ARTEFACT ASSEMBLAGE CHARACTERISTICS AND DISTRIBUTION
on the Point Blane Peninsula, Blue Mud Bay, Arnhem Land

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Abstract

Previous analysis of the archaeological material recorded on the Point Blane Peninsula in Blue Mud Bay has highlighted the dominance of shell deposits within this landscape. While only minimally represented within the study area, the stone artefact assemblage characteristics, the level of artefact reduction, raw material use and the distribution of artefacts across the peninsula all suggest that, while there may not have been a heavy reliance on stone technology in this coastal area, stone was largely procured locally and intensively reduced. This reinforces the interpretation of economic activity within this area being focused on coastal resources and locally oriented.

Introduction

This paper presents the results of an analysis of stone artefacts recorded during the course of archaeological surveys across the Point Blane Peninsula, situated approximately 200km south of the Gove Peninsula on the Gulf of Carpentaria (Figure 1). This is one component of broader archaeological research carried out in the region within a community-based context (Clarke and Faulkner 2006; Faulkner 2006, 2008, 2009; Faulkner and Clarke 2004). From the results of this research, our knowledge of several elements of the coastal archaeological record for northeast Arnhem Land has expanded. For example, analyses of shell deposits in Blue Mud Bay indicate a long and focused exploitation of coastal resources ranging from c.3000 BP to the present (Bourke *et al.* 2007; Faulkner 2006, 2008, 2009; Faulkner and Clarke 2004). The shell midden and mound sites recorded on the Point Blane Peninsula suggest that resources were targeted and exploited in a highly localised and discrete pattern, with a higher concentration of these sites clustered around near-shore habitats and shallow embayments along the peninsula margin (Figure 2). Shell mounds and middens are generally located in areas where there are abundant and varied resources available along the coastline (Meehan 1982). Very little archaeological material was recorded across the interior of the peninsula and, as such, the types of sites recorded are evidence of a pattern of landscape utilisation predominantly orientated towards the use of coastal resources.

In contrast, very little is known of stone artefact procurement and use within this region, the only previous research being an ethnoarchaeological study of the Ngilipitji quarry (Jones and White 1988; see also Thomson 1949). It has previously been suggested that within many coastally oriented economies, particularly those focusing on shellfish and fish resources, stone artefacts were not used frequently (Bailey 1993:9; Meehan 1982). We address this proposition here, and demonstrate that the artefacts were reduced intensively. Rather than a high frequency of retouch, the identification of high intensity reduction is associated with technological strategies implemented to extend the use-life of stone artefacts. These strategies prolong the time between raw material resupply through the manufacture of artefacts of a size and/or shape that enables flaking and use over a longer period (Hiscock 2006:81). The aims of this analysis, therefore, are to investigate the procurement and use of stone artefacts in a coastal landscape setting, focusing on a part of the archaeological record not previously investigated in any detail in the region. The approach taken here examines patterns of artefact discard and reduction that have taken place over a long period. Results indicate that although stone artefact representation within this archaeological record is minimal, stone procurement was largely local, and the reduction of stone artefacts in this landscape was relatively intensive.

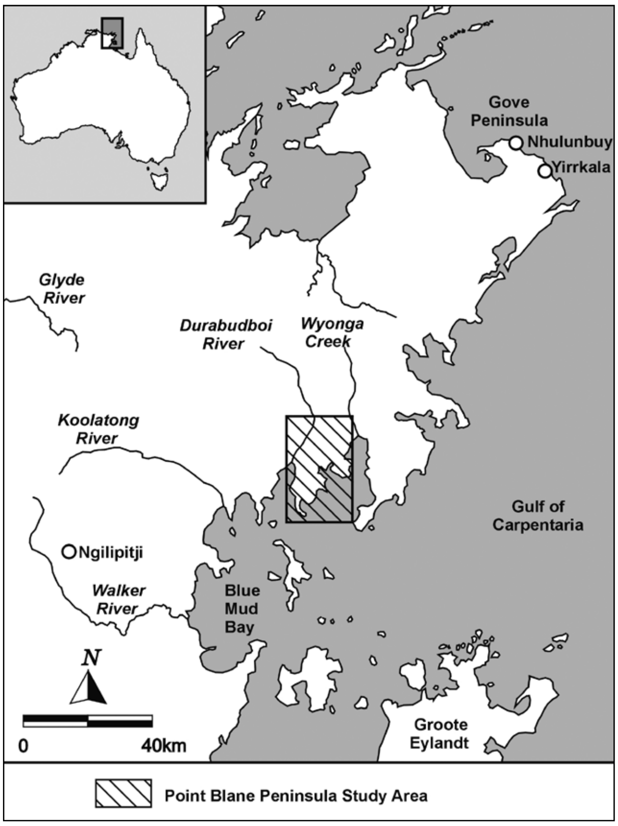

Figure 1 Location of the Point Blane Peninsula, northeast Arnhem Land.

