

33,000 YEAR OLD STONE AND BONE ARTIFACTS FROM DEVIL'S LAIR, WESTERN AUSTRALIA

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ABSTRACT

A lower, largely re-worked zone of the cave deposit at Devil's Lair, Western Australia, radiocarbon dated about 33,000 BP, contains very sparse archaeological assemblages consisting of flakes and other artifacts, including some apparent tools, made of calcrete; a few artifacts of quartz and other stone; and at least three bone artifacts. These assemblages and other small finds of definite or possible archaeological significance are described, and various natural sources of stone and bone fracture within the cave which may have produced pseudo artifacts are assessed. Carbonate encrusted stone and bone artifacts, including two encrusted probable artifacts of bone, both of which may be made on bones of extinct macropodines, are tentatively regarded as re-deposited from an older part of the cave deposit, evidence which may mean that human occupation of this part of south-western Australia substantially predates 33,000 BP.

The scarcity of artifacts and the absence of occupational features in the lower part of the deposit suggest that people seldom or never entered the cave before 27,700 BP, the radiocarbon age of the oldest known Devil's Lair occupation feature. All artifacts stratigraphically below this feature could have washed or fallen into the cave from occupation sites immediately outside.

INTRODUCTION

In 1976 and 1977 staff of the Western Australian Museum and others engaged in the sixth and seventh seasons of excavation in the archaeological and palaeontological investigations which since 1970 have been centred on the cave of Devil's Lair (30°9'S. 115°4'E). These two seasons' excavations were directed principally

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towards the deepening of the eastern end of the main excavation with the purpose of recovering, within the stratigraphical controls developed (Balme, Merrilees and Porter in press; Baynes, Merrilees and Porter 1975; Dortch 1974; 1976; Dortch and Merrilees 1973), faunal and artifact assemblages and also sediment, radiocarbon, pollen and other samples which can provide data for assessing significant aspects of late Pleistocene prehistory in this part of south-western Western Australia (Fig. 1).

During the 1976 season the field team concentrated on the excavation of layers 29-38 in Trenches 2, 7c, 7d, 8₂, 8, and 9 (Figs 2-5), a part of the deposit containing the oldest archaeological material known from Devil's Lair. The 1977 season was basically a test excavation aimed at reaching the bottom of the cave deposit; and

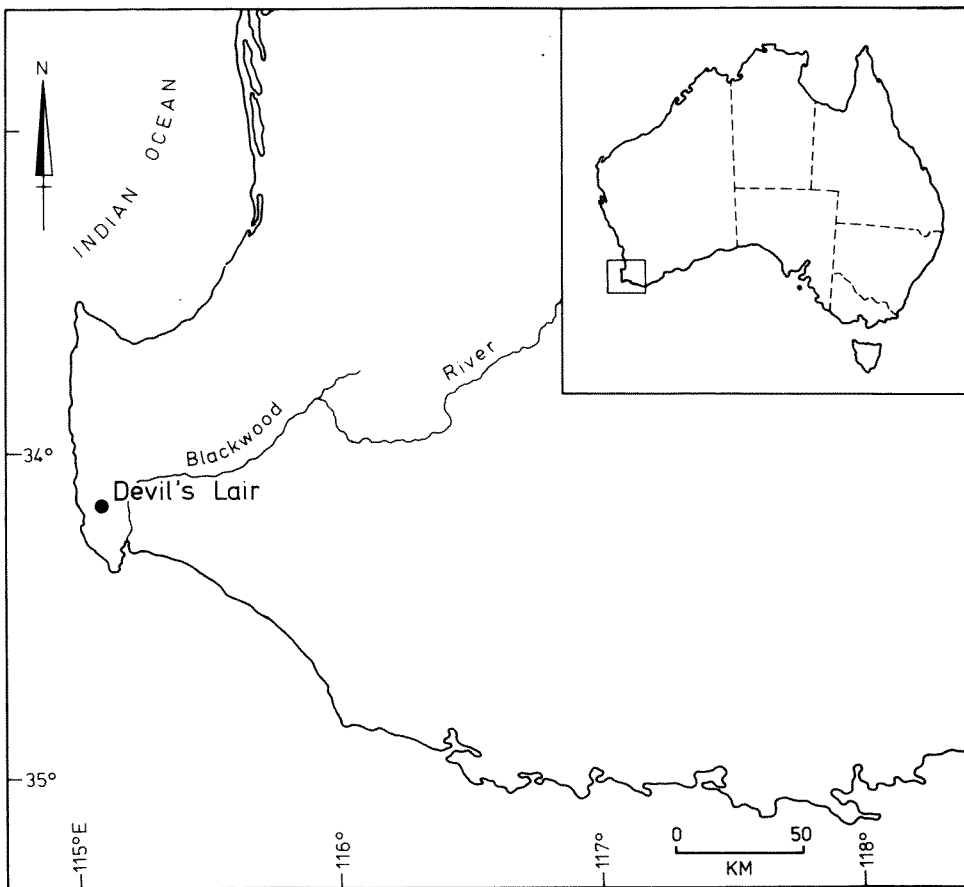


Fig. 1. South western Australia showing the location of Devil's Lair.

during this season layers 39-51 were delineated. Trench 10 (Fig. 2) was opened during 1977 to provide greater working space and a larger sample of material from the lower layers.

The following paper evaluates the rock and bone fracturing capabilities of various natural phenomena in Devil's Lair, and describes a number of stone and bone artifacts, some probable artifacts, and several other small finds of definite or possible archaeological significance which have been identified in layers 29-38.

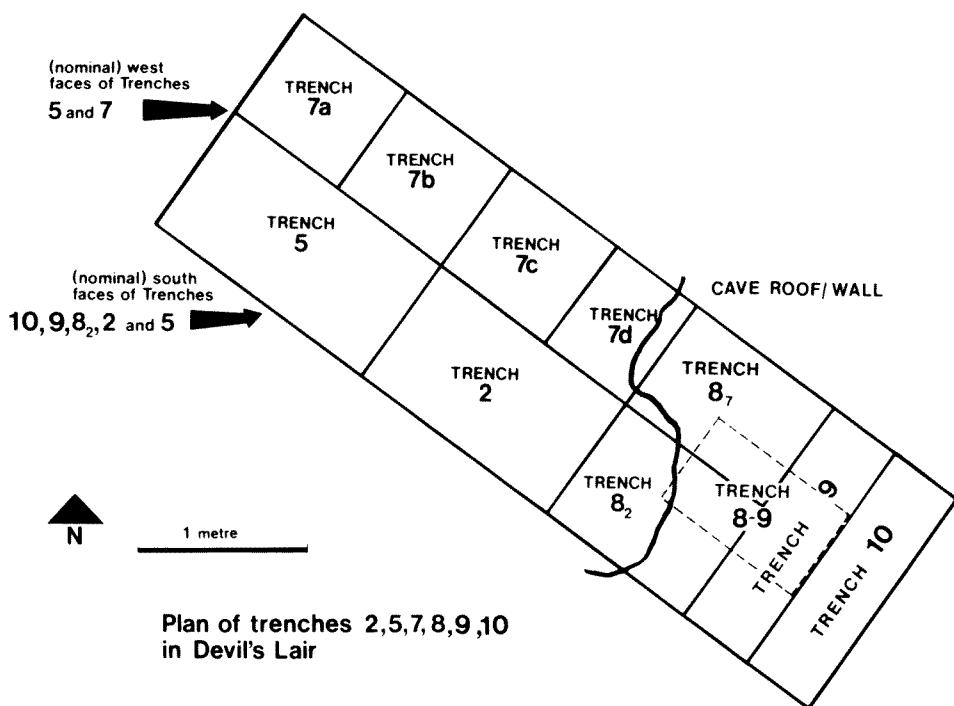


Fig. 2. Plan of main excavation, Devil's Lair (see Fig. 6).

STRATIGRAPHY

Previous publications (Baynes, Merrilees and Porter 1975; Dortch 1974; Dortch and Merrilees 1973; Shackley 1978) have described the sandy Devil's Lair floor deposit as consisting essentially of lightly cemented sand lenses and laminae interspersed with lithified sandy bands, crystalline bands of calcite (flowstone), stalagmitic masses and limestone fragments of different origin and composition, ranging in size from silt through boulder grades.

Most layers in the deposit contain very large quantities of animal bones, some of which are debris resulting from human food preparation and meals; and many layers contain small numbers of stone and bone artifacts. Charcoal fragments occur in abundance in parts of the deposit, and above layer 29 several concentrations of charcoal and archaeological material, some containing fire-crazed quartz grains and patches of scorched sand, seem to be hearths (cf. Shackley 1978, p.38). However much of the charcoal scattered throughout the deposit may have washed or fallen in.

Dortch and Merrilees (1973) theorised that the entrance to Devil's Lair is relatively very recent and that a former entrance is located at the top of a cone or fan of sediments in the present rear of the cave (Fig. 6). The slope of the bands or laminae visible in the walls of the excavation shows that most of the sediments are derived from the former entrance, the most notable exception being the uppermost layer A (Figs 3,5) which is a fan of dark brown sediment sloping through the present entrance. One of the Devil's Lair radiocarbon dates (SUA 342:320 ± 85 BP: Fig. 5) shows that layer A entered the cave very recently, apparently when formation of the present doline outside Devil's Lair created the present entrance.

The nature and size of the probable former entrance have not been established though at times it must have been large enough to have allowed human beings to enter the cave. Evidence for human occupation within Devil's Lair is provided by the hearths noted above and by the presence of several pits, notably Pit 2 (Baynes, Merrilees and Porter 1975; Dortch and Merrilees 1973); and by an occupation surface near the top of the deposit (Dortch 1974). There are no occupational features below layer 28 (Figs 3-5), a charcoal-rich band containing numbers of animal bones and artifacts. This is a hearth zone tentatively interpreted as containing the remains of various episodes of occupation scattered by people or animals, erosion, or a combination of these, and apparently compressed following burial.

Layers 29-51, including their various sub-units, are a series of sandy lenses which in the confines of the excavation appear as a succession of broad layers and relatively much thinner bands and laminae. In layer 44 and below some of the sandy units are interspersed with crystalline bands or lenses and bands of sand indurated with carbonate cement (Fig. 4).

In layers 31-38, and to some extent 29 and 30, there are numerous clearly defined cut and fill structures including channels ogival in section with steeply sloping sides two to 15 cm apart and up to eight cm deep; and multiple, partly superimposed channels showing complex convoluted or angular section contours. Most of these channels can be clearly seen because they are filled with well sorted large, orange quartz grains, sediments which in the context of Devil's Lair are suggestive of deposition by relatively high energy water flow.

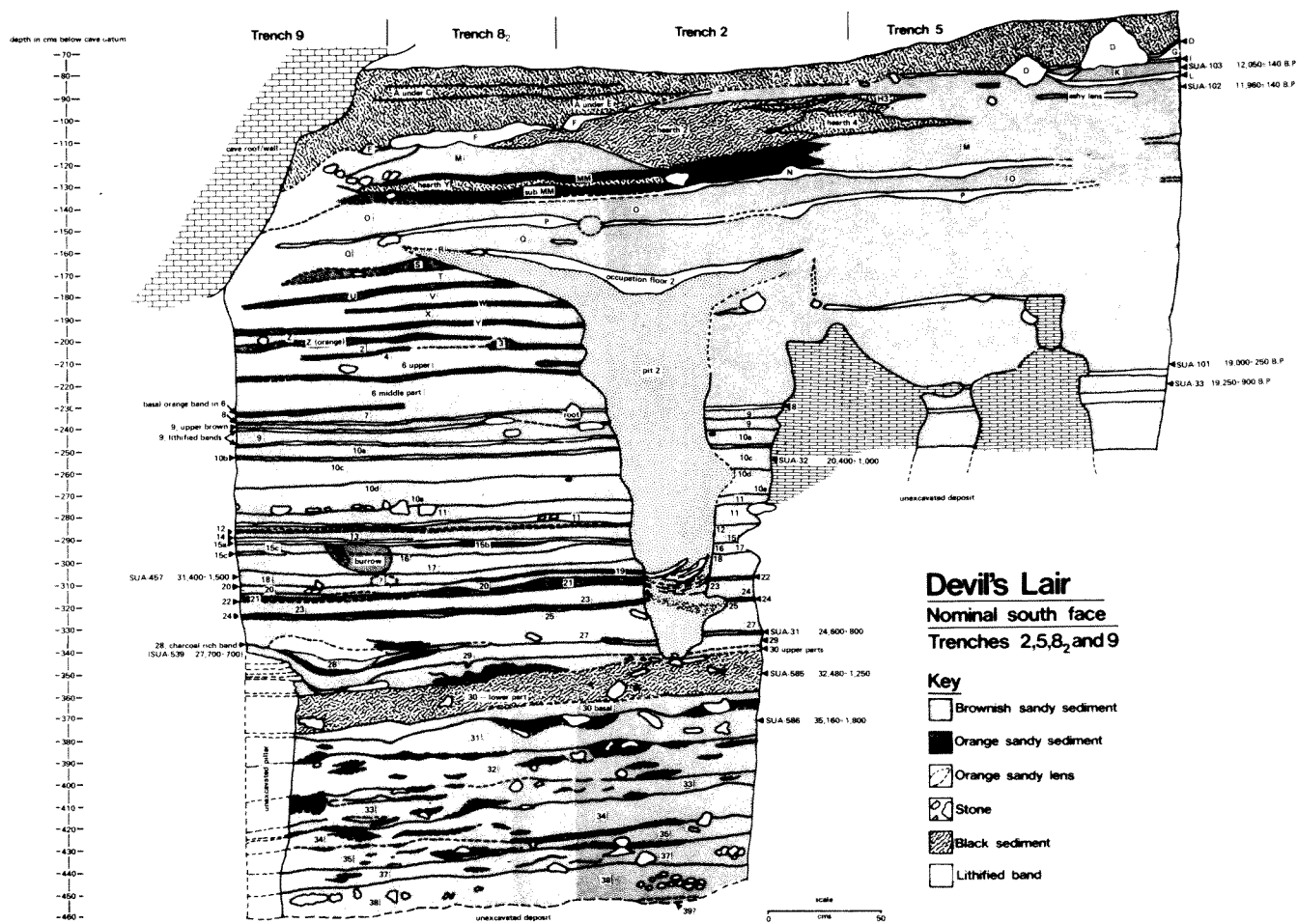


Fig. 3. Nominal south face of main excavation, Devil's Lair. (Trench 10 is not shown).

