# Who can see the sea? Prehistoric Aboriginal occupation of the Cape Range peninsula

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**Abstract**

Archaeological research on Cape Range peninsula has provided the earliest unequivocal evidence for the use of coastal resources by Pleistocene Australians. Mandu Mandu Creek rockshelter, a small limestone cave in the western foothills of Cape Range is currently the oldest reliably dated archaeological site in northern Western Australia. Excavations in this site, and in two other rockshelters in Cape Range, firmly establish that coastal resources have been an integral part of Aboriginal subsistence strategies in this region for over 30,000 years. The archaeological record from midden sites near the modern shoreline provides important evidence for the presence and subsequent decline during the middle Holocene of a more diversified intertidal environment than exists today on this semi-arid stretch of the Western Australian coast.

## Introduction

In 1985 one of the prevailing issues in Australian archaeology was the question "at what point in time did the resources of the sea and coast become a significant part of human economies?". It was argued, both in Australia and overseas, that it was not until sea levels stabilized during the late Holocene that widespread coastal and marine habitats highly favourable to human subsistence evolved and were exploited by hunter-gatherers (Osborne 1977; Perlman 1980; Bailey and Parkington 1988). An American archaeologist working in Australia, went so far as to declare "The late Holocene [midden] sites on our coast are not just some tail end of our coastal history, they are it!" (Beaton 1985:18).

At the other extreme was the coastal colonization hypothesis (Bowdler 1977, 1990a) which argued that since the first Australians had to have arrived here by boat, some 40- 50,000 years ago, they were obviously well versed in living off the sea and its resources.

The problem was to obtain the evidence to test these hypotheses. As many researchers have pointed out, the apparent world-wide scarcity of archaeological evidence for occupation of the Pleistocene coast may be more apparent than real: the evidence may be there, but it has long since been drowned by subsequent sea level rise (Mulvaney 1975; Bowdler 1977; White and O'Connell 1982).

In this context, Cape Range peninsula provides an opportunity, unique in Australia, to investigate the nature of human adaptation to the changing Quaternary shoreline. Located on the extremity of the Australian arid zone, the western coastal margin of the peninsula is the nearest point on the Australian continent to the edge of the continental shelf (Kendrick *et al.* 1991:430). Even at the height of the glacial maximum, when sea level was as much as 150 m below present, the western foothills of Cape Range were never more than 10-12 km from the sea. Moreover, the unusually steep local topography formed by Cape Range has created a situation where the generally destructive effects of rising seas on archaeological sites located

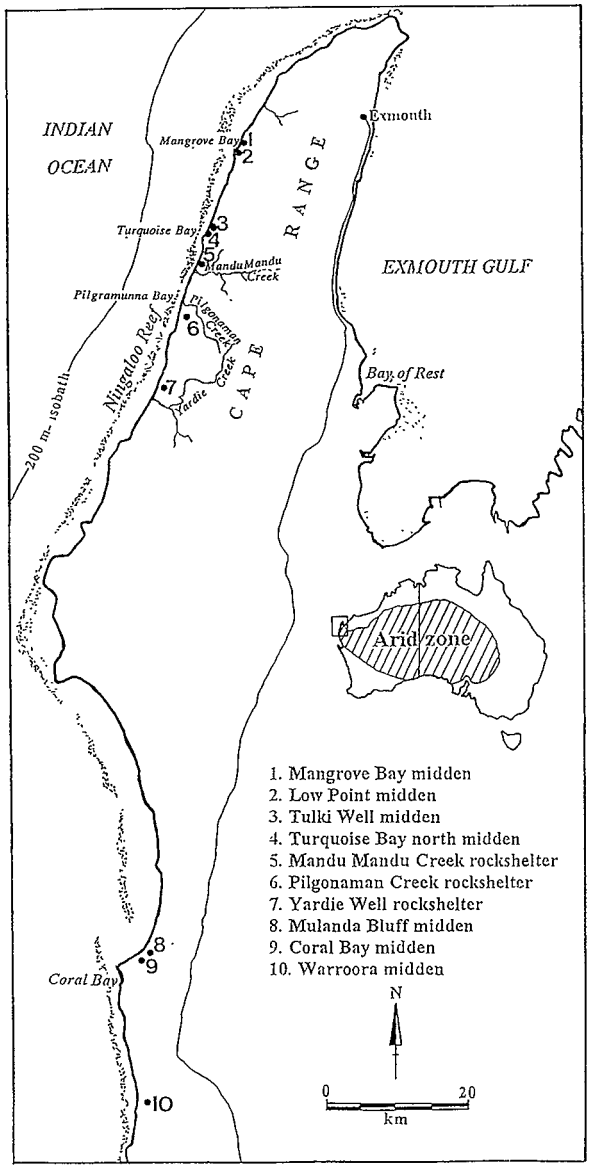



**Figure 1.** Cape Range peninsula showing the location of rockshelters and midden sites mentioned in the text.

near Pleistocene coastlines have been, at least in part, contained. In addition, the limestone environment of rockshelters in Cape Range should preserve material such as shell and bone, the archaeological evidence of human adaptation to Pleistocene environments. The region thus offers a significant opportunity to locate and investigate archaeological sites that have always been well within a day's walk of Pleistocene coastlines (Morse 1988).

Excavations have now been completed in three rockshelters in the western foothills of Cape Range (Morse 1988, in press a). In addition comprehensive surveys along much of the modern shore have been undertaken (Morse and Kee 1985; Morse and Fry 1988; Morse in

press b). Available evidence points to a long and continued use of the western coast of the peninsula by Aboriginal people during both Late Pleistocene and Holocene times.

