

## Microscopic analysis of 'engraved plaques' and other objects from Devil's Lair

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### Abstract

Over twenty years ago some limestone 'plaques' and other unusual objects were excavated in Devil's Lair in the extreme south-west of Australia. Dated to the Late Pleistocene, they are almost unique in Australia. Their status has been questioned, and the present paper summarises the methods and results of a study of eight items from Devil's Lair, using methodology developed for examining rock markings. This involved, among other approaches, microscopic analysis, replicative procedures, geomorphological study and the systematic consideration of all possible alternatives in the context of the site's environment and human use. Some implications of the findings of this study are considered, especially within the context of 'taphonomic logic'.

### Introduction

One of the most significant archaeological finds of Australia is the several marked limestone fragments from the Devil's Lair cave in the extreme south-west of the continent (Dortch 1976, 1984). Dated to the Late Pleistocene, three of these objects have been described as engraved plaques, in which respect they are almost unique in Australia. There is only one close parallel, a find from Koonalda Cave (Gallus 1971:115), while the only numerous portable engravings known from Australian prehistory are the 'cylcons' of western New South Wales (McCarthy 1967:75). The latter are undated surface finds, but the recent discovery of what appears to be a fragment of a 'cylcon' at the Late Pleistocene site at Cuddie Springs suggests that these mysterious objects may date back many millennia.

The status of the Devil's Lair plaques has been questioned (Bednarik 1991), and in resolving the topic of portable engravings from the Australian Pleistocene it is essential that the origin of their markings be established. The present paper describes the results of a detailed study of eight items of apparent portable art from Devil's Lair, using the methodology developed for the study of Palaeolithic engravings of Europe, portable stone objects of Eurasia and cave markings in southern Australia and elsewhere. In addition, the findings' broader implications for Australian archaeology are considered.

Devil's Lair is a small limestone cave near the south-western corner of Australia (Fig 1). Besides being one of the oldest radiocarbon-'dated' sites in Australia, the cave has yielded what have been described as several bone beads and pendants, a series of marked stone plaques and cobbles, limestone artefacts, and stone tools with hafting mastic adhering to them (Dortch & Merrilees 1973; Dortch 1979a, 1984). All of these finds are from Pleistocene layers, and they are rather exotic in the context of Australian Pleistocene archaeology. Many of the Devil's Lair finds are indeed unique, as similar

material has not been found anywhere else in Australia. For that reason they have been subjected to ongoing debate, and recently the excavator, C E Dortch, has modified some of his identifications of the 1970s (Dortch & Dortch 1996) and had some of the controversial objects subjected to specialist study.

My analytical procedure for the Devil's Lair objects involved four separate phases. First I studied all relevant

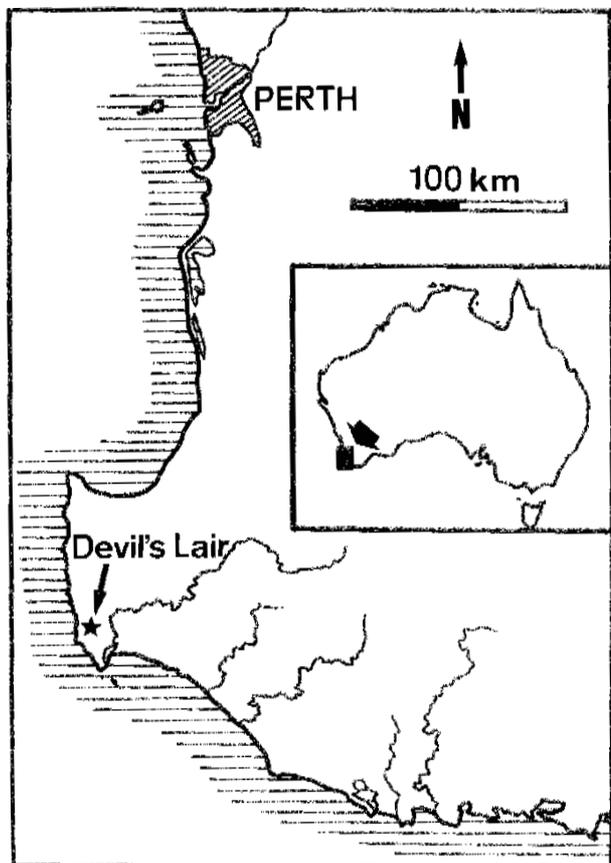


Figure 1. Location of Devil's Lair, south-western Australia.

published literature on the site, a total of about a dozen publications. This was followed by a thorough microscopic examination of each specimen, concentrating on the different types of surface markings. The marl pendant (Dortch 1980) was found to have certain diagnostic markings in its perforation and was studied separately (Bednarik 1997a). The third phase involved replicative experimentation with control material (limestone clasts from the site) and continual reference to the marked stones. During this phase I sought to develop a more detailed understanding of the mechanical properties of the aeolian limestone, a Pleistocene calcarenite consisting predominantly of calcium carbonate. It exhibits varying contents of quartz and other sand grains, whose size gradings and petrological make-up provide useful information. Finally, the fourth

phase of the project involved more intensive microscopic examination of the marked 'plaques' on the basis of replication work, and by reference to previously examined similar types of finds. This final phase also involved various more specific approaches, such as the microscopic study of fractured quartz grains, determination of direction of movement in the production of markings, study of striation patterns, and systematic comparisons of animal claw mark sections on the same and other surfaces.

