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Flat Adzes—a Class of Flaked Stone Tools from Southwestern Australia

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ABSTRACT

Qualitative and quantitative analyses applied to stone tools from the surface of sites in southwestern Australia reveal the existence of a tool type with distinctive characteristics and suggest a wide range of functions, including tasks related to wood-scraping and cutting of meat, skin, and fibrous materials.

INTRODUCTION

In February, 1966, Gould visited a small rock shelter situated in a granite outcrop on Oudabunna Station, about 280 miles northeast of Perth, Western Australia. A stratigraphic test pit was excavated within the cave, and a surface collection was made at the site. The surface collection encompassed not only the interior of the rock shelter but also the talus slope below the cave entrance. A total of 44 stone cores, tools, and retouched fragments was found on the surface within 100 yards of the cave, and two more stone tools were found near a small claypan about one-fourth of a mile east of the site. The site fill within the cave was shallow and appeared to be disturbed by trampling by livestock, but a second small test pit excavated on the talus, in the area where most of the stone tools were found, yielded a few stone flakes in a shallow habitational deposit extending to a maximum depth of 14 to 18 inches. Figure 1 shows

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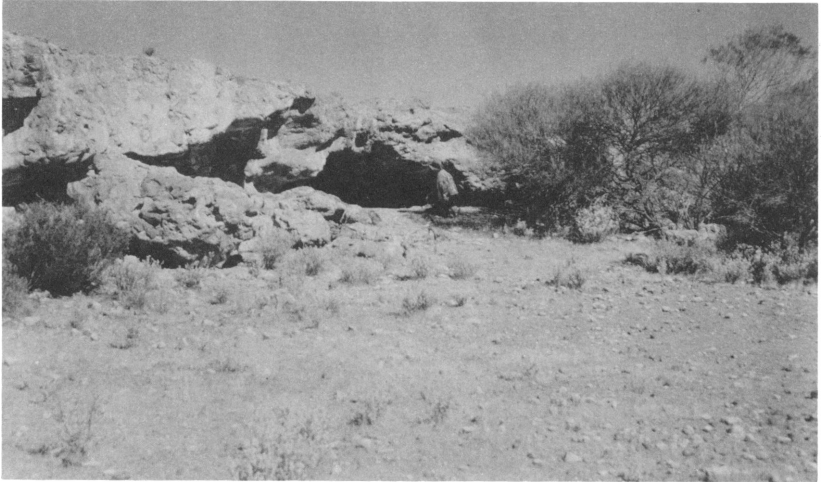


FIG. 1. The Oudabunna Rockshelter Site, Western Australia.

the Oudabunna rock shelter and talus, and figure 2 is a view of the mulga scrub that covers the terrain surrounding the site and extends over wide areas in this semiarid district.

Among the stone artifacts collected at this site, there were eight which formed a distinctive pattern and seemed to warrant further investigation. A later check of lithic materials obtained from the surface of the Walyunga and South Bullsbrook sites near Perth (collected by W. H. Butler and currently housed at the Western Australian Museum, Perth) revealed many more examples of this unusual class of tools. A summary of the early collecting activities at these two sites and others in the Perth vicinity appears in Butler (1958, pp. 133–136.) Examination of collections made by Butler since 1958 at these two sites (currently housed at the American Museum of Natural History) revealed five further examples of this tool type. Finally, surface collections made by R. A. and E. B. Gould (1968, pp. 12–17) at the Kunturu site at Lake Moore on Mt. Gibson Station (about 25 miles south of Oudabunna) turned up nine more.

