EDGE-GROUND AXES IN PLEISTOCENE GREATER AUSTRALIA: NEW EVIDENCE FROM S. E. CAPE YORK PENINSULA.

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INTRODUCTION

Recent archaeological research in S.E. Cape York Peninsula indicates that edge-ground axes were in use in this region of north Australia before 32 k.y.a. Edge-grinding is one of the hallmarks of the Neolithic in Europe but the evidence now suggests that it may have been part of the technological repertoire of the earliest Aboriginal colonists in some areas of Australia-New Guinea. This paper discusses some of the implications of edge-ground artefact distribution and chronology in the region.

NEW EVIDENCE FROM S.E. CAPE YORK PENINSULA

In the 1960's, an excavation was undertaken by P. J. Trezise at Sandy Creek 1, a large sandstone rockshelter on the head of Sandy Creek, tributary to the Little Laura River near the township of Laura, S.E. Cape York Peninsula (Figure 1). The excavation removed the uppermost, artefact-rich deposits in the shelter to an average depth of 75cm to expose panels of partially-buried, pecked engravings at the rear of the shelter. In addition, a trench 8 feet long by 6 feet in width was excavated from the rear wall to the dripline.

In summary this work yielded the following results. The uppermost deposit was of grey sand with a high density of stone artefacts, ochre and charcoal which extended to a depth of 61-100cm. It was underlain by a compact buff sand extending to 152-193cm depth and containing "chunky" utilitarian artefacts at a much lower density. Beneath the sand was a compact rubble which lacked cultural material with the exception of a single quartz scraper. Below this rubble there was a deeply-weathered bedrock, which sloped from 274cm below the surface at the rear of the excavation to 304cm near the dripline. An edge-ground axe of pink quartzite was discovered on bedrock beneath the rubble and just within the present dripline at a depth of 300cm (9' 10"). Unfortunately, no information on these findings was ever published and most of the stone assemblage from the original Sandy Creek excavation, including the stone axe have since been lost. However, plans and cross-sections of the excavation showing the axe in situ were kept, as were photographs taken at the time of its discovery (Figures 2 & 3).

