

of a single stone adze-flake, this works out to 9 adzes per man per year (or the equivalent in unhafted stone flakescrapers if any of these were used for this task instead of the hafted adze) for the sole purpose of resharpening speartips. Similarly, a man will need to replace an average of 17.3 spearshafts per year, and he will be able to shape 2 spearshafts with a single adze-flake or hand-held flakescraper (this is a rather gross estimate, since different types of spearshaft wood vary in terms of hardness and ease of shaping), thus he will need an average of 8.7 adze-flakes each year for this set of tasks. One adze-flake is sufficient for shaping two clubs, and similarly one adze-flake will shape two throwing-sticks. These basic figures can be summarized as follows:

<u>TASKS</u>	<u>AV. NO. of ADZE-FLAKES USED EACH YEAR</u>
1. Resharpening speartips	9.0
2. Replacing spearshafts	8.7
3. Replacing spearthrowers	.5
4. Replacing clubs	.25
5. <u>Replacing throwing-sticks</u>	<u>.5</u>
TOTAL:	<u>18.95</u>

In addition to these basic utilitarian tasks, there are uses applied to the manufacture of sacred boards and other ritual paraphernalia. These are very hard to estimate, since they take place at irregular intervals and at variable rates. Nevertheless, on some ritual occasions, woodworking activities may be considerable. As a general estimate I would add at least another three adze-flakes to the annual inventory, bringing the total now to 22 adze-flakes (if one rounds off the previous total). I regard this as a realistic estimate of the average number of stone adze-flakes needed by an Aborigine man in a year (with the understanding that hand-held flakescrapers may at times be substituted for some of these tasks) for hafted and retouched stone tools.

4. In obtaining spearshaft wood, and in detaching the mulga wood blanks and giving them their rough shape a man will also need some large hand-held core choppers (I have elsewhere called these handaxes) and some hand-held scraper-planes. For all practical purposes these tools are the same, being unifacially retouched and made of some coarse stone like porphyry or quartzite. In many cases these implements are fashioned on the spot, as the need arises, if the stone is available close at hand. In other words, unlike adze-flakes, it is not common for men to make a special effort to collect stone for this purpose from a quarry unless, of course, the needed stone is absolutely unavailable in the area where it is needed (for instance, somewhere out in the sandhills). Sometimes these tools receive no retouch whatsoever, but in most cases I have observed at least a few flakes are trimmed to sharpen the working edge. Tools of this kind are generally discarded after use, with no attempt being made to resharpen or rejuvenate the tool. Thus, for all practical purposes, 1 use = 1 tool. One tool will be needed each time a tree or root is chopped for making into a spearshaft; one tool is needed also each time a spearthrower-, club-, or throwing-stick-blank is removed from the tree and shaped, and, of course, one will be needed each time the blank for a sacred board is removed and trimmed. Basic figures for core-choppers & scraper-planes are summarized below:

<u>TASKS</u>	<u>AV. NO. of "CHOPPER-PLANES" USED EACH YEAR</u>
1. Resharpening speartips	0.0
2. Replacing spearshafts	17.3
3. Replacing spearthrowers	.5
4. Replacing clubs	.5
5. Replacing throwing-sticks	1.0
6. <u>Replacing digging-sticks</u>	<u>2.0</u>
TOTAL:	<u>21.3</u>

Here, again, we also must consider choppers needed in making sacred boards and ritual paraphernalia. My minimum estimate would be two per year, bringing the total to 23.3.

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5. The foregoing figures are estimates based on observed cases, but there is another category of wooden tools which I have very little data on for this problem -- wooden carrying- and digging-bowls. These tools also require core-choppers and scraper-planes in their initial removal and shaping, and they are finished by adzing. But they tend to be kept and used for long periods (possibly as much as 10 years at a time in the case of fine carrying-bowls). I have no basic data on how many adzes are needed to finish one bowl, so all I can do here is offer you my best guess with the understanding that it is a guess. Wooden digging-bowls are probably replaced once a year or thereabouts, and probably require about as much effort in manufacture as a spearthrower (that is, one adze-flake plus one "chopper-plane" will do the job). The large carrying-bowls are much trickier to estimate, since these are kept and used over long periods and may not be replaced very often. One of these would require the use of a single "chopper-plane" plus at least two adze-flakes (or their equivalent in hand-held flakescrapers). Let's say that these need to be replaced once every three years. Thus we can raise the foregoing totals now to an average of 24.6 "chopper-planes" and 23.6 adze-flakes (or their equivalent in hand-held flakescrapers).