## Holocene midden sites

The shoreline between Mangrove Bay and Yardie Creek (Figure 1) is formed of extensive tracts of inter-tidal reef flat interspersed with curved sandy and pebble bays. Along this coast, there is a more or less continuous series of shell midden sites which document a history of intermittent human occupation from middle Holocene to modern times (Morse in press b). Analysis of archaeological material from these, and several other midden sites near Coral Bay (Kendrick and Morse 1982, 1990), points to the presence during the middle Holocene of a more diversified intertidal environment than exists today.

Mangrove Bay is the only mangrove environment on the western coast between Exmouth Gulf and the Gascoyne River nearly 300 km to the south. Today, it is a contracting and marginal mangrove system with a limited associated biota. Historical records indicate however, that the extent and diversity of mangroves was greater as recently as the beginning of this century (Johnstone 1980). Archaeological material including stone artefacts, shell and bone, are present in blowouts throughout the Mangrove Bay area and testify to a wide ranging exploitation of mangrove resources in the past. Mangrove crabs (*Scylla serrata; Thalamita* sp.) and to a much lesser extent the mangrove gastropod *Terebralia palustris* have been the focus of foraging activities at these sites. The remains of both, although badly fragmented, show distinctive breakage patterns and are sometimes charred. *T. palustris* is not known today at Mangrove Bay; the nearest populations are found in the Bay of Rest in Exmouth Gulf, and at the mouth of the Gascoyne River.

The largest of these sites, named Mangrove Bay midden, is clearly located to target the adjacent mangrove environment (Morse and Kee 1985). Over 42% of the faunal assemblage sampled from this site derives from the mangrove environment, compared to only 24% from the shoreline reef (K. Morse, unpublished). The only reef mollusc that appears to have been actively collected is the chiton (*Acanthopleura gemmata*); other species are poorly represented. Numerous fragments of baler (*Melo amphora*) and giant clam (*Tridacna maxima*) shell are also present, the former most probably used as a water container, and the latter used as food, as a container and flaked to form scraping tools (Morse in press b). A similar use of these shells elsewhere in Australia is well documented ethnographically (Davidson 1937; Akerman 1975; Meehan 1982). Fragments of dugong bone (*Dugong dugon*) and turtle shell (*Chelonia mydas?*) are also present.

The stone artefact assemblage, manufactured from primarily local stone material, contains a high percentage of adzes and other wood working tools, indicating that the inhabitants of this site were taking advantage of the readily available supply of mangrove wood, one of the few concentrated sources of timber on the western coastal plain (Morse in press b). Ethnographic and ethnohistorical data from the Cape Range peninsula is extremely limited. It is noted however that the Jinigudjira, the traditional occupants of the peninsula, lived amongst the mangroves and were "coastal people who went out to sea on rafts of sticks" (Tindale 1974:243). Mangrove wood is recorded elsewhere as being used to make spears and fishing boomerangs (Smith and Kalotas 1985). *Avicennia marina*, the dominant mangrove species at Mangrove Bay, has edible fruit and in parts of northern Australia its leaves are used as flavouring in the cooking of shellfish and smoke produced by burning is said to repel insects (Levitt 1981:84).

**Table 1.** Radiocarbon dates from midden sites, Cape Range peninsula. None of these dates have been environmentally corrected.

| Lab Code | Site | Provenance | Sample material | Radiocarbon age (yr BP) |
|---|---|---|---|---|
| Beta 26269 | Mangrove Bay Midden | surface | *Tectus* sp. | 109.2 ± 0.8 |
| Wk 1430 | Low Point midden | surface | *Terebralia palustris* | 4820 ± 60 |
| SUA 1735 | Warroora midden | surface | *Terebralia palustris* | 7810 ± 110 |
| Wk 1429 | Mulanda Bluff midden | surface | *Terebralia palustris* | 7210 ± 70 |
| Wk 1428 | evaporation pan/ palaeolagoon | surface | *Acrosterigma dupuchense* | 5230 ± 60 |
| Wk 1728 | Coral Bay midden | surface | *Terebralia palustris* | 6270 ± 120 |
| ARL 245 | Tulki Well midden | surface | *Turbo argyrostomus* | 5660 ±115 |
| WAIT 118 | Turquoise Bay North midden | 25-30 cm below surface | *Turbo argyrostomus* | 5430 ± 200 |

The only radiocarbon date presently available from Mangrove Bay midden does not relate to use of the mangrove system. A sample of the gastropod *Tectus* sp. collected from a single-species cluster located some 10 m from the main midden scatter, yielded a radiocarbon age of 109.2 ± 0.8 yrs BP (Table 1). This is considered to date use of the site in historical times.