A recently published paper by Akerman (1969, pp. 12–16) on the Walyunga site contains illustrations and descriptions of seven fine examples of this class of tools (pl. 3, figs. 48–54), which we have now chosen to call flat adzes. Akermann (1969, p. 12) asserted, “Walyunga appears to be a comparatively recent site, with artifacts being manufactured up to, and after the arrival of Europeans to Western Australia. Evidence for this is found in the tools fashioned from glass and early pottery—glass microliths

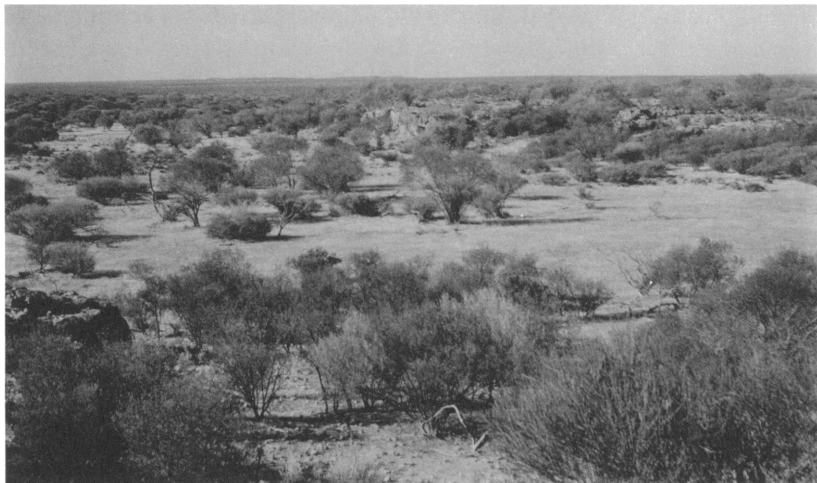


FIG. 2. Terrain near the Oudabunna Rockshelter Site, showing predominant mulga (*Acacia aneura*) vegetation.

found on the site support the theory that microlith users persisted till the arrival of the whites." It must be cautioned, however, that surface sites are always problematical, as materials from all levels of occupation ultimately become mixed together on the surface. Although there is no doubt that Walyunga was inhabited by aborigines until and into historic times, there is no way of determining archaeologically how long ago the first human occupation of the site began. Thus the flat adzes that occur at Walyunga are still of unknown age, and it is not known how long they persisted nor with what other kinds of tools they were associated. The same qualification applies at this time to all known occurrences of flat adzes in southwestern Australia. These questions can be answered only by applying methods of stratigraphic archaeology to this region.

QUALITATIVE ATTRIBUTES OF FLAT ADZES

Flat adzes possess two qualitative attributes which indicate that at least one of the principal functions of these tools was wood-scraping. These attributes are (1) steep unifacial retouch along the working edge (or edges), and (2) small, terminated flakes appearing along the bulbar face of the adze-flake, directly behind the working edge. These became clearly visible when viewed through a binocular microscope under 30 \times magnification. Analysis of ethnographic aborigine woodworking adzes in the Western Desert of Australia by Gould, Koster, and Sontz (1971, pp.

157-160) has suggested that these two qualitative attributes are diagnostic of use and resharpening of stone tools used for scraping hard wood, mainly mulga (*Acacia aneura*), in making aborigine implements like spearthrowers, clubs, throwing sticks, and digging sticks. Both of these attributes appear on all 22 flat adzes in the sample under study.

The steeply retouched working edges are completely unsuited for cutting and slicing tasks, but this fact does not eliminate the possibility that the flakes were sharper before being retouched and may have been first used for cutting tasks. The retouch in all cases is of the "simple" variety described by Gould, Koster, and Sontz (1971, pp. 158-159), consisting of a single row of flake scars along the margin of the working edge of the flake. Some specimens, however, do show traces of undercutting along the working edge which are probably the result of step-flaking during the process of resharpening. This undercutting was especially evident on one specimen (AMNH 85/5605) from Walyunga.