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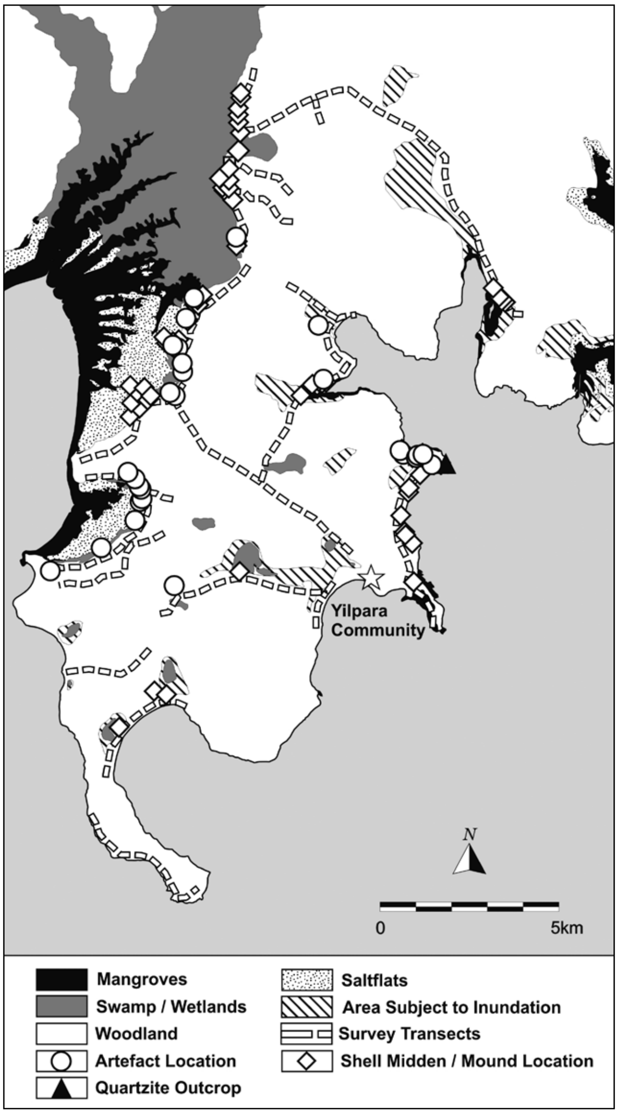

Figure 2 The distribution of sites on the Point Blane Peninsula.

Methods

In keeping with the community-based nature of the research, the selection of survey units was based on community direction and personal judgement. Long, narrow survey units, or transects, were selected owing to the ease of locating these units in the landscape. In order to gain an efficient estimation of non-clustered archaeological elements, bush tracks and roads were also utilised as survey transects across the peninsula, allowing the systematic survey of inland areas, with a total of 81km of transects surveyed (Figure 2). Tracks were used as survey transects as they enabled an example of all landscape zones within the study area to be inspected and afforded higher ground surface visibility than the more heavily vegetated areas off the tracks (Schiffer *et al.* 1978:7). This sampling strategy is effective in defining previously unknown archaeological characteristics of a region, is relatively cost-effective in contrast to random sampling strategies, and facilitates the discovery of highly clustered, small or uncommon elements within the landscape (Redman 1987:251; Schiffer *et al.* 1978:5).

All artefacts were recorded in the field and replaced where found. Owing to time constraints and the need for a reliable and efficient field-recording programme, a number of variables were selected as being the most appropriate for investigating stone technology and reduction (Hiscock 1984, 1989; Hiscock and Hughes 1983) while still taking into account as many variables as was feasible. The first variable selected was raw material type, which was recorded to gain an understanding of raw material movement across the landscape and use in artefact production. The following technological variables were recorded: artefact types, recorded as flaked pieces, unretouched flakes, retouched flakes and cores (following Hiscock 1989:25-26); breakage pattern, and percentage of cortex; percussion length on flakes, or the distance along the ventral surface from the ringcrack to the flake termination (Hiscock 1988), with width and thickness taken at the midpoint of the percussion length, and platform width and thickness taken relative to the point of force on the platform. For cores, length was taken as the percussion length and width of the largest negative scar, as well as the maximum platform thickness. The number of platforms and the number of negative scars were also recorded on cores as an indicator of core rotation and core use; and weight was recorded for all artefacts as another comparative size measure (Faulkner 2006:90-92).

Assemblage Characteristics and Raw Material Variation

Rather than focusing on inter- and intra-site differences in analysing the stone artefacts, the study area was considered as a single catchment area (see Vita-Finzi and Higgs 1970), and the artefacts viewed as a single assemblage. As noted by Holdaway *et al.* (2004:34) surface sites generally lack stratigraphic context, therefore making it difficult to assign a chronological framework and investigate change through time and space. While acknowledging these issues, many studies with a primary focus on surface scatters have assumed stasis, constant rates of change, or contemporaneity in technology and/or behaviour (e.g. Thorley 2001; Veth 1993). This is problematic as time-averaged deposits like surface stone artefact scatters generally do not result from a single event, but repeated activities within that location (Holdaway and Wandsnider 2006:192-193). As such, the spatial proximity of artefactual material does not provide a strong temporal context. Importantly, while the study area is analysed as a single catchment, rather than assume chronological similarity, the aim here is to understand the sum of those activities, and the variability that entails, at particular locations (e.g. Holdaway *et al.* 2004; Holdaway and Wandsnider 2006; Shiner 2004). As the stone artefacts recorded during the field survey do not have an associated chronological framework, this approach enabled general trends in stone raw material use, artefact manufacture and spatial distribution to be analysed.