A sample of *Terebralia palustris* collected from an extensive midden site at Low Point (Figure 1) 1.5 km south west of Mangrove Bay yielded a radiocarbon age of 4820 ± 60 yr BP (Table 1). This is one of the largest midden sites found along the western coast and includes abundant mangrove and reef molluscs, fish, crab, turtle and dugong bone and numerous stone artefacts (Morse and Fry 1988). The presence and age of *Terebralia* at this site, now located some distance away from a mangrove habitat, suggests that at the time of occupation the mangrove environment at Mangrove Bay was more extensive. This corresponds well with a series of radiocarbon dates recovered from three midden sites located further south on the Warroora coast and near Coral Bay (Figure 1: Kendrick and Morse 1982; 1990; Veth 1990). One of these sites, Waroora midden, dated 7810 ± 110 yr BP, is located on an inland cliff, a remnant of a higher middle Holocene shoreline, some 300 m from the present shore. The other sites, Mulanda Bluff and Coral Bay middens, are associated with a present day evaporation pan. Samples of *Terebralia* shell collected from the surface of both sites have yielded early middle Holocene ages (Table 1). A shell sample (*Acrosterigma dupuchense*) collected from the indurated, richly fossiliferous surface unit of the evaporation pan yielded a radiocarbon age of 5230 ± 60 yr BP. Many of the lower valves of *Saccostrea* sp. (cf. *S. commercialis*), which are mangrove-associated in modern seas, found in association with the dated shell sample, exhibit attachment areas consistent with the impressions of intertidal mangrove roots (Kendrick and Morse 1990). This evidence indicates that prior to *c.* 5000 years ago the present day evaporation pan was a lagoon in exchange with the ocean, which had supported a thriving mangrove community for at least the previous 2,000 years (Kendrick and Morse 1990).

The evidence from these midden sites suggests that during the middle Holocene mangrove environments prospered along parts of the western coast of the Cape Range peninsula (Kendrick and Morse 1982, 1990). These data are consistent with evidence from tropical Australia and South-east Asia indicating that around 6500-5000 years ago mangrove environments flourished and then declined in response to changing environmental conditions (Woodroffe *et al.* 1985, 1988; Allen 1987).

Two other midden sites, located some 14 km south of Mangrove Bay have also yielded middle Holocene dates (Table 1). These sites, known as Tulki Well and Turquoise Bay North middens (Figure 1), are located in blowouts adjacent to extensive inter-tidal reef platforms. Two species of reef gastropod, the turban shells *Turbo argyrostomus* and, less commonly, *T. cinereus* dominate the faunal assemblages at these sites. A sample of turban collected in situ from a surface hearth feature in Tulki Well midden yielded a radiocarbon age of 5660 ± 115 yr BP. A similar age of 5430 ± 200 yr BP was obtained for a sample of turban from a single layer of shell midden material revealed at a depth of 25-30 cm below the surface in a 1 $m^2$ excavation in the nearby Turquoise Bay North site (Morse in press b). These dates, together with others ranging in age from 5500 to 400 years ago obtained from the upper layers of excavated sites in nearby rockshelters (Morse in press a), firmly establish an ongoing use of the western coast of the Cape Range peninsula from middle Holocene to recent times and demonstrate that where remnant coastal landforms are extant there is evidence of human use of these through time (Morse in press a, b).

## Rockshelter sites

In 1985 excavations in Mandu Mandu Creek rockshelter, a small limestone cave in the Tantabiddi Scarp some 500 m north of Mandu Mandu Creek, yielded archaeological evidence of intermittent human occupation from at least 25,000 to 400 years ago. Stratigraphic evidence suggested that there was a hiatus in occupation some 20,000 years ago, which corresponded with the onset of extreme arid conditions during the last glacial period, and the site was not re-occupied until the late Holocene. Significantly, throughout its occupational history the site was used by people exploiting a range of marine resources including fish, shellfish and crab (Morse 1988).

Elsewhere in Australia a similar pattern of occupation was emerging from a number of archaeological sites. With the onset of glacial aridity many sites appear to have been abandoned and not re-occupied until at least early Holocene times (Veth 1989; O'Connor 1990). It was only in rare sites such as Lawn Hill located in deep gorge country with permanent water in north eastern Queensland (Hiscock 1984), Puritjarra rockshelter in the Central Australia Ranges (Smith 1989) and two rockshelters in the Hamersley Plateau of Western Australia (Maynard 1980; Troilett 1982), that there was evidence of a human presence during much of the glacial period. On the basis of this evidence it was proposed (Veth 1989) that during arid conditions human populations withdrew to more reliable or permanent sources of freshwater in refuges located in piedmont and montane regions and on riverine systems. The possibility that some groups may have followed the retreating Pleistocene coastline was noted in passing (Veth 1989; Smith 1989). Archaeological sites located on the western margin of Cape Range peninsula had the potential to make an important contribution to this debate.

Excavation has now been completed in three rockshelters in the western foothills of Cape Range peninsula. The principle aim of this research has been to locate evidence of human responses to the arid conditions of the last glacial period. As already noted, the unique coastal-topographical configuration of Cape Range peninsula provides a rare opportunity to investigate the possibility that during glacial aridity, the human occupants of this region followed the Pleistocene shoreline as it retreated to the west. If this was the case some hinterland expression of this occupation strategy might be expected at sites in Cape Range that have never been more than days walk from the Pleistocene coast.

In this arid region, access to freshwater is clearly a key factor in both the location and occupation of sites. Two of the excavated sites, Mandu Mandu Creek rockshelter and Pilgonaman Creek rockshelter located respectively in the Tantabiddi and Jurabi scarps, are within several hundred metres of two of the main creek-gorge systems which dissect the western coastal margin of Cape Range. The third site, Yardie Well rockshelter, located in the Tantabiddi Scarp some 2.2 km north of Yardie Creek, was simply the largest accessible cave site found near Yardie Creek, the only permanent above ground source of freshwater on the peninsula. Recent research on the freshwater subterranean fauna of the area (Humphreys and Adam 1991; Poore and Humphreys 1992) suggests however that even in times of considerable aridity, freshwater may have been widely available across the emergent coastal plain bordering Cape Range. This clearly has important implications for an understanding of patterns of human use of the Cape Range region during glacial conditions.

