CHAPTER THREE
ARTEFACT ATTRIBUTES, CLASSES AND ANALYSIS

3.1 INTRODUCTION

An "attribute" is a commonly used term in a technological analysis. An attribute can be a trait, characteristic, feature, peculiarity or quality of an artefact. It may be the result of an action on the artefact (such as a flake scar resulting from the removal of a flake from a core, a retouch on an artefact or a rotation of a core) or a natural attribute such as a type of raw material (quartz, chert, quartzite). The attributes recorded for this analysis were all selected because they had some technological importance in assessing what part the artefact had played in the reduction sequence of the raw material from its natural state to the discarded artefact.

The size of artefacts left in a site has much to do with where they end up in a site. O'Connell (1987:74-108), after viewing the deposition of various sizes of material in current Alyawara camps about 280 km north east of Alice Springs in Central Australia, stated that:

> *the most informative items of refuse may be relatively small, with maximum dimensions less than (perhaps much less than) five centimetres. It could be no wonder that sophisticated quantitative pattern recognition techniques, which have attracted so much attention in the the study of site structure over the past two decades, have produced so few substantive results. They may well have been applied to the wrong artefacts at the wrong spatial scales*
> (O'Connell 1987:105).

Taking into account O'Connell's statement, then the very small artefacts in the sites may then be more important than the larger ones. A technological analysis should then include all artefacts less than 5 cm in size. All artefacts will be analysed for this research.

The distribution and nature of stone resources has a major influence on the manufacture of artefacts and their ultimate shape (Hiscock 1979:114-116, Rolland and Dibble 1990:480-499.). According to Witter (1992:26), the final form of potential tools (cores and flakes) depends on the initial size and flaking qualities of the raw material although certain rules apply regardless of the raw material selected. These rules relate to attributes such as platform angles, core overhang (Witter does not define core overhang) and contours of the flaked surface of the core. Witter emphasises that reduction strategies

emerge from having the technological knowledge of the various steps that could be employed at certain stages of the reduction of the raw material and also knowing the flaking characteristics of the raw material. As quartz in the Coonabarabran region is in the form of pebbles of varying size, the above statements regarding size, flaking qualities and reduction strategies have to be taken into account in determining the importance of quartz, especially when quartz's particular structure and flaking characteristics are taken into consideration. Attributes were also chosen to reflect aspects of land use patterns so that the model proposed in Chapter Two could be further tested (see 3.4).

The attributes selected were suited to all artefacts manufactured from quartz, fine grained and coarse grained raw material. These attributes would be instrumental in helping to determine the importance of quartz in assemblages containing artefacts manufactured from both quartz and fine grained material. Because of quartz's unusual flaking qualities, it was necessary to select attributes that could be used for both the fine grained and quartz artefacts. Some archaeologists may think these attributes and classes are very simple, but this is a necessary path to be taken if meaningful comparisons are to be made between the quartz and fine grained artefacts.

All artefacts were classified into categories according to the part they played in the reduction sequence. The artefact categories (flake, core, flaked piece, etc.) were in turn divided into sections that I have termed classes. For example, flakes in a particular raw material group are to be divided into complete flakes, transversely broken flakes, longitudinally broken flakes, and broken flakes with both types of breaks.

3.2 RAW MATERIAL DESCRIPTION

One of the most common methods of describing stone artefacts is to first sort them into raw material groups, and then use the numbers and/or percentages of each raw material groups to show changing preferences and/or trends of the use of these raw materials through time and/or space (see Kuhn 1991:192, Barnforth 1991:223, Gould and Saggers 1985:119, Hiscock 1984:183, Hiscock and Hall 1989a:95-96 for some examples).

Hiscock and Hall (1989a:95-96) used varying ratios of percentages of chert to basalt flakes as a measure of changing stone technology over 5400 years at Bushrangers Cave in the Laming ton Range, Queensland, which is north west of Murwillumbah NSW (see map 1.1). As the two main raw materials in the assemblage (chert and basalt) behaved differently when knapped, different strategies were detected in reducing the raw material. At Bushrangers Cave, preference for basalt flakes only occurred in the middle occupation

levels of the site. It was found that each raw material produced flakes of different shapes which may have been used to exploit different resources. It is anticipated that there will be raw material preferences in the Coonabarabran region over time and these will probably point to different knapping strategies or scarcities of raw material.

