Editorial enquiries and offers of papers are welcomed, particularly from Melanesian, Polynesian, and South East Asian scholars, and should be addressed to:

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ABORIGINAL ADZE STONE HOARDS FOUND ON THE ARCOONA PLATEAU NEAR WOOMERA, SOUTH AUSTRALIA

Introduction

In October 1970, the Woomera Natural History Society held a field excursion to the Lake Hanson area. The purpose of this paper is to provide details of a hoard or cache of Aboriginal adze stones found by the writer on that occasion. This paper will also describe two smaller finds of hoarded adze stones, made in other parts of the region in recent years.

Part 'A' - North East Lake Hanson

Description of the Site

Lake Hanson is a salt lake situated about 220 km north-west of Port Augusta. This lake is located at the western end of the Arcoona Plateaux, an elevated salt bush and gibber plain dissected in places by lowlands of sand, scrub and salt lakes. The region has been described in detail by R.K. Johns, 1967:21-2.

Permanent surface water is virtually non-existent although after good seasons waterholes and fresh water lakes may hold water for several years. In some creeks, soak water possibilities are good and this find of adze stones was made near one such spot.

Running into the north-east section of Lake Hanson is a creek consisting of two arms. The confluence of the two arms occurs just above a rocky bar and it is at this point that soak water is likely. One arm of the creek rises on the plateau to the east whilst the other arm drains a valley cutting back into the plateau to the north.

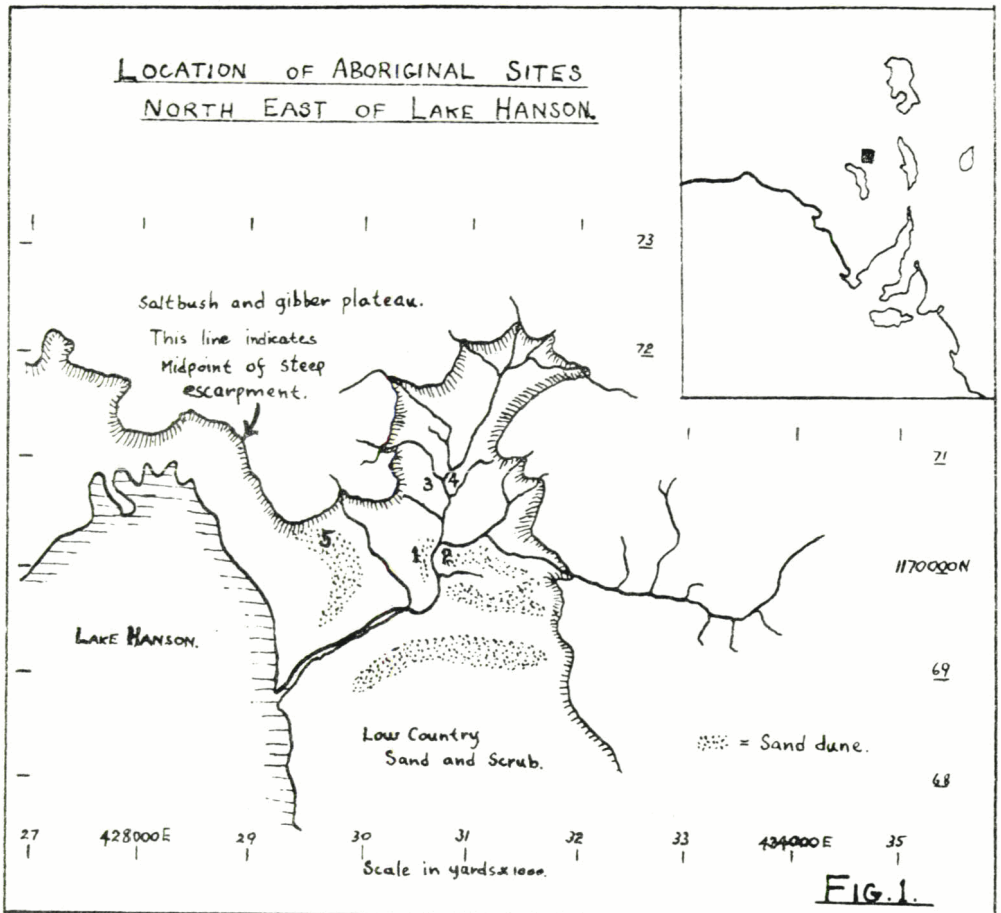

FIG. 1.

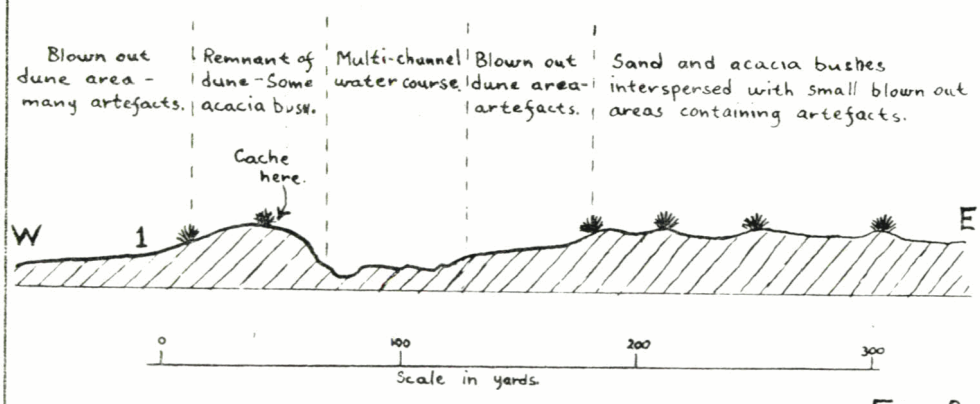

FIG. 2.

Four principal campsite areas occur, one each side of the northern creek arm about six hundred metres north of junction point, and one each side of the watercourse just below the junction, near the bar. The campsite near the bar, on the western side of the watercourse (see Fig.1), is on a low north-south aligned dune, the western face of which is wind eroded, the sand being carried over the top of the dune into the creek.

Many points, geometric microliths, blades, scrapers and a large number of adze slugs occur at this site, along the lower western edge of the dune. The cache was found on the upper part of the dune near the point where it falls away suddenly into the creek (Fig.2).

Description of the Material (Fig.3)

An attempt has been made to differentiate the materials used for these artefacts (Fig.3). The divisions selected are mainly arbitrary as most of the stone comes under the general heading of crypto-crystalline quartz and many of the specimens do not fall clearly into the stone types chosen. However, a need existed to differentiate the materials further, so that their origin and 'working' properties might be considered. In some cases colour is not a reliable identification for a particular material type as some specimens, in material type 1a for example, vary from cream, through buff, brown to translucent!

Type 1a (Oolitic Chert - 49) All but four of the specimens in this group type are considered to be of identical material. It has been called oolitic chert and is characterised by a slightly greasy feel (not as pronounced as jasper) and under magnification is seen to be composed of regular sized rounded concretions loosely floating in a chalcedonic matrix.

When knapped, it parts with a pronounced convex lower surface to the flake but often without any pronounced bulb of percussion or striations. The fracture has a slight tendency to be conchoidal. More than half the specimens in this group have varying areas of cortex material on the platform at the point of percussion.

	Qty	Description	Lower (Inner) Surface	Colour
1a	49	Oolitic Chert	Convex, tends to conchoidal.	Opaque, deep brown buff to creamy pink.
1b	14	Translucent Chalcedony	Flattish, poor control.	Grey, honey coloured, dark grey to blackish.
1c	3	Silcrete	Tends to convex, good control.	Grey, pinkish brown.
1d	11	Banded Jasper	Flattish, conchoidal, poor control.	Banded brown, grades to translucent areas,
2	13	Chert	Convex, conchoidal.	Buff to pale grey.
3	5	Jasper	" "	Cream, buff, grey.
4	8	Indurated Mudstone	As for 1a (7). As for 1b (1).	Yellow/brown. Black/brown.
5	2	Porcellanite	Variable.	Whitish, opaque.

FIG.3: L. HANSON - MATERIAL TYPES

Type 1b (Translucent Chalcedony - 14) This material could have an origin similar to type 1d (see below) as some of the stones of that type show a grading into the type 1b material. However as the major part of each stone in type 1b is translucent, a separate category has been used. Many of the specimens show faint oolitic markings and small quantities of this material do occur in some of the specimens of type 1a. The flakes are small and often angular as if they had been knapped from small cores similar in characteristics to type 1d.

Type 1c (Silcrete - 3) This material is an impure quartzite; the quartz grains being loosely sorted and lightly packed. For this reason it has been called silcrete rather than quartzite. It is the most common artefact material of the Arcoona Plateau area, and has the characteristicly stoney yet smooth feel and the fractures run through the grains of quartz.

Type 1d (Banded Jasper - 11) A characteristic of this material is its rich brown banded colour with a feel between that of the oolitic chert (type 1a) and jasper. The fracture is usually conchoidal but difficult to control and often provides angular and pointed pieces similar to type 1b. A faint but distinct oolitic structure, in most pieces, is apparent. Grades into type 1b in many cases.

Type 2 (Chert - 13) Chert is also a common material on the Arcoona Plateau area and is characterised by a mottled or lightly banded appearance. Conchoidal fracture is common in some varieties and the material has a tendency to rapid patination in some parts of the region. It is commonly used for adze stones but usually provides a convex upper surface type. In some varieties control is not easy. Although faint oolitic markings appear in some pieces it is quite different material to 1a.

Type 3 (Jasper - 5) This category represents the true jaspers - single colour, conchoidal fracture, very soapy feel. A tendency to patination occurs in some pieces.

Type 4 (Indurated Mudstone - 8) The stones in this group are basically of a limonite or haematite base, indurated to various extents to provide a material with visual properties similar to jasper but not as soapy feeling. The hardness can vary markedly in different parts of the stone and areas of the surface often show a grading or breakdown to ochre. A yellow or reddish streak is obtainable and the material tends to knap like type 1a.

Type 5 (Porcellanite - 2) The exact nature of this material is not known but as it has a hard stoney feel and is evenly whitish, it is referred to as porcellanite. It may be a very fine grade of quartzite, but it is not common in the region.

Form		Upper (Outer)		Material Type								
	Description	Surface	Qty	1a	1b	1c	1d	2	3	4	5	%
A	Adze slug	Convex	3					2			1	2.9
B	Part: reduced adze	C'cave	4	1				2	1			5.7
		Convex	2	1		1						
C	Semi-discoidal adze	C'cave	15	9		1	1		1	3		41.1
		Convex	28	22		1		3		1	1	
D	Asymmetric adze	C'cave	3	2						1		5.7
		Convex	3	2						1		
E	Discoidal adze	Convex	2	1				1				1.9
F	Side trimmed adze	C'cave	2	1						1		4.7
		Convex	3	2				1				
G	Adze blank	C'cave	3	2				1				8.6
		Convex	6	3			1	1		1		
H	Micro adze	-	4		1		1		2			3.8
I	Micro adze blank	-	2		1		1					1.9
J	Burin/ Engraver	-	14		8		6					13.3
K	Nondescript flake	-	5	2	2		1					4.7
L	Nondescript lump	-	6	1	2			2	1			5.7
TOTALS			105	49	14	3	11	13	5	8	2	
Percentage of total materials				46.7	13.3	2.9	10.5	12.4	4.7	7.6	1.9	

FIG.4: L. HANSON - ANALYSIS OF FORM

Description and Analysis of the Hoard (Fig.4)

From an area of about one square metre over 100 items were found, with a total weight of 1.75 kilogrammes. In the centre of this area, many of the artefacts were still piled one upon another while the lower ones were partly covered by sand. The whole group had the appearance of a neat pile that had been disturbed only by the action of wind, sand movement and the occasional animal. The hoard was situated on the top of a remnant dune area, a couple of metres to the north of an acacia bush.