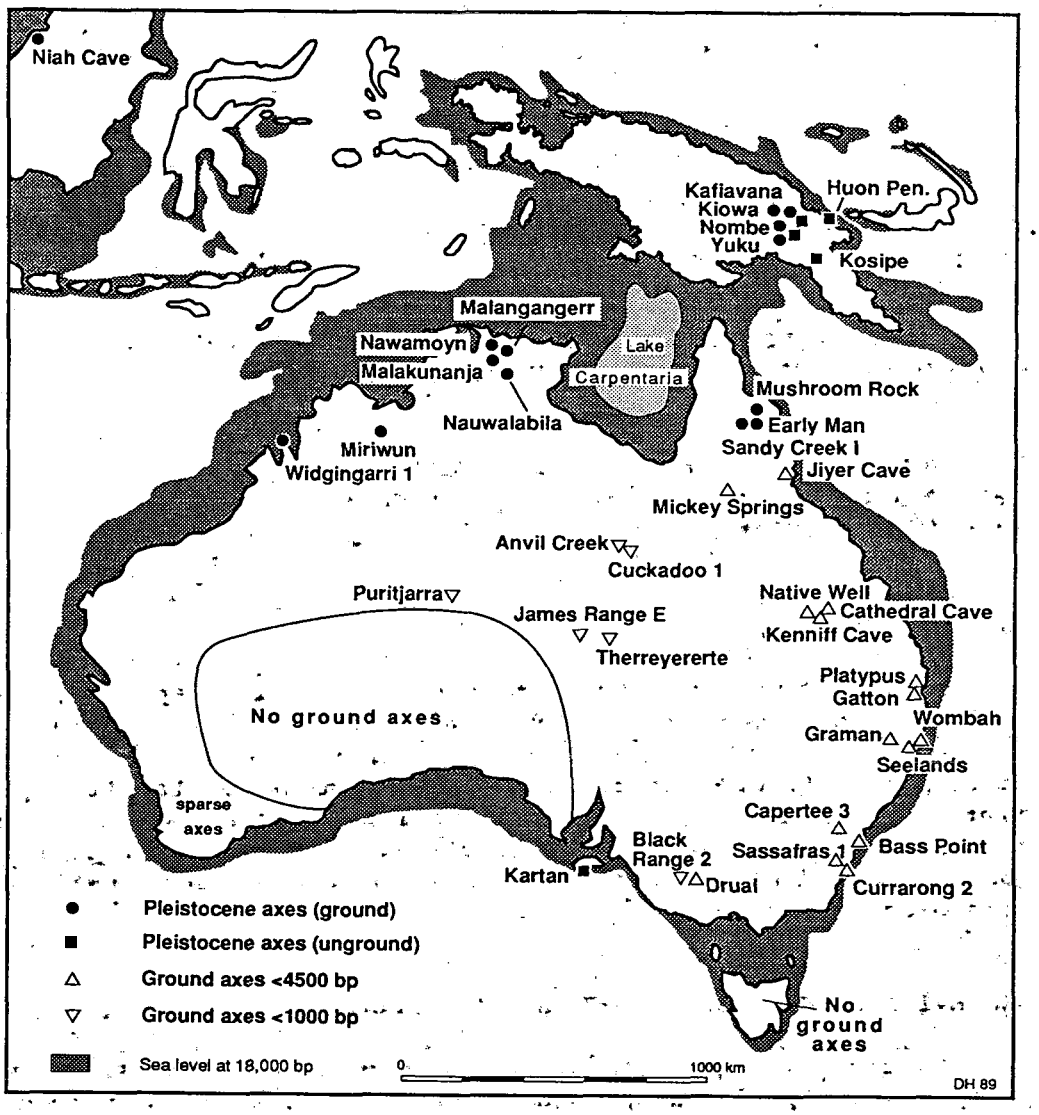

Figure 1. The distribution and chronology of edge-ground axes in greater Australia (Sources for distribution: Davidson & McCarthy 1957; Dickson 1981; Ride 1958; Dortch pers. comm.; Bindon pers. comm. Sources for chronology: Bowdler 1970; Bulmer 1977; Coutts & Lorblanchet 1982; Dortch 1977a; Flood 1980; Gould 1978; Groube et al 1986; Hiscock & Hall 1988; Horsfall 1987; Jones & Johnson 1985; Johnson 1979; Lampert 1971, 1981; McBryde 1974; McCarthy 1964; Majiid 1982; Morwood 1981, 1986; Mountain 1983; Mulvaney & Joyce 1965; O'Connor pers. comm.; Rosenfeld et al 1981; Schrire 1982; Smith 1988; White et al 1970; White & O'Connell 1982; Wright 1971).
NB. 1 - Grooved axes from Stonewall Creek, Kimberley, remain undated but their geomorphic and cultural context suggests an early Holocene - late Pleistocene date (Dortch 1977b).
NB. 2 - Owing to the uncertainty about dates from Trench 1 at Graman Area B, Site 1, the slightly earlier mid-Holocene ages for edge-ground artefacts from this site have not been used (McBryde 1974).
NB. 3 - Although there is no direct evidence, fragments of diabase from Fromm's Landing suggests the probable use of edge-ground artefacts along the lower Murray River in South Australia by ca. 3 k.y.a. (Mulvaney 1960:80).

