-2	567.9	12.0	8.5	4.0	58°	dulling
HUM 118	1-72198	992.2	12.7	11.3	7.5	60°	dulling
HUM 126	1-90386-3	1215.3	16.1	11.7	4.4	60°	ventral abrasion; dulling of edge
HUM 126	1-90386-4	1487.7	13.8	13.0	5.5	85°	heavily nibbled (resharpening?)
HUM 169	1-116252	162.7	6.9	5.7	2.7	57°	very heavy dulling; abrasion of flakes
HUM 169	1-98837	160.5	7.3	6.5	2.3	68°	dulled; striations perpendicular to edge
HUM 169	1-99145	248.7	8.5	5.9	3.6	80°	nibbling; heavy dulling
HUM 126	1-72187	113.9	4.6	5.1	3.4	72°	resharpened; no other wear
HUM 169	1-98964	331.0	8.6	5.6	4.4	79°	dulled
HUM 126	1-90386-A	478.0	9.3	9.9	4.5	70°	light dulling; in middle of ventral face is battered area; anvil?

Site No.	Catalog No.	Weight (g)	Length (cm)	Maximum Width	Maximum Thickness	Edge Angle	Wear
HUM 126	1-90386-B	580.5	10.8	10.1	4.5	80°	nibbling; (heavy) ventral abrasion
HUM 126	1-72093	140.5	7.0	7.0	1.7	60°	dulling; flake abrasion
HUM 169	1-98666	160.0	9.8	6.6	2.5	50°	ventral abrasion
HUM 126	1-90386-D	468.0	11.8	8.3	3.5	57°	dulled; ventral plus flake abrasion
HUM 129	1-90420	366.9	9.6	9.2	3.0	55°	dulling; ventral abrasion; light striations perpendicular to edges of cobble heavily battered; hammerstone?
HUM 126	1-90386-E	467.0	16.3	6.5	2.7	68°	dulled
HUM 169	1-98665	360.0	9.6	7.0	3.7	65°	striations perpendicular to edge; abrasion flakes
HUM 126	1-90386-C	601.1	10.5	8.9	4.4	60°	ventral abrasion
HUM 169	1-98662	350.4	8.0	9.1	4.2	60°	heavy dulling; ventral abrasion
HUM 169	1-98680	745.4	10.1	8.7	5.2	70°	heavily dulled; perpendicular striations; flake abrasion
HUM 169	1-98947	430.0	9.1	8.2	3.7	67°	heavily dulled; perpendicular striations; ventral flakes
HUM 169	1-114863	547.0	9.5	10.5	3.8	88°	heavily dulled; ventral flakes
HUM 169	1-98838	325.8	7.9	9.6	4.1	68°	striations at angle
HUM 169	1-98813	394.8	8.8	7.7	4.7	72°	dulled, ventral and flake abrasion
HUM 169	1-99149	719.7	12.6	7.5	4.2	75°	heavy dulling; flake and ventral abrasion and ventral flakes
HUM 118	1-72201	547.2	8.1	9.2	5.3	90°	very heavily dulled; battered; resharpened; battered at poll
HUM 169	1-98859	314.2	7.1	7.7	3.7	75°	resharpened
HUM 169	1-90176	523.7	9.8	8.6	4.3	50°	resharpened
HUM 126	1-90386	401.2	7.8	10.0	4.2	75°	dulling and nibbling
HUM 126	1-90386-G	326.2	6.5	8.3	4.1	70°	dulling
	N=47						
	Mean:	475.94	9.48	8.58	3.88	68.48°	

All measurements are in centimeters, weights are in grams, and edge angles in degrees.