The distribution of sites containing artefacts is shown in Figure 2. A total of 248 stone artefacts was recorded, and as with the distribution of the other sites in the study area, these artefacts are largely concentrated on the margins of the peninsula. In order to identify diversity within this assemblage, the frequency of the major artefact types and raw material components of the assemblage are presented in Table 1. As noted by Grayson and Cole (1998:928), assemblage richness or diversity is largely dependent upon sample size. Differences in stone raw material abundance and quality may also place constraints on the variability of the archaeological record (Brantingham *et al.* 2000:256; Dibble 1985; Kuhn 1991:76-77). The data presented in Table 1 suggest a very low level of assemblage diversity in both artefact type and raw materials used on the Point Blane Peninsula. Nevertheless, a number of useful points can be addressed. Unmodified flakes dominate the assemblage at 73.39%, followed by flaked pieces at 17.74%, possibly representing the by-products of manufacture and/or use. Cores and retouched flakes represent minor components of the assemblage at 4.84% and 4.03% respectively. On the Point Blane Peninsula, quartzite is the dominant stone raw material (88.31%), followed by silcrete occurring at a considerably lower frequency (10.48%). Chert, quartz and volcanic artefacts form such a minor component of the assemblage (at 0.4% each) that they will not be included in the following analysis.

In conjunction with the physical properties of the various raw materials used in artefact production, the size and shape of cores are important considerations (Clarkson 2004:114; Cotterell and Kamminga 1987:677-678; Kuhn 1995:32). Size and shape were measured as the percussion length and width of the largest negative scar as well as maximum platform thickness, which together may indicate reduction and discard thresholds. Twelve cores were recorded across the peninsula, comprising 4.84% of the complete assemblage. The 11 cores analysed in this study are quartzite, the dominant raw material in the area. A mean weight of 15.91g, in conjunction with the low mean dimension values for cores (mean length 21.36mm, mean width 22.42mm, mean thickness 18.12mm), indicates a relatively small size for these artefacts. Dividing artefact length by width measurements provides an elongation ratio, which establishes the basic shape of the artefact. A mean elongation value of 1.11 indicates that, on average, the cores are relatively square. These dimension and shape attributes suggest a reasonable degree of reduction for the cores, as the level of reduction should correlate with the low elongation value combined with the small, consistent length, width and thickness measurements (Clarkson 2004:193).

Looking at the number of core platforms and negative flake scars enables the use of this raw material to be examined. For example, once a platform angle becomes too high, or there are too many step-terminated flake scars, continued use of the artefact may only be possible with the creation of a new platform (e.g. Clarkson 2004; Hiscock 1988:25). While platform angle and step-terminations were not recorded in the field, the number of platforms and the number of negative scars may be viewed as measures of overall reduction intensity and the ability to maintain core geometry and prolong reduction. The variation in core rotation in this assemblage is minimal, ranging between no rotations (one platform) and two rotations (three platforms), with the mean number of core platforms at 2.18. Combined with the mean number of negative scars per core at 7.18, and the mean number of negative scars per platform at 3.55, these values indicate that these artefacts were consistently worked to a point where the removal of flakes was no longer viable, possibly due to the relatively small core size at the point of discard.

While it would be expected that an assemblage exhibiting the characteristics of intensive reduction would contain cores that were heavily rotated, this does not necessarily need to be the case. The data presented above suggest consistent rather than intensive reduction. The interpretation of a higher intensity of reduction in this assemblage is more strongly supported by considering the overall small size of the cores combined with the percentage of remaining cortex on these cores. The amount of cortex on an artefact may be an indication of the level of reduction, where large amounts of cortex may indicate an early stage of reduction, and very little cortex may indicate a higher degree of reduction (Clarkson 2004:114; Hiscock 1988:369; Holdaway *et al.* 2004:50). All of the cores in this assemblage contained little to no cortex at all, with cortex on approximately 25% of the flaking surface but not on the platform of two cores, and no cortex on nine cores.

As the primary product of artefact manufacture from a core, flakes are representative of their parent material, being no larger than the core at the time of flaking and carrying away many features of the core. Thus, in the absence of silcrete cores, certain inferences can be made regarding the intensity of reduction of silcrete by examining flake morphology. The flakes were divided into unretouched and retouched categories. There are 182 unretouched flakes, comprising 73.39% of the assemblage, of which 162 are quartzite and 18 silcrete. Following from the analysis of the cores, the main attributes measured on the flakes from the assemblage give an indication of size and shape, with the addition of a platform shape index (platform length/platform width). Flake size and shape were measured by percussion length, with width and thickness taken at the mid-point. Flake elongation was calculated by the length/width ratio and is seen here as an indication of shape. These measurements may indicate consistency or standardisation in artefact manufacture. T-test results indicate that the mean values for all dimensions and indices are not significantly different between the two raw materials (see Table 2); this suggests that although the number of quartzite artefacts outweighs the silcrete artefacts considerably, there are negligible differences in the intensity of reduction and the point of discard. As indicated by the mean dimension values, the unretouched flakes are relatively small and square in shape, with low mean length, width and thickness measurements, and with mean elongation indices indicating a slightly longer than wide shape with a long and thin platform. As with the amount of cortex on cores, the majority of unretouched flakes contain very little to no cortex, with 99.44% of the assemblage containing 0–25% cortex on the dorsal surface.

Table 1 Number and type of stone artefacts by raw material.