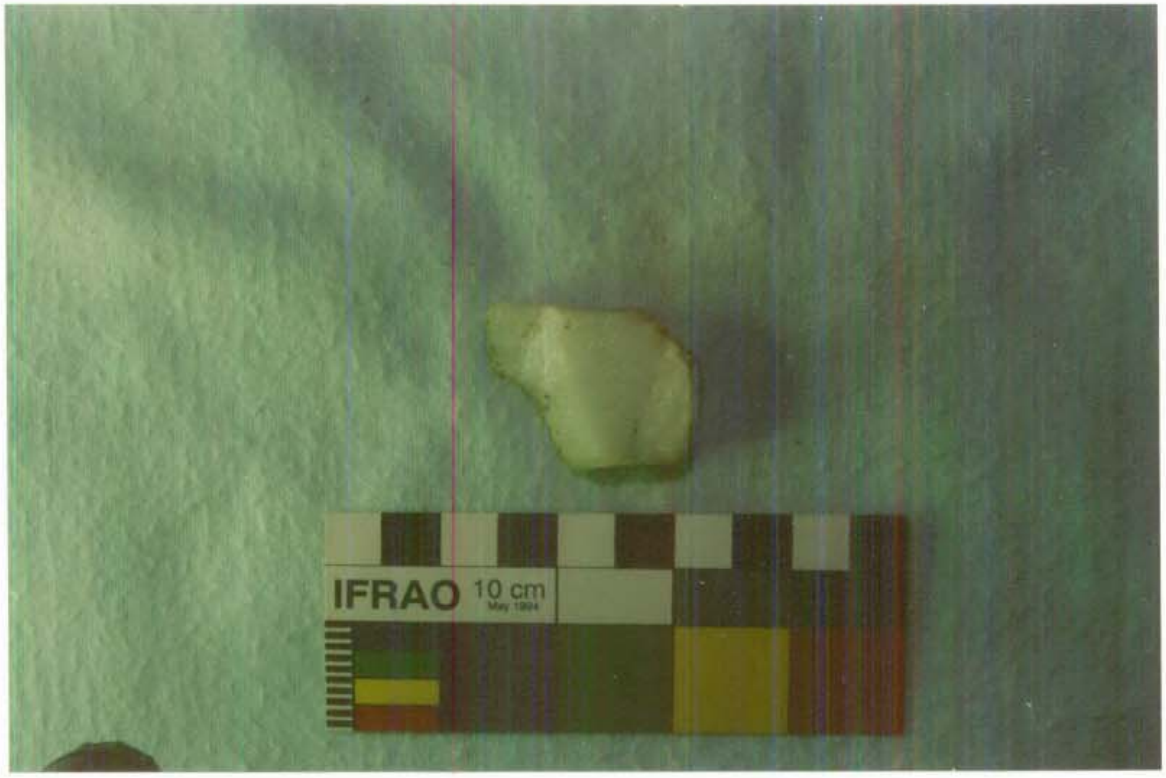
From past research in the Coonabarabran area, there are three main types of raw materials that were used by Aboriginal knappers in the past.
These were :

1. Quartz
2. Fine grained material (such as chert, jasper and chalcedony)
3. Coarse grained material (nearly all coarse grained material knapped in the Coonabarabran area was quartzite .

3.2.1 Quartz (see plate 3.1)

Geologically the crystalline group of quartz consists of massive quartz, quartz pebbles, quartz sands and disseminated grains of quartz in other rocks. This group is very common and its members are usually the largest constituents of any gravel or beach sand. Quartz (silicon dioxide) forms under all types of conditions and is the most common of all minerals throughout the world (Pough 1960:231). Quartz can vary in colour from colourless to white, smoky, rose, violet, and brown. It can also be translucent or be tinted any hue according to the impurities present (Pough 1960:231-232). The most common type of crystalline quartz found in Coonabarabran is white quartz in the form of pebbles that have eroded out of the Pilliga Sandstone formation. The Pilliga Sandstone was formed when landscapes from a pre-Jurassic period were eroded away and the sediments deposited in thick sandstone and conglomerate layers. The quartz was deposited in these conglomerates. These layers consolidated into the Pilliga Sandstone Formation (McElroy 1969:469, Vallance et al. 1969:532, Hind and Helby 1969:481). Quartz and quartzite pebbles can usually be found eroding out of any of the sandstone cliffs in the region (personal observations). These pebbles are reasonably plentiful in the hilly to mountainous regions, but are scarcer on the flatter sandy country between Baradine and Pilliga (see map 1.1).

As far as I can ascertain from inspection of quartz artefacts containing cortex from the region, they are all of pebble origin. Quartz pebbles are common around the areas of the five sites (personal observations). Quartz would account for about 95% of the pebbles lying around sandy soils adjacent to sandstone cliffs, but this percentage would be much lower in the streams where there are many pebbles, cobbles and rocks of volcanic origin.



QUARTZ
PLATE 3.1

3.2.2 Fine grained (FG)

The fine grained group of quartz has microscopic crystals (as distinct from crystalline quartz which has large crystals) and this fine grained quartz occurs in two sub-groups. These are the chalcedony group, and the chert, flint, and jasper group. Chalcedony surfaces are smooth and translucent and the individual crystals are arranged in parallel bands. This is quite conspicuous in agate, which is a type of chalcedony. Chert, flint and jasper do not have the translucency nor the definite banding of the chalcedony group and there are usually more impurities present in these stones than in the chalcedony group (Pough 1960:231-232). These fine grained raw materials, however, all behave alike when knapped, leaving noticeable bulbs of percussion and often ripple marks and ring cracks. These raw materials were all grouped together as fine grained (designated as FG in the analysis). Flakes made on fine grained siliceous material usually display a distinct bulb at the point of impact when knapped. This has to do with the size of the crystals in the material, whereas most often, quartz because of its large crystal size, does not.

Some fine grained material is very distinctive in colour. A yellow-brown chalcedony was present at KACA throughout the whole occupation of the squares analysed, but only in small quantities (Gaynor 1987:120). This material (see plate 3.2) was also found at the

Crazyman Shelter dating back to 6000 calibrated (2 sigma) BP. In 1987, I thought that the raw material source was coming from a rhyolite formation but the finding of a split pebble on the surface at the Crazyman Shelter, clearly shows it is of pebble origin and not part of a reef or infil in a volcanic flow. (Chalcedony is often found in association with volcanic flows in nearby Boggabri and Gunnedah areas in Northwest NSW (personal observations). This yellow-brown chalcedony accounted for only 1.22% of the total assemblage of 2130 artefacts analysed from KACA in 1987 (Gaynor 1987:120). Fine grained rocks are not visible on the sandy soils, but may well be present in small numbers in the streams of the region. These fine grained pebbles are disguised by a dark cortex on many occasions, making identification difficult (see plate 3.2). From observations, these chalcedony deposits can be quite small in size and sources used by the Aborigines in the past, may now be exhausted. Ms. Mandy Timmins (personal communications), a PhD student with the Department of Geoplan, University of New England, Armidale, has recently been told of the existence of chalcedony in the vicinity of Tooraweenah, which is in the southern side of the Warrumbungles and about 40 km southwest of Coonabarabran (see map 1.1)

