BUTCHERING A DEER WITH OBSIDIAN TOOLS

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During a seminar in experimental archaeology at the University of California, Berkeley, in Fall, 1972, several class members designed an experiment involving the use of obsidian flake tools in the skinning and butchering of a deer carcass. There have been several other experiments involving the use of stone tools to skin and dismember animal carcasses. For example, there is the illustrated experimental use of Paleolithic cleavers to butcher an African antelope (Howell 1970: 121), similar experiments by L. S. B. Leakey (cf. Pfeiffer 1972: 403), Don Crabtree's notes on the use of obsidian blades to skin a bear (Crabtree 1968: 470; Pfeiffer 1972: 402-403) and J. Swauger's deer-skinning experiment utilizing Egyptian Paleolithic tools (Swauger and Wallace 1964).

In preparation for the experiment, the seminar group viewed a film which documented the use of chert flakes and bifaces in the skinning and butchering of a deer.[1] Plans were also made to obtain the necessary obsidian raw material, to secure the deer carcass, and to develop a system of recording the experiment.

A deer carcass was obtained via a donation from the office of the Pleasanton, California, Animal Control Unit (California Department of Fish and Game). The deer had been illegally killed and had been confiscated by these authorities. The specimen, a young doe, weighed 18.45 kg.

The lithic raw materials were obtained from the Glass Mountain obsidian source north of St. Helena, California. L. Spencer then manufactured a series of obsidian flake tools. These included naturally-backed flakes, large cortex flakes, blades, and bifaces. As we assumed that most of these tools might be employed during the course of the experiment, all were measured, their working edges examined under a microscope, a description was written of each, and all were photographed.[2]

After the animal carcass had been obtained, and on the day preceding the experiment, Spencer gutted the animal using several thick, naturally-backed obsidian flakes. During the gutting process, the sternum and pelvis were broken with the use of an obsidian chopper. Spencer, who had performed such tasks before using steel hunting knives, was able to accomplish the gutting procedure in 40 minutes using the obsidian tools. The gutted specimen weighed 10 kg.

On November 22, 1972, the seminar group performed the skinning and butchering activities. The principal work was performed by Spencer since, as mentioned above, he had substantial prior experience in animal butchering. Other members of the seminar group assisted in the experiment by taking notes on the sequence of activities, recording the tool used in each activity, and keeping careful track of the amount of time each tool was used.

The obsidian tools used during the experiment (Fig. 1, a-e) were: #2: a large naturally-backed flake; #4: a blade-like cortex flake; #7: an interior flake; #5: a biface; and #10: a naturally-backed flake.

For the purpose of illustrating the detail in which the experiment was recorded, we have provided below an edited version of the notes taken as the skinning and butchering sequence progressed:

TIME	TOOL #	OBSERVATIONS
1:21 (pm)	10	Butchering commenced on one hind leg, cutting through hide on underside taking care not to cut muscle, but rather only the white membrane which attaches the hide to the muscle.
1:24	" "	Pulls hide as he cuts this membrane.
1:25	" "	Pulls skin loose and away from lower leg using tool in what can be described as a delicate stroke or motion.
1:26	" "	Skin free from leg and hip and ham area.
1:27	" "	Starts a similar process on the other leg.
1:31	" "	Cuts hide where attached to hoof area.
1:32	" "	Cuts area around tail, frees hide, then pulls hide over back without the aid of the tool.
1:34	" "	With tool again, with much use of both hands, the hide is pulled over the ribs.
1:35	" "	Pulls hide above ribs toward front legs; minor edge wear detected, described as small nicks.
1:36	" "	Now cutting hide around the neck area. Hide is now off breast area.
1:38	" "	Hide is pulled over front leg, away from center of carcass.
1:40	" "	Cut and pull hide away from leg.
1:41	" "	Incision of hide around fore quarter; lateral or longitudinal cut made along leg to facilitate hide removal.
1:42	" "	Pulls hide off leg, final cuts to free the hide. Hide now pulled towards body of deer.
1:44	" "	Cuts hide around neck area.
1:45	" "	Hide now free from body except around head area and right front leg.
1:46	" "	Still only minimal wear noted on the tool.
1:48	" "	Lateral incision along leg.
1:50	" "	Hide pulled from leg, now attached only to the head.
1:51	" "	Pulls hide over head.
1:52	" "	Cuts attaching muscle.
1:53	2	Chops off head, using a short chopping motion. There is use-flaking present already. Now uses a slicing motion. Finish use of tool #2. Head off after 1.5 minutes.
[BREAK]		
1:56	10	Cuts around legs and back, separation of hind quarters from spine, slicing and twisting of meat. (Holding meat, twisting it in various directions as he slices).
1:58	" "	Hind quarters separated.