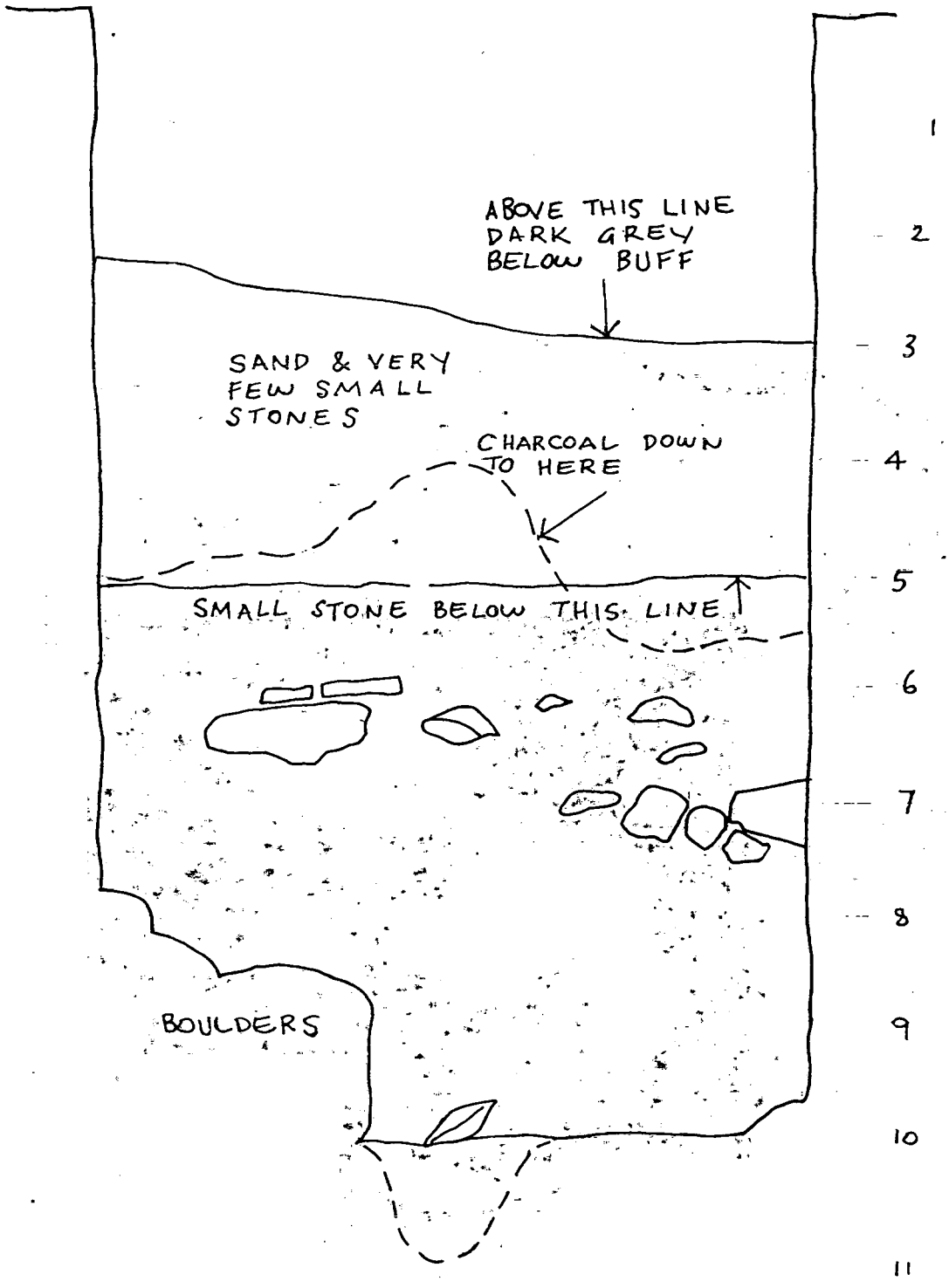

Figure 2. The east (outer) baulk of the deep trench excavated at Sandy Creek 1 in the 1960's. This drawing was made by Eddy Oribin, an architect, using a grid of 1 foot squares. It shows the position of the edge-ground axe on bedrock, as well as the stratigraphy of the deposits.