### The Marl Pendant

On the basis of the excellent published descriptions I had expected that none of the specimens would bear

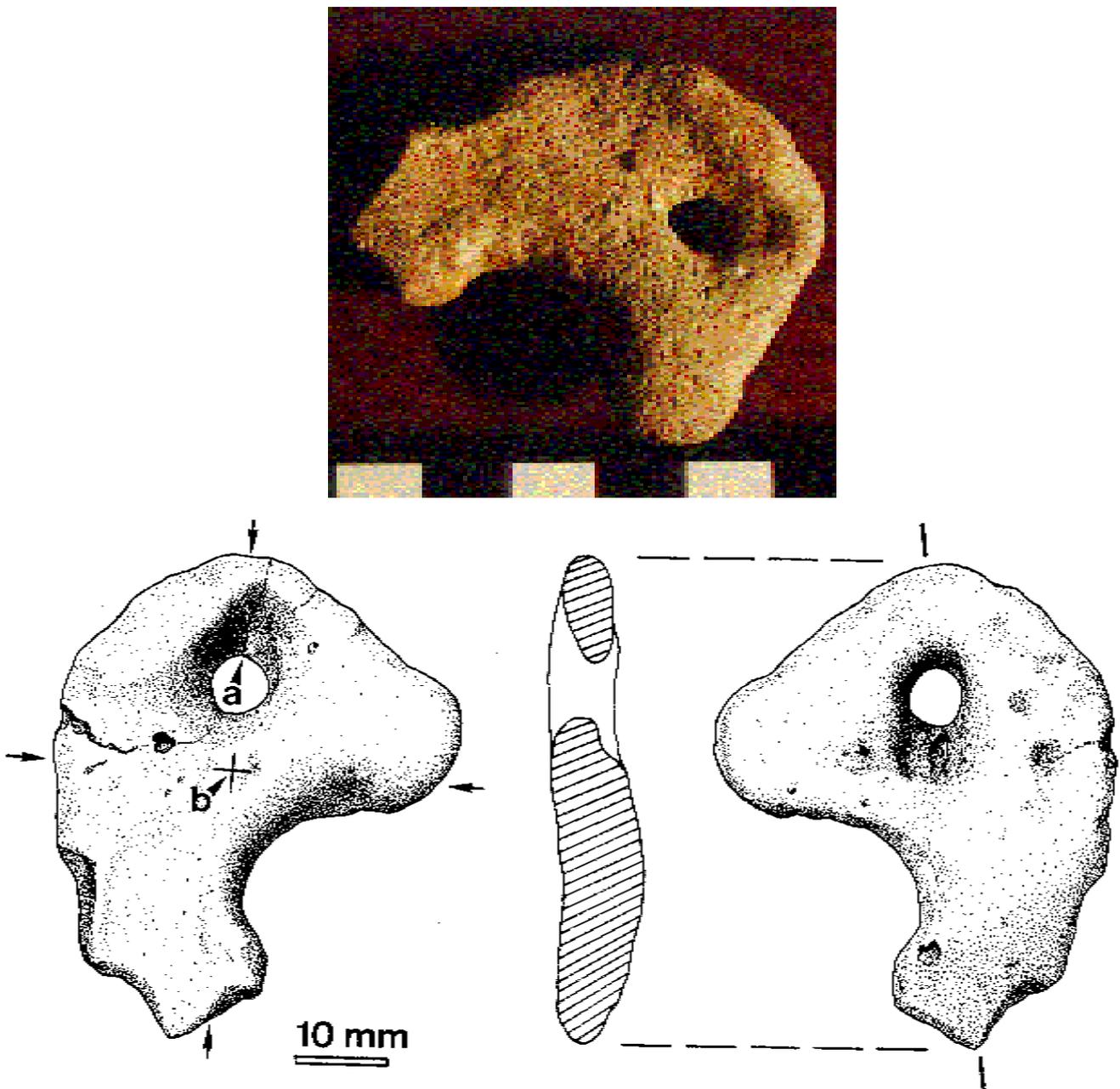


Figure 2. The Pleistocene marl pendant from Devil's Lair. The two sides and a section of the marl pendant, indicating the location of the wear grooves (a) and of the point of gravity (b). Adapted from Dortch (1980). Scale bars are 1 cm.