Artefacts in the immediate area were only sparse and were mostly nondescript flakes and lumps of stone.

An analysis of the forms and styles of the specimens appears in Fig.4, and a detailed description will follow. To avoid any confusion in terminology, Fig.5 has been used to indicate the terms used here to describe different aspects of the specimens.

Type A (Slugs - 3) The three items in this group are so reduced that the percussion point is no longer evident and insufficient stone remains for hafting as conventional adze stones. However, two of the group have had one end finely trimmed to a graving point (one each of materials 2 and 5, Fig.6).

Type B (Partially Reduced - 6) Although only about 1.5 cm of depth of the lower surface remains on several of these items, five of them have had their cutting edge trimmed for re-use. Two specimens, one of which is heavily patinated, have had one end trimmed as an end scraper. Another (material type 2), appears to have been a semidiscoidal stone that has broken across the middle, the broken edge then trimmed for re-use. One specimen (material type 1a) has had the upper edge of the platform trimmed so as to make it reversable (Fig.7). A sufficient thickness of stone remains in these specimens to enable them to be categorised as concave or convex on the upper surface.

Type C (Semi-discoidal - 43) The criteria used to describe this group as semi-discoidal are:-

a) the platform and/or point of percussion is diametrically opposite the worked edge;

b) the worked edge is curved and extends to points that agree roughly with the extremities across the width of the flake. (Fig.5 and also McCarthy, 1967:27-8 and Fig.11.)

The group has been separated into concave and convex upper surface categories and the average sizes calculated as shown in Fig.25. More than two-thirds of all specimens in Type C had cortex material on some part of the flake (Fig.9). The material type 4 stone is

CORTEX OCCURRENCES ON LAKE HANSON

TRIMMED ADZE FLAKES

FORM (See Fig.4)	CORTEX DISTRIBUTION				TOTALS
	PLATFORM ONLY	UPPER SURFACE ONLY	PLATFORM & UPPER SURFACE	NIL OCCUR-RENCE	
TYPE 'C'	2	12	17	12	43
TYPE 'D'	-	2	2	2	6
TYPE 'E'	1	1	-	-	2
TYPE 'F'	-	1	3	1	5
TOTALS	3	16	22	15	56

FIG. 9.

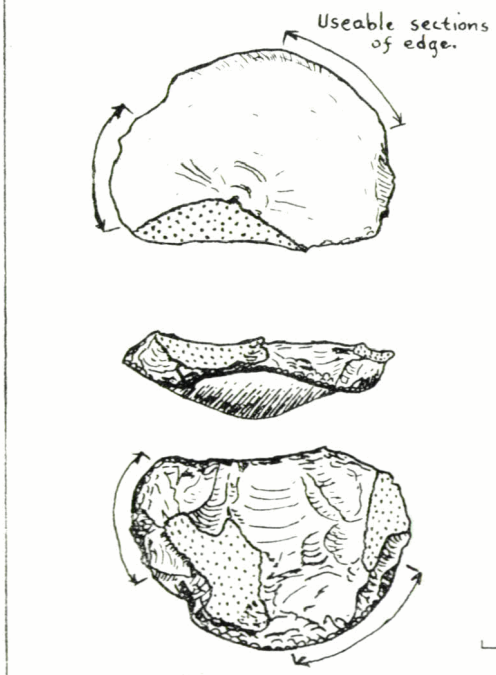

FIG. 10.

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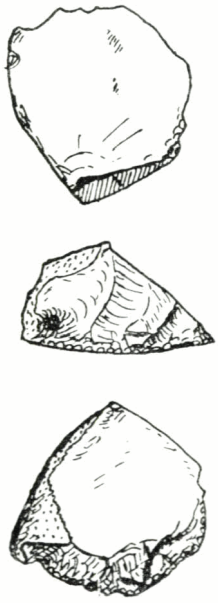

FIG. 11.

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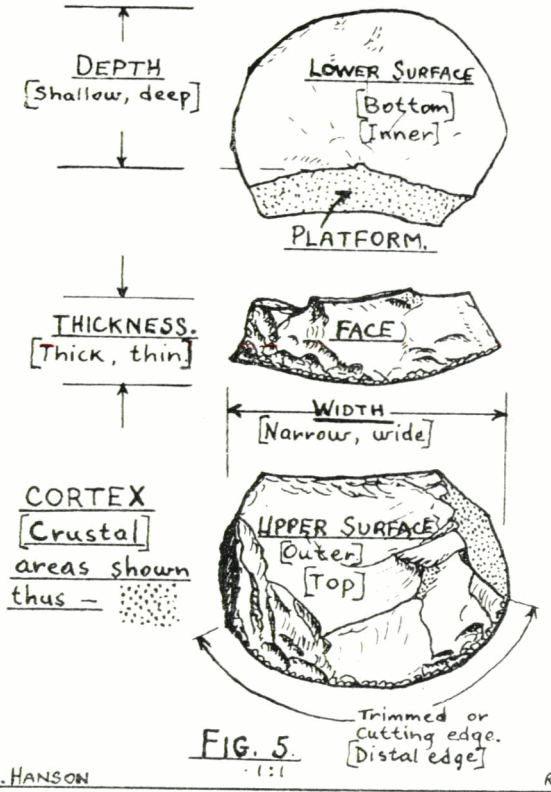

FIG. 5.

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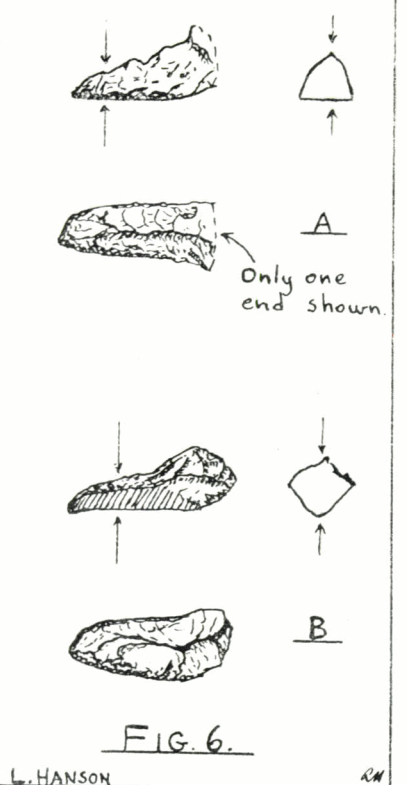

FIG. 6.

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FIG. 7

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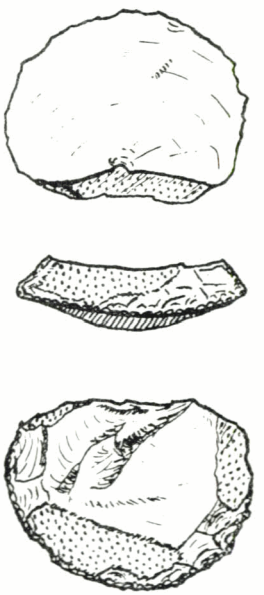

FIG. 8.

L. HANSON

classified as having cortex material, but this is uncertain as it could be patination in this case. The cortex extended to within a millimetre of the trimmed edge of several implements. (Fig.8).

Although all items have been shaped by primary retouch to the conventional semi-discoidal shape, three or four could be said to be in need of sharpening due to irregularities on the cutting edge. Two have secondary retouching at two separate parts of the edge due to irregularities at the centre of the edge, and these could be used in two different modes (Fig.10). The remaining items have secondary retouching along the working edge and are considered ready for use.

None of the flakes have cortex on the lower face but several have cortex on one or both sides, and this would require removal when the working edge was extended. (Fig.5).

Two items in the group approach the shape of small cores, both being 3 cm wide by at least 1.5 cm thick (Fig.11). Their shape is nearing circular and they have a rather flattish lower surface; one is of material type 4 and the other is of type 5.

Type D (Asymmetric - 6) These six stones have similar general characteristics to type C except that on three (all of material type 1a), the working edge is at about 45 degrees to the line of the platform (Fig.16). Another stone of material 1a is more the shape of a short thick end scraper, being 3 cm wide by 3 cm deep by at least 1 cm thick; it is trimmed for use in two modes (one side, the end). Cortex material extends the full length of the third side.

The two specimens of material type 4 have not been further shaped after knapping but secondary retouching has been applied to the working edge produced by the initial knapping. Both also have fine secondary retouching on the upper edge of the butt. (Fig.17). All six specimens show no sign of reduction other than that required to produce a working edge at some portion of their perimeter. One of the type 1a material specimens has cortex material over most of the upper surface and all of the platform. This specimen also has the clear imprint of part of aleaf across the upper surface (Fig.16).

Type E (Discoidal - 2) These two stones are nearly circular in outline with a delicately prepared working edge extending for more than three-quarters of the perimeter. The specimen of type 1a material measures 4.6 cm wide, 4 cm deep and 1.7 cm thick (Fig.15). The type 2 material specimen is the largest in the entire hoard, measuring 5.8 cm wide, 5 cm deep and 2.5 cm thick (Fig.14). The workmanship on both stones is of a high standard but the latter in particular displays primary retouching to shape and secondary retouching of the edge to a high degree of regularity.

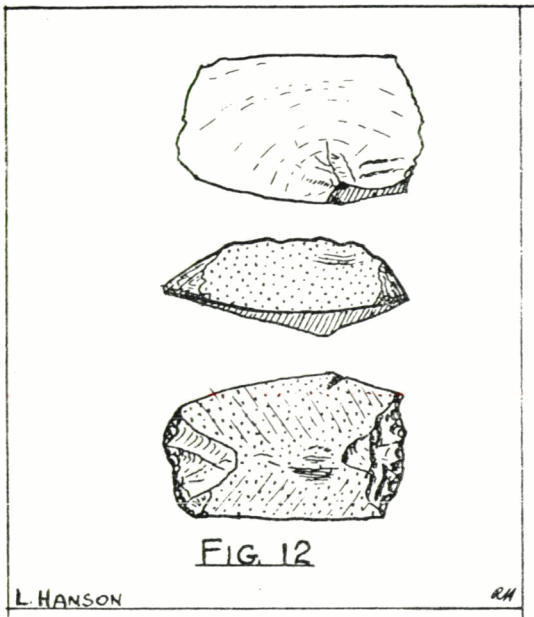

FIG. 12

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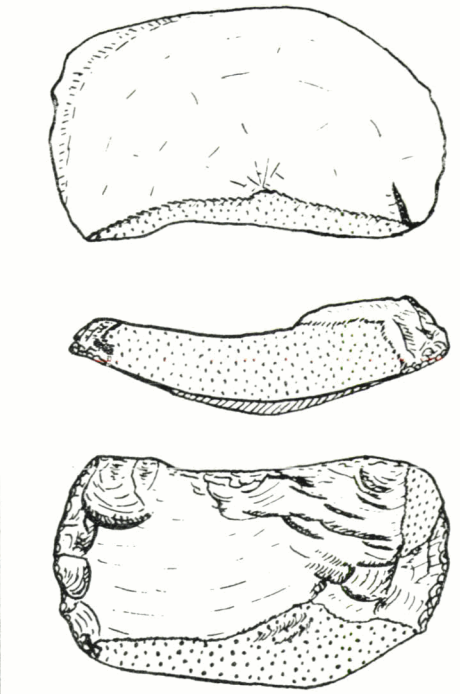

FIG. 13.

