NOT JUST FOR SHOW

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The Archaeology of Beads, Beadwork and Personal Ornaments

Edited by

DANIELLA E. BAR-YOSEF MAYER,
CLIVE BONSALL and ALICE M. CHOYKE

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Front cover and spine: Selection of beads from Ypenburg (B.Grishaver).
Back cover: Tear-shaped bone pendants, Hayonim Cave (D. Shaham).

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Part 1

Socio-Cultural Reflections

2

Traditions and Change in Scaphopod Shell Beads in Northern Australia from the Pleistocene to the Recent Past

Jane Balme and Sue O'Connor

Abstract: *Shell beads were made in Australia from about 35,000 years ago. They include perforated marine gastropods and intentionally fractured segments of scaphopods. While some of the oldest Australian examples are in archaeological sites that were close to the Pleistocene coastline, in the southern Kimberley of northern Australia, beads are found primarily in early Holocene contexts and in sites that were more than 500 km from the coast at the time of their deposition. This suggests that they were either traded or exchanged "down the line." Historic photos and ethnographic evidence reveal that in the recent past Indigenous men, women and children in coastal locations wore such beads, whereas in central Australia they took on powerful properties and were used in ceremonial contexts with gender and age restricted use. One of the characteristics of marine shell ornaments in northern Australia is their bright, white or lustrous appearance that seems to have been intrinsic to their selection as body adornments. Distributions of shell beads across time and space in Australia can be interpreted as being related to changes in access to resources and social value which has implications for the interpretation of archaeological beads elsewhere.*

Introduction

Beads and pendants made from organic materials including seeds, grass stems, bone, teeth and shells were and remain a common form of body decoration in Australian Aboriginal societies. Those found in pre-Macassan and European archaeological contexts are made of the most durable materials, bone, teeth and shells and, of these, shell beads have been found in the oldest contexts where they date from at least 35,000 years ago. In mainland Australia, shell beads are confined to the north of the continent and archaeological finds are restricted to only two shell varieties – *Conus* and scaphopod.

In the southern Kimberley, beads are exclusively made from segments of scaphopod and are found primarily in early Holocene contexts of inland archaeological sites. As these sites were between 200 and 500 km from the coast at the time of the beads' deposition, it is likely that the beads were traded or exchanged "down the line." Historic photos and ethnographic evidence reveal that in the recent past Indigenous people in coastal locations wore scaphopod as strands and as hair adornments. There is no record of their use in the inland regions of the Kimberley at European settlement, perhaps suggesting that they were used differently away from the coast, or that there was a break in traditional use. Here, we discuss some of the features of the beads, the evidence for their location and antiquity from five Kimberley sites and speculate that their uneven temporal and geographic distribution in the archaeological record may be related to their changing social value and meaning with increasing distance from their coastal source.

In this paper, rather than the commonly used genus name *Dentalium*, we use the class term scaphopod for all tusk shells. As none of the fragments include the posterior part of the shell, it is not possible to further classify the shells beyond saying that they could represent eight species within the families Dentaliidae, Fustiariidae and Laevidentaliidae (G. Kendrick, pers. comm.).

Chronology and Distribution of Shell Beads and other Marine Shell Ornaments and Value Goods from Archaeological Sites in Australia

Shell beads have only been found in two areas in Australia, northwest Australia and Tasmania, an island to the south of the mainland that was effectively severed from mainland contact by the rough waters associated with the rising of sea levels about 12,000 years ago. The oldest Tasmanian shell beads so far recovered are associated with a burial at the site of West Point and are dated to between 1,800 ± 80 and 1,330 ± 80 BP (Jones 1967:363).

The oldest shell beads found in Australia date to earlier than 35,000 cal BP (Morse 1993a) and derive from sediments within a rock shelter on the Pilbara coastline known as Mandu Mandu Creek (Fig. 2.1). There are 22 beads, all made on *Conus* sp. (provisionally ascribed to *C. doreensis*) and all, except the smallest one, have been modified to form beads (Balme and Morse 2006:803; Morse 1993b:880). Six of the shells have been pierced and hollowed out while the remaining beads have been made from a section of spire of individual shells (Balme and Morse 2006:803). There is evidence of string wear and the large number and even size distribution of the beads in a single excavation unit combine to suggest that they once formed a single strand (Fig. 2.2).

Conus doreensis typically lives in shallow waters on reef platforms and in sand under rocks, environments consistent with the predominantly reefed shoreline of the area (Balme and Morse 2006:882). The shells used to make the Mandu Mandu beads were probably acquired locally as the shelter is located less than a kilometer from the coastline today and where, because of the steeply shelved offshore profile, it would never have been more than 10 km from the Pleistocene coastline, even at the low stand of the Last Glacial Maximum.