FINE GRAINED MATERIAL

PLATE 3.2

3.2.3 Coarse grained material (CG)

The most common type of coarse grained material knapped in the Coonabarabran area was quartzite. Quartzite (see plate 3.3) is a metamorphic rock derived from sandstone. The sand grains of which it is composed, are pressed so tightly together (by deep burial and/or cementation) that a subsequent fracture will always occur through the grains and not around them as is the case with sandstone. A freshly broken surface will show a glassy surface with a conchoidal or splintery fracture while sandstone is of a granular nature with a matt finish devoid of lustre. Quartzite can be any colour that is attributable to sandstone such as white, yellow, reddish, grey and brown (Pough 1960:24,316; Scott 1947:496). Quartzite is a very solid and durable rock and Coonabarabran quartzite pebbles usually make excellent hammerstones (personal experience). Quartzite would account for about 2 % of pebbles on the sandy soils.

LARGE QUARTZITE CORE AT CMS SHOWING SHORT WIDE FLAKE SCARS

PLATE 3.3

3.3 ARTEFACT CATEGORIES AND ATTRIBUTES

I decided to use some of the attributes and artefact categories previously selected for my Honours thesis in 1987 as well as some used by Wall (1993) in order to make some comparisons. More importance, however, was placed on attributes from which some inferences of human behaviour could be made, which in turn could define the importance of quartz in an assemblage. Some artefact categories would seem to be more important than others (for example, cores and flakes would seem to be the most important artefacts from which to obtain inferences of human behaviour). Others categories (such as raw material numbers and percentages) are also important in defining differences between open and shelter sites.

3.3.1 Artefact categories

The definitions chosen were those that I thought were the clearest, the most relevant for the assemblages researched in the Coonabarabran/Warrumbungle region and the most useful for analysing quartz. However, the attributes alone were not the only criteria used to distinguish quartz artefacts, context was also important for example, a chipped quartz pebble would seem to be more likely to result from Aboriginal action if the artefact came from a shelter than from an open site where a plough or an earthmoving machine may have been responsible.

The categories selected for the analysis were as follows :

CONCHOIDAL FLAKE

Definition. Any piece of stone detached from a larger mass by the application of force and having a a bulb of percussion plus a feather, hinge or step termination. A platform may be present if the proximal end is unbroken or free from crushing (Crabtree 1972:64; Hiscock 1979:126).

LAMELLATE (Witter's terminology)

Definition. A flake not showing a bulb of percussion or platform and not part of a larger conchoidal flake. This flake is characterised by straight sides showing signs of shearing and may or may not show signs of crushing on one or both ends (Witter 1986c:3). They usually range in size from 8 by 8 mm to 12 by 12 mm. Witter described them as being flat and thin and square in shape (Witter 1992:77).

FLAKED PIECE

Definition. Any piece other than a flake that has been detached from a core by freehand percussion. It does not have a platform and may or may not have a bulb of percussion, but

there will always be negative scarring present. These artefacts can be confused with broken conchoidal flakes, but flaked pieces are usually much thicker and chunkier and they have fewer breaks than flakes. Witter (1990:8) uses the term block fractured fragments to roughly equate to Hiscock's flaked pieces. Hiscock's (1989b:64) definition of a flaked piece was "any chipped artefact with negative flake scars which cannot be classified as a flake, core, or retouched flake". I favour Hiscock's definition and used it although any artefacts under 5 mm in maximum length, if they met this criterion, they were placed in the microdebitage category (see later definition).

AMORPHOUS BLOCK (Witter's terminology)

Definition. These are irregular and chunky blocks of stone not having a bulb of percussion or negative scarring (Witter 1986c:3). These artefacts can be shaped much like flaked pieces, but negative scarring is absent in an amorphous block. They are usually synonymous with the fracturing of quartz pebbles both naturally and by human agency. These are hard to identify in an open site particularly if there is a background of naturally broken quartz. If amorphous blocks were found in context with other artefacts, then I assumed that they were humanly made. Identification was more positive if found in a shelter with other artefacts, because they could not be a product of natural elements.

MICRODEBITAGE (from Gaynor 1987)

Definition. Any artefact having a maximum length of less than 5 mm. It was found that any inspection of this material for features such as the presence of cortex required the use of a microscope because it was extremely hard to analyse the artefact without magnification, so this definition was devised. Hiscock and Hall (1989a:93) have followed this reasoning and only analysed artefacts over 5 mm in maximum length. Petraglia and Potts (1994:233) also use this criterion (under 5 mm maximum length) but used the term "microartefacts" and define them as stone flakes and particles having a maximum dimension of less than 5 mm).

CORE

Definition. A core is a piece of stone from which flakes or pieces have been struck. It may have negative bulbs of percussion or straight shear edges according to the method of reduction. It may have both, if freehand and bipolar knapping methods have been used on the reduction of the core (Crabtree 1972:54; Witter 1986e:3). The shape of the material before it was flaked often dictates which primary reduction method was used to reduce it (Flenniken and White 1985:133).

ANVIL/HAMMERSTONE

Definition. A hammerstone is defined as any stone showing signs of scarring, pounding, staining by plant material or ochre, cratering or crushing but still retaining most of its cortex. Because bipolar knapping methods were used in the Warrumbungles (Gaynor 1987:142, Wall 1993:57), one might expect to find scarring and/or cratering on rocks used as anvils, as well as crushing on both hammerstones and anvils. Anvils were also used to shape artefacts in readiness for hafting If the stone had many negative flake scars even though still possessed many of the above attributes nevertheless it was classified as a core. Hammerstones were mostly used for delivering percussive blows to artefacts, but were also used for pounding plant material such as Kurrajong seeds.