	Raw Material						
Artefact Type	Chert	Quartz	Quartzite	Silcrete	Volcanic	Total	%
Core	–	1	11	–	–	12	4.84
Flaked Piece	–	–	40	4	–	44	17.74
Retouched Flake	–	–	6	4	–	10	4.03
Unretouched Flake	1	–	162	18	1	182	73.39
Total	1	1	219	26	1	248	100
%	0.40	0.40	88.31	10.48	0.40	100	

As suggested by Holdaway (2000:223), a high ratio of quartzite flakes to cores may be an indicative measure of the intensity of reduction of this material. At 15:1 this suggests that the quartzite cores were heavily reduced, and that the intensity of stone utilisation was high. Additionally if the ratio of unretouched to retouched flakes is viewed as indicating the level of stone conservation, at 27:1 for the quartzite flakes, this might suggest that conservation of this raw material may not have been important. A very low number of retouched quartzite flakes do not necessarily indicate a lack of conservation, however, as the data presented above suggest that quartzite was still conserved, with strategies in place to maintain or prolong the use of this material across the area. This has particular relevance given the location of a quartzite outcrop in the area (see below). When considering the silcrete artefacts, with 22 flakes and no cores, and an unretouched to retouched flake ratio of 4.5:1, we may be seeing differential use of raw materials. In comparison with the quartzite flakes, this pattern may indicate that different strategies were used relative to variability in the flaking properties of raw material and/or people may have been transporting flakes into and across the area rather than cores (Holdaway 2000; Kuhn 1992:187). Regardless of the potential differences in the use of raw materials, the characterisation of the assemblage, the analysis and comparison of artefact sizes and raw materials suggests that while there was not a heavy reliance on stone artefacts, it does appear that the stone artefacts were reduced relatively intensively. In this area, where and when stone artefacts were required, the most important strategy appears to have involved keeping a supply of fresh edges where needed, while at the same time extending the life of raw material only minimally available within the area. This is a potentially important strategy as sources of reasonable quality stone are only available to a limited degree within the coastal plains of Blue Mud Bay.

Stone Artefact Distribution in the Landscape

Following from the characterisation of the stone artefacts, their distribution across the study area becomes important. Artefact distribution may indicate differences in frequency between the focal point of raw material procurement and areas of artefact discard (e.g. Byrne 1980; Foley 1981a:11, 1981b; Hiscock 1984, 1994; Isaac 1981) as material will generally accumulate in those places that were used more often than locations used infrequently. Figure 3 shows the density of artefactual material across the study area with a contour interval of 10 artefacts. The density of stone artefacts between two points across the Point Blane Peninsula is also graphed as another relative density measure. Also shown in Figure 3 is an area of quartzite that outcrops on the eastern coastline of the peninsula. Sources of knappable stone generally occur in small, localised areas close to the coast. As already noted, quartzite forms the bulk of the raw materials recorded in the assemblage, and this raw material is derived from the underlying Cretaceous and older quartzite, sandstone and granitic deposits (Haines *et al.* 1999:8).

The higher artefact density on the eastern side of the peninsula is probably due to the quartzite outcrop located in this area. That is, the density of material closer to the quartzite outcrop illustrates the strong relationship between resource position and the location of activities within the landscape (Fanning and Holdaway 2001:669-670; Hiscock 1989:22). Although no obvious stone-working was noted within the quartzite outcrop itself, the area is significant as it was the only source of flakeable stone located during the survey. In addition, the quartzite artefacts recorded have similar physical properties to the stone outcrop. Therefore, the fact that this specific location does not appear to have been quarried may not be important (Hiscock and Mitchell 1993: 27; Ross *et al.* 2003). The distribution of artefacts is further analysed below, testing the proposition that this outcrop was the central raw material procurement point.

Figure 4 shows the location of quartzite artefacts in 4km radius intervals from the quartzite outcrop, with Table 3 detailing several artefact variables within these intervals. The number of artefacts per 4km interval shows a concentration of stone artefacts on the margins of the peninsula, particularly on the eastern side closest to the outcrop. All quartzite cores and retouched flakes occur within this area, the only artefact classes occurring within all intervals being unretouched flakes and flaked pieces. This concentration of material close to the outcrop suggests that, even though there is no evidence of

Table 2 Descriptive statistics for quartzite and silcrete unretouched flakes.

			Weight (g)	Length (mm)	Width (mm)	Thickness (mm)	Elongation L/W (mm)	Platform Shape L/W (mm)
Quartzite	Unretouched=162	Mean	9.60	27.51	23.97	7.59	1.26	2.79
		Median	6.00	24.92	21.08	6.53	1.18	2.42
		Std. Dev.	12.99	12.24	10.78	4.24	0.55	1.27
		Min.	0.50	5.16	6.24	1.30	0.15	0.66
		Max.	92.00	63.57	65.68	24.79	3.11	7.49
		Range	91.50	58.41	59.44	23.49	2.97	6.83
Silcrete	Unretouched=18	Mean	10.22	28.77	25.35	7.19	1.17	3.83
		Median	7.50	24.36	25.03	5.76	1.04	3.29
		Std. Dev.	6.89	14.63	7.70	3.98	0.48	1.80
		Min.	2.00	14.95	11.08	2.38	0.63	1.84
		Max.	24.00	78.25	40.92	16.09	2.51	8.68
		Range	22.00	63.30	29.84	13.71	1.88	6.84
		T-test results	t=0.201 df=174 p=0.841	t=0.406 df=174 p=0.685	t=0.578 df=174 p=0.564	t=0.356 df=174 p=0.722	t=0.719 df=174 p=0.473	t=0.413 df=174 p=0.680