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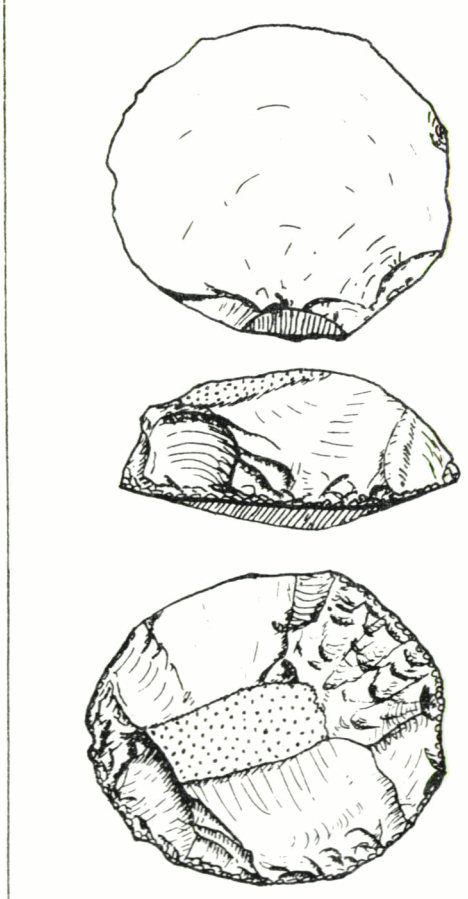

FIG. 14

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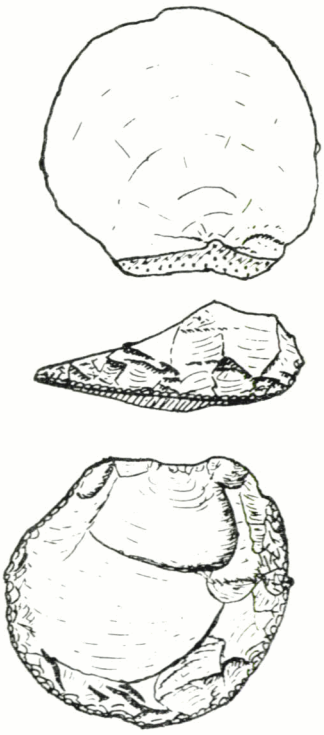

cm

FIG. 15

L. HANSON RH

Type F (Side trimmed - 5) Of the five specimens in this group, four have both margins of the flake trimmed but not the front face. Two of the four have a hinge fracture at the front edge produced by the initial removal of the flake (e.g. Fig.10). One of the other two (material type 1a) is triangular in section and has been trimmed at both sides, producing stout chisel like edges at these points each about 1 cm long (see Fig.12).

The other specimen of material type 1a is the shape of a large concave/convex implement but with cortex material on the entire front face and platform. Both sides are trimmed to conventional adzing edges about 3 cm long. The flake measures 6.5 cm wide, 3 cm deep and 1.2 cm thick (see Fig.13).

The fifth item in the group has an indistinct point of percussion and as it has two surfaces of cortex material at right angles to each other, each of which is suitable for a platform; it is difficult to say whether it is a wide, shallow flake or a long, narrow one. It has been trimmed at two different points on its perimeter and could be used in two different positions as could the other four of this group.

Type G (Untrimmed blanks - 9) Seven specimens in this group have cortex material on the upper surface and platform, the other two (one each of material types 1a and 1d) have cortex on the upper surface only. Several specimens appear to have had a few small flakes removed from promising edges. This is particularly noticeable on three convex types of a wide but shallow shape, where one end has been worked a little (Fig.18). Two of the stones if trimmed for use, would produce tools intermediate in size between a micro adze and the size of a conventional adze stone of type C.

The type 1d material item is roughly circular and high backed. It has some casual work at various points of its edge and has the characteristics of a discoidal tool in the making (Fig.19).

Type H (Micro-chisel - 4) The four specimens of this group are all of materials commonly used for micro tools in the region. All have pronounced and characteristic micro-scraper or chisel like edges, but the group is remarkable for the variety of forms represented.

The type 1d material specimen is a stout double edged micro-adze with the worked edges terminating in a point like an engraver at one end and in a flat butt about 1.5 cm long at the other end. No point of percussion is apparent (Fig.20), and it could be part of a reworked slug.

The type 1b material specimen is of conventional micro-adze shape with a finely retouched edge extending across two-thirds of the face. The remaining third of the face protrudes and is unworked; it appears unfinished. The platform is not opposite the worked edge (Fig.21).

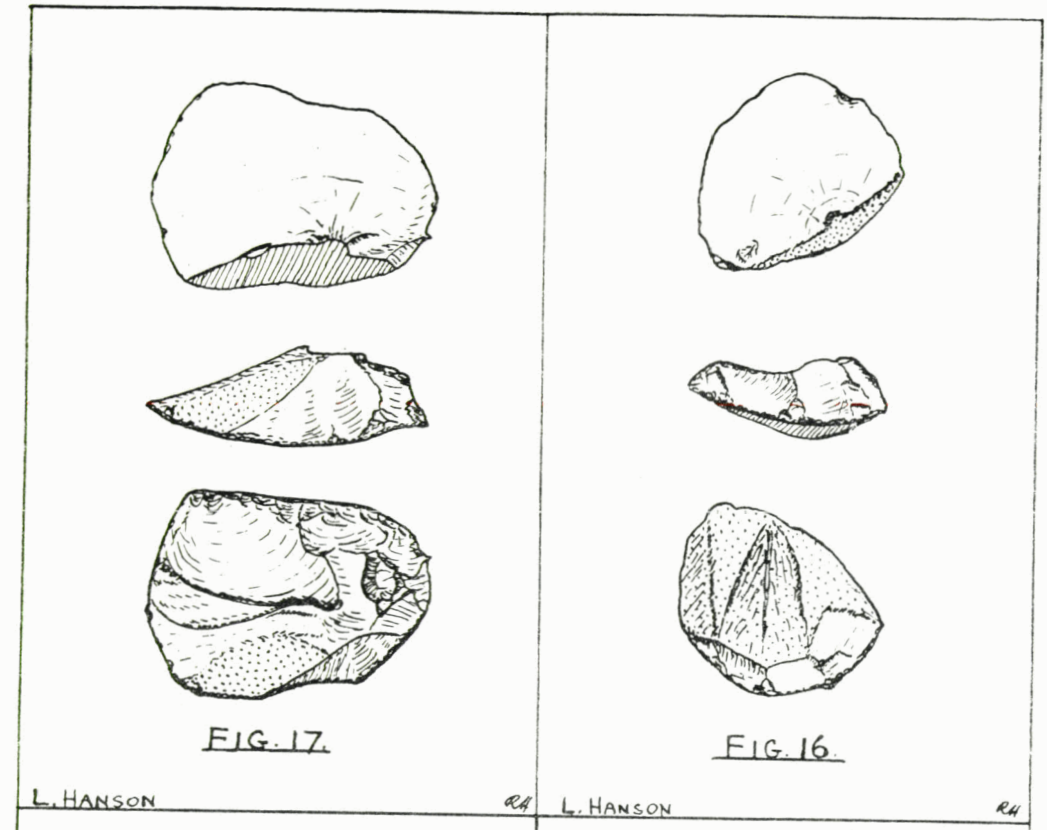

FIG. 17.

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FIG. 16.

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cm

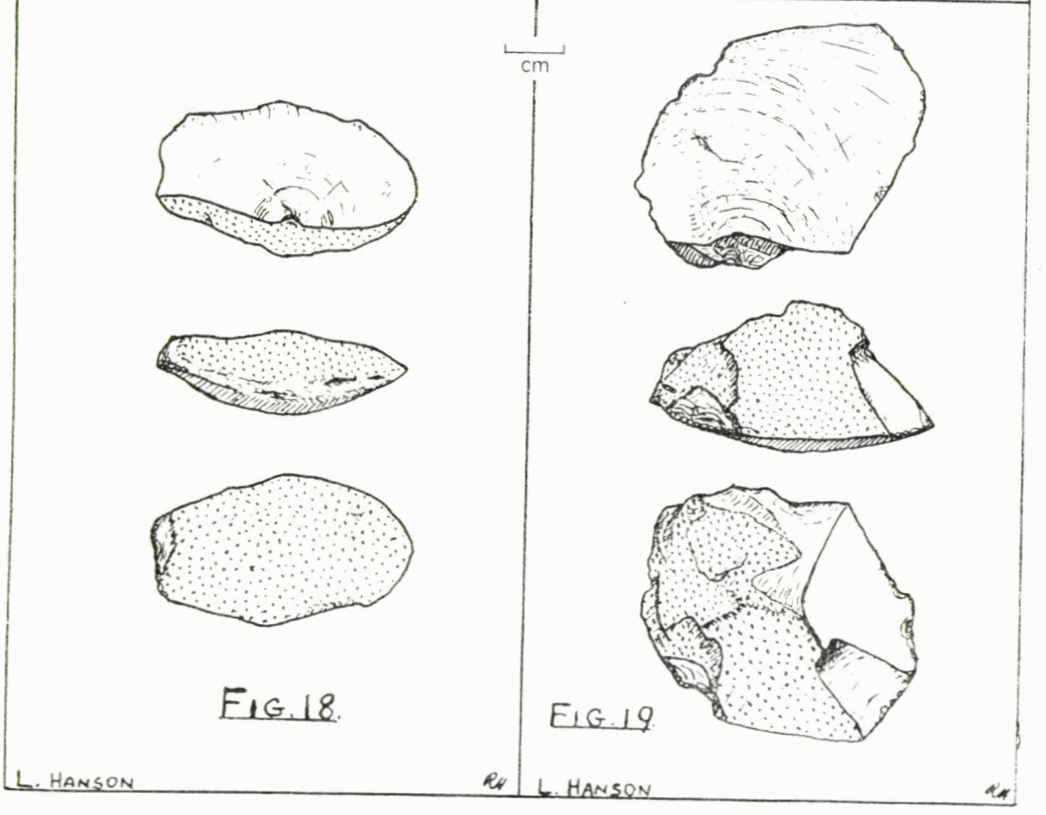

FIG. 18.

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FIG. 19.

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FIG. 20.

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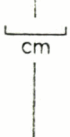

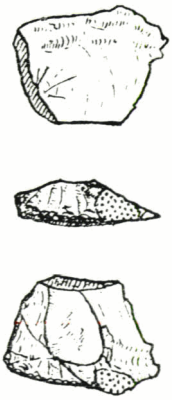

FIG. 21.

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FIG. 23.

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FIG. 22

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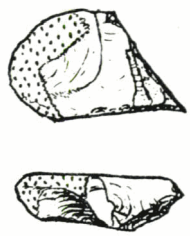

FIG. 24.

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LAKE HANSON HOARD.

AVERAGE SIZES.

CATEGORY.	AVERAGE WIDTH	AVERAGE DEPTH	THICKNESS RANGE
TYPE 'C' CONCAVE [15 ITEMS]	4·0	3·0	0·6 – 1·0
TYPE 'C' CONVEX [28 ITEMS]	4·4	3·5	1·0 – 2·2
	CMS.	CMS.	CMS.

FIG. 25.

Of the remaining two specimens, both of which are of grey jasper; one has a conventional micro-chisel edge which appears to have been worked on the butt or thick edge of a small flake that tapers away to a thin edge. The other is also worked on the thick edge of a small flake, but the worked edge is typical of the geometric microliths. The lower surface is flat and the worked edge is slightly concave with a noticeable overhang.

Type I (Micro-chisel blank - 2) The type 1b material specimen is of a shape that with trimming could produce a very small conventional micro-adze with a convex lower surface and concave upper surface. It has very fine secondary retouching and attrition on both lateral edges suggesting some use as a small cutting implement.

The type 1d material stone is similarly shaped but it is quite thick. It bears no sign of secondary work but the knapping of the flake has produced a curved sharp edge with a convex lower surface that is suitable for use without further work!

Type J (Burin/engraver - 14) All items in this group are comprised of material that is both difficult to control and given to breaking into sharp pointed angular pieces. All have at least one sharp stout projection or point with evidence of spalling and appear suitable for engraving work (Fig.22).