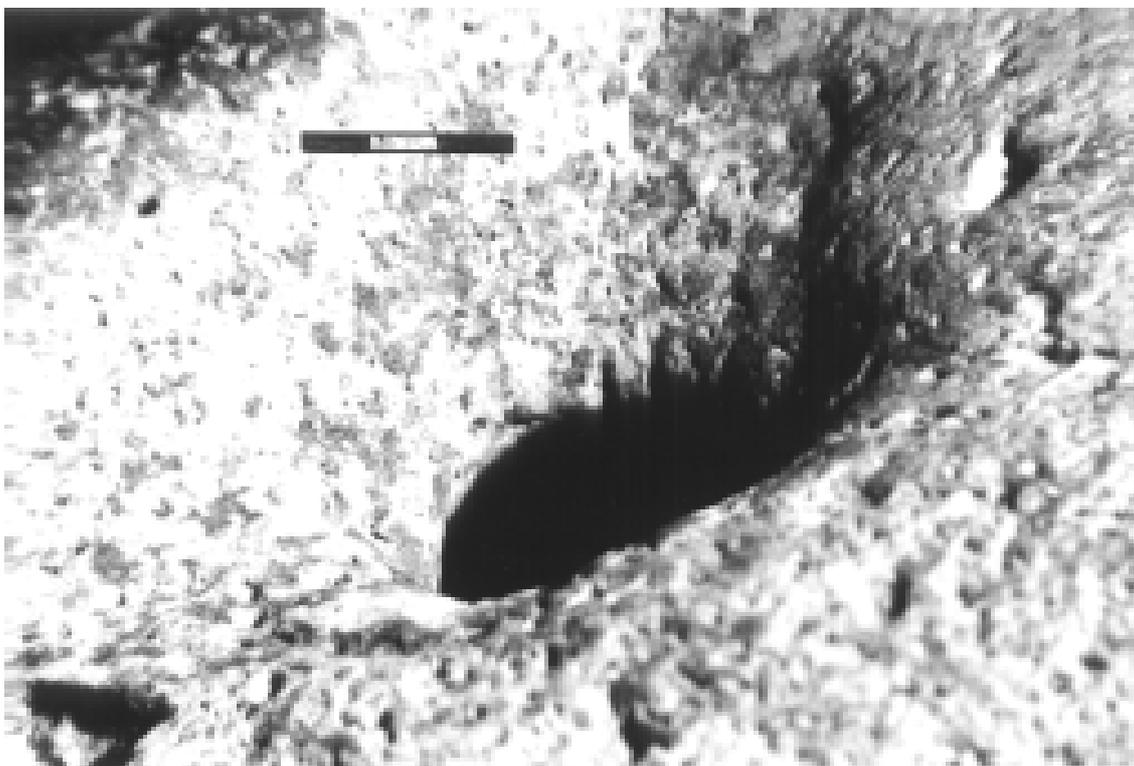
intentional markings, or provide any evidence of having been used as palaeoart objects, because the descriptions were consistent with taphonomic marks I had studied at hundreds of other sites. The perforated marl object had been described as having been drilled either by boring or gouging. The object bears a faint fracture line which follows an inherent structural weakness that has given rise to the formation of the perforation and other hollows, through natural weathering processes. The 6.5 mm diameter hole bears no trace whatsoever to indicate that it was drilled, enlarged, modified or reamed in any way by human hand. It is not circular or chamfered as drilled holes on experimental or Palaeolithic stone pendants generally are (Bednarik 1997b) and I conclude that it was formed entirely by natural attrition.

The perforated marl object weighs 18.65 g and measures maximal 55 mm (Fig. 2). It is from trench 8<sub>7</sub>, layer 0, about 140 cm below datum, which stratigraphically indicates a Late Pleistocene age. The soft and porous 'marl' resembles the calcareous material that numerous Upper Palaeolithic stone objects of Europe were made from, such as the Willendorf No 1 figurine and many of the Russian figurines and fragments thereof (e.g. 24 figurines from the two Avdeevo sites and many more from Kostenki I; Bednarik 1990, 1995a). There are also numerous Palaeolithic marl pendants known from Russia, especially the 30 from Avdeevo Staraya, 145 from Avdeevo Novaya, and others from Kostenki, as well as many other objects of carved marl from these and other Russian sites. Thus the use of marl for the production of decorative or artistic objects is well known from the late Pleistocene.

The Devil's Lair marl object had been examined petrographically in the 1970s, which led to the conclusion that it differs from the coastal limestone the cave occurs in. Dortch (1980) therefore assumed that it must have been carried in from another locality.

In examining Pleistocene stone pendants for use traces of wear one focuses on the inside of their perforation. More specifically, the most important area is the perforation surface opposite the object's centre of gravity (cf Fig 2). This is where wear traces are usually present if a perforated object was used as a pendant. The inner surface of the perforation of the Devil's Lair marl piece bears four wear grooves (Fig 3). The first groove from the left is very shallow and wide, measuring up to 550  $\mu\text{m}$  width. Next follows an almost V-shaped groove which still has a rounded bottom. It is 530  $\mu\text{m}$  wide at its widest point, and as much as 240  $\mu\text{m}$  deep. Quite close to this is the third groove, well rounded but shallow, and of up to 310  $\mu\text{m}$  width. Immediately adjacent follows a wide, rather faint abrasion of maximal 750  $\mu\text{m}$  width. One part of the deepest groove (the second) seems to provide a good indication of the size of the string that caused this marking. It includes a well-rounded section of 225  $\mu\text{m}$  diameter, indicating the approximate diameter of the string.

