KEYWORDS: ***Kimberley – Rock art – Wandjina – Beeswax – Charcoal – Radiocarbon age***

AMS RADIOCARBON AGES FOR BEESWAX AND CHARCOAL PIGMENTS IN NORTH KIMBERLEY ROCK ART

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Abstract. Here we report AMS radiocarbon ages associated with rock art in the Kimberley, north-west Australia, from beeswax motifs (26), charcoal pigments (7), a fragment of ochred baler shell used for mixing pigments, and mineral deposits from the base of a pecked cupule. With one exception, these ages are for motifs or paraphernalia associated with the Wandjina painting tradition, which appears to have included a number of contemporaneous art 'styles'. The radiocarbon determinations range from ~3800 BP to modern, a distribution very similar to that previously obtained for wax figures in Northern Territory rock art.

Background

The Kimberley in the north-west corner of Australia has one of the largest concentrations of rock paintings in Australia, with a sequence of visually specific, figurative styles extending back into the Pleistocene (Roberts et al. 1997). There is also detailed ethnographic information on the ideological, social and economic significance of the most recent rock art in the region — the iconic Wandjina rock painting tradition, in which large creative beings, often on a white background and without mouths, were depicted in association with animals and plants (Crawford 1970; Blundell 1975; Layton 1985) (Fig. 1).

The regional rock art sequence, inferred from studies of superimpositions and differential weathering, shows that there have been associated changes in artistic conventions, subject matter, context of production and function over time (e.g. Crawford 1970, 1977; Schulz 1956; Walsh 1988, 2000; Welch 1993a). As such, the sequence contains information on past environments,

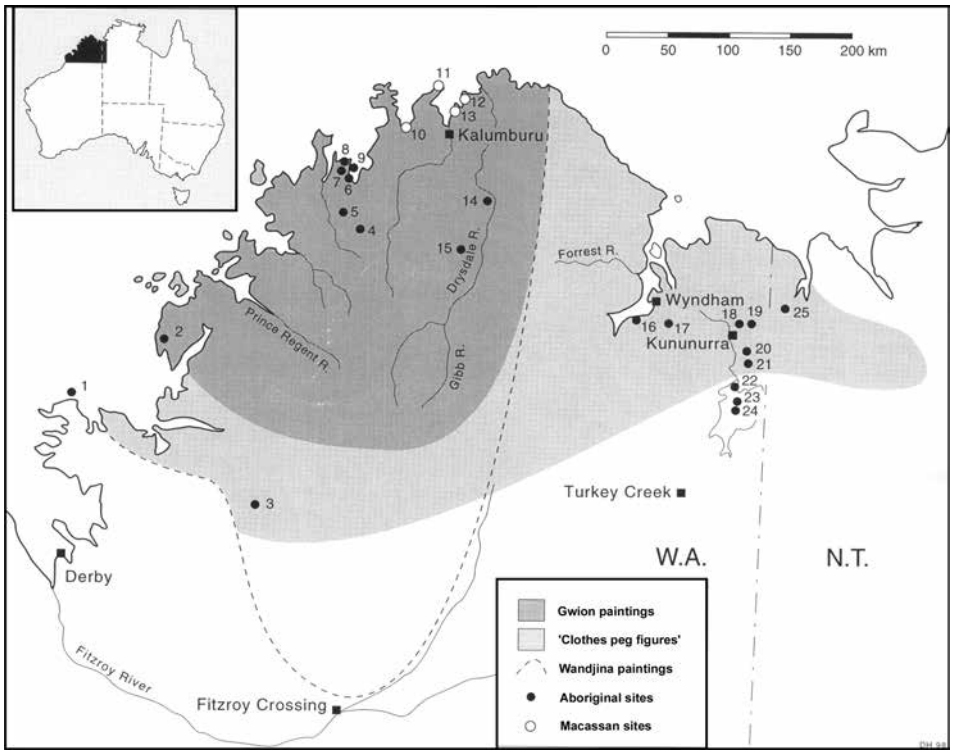

Figure 1. *General location of the Kimberley in N.W. Australia, showing the distribution of some major rock art styles.*