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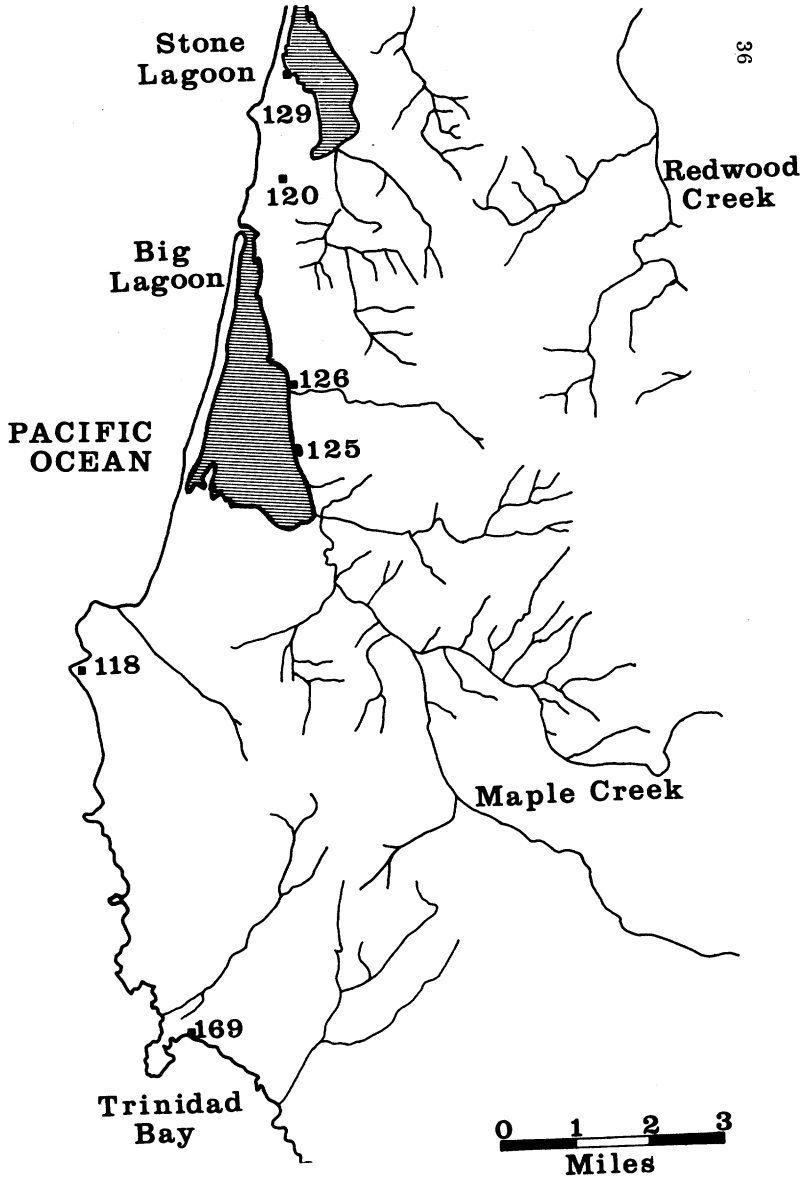
Figure 1. Sites in Humboldt County, Northwest California. (left) map of state showing location of county; (right) detailed map with locations of sites mentioned in text.