These four abrasion or wear marks are distributed precisely across the surface where such wear would have had to occur if the object had been suspended on a string (Fig 4). The presence of several single marks alongside one another suggests that the object was not tied to the string by means of a knot, but was merely threaded onto the supporting cordage. There is no indication of the type



**Figure 3.** Microphotograph of the four wear grooves in the perforation of the marl pendant from Devil's Lair. Scale = 3 mm.

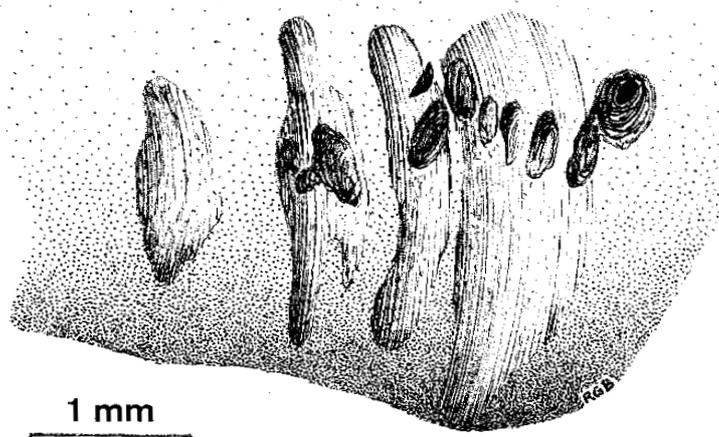


Figure 4. Detail of the four wear grooves on the marl pendant.

of string employed. In view of the extreme softness of the marl, the comparatively shallow wear grooves indicate that the object was not worn for a long time, presumably not more than a few days. There are no discernible markings suggesting that the pendant was worn suspended next to another perforated object.

Dortch (1980) considered and rejected the possibility that the object was utilitarian, *e.g.* used as a polishing tool for wooden artefacts or bone tools. I agree with his rejection of this possibility. The specimen's material is far too soft for this, and it entirely lacks wear traces that such use would have produced. Similarly, its use as a buckle or pulling handle (Boas 1888:Figs 15,17,121d; Nelson 1899:Pl 17; Kroeber 1900:Fig 8) can be safely excluded due to its fragility. It is of course possible that the piece was used as a weight for some purpose, but this does not seem likely in view of its very small weight. Among its possible uses, that of a pendant remains by far the most convincing, confirming Dortch's initial opinion.

This object is the only stone pendant so far recovered from the Australian Pleistocene. In Europe and Asia such stone pendants have been found at Palaeolithic occupation sites from France to Japan (Bednarik 1994a), and although a variety of materials have been used, marl is the most common for this application. It should be emphasised, however, that taphonomic logic (as defined in Bednarik 1994b) predicts a significant over-representation of ornaments made of stone, hence they are still to be regarded as rare, even in Europe.

Beads made of organic materials occur among archaeological finds in Australia, even of the Pleistocene and early Holocene. We already have several hundred such specimens (Morse 1993; Feary 1996) besides the three well-made bone beads from Devil's Lair (Dortch 1979b: Pl 2, 1984: 67). However, the stone pendant considered here remains the only early example of its kind in Australia.

### Criteria for the Identification of Rock Markings

Among the basic classes of rock markings (see

Bednarik 1994c for nomenclature), only a few are of interest in the present context; GK1 (general taphonomic marks), GK2 (clastic movement marks), BH2 (non-utilitarian anthropic marks) and especially BA1 (animal scratches). The latter are among the most common rock markings in the world, being about as common as glacial striae. Animal scratch marks have been thoroughly studied in over one thousand caves worldwide (Bednarik 1986a,b, 1991, 1992, 1993a, 1994c; *cf* Flood 1997:55) as well as at open sites. They occur in Australian caves and are particularly prominent in the continent's southern karst regions. Having never seen an Australian limestone cave that lacks animal scratches, I expect that all caves in the country contain this class of wall marking.

To recognise individual animal scratch marks requires considerable experience, because their morphologies differ greatly according to the species' climbing ability and method, 'speleo-behaviour', mobility, relative length of extremities, shape of claws or talons and their mechanics of application, and according to the shape of the claw points. The latter, for instance, can vary according to local conditions, the specimen's age, and so forth. Claw marks of Chiroptera (the most common of all animal scratch marks) may be quite different from those of similar-sized animals that are unable to fly (Bednarik 1991). Moreover, great variations can be caused by the lithology of the support rock (relative hardness, moisture content, relative air humidity, *etc*), and most particularly by modification processes (weathering, including speleo-weathering, the deposition of speleothems, and the deforming action of some precipitates, notably certain types of carbonate deposits). It is therefore necessary to appreciate that there are no simple, ready-made rules for discriminating between animal scratch marks and other, similar, rock marks. Rather this is a process of elimination in which many factors need to be taken into account, and in which alternatives have to be discounted systematically.