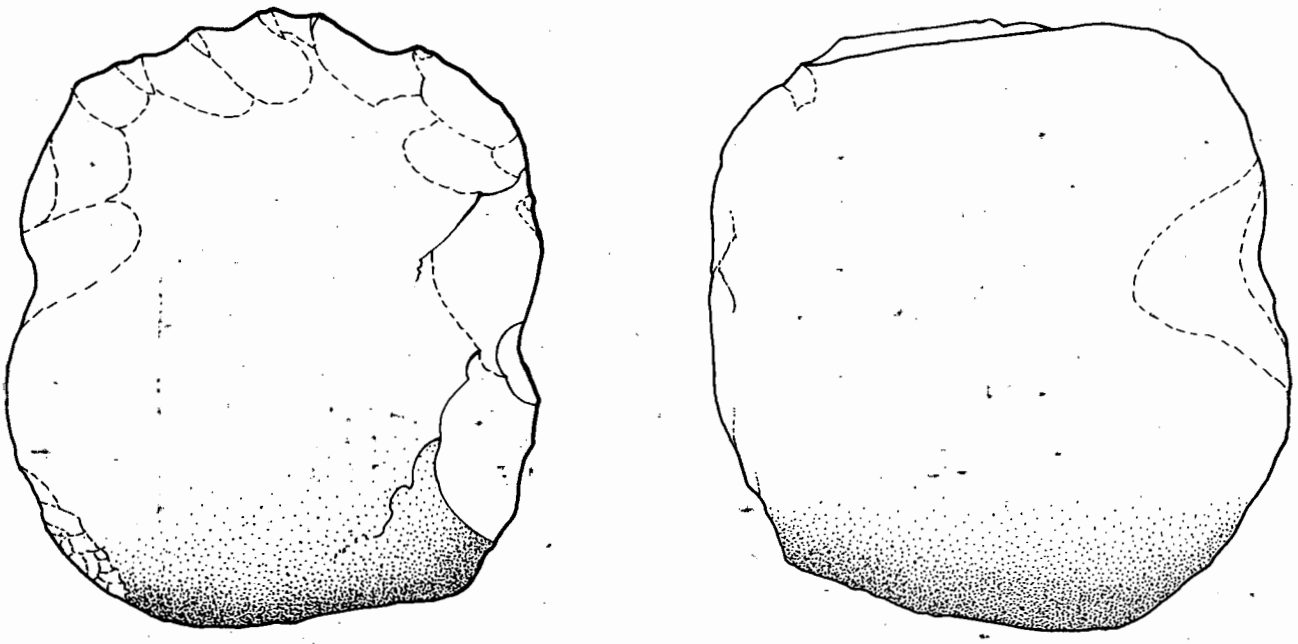

Figure 3. The edge-ground axe recovered from the base of the 1960's excavation at Sandy Creek 1. It is of pink quartzite and has a maximum length of 8.7cm. The implement is both waisted and grooved to facilitate hafting.

In 1989, the site was re-excavated by Morwood as part of a research project on the archaeology of Aboriginal art in S.E. Cape York Peninsula. Principal factors in the selection of Sandy Creek 1 for investigation included its potential for dating a distinctive assemblage of rock engravings as well as providing details on the nature, depth and content of the deposits, as recounted by Trezise. This excavation comprised a 3x1m transect trench running from the rock-fall at the rear of the shelter to beyond the dripline where the uppermost deposits remain untouched by the earlier excavation. It was placed parallel and immediately adjacent to Trezise's trench.

In summary, this excavation yielded the following results. There are two main sedimentary units at the site, a sand sheet ~175cm deep and an underlying concreted sandstone rubble which extends to a bedrock of deeply-weathered white sandstone at a depth of 265cm (the difference apparent in the depths of bedrock encountered in the two excavations closely matches the difference in the relative heights of the adjacent ground levels; the humus layer fronting the 1960's trench is 32cm higher). Both the sand sheet and the rubble are colluvial, derived from coarse stratified sandstones which occur on a higher ridge behind the shelter. Within the sand sheet is an upper grey layer some 60cm deep which contains a high density of stone artefacts, ochre and charcoal. Seed grindstones, microblades, backed blades, and burren adze slugs are restricted to this grey sand. Below this is an orange sand, which is generally lower in artefact, ochre and charcoal density, but exhibits definite occupational horizons corresponding to periods of apparent shelter use and abandonment. The earliest of these begins just above the rubble at a depth of 140-175cm.

Excavation of the concreted rubble required use of a crowbar and geological pick, as the cementing matrix was often harder than the sandstone component. The rubble was found to be culturally sterile apart from a discrete knapping floor of crystalline quartz cores and flakes at a depth of 240-245cm, some 20cm above bedrock. Charcoal was absent in most excavation units throughout the rubble except for a concentration directly associated with the knapping floor. A sample of this charcoal has yielded a radiocarbon date of 31,900 +700/-600 b.p. (SUA 2870). Because of the proximity of the trenches excavated at Sandy Creek 1 in the 1960's and 1989, and the fact that the cultural and natural stratigraphies closely correspond, this date must provide a minimum age for the base of the rubble in both excavations. The concreted nature of the rubble also precludes down-movement of artefacts from the overlying sand sheet, particularly as 70cm of sterile deposits lay above the earliest evidence of occupation. Although the present whereabouts of the edge-ground axe recovered by Trezise are unknown, its provenance within the deposits is not. The radiocarbon date, therefore, provides a minimum age for the edge-ground axe recovered from the base of the rubble.