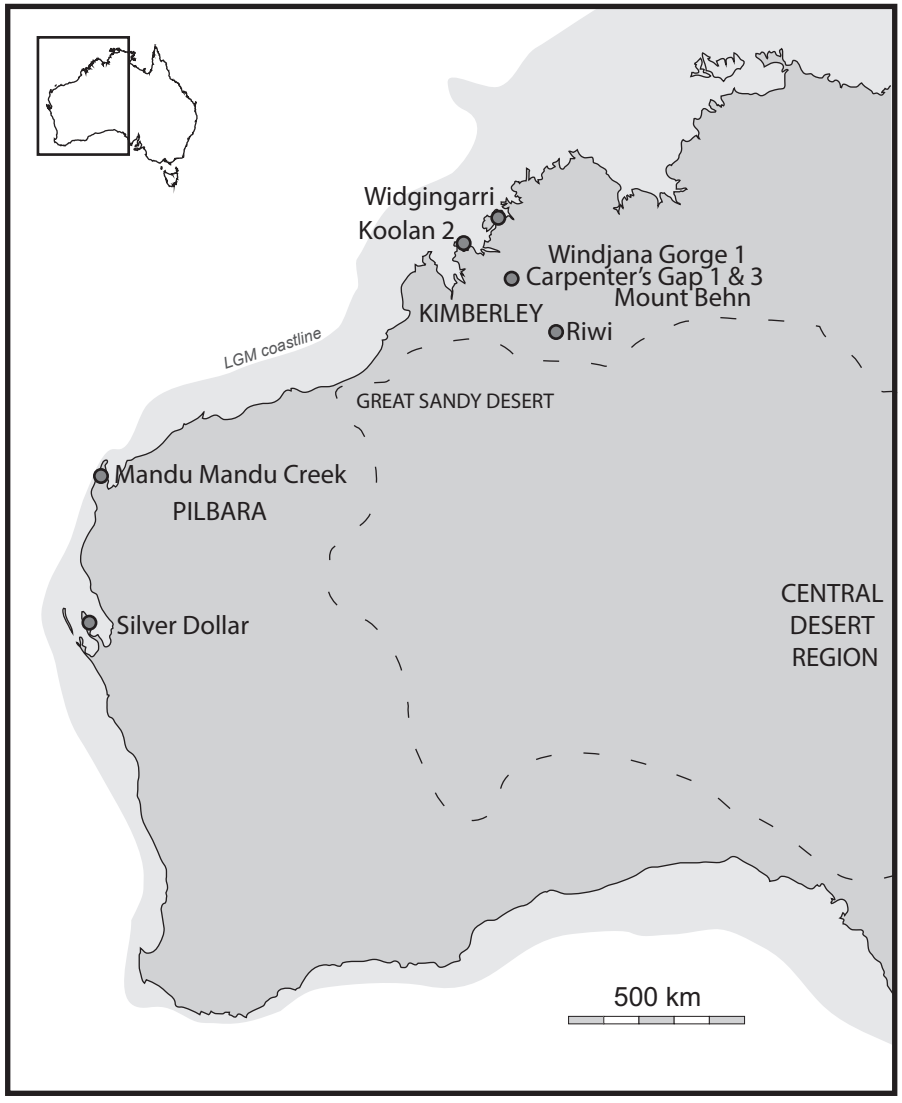

Figure 2.1 Locations of sites and places mentioned in the text (illustration by Dorcas Vannieuwenhuyse).

While there are other shell fragments from species traditionally used to make jewelry rather than as dietary items at Mandu Mandu, these are somewhat younger. Three more fragments of *Conus* sp., one of which shows signs of modification, were recovered from deposits estimated to be about 24,000 cal BP (Morse 1993a:882) and fragments of pearl oyster shells, which were commonly used as personal ornaments in the recent past (see Akerman and Stanton 1994), were found in Pleistocene deposits (Morse 1993b:145–146).

Fragments of scaphopods were also recovered from Pleistocene deposits at Mandu Mandu in sediments dating to between ca. 26,000 and 22,000 cal BP as well as in Holocene levels (Morse 1993b:145–146) including the uppermost excavation unit, which is less than 400 years old, (Morse 1989:86). Interestingly, these beads are isolated occurrences in the Pilbara region as no examples of shell beads have been reported from other coastal sites there, although pierced baler shell (*Melos* sp.) fragments, interpreted as pendants, have been found in late Holocene coastal shell middens in the area (Przywolnik 2003).

Ten scaphopod fragments interpreted as beads and recovered from deposits dated to ca. 34,000 cal BP have been previously reported from Riwi, a limestone cave site in the southern Kimberley that is currently located some 300 km from the coast (Balme 2000; Balme and Morse 2006). Scaphopod beads have also been reported from Carpenter's Gap 1 rock shelter to the west of Riwi in Windjana Gorge National Park (O'Connor 1995:59); however, these were all from Holocene contexts. Recent excavations in the same limestone system as Riwi have shown that inland movement of scaphopod beads was relatively common in the southern Kimberley and that the use of shell beads has a long history in this region.

Scaphopod Beads from Inland Kimberley Sites

The caves and rock shelters described here are all formed in the extensive Devonian limestone reef complex of the southern Kimberley of Western Australia (Playford et al. 2009). The region today has a tropical monsoon climate that is warm and dry during the winter months and hot and wet in the summer. Its southern border abuts the very hot and dry Great Sandy Desert. The alkaline and relatively dry environments of the caves and shelters in the reef complex have resulted in remarkable preservation of organic material within the sites.

In addition to Riwi, beads have been recovered from four shelters: Carpenter's Gap 1 and 3, Windjana Gorge 1, and Mt Behn (Fig. 2.1). All sites were used into historic times and were known to local Indigenous people. The evidence for Riwi and Carpenter's Gap 1 suggests that human occupation began ca. 47,000 cal BP, although a recent program of sample collection for Optically Stimulated Luminescence (OSL) dating at Riwi may extend this age estimate. Currently, the earliest evidence for occupation at Carpenter's Gap 3 is ca. 34,000 cal BP, at Windjina Gorge ca. 13,000 cal BP and at Mt Behn ca. 3,000 cal BP.

The beads from Riwi have been described in some detail in Balme and Morse (2006:806). In brief, they vary between 5.2–17.55 mm with a mean of 12.5 mm. Most are longer than 10 mm. The fragments used are from the anterior (non-tapering) end of the shell. A residue, visible to the naked eye, is present within the sinuous grooves and on rough surface areas of the shells, notably the broken ends. Under a stereomicroscope at 50× magnification, this residue is dark red/black (Fig. 2.3a) and could be ocher or ocher mixed with some binding substance.