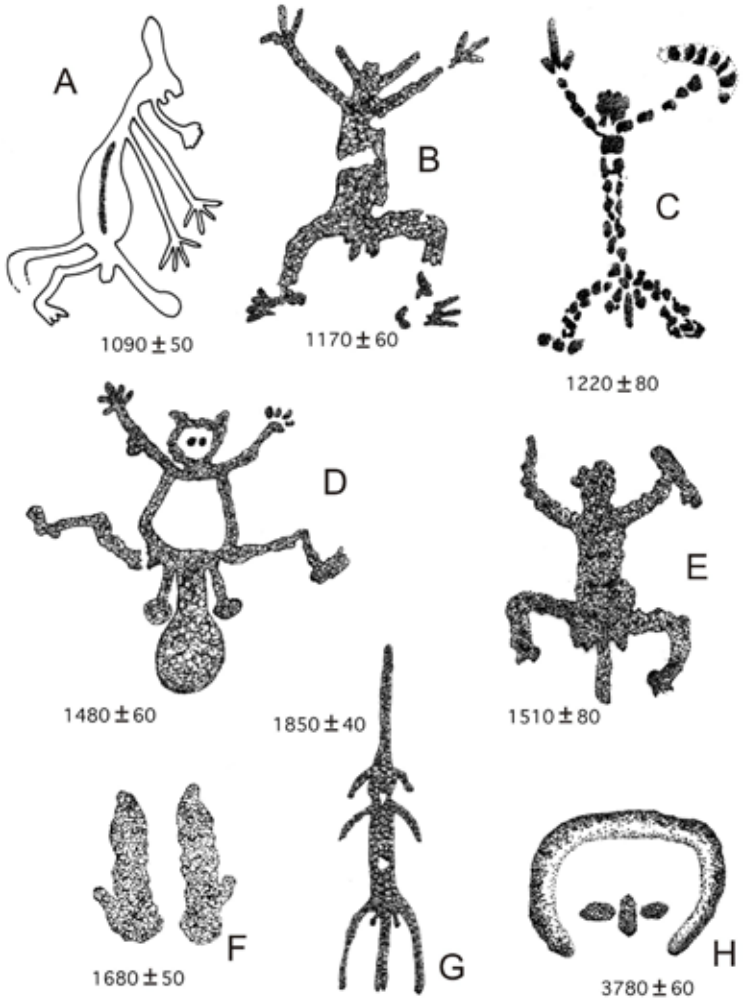

Figure 2. *Kimberley beeswax anthropomorphs with their ages obtained by AMS radiocarbon dating (uncalibrated).*

animals, human responses to climate change and a range of material culture not commonly represented in other types of archaeological evidence (e.g. Morwood 2002; Walsh and Morwood 1999; Welch 1993b). In fact, the Kimberley rock art sequence is likely to prove one of the longest and most complex anywhere in the world — rivalled only by the rock art of western Arnhem Land, with which it shares a number of stylistically-similar, early phases (see Brandl 1973; Chaloupka 1993; Lewis 1984, 1988; O'Connor and Fankhauser 2001; Taçon 1989).

Although there is a generally accepted relative chronology and there are some absolute dates for Kimberley rock art (Morwood et al. 1994; Watchman et al. 1997; Roberts et al. 1997), there are not enough of the latter to anchor the sequence. In this paper, we present another thirty-five AMS radiocarbon ages from, or associated with, Kimberley rock art, and discuss the significance of the results and their implications.

The sample

With one exception, radiometric ages obtained for this study are from motifs or paraphernalia associated with the Wandjina painting tradition. Samples dated comprised beeswax (26), charcoal pigments (7), a fragment of ochred baler shell used for mixing pigments at a Wandjina art site, and mineral deposits from the base of a pecked cupule.

Beeswax (or, more accurately, bee-collected plant resins with a little wax) was occasionally used by indigenous rock artists in the Kimberley and other parts of northern Australia (Bednarik 2001; Chaloupka et al. 2000: Fig. 1; Chaloupka and Alderson 2000; Walsh 1988: 240). Usually the artists pressed arrays of wax pellets, about 1 cm in diameter, onto the rock surfaces, but could also incorporate other techniques, usually painting, to make composite motifs. Although wax motifs are not a major component of Kimberley rock art and are often not stylistically diagnostic, the fact that they were originally made of fresh, malleable wax means that the age of the beeswax corresponds with the age of the associated motif. Some dated wax pellets also occur beneath or over stylistically diagnostic paintings, and thereby provide maximum and minimum ages for these paintings, respectively.