TIME	TOOL #	OBSERVATIONS
2:00	10	Uses his foot to hold thorax and pulls fore leg away and cuts with tool.
2:01	2	Uses tool 2 to slice off one fore quarter (this takes 10 seconds) and resumes use of tool 10.
2:02	10	Cuts off (small slabs) meat from thorax and works on other fore quarter.
2:03	" "	More use-flaking noted on tool 10, small nibbling along edge, one or two small flakes detached.
2:04	" "	(Another slab of meat removed from fore quarter shoulder)
2:05	" "	Start slicing neck. Tool makes contact with bone.
2:06	2	Chop with tool 2 in order to remove neck from body. Slices with same tool. Neck twisted as it is chopped.
2:07	" "	Neck free from body.
[B R E A K]		
2:09	5	Tool 5 cuts very well.
2:09.5	2	0.5 minutes with 2; hit vertebra.
2:10	5	Removes back-strap. Though the tool is now dull on the sinuous edge, it nonetheless made a good tool for a sawing motion. Back-strap removed.
2:11	5	Cuts back-strap into sections.
2:13	2	Separation of spine from hind quarters. Downward chop and stroke used.
2:14	5	Twist hind quarters; hind quarters are separated.
2:15	2	Cutting back leg at hock, severed tendon, and switched to tool 5 in process.
2:15.5	5	Started to separate lower leg at ankle.
2:16	" "	Ankle and hoof are separate, cut behind hoof to sever tendon.
2:16.5	" "	Tendon pulled out of leg.
2:17	" "	Sinew removed with tool 5. Boning of thigh, separate knee from thigh with tool 5.
2:19	" "	Sawing motion.
2:20	" "	Broke tibia from thigh area.
2:21	" "	Boning of thigh or ham.
2:24	4	Begins use of tool 4. As boning continues, tool 4 occasionally hits femur.
2:26	" "	Remove skin from tendon.
2:28	" "	Twist off hoof and lower leg area (hind quarter).
2:29	" "	Circumscribe foreleg (hind above hoof) using blade to cut through hide circumference. Experimentor uses his feet as a brace.
2:31	" "	Makes longitudinal cut on lower leg to remove tendon. Still removing sinew from lower leg area.
2:34	" "	Proceeds to bone-out other ham.

TIME	TOOL#	OBSERVATIONS
2:35	2	Chops and cuts.
2:36	4	Work continuing.
2:37	" "	Twist off tibia-fibula from thigh or ham.
2:40	" "	Femur out of ham.
2:42	" "	Tool 4 seems dull after boning 1 1/2 hams.
2:43	5	Fleshing out neck, hitting vertebrae.
2:50	" "	Neck sinew very fibrous.
2:52	7	On neck, removing sinews.
2:54	" "	On fore leg, removes shoulder muscle.
2:55	" "	On other fore leg, hits bone occasionally.
3:00	" "	Skinning-butchering completed.
3:01	2	Chop bone, a leg joint.

Tool #	Total time used (in minutes)
10	38
2	10.5
5	22
4	16
7	8

Table 1. Time, in minutes, each obsidian tool was used during experiment.