Although excavations at Mushroom Rock and Early Man Rockshelter had previously indicated that edge-ground axes had a late Pleistocene antiquity in S.E. Cape York Peninsula, this inference was based on the presence of small rock fragments with grinding marks, the oldest dated examples of which were from deposits dating to ~10 k.y.a. at Early Man Rockshelter (Wright 1971; Rosenfeld et al 1981:26-7). The complete specimen from Sandy Creek 1 not only provides confirmatory evidence, but considerably extends the time depth of edge-ground axes in the regional sequence and in Australia generally.

EVIDENCE FROM GREATER AUSTRALIA

Pleistocene edge-grinding has long been documented in parts of northern Australia, most notably from sites in W. Arnhem Land. The oldest examples come from Nawamoyn and Malangangerr Rockshelters where edge-ground axes, some of which are waisted, grooved or stemmed to facilitate hafting, were recovered from deposits as old as 25 k.y.a. (Schrire 1982:84,106,133, 241). More tenuous evidence that edge-grinding is of greater antiquity in the region comes from the Lindner Site, Nauwalabila 1 (Jones and Johnson 1985:216-7). At this site pieces of dolerite with ground facets occur consistently in the sequence from a depth of 150cm, which corresponds to an age of ~15-19 k.y.a. However, below this level highly weathered and decomposed pieces of dolerite occur in levels, which by extrapolation of the age-depth curve for the site, are likely to be 25-30 k.y.a. old. The authors argue that "there is a reasonable case that these objects are the remains of edge-ground axes" (Jones and Johnson 1985:217), but also point out the need for more detailed analysis of the pieces to resolve the matter. Similar pieces of dolerite are also reported from the lowest occupation levels at Malakunanja II associated with TL dates spanning 50 to 60 k.y.a. (Roberts et al 1990).

The time depth of edge-grinding in W. Arnhem Land and S.E. Cape York Peninsula now suggests that this technology was part of the cultural repertoire of the early colonists of Greater Australia, at least in some areas. In addition, late Pleistocene dates for edge-ground artefacts come from sites in the Kimberley. At Widgingarri Shelter 1 in the western section flakes with ground facets were associated with a non-basal date of ~27 k.y.a. (Sue O'Connor pers. comm.), while at Miriwun Shelter in the Ord River Valley, a single flake with striations and smoothing on the dorsal face was recovered from the basal deposits dated to ~18 k.y.a. (Dortch 1977:121). Similar evidence has been recovered from a series of sites in the New Guinea Highlands including Kafiavana, Kiowa, Yuku and Nombe. At the latter a complete axe was recovered from a red-brown clay deposited between 14.5 and 26 k.y.a. (White and O'Connell 1982:67; Mountain 1983:94-5). Because of the relatively limited archaeological research undertaken along the northern margin of this continent, the Pleistocene extent of the trait is uncertain. Nor is it certain whether the area of distribution is contiguous. For instance, edge-ground axes do not appear in Pleistocene sites of the general Mt. Isa region of N. W. Queensland, despite the intermediate position of the region between Arnhem Land and Cape York Peninsula (Iain Davidson: pers. comm.).

THE SIGNIFICANCE OF PLEISTOCENE EDGE-GROUND AXES

Edge-ground axes are particularly significant in the light of the predominance of expedient stone artefact technologies in S.E. Asian-Australian prehistory, as they provide the earliest evidence for the use of curated items in this part of the world. They were produced in anticipation of future requirements, transported between sites, and were high-cost item in terms of manufacture and maintenance. Together with evidence for the storage/caching of complete specimens at some sites in northern Australia, these traits suggest that some Aboriginal groups in Pleistocene Australia scheduled economic activities well in advance, that the schedule recognized logistic constraints on resource procurement, and that specific sites were revisited by individuals on a predictable basis in a recurrent pattern of land use (see Bamforth 1986;

Binford 1973, 1977; and Torrence 1983 for interpretations of curation in the archaeological record).