## Mandu Mandu Creek rockshelter

Mandu Mandu Creek rockshelter is a small cave with a floor area of some 80 m². Three 1 m² pits have been excavated in this site. In 1989, in an attempt to confirm the stratigraphic and archaeological sequences identified in the original test pit (Square C3), two additional one metre squares (Squares E2 and C1) were excavated to baserock, reaching a maximum depth of 91 cm below the floor surface, 10 cm deeper than the original Square C3 excavation.

The deposit in this rockshelter consists of two main stratigraphic units, distinguished by sediment colour, texture and content and separated by a marked disconformity (Figure 2). Radiocarbon dating of shell and charcoal samples indicated that Unit 1, the upper unit of greyish brown sand containing the bulk of archaeological material, was late Holocene in age (Morse in press a). Below this, Unit 2 consists of yellowish red and red carbonate-rich sands. Archaeological material is present throughout this lower unit although in markedly smaller quantities and sediment analysis indicates that there is a strong positive correlation between the intensity of human use and the rate of sediment accumulation at this site (K. Morse, unpublished; *cf.* Hughes and Lampert 1982).

### Dating the deposit

Nine radiocarbon dates have been obtained from Mandu Mandu Creek rockshelter (Table 2)

**Table 2.** Radiocarbon dates from Mandu Mandu Creek Rockshelter, listed in order of age (yr BP). Depths are below floor surface (cm); New age is based upon the more accurate half-life of 5730 years. Conv. age - Conventional age. None of the shell dates have been environmentally corrected.

| Lab. Code | Square | Spit | Unit | Depth (cm) | Material | New age | Conv. age |
|---|---|---|---|---|---|---|---|
| WAIT 116 | C3 | 2/3 | 1 | 10 | charcoal | - | 430±130 |
| Wk 1512 | E2 | 6 | 1 | 25-30 | marine shell | 2010±80 | 1960±80 |
| WAIT 117 | C3 | 7 | 1 | 30-35 | charcoal | - | 2420±200 |
| Wk 1511 | E2 | 8 | 1 | 35-40 | marine shell | 5650±80 | 5490±80 |
| SUA 2614 | C3 | 9 | 2 | 40-45 | marine shell | - | 20,040±440 |
| Wk 1575 | C1 | 14 | 2 | 65-70 | marine shell | 22,700±500 | 22,100±500 |
| SUA 2354 | C3 | 16/17 | 2 | 81 | marine shell | - | 25,200±250 |
| Wk 1576 | C1 | 19 | 2 | 91 | marine shell | 30,900±850 | 30,000±850 |
| Wk 1513 | C1 | 18 | 2 | 85-90 | marine shell | 35,200±1050 | 34,200±1050 |

**Table 3.** Mollusc species identified in the Holocene and Pleistocene stratigraphic units, at the excavated rockshelter sites.

| Mollusc species | Mandu Mandu rockshelter | | Pilgonaman Creek rockshelter | | Yardie Well rockshelter |
|---|---|---|---|---|---|
| | Holocene | Pleistocene | Holocene | Pleistocene | Holocene |
| *Accanthopleura gemmata* | * | * | * | * | * |
| *Turban* sp. | * | | | | * |
| *Thais* sp. | * | | * | | * |
| *Cellana* sp. | * | | | | |
| *Tectus* sp. | * | | | | * |
| *Nerita* sp. | * | | | | * |
| *Hipponix* sp. | * | | | | |
| *Tonna* sp. | | | * | | |
| *Conus* sp. | | * | | | |
| *Tridacna maxima* | * | | * | | * |
| *Terebralia* sp. | * | | | | |
| *Melo amphora* | * | * | * | * | * |
| *Tellina* sp. | * | * | | | |
| *Pinctada* sp. | | * | * | ? | ? |
| *Dentalium* sp. | * | * | | * | * |
| Shell indet. | * | * | * | * | * |

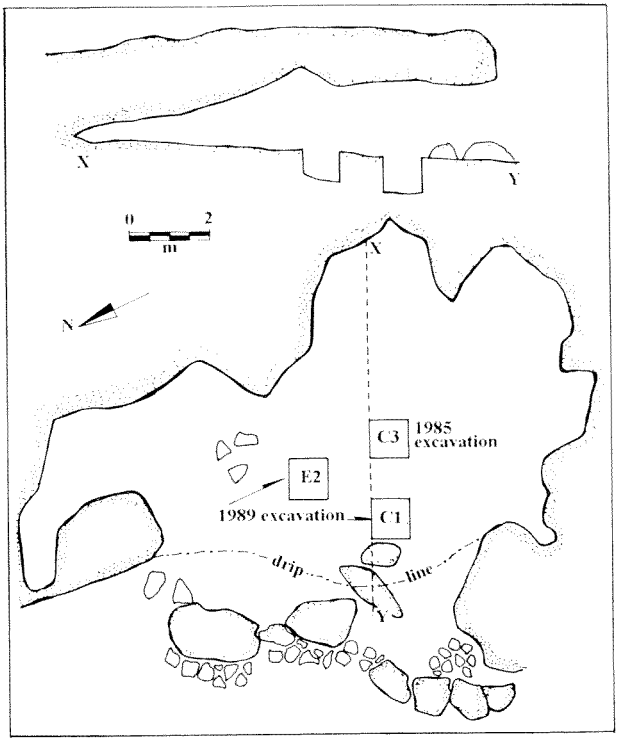
and these, together with the stratigraphic and archaeological evidence, document a history of intermittent human occupation spanning at least 30,000 years.