Three or four specimens also have a small, stout, rounded but finely retouched end and appear suitable for gouging work (Figs.23 and 24). Several show small finely retouched concave edges. A careful examination of the items in this group revealed the fact that eight of the specimens could be fitted together into four pairs, the fracture surfaces fitting together exactly leaving no doubt that each pair was originally a single piece. Four of the eight pieces in these mating pairs had secondary retouching of the edge that formed the dividing fracture.

In the case of one pair, one of the pieces has fractured producing a natural, sharp cutting edge. A little secondary retouching and attrition appears on this edge. The second pair shows a little secondary retouch on a sharp edge that resulted from the parting fracture. The other piece has stepped secondary retouching on the dividing fracture edge which is of a high angle, and is similar to the work on the edge of a micro core. In the third pair, one piece has had a small nose worked on the end of the dividing fracture edge similar to one on the other piece. Both these specimens are illustrated at Figs.23 and 24.

One piece comprising the fourth pair shows a little work on a small natural nose on part of the fracture edge. Only sufficient work appears to have been used to round off the naturally produced nose.

A ninth specimen in this type was found to fit with the partly worked micro-adze (Fig.21) with the working edge of the micro-adze forming the fracture edge. The partly worked appearance

of this micro-adze is mainly the result of the dividing fracture characteristics, but as noted in the discussion of type H implements, there is some very fine secondary retouching of this portion of the edge. Of the five pairs of mating pieces, three pairs were of the type 1b material and two pairs of the type 1d material.

Type K (Nondescript Flake - 4) Two of these items show no secondary work at all and it is hard to imagine them being used without extensive modification. The other two in this group both have sharp edges which show some attrition and may have had use for cutting. One of the latter also had the upper edge of the platform extensively trimmed.

Type L (Nondescript lump - 7) Most of these stones are angular lumps with some sharp edges and points but as no methodical trimming or spalling of points is apparent, then have not been included in Type J. Attrition is evident on some edges and points and a few small concave areas occur. Use is possible in some cases.

General Note: In the great majority of cases in the preceeding type categories, where the specimens had secondary retouching to the edges, the work was fine, sharp and even; they are considered ready for use. Their edges are not absolutely sharp because of wind erosion. In addition, a slight but general desert glaze or polish appears on all fracture surfaces. These aspects are covered later in the discussion of antiquity.

Discussion

Implement Types: The implement types represented in this hoard are semi-discoidal adzes, discoidal adzes, micro-adzes, gouges, engravers and burins, which together make up a comprehensive woodworking kit. These implements are all efficient woodworking tools when used in a hafted state, with the possible exceptions of the burin and engraver types, some of which may have been used unhafted. A distinction is made between these implements and those commonly referred to as distal scrapers, end scrapers, women's knives and other forms of implements used for light woodworking and other general purpose functions, but having differences in the method of use, the nature of the working edge and the shape of the lower surface.

The texture of the stone and the form of the lower surface of knapped flakes is of prime importance in the selection of material for adze stones. It is not intended to enter into a detailed discussion on this subject in this paper, as another paper is proposed at a later date covering the relationship of materials to the forms of artefacts of the Arcoona Plateau region. However, in an analysis of more than 2350 implements of various types collected at nearby Eucolo Creek (40 km SE of L. Hanson site) campsites by the writer, it was found that

although the overwhelming number of artefacts (over 90% in some cases) such as points, blades, knives, scrapers and geometric microliths were of silcrete or quartzite. (Type 1c material here); the overwhelming number (80%) of adze stones were not of this material (reports to SAM 1969 and 1971). A comparison of Figs.3 and 4 shows the relationship of the material to form in the case of burins/engravers; these implements all consist of a material difficult to control in knapping and prone to break with pointed and angular edges.

It is seen in Fig.4 that concave and convex upper surfaces are both well represented and it is reasonable to assume they were contemporaneous forms of adze stones hafted and used in an identical manner. The high keeled form must have presented some hafting problems however. A number of the semi-discoidal type C implements with convex upper surfaces become concave towards the platform edge (see Fig.26), and by the stage it is discarded as a slug, it would appear to have been a typical concave-convex adze. The implication is, that many concave adze slugs found on campsites in the region may have had much of their working life as keeled or convex upper surface types. An analysis of slugs will not give an accurate indication of the ratio of 'domed' to concave implements in the culture.

The significance of the discoidal form is unclear here, except that it may be regarded as a normal convex upper surface adze stone that can be rotated and reset in the haft in several positions without re-sharpening. The trimming and lower surface shape are typical of adze stones. Professor J.B. Birdsell had observed 'high backed discoidal scrapers' hafted as adze stones (Tindale 1968:628-9). The markedly small platform appears to be a significant factor in the development of these implements (see Figs.14, 15 and 19).

The asymmetric type 'D' and the side trimmed type 'F' implements are regarded as examples of knapped flakes the shape of which does not permit immediate use as semi-discoidal tools. However, the craftsman was apparently satisfied with their basic characteristics and has produced worked edges at the extremities of the flake regardless of the position of the platform. As it is reduced, the asymmetry would tend to disappear and the implement becomes semi-discoidal. Asymmetric variations in section (thickness) of the flake have little if any bearing on the shape as reduction proceeds. This can be seen in Figs.14 and 15 where both are discoidal even though one is quite symmetric whilst the other is quite asymmetric in section.

The side trimmed type 'F' forms such as in Figs.12 and 13 are also regarded as eventually becoming semi-discoidal implements as reduction of width proceeds far enough to allow the face of the flake to be utilised. Slugs with the butt at one end are virtually non-existent in artefact collections from the region and it is assumed therefore that side trimming does not continue to the slug stage, to produce the 'Burren' or 'Adelaide' types described by McCarthy (1967:28).

Those flakes with flaws in the proposed cutting edge, such as hinge fracture (Fig.10) are immediately suitable, in the same manner as the type 'F' side trimmed forms. Reduction at these places will eventually remove the unsuitable section far enough to expose material at the face of the flake that has the required characteristics. The implement can now develop into the normal semi-discoidal form.

Material: The origin of the principal material type 1a (oolitic chert) used in this hoard is in the silicification processes which have affected many rocks in the region. It is of interest also that one specimen (Fig.16) has a leaf impression, typical of many Tertiary fossil occurrences found in the region. (R.K. Johns 1968:36-7, plate XXII.) A chart of the distribution of cortex occurrences on the type 1a (oolitic chert) material is shown in Fig.9. Of the 49 specimens of this material, 45 have cortex on some part of the flake, while in 31 cases it occurs on the platform. Only 4 have no cortex at all and predictably it does not occur on any lower surface. In nearly all cases of cortex on the platform, it included the point of percussion.

In view of the high percentage of cortex appearing on the type 1a material specimens, it is probable that the material occurred in rather small nodules or pebbles of angular shape.

In many cases where cortex appears on both platform and upper surface, these surfaces meet at 60 degrees, characteristic of adze stones. It thus appears that the craftsman selected the nodules with this characteristic in mind.

The locality from which this type 1a (oolitic chert) material originated is not known and as the writer has little knowledge of the materials and campsites north, west and south of Lake Hanson, it is possible the source is in one of these directions. An analysis of 117 slugs from other large campsites to the east produced only two specimens of this material at the NE Lake Hart site (Fig.27). Inspection of the 59 slugs from Lake Hanson sites was similarly unsuccessful. In vew of the large amount of stone required to produce the 50 implements of this material it is considered the origin is relatively close. Its paucity in the Lake Hanson campsite collections however is a puzzling aspect.

The origin and nature of this material has been discussed with South Australian Museum officers who identified it as oolitic chert, a well known source of which is in the Flinders Ranges. It was suggested that Aboriginal trading could account for its appearance as far west as Lake Hanson. However, the small apparent size of the original nodules and typical desert 'gibber' appearance of the cortex, together with the lack of specimens in collections from further east and south east does not support a Flinders Ranges origin.

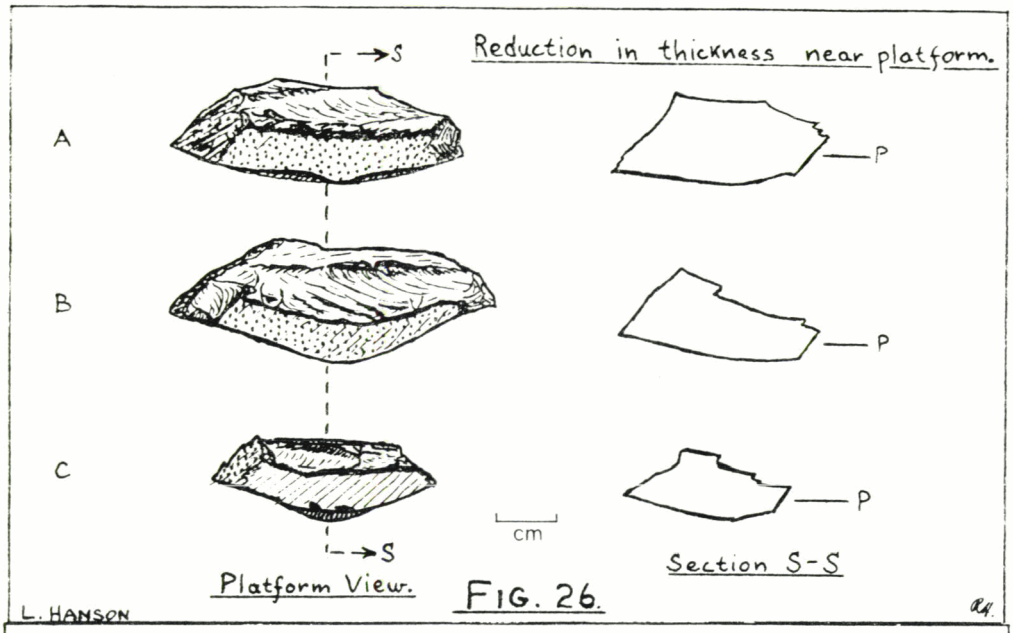


FIG. 26.

CHART OF THE APPEARANCE OF THE TYPE MATERIALS ON OTHER CAMPSITES

Location of Campsites	SE of Shell Lagoon	NE of Lake Hart	SW of Wirrappa	NE of Lake Hanson	East of Arcoona H/stead
From L. Hanson (km)	40 E	30 SE	80 SE	-	90 E by S
From Arcoona (km)	53 WNW	70 W by S	51 SSW	90 W by N	-
Total of Slugs	24	41	36	59	16
OOLITIC CHERT Lake Hanson (Type 1a)	-	2=4.9%	-	-	-
CREAM JASPER East of Arcoona	7=29%	12=29%	7=19%	5=8.5%	4=25%

1. The cream jasper is without the rust coloured fleck except for one specimen in the Wirrappa group, otherwise it is identical to the Arcoona hoard material.

2. Oolitic chert occurred in several groups but as the colour was quite distinct from the Lake Hanson hoard material, they are not included here.

FIG. 27.

Oolitic tendencies occur in many of the cherts, jaspers and chalcedonic materials used for artefacts found along the northern edge of the Arcoona Plateau region. R.K. Johns (1968:32) states that the lower part of the Andamooka limestone formation is commonly oolitic and that various coloured chalcedonic concretions weather from this material and may cover large areas even where the original limestone has completely disappeared. This latter origin is considered the more likely.

An Integral Collection? An important factor in the consideration of this question is the type 1a material. It is used in all implement categories of Fig.4 except the slug, the micro-tool and the engraver-burin. It represents nearly 50% of the specimens in the hoard and all of these specimens except one type 'B' implement, are very little reduced indicating little if any usage. In view of these factors, it is considered highly probable that the implements of this material represent the work of a single craftsman on a parcel of material from a single source, probably local. By association, it is also likely that the little reduced types in other materials are also the work of the same craftsman. Similarly in the case of the type 4 (mudstone) material which is relatively rare in collections from the vicinity; and even more so, as the specimens concerned are mostly unreduced adze stones.