GRINDSTONE

Definition: Any stone showing grooves, smoothing or grinding that appear to have been made by humans (e.g. muller, grindstone). This category is important for the detection of artefacts displaying wear patterns from some specific use, such as seed grinding.

OTHER

Definition. This category was created to cover any stone that was unflaked and/or unmarked by humans, but because it was not a stone normally found in the site, it was likely that it had been carried in. This is sometimes known as a manuport and needs no further definition. This section also included local unflaked stone with stains suspected as coming from human activity (such as ochre staining on stones).

NON-ARTEFACT

Definition. This category was created to cover any stone that initially had been included in the recovered assemblage but on further analysis did not meet any of the criteria listed above.

3.3.2 Artefact categories

LENGTH, WIDTH, THICKNESS

Length is defined as the maximum linear dimension of an artefact in any direction. Width is defined as the maximum width of an artefact in any position and it is never more than the length. It may or may not be at right angles to the length. Thickness is defined as the maximum thickness of the artefact in any position. Thickness is never more than width (Witter 1986c:2). All artefacts were measured with callipers using this criteria.

For the measurement of flakes, criteria used by Hiscock (1986:48) and Witter (1986d:3) were considered. Hiscock described length as being :

> *the distance along the percussion axis from the ringcrack to the distal margin*

and width as the :

> *distance between the lateral margins measured at right angles to the length midway between the ringcrack and the distal end .*

These are known as axial measurements. Witter (1986c:2) indicated the usefulness of axial measurements in certain analyses, but warned that in this system, axial width is not always less than axial length, but these measurements are always at right angles to each other and in the same plane. It was decided to use the maximum measurement criteria because comparisons were to be made of past artefact sizes recorded by this method in the Coonabarabran region (Witter 1986c, Gaynor 1987, Wall 1993). Witter (1986c:2) is of the opinion that maximum measurements method are :

> *least subject to variation by individual measurers, and provide the most consistent results regardless as to who is measuring.*

For these reasons, maximum measurements were used in this thesis. These measurements will be used to prepare the data for use in the core reduction charts for three raw material groups (Reduction charts were discussed in 2.3).

CORTEX

Definition. Cortex is the weathered surface of the rock or stone. If the primary geological cortex is present, it can indicate the type of geological formation that the rock initially came from and so can help in sourcing of that particular material. In many cases, the cortex on rocks consists of hundreds of small intersecting fractures caused by the rock being transported by water (Flenniken and White 1985). The presence of cortex on an artefact can also indicate that the artefact was manufactured in an early stage in the reduction sequence or (in combination with broad platforms), it can denote that there was little control over the raw material by the knapper (Hiscock 1986:44). This attribute in association with the rotation of the core, can be a good indication of where the artefact came from in the reduction sequence, and so be an indication of whether the knappers were reducing the raw material to its fullest extent. In my opinion, cores and the presence of

cortex (in combination with rotation or non-rotation of the core) are a very important aspect of any technological analysis.

FLAKE BREAKAGE

General discussion. Conchoidal flakes can be broken during manufacture, in use, and by the effect of too much heat, but more often breakage occurs as the result of trampling (Hiscock 1987:14). This can occur when the discarded flakes are left lying on or near the surface of a site. When breakage is the result of trampling, the frequency of broken flakes is in proportion to the amount of trampling (Hiscock 1987:14).

Transverse breaks

Definition. This flake break occurs across the lateral margins of an artefact. As the distance between the edges is usually shorter than the distance between the proximal and distal ends. This type of break is likely to occur from trampling than longitudinal types (Hiscock 1985:86).

Longitudinal breaks

Definition. This break occurs between the platform and feather ends of the flake. Hiscock (1985: 87) suggests that many of these breaks occur during manufacture of artefacts as the result of too much force being applied in the knapping of the flake.

Both transverse and longitudinal breaks

Definition. A flake showing evidence of both types of breaks.

Unknown

Definition. When the piece of flake analysed cannot be recognised as to what part of the flake it represents.

KNAPPING METHOD

General Discussion. Knapping methods are important according to some archaeologists in determining the amount of stress on a population (see Jeske 1992:480-481). This stress may relate to access to raw material. Where other factors (such as warfare and/or food resources) are taking up much of the groups available time, there would be little time left to access stone for knapping. The type of knapping carried out could reflect this stress. The knapping method is also important when in combined with other attributes (such as the the whether the core has been rotated or not) in determining whether the raw material was scarce or was difficult to reduce.

Freehand

Definition. Crabtree (1972:59) defined freehand percussion as a method involving holding the material in one hand and using the other hand to hold the hammerstone to deliver the

percussive blow. The core may have some retouch on the platform due to crushing from blows, the preparation of the platform, or from use wear or resharpening if the core was used as a tool (Witter 1986c:2) The core reduced by the freehand method is usually the most common type of core found. The size of the core at discard will depend on the raw material type used as well as the knappers expertise in reducing the material as well as the availability of the raw material.

Bipolar

Definition. Bipolar knapping occurs when the core is placed on an anvil and struck with a hammerstone and a flake is detached. The flake as well as the core can then display signs of shearing and crushing. Bipolar knapping results in an artefact without bulbs of percussion, but with possible signs of crushing on one or two ends, but in many cases this crushing may not be present (Witter 1992:44 and personal knapping experience). There may also be signs of shearing on one or two sides. Platform angles of about 90 degrees or more result (Hiscock 1979:125).