The small terminated flakes along the bulbar face of the working edge vary considerably in size but are as readily visible as they were on the ethnographic Western Desert aborigine adzes. Experiments were undertaken at the American Museum of Natural History to reproduce these microscopic terminated flakes under controlled conditions, using various kinds of chert, quartzite, and other lithic materials from Australia. The flakes were hafted to a Western Desert aborigine club (known to have been used for this purpose ethnographically) with spinifex resin, the adhesive most widely used for hafting in the Western Desert. The hafted stone flakes were drawn hard across a mulga wood surface in a manner like that observed ethnographically. Each flake was examined under the microscope before being used and again after use. Initially, these experiments consisted of 1000 woodworking strokes, but later experiments sought to determine the relative edge-holding capabilities of different stone materials by simply counting the number of effective woodworking strokes (strokes which resulted in removal of recognizable wood shavings) between resharpenings. In general, coarse-grained quartzites and porphyry gave better results than did smooth-grained cherts; that is, they gave a larger number of useful woodworking strokes between resharpenings. Twenty-five experiments of this latter type were performed. Microscopic examinations were made of the bulbar face of the working edge of each tool before and after each experiment. In all cases small, terminated flakes, which had not been present at the start of the experiment, were found. These small, terminated flakes in this case arose as the result of woodworking wear, with no other kind of wear (such as striations or gloss) appearing. Visually, the results of these experiments were identical with the use-wear appearing on the

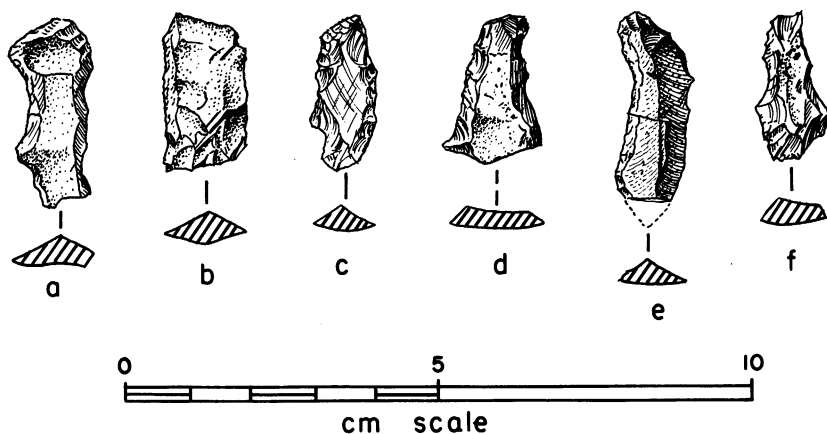


FIG. 3. Flat adzes collected from the surface of the Oudabunna Rockshelter Site.

22 flat adzes from southwestern Australia. However, the raw material aspect of the study was inconclusive with respect to the flat adzes, as there were not enough usable flakes in these collections to experiment with, and the natural sources and geological nature of these particular raw materials are not well known.

Overall shape is a third qualitative attribute which should be considered, although there is considerable variability within the sample of flat adzes. The only generalization it is possible to make at this time is that the only retouch these tools possess occurs along the working edge or edges. In all cases it is clear that no attempt was ever made to shape the tool beforehand or affect the shape during use and resharpening other than by trimming the working edge. Successive use and resharpenings, however, caused the working edges of these tools to become deeply concave. In cases in which the working edges occurred opposite each other on the lateral sides of the flake, the tool tended to assume a narrow, "hourglass" shape reminiscent of the "strangulated blade" familiar to archeologists who have studied the Upper Paleolithic cultures of Europe, as described by Bordes (1968, fig. 56, no. 5) and Bordaz (1970, fig. 22, no. 3). Examples of flat adzes from Walyunga with this "strangulated" shape are illustrated by Akerman (1969, pl. 3, figs. 48-51), and many more were seen in the collections from Walyunga at the Western Australian Museum by Gould in 1966. When larger samples of flat adzes become available for study it may be possible to break down the category of shape into subcategories which can be measured and grouped for comparisons with materials from other