DEVIL'S LAIR, TRENCH 9 Nominal East face

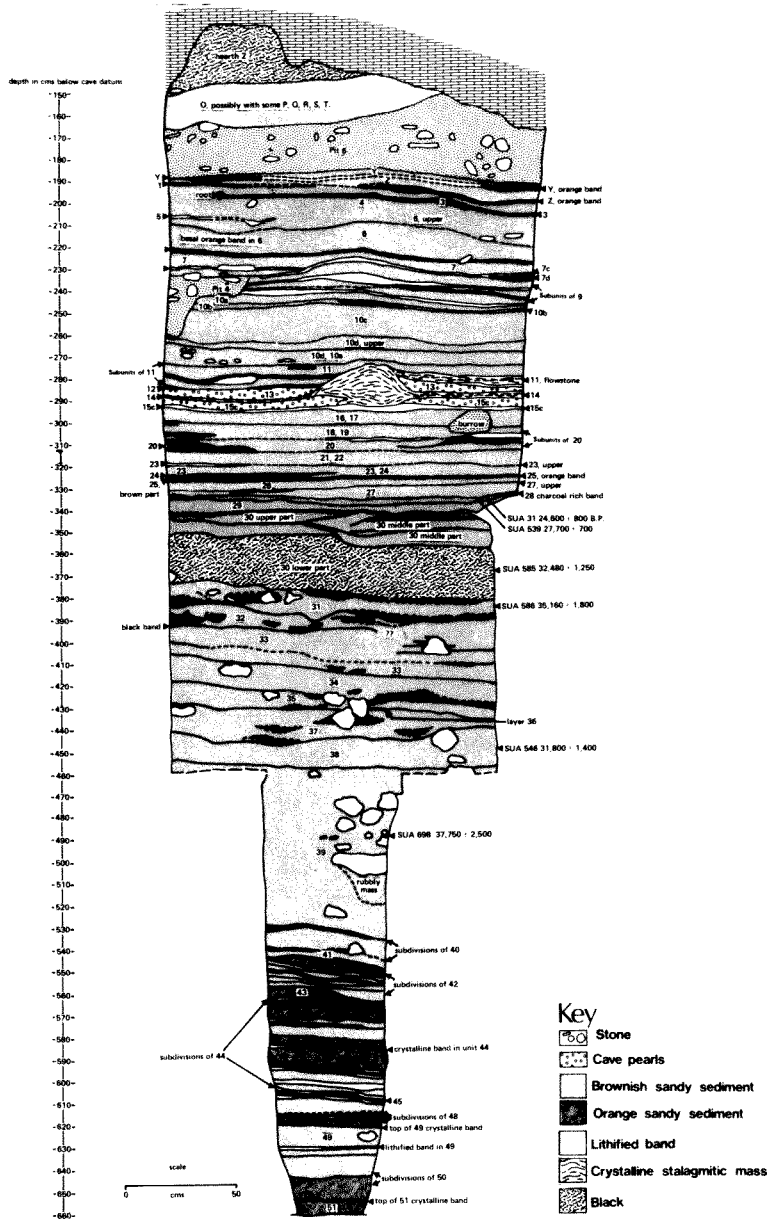


Fig. 4. Nominal east face of Trench 9, Devil's Lair, showing Test Trench 8-9 extending two metres below layer 38 (see Fig. 2).

Devil's Lair Trench 7c Nominal north face

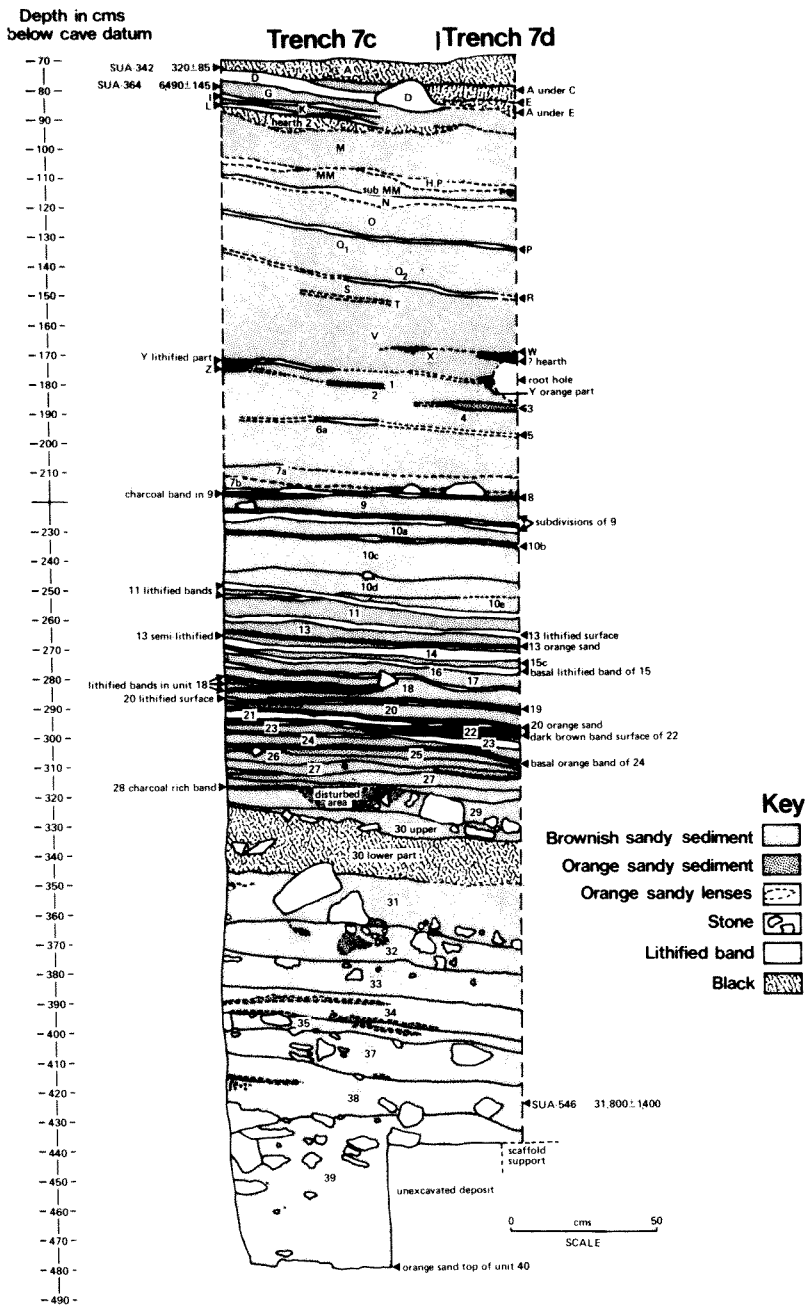


Fig. 5. Nominal north face of Trench 7c, and part of Trench 7d, Devil's Lair.

Despite the extensive erosion which has occurred here the depositional sequence of layers 31-38 is largely preserved; and in most parts of the trenches it was possible to remove much of each layer without mixing from adjacent units above or below, or from channel fillings. Relatively large amounts of sometimes massive limestone rubble, mostly weathered sub-rounded to sub-angular fragments typical of entrance debris, were recovered from layers 31-38; and most of this rubble probably derives from the former entrance.

Also in layers 29-51, particularly in layers 31-38, there is an important and distinctive series of carbonate encrusted stones and bones. Although many other bones and limestone fragments from various parts of the cave deposit are encrusted with carbonate cement of varying colours and textures, the encrusted group here seems distinctive, not only because of the appearance of the encrustations – a fine brown carbonate cement very thickly studded with large iron-stained quartz grains, but also because the series seems a characteristic component only below layer 28.

The evident concentration of encrusted stones and bones in layers 31-38 may mean that they were washed in during the episodes of exceptional erosion occurring intermittently with the aggradation of these layers. Since these layers also contain many stones and bones entirely without encrustations it is suggested that the encrusted series derives from a part of the deposit at least marginally older than layers 31-38. The presence of similar carbonate encrusted bones in layers 39-51 suggests that the series in layers 31-38 may derive from a part of the cave deposit near the entrance which is perhaps wholly or in part contemporaneous with layers 39-51. Also possibly indicative of relatively advanced age for the encrusted series is the presence in it of a number of bones pertaining to totally extinct marsupial species, taxa which in layers 30 and below are only very poorly represented among the bones without encrustations (Balme, Merrilees and Porter in press, Table 8). Samples of encrusted and unencrusted bones from layers 31-38 are due to be analysed chemically in an attempt to determine whether there are significant differences in their ages, as was recently done by Milham and Thompson (1976) with bone assemblages at Madura Cave in the Nullabor Plain.

Layer 30 (Figs 3-5) resembles layer A in colour, texture and structure, i.e. it consists of thick bands of dark brown to black earthy sediment intercalated with thinner bands or laminae of fine textured compacted material. It is suggested that layer 30, like layer A, is part of a fan of earth which slumped relatively quickly into the cave, in this case with the possible sudden widening of the former entrance (Fig. 6). If so, it may be that the absence of occupational features in layers 31-38, assuming that they were not totally destroyed by erosion, reflects a period when the former entrance was too small for human entry. Layer 30 seems then to mark a turning point in the cave's history. Above it there is, as noted above, good evidence for in-

intermittent human occupation, and there are relatively numerous artifacts (Dortch and Merrilees 1973, Tables 2,3), whereas artifacts are extremely sparse in layers 30-38, and absent in layers 39-51. These lower layers may represent a time when the cave was never or rarely occupied by human beings and artifacts washed or fell into the cave only very occasionally from occupation sites in the vicinity of the former entrance.

RADIOCARBON AGE OF LAYERS 28-51

Radiocarbon dates obtained from charcoal samples collected from layers 18 to 39 are listed in **Table 1**; and stratigraphical positions of all dated samples in the Devil's Lair main excavation are shown in **Figs 3-5**.

Table 1

Radiocarbon dates from layers 18 to 39, Devil's Lair, Western Australia (cf. **Figs 3-5**)

Reference Number	Radiocarbon date (in years B.P.)	Layer or feature	Depth below Cave Datum (in cm)	Trench
SUA 457	31,400 ± 1500	Hearth in 18	293-302	8,9
SUA 31	24,600 ± 800	28 (Hearth)	c. 340	2
SUA 539	27,700 ± 700	28 (Hearth)	c. 340	8,2,8,7
SUA 585	32,480 ± 1250	30, lower part	c. 350	2,8,2,9
SUA 586	35,160 ± 1800	31	c. 375	2,7d,8,2,9
SUA 546	31,800 ± 1400	38	438-460	8,2,8,7,9
SUA 698	37,750 ± 2500	39	483-496	8,2,8,7,9

With the exceptions of SUA 457 and SUA 539 all radiocarbon dates in the series from layers A to 28 have been appraised in previous descriptions of the Devil's Lair dating sequence (Baynes, Merrilees and Porter 1975; Dortch 1974; 1976; Dortch and Merrilees 1973). The discrepant date SUA 457 is unresolved in this interpretation of the dating sequence. Further radiocarbon assessment now underway may provide a more reliable age for this part of the deposit and also for unit 28, now dated by the statistically dissimilar SUA 31 and SUA 539. However this charcoal band, the stratigraphically lowermost and oldest human occupational feature known in the cave, is provisionally assumed to be as old as 27,700 ± 700 BP (SUA 539), since it is possible, as noted earlier, that it has a composite origin and contains compacted charcoal of more than one hearth resulting from intermittent occupation over a long period.

Regarding layers 29-51, Dr R. Gillespie, Sydney University Radiocarbon Laboratory, has advised to refer to the statistically similar dates SUA 585, SUA 586 and SUA 546 by their "mean pooled age". The radiocarbon ages in years BP of these lower layers is as follows.

layer 29 - c. 29,500 (age estimated by interpolation)

layers 30 to 38 - 32,800 \pm 830 ("mean pooled age": R. Gillespie, pers. comm.)

layer 39 - c. 37,750 \pm 2500

layers 40 to 51 - >37,750

The three statistically similar radiocarbon dates between layers 30 and 38 suggest that the high energy mode of deposition which accounts for at least part of these layers' accumulation took place over a relatively short period of time, compared with the slower rate of deposition implied by radiocarbon dates from the upper part of the deposit.