Jeske (1989:467-481) has suggested that the presence of bipolar knapping in an assemblage may signal that the population that made the assemblage was conserving energy; energy that could be channelled into other activities that may have been more important at the time (such as those determined by social and environmental constraints). The presence of cores showing signs of being reduced by the bipolar method can, however, be indicative of other inferences of human behaviour. Bipolar knapped cores can be indicative of :

1. A lack of experience and/or skill needed to reduce the raw material because of the particular characteristics of raw material (e.g. the number of cracks in a particular quartz pebble may restrict inexperienced knappers from reducing the material successfully by the freehand method).
2. The raw material being too small to successfully knap by freehand percussion, so the bipolar method was used to reduce it beyond the size when the downward force from the freehand blow was transferred more into the hand instead of onto the raw material.
3. the raw material being highly prized, so the bipolar method was employed to reduce the material beyond that achievable by the freehand method.

Combined

Definition. Flakes resulting from this process can be identified by the presence of a negative bulb of percussion on one side and straight (90 degree) shearing on any another side or sides. Once a core, that has been reduced by freehand percussion, becomes too small to flake further by this method, it may then be further reduced by the bipolar method.

CORE MODIFICATION

General Discussion. The type of core modification can be detected on flakes as well as on cores by noting the direction of flake scars present on the artefact. If the scars do not run the same way as the proximal-distal axis of the flake, then a multiple platform is indicated. This attribute is important in determining the amount of reduction that is occurring in a site. Hiscock (1984:178-190) cites raw material rationing as an explanation of assemblage differences and argues that cores will be more heavily reduced the further the artefact is found from its raw material source.

Single Platform

Definition. A single platform is indicated when all the scars on a flake or core run in the same direction. The presence of a single platform on a core indicates that the flakes have been struck from one surface or from one direction, and this signifies that this is a non-rotated core. This type of core signifies that there was less efficient use of material being made than on a rotated core with multiple platforms (Hiscock 1986:49). A single platform on a core can also indicate that the material was plentiful and there was no need to conserve material by rotating the core to get the most out of the material.

Multiple Platform

Definition. This is an artefact that has at least one flake scar running in a different direction to other scars. These multi-directional scars indicates that the core has been rotated to get the more use out of the raw material.

Unknown platform

Definition. If the artefact was badly broken and no classification of modification could be made with any certainty, then this category was used. This definition was used with amorphous blocks which do not have flake scars.

ROTATION OF CORES AND CORTEX

Cores in this analysis were divided into four classes according to at what stage of the reduction of the raw material the cores were discarded. Using a combination of attributes involving the presence or absence of cortex and whether the core has been rotated or not, was more enlightening than viewing these two attributes separately.

The four classes were :

1. The least reduced : cores with cortex that were not rotated (C&NR).
2. Medium reduced : cores with cortex but rotated (C&R).
3. Medium reduced : cores without cortex but not rotated (NC&NR).
4. Most reduced : cores without cortex and rotated (NC&R).

Discussion. Cores in Class 1 (C&NR) signify low knapping skills and/or a plentiful supply of raw material. Cores in Class 2 (C&R) signify that a higher degree of skill was used in

reducing the cores than in Class 1, and the raw material was being rationed to some degree. Cores in Class 3 (NC&NR) show a high degree of knapping skill in being able to completely dispose of the cortex without rotating the core. It also shows that the raw material was being reduced substantially. Cores in Class 4 (NC&R) show that the core was discarded in a late stage of reduction, a higher degree of skill was present than in Class 2, and the raw material was being rationed. This combination of attributes can be responsible for outlining differences between the reduction of quartz, fine grained and coarse grained in the 5 sites and across the 4 phases of the Crazyman Shelter.

RETOUCHED TOOL TYPE

Discussion. Retouch is the removal of flakes from, or initiating from, the ventral surface (the side that was last separated from the core) of a flake. It may result from the shaping of the flake before and for use, or during use or as a result of use.

Backed blade

Definition. A Blade is defined as a specialised flake with the lateral edges parallel or sub-parallel to each other and the length is more than twice the width. There can be one or more dorsal ridges which are more or less parallel to the long axis of the blade. This is not a randomly struck flake but one struck from a specially prepared core (Crabtree 1972:42, Flennekin (1985:136). A Backed Blade has been intentionally dulled or blunted on the side opposite the sharp edge; this backing can also utilise cortex (Crabtree 1972:36). Backing is usually carried out by placing the artefact on a narrow anvil and chipping away the unwanted part of the artefact with another stone (Flenniken and White 1985:143). Any artefact that was classified as a backed blade in a typological analysis (for example see McBryde 1974:300), but was not made on a blade was classified as a backed piece. Witter (1992:58) stated that there was no "classic" blade core type. Aboriginal knappers had a variety of ways of producing a backed blade and those manufactured from prismatic cores, produced a thin blade, while those manufactured from a burin or tranchet blade core, produced a thicker blade (Witter 1992:63).

Backed piece

Definition. Any artefact that has been backed but does not meet the criteria of a blade.

3.4 ARTEFACT FUNCTION

Camilli (1989: 22-26) has stated that stone artefacts can be classified into three categories. These categories were originally put forward by Binford (1979) but expanded upon by Camilli (1989). These categories were:

1. Site furniture.
2. Situational gear.

3. Personal field gear.

These categories may be related to raw material types.

1. SITE FURNITURE

Binford (1979 :264) has described site furniture as site specific items that were available for all occupants of the site. These items were manufactured for use at that particular site and were cached or stored there for later reuse. Australian examples might include grindstones, anvils, large cores. These are unlikely to be made from quartz. As most site furniture consisted of large items they were seldom buried, they were continually scavenged and reused. According to Camilli (1989:23), site furniture items were not related in any way to the size of the assemblage. Because of the different requirement of each site's location, items of site furniture will possibly vary considerably between sites. The duration of the stay at the site and the type of processing undertaken there, will also affect the amount of material used from the site furniture cache (Camilli 1989: 23).