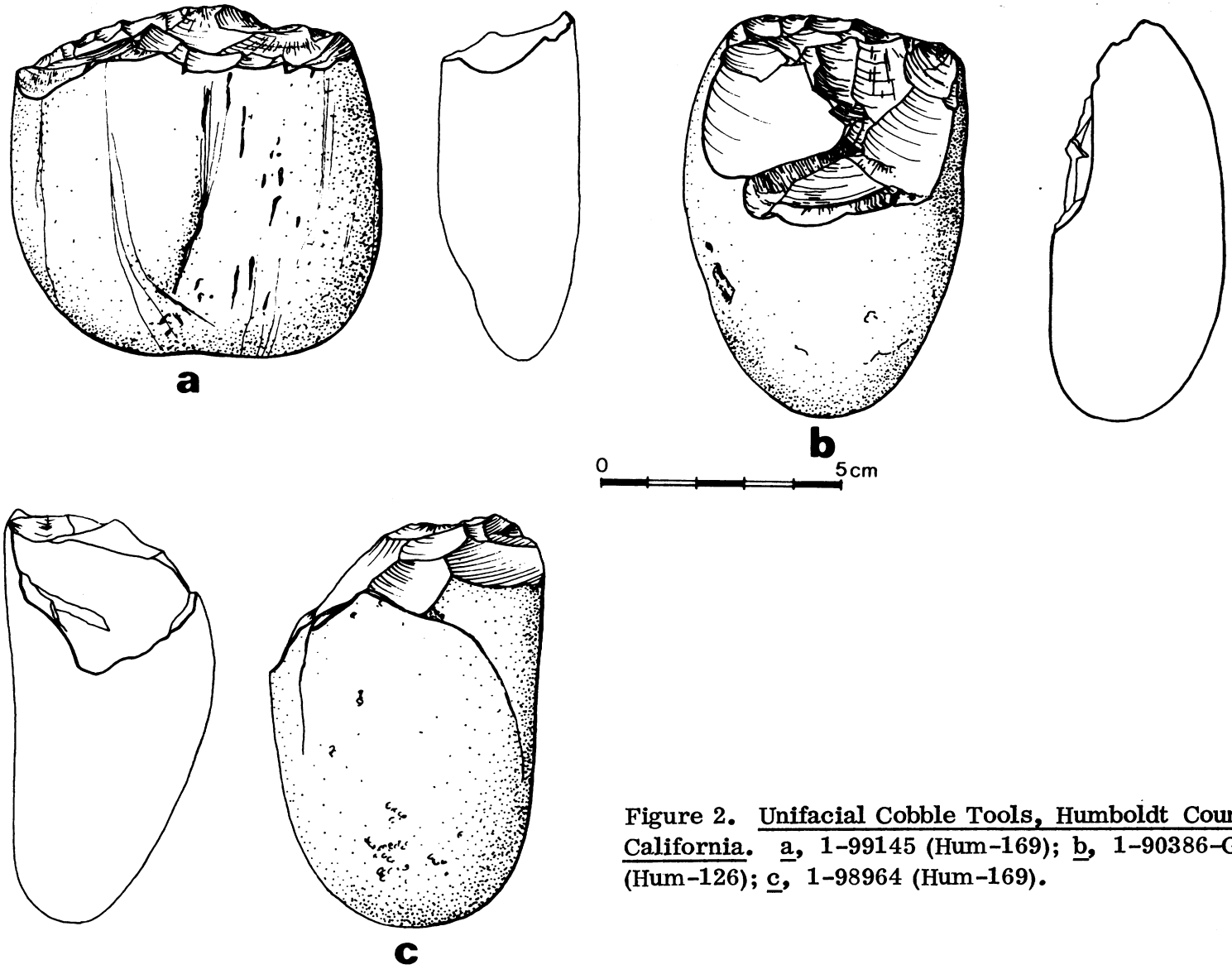
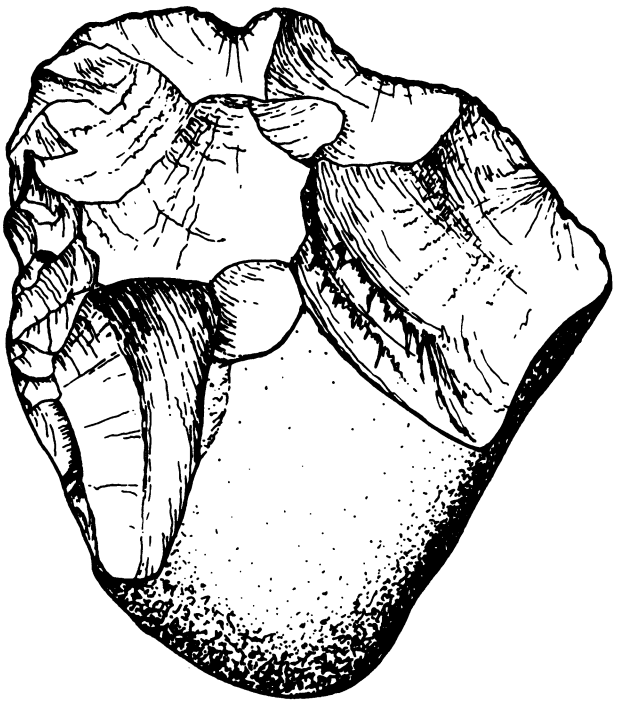
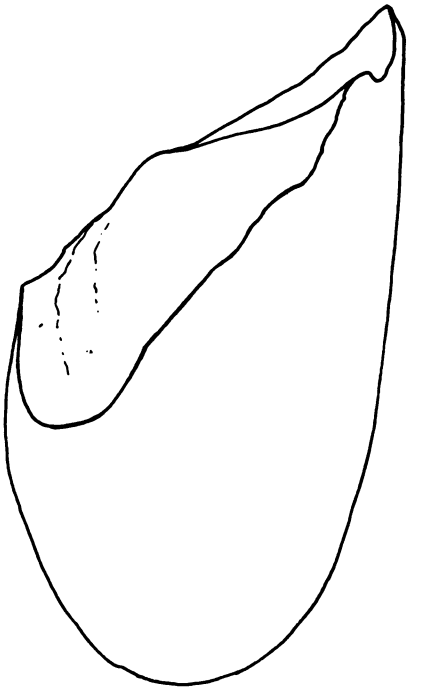


Figure 2. Unifacial Cobble Tools, Humboldt County, California. a, 1-99145 (Hum-169); b, 1-90386-G (Hum-126); c, 1-98964 (Hum-169).