The empirical basis of this discrimination process consists of two bodies of evidence: the study of markings that can safely be attributed to animal species (*e.g.* megafaunal marks, which have been most thoroughly studied in Europe, such as those of *Ursus spelaeus*, and in

Australia; cf Bednarik 1993a), and the study of 'experimental' animal markings. The latter have involved a number of species, and in Australia especially possums. I have documented several instances of occupied possum dreys in limestone cavities (including in actual caves), and have microscopically surveyed the fresh climbing marks in the immediate vicinity of the occupied lairs of *Trichosurus vulpecula*. Marking experiments have also been conducted with live specimens, and their claws and claw spacings examined as part of this project. I have not conducted such experimental work with *Sarcophilus*, but have studied the very numerous claw markings in known lairs of the Tasmanian Devil, e.g. in Koonalda and Tantanoola Caves.

In Australia, four broad categories of animal scratch marks on rock surfaces have been distinguished (Bednarik 1991, 1994c). Large accumulations of claw marks are usually much easier to identify than isolated or single marks. One of the distinguishing characteristics refers to the relative positions of multiple marks constituting a 'set', and the relative course of individual grooves of a multi-pronged instrument such as an animal paw. Small rock fragments may only bear one or two grooves of a set (either exfoliated from a wall, or marked in situ within the sediment), which renders discrimination more difficult than on a cave wall. Nevertheless, other variables remain and can be consulted quite effectively in such cases, referring to the experience gained from parietal markings. These include;

1. Longitudinal striations are very frequently present in lines engraved with stone tools, and several distinctive forms are recognised by researchers as being characteristic. Animal scratches typically bear no striations.
2. Even if a claw did bear some irregularities which would produce striations, as may conceivably be the case, these would significantly differ from those occasioned by stone points. In the latter, the point is usually slightly turned over the course of a groove, which results in significant changes in the longitudinal striations. This is particularly clear at changes of direction. A claw point, forming part of a multi-pronged instrument, cannot be rotated in the same way.
3. Claw points are always rounded and comparatively symmetrical; stone points are rarely so.
4. In cross-section, a claw-caused groove is rather U-shaped, with the side walls steep, and *striae parasites* are never present.
5. Morphologically, claw marks are frequently of slightly 'cuneiform' appearance, i.e. with one end deeper and abrupt, and the other shallow and 'fading'. This applies especially to short marks.
6. Where such a mark is well preserved, the deeper and wider end can provide a fairly good impression of the shape of the claw point.

If the limestone is very soft, lines may have been incised by a material such as bone or even wood. This would be much harder to distinguish from claw markings than are stone marks, but there is no evidence of such tool materials having been used, in either

Australian cave art or portable engravings on stone. I have conducted experimental work with dry and 'green' wood, bone, and other materials, including in south-western Western Australia (Bednarik 1988/89). Tool marks occur very frequently in about a dozen Australian caves we know of, and they have been studied in some detail in Nung-kol, Mooraa, Paroong, Ngrang, Orchestra Shell and Mandurah Caves. In all cases they could be demonstrated to have been made with stone tools, and the stone types of these tools were convincingly determined at two sites, from their distinctive striation patterns (Bednarik 1988/89, 1992). Much less work has been done on the systematic study of portable stone engravings in Australia (notably the hundreds of engraved cylcons) but preliminary work indicates that they were also fashioned entirely with stone tools.

Clastic movement marks are, as mentioned, also among the most common rock marks in the world, and they do occur in limestone caves. They have been described (Bednarik 1994c:33) as being attributable mainly to glacial action, fluvial sedimentary movement, animal borrowing, gravity and tectonic movement (e.g. through adjustment in cave systems with a sub-floor phreatic reservoir). Such marks are most distinctive on cave walls rather than on clastic debris, and are easily recognised by their typical morphology where they are well preserved. Their size ranges from microscopic size to over one metre width. On sediment clasts they are likely to occur together with other marking types, such as animal scratches where they result from burrowing. They grade into 'general taphonomic marks', which include those caused by cryoturbation, solifluction and trampling. There are numerous examples on record, in most continents, where archaeologists described taphonomic, clastic and animal marks as anthropic engravings or rock art (many are listed in Bednarik 1994c).

### Stone 'Plaques' from Devil's Lair

My interpretation of the six stone fragments with surface markings from Devil's Lair was not consistent with previous assumptions. Two have been described in



Figure 5. Naturally perforated marl fragment with single groove; No. B5348B. Scale bars are 1 cm.



**Figure 6.** Limestone cobble bearing numerous animal scratch marks; No. B5348A. Scale bars are 1 cm.

detail and published as engraved plaques (Dortch 1976), and the others were considered as possibly having been engraved. All fragments consist of geologically recent aeolian limestone containing a small component of rounded quartz grains and in some instances other mineral grains.