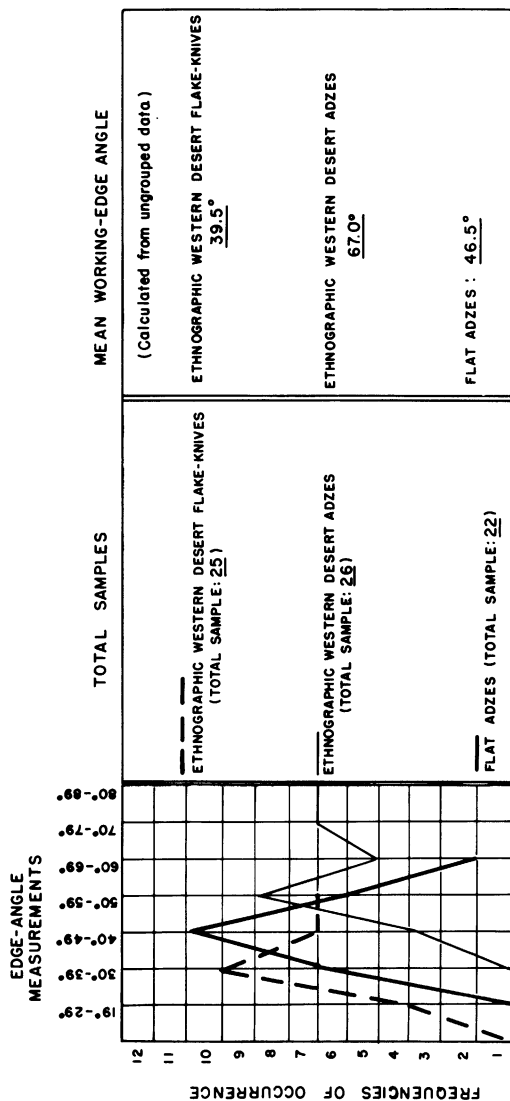


Fig. 4. Edge-angle frequencies of surface-collected flat adzes and ethnographic Western Desert aboriginal adzes and flake-knives.

areas of Australia. For example, descriptions by Noone (1943, p. 279) suggest some possible similarities between what we call flat adzes and certain retouched flakes from South Australia (the so-called Adelaide adze-flake). Figure 3 shows six of the flat adzes from the sample described in the present paper.

QUANTITATIVE ATTRIBUTES OF FLAT ADZES

The qualitative attributes reviewed above show strong points of similarity between the specimens in this sample of flat adzes and the wood-working adzes observed in use among ethnographic Western Desert aborigines. The three quantitative attributes analyzed in this paper, however, tend to show differences between these two samples. These differences were sufficiently marked to lead us to view flat adzes as a separate class of stone artifacts rather than as a simple extension of the adze-flakes known ethnographically from throughout the Central and Western deserts of Australia.

Perhaps the most important single measurement from a functional point of view is the angle of the working edge of the flake, as measured at the mid-section of the working edge. This measurement is easily and accurately achieved with an artist's template-gauge used in the same manner as suggested by Crosby (1967, pp. 102-103). In the ethnographic studies of Western Desert aborigines cited earlier a high correlation was found between flakes which were observed in use exclusively as wood-working scrapers and steep working-edge angle measurements ranging between 45 and 87 degrees (with the mean for a sample of 26 adzes of 67°). Working-edge angle measurements for flat adzes, in contrast, ranged from 37 to 63 degrees (with the mean for a sample of 22 flat adzes of 46.5°). Yet, despite this difference in distribution and means for the working-edge angles of these two samples, the qualitative similarities still provide compelling evidence for regarding scraping of hard wood as one of the principal functions of the flat adzes.

In the ethnographic Western Desert studies, the working-edge angle measurements of adzes were found to differ significantly from similar measurements taken on flake-knives. The Western Desert aborigines distinguish terminologically between woodworking scrapers (*purpunpa*) and flake-knives (*tjimari*). The latter were observed in use entirely for cutting skin, meat, sinew, and other fibrous materials. Working-edge angle measurements for ethnographic flake-knives ranged from 19 to 59 degrees (with the mean for a sample of 25 flake-knives of 39.5°). The differences in distribution and means for the working-edge angles of these three samples of material are summarized in figure 4, from which it should be clear that