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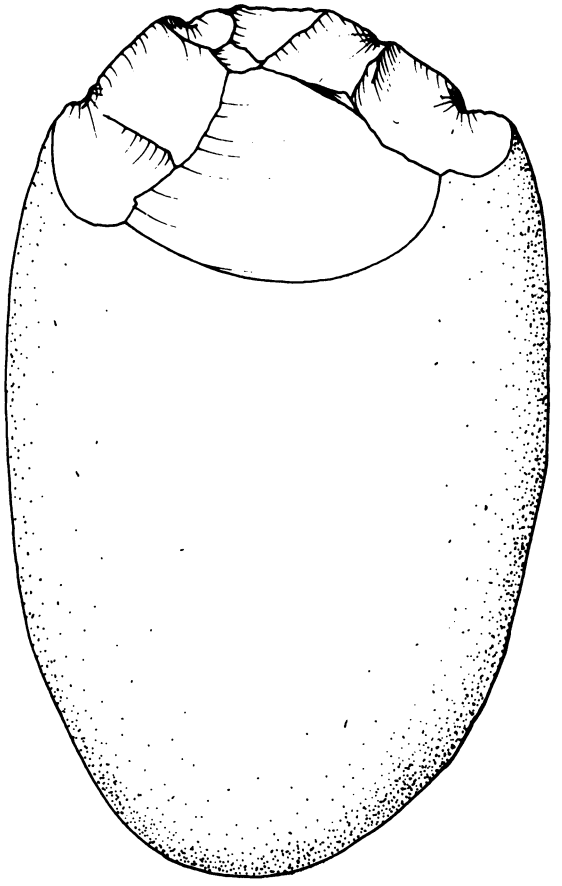

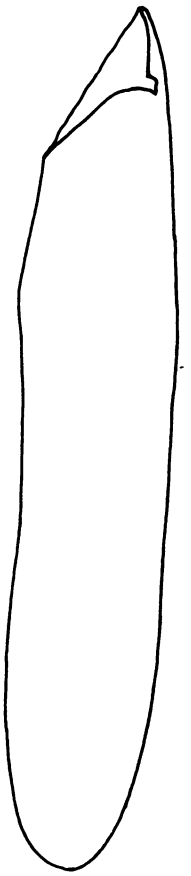

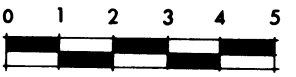

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Figure 3. Unifacial Cobble Tools, Humboldt County, California. a, 1-72198 (Hum-118); b, 1-90422 (Hum-129).