Whether edge-grinding was an indigenous technological development or a component of the parent culture in adjacent areas of island S.E. Asia is uncertain at present since virtually nothing is known of the east Indonesian sequence during the crucial 40-50 k.y.a. period. The closest comparable evidence from S.E. Asia comes from the site of Niah Cave in Sarawak where edge-ground axes appear in the sequence some time between 10 and 20 k.y.a. (Majid 1982: Appendix 3). Further afield in Asia the earliest evidence comes from Japan, where ovate bifaces with partially ground cutting edges first appear between 27-30 k.y.a. (e.g. Takashi 1987:10,20). However, on the S.E. Asian mainland edge-ground artefacts do not appear until much later in sites of the Hoabinhian Complex between 8-11 k.y.a. (e.g. Gorman 1970:106). Bellwood (1985:175) has noted that regional variation in stone artefact industries of S.E. Asia over the past 40 k.y.a. is best seen in terms of periodic and highly localised additions to a basic pebble and flake technocomplex, and that intra-regional differences in the timing of technological traits, such as edge-grinding, probably result from a combination of multiple independent developments and diffusion. The Australian evidence fits this pattern well.

As well as establishing possible technological parallels between late Pleistocene stone artefact industries in S.E. Asia and greater Australia, the distribution of early edge-grinding in the latter has general implications for Australian prehistory. There are two important considerations. Firstly, although there is a sampling problem, current evidence indicates that the technology was geographically restricted to specific areas of northern Australia during the Pleistocene and early Holocene. Detailed assessment of the environmental and cultural correlates of early edge-grinding distribution may indicate why this was so, and provide another perspective on the nature of Pleistocene Aboriginal culture.

In an overview of Pleistocene edge-ground tools in New Guinea and Australia, White and O'Connell (1982:67) suggest that "a resource-oriented explanation" is most likely for their restriction to the tropical north of Sahul, but can not specify a regionally-specific resource or task requiring such tools. Jones (1987) notes such a functional explanation for the occurrence of unground waisted axes by at least 40 k.y.a. at the Huon Peninsula site on the north coast of New Guinea (see Groube et al 1986). He argues that they were used to ring-bark rainforest trees to promote the growth of edible "weed" species. Unground waisted axes also occur at Kosipe by 26 k.y.a., possibly associated with use of pandanus from an adjacent swamp, as well as the rockshelter sites of Yuku and Nombe (Bulmer 1977:43-5; Mountain 1983; White et al 1970). Waisted axes from Kangaroo Island off South Australia are also of Pleistocene age (Lampert 1981), whereas examples from the coastal strip between Cooktown and Ingham, N.E. Queensland, probably post-date the expansion of rainforest in this area; i.e. they are no older than 9 k.y.a. and possibly much younger (Horsfall 1987:221). Although not ground, these waisted axes were clearly hafted and probably functionally equivalent to edge-ground chopping implements. Possibly, they had a role in the early manipulation, as well as exploitation, of plant resources in parts of New Guinea and the rainforest areas of N.E. Queensland. However, this does not seem an appropriate explanation for the Pleistocene occurrence of unground and ground axes outside the tropics in the Eucalyptus woodland of Kangaroo

Island, South Australia, and inland, northern Australia respectively. Here it is more likely that they were mainly used for making wooden implements and extracting foods from hollow trees, as widely observed in historic times (e.g. Dickson 1981:6-9; Petrie 1904:100-5).

Hayden (1977:81) argues that edge-grinding in the Australasian region is an adaptive strategy for conserving raw material because the tool may be sharpened and resharpened. In some situations this is likely to have been the case. For instance, Bellwood (1985:178) suggests that the appearance of edge-grinding at Niah (in apparent isolation) may have resulted from restricted access to good stone for flaking. However, this is not the case in the Kimberley, Arnhem Land and S.E. Cape York Peninsula areas where suitable sources of stone are plentiful. Pressure to economize use of stone materials by incorporating high-maintenance, curated items into the cultural inventory may also result from a high rate of stone material use in the manufacture and replacement of wooden items. Hayden (1977:91) demonstrated this point by using the presence of boomerangs and throwing clubs in areas of Australia as a coarse measure of wood and lithic consumption. He showed a close fit between the distributions of these items and edge-ground axes in recent times; none of these items was used by Aborigines of the treeless Nullarbor Plain or the Great Victorian Desert immediately to the north. At present there is insufficient evidence to compare the overall material complexity of Aboriginal groups in northern and southern Australia during the Pleistocene, but what is known would suggest general equivalence. Early rock paintings in W. Arnhem Land show that the range of wooden implements contemporaneous with hafted axes included boomerangs, barbed spears and clubs, and there is circumstantial evidence that these paintings are of Pleistocene antiquity (Brandl 1973:167; Lewis 1988:45,86). However, a wooden tool industry from peat deposits in Wyrie Swamp, South Australia, shows that a wide range of wooden implements, including boomerangs, barbed spears, and digging sticks, was also used in some southern regions by 9-10 k.y.a. (Luebbers 1975), well before the appearance of edge-ground axes.