With the exception of the two basal dates (Wk 1576 and Wk 1513), the chronological sequence at this site is intact. X-Ray diffraction analysis of all the dated shell samples confirmed that they consisted of primary aragonite. However, isotopic analysis of the two oldest dates suggests that a 30 % contamination by groundwater carbon dioxide has occurred in this basal part of the deposit and the older sample appears to be between 950 -1250 years too old (C. Hendy, pers. comm.). On this basis, an age of 32,000 yr BP is recommended as a more accurate date for the initial human occupation of this site (A. Hogg, pers. comm.).

The disconformity between the two stratigraphic units units, corresponding to the period between 20,000 yr BP and 5500 yr BP, represents a hiatus in occupation when the site appears to have been abandoned as the arid conditions of the last glacial period intensified and not re-occupied until about the same time as midden sites appear on the adjacent coastline. (Morse 1988, in press a; cf. Table 1).

## Archaeological material

Archaeological material including stone artefacts, marine shell and marine and terrestrial fauna is present throughout the deposit although most of it was recovered from the upper Holocene unit. The Holocene marine fauna is represented by at least four species of fish (*Scarus* sp; *Choerodon* sp. *Acanthopagrus* sp.; *Epinephelus* sp.), at least thirteen species of marine mollusc (Table 3), reef crab (family Xanthidae), sea urchin and rare fragments of turtle bone and shell. In the Pleistocene unit, marine fauna is comprised predominantly of marine shell, notably *Melo amphora*, and in the basal 9 cms of the deposit *Conus* sp. The earliest fish bone was recovered from spit 10, and fragments of crab and sea urchin were found in spit 13 and above. At this time, *c.* 20,000 years ago, sea level was approaching its lowest point and it is estimated that the coastal plain would have stretched some 8-10 km to the shore (Australian Nautical Chart 330; Chappell and Shackleton 1986).