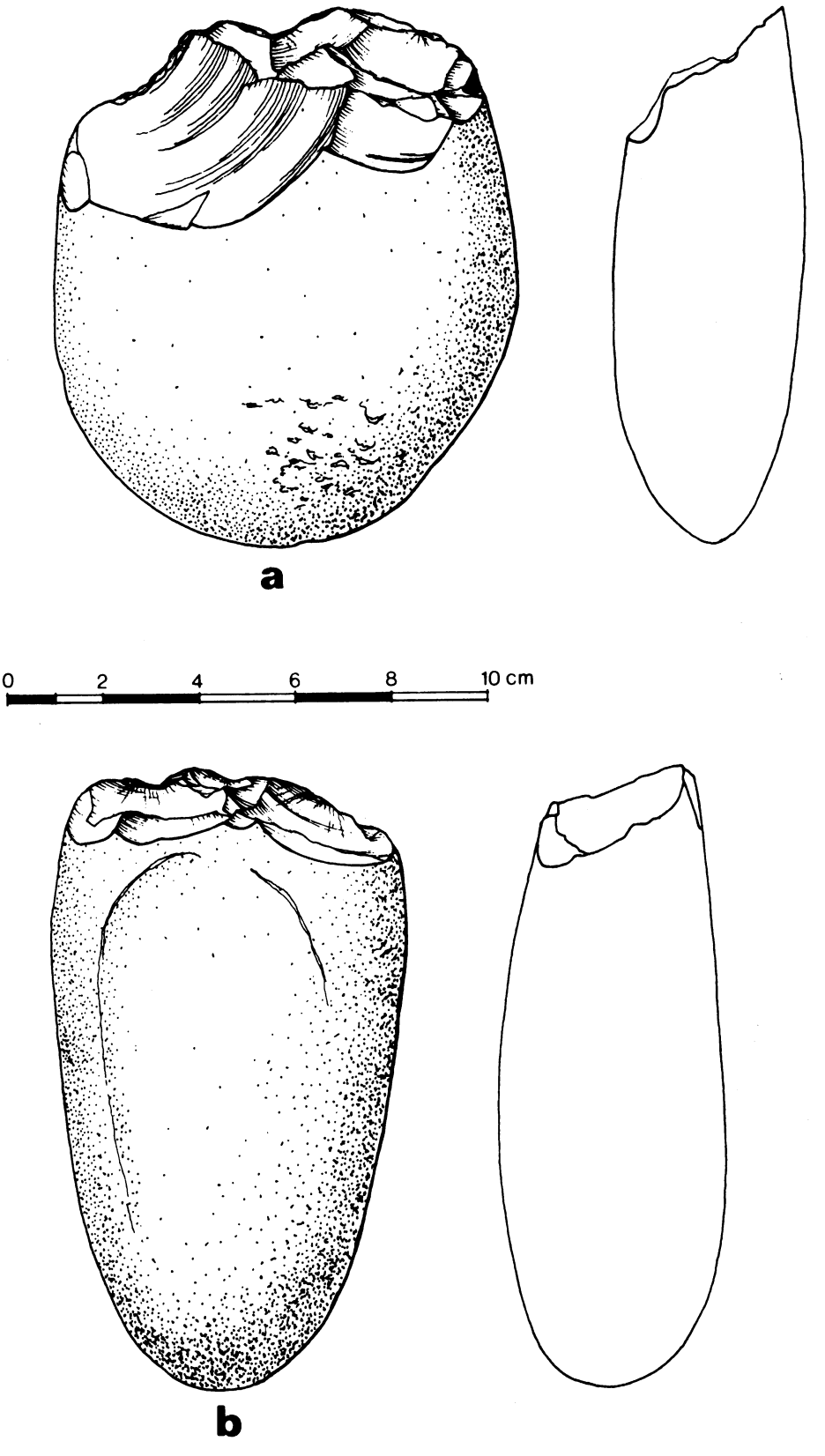
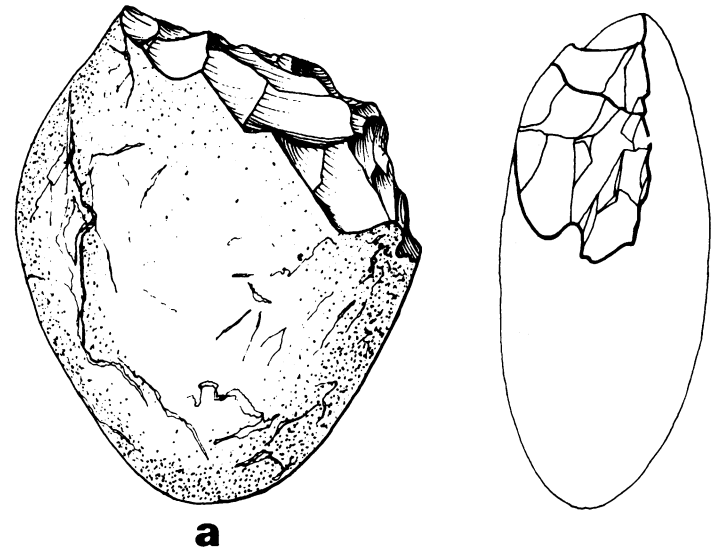


Figure 4. Unifacial Cobble Tools, Humboldt County, California. a, 1-90363 (Hum-126); b, 1-99149 (Hum-169).



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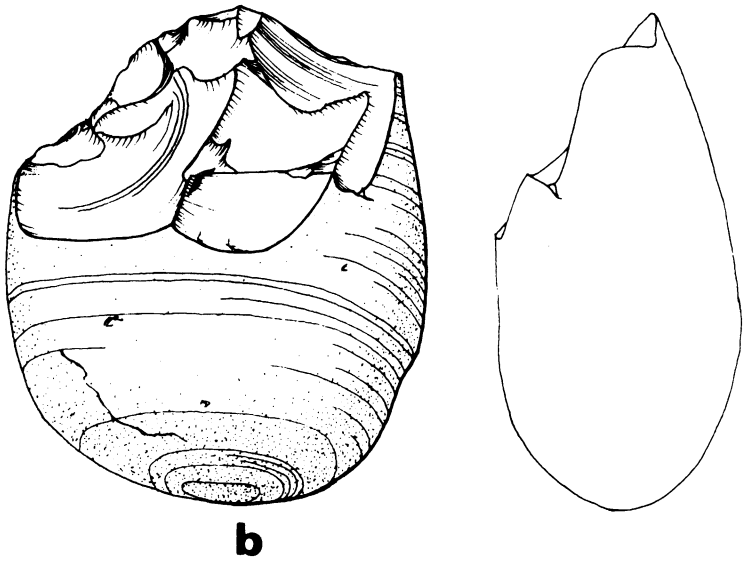