A total of 37 beads have been recovered from the other four sites, 15 from Carpenter's Gap 1, five from Carpenter's Gap 3, two from Windjana Gorge 1 and 15 from Mt Behn. Like the Riwi beads these beads vary in length; the Carpenter's Gap 1 beads range from 2.65 to 22.10 mm, the Carpenter's Gap 3 beads from 9.13 to 23.75 mm, those from Windjana Gorge 1 from 14.18 to 18.69 mm and at Mt Behn from 4.2 to 12.6 mm. There are a variety of signs indicating the modification and use of these beads including polish, small fibers on the inside edge of the bead, wear on the edge of the bead and residue suggesting applications of color either on the bead itself or through rubbing against a painted body. Six beads have a deep undulation on at least one of their ends that are interpreted as the result of rubbing against stringing thread (e.g. Fig. 2.3b).

The fractured ends on the beads from all sites display a variety of morphologies including some with cut notches (Fig. 2.3a), straight (Fig. 2.3c) and some of the broken ends having uneven surfaces (Fig. 2.3d) in addition to edge polish.

Vanhaeren and d'Errico (2001) showed that breaking scaphopod shell by snapping and by sawing produced different characteristics on the fractured end of the shell. Snapping the shell produces sharp and perpendicular ends whereas sawing produces ends with two facets – one of which is oblique to the shell axis and the other is perpendicular (Vanhaeren and d'Errico 2001:216). Sawing also leaves marks resulting from the to-and-fro movement of the cutting edge. Moya Smith, of the Western Australian Museum, observed another method of creating beads from scaphopods on the coastal Kimberley in 1993. These beads are still made today by Bardi women, and Audaby Jack, the woman observed by Smith, made the beads by placing an intact shell on a stone anvil and then applying pressure to the shell with the back of a knife which she then snapped along the knife edge (Fig. 2.4). The shells were considered to be too delicate to be directly cut with the knife. Kim Akerman also observed this method in the same area during the 1970s (Kim Akerman, pers. comm. 2013). It produces a variety of morphologies on the fractured end, including perpendicular straight edges, oblique straight edges and

edges with small chips presumably from the pressure of the knife. The combinations of fractured ends of the southern Kimberley beads indicate that they may have been produced by a combination of snapping and pressure breaking, as in the modern Bardi method.

In morphology, the beads are not unlike those in Australian museum collections collected in the nineteenth and early twentieth centuries. Figure 2.5 shows one such strand collected in 1942 from Wyndam in the northern Kimberley. Most of these were strung on string made from a native plant fiber although later strings are often made from material brought by Europeans, such as wool. The example in Figure 2.5 has ocher over the surface, which is thickest in the cracks, much like the example from Riwi shown in Figure 2.3a. This suggests some very long-lived practices.

Figure 2.2 Mandu Mandu shell beads Conus *sp. (photo by Doug Elford, Western Australian Museum).*

Chronology of the Kimberley Beads

The chronology for the beads found in these sites was determined by a combination of interpretation of their association with radiocarbon dates from other organic materials and from direct AMS dates that were attempted on samples of the beads.

All ten of the Riwi beads came from the northeast quadrant of a one-meter test trench and from sediments with two similar charcoal radiocarbon dates calibrating to between about 30,700 and 33,500 years ago. Only one bead fragment was selected for direct dating. This returned an early Holocene date of between 7,644 and 7,459 cal BP (Wk36313R, p = .95). Unfortunately, the aragonite shell has been recrystallized as calcite. There is no discoloration of the bead or the ocher covering part of the bead and there are no obvious indications of burning or other visible evidence of alteration to the structure of the shell. In the absence of any indications of burning, the source of this re-crystallization can only derive from groundwater within the deposits. This