B5348B (Fig 5) is from trench 10 south, layer 6, found at 210 cm depth. The small flattish stone fragment is especially soft, weighs 5.88 g and measures a maximal 36.6 mm. It bears a natural perforation which shows no wear marks. Numerous fine striations are apparently modern cleaning marks. The most distinct line marking



**Figure 7.** Limestone slab bearing remnants of fine taphonomic marks; No. B5300. Scale bars are 1 cm. Photograph by C E Dortch.

is 0.9-1.0 mm wide and has a well-rounded cross-section. This and the specific morphology of its starting point (cuneiform, indicating where the incising point first scored the very soft stone) suggest that this is an animal scratch mark (*cf* Bednarik 1991).

B5348A was recovered nearby and at the same depth. This 230.17 g limestone cobble has one flat and one convex side. It is 89.4 mm long. Linear markings are more prominent on the flat side and most are consistent with animal scratch marks (Fig 6). They fall readily into two quite distinctive groups. Of the larger group, a pair on the convex side has a 13.5 mm spacing. The smaller sets measure on average 415  $\mu\text{m}$  between scratches (range 300-650  $\mu\text{m}$ ,  $n = 9$ ). I interpret these small scratches as having been made by a small animal, up to mouse size. There is considerable evidence of the activity of such a species present on this surface, but it relates to moister conditions which would have rendered the stone significantly softer. Both the very small markings and the large scratches are not randomly orientated; they are predominantly in one direction and they occur as distinctive clusters. The marks in each cluster are similarly weathered, but clear differences in weathering are apparent between the clusters.

B5300, also from trench 10 but without secure provenance, is of plaque-like shape, weighs about 360 g and measures 122 mm (Fig 7). It has had a particularly complex history, including erosion by micro-pitting, exfoliation and deposition of calcite precipitate. Remnants of linear markings have survived the subsequent solution of much of the precipitate. One side has been rubbed against a similar flat surface under considerable pressure. Quartz grains that protrude from the surface have been pressure flaked and bruised, while similar grains embedded in the contact surface of another piece of stone have produced a variety of random linear markings on the formerly soft surface. The damage could have occurred through trampling or similar activity, or through sediment movement after the object became



**Figure 8.** Limestone fragment bearing animal scratches; No. B3651. Scale bars are 1 cm.



**Figure 9.** Small limestone fragment with deep marking; No. B3697. Scale bars are 1 cm.

buried. The marking pattern suggests trampling as the most probable explanation, whether it was by humans or other animals. The second side of the specimen is almost unmarked.

Three pieces come from trench 9. B3651 weighs 18.66 g and is maximal 52.8 mm long. It has a higher content of quartz grains than the other specimens and is consequently harder (Fig 8). Nevertheless, it bears at least one mark that is 20 mm long, and a few shorter marks. The most numerous marks, however, occur near one end, where an accumulation of very short, 3-10 mm long scratch marks show spacings in the order of 1-1.5 mm between the points of the multi-pronged marking instrument. Some of the longer marks cross one of the larger and much older grooves.

B3697 is an irregular pebble of very soft, light-coloured 'marl'. It has one deep and prominent incision which curves around the surface profile (Fig 9). The groove is of well-rounded section, 1.5-2 mm wide, and is morphologically consistent with claw marks in hundreds of Australian caves. The pebble is 36.7 mm long and weighs 15.54 g.

The largest of the presumed plaques, B3652, comes from a depth of about 2.6 m. It measures 137 mm and weighs 180 g. This specimen has flaked off the cave wall or ceiling during the Late Pleistocene, judging by its stratigraphical position. The original outer surface bears several skins of re-precipitated calcite. The distinctive morphology of these carbonate speleothems indicates that the fragment is probably from a sloping ceiling area. There are almost no markings on this, the former outer surface, which demonstrates that the object was marked after it had become detached (*i.e.* on its 'inner' surface). Some recesses contain calcite-cemented sand grains, which shows that during burial, conditions were sufficiently moist to permit some further precipitation of calcite.

The linear markings are on the object's inside surface



**Figure 10.** Plaque-like limestone slab bearing numerous taphonomic markings and some animal scratches; B3652. Scale bars are 1 cm. Photograph by C E Dortch.

(Fig 10). Among the most prominent are two sets of widely spaced marks which I interpret as animal claw marks, from their morphology, cross-section and course. The fact that they were executed in opposite directions suggests that these markings were made on an exfoliated fragment, and not on the rock face. These marks are spaced about 24 mm apart, which is well within the range of several possible species (e.g. Tasmanian Devil, large possums). Individual groove sizes and shapes are generally well rounded and range from 600-900  $\mu\text{m}$ , but up to 1.1 mm in one case. These marks as well as most other marks on this specimen lack any striations or other indication that stone tools might have been involved. In the central part is a curved, meandering line with distinctive striations, 400-500  $\mu\text{m}$  wide, with a pronounced depression at its point of commencement. This was probably caused by an irregularly shaped sand grain that was pressed hard onto the surface as it travelled over it erratically. Along its course it was forced over a red-coloured quartz grain embedded in the stone which it fractured and partly removed. Other markings on this surface include an accumulation of several slightly curved, very small marks near the upper left corner. Finally, the entire surface bears innumerable fine striations all over, especially within depressions. These were caused by nylon bristles, and many microscopic bristle fragments or shavings were found still attached to

the surface. I have been informed that the specimen was cleaned with a soft toothbrush.