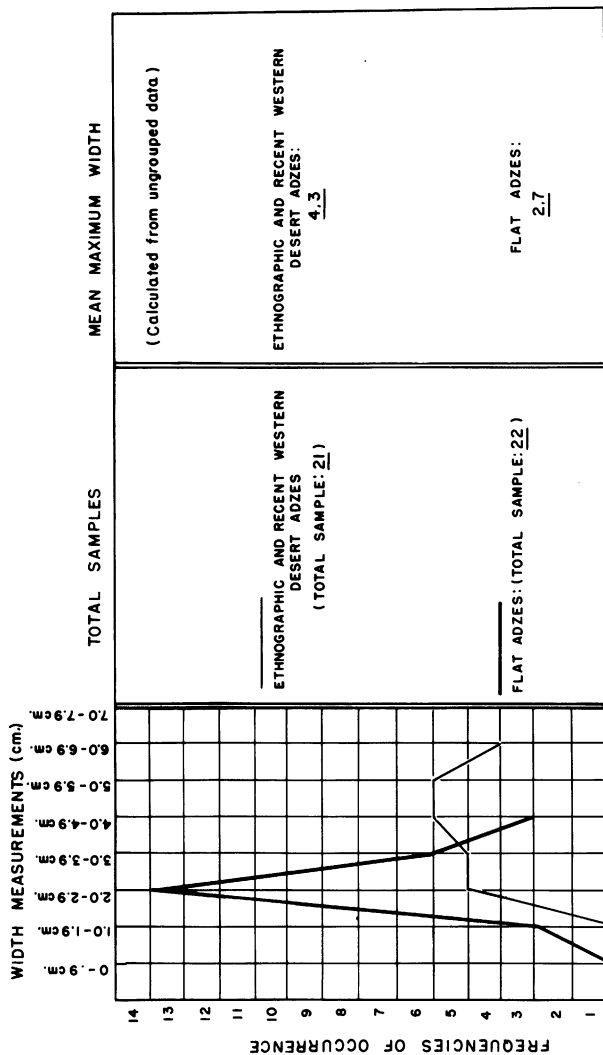


Fig. 5. Maximum width-measurement frequencies of surface-collected flat adzes and ethnographic and recent Western Desert aborigine adzes.