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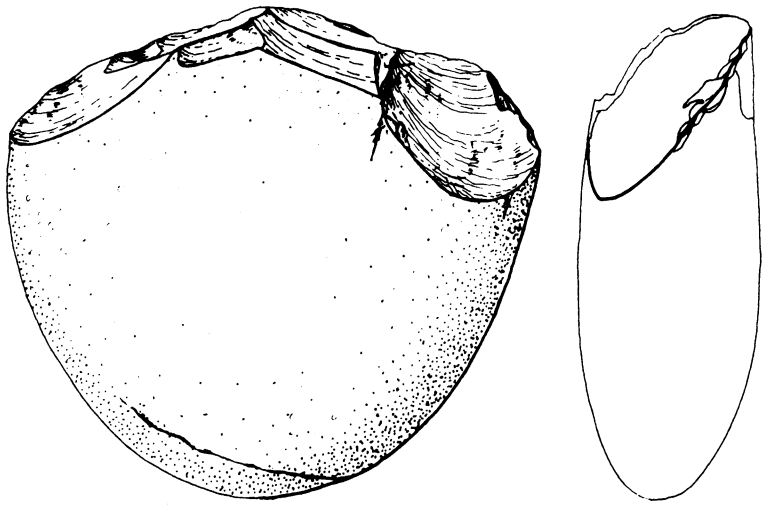

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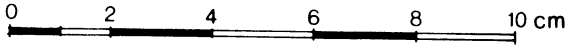

Figure 5. Unifacial Cobble Tools, Humboldt County, California.
a, 1-99142 (Hum-169); b, 1-72181 (Hum-126); c, 1-115863 (Hum-169).