In summary, the six supposedly engraved limestone fragments from Devil's Lair bear a variety of taphonomic markings which present an initially confusing picture to the observer, but which can be untangled and analysed through detailed observation in combination with various replication experiments. There is not a single marking on these objects that I conclusively attribute to a stone tool, and there are very few that I consider might possibly be marks of stone tools from diagnostic characteristics such as longitudinal striations, *stries parasites*, and *sillons rectilignes* (e.g. d'Errico 1994; Bednarik 1992, 1994c, 1995b, 1977c). This is based on my experiments on rock samples from the site (the results confirmed entirely those of similar work at many other sites), and previous studies of animal scratches on rock involved a great deal of 'replicative' and observational work, relating to many mammalian and non-mammalian species. Among the many hundreds of macroscopic and microscopic markings on the Devil's Lair objects are kinetic markings caused by sand grains or projections from other stones, minute solution pits and animal scratches of various species, but numerically they are dominated by the traces of various types of modern damage.

Only one similar object has ever been reported from an Australian site, a small limestone fragment from Koonalda Cave with a few linear markings (Gallus 1971:115). I have proposed that it bears typical animal scratches (Bednarik 1991), which are extremely common on the walls and floor boulders of Koonalda Cave. Animal scratches, which are numerous in the caves of the Mount Gambier karst where they have been studied in detail (Bednarik 1991, 1994c), are comparatively less common in the far south-west of Australia, but I have observed them in all of the approximately twenty caves I have examined in that region (Bednarik 1988/89).

### The Bone Sliver

The eighth object from Devil's Lair that I examined is a small bone sliver, 19.6 mm long, with a perforation near one end. It seems to be from the long bone of a bird. Dortch (1984:65) described it as a bodkin or pendant. In either case it should exhibit some wear on the rim of the perforation nearest to the broad end. I have searched in vain for such evidence, but the perforation itself was clearly made by human hand. It was first punched through from the convex surface, and the resulting hole was then lightly reamed with a stone point (Fig 11). Splinters of the punching action are still attached to the perforation, clearly indicating the direction of impact. The pointed end shows no use wear. I favour Dortch's interpretation that this was intended as a pendant, but perhaps it was used only briefly. Bone is much more resistant to wear than soft marl, and since the object

weighs a mere 0.12 g it would not experience a great deal of wear from a supporting string. However, this is only speculation, and while the object is clearly an artefact I have not been able to determine its function reliably.

### Discussion

While these objects from Devil's Lair are no doubt of Pleistocene age, I have avoided attaching specific ages to them and have not cited results of radiocarbon determinations. This is because the processing laboratory at Sydney University discovered a systematic error subsequent to its determinations relating to charcoal from Devil's Lair, when it was realised that the hand-made glass vials used on the old counter led to variations in the count rate (Temple & Barbetti 1981). Since only samples after December 1978 (beginning with SUA-963) were re-calibrated, the radiocarbon results from Devil's Lair (which are of earlier sample numbers) must be considered as imprecise, so I have not cited or discussed them here.

To summarise the current status of the Devil's Lair collection of objects, only material of doubtful status was submitted for examination by me. There is no reason to question the identification of the three bone beads from the site. Dortch's (1984:67) excellent photographs suffice to demonstrate their use as beads. There is solid evidence that the cave has yielded the only Pleistocene stone pendant so far discovered in Australia. A small perforated bone sliver is certainly an artefact, and may also have been a pendant. However, I interpret the markings on the various presumed stone plaques to not