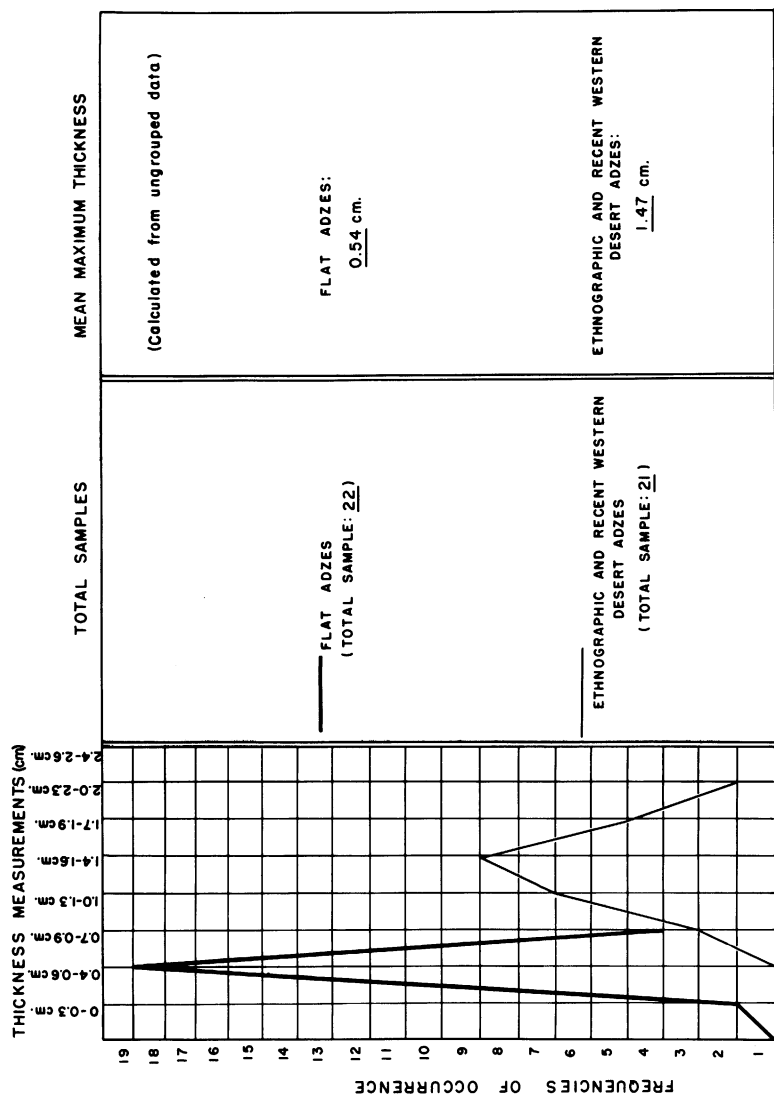


FIG. 6. Maximum thickness-measurement frequencies of surface-collected flat adzes and ethnographic and recent Western Desert aborigine adzes.

the working-edge angles of flat adzes are exactly intermediate between those of the ethnographic Western Desert adzes and flake-knives.

Maximum width was accepted as a good measurement for expressing overall size, and the same was true for maximum thickness. Measurements of maximum length and weight, however, were discarded, both for the same reason. As use-wear and resharpening proceed on woodworking flakes, the flakes become progressively shorter and lighter, tending ultimately to become slugs (worn out remnants which are too narrow to be held in any kind of haft). Both the ethnographic and flat-adze samples analyzed herein are made up of examples from virtually every stage of wear and resharpening. Much larger samples of these tools are needed before analyses of maximum length and weight will become valid. Figure 5 summarizes the maximum width measurements of the flat adzes and ethnographic Western Desert adzes, and figure 6 does the same for maximum thickness measurements. A special note is made here concerning the sample of ethnographic Western Desert adzes for figures 5 and 6. Thirteen of the 26 ethnographic adzes in the sample described in figure 4 were hafted to the ends of wooden spearthrowers or clubs. Thus the hafted examples could not be measured for maximum width or thickness, as the bulk of each adze-flake was covered with the hafting material (spinifex resin). It was found that one can X-ray the flake in its haft, but because of irregularities of surface curvature it is not possible to make dependable measurements from these X-rays. Another alternative would have been to destroy the haft on each specimen for the purpose of making these measurements. The authors were unwilling to take such a drastic step and compromised by diluting the sample with eight adzes recovered from excavated levels between 6 and 15 inches in depth at the Puntutjarpa Rockshelter site (situated about 3 miles south of the Warburton Ranges Mission, in the heart of the Western Desert). On the basis of stratigraphic evidence and radiocarbon dating we know these levels to be essentially modern (i.e. within the last 200 years), and the adzes found in these levels are indistinguishable in both general appearance and specific measurements from the modern, ethnographic specimens. So the diluted "ethnographic" samples of Western Desert adzes in figures 5 and 6 are still considered valid for purposes of comparison.

Examination of figure 5 shows that flat adzes are generally smaller in width than the ethnographic Western Desert adzes, and figure 6 shows an even more dramatic difference in thickness. Flat adzes are much thinner than ethnographic Western Desert adzes, which accounts for the name that has been assigned to this class of artifacts. During the course of experiments in producing and working with stone adze-flakes, it was found that

TABLE 1
SIMPLIFIED SCATTERPLOT SHOWING CORRELATION OF MAXIMUM THICKNESS AND
WORKING-EDGE ANGLE MEASUREMENTS FOR 25 EXPERIMENTAL ADZES

Working-edge Angle Measurements	Maximum Thickness				
	0-0.3 cm.	0.4-0.6 cm.	0.7-0.9 cm.	1.0-1.3 cm.	1.4-1.6 cm.
30°-39°	—	—	—	—	—
40°-49°	—	5	—	1	—
50°-59°	—	1	2	—	—
60°-69°	—	3	2	3	—
70°-79°	—	2	3	—	—
80°-89°	—	—	—	—	—
90°-99°	—	—	—	1	—
100°-109°	—	—	—	1	—
110°-119°	—	—	1	—	—

there was a general tendency for more acute working-edge angles to be positively correlated with thinner flakes, as shown in table 1. By applying this experimental model to the situations depicted in figures 4 and 6, we may conclude that the relatively greater acuteness of working-edge angle measurements among flat adzes as compared with ethnographic adzes is at least partly a function of the fact that flat adzes were made on thinner flakes than was the case for the ethnographic Western Desert adzes.