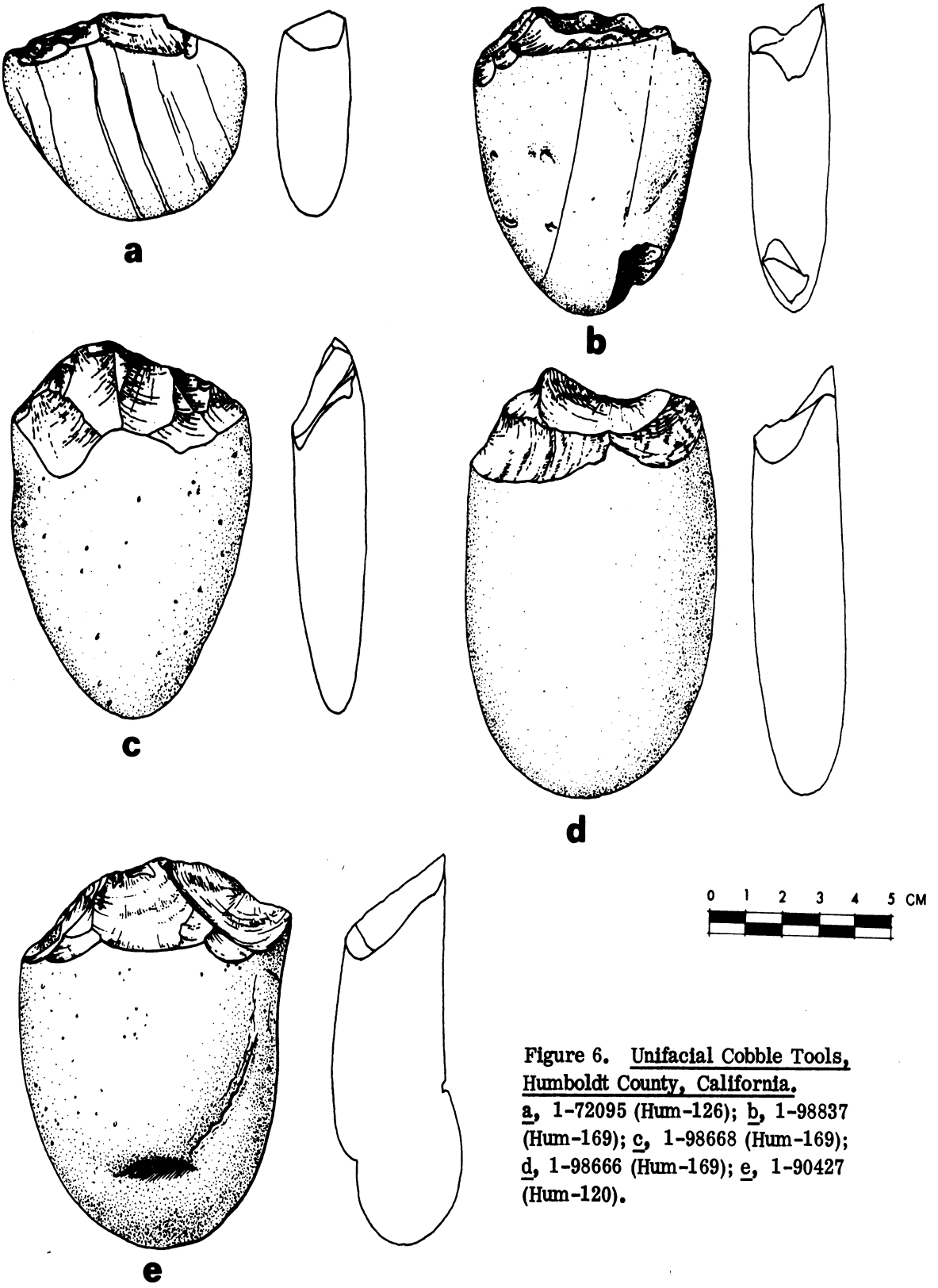

Figure 6. Unifacial Cobble Tools, Humboldt County, California.
a, 1-72095 (Hum-126); b, 1-98837 (Hum-169); c, 1-98668 (Hum-169); d, 1-98666 (Hum-169); e, 1-90427 (Hum-120).