LIMESTONE FRAGMENTS AND SOURCES OF FRACTURE

There are three main forms of limestone found in and around Devil's Lair. The first of these, aeolian calcarenite or "aeolianite", is a chief component of the Quaternary Coastal Limestone of south-western Australia (Lowry 1967; McArthur and Bettenay 1960). This stone consists essentially of calcareous particles and quartz grains cemented by calcium carbonate (cf. Shackley 1978, p.33); it is often very friable in fresh exposures though it becomes hardened with exposure. When flaked aeolianite shows uneven fracture, described in Dana as "rough and entirely irregular" (Ford 1958, p.214). Calcrete is a secondarily carbonate-enriched limestone which often forms a thick caprock developed within some sandy soils of the Coastal Limestone, as locally in the Deepdene Soil Association (Smith 1951). Calcrete and strongly cemented aeolianite are the dominant rocks exposed in outcrops and dolines in the neighbourhood of Devil's Lair.

The calcrete is tough and sometimes very fine textured, though often containing small amounts of quartz grains. Fragments and nodules of this stone can be flaked as easily as chert, producing sharp-edged flakes with durable cutting edges. Calcrete shows conchoidal, sub-conchoidal or even fracture, depending on its degree of consolidation and textural fineness, and to some extent on the nature of the fracture source (see below). Even fracture is flat or slightly curving and shows none of the definitive features of conchoidal fracture. Sub-conchoidal fracture refers to positive or negative flake scars lacking some of the distinctive features of conchoidal fracture (cf. Ford 1958, pp.213-14; Oakley 1965, Fig. 4).

The two flakes in **Fig. 7** were experimentally struck from calcrete nodules by direct percussion with a calcrete hammerstone. Each flake has sub-conchoidal fractures characterised by diffuse bulbs of percussion (negative and positive), and extensive, faint fissures; bulbar scars and ripples are absent. Most Devil's Lair calcrete artifacts have sub-conchoidal fractures similar to these produced experimentally; well developed conchoidal fractures are rare.

Another form of limestone found within Devil's Lair consists of calcite

speleothems, notably stalactites, stalagmites and flowstone (the latter is labelled "lithified bands" in Figs 3-5). In Dana (Ford 1958, p.513) it is noted that calcite shows conchoidal fracture, though "obtained with difficulty"; instead this stone tends to break along lines of cleavage. Numbers of fragmentary calcite crystals are also present in the cave deposit; although some of these resemble artifacts it has not been possible to make any positive identifications.

Fragments (clasts) of aeolianite and calcrete found in the cave deposit with some exceptions derive from collapse or breakdown of the walls and roof of the cave; or they have washed or fallen into the cave from outside. Pieces of speleothems, not including the flowstones and stalagmites developed within the cave deposit, have also fallen from the cave's ceiling and walls; or they may have been fractured and transported by collapse and erosion. Human and possibly animal activities account for some fracturing of all three forms of limestone within the cave.

The fracture surfaces on most of the limestone fragments from the deposit are generalised breaks probably resulting from mechanical adjustment of the cave roof and walls, and of limestone features outside the former entrance. In addition to clearly identifiable limestone artifacts the deposit contains *simple* flaked pieces, i.e. fragments with one or two negative flake scars (conchoidal, sub-conchoidal or even fractures), and *simple* flakes and chips which may be artifacts, or perhaps have been flaked naturally through rockfall. (Here and below *simple* flakes and chips are ones whose dorsal faces and butts are natural surfaces.)

Special attention is given here to the differences between artificially and naturally flaked limestone fragments as found in the Devil's Lair deposit. The problem is fundamental since throughout most of the deposit there are naturally broken fragments, including both those produced by mechanical and by thermal fracture; and because over half of the artifacts in the very small assemblages below layer 29 are made of limestone. The first step in dealing with this problem is to review the possible or known sources of natural fracture, particularly percussion, in and around Devil's Lair. The mechanical forms are deposit subsidence, erosion and rockfall; thermal fracture resulting from bush fires is the only form of non-mechanical fracture.

The first of these, subsidence of the cave deposit, does not seem to have caused pseudo-artificial stone chipping or flaking. This process could cause such fracturing if it involved high velocity movement of stones, or extreme shearing stresses within the deposit, though as yet there is no evidence that such subsidence has taken place in Devil's Lair. While it is true that several thick stalagmitic columns resting on the present surface of the cave deposit are broken through horizontally, presumably through subsidence, in each case the gap between the fracture faces is very narrow, measuring 1-1.5cm, and indeed this suggests relative stability of the deposit. Stability is further suggested by the apparent absence of subsidence features within

the layered deposit exposed in the walls of the main excavation (**Figs 3-5**). Nor does sediment creep on the talus cone or fan below the probable former entrance or on the cave floor seem a likely source of stone fracture, considering these features' low gradients (cf. **Fig. 6**).

Unfortunately the degree or nature of erosional activity in and around the cave, and its capabilities for producing stone or bone fracture, cannot be fully evaluated until more is learned about the former entrance and the nature of the sediments buried below it. However the subdued relief and small size of the cave (**Fig. 6**), and most significantly the presence of many completely undamaged, very small and delicate bones in the channel - cut layers 31-38 seem to show that during these layers' deposition there was no erosion capable of significant fracturing and perhaps not even of extensive abrasion of stone or bone. This seems true even when taking into account the introduction, probably by erosion, of many large stones into this part of the deposit at this time.

Rockfall, the last potential source of natural percussion discussed here, warrants close consideration since it probably has produced some fracturing of stone and perhaps also bone in the Devil's Lair deposit. Fortunately it is possible to gain an idea of the percussion potential of rockfall experimentally by dropping limestone fragments on heaps of limestone rubble, in this way simulating rockfall situations as must have occurred at times in Devil's Lair. It is assumed that vertical distances within the present Devil's Lair chamber have never been greater than about six to nine m, including the drop between the probable former entrance and layers presumably buried below it which are contemporaneous with layers 29-51. This assumption seems warranted considering the proportions and size of the present cave chamber, and the relatively small size of the former entrance and its surrounding doline (**Fig. 6**).

In the rockfall experiments sub-round to angular limestone (calcrete and well lithified aeolianite) fragments selected from the Devil's Lair excavation spoil heap, and weighing 2-10 kg were dropped on rubble heaps of similar limestone fragments from vertical distances of 4-8 m. Optimum rock fracturing conditions existed in the experiments since no sand was present in the rubble heaps, as generally would have been the case in Devil's Lair.

The following observations are made from approximately 300 drops on different arrangements of limestone rubble.

1. Significant flaking, i.e. percussion producing flakes of maximum dimension < 4 cm, occurred only very infrequently, resulting in only three such flakes.
2. Very minor chipping (producing chips having maximum dimensions < 3 mm) was relatively frequent with more than 100 chips being produced. As many as four tiny chips could be produced by impact from a single falling rock.

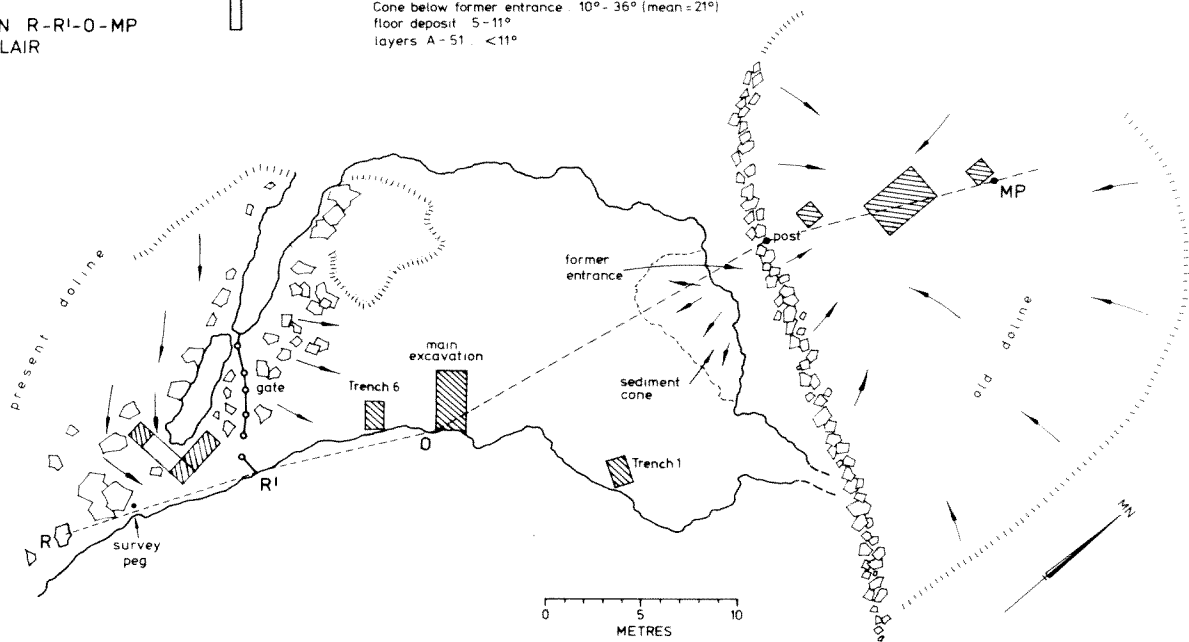
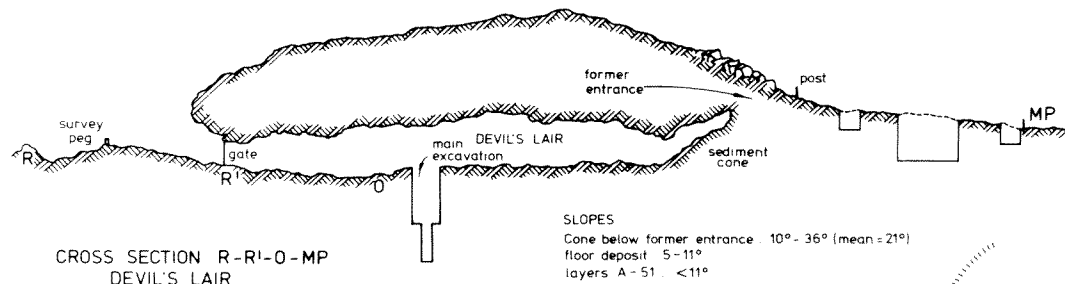


Fig. 6. Cross section and plan of Devil's Lair (after Williamson, Loveday and Loveday, 1976).

3. All of the above flakes and chips are of the simple form defined above. All have very irregular, very thin or virtually non-existent butts; where present butts are natural surfaces, not fracture surfaces.

4. All flakes and chips have poorly defined sub-conchoidal fractures; in no case is the flake scar as well developed as on those flakes experimentally produced on some of the same nodules of stone by direct percussion with a hammerstone (e.g. **Fig. 7**).

Close observation of impact between limestone fragments in rockfall showed that it lacked the explosive quality of artificial percussion: either direct, or on an anvil in the bipolar method, or even by hurling stones downwardly against a rubble heap.

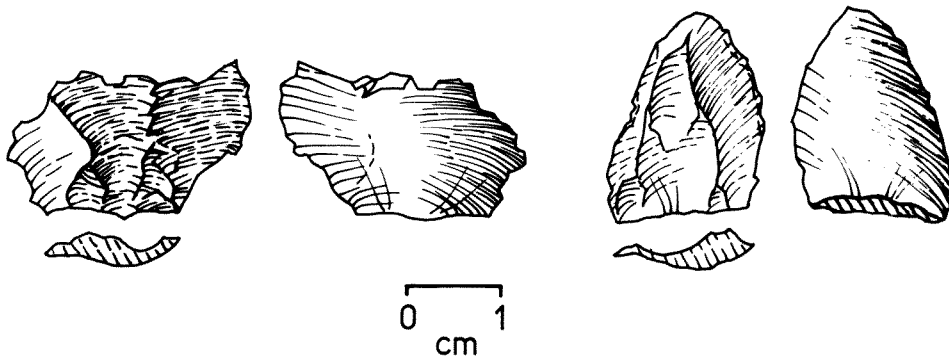


Fig. 7. Calcrete flakes produced by experimental direct percussion.

5. Rebound or tumbling did not cause fracturing of any consequence. Slopes of the rubble heaps in the experiments were much the same as those of various features in the cave, as shown in **Fig. 6**; it is concluded then that rebound was not a significant cause of natural fracture in Devil's Lair.

Following the above, a separate experiment was set up aimed at assessing the percussive potential of multiple rockfall against a single fixed edge. Different blocky pieces of fine grained calcrete selected as rockfall targets were successively wedged in the rubble heap in such a way that one angular portion of each piece presented a clear striking area. Multiple rockfall against these wedged fragments ranged between five and 100 drops. Impact almost always produced slight crushing or very minor shattering. However from one fragment three irregular chips, each with a single negative flake scar on its dorsal face, were produced by bombarding the same edge, though in varying positions, with fragments of stone, with total drops numbering about 50. The three chips produced did not closely resemble bona fide artifacts since they lacked the well pronounced conchoidal or sub-conchoidal fractures typically produced in stone knapping; because they lacked butts and merely had splintered edges at their proximal ends; and because they were entirely irregular.