2. SITUATIONAL GEAR.

Binford (1979:265) has described situational gear as artefacts gathered, produced or brought into use for carrying out a specific task and then left at that site. Australian examples could include stone flakes for cutting plant or animal food. According to Camilli (1989:23), there should be a strong correlation between the length of the site's use and the amount of situational gear produced at it, as the gear is not carried on to the next site. There will, however, not be a strong correlation between the amount of situational gear at individual sites because each site's location, resources and the occupant's length of stay will determine the amount of situational gear. The amount of situational gear produced at a site, however, can be used as a measure of a site's use. As quartz is readily available around most sites in the Coonabarabran region, its use as situational gear was a strong possibility because quartz was known to have been used for cutting plant material (Purcell 1994:82-87).

3. PERSONAL GEAR.

Binford (1979:262) stated that personal gear was carried around in anticipation of some personal use or activity. Australian examples could include retouched flakes for use as hafted spear tips, axes for stripping bark or cutting possums out of trees. The amount of debris from the manufacture and the maintenance of personal gear from residential sites should bear a strong positive correlation to the intensity of site use but will have a negative correlation at special purpose sites of short duration. This means that the debris from the

retouching or flaking of the personal gear will be found in a site, but not many of the flakes or the cores, which are carried on to the next site. Lurie (1989:47) has argued that the high carrying cost of obtaining raw material from a distance, has a restriction on the time left in manufacturing the artefacts. As a consequence of this time restriction, curated artefacts will be smaller in size and less waste will be left from their manufacture. The number of discarded curated tools should also bear a strong positive correlation to the amount of debitage at residential sites (Camilli 1989:23; Binford 1979;262). Due to the shortage of fine grained artefacts in the Coonabarabran surface assemblages and its preferred use over quartz at certain times in the past (Gaynor 1987:124-126), it is conceivable that artefacts made from fine grained material would have been used as personal gear. Chert was known to have been preferred for the manufacture of backed blades which could have been used as spear barbs (McBryde 1985:239).

Camilli (1989:23) has further stated that artefacts that fit the categories previously described, were used and discarded at different rates. Camilli states that the disposal of an item in a particular category can tell us the intensity of a site's occupation. To understand what can be assessed from the disposal of artefacts in each category, it is important to examine how each tool in each category was used and was ultimately discarded in order to understand what can be assessed from the disposal of artefacts in the category. It is also important to define how this type of gear could be recognised in a site and if quartz was used for any of these types of gear. Quartz was most likely to have been used for cutting plant and animal material (Purcell 1994:82-87). As such it would be flaked on site and was most unlikely to have been carried from site to the next. Quartz cores and flakes should then be found on site. In addition, its ubiquity means there was little advantage in carrying it (but cf. Wall's thesis). Determining if quartz was used for any of these three types of artefacts, could aid in assessing the importance of quartz.

3.5 DETERMINATION OF HUMAN BEHAVIOUR FROM ATTRIBUTES

The general aim of this thesis is to make the technology of quartz artefacts better known, and to assess the problems and potential of assemblages containing quartz. Part of the method is to ascertain whether analysing the quartz portion of a stone artefact assemblage in a site could be instrumental in detecting human behaviour missed when studying only the fine grained portion of the assemblage. This should give some indication of the importance of quartz in an assemblage. Single types of attributes that support inferences of human behaviour (such as the percentage of broken flakes, which may indicate the amount of trampling in a site) together with combinations of attributes, such as those used to denote rationing of raw material (e.g. smaller cores and flakes, very little or no cortex, rotation

of cores) will be explored in both the fine grained and quartz sections of the assemblage to see if there is a discrepancy between the assemblage parts. The main comparisons then will be between the fine grained section and the quartz raw material but the results from the Coarse grained section will also be tabled and trends noted.

3.6 SUMMARY OF ATTRIBUTES AND COMBINATIONS IN RELATION TO THE IMPORTANCE OF QUARTZ

The combining of different numbers and percentages of artefact attributes and attribute classes will be used to obtain insights into reduction strategies occurring at individual sites. This is a relatively simplistic method of linking behaviour and attributes. it is intended to provide explicit hypotheses for testing rather than firm conclusions. Alternative explanations for knapping behaviour are proposed where possible. The raw material preference, distance from source, rationing and knapping skills will all be tabled (Hiscock 1984). Variation will be examined through time (at the Crazyman Shelter) and at various sites dating to the last c.1000 years.

Changing percentages of artefact attributes and classes will also be used to detect changes in knapping strategies (Hiscock 1986, Hiscock and Hall 1989a). Large amounts of microdebitage were detected in KACA in 1987 in certain phases of occupation (Gaynor 1987:126), and these separately or in combination with other types of attributes were used to suggest changes in technology. Wall (1993:99) found evidence of rationing in quartz artefacts found beyond 2 km from the raw material source, so even though an artefact may be classified as local, it can be instrumental in relaying aspects of human behaviour and in particular the importance of quartz for this research.

Lengths, widths and thicknesses will also be used to detect changes in the size of artefact (Witter 1992). The range of sizes of each of the three categories (cores, whole flakes and flaked pieces) may be instrumental in detecting changes though time and space. From the literature reviewed, core attribute analysis was a highly regarded type of analysis (see Hiscock 1984:185-186, Witter 1992:30-34). Hiscock used sizes of cores, cortex on cores and core rotation on the most common types of raw material at Lawn Hill in Queensland (chert and greywacke) to detect rationing of the raw material. Witter used core types connected with specific industries to denote different knapping strategies. Some aspects of Hiscock's ideas concerning rotation, cortex and size of cores will be applied to the assemblages studied.