The type 1b (chalcedony) material is fairly common in the form of small artefacts over most of the region and it is likely that the representatives in this hoard are random pieces or reworked artefacts found on nearby campsites. However, the type 1d (banded jasper) material, although common some distance to the east and north east, is rare in the Lake Hanson campsite collections. In view of the quantity of this material in the hoard, it probably is a trade parcel. The case of the five pairs of implements adds further weight to the probability of the hoarder being the fabricator of these implements, as the rather simple nature of the work on them does not support their consideration as a prized and refined tool that was manufactured for trade purposes. It is more likely the material was traded in large pieces and broken and worked by the hoarder. The fact that the type 1b (chalcedony) material is fairly common as detritus on local campsites suggests the hoarder collected, or had collected by others, useable lumps of the material and then proceeded to rework them.

The slugs and partially reduced types are considered to represent re-use of discarded implements found nearby.

In view of the above considerations regarding the homogeneity of much of the material, and the minimal reduction of most of the implements; it is considered to be in fact the work and the hoard of one man. Spencer and Gillen (1899:586-7) confirm such specialisation in Central Australia in historic times.

Antiquity: The antiquity of implements found on open campsites is difficult to determine. Because stratigraphic deposits are unknown in the Arcoona Plateau region, accurate determination of implement style sequences from these sources is not possible at present. However, they may be compared with stratigraphically proven sequences further afield.

The styles represented in this hoard encompass a long time span that ended in historic times as testified by hafted specimens of adzes and micro-adzes in museum collections. The other limit to the time scale for this hoard is not so clear. Dortch and Merrilees (1973:106-7) in their analysis of the Devil's Lair excavations in WA give a date of 12,000 BP for hafted adze flakes and a date of 10,000 BP for the earliest known micro-adzes. (See also Gould 1971:162.)

The location of this hoard near soak water and large campsites suggests the unlikelihood of the implements being exposed by erosion between the time they were cached and the time Aboriginal activity ceased in the area. An Aborigine finding so many fine unused implements would surely have removed and used many of them and scattered the pile in doing so.

Whether the hoard was deliberately buried, or deposited at the edge of an advancing dune face and suddenly buried, by advancing sands cannot be determined. However, there is considerable circumstantial evidence to suggest the dune in question has been in situ over a long period of time. Referring to Fig.1 for an explanation of sand movement, it will be seen that prevailing SW winds provide sand from the lake shore to maintain the high dune (Site 5). As sand is eroded by the wind from this dune, the small water course to the NE of Site 5 would transport it to an area SW of Site 1 where the watercourse becomes a series of claypans before draining into the main creek. Wind erosion on the claypan area would then provide replenishment of sand for the Site 1 dune to the NE and thus ensure the relative stability of this dune. Evidence of these processes can be found in many places in the region. On this basis, constant sand cover at the location of the hoard is possible over a long period of time predating the pirrian and microlithic cultures found in the Site 1 campsite collection. Pastoral activities over the past 100 years and perhaps some climatic variation are the likely cause of the recent erosion of sand from the area and consequent exposure of the hoard.

Effects on the hoard, of weathering and patination processes are in evidence. To date however, there has been insufficient work done in this field, to enable stone implements to be dated from weathering and patination effects under variations of environment. As stated earlier in this paper, the implements of this hoard have a uniform dull glaze and slight dulling of fracture edges. Comparison with artefacts from main campsites nearby, reveal many implements with a similar condition and also many where the edge is still sharp and surface colour and condition shows little or no change. The use of micro-wear analysis would help considerably in determining the nature of this condition

(McBryde, 1975:371-2). Whether 100 years is sufficient time for slight desert polish to be imparted to the implements is not known but in view of the evenness of the condition and the fact that many implements were still in the form of a pile when found, it seems unlikely the condition is desert polish.

Hossfield (1965:273) describes a chemical patination process where a veil or skin of crystalline silica is deposited over the surface of artefacts, particularly in arid areas of SA, Mitchell (1947:102) quotes Ward and Howchin on the subject of upward movement of water carrying to the surface soluble silica, also in the arid areas of Australia. Walston (1974) mentions a similar process responsible for a thin siliceous coating over rock paintings. Considering the state of the implements and the conditions in which they were found, the writer is of the opinion that they have experienced chemical patination in the form of a thin siliceous coating, as described above. Evidence of this process is most noticeable in the case of the type material 1a (oolitic chert); other forms of chemical patination have occured to some of the implements of other materials. The type 4 material specimens for example, which are of indurated mudstone, show areas of surface where the stone has reverted to yellow ochre. Many of the chert (material type 2) implements show patination extending from change of colour to an extensive white chalky condition; however some of this material is notorious in the region for heavy patination. There is a strong possibility that the rate of patination of chert may be associated with localities lying to the leeward of salt pans and hence subject to heavy concentrations of wind borne salt (Mitchell 1947: 103-4).

The rapid weathering process due to alternating conditions of wet and dry with solvents in water around claypans (Mitchell 1947:103) would not apply to the Lake Hanson site due to its location high on the dune.

The preceeding discussion suggests a considerable antiquity but lack of knowledge of patination and weathering rates deters the writer from attempting to further date the hoard.

A minerological and petrographic examination may throw further light on the antiquity of the hoard (cf. McBryde 1974: 371).

Part 'B' - East of Arcoona Homestead

Description of the Site

The location of this find is 16 km nearly due east of the Arcoona Station homestead in an area that approximates the centre of the Arcoona Plateau. The terrain is nearly flat in this area but falls away gently to the east and south. A strip of sandy country several kilometres wide extends through the area from WSW to ENE; this sandy stretch originates in the Lake Richardson area some 30 km to the west and terminates a few

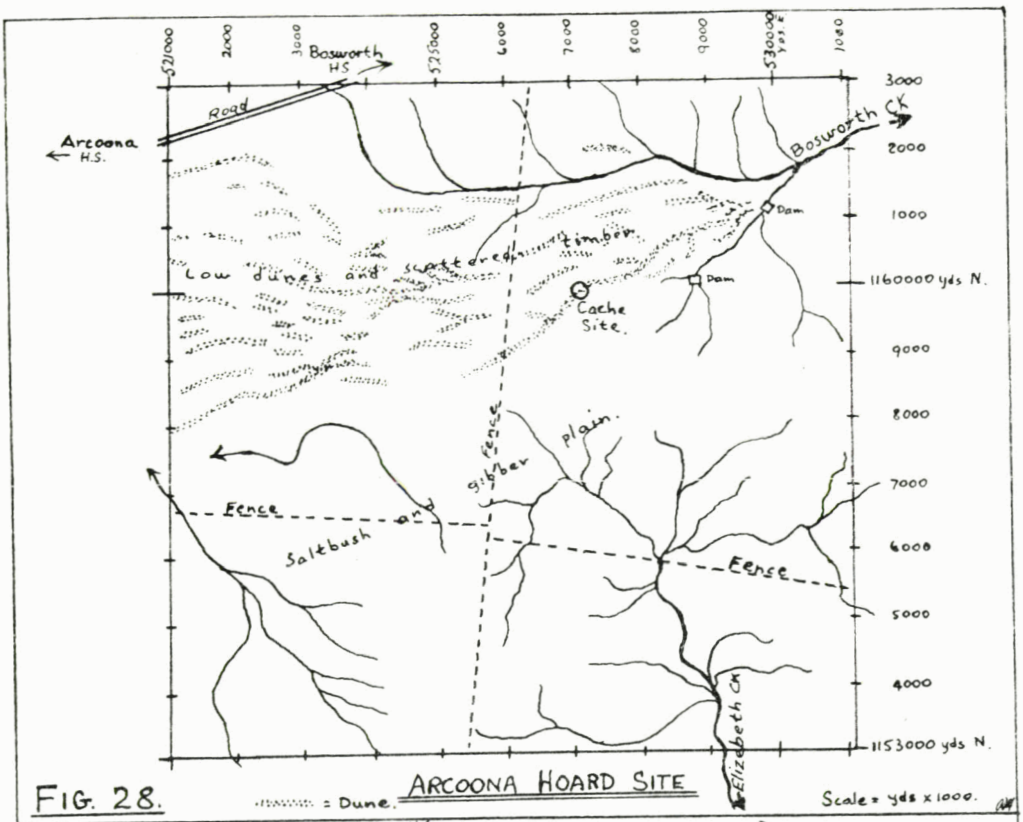
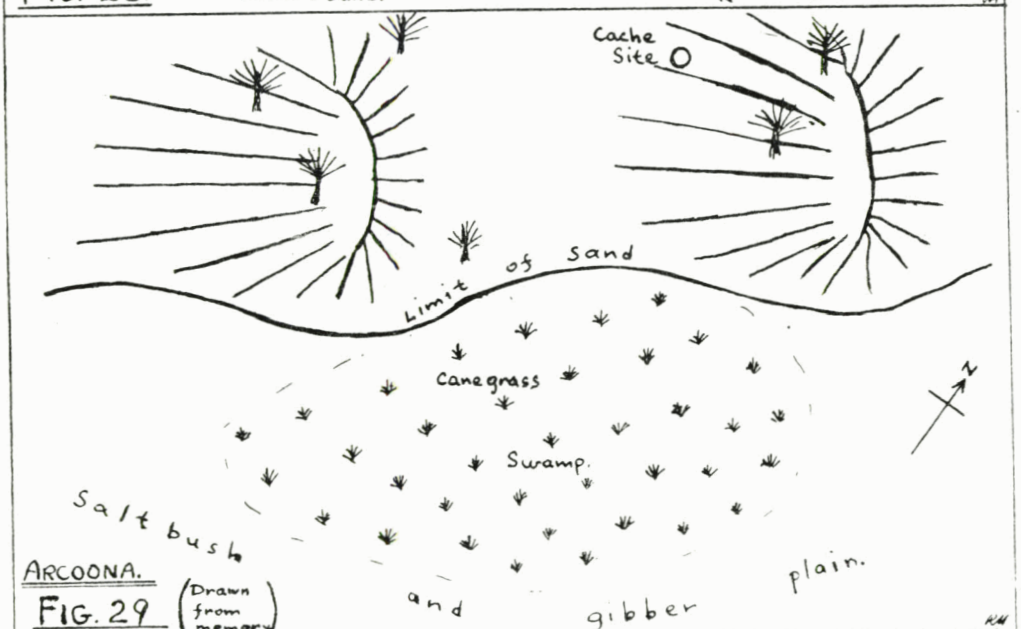
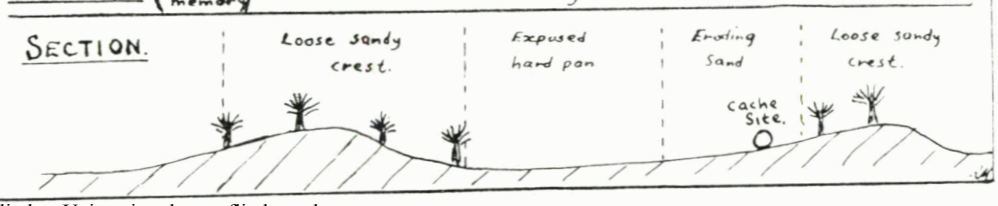


FIG. 28. = Dune. ARCOONA HOARD SITE



ARCOONA.