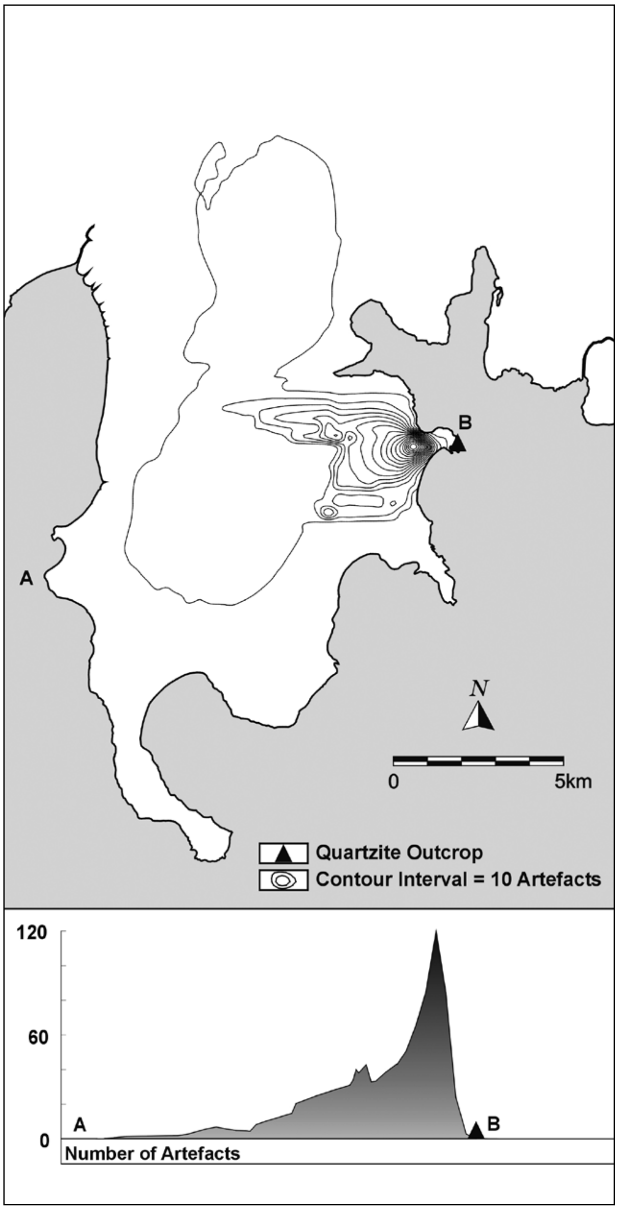

Figure 3 Stone artefact densities across the Point Blane Peninsula.

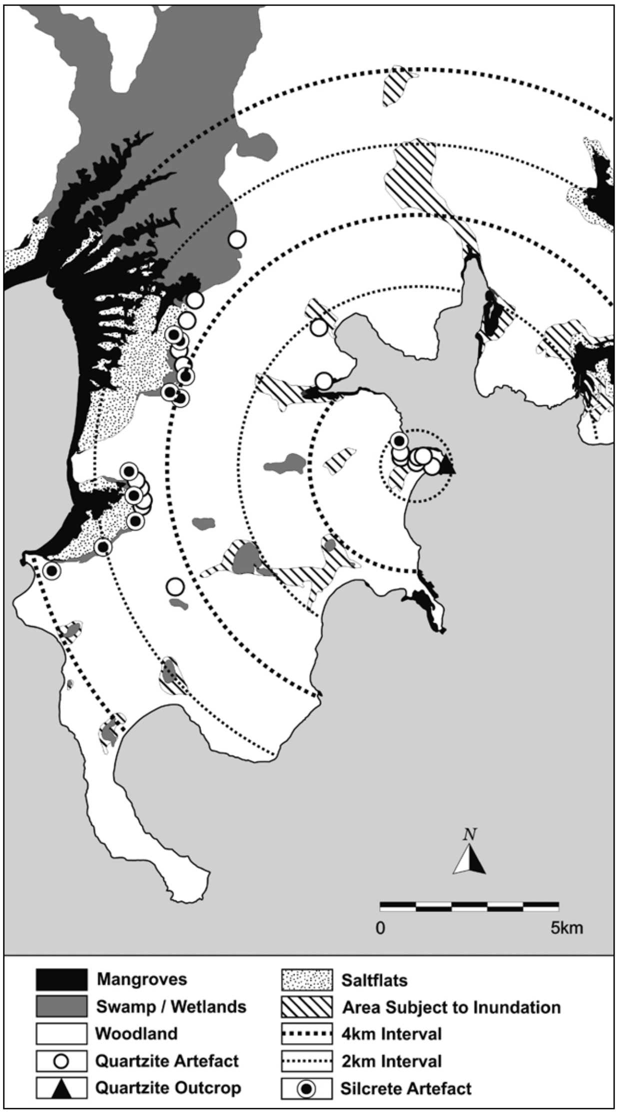

Figure 4 Location of quartzite and silcrete artefacts across the Point Blane Peninsula, with 4km intervals from quartzitic outcrop.

stone extraction in this area, it may have been a focal point for quartzite artefact manufacture and use (cf. Ross *et al.* 2003). The apparent lack of raw material curation, represented by the dominance of unretouched or unmodified flakes, may indicate the opportunistic use of this raw material primarily at, or near to, the source.