In general, the skinning and butchering of the deer carcass was accomplished with considerable efficiency using the obsidian tools. In most of the cutting movements, the obsidian implement was drawn toward the experimentor; the next two most common motions or movements involved sawing and pushing the tool away from the operator. One particularly interesting observation was that the obsidian tools tended to "resharpen" themselves during use. Due to the brittle nature of the tool edges, tiny flakes would be detached during sawing or light chopping rasks. Spencer observed that most of this spalling occurred when the tool came into recurring contact with bone and skin.[3] It should be pointed out that while several tools were employed during the experiment, a single obsidian flake implement (such as tool #10) could have been used to carry out the entire skinning and butchering operation.

Use-Wear Observations

As noted earlier, each tool had been checked prior to use, and the condition of the intended working edge had been carefully recorded. After experimental use, each tool was wrapped and labeled, and was later examined, with the use of a 75X binocular microscope, for wear patterns resulting from the experiment. These data are summarized briefly:

Tool #2. Prior to use, this tool (Fig. 1, a) had a very sharp edge, marred only by two small nicks resulting from its detachment. The edge angle was 45°. During the experiment, the tool was used for 10.5 minutes, and was involved in cutting of the deer's neck (using a short chopping motion, coupled with a slicing motion), and was also used to cut and chop at leg joints (see narrative above).

Extensive modification of the tool edge occurred during use. There is continuous bifacial use-retouch. On the dorsal surface, there is use-retouch, with flakes up to 15 mm. in length, although most are .5 to 3 mm. in length. Accompanying the use-retouch is nibbling and snapping of the edge. On the ventral face, there is continuous use-retouch, with several major arc-shaped flake scars, 3 to 20 mm. long. In addition to these alterations, crushing is noted along the cutting edge.

Tool #4. This blade-like cortex flake (Fig. 1, b) had a very sharp, unmarred edge (angle, 32°) prior to use. It was used for 16 minutes, primarily in cutting flesh, although the cutting of hide was also done. The only visible wear after use is a roughening or nicking of the edge, and a few small (.05 to .1 mm. long) use-retouch scars scattered along the edge.

Tool #5. This tool, an ovate biface (Fig. 1, c), had one edge thinned for use (edge angle, 45°). It was utilized for a total of 22 minutes, and was used primarily for cutting along the vertebral column of the deer, and in removing the back-strap. Later, it was used in the boning-out of the thigh, removal of sinew, and the fleshing out of the neck, where it came into repeated contact with vertebra. Before use, it had a sharp sinuous edge (without any marginal trimming). While it was being used in the various activities described above, the experimentor observed that it was beginning to feel "dull", though it was still serviceable for "sawing" activities. Microscopic examination of the used tool edge revealed light crushing of the edge, accompanied by scattered bifacial nibbling and use-retouch flakes. Given the comments of the experimentor while using this tool, we had expected much heavier wear than was observed.

Tool #7. There was a very sharp unmodified edge (angle, 20°) on this naturally-backed flake (Fig. 1, d) prior to use. It was used for eight minutes near the conclusion of the experiment, to remove sinews from the neck, and to remove muscles on both forelegs; during the latter task, it occasionally struck the bone. As a result of this use, the dorsal edge of the flake showed more or less continuous use retouch, with

the largest of the scars ca. .5 mm long, but most in the range of .1 to .2 mm. On the ventral edge, a few similar use-retouch scars were found, and near mid-edge, there was a group of three striations, disposed perpendicular to the edge. These may have resulted from contact of the tool edge with bone.

Tool #10. This tool (Fig. 1, e) was used for 38 minutes and was employed extensively in the cutting of hide and flesh (see narrative). The experimentor observed that the tool, a naturally backed flake with a cutting edge angle of 30°, could have probably been used without modification to carry out the entire operation. Before use, the tool had an unmarred, straight and sharp cutting edge. Although used for over a half-hour, only minor edge wear was subsequently observed. This wear consisted of a roughening or nicking of the edge (i.e., several indentations in a previously straight edge), and the removal of three use-retouch flakes, 1 to 3 mm. in length.