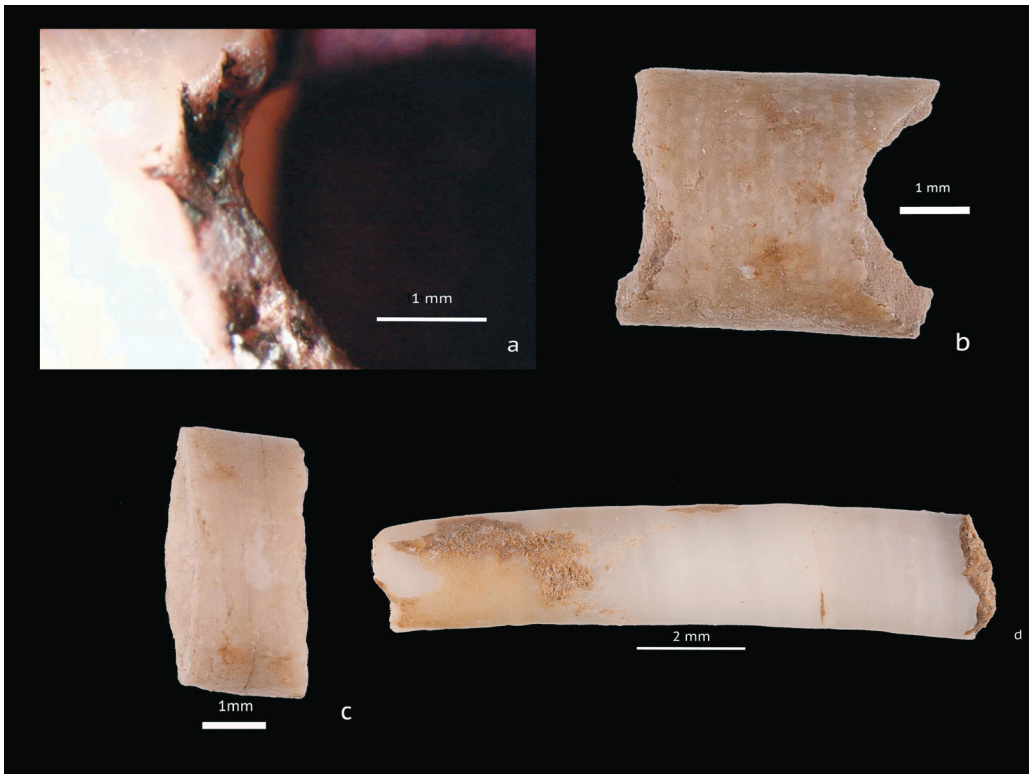

Figure 2.3 Scaphopod beads from southern Kimberley sites: a. Riwi bead showing red residue and cut notches; b. Mt Behn bead showing wear from stringing thread; c. Mt Behn bead showing straight fractured end; and d. Carpenter's Gap 3 bead showing uneven fractured ends (photos by Jane Balme and Rose Whitau).

leaves some uncertainty surrounding this date that we hope to resolve with fine resolution excavation and associated OSL and radiocarbon dates in future.

Carpenter's Gap 1 is a spacious rock shelter located along the northern margin of the Napier Range and about 25 m above the surrounding plain. Today the site is a minimum distance of 150 km from the coastline. A five-meter trench was excavated in two-centimeter excavation units at Carpenter's Gap 1 between 1992 and 1993 (McConnell and O'Connor 1999; O'Connor 1995). Scaphopod beads were encountered in only two of the five excavation squares. Although the beads have not been directly dated, they all derive from within or above excavation units dated to ca. 4,000 cal BP.

Direct dating of beads from Carpenter's Gap 3, Windjana Gorge 1 and Mt Behn has produced only Holocene ages (Table 2.1). The two dated Carpenter's Gap 3 beads are mid-Holocene. Of the remaining three beads, one was recovered from sediments associated with a radiocarbon date of 6,436–6,298 cal BP (SANU-30229, p = .95), one was recovered from between these dated sediments and sediments dated to 11,590–10,876 cal BP (SANU-29413, p = .95) and the third is from sediments that are undated but are probably Holocene in age.

Figure 2.4 Bardi woman, Audaby Jack making scaphopod beads (photo by Moya Smith, Western Australian Museum).

Mt Behn is a richly decorated rock shelter in an isolated limestone outcrop a few km to the east of CG1. The area of the deposit sampled during the 2012 excavation (2 × 1 m) dates from the late Holocene, although it is possible that a longer sequence may be preserved elsewhere in the site. There is a break in deposition between about 2,000 years ago, and historic times. Seven of the eight beads that have not been directly dated derive from excavation units that are older than 2,000 years and the remaining bead derives from excavation unit 2 on the border of the historic and pre-2,000-year-old material.

The two Windjana Gorge 1 beads are the same age – early Holocene – and derive from sediments at the upper boundary of a discontinuity in the deposition at the site that dates from about 13,000–8,000 years BP. All material above that discontinuity dates to the last 1,500 years.

In summary, apart from the Riwi beads that need further work on the dating, all the beads from the remaining sites date from the early to late Holocene. The one exception is a bead from the Mt Behn site, which has not been directly dated. It lies on the boundary of a break in deposition between late Holocene and historic deposits dating to the last 260 years and could possibly belong to the period just before European settlement of the area that began in the late nineteenth century.

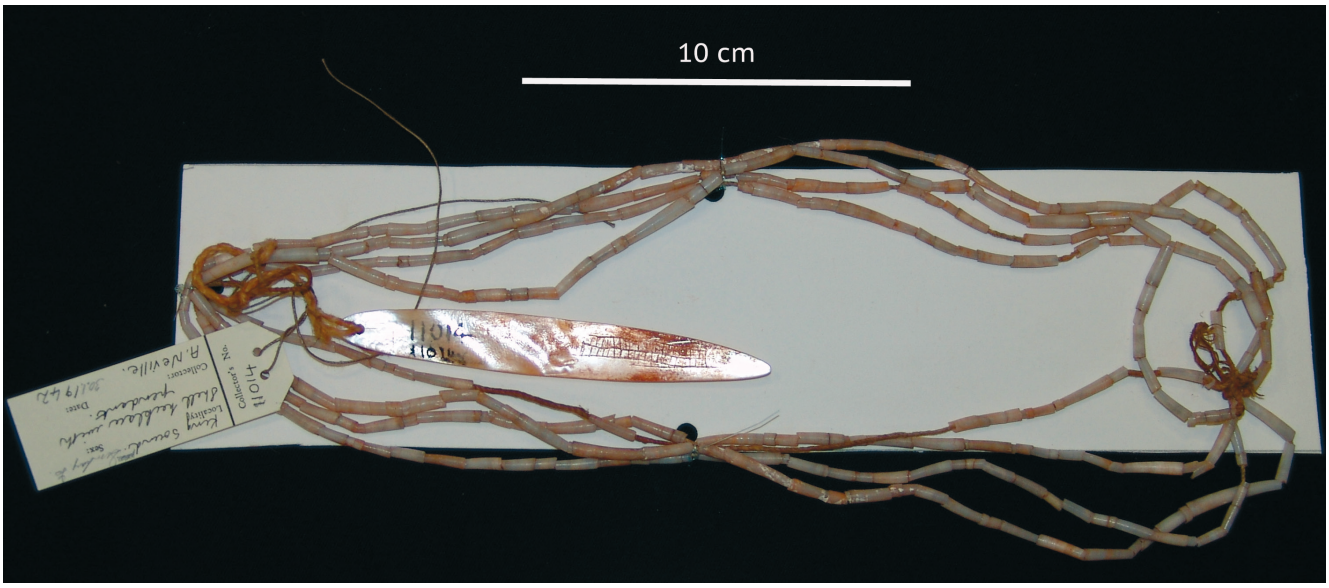

Figure 2.5 Scaphopod bead string with pearl shell pendant collected from the north Kimberley in 1942 (photo by Jane Balme of artifact held in the Western Australian Museum collection).