This pattern contrasts with the distribution of silcrete artefacts (Figure 4), with Table 4 detailing the silcrete artefact size and shape variables. Although occurring in considerably lower numbers than quartzite artefacts, this pattern is similar to the unretouched quartzite flakes in that silcrete also has a predominantly marginal distribution. Whereas the quartzite artefacts cluster close to the outcrop, the silcrete artefacts occur in more even numbers along the margins of the peninsula (Table 4). Additionally, the same number of unretouched flakes occur at both distances, with a single retouched flake within a 4km radius and three retouched flakes at 8km or greater. With similar numbers of silcrete artefacts occurring within the two areas, there does not appear to be preferential use of this material within any one area.

To determine the significance of this distribution pattern in terms of reduction intensity, the size variables used previously for the unretouched flakes were assessed by distance from the quartzite outcrop. In this case, for comparative reasons the sites are grouped into 0 to 6km and 6 to 12km distance intervals (Table 5). Only quartzite unretouched flakes have been included in this analysis due to sample size. Using length as a simple indication of artefact size, there is not a significant difference in mean dimensions between distance intervals ($t=0.365$, $df=156$, $p=0.715$), and no significant difference in the shape of the artefacts, as evidenced by the elongation ratios ($t=0.693$, $df=156$, $p=0.489$). Even though differences in the density of artefacts has been shown, it appears from the size and shape data that there is very little difference in the way stone was worked across the peninsula. That is, regardless of the distance from the source of the dominant raw material, stone was reduced relatively intensively before being discarded.

It must be acknowledged that this analysis is based on linear distance to source, and as such represents the minimum possible distance. A number of researchers have noted that the relationship between the intensity of reduction and increasing distance from source is not always linear (e.g. Hiscock 1996; Hiscock and Clarkson 2000; Kuhn 1995; McNiven 1993). Artefacts and specific raw materials were often transported around the landscape in multiple directions. As Shiner (2004:69-70) has recently advocated, to disentangle the complex factors that contribute to non-linear patterns of artefact movement, we need to consider use of local versus exotic raw materials and the degree of variability in occupation intensity. Therefore, more detailed and systematic survey of the Point Blane Peninsula and surrounding areas is required to investigate these elements in greater detail.

Discussion and Conclusion

The marginal distribution of artefactual material within this landscape accords well with the overall pattern of occupation in the area briefly outlined at the beginning of the paper. With the dominant components of the archaeological record of this area being shell-bearing deposits, and the primary economic focus being on coastal resources, the stone artefacts in this area are also largely distributed along the peninsula margins. Therefore, in combination with the evidence provided by the shell mound and midden sites, the stone artefact evidence suggests that resources were targeted and exploited in a highly localised and discrete pattern within the area. Support for this interpretation comes from the analysis of the stone artefacts presented here. The artefact assemblage in the study area is dominated by locally available raw materials, again indicating a localised use of resources. In addition, the size and shape of the artefacts, combined with little cortex being evident, suggests that people in this area were maximising or extending the use-life of stone due to its relative scarcity in the landscape.

As there was very little flakeable stone outcropping in this region of the coastal plain, any locally available raw materials were intensively reduced, particularly those artefacts in close proximity to the main source; artefacts were distributed relatively sparingly across the study area. The general area surrounding the quartzite outcrop appears to have been the central procurement point for artefact manufacture in the study area. It is, however, possible that other outcrop locations have previously been exposed, with the dynamic and changing nature of the coastline masking these locations. This may be seen as an aspect of the 'maximising' strategy proposed above, with stone being worked in close proximity to the main source, and then distributed sparingly across the study area as required. Although a small sample, something that potentially reflects less of a need for stone artefacts in these kinds of coastal landscapes, this analysis provides an additional line of evidence for investigating past economic activity in this area.

The interpretations of the artefactual assemblage from the Point Blane Peninsula presented here only become significant when viewed as a part of the accumulated, longer-term economic and settlement systems. The patterns highlighted here have also been noted by Meehan (1982) and Bailey (1993:9) in other regions, where relatively few or a limited range of stone artefacts are discarded in locations where a limited range of economic activities were carried out, such as with shell-processing sites.

Table 3 Quartzite artefact data at 4km intervals from quartzite outcrop.

Criteria	0-4km	4-8km	8-12km
No. of locations containing quartzite artefacts	6	2	10
No. of quartzite artefacts	197	2	20
No. of quartzite cores	11	–	–
No. of quartzite flaked pieces	37	–	3
No. of quartzite unretouched flakes	143	2	17
No. of quartzite retouched flakes	6	–	–

Table 4 Silcrete artefact data at 4km intervals from quartzite outcrop.

Criteria	0-4km	4-8km	8-12km
No. of locations containing silcrete artefacts	1	–	14
No. of silcrete artefacts	12	–	14
No. of silcrete cores	–	–	–
No. of silcrete flaked pieces	2	–	2
No. of silcrete unretouched flakes	9	–	9
No. of silcrete retouched flakes	1	–	3

Table 5 Descriptive statistics for quartzite unretouched flakes at 6km intervals from quartzite outcrop.

		Weight (g)	Length (mm)	Width (mm)	Thickness (mm)	Elongation L/W (mm)	Platform Shape L/W (mm)
0-6km N=145	Mean	9.13	27.58	23.93	7.52	1.27	2.82
	Median	6.00	24.97	20.91	6.52	1.18	2.42
	Std. Dev.	13.05	12.48	10.94	4.24	0.57	1.30
	Min.	0.50	5.16	6.24	1.30	0.15	0.66
	Max.	92.00	63.57	65.68	24.79	3.11	7.49
	Range	91.50	58.41	59.44	23.49	2.97	6.83
6-12km N=17	Mean	11.41	26.65	22.62	7.50	1.21	2.52
	Median	7.00	22.33	20.84	6.08	1.12	2.21
	Std. Dev.	11.51	10.97	8.77	4.05	0.30	1.03
	Min.	1.00	13.45	10.78	2.74	0.74	1.32
	Max.	42.00	49.75	36.98	15.39	1.83	5.38
	Range	41.00	36.30	26.20	12.65	1.09	4.06

This is also particularly important given the problems associated with deriving behavioural inferences from surface artefact scatters due to a lack of chronological control (Fanning and Holdaway 2001:669; Holdaway *et al.* 2004:34).