Concluding Remarks

The limited nature of an experiment such as the one reported here precludes broad conclusions or far-reaching inferences. However, it does allow us to offer a few comments on the use of obsidian tools in deer-butchering. Since obsidian was a raw material widely used in central and northern California for the production of utilitarian implements, we believe that some of the observations recorded during the experiment will be of direct interest to archaeologists working in these regions.

Obsidian, with its extremely sharp edges, works very well in cutting, slicing, sawing, and related tasks in deer butchering. Despite the brittle nature of the material, use-wear is not easily incurred if the tool is used in the cutting or slicing of hide and flesh. Pronounced wear will occur whenever the tool comes into repeated contact with bone, as in the case of tool #2 used in severing the deer's neck, striking the vertebral column on a number of occasions. Although one sharp-edged tool (#10) was used for over 30 minutes in cutting tasks, only very minor wear resulted and the tool was still serviceable at the conclusion of the experiment. One interesting technological factor that we observed was that the obsidian flake tools tended to "resharpen" themselves; tiny use-retouch flakes and bits of the tool edge were continually being removed during certain cutting or sawing activities, thus creating a new, sharp edge. It should be emphasized that no intentional resharpening of tool edges was required during the experiment.

Flake tools seemed to work much better in the butchering activity than did the single biface (tool #5) that we tried. Shafer (1971: 103) notes similar results from the comparative use of chert bifaces and flake tools in deer-butchering. The flakes, in that experiment, functioned much more efficiently than the biface (of a form, as was our obsidian biface, that archaeologists often call "knives"). The five chert flakes used to skin and partially butcher the deer showed nicked edges and only faint dulling appeared on the edges of two of the specimens.

In our experiment, the most useful of the flake tools proved to be those with a flat or cortex-covered edge opposite the cutting edge (e.g., a naturally backed flake like tool #10). All of the flake tools we used had acute edge angles (20^{o}-32^{o}).

Although we used a chopper (tool #2) in processing the deer carcass, the entire task could have been accomplished just as easily without it (cf. Shafer 1971: 103). And, as we noted above, the biface was of little value. Thus, a very simple, non-specialized tool kit of obsidian flakes would be, upon analysis, the most efficient implements for the gutting, skinning, and butchering of a deer.[4] Such a possibility should serve as a warning to those archaeologists who make subjective judgements about tool functions (e.g., biface = "knife") and to those who continue to ignore flake assemblages as a source of information of prehistoric activities.

NOTES

1 The film viewed by the seminar group recorded an experiment performed at the Texas Archeological Research Laboratory. J.E. Corbin carried out the skinning and partial butchering of a young deer, using five chert flakes to accomplish the entire task. See Shafer (1971: 103) for a further discussion of this experiment. The film is in the possession of R.L. Alexander, Dept. of Anthropology, University of Delaware.

2 An extensive series of Kodachrome slides were taken by seminar members A. Albee and C. Busby.

3 The spalling of tiny flakes from an obsidian tool during meat-cutting activities may help to explain the presence of such materials in prehistoric coprolites analyzed from California (Nissen 1973: 69) and Utah (Fry 1970: 239).

4 A further experiment conducted by J. Bard, C. Busby and L. Spencer with a similar sized deer utilizing a hafted biface and a tool kit of unmodified obsidian flakes accomplished the butchering of the animal in approximately 30 minutes. In this experiment the antler-hafted biface was discarded after a short period of use (2-3 minutes) because it became too slippery to hold during the butchering activities. The rest of the butchering was conducted using four unmodified flakes and a large angular obsidian chunk ("chopper") and was completed using the same sequence of steps outlined in the present report.