Table 2.1 Direct AMS dates for scaphopod bead fragments from three sites in the southern Kimberley. All radiocarbon samples were calibrated using Ox Cal 4, with marine shell samples calibrated using the marine curve [Marine13] (Reimer et al. 2013), with a delta R correction of ΔR = 54 ± 37.

EU	*Site*	*Lab. code S-ANU*	*Excavation code*	*Radiocarbon age*	*Age cal BP 2 sigma 95.4*
4	Mt Behn	33026	MB1-1a-4	2740 ± 35	2602–2270
6	Mt Behn	33027	MB1-1a-6	2505 ± 35	2273–1958
8	Mt Behn	33029	MB1-1c-8.2	2225 ± 40	1891–1608
8	Mt Behn	33106	MB1-1c-8.1	2995 ± 35	2843–2567
9	Mt Behn	33030	MB1-1a-9	3695 ± 40	3685–3399
10	Mt Behn	33031	MB1-1b-10	3755 ± 40	3790–3468
11	Mt Behn	33032	MB1-1b-11	3310 ± 40	3239–2611
12	Mt Behn	33033	MB1-1d-12	5060 ± 40	5510–5240
16	Windjana Gorge 1	33034	WG1-1a-16	8105 ± 45	8709–8431
18	Windjana Gorge 1	33035	WG1-1c-18	8100 ± 45	8698–8426
7	Carpenter's Gap 3	33036	CG3-b-7	5115 ± 40	5553–5298
10	Carpenter's Gap 3	33037	CG3-b-10	6910 ± 45	7476–7255

Conclusions from the Review of Australian Shell Beads from Archaeological Deposits

Five points can be made from this review of shell beads from archaeological deposits in Australia. First, they are restricted to the northwest of Australia and Tasmania. This may be in part a factor of preservation or the lack of access to suitable shellfish supply zones in some areas, but archaeological sites in other areas, such as southwest Australia and the Murray Darling system of western New South Wales contain beads made of other materials including bones and teeth (Dortch 1979; Macintosh 1971; Pretty 1977). Within northwestern Australia the beads appear to be confined to the Pilbara and Kimberley regions, as no examples have ever been reported from archaeological contexts in Arnhem Land, or elsewhere in the Northern Territory, despite this region being a focus of archaeological excavation over many decades.

Second, there is clear evidence of species selection for bead use. The northwest coastline is extensive and diverse. It contains rocky platform, mangrove and sandy embayments and has one of the greatest diversities of marine species available in any region of Australia with many Indo-Pacific species. These include cowries, cone shells and large numbers of brightly colored and vivid shells prized by collectors today. It is therefore somewhat surprising that only two shell species have been recovered from archaeological sites as beads: *Conus* and scaphopods. Both would have been readily available in the nearest coastal waters to the sites. *Conus* shells are colorful and patterned and so are very attractive for ornamental purposes but the snails are venomous and would not have been eaten. Their collection would have therefore only been for ornamental purposes. Scaphopods, while edible, are abundantly available on sandy beaches after storms. They require little modification apart from breaking into sections for beads and are a bright, shiny white.

Third, apart from the early *Conus* shell beads from Mandu Mandu and the Riwi beads whose dating is uncertain, all of the shell beads date from the early Holocene. This is consistent with beads made from other materials in Australia (see Hapgood and Franklin 2008:tab. 3).

Fourth, the distribution of the Kimberley shell beads indicates that they were carried or exchanged down the line over considerable distances in the past. Over 30,000 years ago, at the time the Riwi beads are presumed to have been deposited, sea levels were low and the site would have been at least 500 km from the ocean source of scaphopods. The other Kimberley beads reported here are from sites closer to the coastline and are associated with sea levels similar to those of today. Nevertheless, even today these sites are a good 150 km or so from the nearest coastline (Fig. 2.1).

Finally, the archaeological distribution of beads does not include the areas from which the raw materials are derived. Surprisingly, no scaphopod or other shell beads have been recovered from the many shell middens, cave and rock shelter sites excavated along the Kimberley coastline. It would appear that, while beads were made and used in coastal communities in historic times, if they were similarly used on the coast in prehistory they were treated differently in their discard state and did not end up as part of the archaeological record.