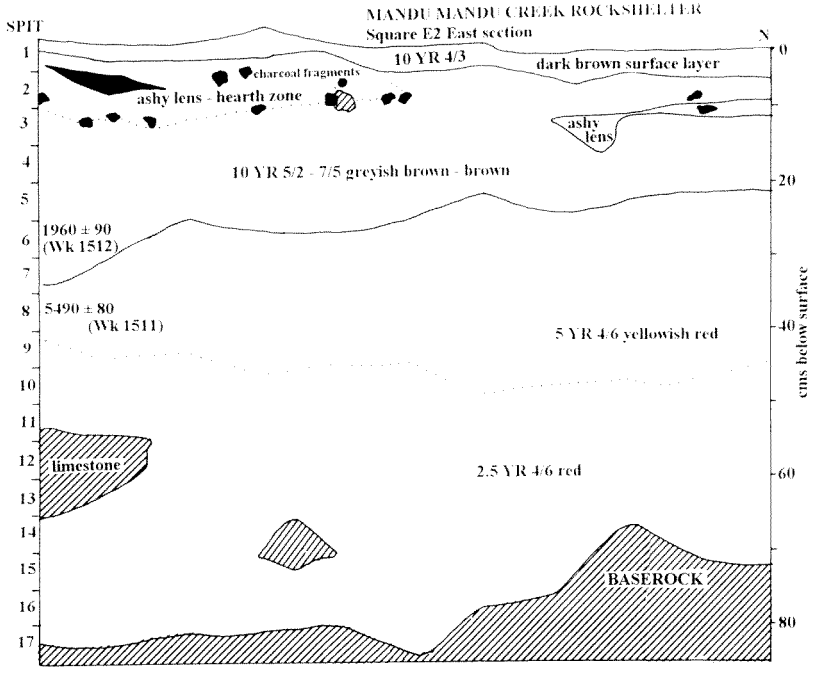




**Figure 2a.** Mandu Mandu Creek rockshelter, profile, plan and dated stratigraphic section of square E2.

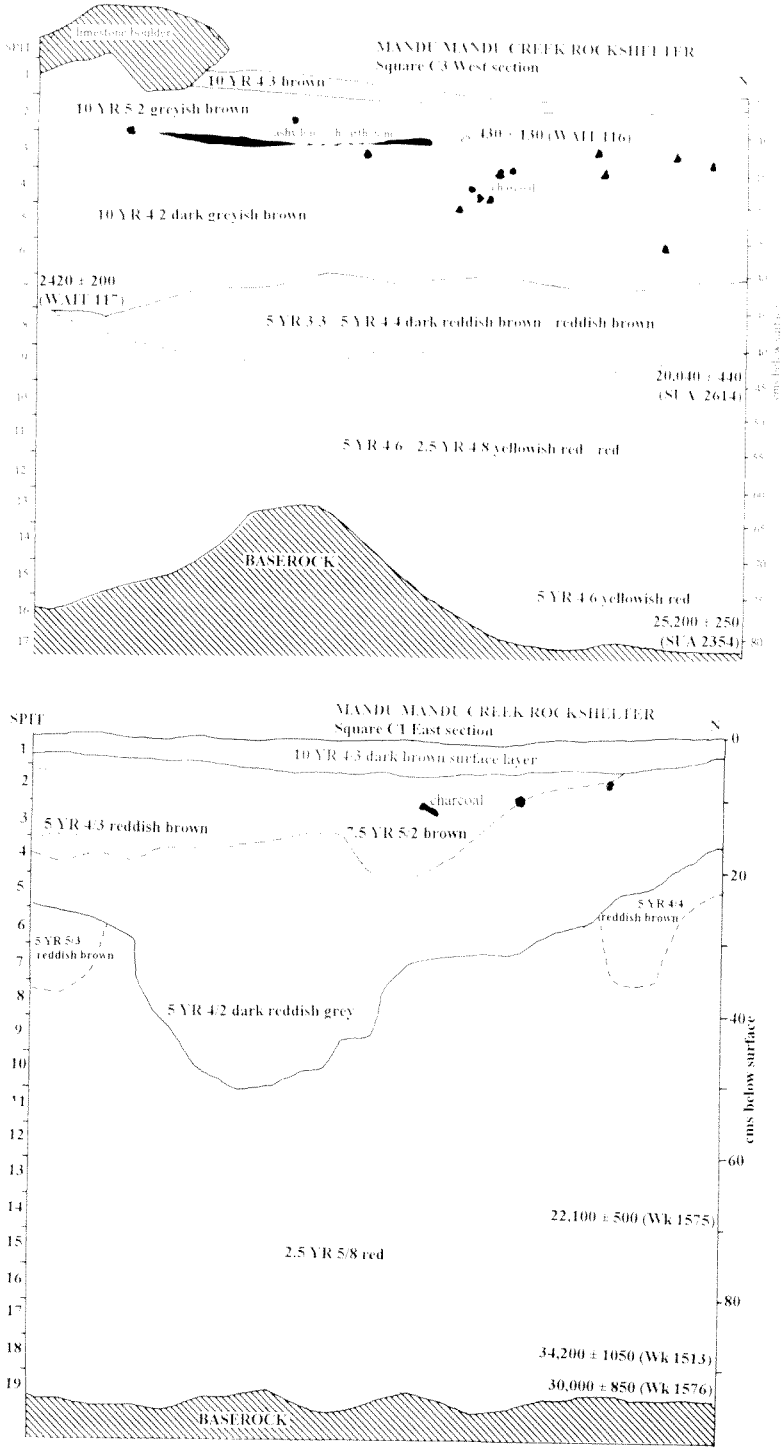



**Figure 2b.** Mandu Mandu Creek rockshelter, profile and dated stratigraphic sections of squares C3 and C1.

The predominance of rocky shore mollusc species in the Holocene unit reflects, at least in part, the nature of the present day coast. The modern shoreline on the western margin of the Cape Range peninsula is characterized by extensive tracts of intertidal reef. The occurrence and relative contribution of different species of shellfish by weight, in each of the excavated spits can be used circumspectly as an index of habitat proximity (K. Morse, unpublished). On this basis, the relative predominance of sandy bottom species including *Melo amphora, Pinctada* sp., bivalve and *Dentalium* sp. in the Pleistocene layers at Mandu Mandu Creek rockshelter suggest that a reefed or rocky coast was perhaps not such a dominant shoreline feature as it was in later Holocene times. While other factors such as preservation, age of the deposit, the distance of the site from the coast and, not least, human choice obviously enter this equation, the apparent patterning of shell species within the deposit must, at least in part, reflect the nature of the adjacent shoreline. Recent oceanographic data add to this interpretation. Rather than being an ancient coral reef, the Ningaloo reef is now thought to be

**Table 4.** Terrestrial faunal material identified in the Holocene and Pleistocene stratigraphic units at the excavated rockshelters. * present, ? probable.

| Species | Locally extinct | Mandu Mandu rockshelter | | Pilgonaman Creek rockshelter | | Yardie Well rockshelter |
|---|---|---|---|---|---|---|
| | | Holocene | Pleistocene | Holocene | Pleistocene | Holocene |
| *Macropus robustus* | | * | | | | |
| *Macropus agilis* | | | * | | | |
| *Petrogale* sp. | | * | * | * | * | |
| *Macropus* sp. large | | | | * | * | |
| *Macropus* sp. medium | | | | * | * | * |
| *Macropus* sp. indet. | | * | * | | | |
| *Macropodid* sp. indet. | | * | * | * | | |
| *Bettongia leseur* | * | * | | * | * | |
| *Isoodon auratus* | ? | * | * | * | * | * |
| *Trichosurus vulpecula* | | * | | * | | |
| *Macrotis lagotis* | | | | | * | |
| *Sminthopsis longicaudata* | | | | * | * | |
| *Dasyurus hallucatus* | | | | * | * | |
| *Chaeropus ?* | * | | | * | | |
| *Thylacinus cynocephalus* | | | | * | | |
| *Pseudomys desertor* | | * | | | | * |
| *P. nanus* | * | | | * | * | |
| *P. hermansburgensis* | | | | | * | |
| *Notomys alexis (?)* | | * | | * | * | |
| *N. longicaudatus* | ? | * | | | | |
| *Zyzomys pedunculatus* | | * | * | | | |
| *Rattus tunneyi* | | * | * | * | * | |
| *Capra hircus* | | * | | | | |
| *Eptesicus finlayson* | | * | | | | |
| Rodent indet. | | * | | | | |
| Muridae indet. | | * | * | | | |
| Lizard indet. | | | | * | | |
| Bird indet. | | | | * | | |
| Bone indet. | | * | * | * | * | |

a thin coral matrix built on old coastal features during the Holocene transgression. Preliminary research suggests that the level of Holocene precipitation may have allowed the reef to grow closer to the shore than had been possible during previous interglacial periods (Hatcher 1991: 120).

Terrestrial vertebrate fauna identified in the deposit is listed in Table 4. Several of these species are locally extinct most probably as a result of European settlement and the establishment of foxes and feral cats in the area.