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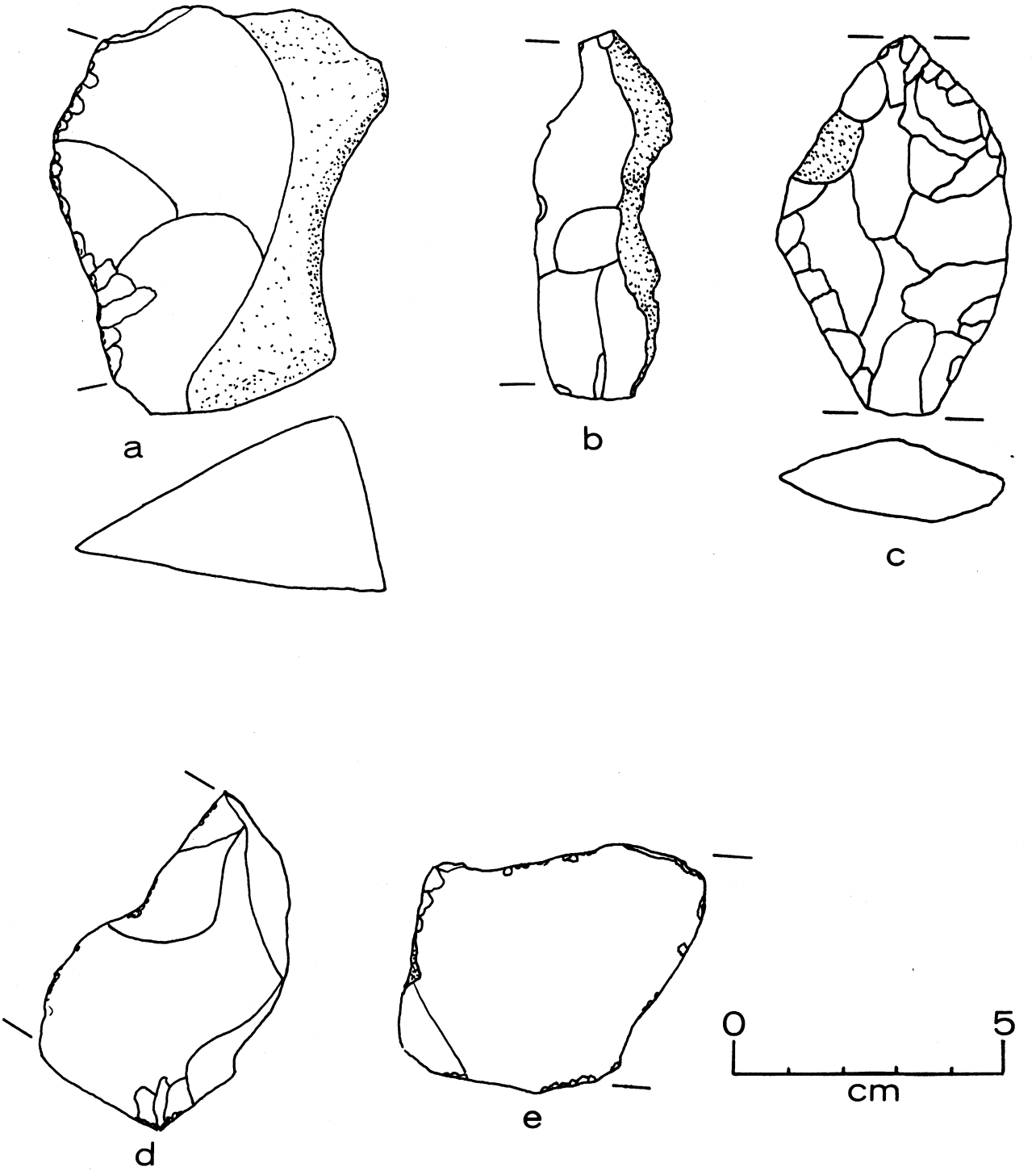

Figure 1. Obsidian Tools Used in Deer-Butchering Experiment. a, Tool #2; b, Tool #4; c, Tool #5; d, Tool #7; e, Tool #10. Transverse cross sections are shown for a and c. Horizontal lines along the tool edges indicate those areas of the tool used during the experiment. All tools retaining the bulb of percussion and striking platform (a, b, d, e) are oriented with the bulb and platform down (i.e., toward the bottom of the page).