Shell Beads and the Wider Context

The features of shell beads, that is, species selection, uneven distribution, and transportation are frequent observations elsewhere in the world during Paleolithic times. Beads, and shell beads in particular, are a common type of ornament that occur in archaeological sites from ca. 100,000 years ago, with the earliest shell beads being recovered from Skhul Cave and Qafzeh Cave in Israel (Bar-Yosef Mayer 2005; Vanhaeren et al. 2006). Some of these, like the Kimberley beads described here, have ocher stains on them (Bar-Yosef Mayer et al. 2009). Selectivity of shell species used as beads is seen in most sites containing shell beads. For example, White (1992:550) has shown that fewer than a dozen species make up 90 per cent of several hundred known beads from the Aurignacian. Some researchers have found changes in proportions of different species over time (e.g. Taborin 1993 for French Aurignacian and Perigordian) and Stiner et al. (2013) have noted an increasing richness of species used over time at Üçağızlı Cave in Turkey over the Upper Paleolithic and Epi-Paleolithic. *Dentalium* species in particular are more prevalent in the later period, a pattern also noted by Bar-Yosef Mayer (2005) for the Levant. The availability of shell species is obviously one reason for the selection used but, other than that, the reasons for selection are difficult to speculate upon although size and morphology may have played a role (Stiner et al. 2013:393).

The uneven distribution of shell beads in Upper Paleolithic Europe has been documented by Vanhaeren and d'Errico (2006) who noted the absence of shells for use as beads in some sites close to shell sources and their presence in some sites at distance from their sources. White (2007:299) has also pointed out the lack of clear association between raw material abundance and selection of bead-making raw material in the early Upper Paleolithic.

Shell beads in the European Aurignacian are found in sites that are a similar distance inland to those found in the southern Kimberley. Vanhaeren and d'Errico's (2006) review of the distribution of these shell beads report that five shell species, only available on the Mediterranean coast, are found at five sites from the southwest of France that are located more than 300 km from the Mediterranean Sea and three Atlantic shell species are found at five Mediterranean sites. Mediterranean shell beads are also common at sites in Italy and Austria that were at least 300 km inland at the time of their deposition (Vanhaeren and d'Errico 2006:1118).

The appearance of beads has been suggested to have coincided with times when the chances of meeting strangers and the benefits of advertising one's identity is high (Kuhn et al. 2001) and such times would have been higher when population density increased (e.g. Gamble 1999; Kuhn and Stiner 2007; Shennan 2001), but see Sterelny (2011:812) on some of the difficulties with such arguments. Whatever the function of the beads, the distance over which they have been traded or carried supports at least the notion of inter-group contact, and that these particular species of shell beads had significant social value to the communities living at the sites in which they were recovered. Ethnographic sources from Australia's north demonstrate how these values might change across distance.

Ethnographic Use of Scaphopod Shell for Beads and Worn Paraphernalia

In the Kimberley region, there is ethnographic evidence – in the form of photographs and items in museum collections – that shell beads made from segments of scaphopod shell were worn strung in long strands, sometimes with pearl shell pendants, and as hair decoration, by people in coastal communities. In these coastal settings, they were worn by children as well as adults (e.g. Fig. 2.6) and so it does not appear that there was necessarily any special significance accorded to the beads at their point of origin. However, they were also used in ceremonial contexts on the Kimberley coast. For example, the anthropologist Worms (1938), describes the placement of scaphopod shell necklaces around the neck of male initiates in a coastal initiation ceremony. This use of shell ornaments for both secular and ceremonial use on the Kimberley coast is not restricted to scaphopod beads as ornaments made of baler shell (*Melos* sp.) (Akerman 1973) and pearl shell (*Pinctata* sp.) were also worn in secular life as well as having particular ritual uses in the coastal Kimberley (Akerman and Stanton 1994:22–23).

In coastal Western Australia, as in many other parts of Australia, many different types of marine shells, including baler shell, have been used for a variety of functions including containers, scrapers and spoons (see Przywolnik 2003:16 for a short review). However, it is only these three species – scaphopods, baler shell and pearl shell – that have been recorded in sites far from the coast and dating to pre-European settlement and early European settlement times.

There are good, dated ethnographic records, especially photographs and objects held in museum collections, for the movement of baler and pearl shell from coastal areas, into the desert. Mountford and Harvey (1938), Mulvaney (1969), Akerman (1973) and Akerman (1979) and Akerman and Stanton (1994) have documented the distribution of traded baler, pearl and scaphopod shell. One of the features of these records is the degree to which the shells are curated the further down the line they were traded (Akerman and Stanton 1994; Mountford and Harvey 1938; Mulvaney 1976). For example, Akerman (1973:124) reports that in 1972 he found fragments of baler shell within the environs of a camp at Wiluna and the men told him that these were places where pendants had been chipped and ground down for rain making ceremonies. While Akerman (1973) and Akerman and Stanton (1994) report that baler shell found inland was used for other purposes, the primary purpose for

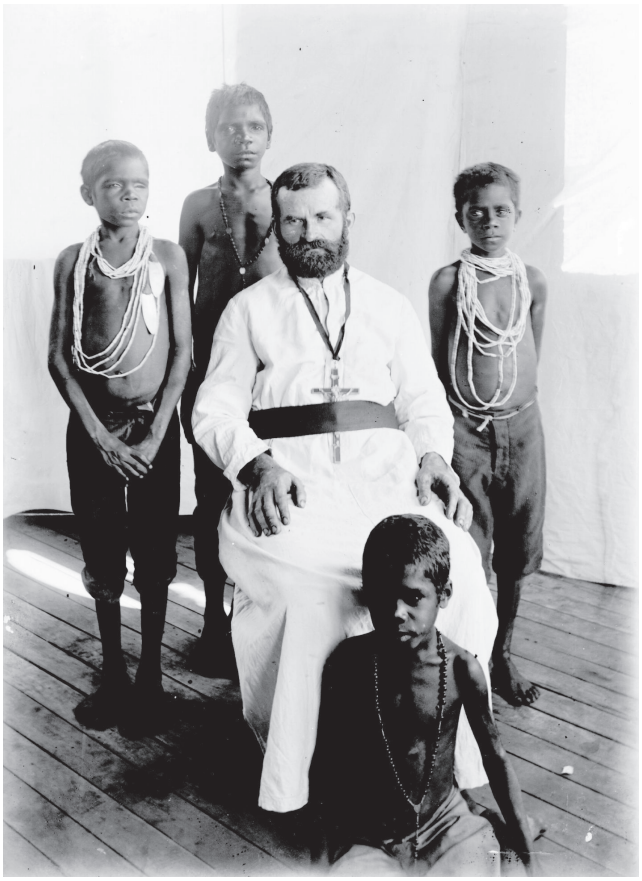

Figure 2.6 Father Rudolph with some young boys at Beagle Bay Mission on the Kimberley coast. Image taken in 1909 by Fr Bischoff (photo courtesy of the Western Australian Museum, Registration number DA Bischoffs 09).