Bone in the Pleistocene unit is sparse, extremely brittle and fragmented and covered in a red carbonate cement. Very little bone at all was recovered between spits 10 and 18. The presence of emu eggshell and macropod bone in this part of the deposit points to the use of hinterland resources as people traversed the coastal plain between the sea and the foothills. In the basal layers of Square C1, dated *c.* 32,000 yr BP, there is however a relative abundance of archaeological material including bones of a Thylacine (*Thylacinus cynocephalus*) and of an Agile Wallaby (*Macropus agilis*). The former has previously been recorded in an undated palaeontological deposit in Cape Range (Kendrick and Porter 1974), while the latter is currently restricted to the savannas of northern Australia (Strahan 1991:242). The bones from both these species are highly mineralized and possibly predate human activity in the rockshelter (A. Baynes, pers. comm.). Nevertheless *M. agilis* is well outside modern species range and its presence suggests that in the past this species was distributed over a greater range of ecological conditions than modern records indicate, or that climatic and vegetational regimes at Cape Range peninsula were such that it could inhabitat the area.

Shell ornaments

Some 23 small shells, predominantly *Conus* sp. and fragments, were recovered from the basal layer of the deposit in Square C1. Their worn and etched surfaces suggest they have probably been collected dead from the beach drift and they are provisionally identified as *Conus dorreensis* (G.W. Kendrick, pers. comm.). In view of their condition and very small size, it is considered most unlikely that they were collected for human consumption. With the exception of one small shell, all the *Conus* material has been deliberately modified as beads (Morse in press c) and provide the earliest evidence to date for the antiquity of human decorative traditions in Australia.

## Pilgonaman Creek rockshelter

Pilgonaman Creek rockshelter is a substantial cave with a floor area of some 105 $m^2$. Two 1 $m^2$ pits, Squares D3 and C2, were excavated to baserock. During excavation the stratigraphic sequence appeared to more or less replicate that described for Mandu Mandu Creek rockshelter, with an upper grey, presumably Holocene, unit (surface to spit 7) overlying a lower red unit (spit 8 to baserock). All available visual evidence, that is the absence of charcoal, the texture and colour of the sediment, the much smaller amount of faunal and artefactual material and the presence of a carbonate cement crust on all archaeological material, pointed to a Pleistocene age for the lower red unit. Attempts to obtain a coherent chronological sequence, particularly for the lower unit at this site are however proving difficult (Morse in press a, unpublished).

Three late Pleistocene dates have been obtained from the lower stratigraphic unit. They are however significantly different and the age of this part of the deposit remains as yet unresolved (Figure 3). The occurrence of the bilby *Macrotis lagotis*, a powerful burrower (Johnson 1983),

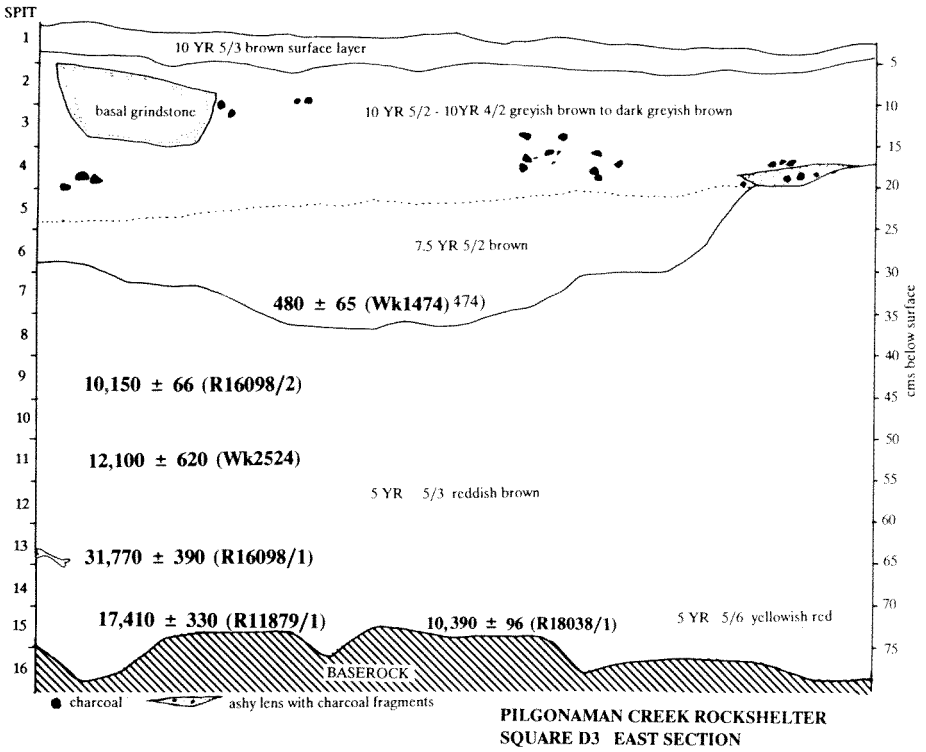



**Figure 3.** Dated stratigraphic section, Square D3 Pilgonaman Creek rockshelter.

in layers which have provided inconsistent dates, may provide a partial explanation for the chronological mix-up at this site (K. Morse, unpublished). On the basis of available evidence the site is considered to have been occupied very occasionally prior to about 12,000 years ago. The presence of fragments of marine shell dated 17,410 ± 330 yr BP (R16098/1) and 31,770 ± 390 yr BP (R11879/1) in the lower part of the deposit, appear to both confirm and extend the chronological sequence identified from Mandu Mandu Creek rockshelter. Albeit somewhat problematic, these data provide evidence of a human presence on the Pleistocene shoreline at the height of the glacial maximum, when sea levels were as much as 150 m below present levels and at the Cape Range peninsula the western coastal plain extended some 10-12 km to the sea.