Lengthier experiments may show that the flaking angles (i.e. the angle between the bulbar face and the butt or striking platform) of pseudo flakes are significantly different from those of bona fide flakes. Although untested it is conceivable that continued massive rockfall against a blocky fragment could produce multiple, adjacent and unidirectional flake scars resembling those on core flaking faces. Multiple rockfall on calcrete flakes wedged among rubble was also capable of producing fracturing resembling very irregular minor retouch or utilisation.

In summary the above experiments showed that the variables of stone weight, distance of fall, angle of contact on impact, and edge angles can at times combine in such a way that percussion by rockfall can result in the production of at least simple flakes and chips and corresponding pieces with negative flake scars. They also show that continued bombardment of rocks against a single exposed edge can, if only rarely, produce more complex chips and probably flakes, and also pseudo retouch and utilisation. I make the obvious conclusion then that rockfall cannot be discounted as a potential source of pseudo artifacts within and around Devil's Lair.

More exacting experiments assessing the flaking capabilities of rockfall do not seem warranted until more is learned about the size and shape of the former entrance, and so the probable nature of the rockfall which once took place there. Nevertheless it has been possible to identify limestone specimens listed in **Table 2** as flaked artifacts, and other specimens described later as probable artifacts (**Table 3**), not only in the light of the rockfall experiments, but also by means of technological criteria in the same way as in many other studies artifacts have been identified in scree slopes, fluvial gravels, cave fills and other deposits containing naturally fractured stones.

Most of the many apparently thermally fractured pieces from the cave deposit presumably derive from outside the cave. Such pieces, produced by bush fires, are very common at limestone outcrops in the area, and include sharp-edged specimens with flat or slightly curved faces resembling flakes, and blocky, sub-round to angular, faceted examples which are similar in appearance to flake cores. Some of these specimens from the Devil's Lair deposit superficially resemble flaked artifacts; however they can be distinguished from artifacts by their facets' lack of any of the features of conchoidal or other fracture resulting from percussion. For example the specimen in **Fig. 8:3** is a faceted, angular calcrete fragment probably produced by fire-induced thermal fracture, though it superficially resembles a bipolar core. (The piece was found in section cleaning, Trenches 7d, 8, and 9, layers 30-32.)

Thermal fractures can be produced simply by placing unbroken blocks or nodules of aeolianite or calcrete in an open wood fire, a few minutes' exposure to this heat being sufficient to cause the limestone to split and shatter. The aeolianite specimens in **Figs 9:1** and **9:2** are, respectively, flake-like and core-like pseudo artifacts

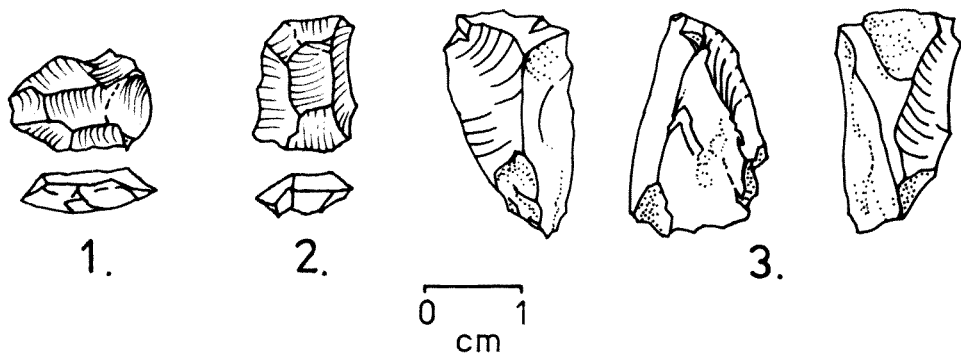


Fig. 8. Thermally fractured calcrite pseudo artifacts. Specimens 1 and 2 were experimentally produced; specimen 3 is from Devil's Lair.

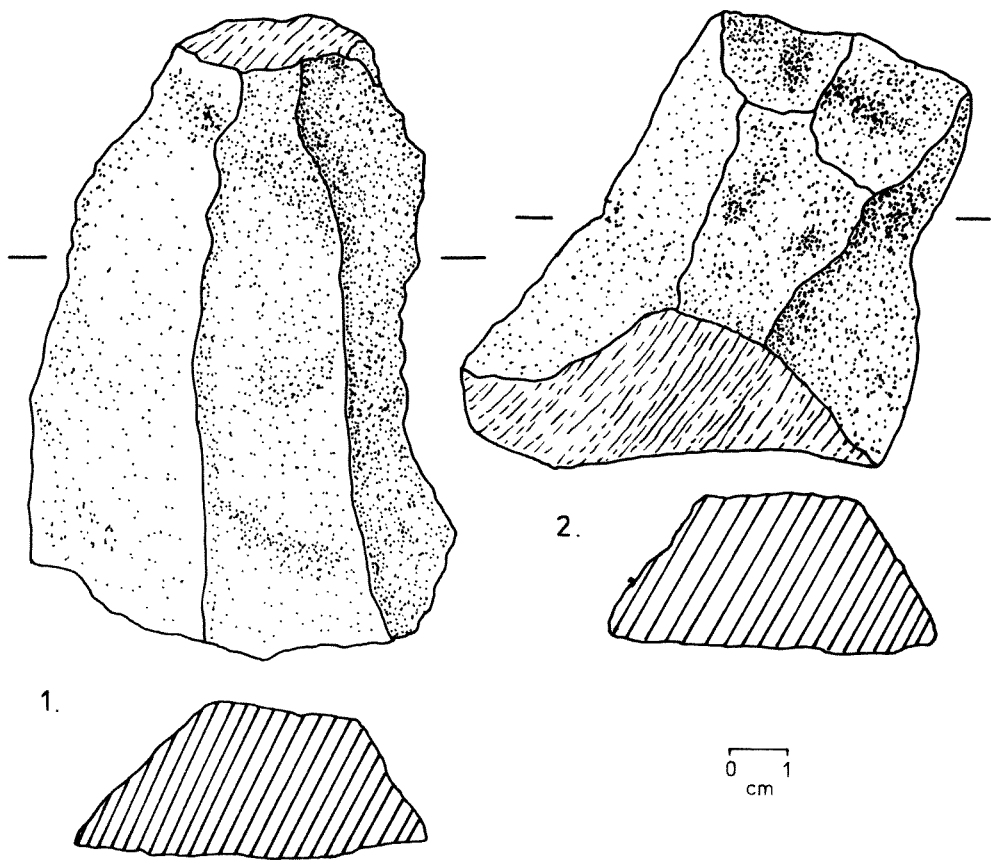


Fig. 9. Experimental thermally fractured aeolianite pseudo artifacts.

produced experimentally by placing limestone nodules in an open fire. These two pieces most closely resemble artifacts from approximately 350 thermally fractured pieces of similar size so produced. The most misleading pseudo artifacts, however, are the small flake-like or core-like specimens made of fine grained calcrete, such as the above core-like piece from Devil's Lair (**Fig. 8:3**), and the two experimentally produced flake-like, fire-fractured pieces in **Figs 8:1,2**. Finally, it should be mentioned that all such pieces from Devil's Lair or produced experimentally are light to dark grey in colour, whereas south-western calcrete, including all the calcrete artifacts described below, is usually cream-coloured, light brown or yellowish.

LIMESTONE ARTIFACTS (Table 2)

Close examination of more than 10,000 limestone fragments, ranging in size < 1 cm - > 30 cm maximum dimension, from layers 29 to 38 in Trenches 2, 7c, 7d, 8₂, 8₁, 9 and 10 revealed more than 50 fractured specimens classifiable as possible artifacts. Approximately 20 other specimens, all of which are almost certainly artificially flaked or fractured, are classified as probable artifacts. Fourteen flaked specimens have been identified as unequivocal artifacts, and all but one of these are made of fine grained calcrete. No artifacts or any other kind of archaeological material have been identified from layers 39 to 51 in test Trench 8-9 (**Figs 2,4**), though several calcrete possible artifacts were recovered from layer 39.

The calcrete artifacts listed in **Table 2** can be grouped as follows:

- retouched or flaked pieces - 4
- denticulated or notched pieces - 4
- flakes - 6

No certain cores of any kind have been recovered from layer 29 or below. A flaked calcrete fragment (B5098) from layer 29 is possibly a small core; and a multi-platform flake core fallen from section probably came from one of the layers between 31 and 38.

The illustrated specimens described below include the clearest examples of calcrete artifacts from these layers, as well as pieces of special interest.

retouched or flaked pieces - The elongate fragment in **Fig. 10:1** has semi-abrupt apparent retouch extending over one long edge. This specimen seems to have been broken off a larger retouched piece, perhaps a flake scraper.

The multi-faceted, retouched fragment in **Fig. 10:3** has a number of very clear negative flake scars. Its left hand edge (left edge of figure) consists of a single, elongate flake scar or break which truncates an invasively flaked surface whose proximal edge is lightly retouched, or perhaps utilised. Possibly this specimen is a retouched remnant of a small core.

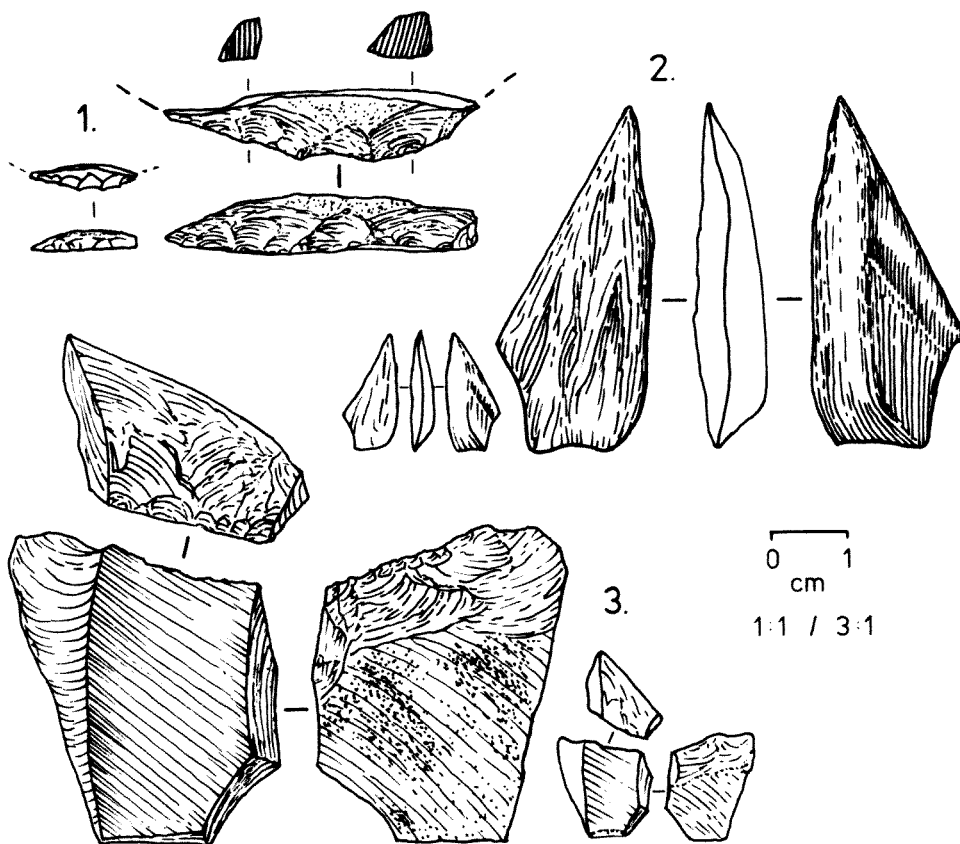


Fig. 10. Calcrete artifacts and a pointed bone tool (specimen 2) from Devil's Lair.