6. Digging-sticks are shaped almost entirely by means of "chopper-planes" and by grinding the tip on an abraisive rock. I have never seen an adze-flake used in the manufacture of a digging-stick (although it is quite possible that on occasion it does occur).

7. Women sometimes take a hand in the final finishing of wooden bowls. Although I have arbitrarily classed this here as a male task, it is not exclusively so. I have no quantifiable estimates on the relative proportions of work on wooden bowls performed by men vs. women, so I think it's best to be arbitrary here and simply say so.

8. From all of the foregoing information you may calculate that an adult male Western Desert Aborigine uses an average of 23.6 adze-flakes (or equivalent flakescrapers) and 24.6 core-choppers & scraper-planes each year. These figures account for all retouched stone tools in the Aborigine assemblage (with the exception of engravers, which are so small as to be negligible). Of these, only the adze-flakes can be regarded as quarried specimens (that is, items where the raw material was collected and transported from a quarry, often at a considerable distance from where the tool was used and finally discarded). I weighed only 9 ethnographic adze-flakes before they were hafted and put to use, and I obtained a mean weight of 41.4 grams for these. I regard this as an inadequate sample, however, and suspect that the true mean should be higher (around 65-75 grams). What I suggest you do is calculate on the basis of two weight estimates; a high of 75 grams per adze-flake and a low of 41 grams per adze-flake -- then at least you will have pretty well covered the parameters. Core-choppers & scraper-planes are much more variable in weight (not surprising, considering their rather ad hoc character), ranging from 4.7 kilograms to 97.0grams, with a mean weight of 739.80 grams. With these figures as a basis for calculation, we can make the following estimates of the amounts of lithic raw material needed by one man each year for retouched stone tools:

- 1. Core-choppers & scraper-planes (i.e. "Chopper-planes")18,199 kg.
- 2. Adze-flakes (& equivalent flakescrapers), high est..... 1,770 kg.
- 3. " " " " " " , low est..... 968 gr.

(Barbara, be sure to check my computations-- I often make mistakes!)

9. Unretouched flake knives are also used by both men and women, mainly at times when a kangaroo or other fairly large animal is about to be cooked. In the Western Desert this does not happen too often, and frequently the flakes used are simply picked up on the spot, in the same manner as core-choppers and scraper-planes, and they are generally discarded immediately after use. Thus much of this material is not obtained from quarries. If we figure average use of approximately 20 of these flake-knives by

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one person (male or female) each year, at a mean weight of 40 grams, we get a total weight of material of 800 grams. This is a reasonable estimate for the amount of lithic material needed for this kind of tool, but when applied to archaeological problems this figure has three important qualifications;

1. both men and women make and use these flake-knives.
 2. flake-knives rarely show retouch and thus may be hard to identify archaeologically.
 3. much, perhaps most, of the raw material used in making flake-knives is picked up and later disposed of where it is used, rather than being obtained in quarries.
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Your questions have given me an opportunity to review my evidence from a new point of view, and I am glad you are asking these kinds of questions. I realize that my answers here are a bit disjointed, and I hope you can make sense out of all this stuff. In some respects the data is uneven in quality. Despite this, there seem to be several general conclusions which are of importance to your work;

1. Even allowing for a high estimate for adze-flakes and figuring on 400 gr. of flake-knife material as quarried stone, the ratio by weight of non-quarried to quarried material in the Western Desert Aborigine assemblage is over 8 to 1.

2. Only hafted and retouched implements tend to be made of lithic material obtained from definite quarries. Impromptu stone tools, whether retouched or not, tend to be made of material obtained as close as possible to the place where the task is being performed. If a quarry happens to be close by it will be used, but this is rarely the case. More often, the stone material, even if somewhat inferior in terms of its flaking properties, will be picked off the surface of the ground, used for the task, and discarded.

3. An Aborigine man can be expected to use an average of between 20.869 kg. and 19.967 kg. of stone for making flaked stone artifacts (both retouched and unretouched) each year. Of this, only an average of between 2.170 kg. and 1.768 kg. of material can be expected to come from recognizable quarry sites.

Does this help you at all? I found it rather interesting to gether all this data together and look at it in this way. Perhaps this stuff ought to be published sometime after it has been looked at more closely, and we might want to get together on this. I shall be very interested in what you are finding out in your dissertation project. Please let me know what questions you have about all this, and I will do my best to answer them. I will be at the AAA Meetings this year, so perhaps we can discuss all this further then.

Cheers,

Dick Gould

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cc/ Don Crabtree

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