baler and pearl shell in desert regions is as pendants in rain making ceremonies. In these contexts, they are powerful objects. It has been suggested that the further the shells were traded, the more powerful they became. Mountford and Harvey (1938:128–129) for example, describe the use of baler shell for witchcraft and in the male initiation ceremony amongst the Dieri in the desert of northeastern South Australia.

The special power of pearl shell in the different places that it was used has been attributed to the qualities of its shimmering iridescence or brilliance and shininess – a detailed discussion of this is provided in Akerman and Stanton (1994:19–32). On the Kimberley coast these qualities of pearl shell are associated with water, spiritual powers and healing. Brilliance or iridescence is a quality that Morphy (1989:36) believes operates cross-culturally and in Australia is often associated with or imbued with special powers. These intrinsic qualities have similarly been suggested to account for the trade distribution of other kinds of raw material or artifacts within Australia, most notably the large, shiny, white stone blades known as "leilira" blades (Allen 1997). It is the presence of these prized qualities that probably underlies the selection of scaphopods, baler shell and pearl shell as items of personal adornment and trade over long distances.

Changes in access, transportation and demography affected the speed in which goods were transported so that before the availability of new forms of transport, initially horses, movement of goods might have been slow, as the goods were curated down the line. However, Akerman and Stanton (1994:16) suggest that movement of prestige goods in pre-contact times was also rapid but that access to new forms of transport affected the bulk of material that could be moved at one time. Akerman and Stanton (1994) document the life histories of pearl shell pendants and show that there was a rapid increase in their production and exchange after 1900 perhaps in part because of new methods of transport also because of the development of the pearling industry on the northwest coast from the late nineteenth century. They also suggest (1994:16) that the concentration of people on missions may also have provided opportunity for more ceremonies in which these objects were needed. Thus, while in pre-European contact times pieces of shell used by desert people might have been rare and very small by the time they reached inland places, changes in access and transport meant that the artifacts were less curated during their trade as there was less need to make the artifacts "go further." Interestingly, these more complex traded objects seem to have, at least sometimes, included scaphopod shells (always abundant on the coast) included in the artifact. For example, in 1976, Akerman (pers. comm.) recorded many pearl shells at Yuendumu, in the Australia's Central Desert, some of which were fixed as pendants attached to long strands of scaphopod shells. Similar objects are held in the Western Australian museum from Kimberley coastal areas.

Although there is much ethnographic literature on the ceremonial use of baler and pearl shell in non-coastal environments, we found very little for scaphopods. An exception to this is Kim Akerman's observation (Akerman, pers. comm. 2013) of a necklace of scaphopod shell beads (traded from Lombardina via Broom) strung on fiber string being used at Fitzroy Crossing for ceremonial purposes in 1976. We could find no references to scaphopod use in the area from which they were recovered from our excavations. We did, however, find one reference to their use by Walpiri people in Australia's central desert. Meggitt (1966) recorded that the Walpiri regarded scaphopods as so dangerous and powerful that they could only be seen by initiated men or men.

> While the initiated men are at Yarungganyi they also encounter for the first time the dangerous and powerful landjulgari scaphopod shells. The moon-dreaming man, during his many journeys back and forth between Ngangga (Mount Leichhardt), Yanarildji (Cockatoo Creek) and Yarungganyi, has worn a string of these

> shells, as well as a bone, through his nasal septum. He places a string in Barili creek, where the men later find it. At once they realize what the object is, and they in turn decorate their initiation novices with it so that the boys may absorb the power of the shells and so become immune to it. (Meggitt 1969:129).

He also reports that women and children could not see the shells at close range for fear of death (Meggitt 1969:129, n.207). So important were these shells to the Walpiri that they are associated with sites that had their own dreaming track (Meggitt 1969:132). Although Meggitt was told that men had found the shells as fossils in the region, at the time he was working in the area (in the 1950s and '60s) the shells "drift in from the Kimberley coast" (Meggitt 1969:129, n.207), which is well over 1000 km away. Scaphopod species occur in coastal waters around most of Australia (Atlas of Living Australia) and so it is conceivable that the shells may have been traded from northern waters but even so some 1000 km from the nearest coastline. These observations seem to mirror that of the baler and pearl shell records from the central desert. The further from the source, the more powerful the objects become.

The antiquity of these trading networks is difficult to ascertain, as rare objects are not likely to be found in archaeological sites. However, in addition to the scaphopod shells reported here, fragments of baler and pearl shell have been reported from inland sites. The oldest of these are some baler shell pieces dated to ca. 32,000 cal BP and recovered from Widgingarri Shelter 1 in west Kimberley (O'Connor 1999a:60, 121). Baler shell in contexts dating to ca. 22,000 cal BP was also recovered from the Silver Dollar site, Shark Bay in the Pilbara (Bowdler 1990). At the time of their deposition these sites were 70–100 km inland. There are no dates of that antiquity for desert sites further inland but Smith and Veth (2004) have obtained direct dates of more than 200 years cal BP on baler shell fragments collected from open sites in the Great Sandy Desert from a site over 400 km inland. Apart from these dates, and those reported here, all inland baler, pearl fragments occur in recent contexts.