The Point Blane Peninsula stone artefact assemblage must therefore be viewed as a time averaged assemblage, which means that particular locations may have been used in quite different ways through time (Shiner 2004:48). Throughout the past 3000 years there has been a high degree of variability in how people have occupied and used this landscape, primarily evidenced by the spatial and chronological evidence related to shell deposits, with the focal activity areas shifting through time and space relative to the availability and abundance of particular resources (e.g. Bourke *et al.* 2007; Faulkner 2006, 2008). Without a chronological context for the stone artefacts, particularly via geomorphic context (Fanning and Holdaway 2001; Shiner 2004), it is difficult to obtain a higher degree of resolution than has been achieved here. That said, as the aim was to investigate the sum of those activities related to stone artefact manufacture and discard, the degree of resolution is sufficient. This analysis has demonstrated that people in this area were maximising their resources, with a primary focus on locally available raw materials. It has also been demonstrated that even very small assemblages can provide useful information about behaviour in the past.

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References

Bailey, G.N. 1993 Shell mounds in 1972 and 1992: Reflections on recent controversies at Ballina and Weipa. *Australian Archaeology* 37:1-18.

Bourke, P., S. Brockwell, P. Faulkner and B. Meehan 2007 Climate variability in the mid to late Holocene Arnhem Land Region, North Australia: Archaeological archives of environmental and cultural change. *Archaeology in Oceania* 42(3):91-101.

Brantingham, P.J., J.W. Olsen, J.A. Rech and A.I. Krivoshapkin 2000 Raw material quality and prepared core technologies in northeast Asia. *Journal of Archaeological Science* 27:255-271.

Byrne, D. 1980 Dynamics of dispersion: The place of silcrete in archaeological assemblages from the lower Murchison, Western Australia. *Archaeology and Physical Anthropology in Oceania* 15:110-119.

Clarke, A. and P. Faulkner 2006 Living Archaeology in the Madarrpa Homeland of Yilpara, north east Arnhem Land. In J. Lydon and T. Ireland (eds), *Object Lessons: Archaeology and Heritage in Australia*, pp.89-106. Melbourne: Australian Scholarly Publishing.

Clarkson, C.J. 2004 Technological Provisioning and Assemblage Variation in the Eastern Victoria River Region, Northern Australia: A Darwinian Approach. Unpublished PhD thesis, Australian National University, Canberra.

Cotterell, B. and J. Kamminga 1987 The formation of flakes. *American Antiquity* 52(4):675-708.

Dibble, H.L. 1985 Raw material variation in Levallois flake manufacture. *Current Anthropology* 26(3):391-393.

Fanning, P. and S. Holdaway 2001 Stone artefact scatters in western NSW, Australia: Geomorphic controls on artefact size and distribution. *Geoarchaeology* 16(6):667-686.

Faulkner, P. 2006 The Ebb and Flow: An Archaeological Investigation of Late Holocene Economic Variability on the Coastal Margin of Blue Mud Bay, Northern Australia. Unpublished PhD thesis, Australian National University, Canberra.

Faulkner, P. 2008 Patterns of chronological variability in occupation on the coastal margin of Blue Mud Bay. *Archaeology in Oceania* 43(2):81-88.

Faulkner, P. 2009 Focused, intense and long-term: Evidence for granular ark (*Anadara granosa*) exploitation from late Holocene shell mounds of Blue Mud Bay, northern Australia. *Journal of Archaeological Science* 36:821-834.

Faulkner, P. and A. Clarke 2004 Late-Holocene occupation and coastal economy in Blue Mud Bay, northeast Arnhem Land: Preliminary archaeological findings. *Australian Archaeology* 59:23-31.

Foley, R. 1981a *Off-Site Archaeology and Human Adaptation in Eastern Africa: An Analysis of Regional Artefact Density in the Amboseli, Southern Kenya*. BAR International Series 97. Oxford: British Archaeological Reports.

Foley, R. 1981b Off-site archaeology: An alternative approach for the short-sited. In I. Hodder, G. Isaac, and N. Hammond (eds), *Pattern in the Past: Essays in Honour of David Clarke*, pp.152-184. Cambridge: Cambridge University Press.

Grayson, D.K. and S.C. Cole 1998 Stone tool assemblage richness during the Middle and Early Upper Palaeolithic in France. *Journal of Archaeological Science* 25:927-938.

Haines, P.W., D.J. Rawlings, I.P. Sweet, B.A. Pietsch, K.A. Plumb, T.L. Madigan and A.A. Krassay 1999 *1:250 000 Geological Map Series, Explanatory Notes: Blue Mud Bay SD53-7*. Darwin: Department of Mines and Energy, Northern Territory Geological Survey.