The second artistic medium sampled, charcoal, was routinely used in rock art whenever the colour black was required — for instance, in portraying the eyes in Wandjina-style paintings. Often such paintings in the Kimberley were redone at regular intervals and the associated paint on some rock surfaces could be up to 15 mm thick. As a result, many Wandjina paintings are subject to severe exfoliation, and the sites often have multi-layered flakes of paint at the base of painted panels.

As part of the sampling procedure for Kimberley beeswax and charcoal rock art, the GPS location, description and environmental context of each site were recorded. The rock art panels were then photographed and sketched, with the position of collected samples shown. For this study, wax samples about the size of a grain of rice were taken with a scalpel blade from pellets already peeling from the rock surface, while charcoal pigment samples were taken from naturally exfoliating flakes. Once collected the samples were wrapped in aluminium-foil, then placed in small plastic vials labelled with information on site and sample provenance.

Results

AMS radiocarbon ages for Kimberley beeswax motifs, which range in age from modern to 3780 ± 60 years BP (uncalibrated) are presented in Table 1. The latter age for a simple Wandjina head provides a minimum age for the start of the Wandjina Style of rock painting (Fig. 2H). This result is compatible with the

AMS Ref	FIELD Ref	MEDIA	AGE BP C14	AGE BCE/CE Calibr.	MOTIF	COMMENTS
OZB013	WC1	Beeswax	550 ± 100	1262 – 1627 CE	Male figure, 18 × 12 cm	One of a pair
OZB016	AC3.1	Beeswax	1270 ± 90	615 – 970 CE	Simple figure with boomerang and club	
OZB019	WCE4.1	Beeswax	670 ± 90	1185 – 1434 CE	Simple figure with shield (and club?) 15 × 8 cm	One of two
OZC104	008881/1	Beeswax	2200 ± 60	393 – 108 BCE	Non-figurative outline, 123 × 88 cm (Fig. 3E)	Over a 'northern muscly figure'
OZC105	00850/6	Beeswax	1060 ± 50	873 – 1149 CE	Male figure in a sex scene, 21 × 23 cm (Fig. 3C)	Deliberately defaced
OZC106	00822/2	Beeswax	1090 ± 50	782 – 1026 CE	Wax gut on a red painted anthropomorph (Fig. 2A)	58 × 46 cm
OZC107	00808/7	Beeswax	1440 ± 120	580 – 650 CE	Stick figure with upraised arms and widespread legs	Under repainted Wandjina head
OZC108	00834/2	Beeswax	1510 ± 80	390 – 662 CE	Male figure with shield and club 21 x 15 cm (Fig. 2E)	One of two holding shields and clubs
OZC109	00882/1	Beeswax	1220 ± 80	662 – 974 CE	Male figure with club and shield (Fig. 2C)	23.5 x 11.5 cm