The bifacially flaked fragment in Fig. 11:3 is the only certain aeolianite artifact from layers 29 to 38. Several of its flake scars are clearly invasive; and the alternate flaking on one of the edges (shown vertically in side view and on the adjacent edges of the adjoining views) forms a sinuous edge. Although some of the smaller flake scars on the edges of this piece could conceivably be the result of natural sources of percussion, it seems impossible that the invasive flaking on this piece could be natural. The piece is also notched on one corner (lower left corner of left hand view).

denticulated or notched pieces - The best example of this group is the flake in Fig. 11:2 which is both notched and denticulated. This flake's dorsal face is a natural surface; its left hand edge is roughly denticulated (i.e. it has a series of closely adjacent small notches resulting in a toothed or saw-like edge); and its right hand edge has several well separated "Clactonian" or single-blow notches (i.e. deeply concave

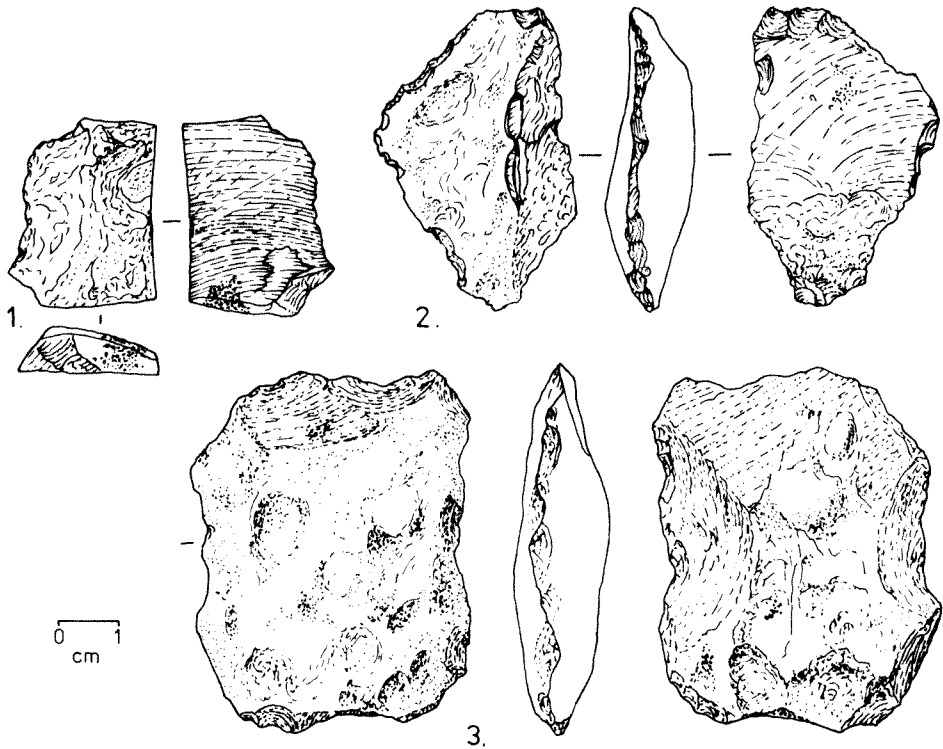


Fig. 11. Calcrete and aeolianite artifacts from Devil's Lair.

negative flake scars). The proximal end of the left edge has a large shallow, apparently retouched notch. The piece has shattering on the distal and proximal extremities of its bulbar face probably resulting from bipolar percussion; its bulb of percussion is obscured by this shattering, and also because this part of the flake is somewhat coarser grained than the distal half.

Another piece (Fig. 12:4), classified as a denticulated flake, has several closely adjacent very small notches along its right edge.

The elongate, triangular-sectioned fragment in Fig. 13:1 has a number of alternately flaked single-blow notches along one of its lateral edges. The uppermost extremity of this piece appears to have been snapped off.

flakes - Several flakes are illustrated in Figs 11:1 and 12:1-3. The flake in Fig. 12:1 has very well developed conchoidal fractures, and those in Figs 12:2, 3 have sub-conchoidal fractures. The butt of the flake in Fig. 11:1 is partially struck off. This flake has very clear edge chipping on both lateral edges which may be the result of utilisation.

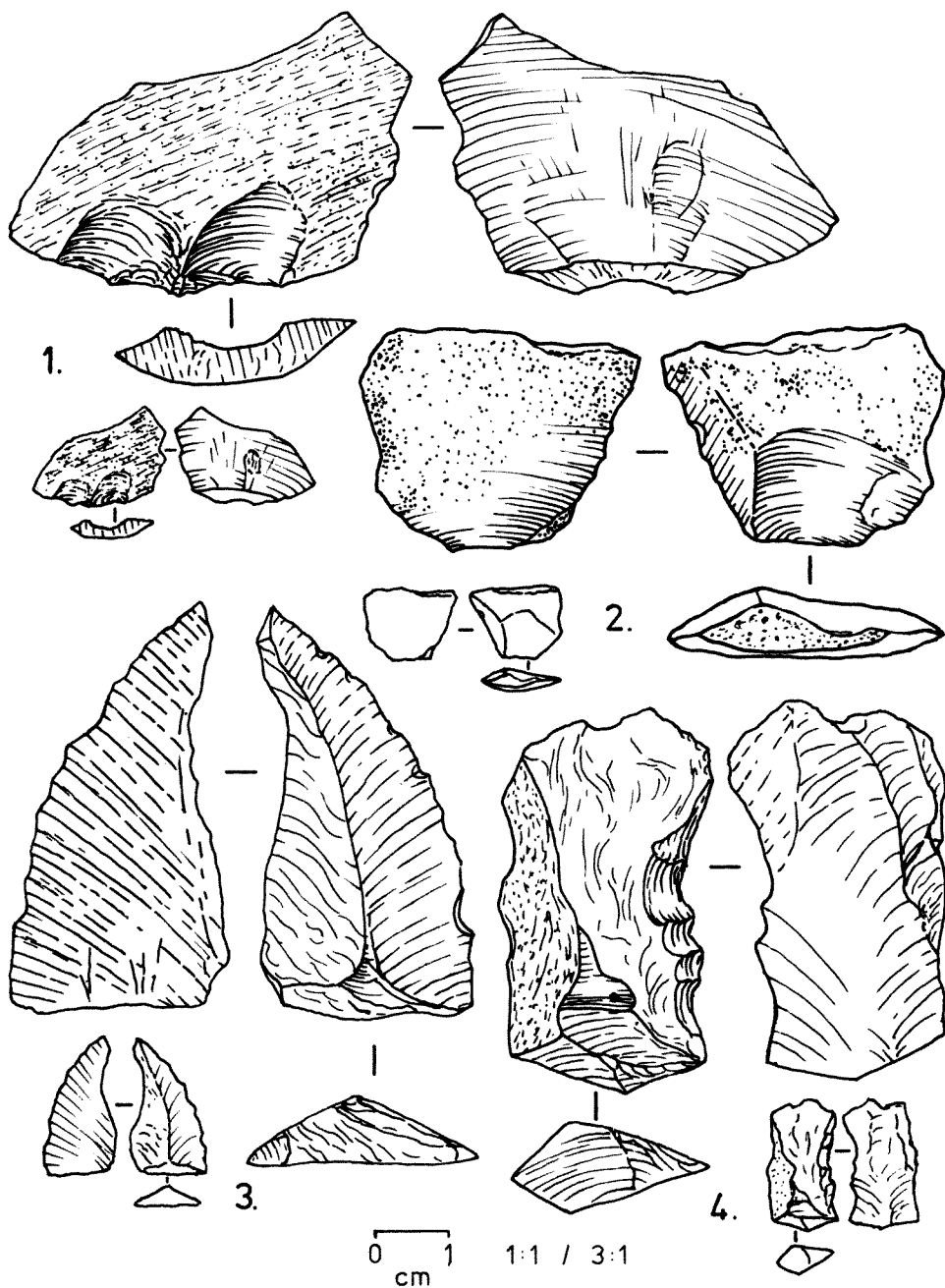


Fig. 12. Calcrete flakes from Devil's Lair.

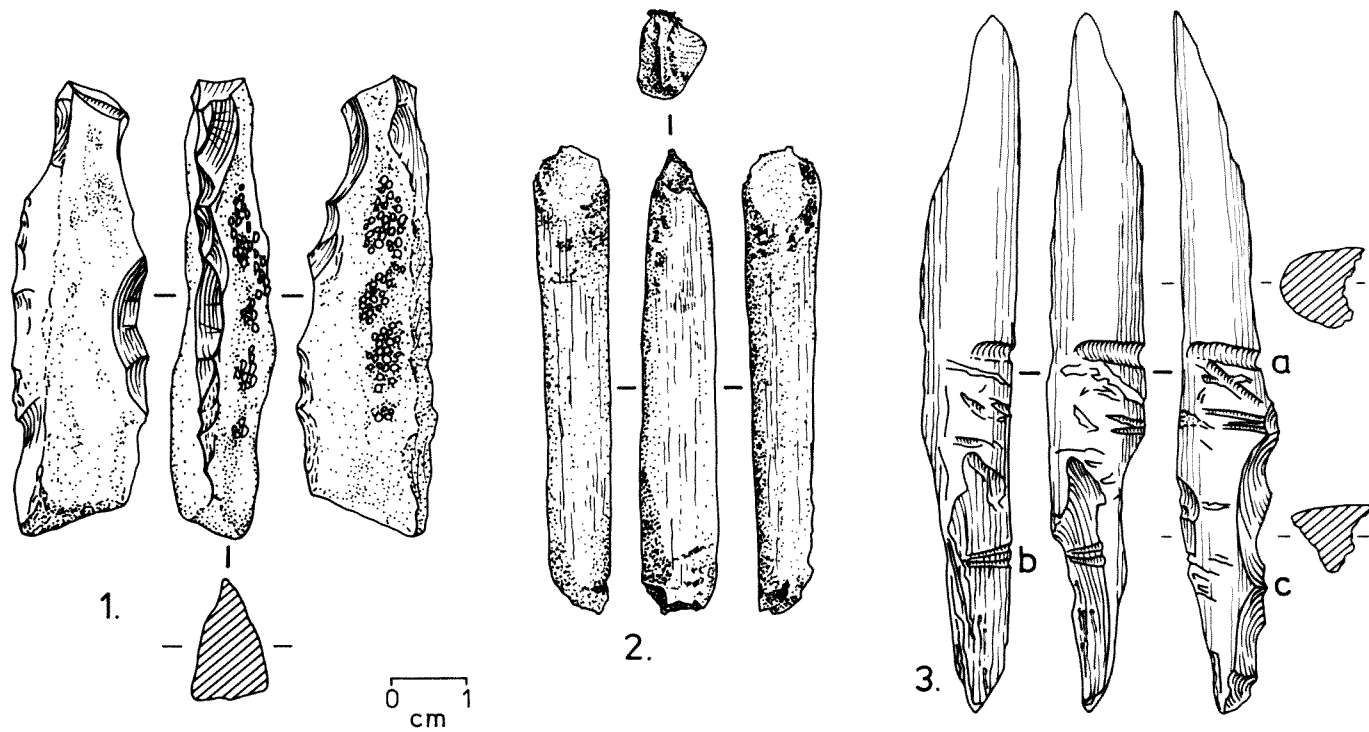


Fig. 13. An alternately notched calcrete fragment (1), a double bevelled bone probable artifact (2), and a grooved, incised and flaked bone splinter (3) from Devil's Lair.

OTHER STONE ARTIFACTS (Table 2)

Noted here are artifacts from layers 29-34 made of stone which is foreign to the limestone environment of Devil's Lair and its vicinity. Layers 29 and 30-upper yielded ten quartz artifacts all of which are classifiable as *débitage* (flaked material from stone knapping). This relatively large group of quartz artifacts much more resembles artifact assemblages in layers above 29 than it does the very scant calcrete assemblages below. The presence of such an assemblage in layers 29 and 30-upper seems to support the earlier suggestion that layer 30 represents a widening of the cave entrance which enabled people, perhaps for the first time, to occupy the cave itself.

From layer 30-lower and below only two artifacts made of anomalous stone have been recovered. The first of these is a chip of biotite granite (pers. comm. J.E. Glover) coming from a mixture of layers 30-lower and 31. The nearest surface sources of this stone, and also of quartz, are in exposures of gneiss either five km east of Devil's Lair; or on the coast five km west of the site. Gneiss is also exposed in the stream bed in Strong's Cave 30-40 m almost directly below Devil's Lair (Williamson, Loveday and Loveday 1976); and it is possible that ancient people obtained stone from there.

The second piece, a flaked opaline fragment (Fig. 14) from a mixture of layers 33 and 34, is described mineralogically by Glover (Glover 1979), who also discusses

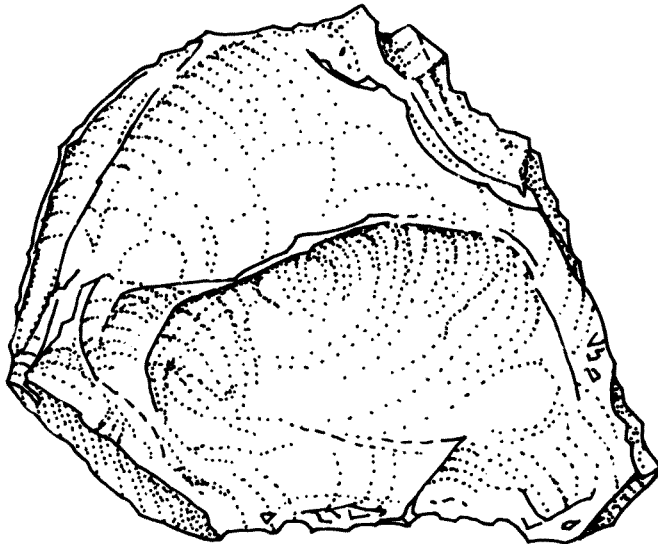


Fig. 14. An opaline flaked fragment from Devil's Lair (cf. Glover 1979, Pl. 1). The maximum width of this piece is 4.72 mm.

possible sources of this stone. This tiny artifact is interpreted as a fragment from the retouching or breakage of a larger piece. Its main significance, as well as that of the quartz and biotite-granite specimens above, is in providing evidence that people were in or near the cave before or during the time that layers 29-33, and perhaps 34, accumulated.