Hiscock, P. 1984 Raw material rationing as an explanation of assemblage differences: A case study of Lawn Hill, Northwest Queensland. In G.K. Ward (ed.), *Archaeology at ANZAAS, Canberra 1984*, pp.178-190. Canberra: Department of Prehistory and Anthropology, Faculty of Arts, Australian National University.

Hiscock, P. 1988 Prehistoric Settlement Patterns and Artefact Manufacture at Lawn Hill, North-West Queensland. Unpublished PhD thesis, University of Queensland, Brisbane.

Hiscock, P. 1989 Artefact recording in the field. In J. Flood, I. Johnson and S. Sullivan (eds), *Sites and Bytes: Recording Aboriginal Places in Australia*, pp.20-38. Special Australian Heritage Publication Series 8. Canberra: Australian Heritage Commission, Australian Government Publishing Service.

Hiscock, P. 1994 Technological responses to risk in Holocene Australia. *Journal of World Prehistory* 8:267-292.

Hiscock, P. 1996 Mobility and technology in the Kakadu coastal wetlands. *Indo-Pacific Prehistory Association Bulletin* 15:151-157.

Hiscock, P. 2006 Blunt and to the point: Changing technological strategies in Holocene Australia. In I. Lilley (ed.), *Archaeology in Oceania: Australia and the Pacific Islands*, pp.69-95. Oxford: Blackwell Publishing.

Hiscock, P. and C. Clarkson 2000 Analysing Australian stone artefacts: An agenda for the twenty first century. *Australian Archaeology* 50:98-108.

Hiscock, P. and P.J. Hughes 1983 One method of recording scatters of stone artefacts during site surveys. *Australian Archaeology* 17:87-98.

Hiscock, P. and S. Mitchell 1993 *Stone Artefact Quarries and Reduction Sites in Australia: Towards a Type Profile*. Technical Publications Series 4. Canberra: Australian Heritage Commission, Australian Government Printing Service.

Holdaway, S. 2000 Economic approaches to stone artefact raw material variation. In A. Anderson and T. Murray (eds), *Australian Archaeologist: Collected Papers in Honour of Jim Allen*, pp.217-230. Canberra: Coombs Academic Publishing, Australian National University.

Holdaway, S., J. Shiner and P. Fanning 2004 Hunter-gatherers and the archaeology of discard behaviour: An analysis of surface stone artifacts from Sturt National Park, Western New South Wales, Australia. *Asian Perspectives* 43(1):34-72.

Holdaway, S. and L. Wandsnider 2006 Temporal scales and archaeological landscapes from the eastern desert of Australia and intermontane North America. In G. Lock and B.L. Molyneaux (eds), *Confronting Scale in Archaeology: Issues of Theory and Practice*, pp.183-202. New York: Springer.

Isaac, G.L. 1981 Stone age visiting cards: Approaches to the study of early land-use patterns. In I. Hodder, G.L. Isaac and N. Hammond (eds), *Patterns in the Past: Studies in Honour of David Clarke*, pp.131-156. Cambridge: Cambridge University Press.

Jones, R. and N. White 1988 Point blank: Stone tool manufacture at the Ngilipitji quarry, Arnhem Land, 1981. In B. Meehan and R. Jones (eds), *Archaeology with Ethnography: An Australian Perspective*, pp.51-87. Canberra: Department of Prehistory, Research School of Pacific Studies, Australian National University.

Kuhn, S.L. 1991 'Unpacking' reduction: Lithic raw material economy in the Mousterian of West-Central Italy. *Journal of Anthropological Archaeology* 10:76-106.

Kuhn, S.L. 1992 On planning and curated technologies in the Middle Paleolithic. *Journal of Anthropological Research* 48:185-214.

Kuhn, S.L. 1995 *Mousterian Lithic Technology: An Ecological Perspective*. New Jersey: Princeton University Press.

McNiven, I.J. 1993 Raw material proximity and bevel-edged tool use, Teewah Beach, southeast Queensland. *Archaeology in Oceania* 28(3):138-143.

Meehan, B. 1982 *Shell Bed to Shell Midden*. Canberra: Australian Institute of Aboriginal Studies.

Redman, C.L. 1987 Surface collection, sampling and research design: A retrospective. *American Antiquity* 52(2):249-256.

Ross, A., B. Anderson and C. Campbell 2003 Gunumbah: Archaeological and Aboriginal meanings at a quarry site on Moreton Island, southeast Queensland. *Australian Archaeology* 57:75-81.

Schiffer, M.B., A.P. Sullivan and T.C. Klinger 1978 The design of archaeological surveys. *World Archaeology* 10:1-28.

Shiner, J.I. 2004 Place as Occupational Histories: Towards an Understanding of Deflated Surface Artefact Distributions in the West Darling, New South Wales; Australia. Unpublished PhD thesis, University of Auckland.

Thomson, D.F. 1949 *Economic Structure and the Ceremonial Exchange Cycle in Arnhem Land*. Melbourne: Macmillan.

Thorley, P. 2001 Uncertain supplies: Water availability and regional archaeological structure in the Palmer River catchment, central Australia. *Archaeology in Oceania* 36(1):1-14.

Veth, P.M. 1993 *Islands in the Interior: The Dynamics of Prehistoric Adaptations within the Arid Zone of Australia*. Archaeological Series 3. Ann Arbor: International Monographs in Prehistory.

Vita-Finzi, C. and E.S. Higgs 1970 Prehistoric economy in the Mount Carmel area of Palestine: Site catchment analysis. *Proceedings of the Prehistoric Society* 36:1-37.

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