It is difficult to nominate any obvious environmental or material correlates for the early use of edge-ground axes, but there is a substantial overlap between the known Pleistocene distribution of this technological trait and areas of long-standing linguistic and artistic complexity. A number of language families occur in a northern coastal swathe across the Kimberley, Arnhem Land and Gulf of Carpentaria regions, but in the remainder of the continent all Aboriginal languages belonged to a single language family - Pama-Nyungan (Dixon 1980:20-1; Oates and Oates 1970: Map 1). Similarly, Complex Figurative Styles of rock art, some of which are almost certainly of Pleistocene antiquity (Lewis 1988; Chaloupka 1985), are restricted to the Pilbara, Kimberley, Arnhem Land and S.E. Cape York Peninsula regions (Maynard 1979:100-1). If the associative patterning between technology, art and language is sustained by future archaeological research, it would suggest that the correlation is due to the operation of an interaction sphere across northern Australia during the Pleistocene and early Holocene, from which the rest of the continent may have been effectively isolated. The second major consideration in the saga of edge-grinding in Australia concerns the late Holocene break down of this isolation.

LATE HOLOCENE DEVELOPMENTS

South of the Kimberley, Arnhem Land and Cape York Peninsula, there is no evidence of edge-ground artefacts prior to the late Holocene; they are absent from earlier deposits at sites with long occupational sequences, such as Mickey Springs 34, Native Well, Kenniff Cave, Seelands and Capertee 3, and never appear in Tasmania which was cut off from the mainland at about 11 k.y.a. In general, edge-ground axes in 'southern' Australia post-date 4.3 k.y.a., but in most regions they appear much more recently (Figure 1). It is significant that when edge-grinding does finally appear in the south, it is broadly associated with a general increase in occupational intensity, a suite of innovations in stone artefact technology and range, stylistic changes in rock art, and the development of labour-intensive economic strategies (see Lourandos 1985).

Overall, these developments may signal increased demands on regional production systems, changes in the scale and intensity of social interaction, and new mechanisms for exchanging information. In some regions these developments appear to have coincided. In others, differences in timing are apparent. In the Central Queensland Highlands, for example, evidence for edge-ground artefacts, substantial occupation, large-scale cycad use, and seed grinding all date from 4300 b.p., as does the addition to the stone artefact range of backed blades, adze slugs and points (Beaton 1982; Morwood 1981, 1984; Smith 1986). In contrast, edge-ground artefacts, substantial occupation and seed grinding at arid zone sites, such as Therreyererte, James Range East and Cuckadoo 1, appear after 1000 b.p. and hence post-date the appearance of backed blades, adze slugs and other diagnostic artefacts of the Australian Small Tool Tradition in the region by a considerable margin (Gould 1978; Smith 1988:333; Iain Davidson pers. comm.).

Despite differences between regions/sites in the timing of late Holocene innovations, there is a consistent sequential pattern of association between edge-grinding and and the restructuring of subsistence-settlement systems to meet increased demands on local, Aboriginal economies. This associative context suggests that the introduction of edge-ground axes may have been to increase extractive efficiency, most probably in the capture of small-bodied faunal species which seem to have received greater emphasis in the late Holocene (e.g. McBryde 1977:234; Morwood 1987:347).

CONCLUSION

The significance of early edge-ground axes in northern Australia is not well understood, nor are north-south differences in the timing of their appearance. However, the late Holocene spread of this technology may be seen as part of a general pattern of change which followed the restructuring of communication networks, but appears to have been initiated by population growth and more intensive resource use. A similar range of factors is reflected in the historically-observed distribution of edge-ground axes. Their value in increasing the efficiency of (aboreal) food procurement seems to have been a principal factor in their spread, but Tasmania was isolated from the required communication networks during the Holocene, while the high cost of material procurement, manufacture, maintenance and transportation appears to have outweighed the economic benefits of edge-ground axes (as well as boomerangs, throwing clubs, stone knives and shields) in the

least favourable and treeless parts of the arid zone. Further evidence for the history of edge-grinding in Australia and the factors determining its chronological and geographical distribution may allow changes in distribution to be interpreted specifically as adaptive responses to changes in social, and demographic context.

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