BONE ARTIFACTS AND BONE PROBABLE ARTIFACTS (Tables 2,3)

Only three of the several thousand pieces of bone from layers 29-38 have been identified as artifacts. Two other pieces described below are regarded as probable artifacts; at least 50 others in these layers are classifiable as possible artifacts since they resemble the bone debris resulting from various artificial methods of shattering limb bones. However rockfall can cause similar fractures on bones; and it is possible that this was an important source of natural bone fracture at Devil's Lair. The category of possible artifacts is then necessary because with many kinds of bone fractures, just as was earlier shown with limestone, there seems little way of distinguishing artificial from natural percussion, particularly rockfall.

Bone chewing by animals is another important source of bone fracture in Devil's Lair (Baynes, Merrilees and Porter 1975, p.102). In the case of small, easily shattered bones it is probably impossible to know whether clean edged fractures clearly resulting from percussion are artificial, or were caused by animal chewing or rockfall.

When found, two of the three bone artifacts (specimens B5260 and B3692; **Table 2**) and both probable artifacts (B3690 and B3693; **Table 3**) were thickly and entirely covered with the distinctive carbonate cement tentatively regarded as representing a re-deposited element among the finds from the lower layers in the Devil's Lair deposit.

The first bone artifact (**Fig. 15**) comes from layer 29 and is a length of tibia shaft from a Western Grey Kangaroo (*Macropus fuliginosus*: pers. comm. J. Balme). Clean edged breaks such as these on a bone shaft of this size and thickness are probably not the result of animal chewing but are caused by violent, explosive impact, either natural or artificial. They resemble very closely fractures produced experimentally by striking fresh or dry limb bones against anvil edges, as for example the kangaroo femur in **Fig. 16:1**, which was broken by two separate blows against an anvil edge with the bone held in the manner illustrated in **Fig. 16:4**. Similar breaks can be produced by dropping limestone fragments on limb bones exposed in various arrangements simulating likely rockfall situations in Devil's Lair. For example the kangaroo metatarsal in **Fig. 16:2**, while lying across two bricks, was broken by two strikes of a 1.5 kg limestone fragment dropped from a height of 1 m.

Table 2

29 stone and bone artifacts from layers 29-38, Devil's Lair, Western Australia.

W.A. Museum Registration Number	Calcrete* Artifacts	Other Artifacts	Layer	Depth below cave datum in cm	Trench	Illustration
B5259		2 quartz flaked fragments	29	316-323	7c	
B5260		1 fractured tibia shaft	29	316-323	7c	Fig. 15
B5245	1 notched flake		29	331-340	7d	
B5098	1 flaked fragment	1 quartz flaked fragment	29	335-340	8,	
B3761		1 pointed bone tool, 1 quartz flaked fragment, 1 quartz flake, 2 quartz chips	29	333-340	9	Fig. 10:2
B5279		1 quartz fragment	29	339-342	10 South	
B5173		1 quartz chip	30, upper	342-347	9 North	
B5288		1 quartz chip	30, upper	342-347	10 North	
B5101		1 biotite granite chip	30-31, mixed	358-370	8,	
B5103	1 alternately notched fragment		32	370-385	8,	Fig. 13:1
B5258		1 opaline flaked fragment	33-34, mixed	c. 400	8,	Fig. 14 cf. Glover 1979.pl.1
B5132	1 flake		34	405-419	2	Fig. 12:2
B5240	1 retouched fragment		34	400-414	7d	Fig. 10:1
B5180	1 denticulated and notched flake		34	400-421	9 North	Fig. 11:2
B5266	1 denticulated flake 1 flake		35	393-404	7c	Fig. 10:4
B5270	1 flake		37	404-409	7c	Fig. 12:1
B5109	1 bifacially flaked fragment	(*This specimen is made of aeolianite)	37	432-437	8,	Fig. 11:3
B5136	1 multi-faceted retouched fragment		38	440	2	Fig. 10:3
B5298	1 flake		38	409	7c	
B3692		1 grooved, incised and flaked bone splinter	38	c. 440	7d	Fig. 13:3
B5185	1 flake		38	447	9 North	Fig. 11:1
B5203	1 flake		38	446	9 South	Fig. 12:3
TOTAL	14	15 (10 quartz, 2 other stone, 3 bone)				

The metatarsal in **Fig. 16:3** was broken by a single strike of a 2.5 kg limestone fragment dropped from a height of 3 m; in this case the bone's shaft was wedged within a stack of bricks with only its proximal end exposed.

Similar rockfall experiments aimed at removing both articular ends of limb bones to produce double truncated shafts, such as those in **Fig. 15** and **Fig. 16:1**, centre, were not successful. One end of the limb bone was first broken off by impact from falling rocks as done with the piece in **Fig. 16:3**. Then the truncated shaft was reversed in the stack of bricks, and the intact articular end was subjected to rockfall. Even under controlled, optimum conditions such as these it was not possible in over 50 attempts with different fresh bones to produce an intact length of limb bone shaft with both ends cleanly broken off, though continued drops under these controlled conditions might eventually produce such bones. In experiments with dry bone general shattering of the shaft occurred.

It is deduced from experimental rockfall and replication, within the context of Devil's Lair, and with regard only to large limb bones as discussed here, that bone shafts with both articular ends cleanly broken off almost certainly result from artificial percussion and not from rockfall. Judging by the very brief, though concentrated effort required it seems reasonable to assume that these truncated limb bone shafts were deliberately broken, either by two separate blows against an anvil edge in the manner illustrated in **Fig. 16:4**; or by resting the shaft on a ridge of rock and then striking it with a hammerstone. It is suggested that the articular ends were removed from limb bones for the purpose of obtaining marrow.

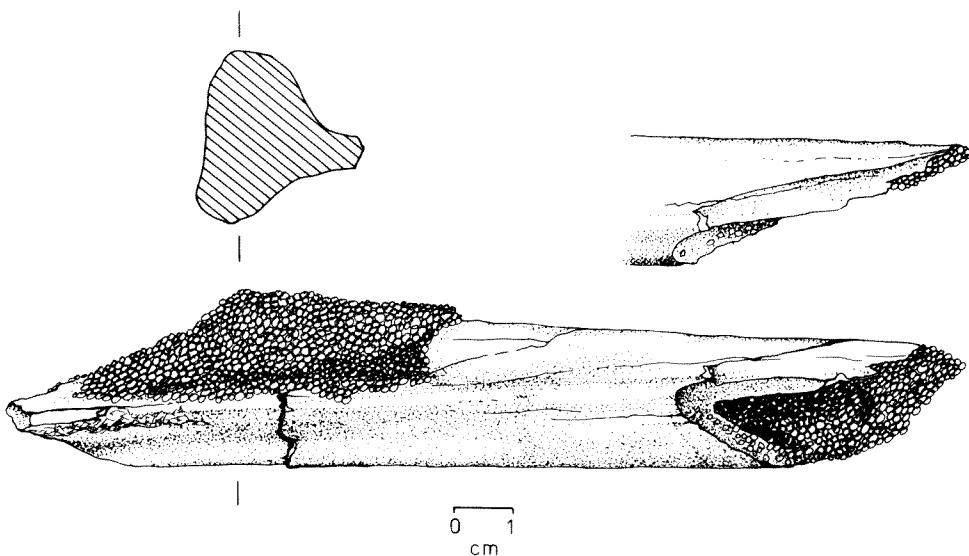


Fig. 15. An artificially fractured *Macropus fuliginosus* tibia shaft from Devil's Lair.

The bone in **Fig. 15** also has several sharp-edged, V-sectioned incisions up to 25 mm long and 0.2 mm wide, as well as elongate shallow striations all of which are judged as artificial, since they closely resemble incisions and other marks experimentally made on bone shafts with calcrete and quartz flakes. Most of these marks are oriented longitudinally on the bone shaft. The elongate incisions' dimensions and orientation, and the multiple striations do not resemble scratches or incisions made by animals' teeth, such as on bones (e.g. 65.11.11 and 68.2.41) kept in the palaeontological collection, Western Australian Museum. In addition to having been beneath the carbonate crust, some of the incisions contain partial infilling of carbonate showing clearly that the marks predate the encrustation of this bone. (All these marks are on the opposite side of the piece as illustrated in **Fig. 15**.)

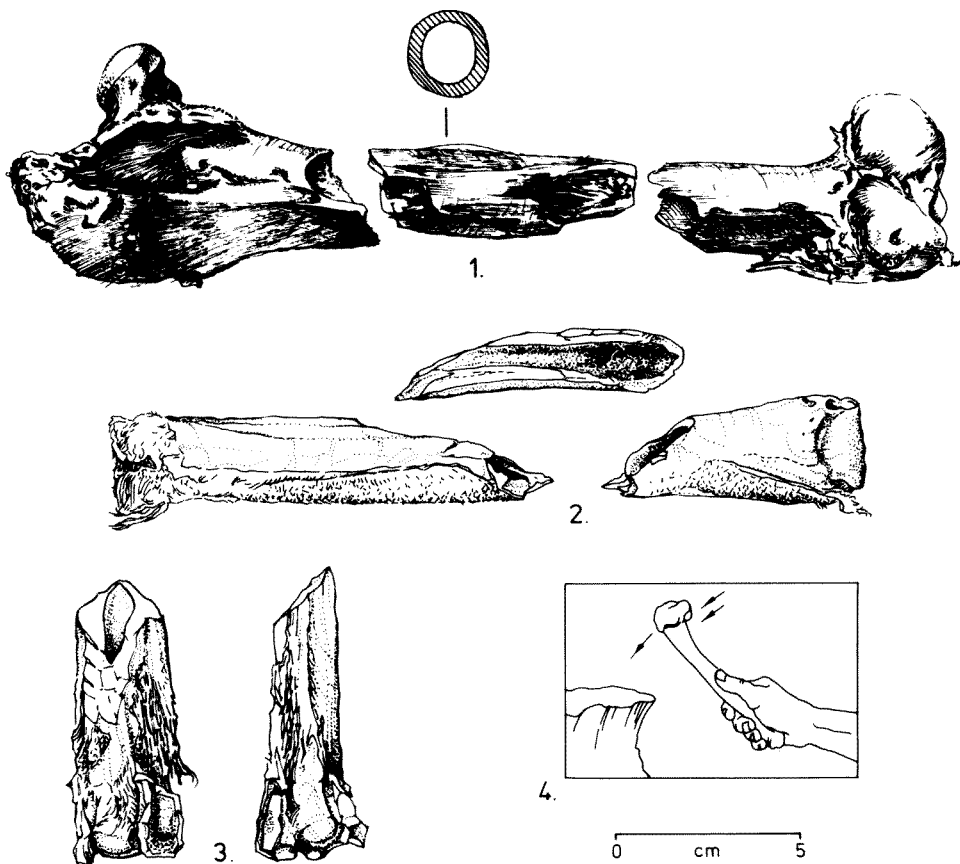


Fig. 16. A kangaroo femur (specimen 1) experimentally broken by percussion against an anvil edge as shown in 4; and two kangaroo metatarsals (specimens 2,3) broken in experimental rockfall under simulated natural conditions.

A second bone artifact also from layer 29 (**Fig. 10:2**) is the only one of the three described which was not covered in carbonate cement. This is a very small pointed bone fragment which is extensively polished and worn over the whole of both faces. Its surface, under x12.5 - x50 magnification, shows no striations or, with one exception, other linear marks attributable to manufacture by abrasion or cutting (cf. Newcomer 1974, pp.148-149). The two features on this piece which are considered to be evidence of artificial modification are the straight V-sectioned mark on one face (**Fig. 10:2**, right); and the clearly scooped out part of one side of one face of the pointed extremity (inner edges of left and right views in **Fig. 10:2**).

This artifact's method of manufacture is problematical. Possibly it is simply a fragment of convenient shape collected from bone debris resulting from the shattering of a large limb bone. Despite its small size the piece could have been an awl used in gouging holes in skins. Whatever its possible function, any use resulted only in a deep polish and not in striations though it is possible that the scooped out part of the pointed extremity was also caused by extensive use.

The last bone artifact (**Fig. 13:3**), from layer 38, is an elongate, weathered bone splinter, probably part of a *Macropus fuliginosus* tibia (pers. comm. J. Balme). The piece has extensive and varied surface modifications labelled on the different views of the figure as follows: (**a**) U-sectioned grooves (the uppermost, very large groove is 10 mm long; 2.8 mm wide; and about 1 mm deep); (**b**) two narrow, closely adjacent and relatively deep, straight incisions (one is V-sectioned); and (**c**) three sub-conchoidal negative flake scars (the largest is about 22 mm wide). The two groups of marks labelled (**b**) and (**c**) and probably also the (**a**) group were made after the splinter had been removed from the bone shaft.