FIG. 29 (Drawn from memory)



kilometres east of the site. In the vicinity of the site, the southern margin of the sandy area forms a defined edge in the form of a longitudinal dune against the saltbush and gibber plain to the SE. Many small canegrass swamps occur along the southern edge of the dune on the gibber plain. The find of a hoard of twelve chesel stones was made on the longitudinal dune which is being wind eroded in a number of places (Fig.28). Even though nearly flat, the area is virtually a watershed as drainage occurs to the south into the headwaters of the Elizabeth Ck and also east into the headwaters of the Bosworth Ck. Although the saltbush and gibber plain to the SE is devoid of all trees and large shrubs the sandy country has a considerable number of mulga trees and acacia bushes with some good stands of callitris.

Permanent and semi-permanent water is non-existent in the area and water channels are barely recognisable as such for some kilometres to the south and east. After good rains, the canegrass swamps and interdune claypans would carry surface water for a time and soak water for perhaps a little longer but for the most part of a normal year the area is considered completely dry.

Artefacts were numerous along the marginal dune in the many places where it was being wind eroded, but although a wide range of types were found there were no large or densely covered campsites. The hoard of twelve adze stones was found on the eastern edge of an area where the wind was gradually exposing the hard pan (Fig.29).

Description of the Material

All twelve implements are made of a cream jasper varying in shade between honey buff to a very pale pinkish buff. Removal of a few small surface flakes reveals a paler cream colour below, the buff to pink tinge being only a surface discolouration or staining. Only one implement shows marked variation, half the stone being a dirty white shade that appears to be a form of patination (Fig.31). A test of hardness reveals the patinated area to be softer; the point of percussion is also in the patinated area.

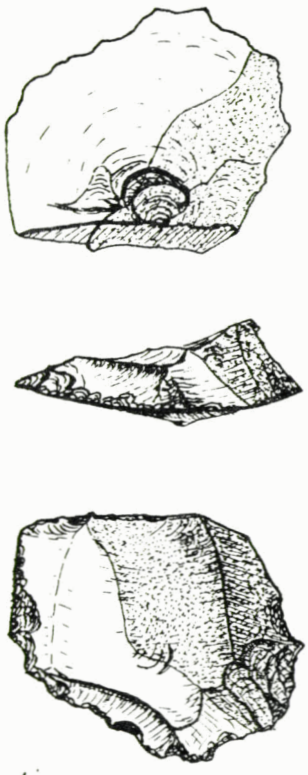
More detailed examination reveals that besides the common general colouring and texture of the stone material, there are random faint rust coloured flecks and/or thin faint lines of the same colouring appearing on all the implements except the patinated one (Fig.31). There is little doubt that the majority of the implements are made of stone from the same source and probably from the same core.

Most of the flakes show a marked conchoidal fracture with bulbar scars and pronounced striations occuring in some cases. The lower surface is markedly convex in most cases but three implements have lower surfaces that are almost flat over most of the surface.

AVERAGE SIZES - ARCOONA.

Type.	Qty.	Average Width. Cms	Average Depth. Cms.	Thickness Range Cms.
Concave upper.	9	4·6	3·0	0·7 – 1·2
Convex upper.	3	5·2	2·6	1·4 – 1·9

FIG. 30.



= Patination.

cm

FIG. 31

ARCOONA RH

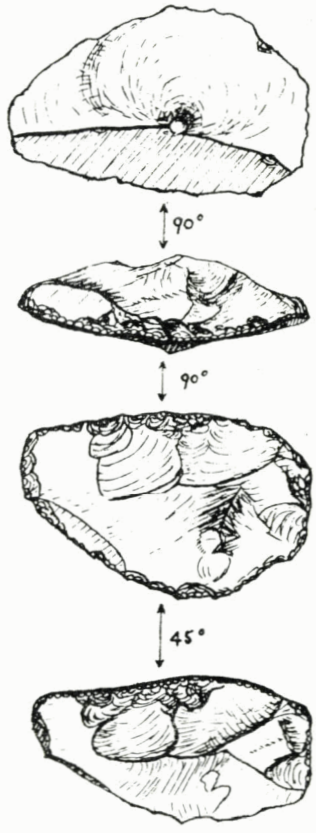


FIG. 32

ARCOONA RH

Crustal surface appears as a small area on one implement while part of the patinated area on the bi-colour implement appears to be crustal material.

Analysis of the Hoard

Most of the implements comprising this hoard were found in an area about half a metre square, but two were about one metre away from the main group. Several implements in the main group were completely covered by loose sand while others were partially covered. Exposed hard pan occurred seven or eight paces to the west while the sand rose to form a low dune dotted with bushes on the east side; exposure of the implements appeared recent and due to wind erosion.

Of the twelve implements that make up the hoard eight are finely and evenly worked ready for hafting as semi-discoidal adze stones. Except for the working of the cutting edge which is irregular or slightly nosed and notched, the other four have most of the characteristics of semi-discoidal adze stones.

Most of the implements showed little reduction, but two, both with convex upper surfaces appeared to be partly reduced. Nine of the implements are concave on the upper surface and the range of sizes is shown in Fig.30.

One specimen with a low convex upper surface has a change of curvature in the cutting edge associated with a hinge fracture or ripple in the lower surface (Fig.32). This has produced two distinct curved edges thus allowing the implement to be hafted in two different positions and possibly a third position utilising the upper edge of the platform which is also finely worked. This particular flake has its greatest thickness at the butt.

Two specimens, both of which are thinner one margin than the other, have portions of the cutting edge unworked. Both thin margins have some fine regular secondary retouching and are little reduced. In one case the thicker margin is stepped and use blunted while in the other case the thicker margin is irregularly worked rather in a serrated fashion (Fig.33). The thicker margins seem to have been considerably reduced and both implements were in need of sharpening if they were to be used satisfactorily. The marked difference in thickness at each margin of these two flakes appears in three other flakes and indicates some control difficulties in the knapping of this material.

Two other specimens, one of which is convex on the upper surface, both have notches and noses on the cutting edge with fine trimming along most of the cutting edge including the notched and nosed portion. The concave specimen is asymmetrical due to a piece of the flake breaking away possibly during the knapping. The trimming does not extend far up the face of the flake and the notch/nose aspect of the edge appears to have been shaped during the primary retouch stage (Fig.34). The upper

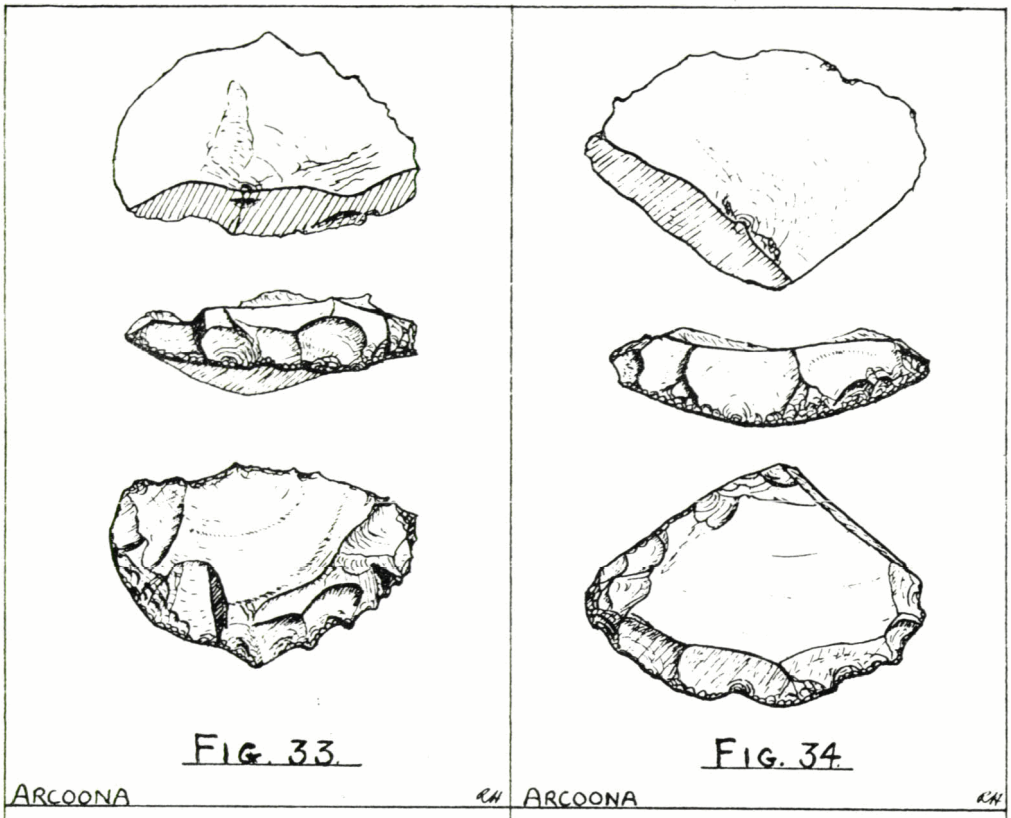


FIG. 33.

ARCOONA RH

FIG. 34.

ARCOONA RH

cm

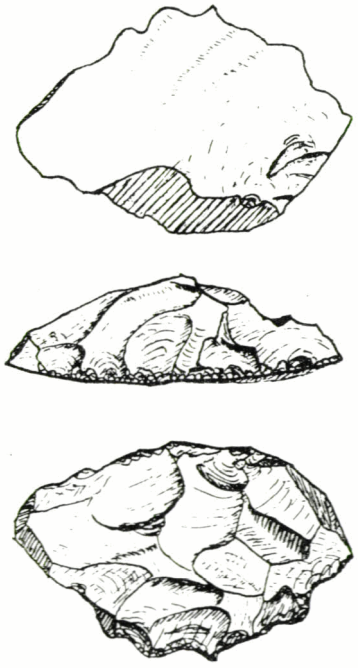


FIG. 35.

ARCOONA RH

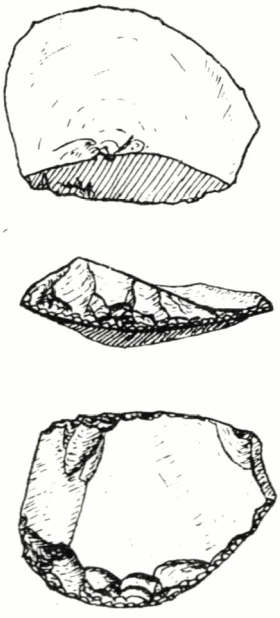


FIG. 36.

ARCOONA RH

platform edge is extensively worked. The convex upper surface specimen appears to be partially reduced in shape and the finely worked notch/nose edge would appear to be intentional. This specimen displays a noticably flat lower surface (Fig.35).

The final item in the hoard is the patinated specimen (Fig.31). It has parts of its lower surface nearly flat and a difficult hinge fracture at one part of the distal end of the lower surface. The upper surface is low convex. The working edge is quite irregular but fine secondary retouch occurs over much of the edge. Very fine secondary retouch occurs along the straight portion of one side but there is a distinct dulling of this work. This edge appears to be a cutting (knife) edge and in fact the shape of the flake together with the two butt to distal aligned ridges and flattish lower surface indicate a strong possibility of the flake originally being a long trimmed blade that has been heavily reduced. In its present form, it fits quite snugly into the right hand so that the straight finely trimmed edge can be used as an unhafted 'long blade' cutting implement.

About 50% of the implements have some secondary retouch on the upper edge of the platform.

Discussion

Implement Types: It will be seen from the preceeding descriptions that eight of the implements were worked for hafted adze use although one (Fig.32) has some unfortunate irregularities in form. The other four although generally suitable for adze use if the edge was appropriately worked, were found with their edges trimmed for use in cutting (Fig.31), grooving and engraving (Figs.33 and 35), and concave and nosed scraping (Fig.34). The flattish lower surface of Fig.35 would limit that implement's use as an adze.