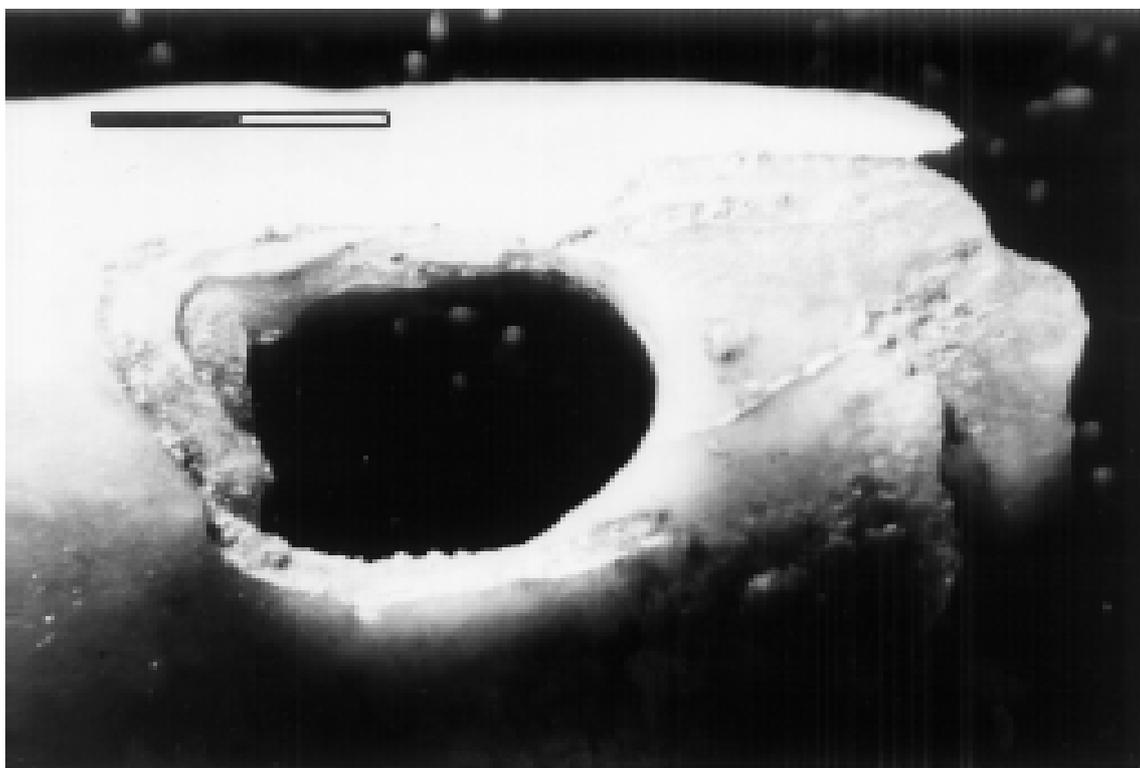


Figure 11. Microphotograph of the perforation in a small bone pendant; No. A22028. Scale = 2 mm.

be anthropic engravings. Rather, I attribute their markings to their often complex taphonomy and to recent damage.

Perhaps the most surprising aspect of this collection of five 'decorative' objects (presumed beads or pendants) from Devil's Lair is that they are not from a single layer, but are of widely differing ages. The three bone beads, for instance, are all from different sediment strata, and one is significantly younger than the two other. Why then do we have such a collection of unusual Pleistocene objects from a single site? The answer is probably taphonomic; these objects would have survived only in high-pH sediment conditions, e.g. in a limestone cave, and the number of suitable sites ever excavated in Australia is somewhat limited. Mandu Mandu Creek Shelter, where the only other Australian Pleistocene beads were found (made from marine shells; Morse 1993), is also a limestone site in a near-coastal region. This is hardly a coincidence, but is a fair reflection of preservation bias; such material survives only very rarely and in specific environments.

To appreciate the significance of this pattern of occurrence it is necessary to perceive it in its greater metamorphological context (metamorphology is the study of how forms of evidence change with time to become the forms as which they are perceived or understood by the individual archaeologist today; cf Bednarik 1995c). Beads or pendants had to be made in quite large numbers if such symbolic objects were to be imbued with social meanings, because it is repeated and 'structured' use which confers meaning on symbolic artefacts (Bednarik 1997b). Beads can be used in a number of ways or for several purposes, and provide various forms of information about the wearer and their status in society. They are not merely 'decorative'. Even if vanity were the motivation for wearing such items, stating this explains not why such items are perceived as 'decorative'. The concept is itself anthropocentric, we do not assume that other animals detect the information imparted by beads. In human culture, however, various forms of meanings may be encoded by such objects and in other kinds of body adornment. In ethnography, beads sewn onto apparel or worn on necklaces, for example, may signify complex social, economic, ethnic, ideological, religious or emblematic meanings, all of which are only fully understandable by a participant of the culture in question.

Beads and pendants cannot therefore exist in isolation, or have been used in small numbers only; it seems their use in any society could only be justified if they were used in large numbers. Wherever beads were used by recent people, they were typically encountered in large numbers, with individuals often wearing thousands (Anderson 1887:216; Dunn 1931). Yet, in the Pleistocene, beads occur very sparsely and in the earliest periods they are extremely rare. For example, only five bead specimens have so far been reported from the entire Lower Palaeolithic period (three in the Sahara, two in Europe; Bednarik 1997b). The entire Palaeolithic of India has yielded merely three beads (Bednarik 1993b). So, the Australian situation is consistent with that of the rest of the world. A notable exception is the three Streletsian burials at Sungir' in Russia, which yielded about 13 370 beads (Bader 1978).

The spatial and temporal patterns of occurrence of beads and pendants, especially in the Pleistocene, have to be explained through taphonomic logic and other metamorphological terms of reference, not in the traditional ways of archaeology. This shows that such patterns are found to be precisely as this form of logic (Bednarik 1994b:Fig 2) would predict them to be. Rather than interpreting these patterns as reflecting a paucity of such materials (Vishnyatsky 1994), they should be viewed as indicating a high probability that such artefact types were widely used.

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