The piece is classifiable as an artifact; it is not interpreted as a tool since it seems incomplete, and none of its edges shows signs of wear. Its identification is based on the following criteria. First, the splinter itself and all the marks on it can be quickly and easily replicated on fresh or dry bone, using the simplest stone tools (an anvil, a flake and a hammerstone). Second, although ease of replication does not prove that the marks are artificial, it is still purely conjectural whether animals could have produced the uppermost U-sectioned groove (**a**); the largest sub-conchoidal fracture (**c**); or the two closely adjacent, sub-parallel, straight incisions (**b**). Obviously the possibility cannot be ruled out entirely that the marks were made by one of the larger marsupial carnivores or possible carnivores which lived in this part of the south west 30,000 or more years ago, i.e. the Tasmanian Devil (*Sarcophilus harrisi*), the Thylacine (*Thylacinus cynocephalus*), or the "marsupial lion" (*Thylacoleo* sp.) (Balme, Merrilees and Porter in press, Table 3; Merrilees 1968, pp.11-12). But this origin for the marks cannot be tested easily since practically nothing is known of the diet and habits of *Thylacoleo*; nor is very much known of the bone chewing

capabilities of Thylacines. As for Tasmanian Devils, at least the largest U-sectioned groove (a), and the small V-sectioned incision (b) seem well outside the size and shape ranges of this species' teeth marks, judging by collections of bones chewed by these animals (e.g. palaeontological specimens 65.11.11). Taking these uncertainties into account, the piece in Fig. 13:3 is regarded as an artifact until a more plausible alternative can be suggested.

The two carbonate encrusted pieces classified as probable bone artifacts (Table 3), are of particular interest since both may be made on bones of extinct marsupials. The first of these (Fig. 13:2), from layer 32, is a broken, weathered long bone shaft, without a cavity, which has a double-bevelled edge at one end. The bone has been examined by staff of Palaeontology Department, Western Australian Museum, and described by them as follows:

We have compared B3693 with various anatomical structures of a number of species, ancient and modern, and have found no close match. The virtual absence of a central cavity and the form suggest that it comes from a fibula, nearer the proximal end. By elimination, we suggest it represents *Sthenurus* but we have insufficient comparative material to verify this.

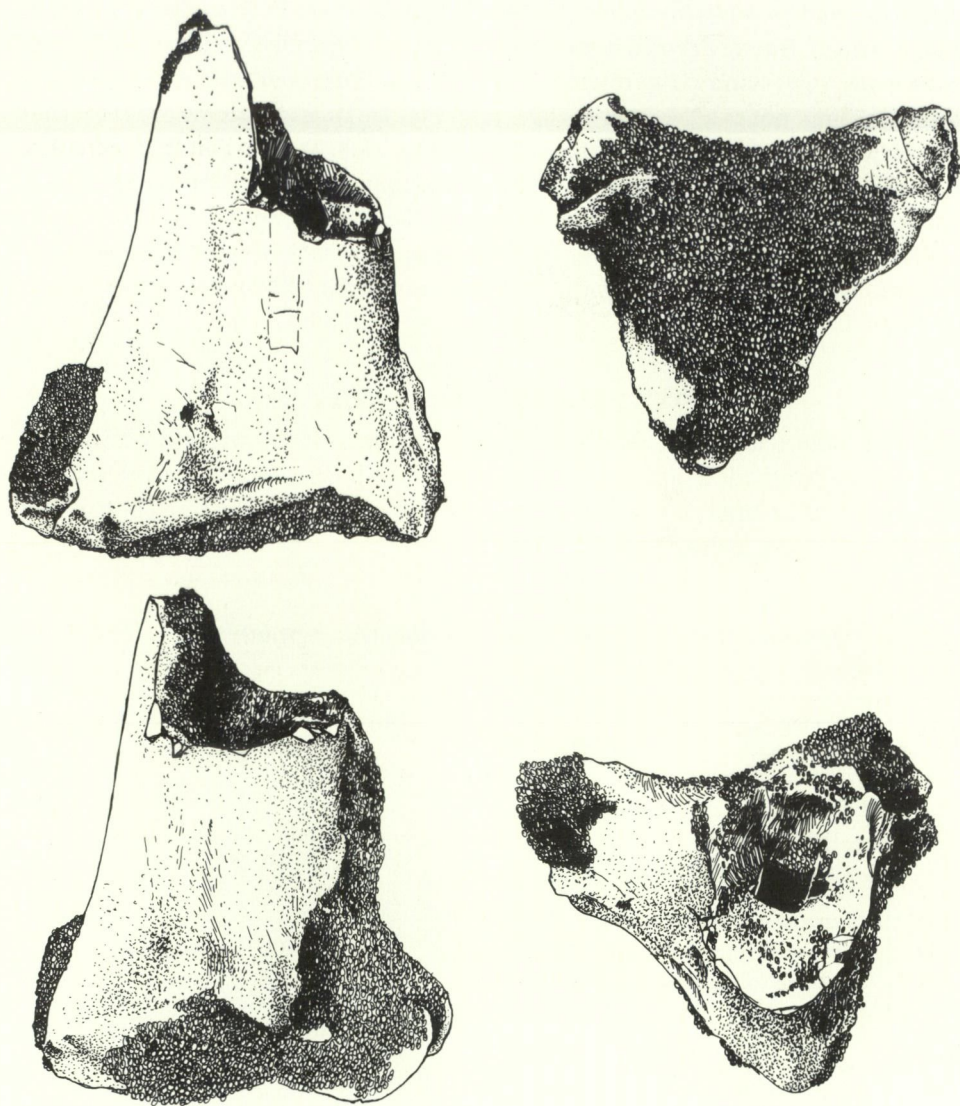
(pers comm. D. Merrilees, J. Balme, J. Porter.)

The bone's bevelled surfaces are much the same size and are slanted at much the same angle, and meet to form a roughly convex edge. Microscopic examination (up to x50 magnification) shows no signs of artificial cutting or abrasion of the bevels, or of the edge they form. A few of several marks on the shaft are possibly artificial; most others, including some on both bevels, are shallow indentations and short, curving shallow grooves resembling animal tooth marks.

There seems to be no form of animal activity, or any other natural force which can produce a double bevelled extremity on a solid bone shaft. Experimental replication shows that such a feature can be produced on one broken end of the solid section of a kangaroo fibula, fresh or dry, with very little effort. The end of the bone is simply rubbed vigorously against a sandy limestone surface, first on one side and then the other; less than two minutes' such abrasion suffices to create a bevelled edge similar to that of the Devil's Lair specimen. Furthermore the edge so produced is sharp, tough and capable of being quickly re-sharpened.

The apparent lack of natural agencies which could produce a double bevelled extremity and the ease with which double bevels can be made seem evidence enough to suggest that the bone is an artifact. However the total lack of any definite marks of artificial modification prevents this specimen from being classified as a definite artifact.

The second probable bone artifact, from layer 31 (Fig. 17, Table 3), has been identified as a metatarsal from a macropodine much larger than *Macropus*



0 1 2
cm

Fig. 17. A probably artificially broken metatarsal from Devil's Lair, possibly belonging to the extinct macropod *Protemnodon*.

fuliginosus and possibly *Protemnodon brehus* (pers. comm. D. Merrilees). The prominent curving fracture shown in the left hand views of the piece, and shown end-on in the lower right hand view, resembles very closely those produced experimentally by striking limb bones against anvil edges (e.g. Fig. 16:1); and it seems probable that this fracture was made in the manner shown in Fig. 16:4. Moreover it does not seem likely that rockfall at Devil's Lair could have caused such a cleanly fractured edge on a bone this thick (cf. lower right hand view in the figure). Nevertheless the much smaller kangaroo metatarsal in Fig. 16:3 was broken by rockfall, and the possibility of rockfall having caused the fracture on the piece in Fig. 17 cannot be precluded.

LIMESTONE PROBABLE ARTIFACTS (Table 3)

Several limestone specimens classified as probable artifacts warrant description since they help provide a probably truer picture of the limestone artifact assemblages from layers 29-38 than can be shown only from the study of those pieces listed in Table 2 as definite artifacts.

Table 3

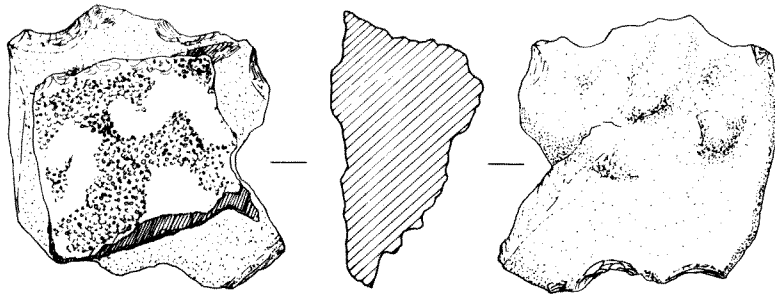
Selected limestone and two bone probable artifacts and other finds from layers 30-38, Devil's Lair, Western Australia.

W.A. Museum Registration number	Description (All specimens are limestone probable artifacts except where otherwise indicated)	Layer	Depth below cave datum in cm	Trench	Illustration
B5297	1 fragment of turban shell*	30	326-345	7c	
B5129	1 alternately notched fragment	31	357-373	7d	Fig. 18:1
B3690	1 fractured metatarsal, from a large macropod†	31	358-370	8 ₇	Fig. 17
B5299	1 fragment of marine bivalve shell	32	381-395	9 North	
B3693	1 double bevelled bone, probably a macropod fibula‡	32	383-406	9 South	Fig. 13:2
B5156	1 notched flake	32	403	8 ₂	Fig. 18:2
B5237	1 notched flake	33	c. 399	7d	Fig. 18:3
B5106/1	one half of a fractured limestone fragment	33	section cleaning	7d, 8 ₇ , 9	Fig. 20
B5119	one half of a fractured limestone fragment	33-34, mixed	c. 400	8 ₇	Fig. 20
B5116	1 flaked fragment	34	section cleaning	7d, 8 ₇ , 9	Fig. 19:1
B5298	1 notched fragment	38	409	7c	Fig. 19:2
B3684	1 quartz pebble	38	449	2	Fig. 21:2

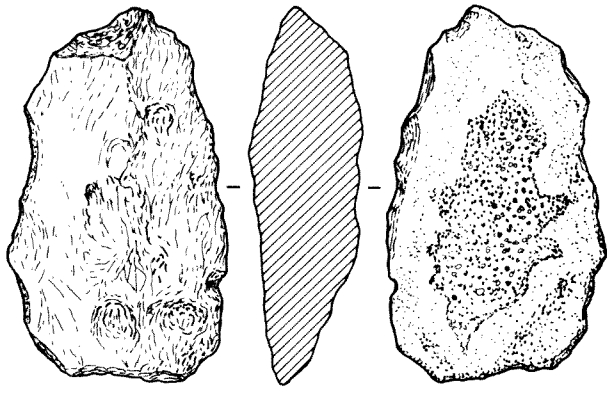
* *Turbo (Ninella) whiteleyi* (Iredale): pers. comm. G.W. Kendrick

† possibly *Protemnodon*: pers. comm. D. Merrilees

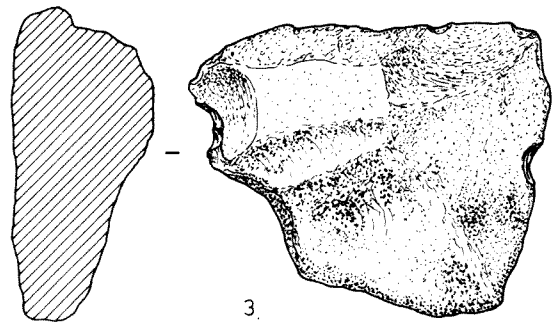
‡ possibly *Sthenurus*: pers. comm. D. Merrilees, J. Balme, J. Porter



1.



2.



3.

0 1
cm

Fig. 18. Three limestone probable artifacts from Devil's Lair.

The probable artifacts include some simple flakes and chips, and simple flaked fragments made of fine textured calccrete, as well as several more complex pieces made of coarser grained limestone, three of which are described here. The first two of these, illustrated in **Figs 18:2,3**, seem to be heavily weathered flakes. Both pieces have notches, and the notch on the left hand edge of the piece in **Fig. 18:3** appears retouched. The piece in **Fig. 18:2** has a number of single-blow notches on both lateral edges.

The third piece (**Fig. 18:1**) is a weathered calccrete fragment with an alternately arranged series of apparent notches on two opposite edges (upper and lower, as illustrated). I suggest that this piece is classifiable as a probable artifact since it is difficult to see how such an arrangement of notches could have been produced naturally. It is probably correct to say that this piece, like the two described above, is not acceptable as a definite artifact only because it consists of relatively granular material which has subsequently weathered to the extent that diagnostic elements of its suggested artificial features have been obliterated.