## Archaeological material

Archaeological material including stone artefacts, marine shell and marine and terrestrial bone is present throughout the deposit at this site. As at Mandu Mandu Creek rockshelter most of it is concentrated in the topmost spits of the Holocene unit. The marine faunal assemblage is less diverse than that recovered from Mandu Mandu Creek rockshelter. Only eight mollusc species were identified (Table 3). Below spit 13 shell has been identified only as unidentified fragments. Sea urchin, provisionally identified as *Tripneustes gratilla*, and crab (family Xanthidae) are present throughout the deposit. Fish is found in spit 10 and above and includes several species of parrot fish (*Scarus* spp.), moray eel (*Gymnothorax* sp.), and the vertebra of a shark or ray.

The faunal assemblage in the lower stratigraphic unit (spits 8-17) albeit small, is dominated by terrestrial animals (Table 4). Emu eggshell is also present in spits 11-16. Today at Cape Range peninsula emu (*Dromais novaehollandiae*) breeding season occurs between the months of April and June (Storr 1984; R.E. Johnstone, pers. comm.). The occurrence of emu eggshell in the archaeological deposit suggests that occupation of this site was taking place, at least sometimes, during the early winter months (K. Morse, unpublished; cf. Flood 1983:51). The occurrence of *T. gratilla* also suggests a seasonal use of this site. The spawning season for this echinoid appears to relate to both diet and sea water temperature (Chen and Chang 1981). While there is no evidence of direct relevance to the Ningaloo region, available data obtained from New South Wales and the Great Barrier reef (O'Connor *et al.* 1976), indicates that the breeding season of *T. gratilla* in Australian waters occurs between late summer and early winter (Chen and Chang 1981; O'Connor *et al.* 1976). From the earliest levels at this rockshelter the emerging picture is of a site occupied very occasionally by people who evidently came from the coast, perhaps on a seasonal basis, and who exploited the resources of the adjacent coastal plain and hinterland during their visits to the rockshelter. Interestingly, ethnographic evidence from the nearby Hamersley Ranges and Great Sandy Desert indicates that this pattern of seasonal site use has a long antiquity. In this part of arid Australia occupation of rockshelters and caves was largely peripheral and took place for the most part during periods of wet weather (Brown 1987; Veth 1989).

## Yardie Well rockshelter

Yardie Well rockshelter, the third site excavated, is perhaps most accurately described as a small limestone overhang. Slabs of roof fall at the front of the site indicate that the modern overhang is the remnant of what was once a much larger cave. A 1 $m^2$ pit located in what is today the central front of the site, was excavated to baserock, a maximum depth of 1.05 m below the modern floor. Despite its forward location, the excavated square was barely 2 m from the back wall. As noted below, the sparcity of archaeological material recovered from this site is probably at least in part a function of the position of the excavated square within the rockshelter.

### Archaeological material

Archaeological material including stone artefacts, marine shell and terrestrial bone was sparse throughout the deposit and like both Pilgonaman Creek and Mandu Mandu Creek rockshelters most of it was recovered from the upper layers. Three radiocarbon dates (Morse in press a) indicate that the site was first occupied 10,490 ± 100 years ago (R11879/2) and has been used throughout the Holocene.

Table 3 lists mollusc species identified at this site. With the exception of a fragment of crab carapace in spit 18, mollusc shell, crab and sea urchin are only present in spits 15 and above. In the basal layers shell material is recorded only as unidentified mollusc fragments. Bone is extremely sparse. With the exception of fish (*Scarus* sp.) and fragments of turtle bone and shell in the upper unit, the only other identifiable fauna are the desert mouse (*Pseudomys desertor*), today a rare and possibly endangered species, in spit 2 (Happold 1983), a bandicoot (*Isoodon auratus*) in spit 3 and a kangaroo (*Macropus* sp.) in spit 10 (Table 4). Emu eggshell fragments were identified in spits 13, 14 and 15.

## Conclusion

Archaeological evidence from the Cape Range peninsula documents a long term use and adaptation to the changing Quaternary coastline by Aboriginal people. The archaeological record from the excavated rockshelters firmly establishes that coastal resources have been an integral part of subsistence strategies at Cape Range peninsula for over 30,000 years. The Holocene archaeological record from both the rockshelter and midden sites documents the diversity of coastal resources being exploited in more recent times. The evidence from these sites for environmental change and the decline of mangrove habitats during the middle Holocene contributes to the emerging picture of the biogeography of the Cape Range region. Moreover it clearly indicates that the pattern of occupation and use of the rockshelter sites is closely related to the proximity of the coast. It is not until the mid-late Holocene, when the modern shoreline was established a little over a kilometre from the western foothills of Cape Range, that a real trend towards an increased intensity of site use can be identified (K. Morse, unpublished). In this context, the occurrence of marine shell fish and other coastal resources in Pleistocene layers in these rockshelter sites, when the coastline was some 10-12 km distant, provides compelling evidence for the presence of a human population which followed the Pleistocene shoreline as it retreated to the west during the arid conditions of the last glacial period. During arid conditions it is evident, and not surprising, that use of the then far hinterland of Cape Range itself was at best only occasional and perhaps seasonal. The offshore reef system at Cape Range would have provided a local resource able to support viable social groups on the coast and use of the hinterland is likely to have become increasingly opportunistic. The available terminal Pleistocene dates from both Pilgonaman Creek and Yardie Well rockshelters clearly reflect an increased use of the foothill rockshelters when the sea was once again within several kilometres of these sites.

The Cape Range peninsula, as a very distinctive coastal-topographic feature, provides a unique opportunity to further investigate these and other questions of significance to Australian archaeology.

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