Discussion and Conclusions

Beads of various organic materials have been an ornament used by Aboriginal societies since Pleistocene times. However, despite the abundance of decorative shells around Australia's coastlines, shell beads had a very restricted distribution in Aboriginal Australia. They were only made in the northwest of Australia and in Tasmania. This regional distribution of bead raw material types and the over 35,000 years BP antiquity of northwest shell bead-making, is reflected in other material culture forms, most notably, edge ground axes (Balme and O'Connor 2014:170; O'Connor et al. 2014).

In addition to these regional differences in broad raw material types, people were also very selective about the particular shell species they used. In northwest Australia, only two shell types are recorded to have been made into beads – *Conus* sp. (probably *Conus doreensis*) and undetermined (because of the absence of the critical identifying posterior element) scaphopod species. Only one example of *Conus* use is recorded and these are the beads recovered from Pleistocene deposits at the Mandu Mandu site. All the remaining beads are scaphopods. In addition, two other much larger kinds of shell, *Melos* sp. and *Pinctata* sp. are frequently recorded to have been curated and strung as pendants. There is no doubt that ease of access and abundance of the scaphopods, and perhaps the lack of processing required, would have contributed to their selection for bead-making. But, other gastropod and bivalve shells are also very abundant on beaches, many naturally perforated. Baler shell and, until the advent of the pearling industry, pearl shell are not so easily obtained. It seems likely then, that the shells were selected for the other quality shared by all three types, that is, their bright, and shimmering surfaces and, for pearl shell, iridescence. These features, including iridescence, are also shared by the maireener shells that dominate the beads made by Tasmanian Aboriginal people but are not so evident in the patterned *Conus* shells. Could these qualities that were associated with spiritual and magical power at European contact have a deep antiquity?

We have discussed the ethnographic evidence for increasing social value and power that the shell items obtained as they moved inland. If the same situation pertained in the past it would be expected that the more accessible the raw material was, the more common would be the shell artifacts made from it, and that the converse would apply, that is, the further inland the shells moved the scarcer the beads would be in archaeological deposits. However, this is not the pattern that exists. Shell beads have not been found in coastal sites although they are widely observed to have been worn in the post-Contact period and many necklets of scaphopod segments from the Kimberley coast can be found in museums. This is not just a matter of sampling as more shelter sites have been excavated in the coastal Kimberley (O'Connor 1999b; Veitch 1996), as well as open sites and middens with excellently preserved shell food refuse and other shell tools (O'Connor 1999b; Veitch 1999). These include shell modified for domestic use such as baler shell bowls, knives and adzes (O'Connor 1999a:36, 1999b:39). Could the differences in distribution of beads in sites be due to the different contexts in which they were used and the different value and meaning they had as a result? Scaphopod shell is readily collected from sandy beaches along the northern Australian coastline. It is possible that the mere fact of their ease of replacement mitigated against the return

of beads to habitation sites. If a strand broke it may simply have been discarded, rather than the shells collected up, wrapped and transported to the habitation site for reuse in another decorative item.

Shell beads are found in greatest frequency in southern Kimberley shelters that were at least 150 km from the coast where they appear in greatest numbers from ca. 8000 years ago. These sites contain spun fiber string fragments and a range of subsistence resources usually associated with women's foraging, such as small mammals and reptiles, freshwater shellfish and plant remains, which we believe indicates that they were used for general-purpose habitation by extended family groups. For this reason, we have argued that in the southern Kimberley the scaphopod beads were likely worn in secular rather than sacred contexts. However, the shells were not readily available and could not be easily replenished as they could in the coastal supply zone. It is therefore likely that they were reused and curated and therefore were lost or discarded at the habitation site. The small size of some segments recovered may indicate a high degree of recycling of shell segments. This period also marks the end of rising sea levels and may reflect not the beginning of trade networks, but rather the changed location of the sites relative to the coast.

Although ethnographically scaphopod beads are observed to have been traded inland into central desert regions of Australia where they were objects of great power and value, they have never been reported from desert archaeological contexts. This is hardly surprising as, although they were rare and valued, they were also dangerous and powerful. The sacredness of the objects themselves would preclude their use (or discard) at general habitation sites. Today, similarly powerful objects are hidden in deep crevices between ceremonies lest they be accidentally seen, or ritually disposed of after use. They are also only used in designated law grounds or sites where their power can be controlled by ritual leaders.

There are three general archaeological points to be made from the discussion above. First, while archaeologists often interpret the presence of beads as evidence of identity markers of social categories within groups and between groups, one of the main points to emerge from the evidence discussed here is that the same beads may have very different meanings throughout their life history. The ethnographic evidence for scaphopod beads and other shell ornaments indicate that at their point of origin they are used in both secular and ceremonial contexts by a variety of social categories but, as they were traded inland their use narrowed. The second point is that the attributes that archaeologists use to analyze bead distribution, especially morphology, may well not be qualities that were of prime importance to the maker of the beads (a point also made by White 2007:299). Third, the distribution of beads in archaeological landscapes may not necessarily reflect their abundance or use but rather the value or meaning with which they were vested. These values and meanings may change as a result of social re-organization and associated ceremonies but also as a consequence of changing access to beads, for example from sea level changes that result in changes to the distance to shell sources and from access to new modes of transport.

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