OZC110	00822/1	Beeswax	1480 ± 60	433 – 656 CE	Argula (a devil), with testicles and paddle penis (Fig. 2D)	Overpainted red, 29 × 38 cm
OZC111	00909/1	Beeswax	1170 ± 60	691 – 989 CE	Argula, upraised arms, 26.5 × 22.5 cm (Fig. 2B)	Under sea Wandjina and rock cod
OZC112	00849/2	Beeswax	1370 ± 70	540 – 855 CE	Deteriorated motif	
OZC113	00737/2	Beeswax	630 ± 125	1050 – 1618 CE	Anthropomorph of ~50 pellets 17 × 6.5 cm	Under small Wandjina
OZC116	00621/1	Beeswax	730 ± 160	1172 – 1394 CE	46 small to medium pellets on sandstone palette	Palette 27 × 25 cm
OZC117	00907/1	Beeswax	1680 ± 50	239 – 532 CE	Pair of hopping macropod tracks (Fig. 2F)	7.5 × 7.0 cm
OZC158	AC2	Beeswax	3540 ± 50	2021 – 1745 BCE	Simple figure with club and shield	
OZC159	AC3	Beeswax	1580 ± 60	344 – 605 CE	Simple figure with club and shield	
OZC160	WCE4.2	Beeswax	805 ± 55	1048 – 1288 CE	Simple figure with shield (and club?)	
OZC161	WC2	Beeswax	860 ± 30	1049 – 1257 CE	Outline male figure	One of four
OZC162	WC3	Beeswax	1370 ± 30	608 – 689 CE	Stick figure	One of four
OZC434	00527/1	Beeswax	3780 ± 60	2457 – 2033 BCE	Simple Wandjina head 12 × 10 cm (Fig. 2H)	
OZD073	01053/2	Beeswax	695 ± 40	1252 – 1394 CE	Artificial dripline around deteriorated paintings	Under a classic Wandjina
OZD074	00737/1	Beeswax	910 ± 40	1031 – 1211 CE	Deteriorated, in a major Wandjina gallery	Under macropod
OZD075	01109/1	Beeswax	610 ± 40	1290 – 1409 CE	Artificial dripline around an early Wandjina figure	90 × 138 cm, under classic Wandjina
OZD076	00737/2	Beeswax	1160 ± 40	775 – 980 CE	Deteriorated anthropomorph, 17 × 6.5 cm (Fig. 3D)	Under a Wandjina and macropod
OZD078	01131/1	Beeswax	1850 ± 40	70 – 250 CE	Anthropomorph, pole headdress, subincised penis	40 × 12 cm (Fig. 2G)
OZB020	WCE4.3	Charcoal	Modern	Modern	Wandjina eye	
OZB022	AC3.5	Charcoal	430 ± 130	1280 – 1953 CE	Argula	
OZC114	00877/1	Charcoal	1120 ± 90	679 – 1148 CE	Polychrome Argula (Fig. 3B) 164 × 59 cm	
OZC115	C/W-1	Charcoal	1200 ± 90	661 – 993 CE	Tail of Wandjina flying possum. 56 × 105 cm	Under Wandjina head (Fig. 3A)
OZC549	00755/2	Charcoal	300 ± 85	1433 – 1954 CE	Head of Wandjina snake.	Lowest of 38 repaint layers
OZD080	01178/2	Charcoal	375 ± 35	1444 – 1634 CE	Eye of frilly lizard Wandjia.	Lowest repaint
OZD081	01125/1	Charcoal	1210 ± 140	565 – 1152 CE	Eye of main Wandjina in major gallery	
OZC118	00877/6	Shell	1240 ± 80	653 – 970 CE	Section of ochred baler shell	From Wandjina art site
OZB024	MF8	Oxalate	2220 ± 100	522 BCE – 3 CE	Deposits from pecked cupule with rock substrate	