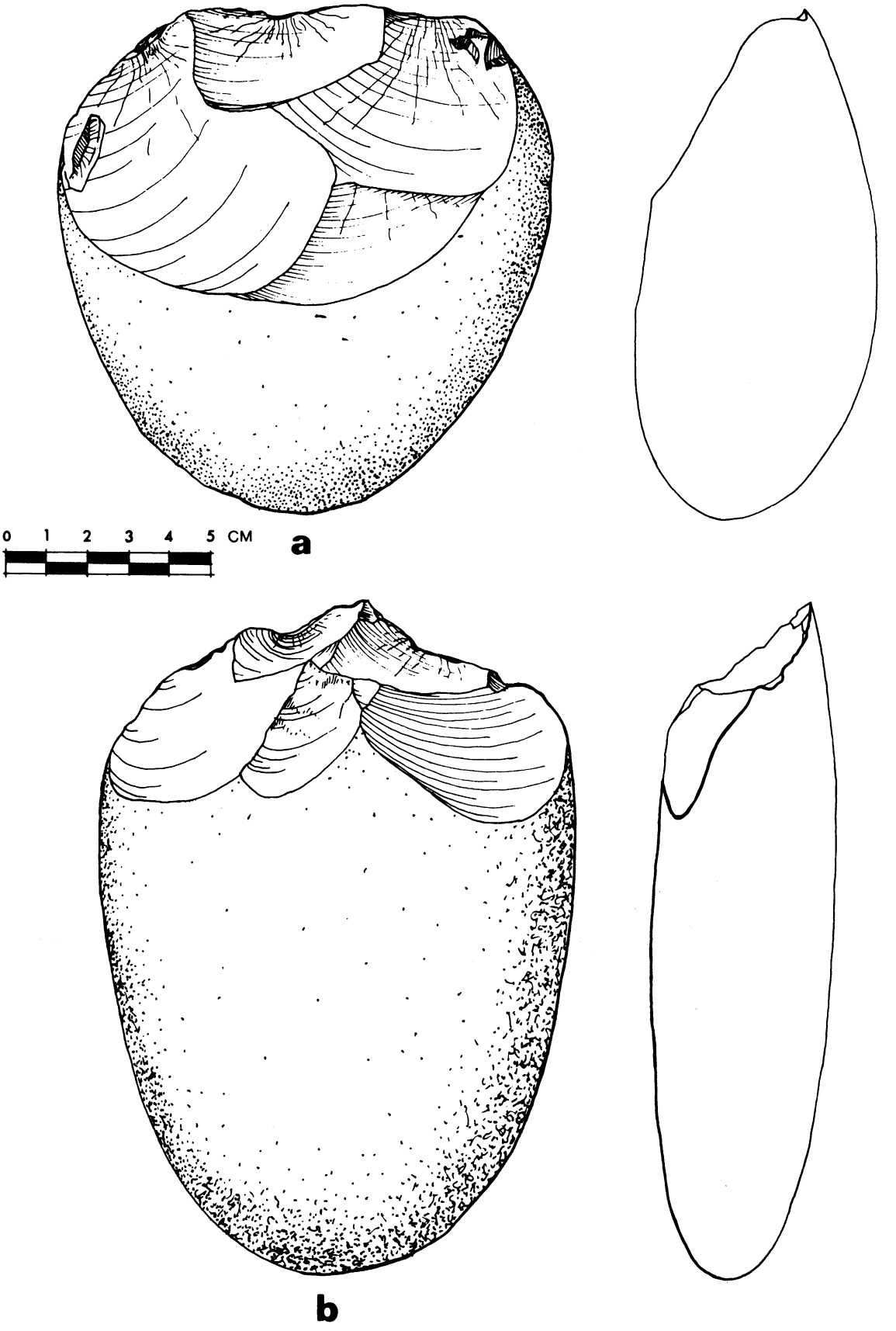

Figure 7. Unifacial Cobble Tools, Humboldt County, California. a, 1-98805 (Hum-169); b, 1-90386-3 (Hum-126).

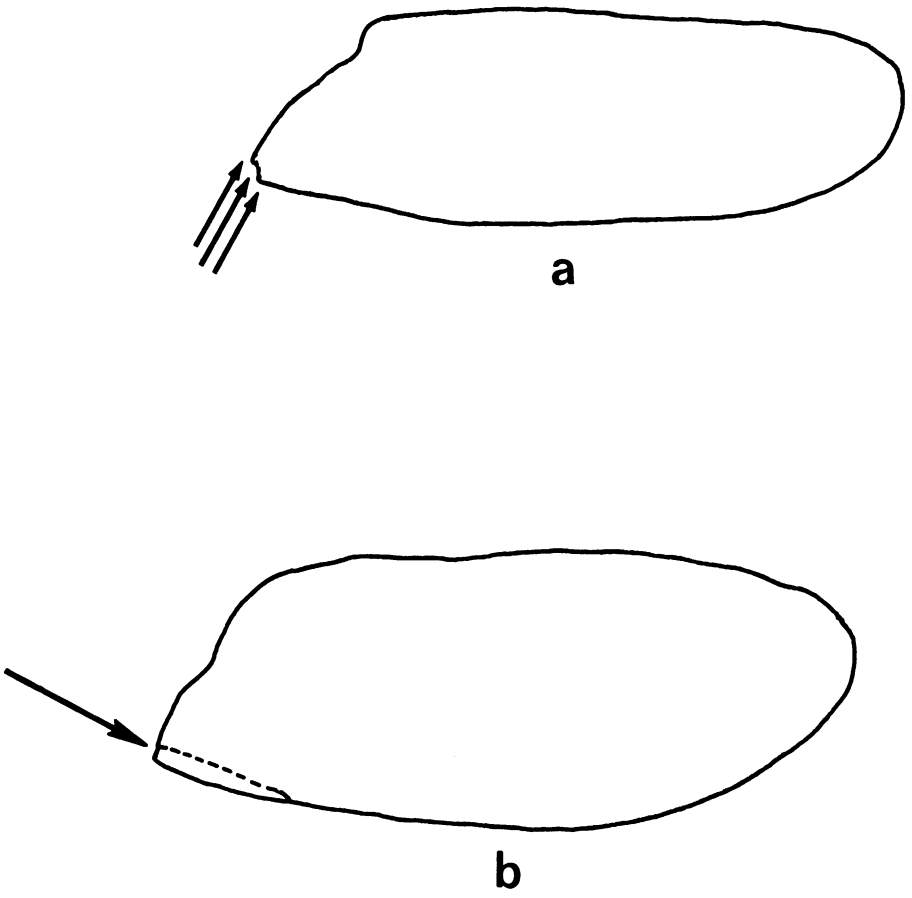

Figure 8. Resharpening Methods Observed on Unifacial Cobble Tools, Humboldt County, California. a, removal of nibbled (step-fractured) edge by removal of flakes from dorsal face; b, removal of dulled edge by detaching flake from ventral face.