Jeske (1989:467-481) has suggested that the presence of Bipolar knapping could signify

the presence of stress on a population but as Wall (1993:52, Dickson 1977, Hiscock 1982) has suggested, it could also denote that the initial material was too small to be successfully reduced by freehand method Flake breakage is another indicator of knapping skills and/or trampling in a site and so flakes will be divided into the four classes already mentioned. Varying proportions of complete flakes and flakes with longitudinal breaks found in a site could be an indicator of knapping skills (Gaynor 1987). Table 3.1 (see following page) depicts which attributes will be used to infer human behaviour.

3.7 ARCHAEOLOGICAL INDICATORS OF CAMP SITE FUNCTIONS

Bamforth (1991:220-234) carried out an analysis of 23 assemblages from Santa Barbara County in California in an effort to find links between stone technology and mobility patterns of hunter-gatherers. Bamforth stated that some factors (such as percentage of debitage) can be studied separately but then taken collectively to illustrate a specific type of stone technology was being used to exploit a particular resource or resources. According to Bamforth, technological adaptation can show a complex mix of strategies with patterns showing up in the context in which the tools were made and discarded. For example the prehistoric knappers of the Hoko river or the northwest coast of North America, used the bipolar method to produce tools to exploit the fish in the river. The quartz artefacts found were made on local stone and these required low maintenance, adding to the efficiency of the whole quartz technology (Flenniken 1981: 113-114).

Chert accounted for over 90% of the artefacts analysed by Bamforth (1991: 225) (there were three different colours and sources), but all the raw materials from which the artefacts were manufactured were available in the general region. Bamforth analysed 40% of the debitage as well as what Bamforth described as the "simple morphological tool types". Bamforth's tool types were divided into: bifaces, unifaces, projectile points, cores, choppers, flaked hammerstones and others. Attributes measured on the debitage were: length, width, thickness, dorsal/ventral platform thickness, exterior platform angle, the presence and position of cortex on the dorsal surface, the presence of cortex on the striking platform and the number of major flake scars on the dorsal surface. This example shows the value of analysing all aspects of the assemblage.

It is important to note here, that Bamforth did not analyse the formal tool types. Much of the information pertaining to the type of camp site was discovered by analysing the debitage or in some cases, the reasons for lack of it. Although quartz was not noted in Bamforth's analysis, the inclusion of artefacts not recognised as formal tool types to obtain inferences of human behaviour is relevant to the Coonabarabran/Warrumbungle region.

BEHAVIOURAL INFERENCE ATTRIBUTE INDICATOR
TABLE 3.1

BEHAVIOURAL INFERENCE	*ATTRIBUTE*	*INDICATOR*
PREFERENCE OF RAW MATERIAL	% OF RAW MATERIAL	HIGH % = HIGH PREFERENCE
	IN ASSEMBLAGE	LOW % = LOW PREFERENCE
REDUCTION OF RAW MATERIAL	MICRODEBITAGE	HIGH % = MUCH REDUCTION
		LOW % = LITTLE REDUCTION
REDUCTION OF RAW MATERIAL	CORES/ASSEMBLAGE	HIGH % = MINIMAL REDUCTION
		LOW % = MUCH REDUCTION
REDUCTION OF RAW MATERIAL	FLAKES/ASSEMBLAGE	HIGH % = MUCH REDUCTION
		LOW % = MINIMAL REDUCTION
RATIONING OF RAW MATERIAL	NON ROTATED CORES	HIGH % = LITTLE REDUCTION
	WITH CORTEX	LOW % = MUCH REDUCTION
RATIONING OF RAW MATERIAL	PERCENTAGE OF CORTEX	HIGH % = GOOD ACCESS
	ON CORES	LOW % = RESTRICTED ACCESS
RATIONING OF RAW MATERIAL	ROTATED CORES	HIGH % = MUCH REDUCTION
	WITHOUT CORTEX	LOW % = LITTLE REDUCTION
RATIONING OF RAW MATERIAL	CORES WITH CORTEX	HIGH % = LITTLE REDUCTION
		LOW % = MUCH REDUCTION
RATIONING OF RAW MATERIAL	PERCENTAGE OF CORTEX	HIGH % = GOOD ACCESS
	ON FLAKES	LOW % = RESTRICTED ACCESS
REDUCTION STRATEGY	CORE SIZE	HIGH MEAN = LONG FLAKES REQUIRED
		LOW MEAN = GREATER RANGE OF SIZES
		WILL SUFFICE
REDUCTION STRATEGY	PERCENTAGE OF COMPLETE	HIGH %=LITTLE TRAMPLING/GOOD SKILLS
	FLAKES	LOW % = MUCH TRAMPLING/LOW SKILLS
REDUCTION STRATEGY	PERCENTAGE OF	HIGH % = MUCH REDUCTION
	FLAKED PIECES	LOW % = MINIMAL REDUCTION
DEGREE OF TRAMPLING	FLAKES WITH	HIGH % = HIGH DEGREE OF TRAMPLING
	TRANSVERSE BREAKAGE	LOW % = LITTLE TRAMPLING
KNAPPING SKILLS	FLAKES WITH	HIGH % = LOW DEGREE OF SKILL
	LONGITUDINAL BREAKS	LOW % = HIGH DEGREE OF SKILL
LACK OF EXPERIENCE IN	BIPOLAR KNAPPING	HIGH % = LOW DEGREE OF SKILL
KNAPPING DIFFICULT		LOW % = HIGH DEGREE OF SKILL
MATERIAL		
STRESS IN POPULATION	BIPOLAR KNAPPING	HIGH % = LOW DEGREE OF STRESS
(JESKE'S CONTENTION		LOW % = HIGH DEGREE OF STRESS

This is because very few formal tool types were recognised in the 1986 analysis of surface sites under the guidance of Witter (Gayror 1987:247-285). The lack of debitage which includes microdebitage and flaked pieces (quartz or other raw material) in a site then can have implications as to the use of that site.