Table 1. *Reference numbers, ages and descriptions of sampled Kimberley rock art motifs. These comprise 26 beeswax figures, 7 paintings, a fragment of ochred baler shell used for mixing pigments at a Wandjina art site, and mineral deposits from the base of a pecked cupule.*

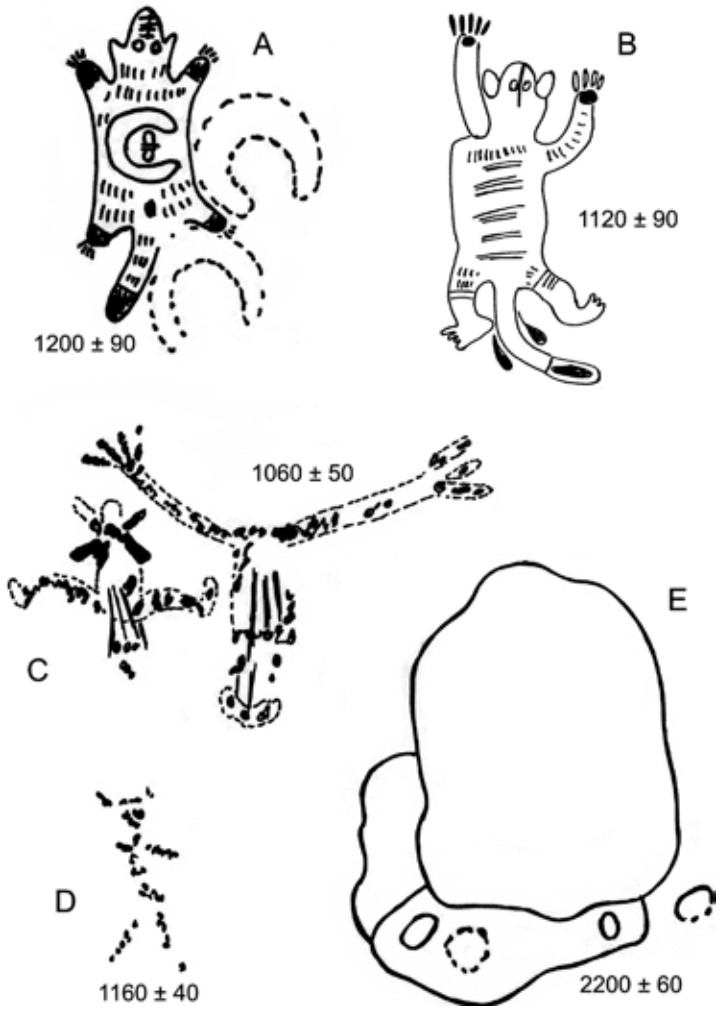

Figure 3. *Kimberley rock art motifs with their ages obtained by AMS radiocarbon dating (uncalibrated): (A) Wandjina-style flying possum with overlying Wandjina head; (B) polychrome Argula (a 'devil'); (C) defaced beeswax anthropomorphs in sex scene; (D) beeswax anthropomorph; (E) beeswax non-figurative outline with circles.*

Figure 4. *Two animals face each other. Their curled upturned tails identify them as dingos (Australian native dogs). These beeswax figures have developed a cracked, white dry surface with age; panel 27 cm across (photograph by David M. Welch).*

inferred ages for late examples of the preceding 'clawed hand style', which includes depictions of stone spear points that were introduced to the Kimberley in the mid-Holocene (Dortch 1977; O'Connor 1996; Veitch 1996; Walsh and Morwood 1998).

Classic Wandjina-style paintings appeared more recently, however, with ages for the black pigments in such paintings ranging from 1210 ± 140 BP to modern (Fig. 3A, B). In fact, heavily repainted examples only date to the last 375 ± 35 years — the age of the lowermost of thirty-eight layers of paint in a Wandjina-style snake depiction. Change and continuity are both apparent in Kimberley rock art — a point emphasised by some of our other results.

Beeswax depictions of simple anthropomorphs clutching shields, clubs or boomerangs are represented throughout a ~3000-year span (Figs 2C, 2E and 5). On the basis of associations and superimpositions, they and similar painted motifs were previously judged contemporaneous with the Wandjina rock painting style (Walsh 1994: Fig. 5); an assessment now confirmed by radiocarbon ages.

In addition, an age of 2200 ± 60 BP was obtained from a large, non-figurative wax motif that overlies, and therefore provides a minimum age for, a painting of a 'northern muscly figure' (Fig. 3E; cf. Walsh 2000: Fig. 369). These anthropomorphs typically lack sexual cues, but have well-defined leg muscle detail and semi-naturalistic heeled feet in profile view. Walsh (2000: 251) argued that this style of rock painting developed in tandem with the more rigid Wandjina style of depiction, in which feet are rotated and shown in 'track perspective'. Our radiometric ages show that at least some 'northern muscly figures' were painted at the same time as Wandjinas. Similarly, the 1090 ± 50 BP date for a wax/paint anthropomorph in profile with exaggerated penis, bent knees and both feet facing the same direction (Fig. 2A), indicates that this distinctive style was not just a latter-day development in Kimberley rock art (cf. Walsh 2000: 251).

More generally, the distribution of radiometric ages for Kimberley wax motifs (Figs 4 to 6; cf. Welch 1995) is similar to that documented by Nelson et al. (2000) for 137 wax figures in the Northern Territory. With one exception — a turtle in simple x-ray style dated to 4000 BP (Watchman and Jones 2002) — the Northern Territory wax motifs were less than 2000 years old: in fact, most clustered within the last 500 years (Nelson et al. 2000: Fig. 2). The age distribution of wax motifs in both regions, therefore, probably reflects taphonomic factors, rather than changes in rate of production over

Figure 5. *Three beeswax anthropomorphs hold up clubs and boomerangs, associated with an animal. Lower human figures 17 cm tall (photograph by David M. Welch).*

Figure 6. *Weathered beeswax anthropomorph, 29 cm tall (photograph by David M. Welch).*

time (Bednarik 2001).

Clearly, the dating of these beeswax figures fixes the most recent rock art tradition of the region, but more research is essential to determine the complete sequence of rock markings, especially the gwion (Bradshaw) figures. Uranium series, OSL and radiocarbon dating methods should be applied to suitable rock art surface coatings and deposits associated with earlier rock art traditions to produce reliable age estimates.

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