HAFTING

Were flat adzes hafted when in use? As J. P. White (personal commun.) has correctly observed, size alone cannot tell the archeologist whether a stone tool had to be hafted in order to be used. But when the extremely small size of flat adzes is considered together with the evidence of wood-working wear it is possible to say that use-wear of this sort is virtually impossible to achieve with tools this small unless they are hafted to a handle of some kind. The experiments with stone adze-flakes demonstrated the mechanical impossibility of duplicating use-wear patterns of this kind without the aid of hafting. Flat flakes in the size range for flat adzes were useless as hand-held wood scrapers. However, this fact does not affect the possibility that flat adzes may have been used as cutting knives, too, either in a hand-held or hafted form before being used as wood-scrapers. So, with the proviso just mentioned, it is possible to consider flat adzes as belonging within the "Inventive Phase" of Australian prehistory, marked by the appearance of hafted stone tools, as suggested by Mulvaney (1969, pp. 107-110). It is worth noting that the region between Oudabunna Station

and Perth, Western Australia, abounds with grass trees or "blackboy" (*Xanthorrea* sp.), a plant which contains resin that is easily extracted and is useful for hafting.

USES OF THE FLAT ADZE

As described by Hasluck (1970, pp. 18-41), European settlement was well advanced in southwestern Australia generally, and in the area discussed in the present paper particularly by 1850, leading to an early disruption of many traditional aspects of an aborigine culture. Early explorations of this region by A. C. and F. T. Gregory in 1846 and 1848, Forrest in 1869, and E. Giles in 1875 had only fleeting contacts with the aborigines and failed to note any details concerning the use and manufacture of stone tools. Early ethnographic observations such as those reported by Curr (1886, p. 380) were also vague but did indicate the presence in this region of stone flakes hafted in a manner generally like that known in the Central and Western Desert of Australia. The uses of these ethnographic tools, however, were not specified.

Interviews with four elderly aborigine men at Paynes Find and Mt. Magnet, Western Australia, not far from Oudabunna Station, were suggestive but not conclusive. These men were shown the flat adzes and other stone tools found at the Oudabunna Rockshelter and Kunturu (Lake Moore) site, and two of them, Arthur Fogarty and Billy Barlow, recognized the flat adzes as flakes (called *maṭa*) which were hafted to the end of a spearthrower with resin from blackboy trees (*Xanthorrea* sp.). They said they had seen these hafted tools used mainly as scrapers for shaping boomerangs, spearthrowers, spears, and other wooden implements, but Barlow added an interesting comment by stating that he had also seen such hafted flakes used in cutting chest scars on novices. However, the implication that flat adzes were in use up to and during historic times must be viewed with caution in light of the current absence of supporting evidence from ethnohistory or archeology.

The analytical evidence drawn together herein offers perhaps the best available basis for inferring the probable uses of the flat adze and the cultural rules underlying those uses. In a sense, this has been the purpose of the present paper. The discovery of this class of stone tools in Australia is of limited interest to local archeologists, but the implications of this discovery for understanding the prehistoric behavior attached to these tools, particularly when compared with the ethnographic Western Desert situation, are of much wider interest to anthropologists and archeologists generally. As the figures 4 to 6 show, the flat adze of southwestern Australia departs from the basic binary pattern of stone tool manufacture

and use described for the Western Desert. The fact that flat adzes were characteristically made on thin flakes suggests that they were used initially or intermittently as flake-knives, in a manner analogous to the Western Desert tjimari, in addition to their demonstrated use as wood-working scrapers, in a manner analogous to Western Desert adzes (purpunpa). In short, both the qualitative and quantitative attributes of the flat adzes indicate to us that despite the observed regularities of this tool class, it combined the functions of cutting knife and woodworking scraper, making it one of the most unspecialized stone tools known from aboriginal Australia.

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