A different problem arises with the notched piece in **Fig. 19:2** which is not a probable flake but a weathered calccrete slab with sandy carbonate cement on both

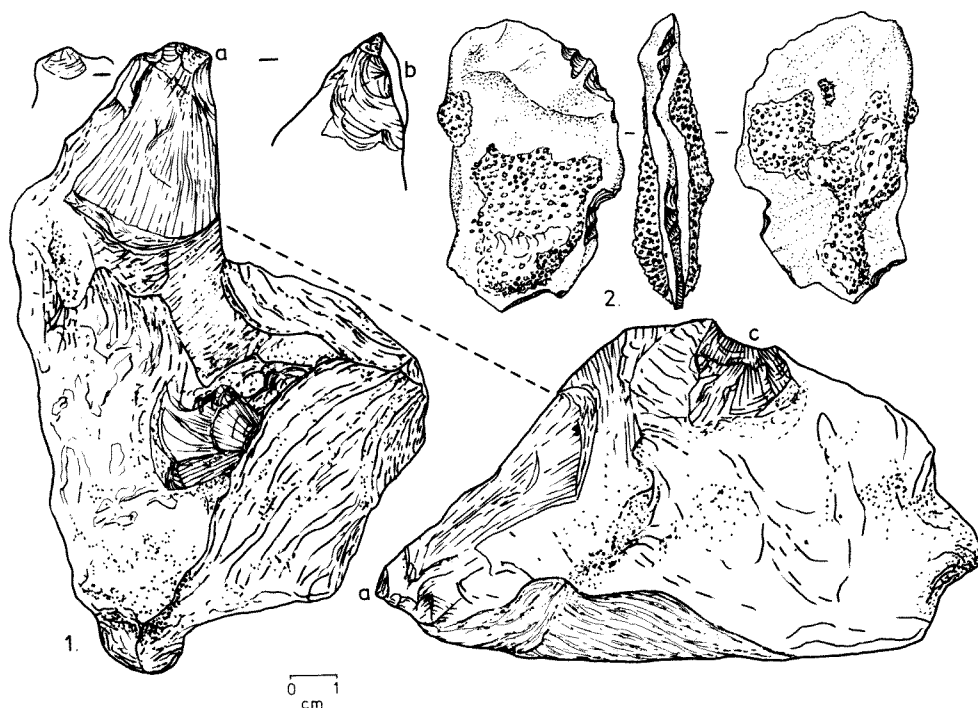


Fig. 19. Two limestone probable artifacts from Devil's Lair.

faces. One edge has a single large apparently retouched notch consisting of at least four partly overlapping flake scars. This notch has a fresh texture and had been covered by a sandy carbonate encrustation. It is very similar to experimentally produced retouched notches on calcrete, yet it is the sole feature on this piece which seems of artificial origin; and this is not sufficient evidence to enable the piece to be classified as a certain artifact.

Another specimen, illustrated in **Fig. 19:1**, is a massive piece of fine grained calcrete which has three differently oriented, sub-conchoidal negative flake scars (**a,b,c**). In addition to the prominent, hinged flake scar (**a**) and the smaller adjacent scar (**b**), the pointed extremity of this piece has some minor flaking which could be either natural damage or the result of utilisation. This piece is not identifiable as an artifact because it is only a simple flaked piece. That is, all of its flake scars have been produced by percussion against natural surfaces, and almost certainly the flakes removed would have been of the simple variety which, as shown above, can result from rockfall. However the flake scars show well developed fissures and some rippling typical of artificial percussion, and which were not produced in the rockfall experiments. From this it is concluded that the piece probably is an artifact.

A final specimen (**Fig. 20**), comprising two halves of an elongate piece of weathered, rough-textured, strongly lithified limestone, perhaps a root concretion, is of particular importance since it may be evidence that people entered the cave during the deposition of layers 33 and 34. The two halves of this specimen were found no more than one m apart in layer 33 (part B5106/1), and a mixture of layers 33 and 34 (part B5119; cf. **Table 3**). The rejoinable, angled central break is much more recent than the extremely weathered fracture surfaces at the ends of the piece. The fact that the two halves were found very close together and at much the same depth and stratigraphic position must mean that the piece was broken within or very near the area of the main excavation, probably on an exposed surface of layer 33. The only plausible sources of stone fracture in this situation are rockfall and human action.

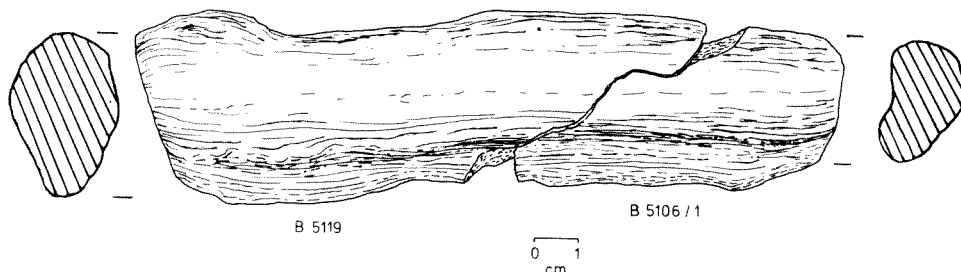


Fig. 20. A probably artificially broken piece of limestone from Devil's Lair.

The two surfaces of the central break exhibit typical uneven fracture, and from neither can the direction of the blow or the point of impact be determined, though the latter may be present on one of the two missing parts of the two halves. It is considered that a sharply angled break of this nature is much more likely to have been produced by the piece being struck against the edge of an anvil rather than by other means of artificial percussion, or by rockfall. Experimentation with various means of artificial percussion and with simulated rockfall on similar limestone pieces should provide clues for the origin of this fracture. For the present this piece is regarded as a probable artifact, and is thus the only tentative evidence that people entered the cave at times prior to the deposition of layer 30.

OTHER SMALL FINDS (Table 3)

The only specimens here of certain archaeological significance are two fragments of marine mollusc shell, each measuring six mm across. The first is a piece of turban shell from layer 30, and the second a probable bivalve shell fragment from layer 32. Each piece has been shown by X-ray diffraction analysis to be composed of aragonite (W.A. Government Chemical Laboratories Report 60243-44/78: pers. comm. D. Burns); and thus each is a fragment of marine shell preserving its original crystalline structure (i.e. the aragonitic form of calcium carbonate), rather than being a calcite cast fallen or leached out of the dune limestone in which Devil's Lair is formed. The only plausible explanation for the presence of these shells in Devil's Lair seems to be that they were humanly transported as much as 30 km from a former coastline (cf. Balme, Merrilees and Porter in press, Fig. 11). It is practically impossible to deduce even the likely range of human activities these tiny specimens could represent, beyond of course the obvious possibilities that people were eating marine shellfish and using their shells as tools or ornaments. Their occurrence in layers dated to 32,800 BP makes them much the same age as scatters of freshwater mussel shells interpreted as human food remains from Lake Mungo, New South Wales (Barbetti and Allen 1972, Table 1; Bowler 1976, p.59).

The objects in Fig. 21 are quartz pebbles; one (Fig. 21:2) is from layer 38, the other two (Figs 21:1,3) are emu cropstones collected in the Murchison district, W.A. by Dr S.J.J. Davies, Division of Wildlife Research, C.S.I.R.O. The Devil's Lair specimen is well within the size and weight range of emu cropstones (pers. comm. S.J.J. Davies), though whether it is a cropstone washed or fallen into the cave through natural circumstances; or one derived from the butchering of an emu; or a pebble brought by a person to the cave from coastal or inland sources cannot be decided, since all seem equally likely possibilities.

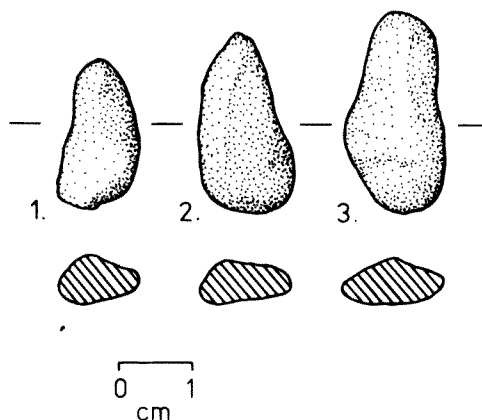


Fig. 21. A quartz pebble from Devil's Lair (specimen 2), and two quartz emu cropstones from the Murchison district (specimens 1, 3).

Layers 29-38 at Devil's Lair, like most of the layers above 29, contain small quantities of charred bone fragments. Charred bone is very plentiful in some of the Devil's Lair hearths; and it is obvious that kitchen activities within and perhaps immediately outside the cave are one important source of charred bone. However very small amounts of some charred bone in the zone below layer 38 where artifacts have not been found may mean that charred bone deriving from bush fires was occasionally washed into the deposit. A separate archaeological study of charred bone at Devil's Lair is presently underway.

DISCUSSION

The main purpose of this and Glover's accompanying paper (Glover 1979) has been to demonstrate that the part of the Devil's Lair cave deposit dated at 33,000 BP contains an archaeological element. Yet some tentative interpretations of the artifacts can be made. Firstly, though most of the stone artifacts resemble quarrying or workshop waste material it is probably valid to refer to some pieces as apparently retouched or utilised tools, i.e. the calcrete specimens illustrated in **Figs 10:3,4; 11:2; and 13:1**. The pointed bone artifact in **Fig. 10:2** has already been described as a tool,

and possibly the bone in **Fig. 13:2**, if it is indeed an artifact, was also a tool. Since apparent tools are present it seems correct to refer to this material as a collection of tools, *débitage* and debris intermittently washed into this part of the cave deposit from occupation sites perhaps within the former entrance or immediately outside the cave. Worth re-emphasising is the broken limestone fragment in **Fig. 20** which, could it be shown to be unequivocally an artifact, would constitute evidence for occasional human occupation, or at least a momentary human presence in the position of the main excavation at 33,000 BP.

Aside from the two fragments of marine shell possibly representing mollusc eating, only two of the artifacts suggest anything about the probable diet of the ancient people living around Devil's Lair. These are the two artifacts made on limb bones of the Western Grey Kangaroo (**Figs 13:3; 14**) which, assuming that artificially modified bones nearly always belong to species preyed on by human beings, can be regarded as direct evidence that Aborigines living around Devil's Lair 30,000 or more years ago hunted this species, just as they did here and in other parts of the south west in more recent periods (Baynes, Merrilees and Porter 1975, pp.102-104); and for ethnohistorical evidence (Meagher 1974).

It is probable that people who hunted the Western Grey Kangaroo were also capable of successfully hunting the extinct large macropods *Sthenurus* and *Protemnodon*, and perhaps other large extinct marsupials represented among the fauna in layers 31-38 (Balme, Merrilees and Porter in press, Table 3). This is suggested by the two bone probable artifacts in **Figs 13:2** and **17**, both of which may be made on the bones of the two named extinct animals, though this evidence seems less significant for people having hunting large, now extinct species than does the presence of the two definite artifacts noted above which are made on large kangaroo bones. In any case better evidence than this from Devil's Lair for the hunting of extinct macropods in this part of the south west comes from Mammoth Cave, 11 km north of Devil's Lair, where several bone artifacts, perhaps considerably older than the Devil's Lair assemblage described here (Merrilees 1968, p.10), are made on *Sthenurus* limb bones (W.A. Museum palaeontological collection specimens 67.11.46; 68.2.27; Archer, Crawford and Merrilees in preparation).

Although not weakening the very strong case for a prey-predator relationship between large macropods and human beings living around Devil's Lair 33,000 years ago, it is nevertheless not yet possible in the channel-cut layers 31-38 to establish definite stratigraphical association between any of the faunal remains, stone or bone artifacts, or other finds. All that can be said about these finds, encrusted or not, from this part of the deposit is that some at least of the bones are contemporaneous with each other and with some of the stone or bone artifacts; and that many if not most or all of the encrusted bones and artifacts are likely to be older than many,

perhaps most of the specimens without encrustations. Some of the encrusted bones and artifacts may well be derived from parts of the cave deposit pre-dating $37,500 \pm 750$ BP (SUA698), the radiocarbon age of the mid-part of layer 39 (Fig. 4). The absence of artifacts in layers 39-51 does not seem significant since this part of the deposit contains very few animal bones, or even large stones below layer 39. Nor are the 1.1 m^3 of sediments removed from Test Trench 8-9 (Figs 2,4) sufficient to constitute a definitive sample from this part of the deposit.

With the exception of the opal artifact (Fig. 14) which suggests possible relatively long-range group movement or contact in the lower south west, the stone artifacts reveal very little about the economy of the culture they represent. Technologically they show only that flakes, sometimes notched or denticulated, may have been used as tools in cutting and perhaps woodworking or other tasks involving shaving or scraping. The very small size of some of the apparent tools (Figs 10:2-4), or fragmentary apparent tools (Fig. 10:1) does not seem unusual since very small tools are common in more recent assemblages at Devil's Lair, at Miriwun in the Ord valley, and at other late Pleistocene sites in Western Australia (Dortch 1977; Dortch and Merrilees 1973).

As noted earlier, layer 29, with its relative abundance of quartz seems to belong to the upper part of the industrial sequence where both quartz and chert are common (Dortch and Merrilees 1973), rather than to the channel-cut zone. The near absence below layer 29 of quartz, a stone which is very common in almost all south-western prehistoric artifact assemblages, is difficult to explain. For the present it can only be said that the pattern of Aboriginal stone use in the locality around Devil's Lair was in some way different during the time these lower layers were deposited from that of later periods in this district when quartz and also chert were commonly used (Dortch 1974; Dortch and Merrilees 1973; Glover 1974; 1975).

The small assemblages of artifacts from layers 29-38 are among the very oldest, reliably dated specimens yet recovered in Australia; and they are roughly comparable in age with the stone artifact assemblages from Lake Mungo, N.S.W. and Keilor, Vic. (Barbetti and Allen 1972; Bowler 1976; Mulvaney 1975). Although yielding very little information relating to patterns of prehistoric subsistence or settlement, the presence of this archaeological material of advanced age in the extreme south-west helps provide a firm basis for further investigations into the duration of human occupation in Western Australia.

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