Several of the latter four implements have their cutting edges blunted apparently through use as the very fine secondary work has been broken away along much of the edge. Usage may account for the irregularities of outline of these edges. In fact, consideration should be given to the possibility that some implements (Figs.33, 34 and 35) are stones that have been removed from the haft for re-shaping and re-setting after use.

Where fine trimming of an extensive nature does exist on the cutting edges of implements in this hoard, it is very even and the outline of the edge if quite regular, indicating a high standard of workmanship. The fine trimming of the upper edge of the platform on many specimens appears to be merely removal of protuberances to facilitate hafting, although several have small noses that could serve for burin or engraver use.

Fig.30 shows that 25% of the implements are markedly convex on the upper surface and apart from Fig.35 which has a

very flat lower surface, they have served equally as well as the concavo-convex flakes for adze use.

In comparison with the Lake Hanson hoard, these implements are notably wider but shorter (butt to cutting edge) thus suggesting that the Arcoona specimens were subjected to some reduction during use. However, this assumption presupposes that the materials of both hoards would produce flakes with a similar width to length ratio.

The tendency for flakes, initially asymmetrical in shape and thickness, to become regularly semi-discoidal in shape as re-edging progresses, is apparent in this hoard. Three of the concavo-convex implements are markedly asymmetric in thickness (Fig.31) but considerable reduction of the thicker margin is taking place while the thinner margin is left almost untouched. The result is that the flake becomes more symmetric (see also Fig.15) even though it may have been initially quite asymmetric as described for Type D in the Lake Hanson group.

Material: Hard, compact and homogeneous forms of jasper such as these implements are made of, do not occur on the Arcoona Plateau. These jaspers occur as duricrust remnants generally north of a line from the north end of Lake Torrens to Mt Eba. Creamy buff jasper has been reported as originating near Stuart Ck, about 150 km north of Arcoona.

A cursory count of this material's appearance among adze slugs from several other sites in the region shows a fairly general distribution (Fig.27). For any particular site, it appears to be the most common of exotic adze materials utilised.

The almost complete lack of cortex surfaces on these implements suggests they were knapped from large cores, and the occurrence of rust coloured fleck in many suggests one core provided most of them. Although the colour and texture of the material of Fig.31 is the same, the lack of red fleck, its apparent original use as a cutting blade, and the extensive patination all suggest the flake came from a different core.

It is of interest that the creamy jasper material appears as one of the reduced implements (Type B) in the Lake Hanson hoard, but the rust coloured fleck is not evident (Fig.27). In Fig.27 we also see that a collection of adze slugs near Wirrappa produced a specimen of the rust flecked type material of the Arcoona hoard. The site of the Arcoona hoard is on a direct line between Wirrappa and the probable source of this material, suggesting a trade route.

An Integral Collection? As with the Lake Hanson hoard the material is the prime factor pointing to this hoard being the work of a single craftsman but in this case the material is not local. Whether the implements were knapped on site or brought in already knapped is not certain, however the absence of chippings, cores, small

scrapers, burins or other implements that could be produced from the detritus of such a prized material suggests that they were not knapped at this site.

This site is not a large camp but one of a series of quite small camps extending along the line of the interface, between the dune area and the saltbush and gibber area. It could only be occupied for any length of time after good rains, however it is at the headwaters of the Bosworth and Elizabeth Creeks which provide access through the gibber plains to the south and east into areas abounding in large campsites. Likewise, dune and claypan country gives access to the lake and creek country to the north and west so that the site area would be subject to considerable traffic.

The site is not a permanent campsite and it is unreasonable to suggest an Aboriginal hunter would carry twelve woodworking adze stones about with him unless shifting camp. The most likely explanation of this hoard however, is that it represents a trade parcel of prepared implements carried in from perhaps 150 km to the north. Some of the implements seem to have had a little previous use.

Antiquity: The location, situated on the longitudinal axes of an extensive sand ridge makes it possible for this hoard to have been covered for some time. The movement of wind eroded sand tends to be longitudinally along the dune in shallow waves, and as the hoard was not very high up in the general sand level (Section: Fig.29) it is possible for it to remain covered during the procession of a number of waves and troughs. The present exposure seems to be related to prevailing winds tending to blow from a more southerly direction in recent times, thus eroding the more southerly edges of sandy areas while the loose sand builds up more on the northerly side of the SW to NE movement. Evidence of this trend in dune sand movement is to be found on exposed sand areas throughout the region.

As in the case of the Lake Hanson hoard, it is unlikely that such fine adze stones would have remained exposed and undisturbed for long, during times of aboriginal activity in the area although seasonal isolation in drought years is possible. Another factor suggesting little previous exposure was the attitude of some of the implements 'keel uppermost', indicating that no great depth of sand had been eroded at the spot. The foregoing shows the possibility of the antiquity of the hoard being greater than the date of the last Aboriginal activity in the area.

The surface discolouration or staining is probably the result of the iron rich red clay environment of the saltbush and gibber plains; the time scale for its formation on the implements is not known.

The patinated implement in Fig.31 is a misfit in the material of the collection as discussed in the 'Material' section above. It cannot be considered when determining the antiquity of the hoard as it is likely that it had been a discarded implement prior to it being embodied into the hoard for re-use. Even so, it is doubtful the hoarder would collect for re-use, a stone that is 50% patinated, so consideration must be given to the patination progressing whilst the implement was in the hoard.

Finally, examination, under magnification, of the fracture edges of the implements in the hoard and also the cream jasper slugs collected on nearby campsites shows that those of the hoard are slightly dulled when compared with some of the slugs. The dulling is not as noticeable as in the case of the Lake Hanson hoard. The only two factors that appear relevant to the formation of this condition are desert polish and siliceous deposition due to ground water.

From the above discussion it would appear that the hoard pre-dates the closing of Aboriginal activity in the area, but has not the antiquity of the Lake Hanson hoard.

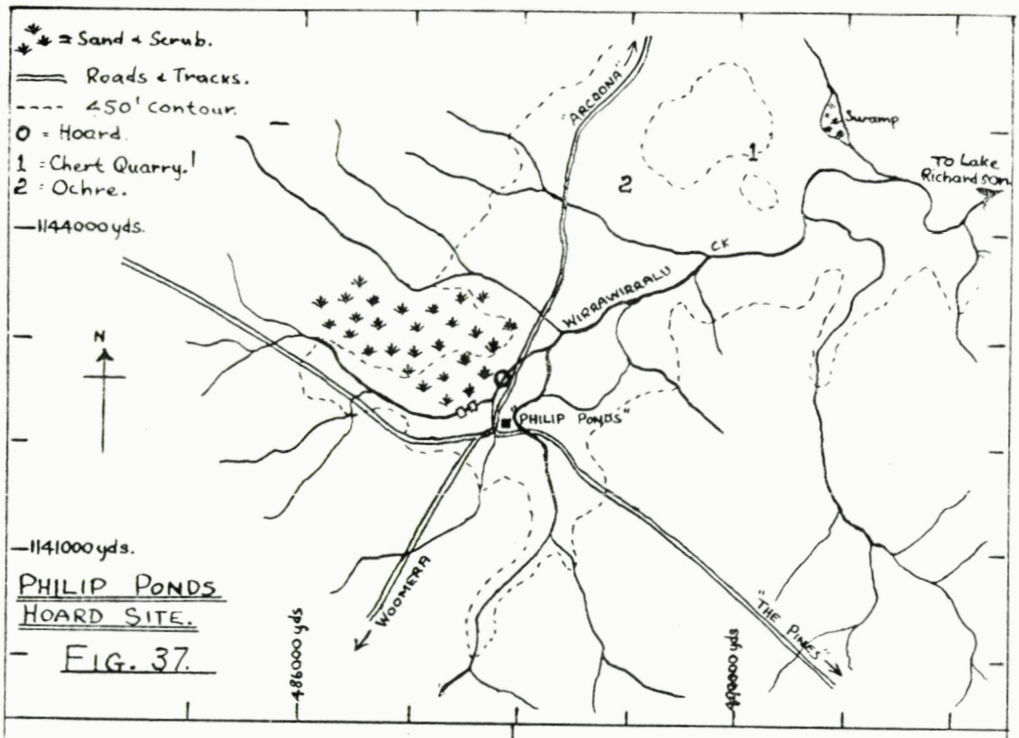
Part 'C' - Philip Ponds

Description

In the winter of 1969, the three adze implements that comprise this hoard, were found on Arcoona Station about 350 metres north of the old Philip Ponds homestead and just to the west of the Andamooka road (Fig.37). The site is on the southern edge of a claypan and low sand dune area that extends about a kilometre to the north. The hoard was found at the foot of a small acacia bush, a thicket of which extends along both sides of a small watercourse. This watercourse comes from an area to the northwest of the sandy area and runs along the western and southern margins to eventually empty into the Wirrawirralu Creek some four or five hundred metres beyond the hoard site.

The sandy area is dotted with surface campsites both large and small; some have had a very dense cover of artefacts but intense collecting, mostly casual, over many years by the residents of Woomera and others, has greatly depleted most of the more easily recognised implements. Other large campsites follow the banks of the Wirrawirralu Creek towards Lake Richardson some 15 kilometres or more to the northeast.

A few kilometres NE of the hoard site, red and yellow ochre is abundant both as stratified deposits and as nodules exposed by wind erosion as at site 2 on Fig.37. In the same locality there is a large chert quarry, the material from which is found in artefact collections from a large area of the Arcoona Plateau. Water remains in waterholes on Wirrawirralu Creek for many months after good rains and soak water at these spots would support near permanent campsites. A large waterhole exists just near the old homestead.



PHILIP PONDS
HOARD SITE.

FIG. 37.

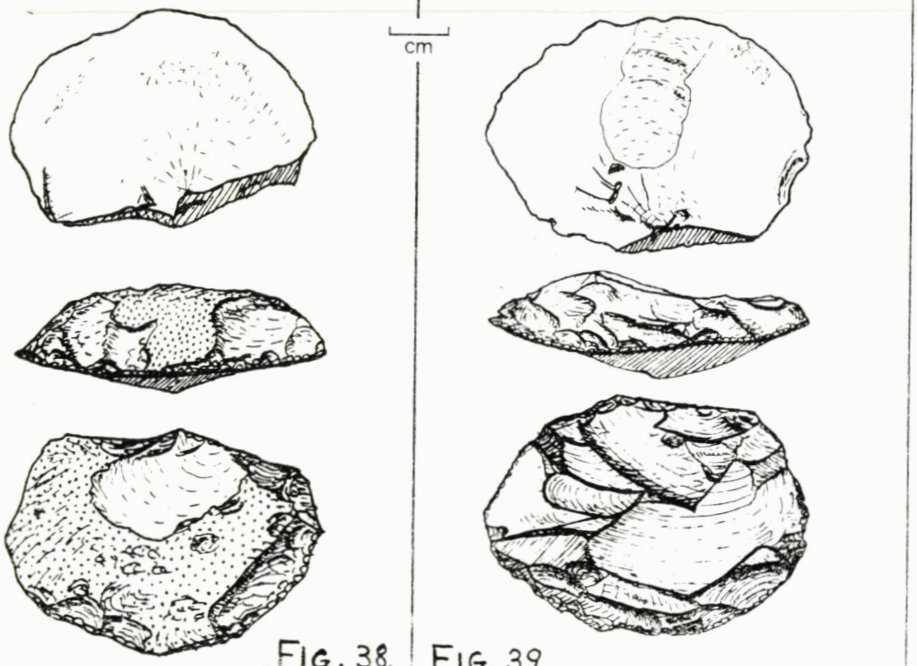


FIG. 38. FIG. 39.

PHILIP PONDS RH PHILIP PONDS RH

FIG. 40.

Chart of sizes of Philip Ponds hoard.