Bamforth (1991:216-234) stated that from his research, he recognised 3 types of camps. These were:

1. Seasonal residential type
2. Short term camp
3. Limited use camp.

As Witter has speculated on the type of camp sites that would have been present in the Coonabarabran/Warrumbungle region in the past, research on how to recognise camp types is of importance.

The Seasonal residential type, according to Bamforth was characterised by many activities, but was complicated by widely different spatial patterning. Portions of this type of camp were used for specific tasks such as dumps for unwanted material (from inferences gained from my analysis of the stone assemblage from KACA in 1987, examples of these dumps include debris from cooking hearths and pits, exotic and local stone reduction, and thermal alteration pits for fine grained material).

The second type, according to Bamforth was Short-term camps, which were typified by evidence of fewer activities than the previous type. The spatial structure indicated relatively brief periods of occupation which could have overlapped, depending on the number of times the site was used.

The last type was the Limited use camp, which showed signs of very short stays with indications only of the production of flaked tools and no formal tools (Bamforth 1991:227).

Furthering research in relation to camp or site use, Kuhn (1991:76-106) has stated that no one indicator was enough to support an argument about a site's use. He claimed that in archaeological assemblages, a variety of factors influence the extent to which tools were worn out and discarded. Among those factors were:

1. Differential transport of the artefacts
2. Raw material availability

3. Tool function
4. Patterns of site use.

(Kuhn 1991:86) stated that open air sites, may have served a somewhat more restricted range of functions or hosted a narrower range of activities than cave occupations, so that a smaller number of factors would have influenced tool reduction. As cave and open sites are to be analysed for this research, this statement is of importance in determining the role of quartz in open and shelter sites. Because of the inherent flaking qualities of quartz, artefacts made from this raw material were probably suited to certain type of activities and not others. From personal experience quartz artefacts generally maintain sharper cutting edges for longer periods than fine grained artefacts when used for cutting, but are inclined to chip if used for sawing type operations. The number and type of sites found across any landscape depends on resources in that area (for example water, stone suitable for knapping). In new territories, these would be largely unknown to the new arrivals, whether they displaced another group or were the first to inhabit that area. This unfamiliar landscape was responsible for a certain amount of risk to the group.

3.8 RISK AND STONE RESOURCES

Risk to prehistoric knappers (in this instance), is that defined by archaeologists, to be the uncertainty experienced by prehistoric knappers when colonising a new area. It is perceived that Aborigines moving into a new landscape would need to employ some risk reduction strategies, whereas more sedentary groups would know the location and abundance of necessary resources (e.g. stone material suitable for knapping). Hiscock (1994:267), has stated that :

> *It has long been recognised that the Australian archaeological record documents alterations in settlement and technological strategies in the middle of the Holocene*

These alterations, according to Hiscock (1994:267), involved the exploitation of previously unoccupied landscapes in which there were significant risks for the survival of the inhabitants. Other risks were related to environmental change, and the high mobility of the inhabitants. Hiscock (1994:267) suggests that archaeological evidence supports his contention that the Aborigines at this time adopted toolkits that minimised this risk. The environmental change in the mid Holocene was, according to Hiscock (1994:287), connected to increasing population, the development of long distant trading networks and the regionalization of art styles. In unfamiliar landscapes, dependable supply of flakable stone

was not always guaranteed, so it was an advantage to carry a portable toolkit that could be retouched and used for a variety of uses.

Hiscock (1994:283) based his interpretation of perceived values of risk on data from Queensland (Morwood 1986:117; 1987:347) and from NSW (Hiscock 1993). Hiscock suggested that when backed blades, points and tulas appeared in the middle Holocene, they were being used by relatively small populations of mobile hunter-gatherers exploiting a large region. By the late Holocene, according to Hiscock (1994:283), data from Attenbrow (1987) indicated increasing human numbers between 3000 BP and 2000 BP and this increase was attributed to a more sedentary population and the importance of local stone sources. The raw material used was often highly reduced and it contained few if any retouched artefacts and declining numbers of specialised artefacts (backed blades, points and tulas).

This risk concept and the rise and decline in the popularity of mobile toolkits is important when considering the importance of quartz in an assemblage. Quartz outcrops were widespread in Southeastern Australia and these had been used extensively by Aborigines in the past to manufacture stone artefacts (Witter 1992:43). The question then arises - does the presence of large percentages of quartz in surface assemblages (see Table 2.1) and the lack of retouched artefacts, indicate that knappers were no longer employing risk reduction strategies as the knappers had become familiar with local stone sources (quartz)? The assemblages from the five sites and the 20000 year sequence from the Crazyman Shelter, will be used to explore this concept.

3.9 CONCLUSION

Artefact categories and attribute classes that I felt were suited to the Coonabarabran assemblages have been selected and defined according to known criteria from other researchers. In cases where no definition seemed applicable, definitions were framed according to locally known criteria (e.g. lamellates, block fractures from Witter 1986c, microdebitage - my own). Camp use criteria and three artefact types as defined by Binford (1979) and Camilli (1989) were outlined. Hiscock's theory on risk and portable tool kits was reviewed. These theories will form the basis for assemblage interpretation. The following Chapter (Four) covers descriptions of the sites selected for this research.