	FIG. 38	NOT SHOWN.	FIG. 39	AVERAGE
WIDTH - MMS.	50	50	53	51
DEPTH - MMS.	35	37	36	36
Thickness-MMS.	15	17	15	16

In the immediate vicinity of the hoard site artefact exposures were small, due perhaps to a mimimum of wind erosion in this rather protected area. A number of microlithic scrapers and geometric implements were found within a few metres of the hoard locations and there was evidence of the scouring effects of flood waters carrying other implements away in the various gutters that comprise the watercourse area. Large exposures of hard pan and artefacts did occur due to prevailing winds however on the westerly margins of the sandy areas.

The three implements all have convex upper surfaces and are almost identical in size and shape (Fig.40). Two of them had cortex material over a large part of their upper surface; on one it occurred to within a millimetre of the cutting edge (Fig.38). These two implements showed no evidence of reduction in depth, but the third, although of the same shape, did appear to have been a deeper flake that had received some reduction. Stepping occurred on the face while parts of the cutting edge of this latter implement appeared to be use blunted (Fig.39).

Two of the implements are markedly reduced in thickness near the butt, and to such an extent in the case of Fig.39, that it tends to be concave over part of its upper surface. The removal of one small rather stout flake from a similar position on Fig.38 has reduced its thickness near the butt also. The unillustrated specimen has no reduction of thickness and is at its thickest near the butt.

Two of the flakes have a straight section of margin between one end of the trimmed working edge and the butt. In both cases these sections are of shallow angle (in section) and are about 1.5 cm long with a fine regular secondary retouching that makes this portion ideal for cutting purposes using a long-blade action (Fig.39).

The three implements are composed of three different materials. One (not illustrated) is of grey and whitish agate, which on removal of a small test flake, shows a darkening or staining of the surface has taken place. Only very slight dulling of the fracture edges can be detected. The second one (Fig.38) is of a faintly marked pale buff material that is intermediate between chert and a quartzite. A test flake reveals a darker greyish colour below the surface which in this case tends to weather lighter. Marked dulling of the fracture edges is apparent. This material is common in the general area but is not identical with the lighter coloured and finer grade of chert that appears to have been quarried locally.

The third implement (Fig.39) is of mottled grey-brown chert and has no cortex exposures. The fracture edges show very little dulling and a test chip reveals no discernable colour change. The source of the material is not positively known to the writer but it may be one of the less common shades of chert from the local quarry area. The material occurs in collections from a wide area within the region, but in limited quantities.

When these three implements were discovered, they were close together (virtually touching) in a triangular group with their lower surface downwards.

Discussion

The three implements are very similar in form and size (Fig.40) and fall in the category of semi-discoidal adze stones with convex upper surfaces. Whether the reduction in thickness near its butt of Fig.39 took place prior to or after knapping is not certain but in view of the small platform area remaining, post knapping reduction is more likely. This process also appears in both the Arcoona and Lake Hanson hoards. All three items are conventional in shape and do not indicate any problems in their use and eventual reduction to slug form.

The cutting (knife) edges on one lateral margin of two of the implements is an interesting aspect and suggests that they were not hafted or intended to be hafted immediately after knapping. As both flakes are of classical adze shape, it is not considered likely they could be heavily reduced knives as Fig.31 in the Arcoona hoard appears to be.

The large areas of cortex material on two implements suggests, as in the case of the Lake Hanson implements, that the material came from relatively small nodules.

The agate of the unillustrated specimen is common as nodules occurring on the slopes of several of the small mesas that occur in the basin drained by the Wirrawirralu Creek in the Philip Ponds area. These mesas are remnants of an old Tertiary land form that can be seen at a lower level than that of the Arcoona Plateau generally (Johns 1968:40-2).

The material of Fig.38 is found on the top of the mesa near the quarry site (Fig.37) which is situated near the top of the southern slope. The material occurs in nodules and pieces up to small boulder size with wide variations in the texture of the stone from an impure chert through to a type of cherty quartzite. Much of the material on the mesa top bears impressions of disintegrated plant material, and the cortex on Fig.38 is of identical appearance with fragments of vegetation showing. The material of Fig.39, while not positively identified with a local source, is considered to have originated relatively nearby for reasons outlined in the 'Description' section above.

There is little doubt in the writer's mind that these three implements were cached by the one person. It is likely that they were all made by the same craftsman as most of the material is local and the implements are all of similar shape and workmanship. However, to entertain this conclusion, different weathering and/or patination rates for the different materials must be assumed as the material of Fig.38 in particular shows considerable dulling on the fracture edges compared with the other two. This is a distinct possibility as the material of Fig.38 does appear to be of a less homogeneous nature.

Whether the hoarder intended them for his own use or for trade is not certain but in the writer's opinion, three adze stones is a reasonable number for one man to hold for his own use. The cutting (knife) edges suggest also, that they served as cutting (knife) implements until such time as it was found necessary to haft them in place of a worn out adze.

The likelihood of the hoarder being a white collector is not an impossibility, however in view of the general rarity of well formed unused semi-discoidal adze stones, and the lack of other attractive implements in the hoard, makes this possibility remote. More likely is the possibility of an Aborigine collecting them from various campsites and caching them away for use later on.

In considering the factors bearing on the antiquity of this hoard, the effect of wind erosion is of little significance, but water erosion is probable during periods of excessive rainfall and when minor variations in the course of the creek occur. The effects of the ponding system carried out a few hundred metres upstream in historical times is not certain as generally the creek flow would be reduced, but breaching of embankments during excessive rains would lead to heavy scouring of the hoard area. The present exposure is due to water scouring.

The only other factor bearing on the antiquity, is patination and weathering. Removal of small test flakes revealed surface colour changes in two cases and as shown in the discussion above of the integral nature of the hoard, sufficient time has passed for the poorer of the materials to show considerable dulling or erosion of the fracture edges. Aborigines continued to occupy the vicinity after the arrival of the white man as is testified by numbers of glass artefacts found by the writer on an adjoining campsite. However, when the hoard was compared with the weathering and patination of the artefacts on nearby campsites, the comparison showed the hoard to be of greater antiquity in some cases. In view of the dulling of the Fig.38 specimen, a date well before historical times is suggested. The occurrence nearby of microlithic implements exposed by the same water scouring is considered significant, as it suggests that in view of the hoard and the microliths being on the same horizon, they may have been deposited at the same time.

Summary

This paper has covered in some detail the description and analysis of three hoards of Aboriginal adze stones. The picture that emerges is that of three quite different sets of relationships between each hoarder and his implements.

The Lake Hanson hoard, which was found well within KOKATA tribal territory is considered to represent either a very large trade parcel of both completed implements and unworked material. Alternatively it may be a tribal stockpile. In either case they appear to be the work of one craftsman and

worked locally from mostly local materials. The group contains most of the hafted implement types used for woodworking purposes. Patination and weathering, implement types and the mechanics of sand movement at the hoard site suggest an antiquity perhaps in the microlithic era, as several implements of this type occur in the hoard.

The Arcoona hoard was also found in KOKATA territory near its boundary with PANGKALA territory on the west side of Lake Torrens. This hoard is a trade parcel and the work of one craftsman using a single source of very popular material that most likely came from KUJANI tribal territory to the north. The implements were probably made at or near the source of the material, and unforseen circumstances interrupted the trade venture and resulted in the hoard occurring at the Arcoona site. Whether the parcel was intended for trade in the KOKATA or PANGKALA areas is uncertain as the site is on a natural route that would also encompass the WIRANGU and NAUO further to the south-west. Patination and weathering suggest a prehistoric antiquity.

The Philip Ponds hoard also is located in KOKATA territory and represents the personal hoard of one man. The material is mostly known to be local but the workmanship and type of material of one specimen suggests they may not all be the work of one craftsman. Weathering and patination influences are vague but associated microliths suggest an antiquity within that era.

Two factors have led to the detailed descriptions and analysis of these hoards. One is the scarcity of reports of finds of hoarded stone implements, particularly 'unused' specimens, in Australian anthropological and archaeological literature. The second factor is the great difficulty in relating cultural sequences and antiquity on purely surface campsites, particularly where these sites are associated with shifting dunes. It is realised that implement types and the processes involved in their fabrication and use, are mostly well known; however the detail provided here will allow minor variations to be identified while confirming for the Arcoona Plateau region those factors that conform. It is hoped that the detail provided will assist in the tracing with greater accuracy, of material sources and trade routes; and also establish the antiquity, should more accurate methods of determining rates of patination and weathering become available later.

The analyses of these hoards have revealed certain parameters in adze style. Some are well known and obvious, others perhaps less so; they have been listed below in so far as they apply to these hoards at the time they were laid down.

a) Adze stones of both the concave and the convex upper surface styles were contemporary (L. Hanson and Arcoona hoards).

b) The discoidal form was contemporary with the semi-discoidal form (L. Hanson hoard).

c) Wide, but shallow flakes and asymmetric flakes were worked from the extremities until they eventually became conventionally semi-discoidal (L. Hanson and Arcoona hoards). The side worked types were not reduced to a 'burren' type slug.

d) Micro-adzes were contemporary with normal adze implements (L. Hanson and probably Philip Ponds hoards).

e) Spalled burins and finely trimmed nosed engraving implements were contemporary with adze implements (L. Hanson and probably Arcoona).

f) Further to para c) above, the shape of the flake was unimportant provided that the lower surface bulb was satisfactory (see also Roth 1904:17).

g) Newly made adze implements were often reduced in thickness near the butt prior to the initial hafting hence the determination of the ratios of concave to convex styles from slug collections will be inaccurate (L. Hanson, Arcoona and Philip Ponds hoards).

h) The user of the adze implement often held a couple of ready made spares on hand (Philip Ponds hoard), which could serve other functions such as those of a knife (Philip Ponds) or nosed and concave scrapers, or burin implements (L. Hanson and Arcoona hoards).

i) Quite large stockpiles of woodworking implements either for trade or tribal use, could occur at some tribal centres.

j) Completed implements of high grade material were traded over long distances into areas where the particular implement was already being made from a local but usually inferior material (see also Cooper 1954:96).

Finally, it is proposed to outline some of the questions that come to mind when considering the implications of the Lake Hanson hoard. The Lake Hanson campsite areas shown in Fig.1 were an important centre of Aboriginal activity, probably over a long period. This assessment is based not only on the physical aspects of the area and the density of artefact exposures; but also on the fact that at the time the hoard was found, two incised cylcons were found at site 5, and to the east of site 2 a baler shell neck ornament was found. The baler shell ornament (now in S.A. Museum) extends the range of these artefacts as summarised in Mulvaney's map (Mulvaney 1975:111 and Fig.14).

If the hoard was the work of one craftsman, was he a tribal specialist? Spencer and Gillen (1899:586-7) for instance, refer to men in particular districts of Central Australia being famous for making particular forms of weapons and implements - this skill being by no means wholly dependent on the fact that suitable material was found only in their district. If in fact the hoard was intended for tribal use, does its size suggest a considerably larger tribal unit at that time, compared

with estimates for recent times? If so the larger populations would imply more food available and the possibility that the tribal group could afford to 'carry' a specialist in the fabrication of stone tools. In respect to large populations and more abundant food supplies it is pointed out that relatively minor changes of climatic patterns can change the Arcoona Plateau region from a marginal living area to a land of comparative plenty. This has been evident from the remarkable changes to the environment and life brought about by the exceptionally wet years of 1967-68, when fresh water lakes that had been dry for many years, filled and have remained so almost constantly as a result of follow up rains, to the present day. Pastoral people long resident in the area reported 1967-68 as the 'lushest' they could remember. Waterfowl and other bird life not seen in decades have moved in and remained in large numbers. Kangaroo, emu and the smaller fauna increased remarkably. The great density of artefacts on the campsites and the existence of a large hoard like this one, suggest that the bountiful conditions described above, also prevailed in an earlier era (see also Dow 1938:105).

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