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Serpents Glen (*Karnatukul*): New Histories for Deep time Attachment to Country in Australia's Western Desert

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Recent work at Serpents Glen (*Karnatukul*) in the Carnarvon Ranges (Katjarra) of the Western Desert has changed our archaeological understanding of both deep time occupation and more recent arid-zone social geography. Mobilising rock art evidence into earlier models for how arid zone peoples have entered, settled and known Country has allowed us to project people into cycles of human mobility. Our understanding of the deep time and more recent engagements with Country (*ngurra*) has changed significantly since Richard Gould wrote *Yiwara* and *Living Archaeology* in the late 1960s. Early ethno-archaeological studies portrayed the desert as harsh and precarious, and the lifeways of arid zone peoples as marginal and conservative. Fifty years of archaeological endeavour working with traditional custodians in the Western Desert, has changed this view of the 'dangerous desert'. 'Risk-minimisation' and the 'dietary stress hypothesis' have been replaced with models that consider human mobility, social geography and information exchange theory as ways of understanding how arid-zone peoples have been successfully on country since the earliest human occupation of this continent. *Karnatukul's* record rewrites the deep history of the arid zone, as well as refining our understanding of social complexity by combining late Holocene arid zone art and occupation evidence.

Introduction

'... images of Australian deserts as dangerous landscapes have been powerful influences generally on archaeological models of Sahul.' (Hiscock and O'Connor, 2005: 72)

Our archaeological understanding of Western Desert cultural landscapes continues to change and become more nuanced. Through a multi-decadal relationship forged between Aboriginal people and collaborating anthropologists and archaeologists (specifically Bob Tonkinson, Peter Veth and more recently – since 2000 – Jo McDonald), this place's deep significance to the Martu Traditional Owners is confirmed. Our investigations of Serpents Glen (*Karnatukul*) are also contributing to a deeper understanding of the archaeology of Australia, particularly in relation to the flexibility of arid-zone hunter-gatherers. The re-analysis of key sites around Australia continues to reveal greater antiquity of Aboriginal culture while increasingly viable data sets also provide new evidence for the models we deploy to understand human behaviour. Australian sites excavated by pioneering archaeologists (Bowdler 1976; Bowler et al. 1970; Gould 1977; Mulvaney 1960; Wright 1971) began to unravel the myth of a shallow timeframe. The rise of professionalism and regionalism at the end of last millennium saw the focus shift from hunting deep-time

excavations, to gathering understandings of social geography and cultural complexity: seen by some as gendered practice (Moser 2007). The last decade has seen a number of the landmark sites being revisited (e.g. Riwi, Carpenter's Gap, *Puntutjarpa*, Malakunanja II/Madjedbebe) and explored in new detail with a range of improved scientific techniques. This has resulted in increasingly earlier evidence for arrivals on the Australian continent (Norman et al. 2017; Veth 2017). This recent efflorescence also provides greater clarity on the complexity and adaptability of the first Australians (Balme 2000/Wood et al. 2016; Whitau et al. 2016; O'Connor 1995/Maloney et al. 2018; Gould 1977/Smith et al. 2017; Roberts et al. 1990/Clarkson et al. 2017).

The most recent archaeological excavations at *Karnatukul* were at the request of Native Title holders who wanted additional knowledge about the landscape before the installation of the first tourist facilities. This investigation has almost doubled the known occupation of this site, making it the earliest known in the Australian arid zone, providing further contradiction to Gould's model for a late Pleistocene-Early Holocene entry into the interior deserts. The stylistic discontinuities at both the regional and site level also refute his *Australian Desert Culture* being one of long-term cultural conservatism.

Revisiting Serpents Glen has resulted in a revision to its deep time significance, but it has also demonstrated the complexity of Holocene arid-zone lifeways. Reanalysis has mobilised stone tool and rock art productions; and by exploring the contemporaneity of these two behaviours we have achieved a level of understanding which Gould

found wanting in early rock art studies in Australia. He described rock art research as ‘a proliferation of purely descriptive accounts... with occasional attempts at formal analysis that have the distinct quality of bean-counting about them’ (Gould 1990: 97). Gould saw that Western Desert visual art (in which he included cave art, body painting, men’s and women’s crayon drawings, sacred boards and decorated spear throwers) was a ‘relationship between site paths and geography of the Dreaming ancestors’ (ibid: 137). But his truncated research around Warburton never mined further into the role that rock art plays in the articulation of social geography through ‘the interaction of art, place, and viewer’ (Rosenfeld and Smith 2002: 122).

Puntutjarpa takes its name from a mythological episode: ‘*punta*’ meaning people and ‘*tjarpa*’ meaning inside the rock (Gould 1990: 82). Gould’s enormous excavation at *Puntutjarpa* (more than 38 square metres yielding almost 77,500 stone artefacts and other economic remains) is unsurpassed in an Australian arid zone rock shelter and indeed the extent is unmatched in any tropical or temperate rock shelter [cf. Clarkson et al. (2017); McDonald 1992]. Indeed this extensive scale of investigation is rarely achieved in open site excavations anywhere in Australia (cf. Cumberland Plain McDonald 2008: Table 4.1) despite the implications of this for understanding the spatial scale of forager-hunter behaviours (O’Connell 1987). But Gould’s publication of *Yiwara* in 1969, which made its way back into the community with sacred imagery, contrary to assurances he had made, meant that he was unable to continue his pioneering work with the *Ngatatjara* peoples around Warburton. While this ‘controversy’ (McGrath 2010) created a research hiatus in Western Australia, it also created the impetus for new ways of doing archaeological research in collaboration with Aboriginal people. This misstep in desert research changed the ways that archaeologists work and the ways that this work is regulated by heritage legislation with requisite permission from Aboriginal communities Australia-wide (see discussion in Mulvaney 2011: 173–174; Griffiths 2018: 102–107).

Gould’s early work around Warburton, and especially at *Puntutjarpa*, set the trajectory for early arid zone research (Gould 1969; Archer 1977). Gould was convinced that the *Puntutjarpa* 10,000 year Holocene sequence was ‘one of the most dramatic cases of cultural conservatism’ (Archer 1977: 182) demonstrating continuity in an economic system through to the current day. This view set the challenge for the next generation of arid-zone researchers, who, within the next decade, demonstrated that this conservatism was not widespread across the arid zone and indeed that occupation commenced during the Pleistocene (e.g. Hiscock and Wallis 2005; Smith 1987, 2013b; Thorley 1998; Veth 1989, 1993, 2005).

As a rock art researcher moving into the arid-zone from Australia’s sclerophyll-rich south-eastern region midway through my career (McDonald 1999, 2005b, 2005a), my expectations about the art were based on this early broad conservative framework. But my expectations were also based on the regional modelling by Lesley Maynard (1977) following Edwards (1965, 1968) and later, Claire Smith

(1992) and Andrée Rosenfeld (1993), which presupposed that the open social networks of the desert would have resulted in stylistic homogeneity across the arid zone – in the deep past and more recent times. The widespread distribution of the Panaramitee style (sensu Maynard 1979) and the interpretation of this being evidence for long-term conservatism in engraved symbolic behaviour was supported by a range of other observed forms of symbolic behaviours such as body and sand painting in the ethnographic present (e.g. Gould 1990; Munn 1970; Watson 2003).

This was the desert orthodoxy

Tracks and geometric motifs dominate most desert assemblages in engraved and pigment assemblages (Clegg 1987; Franklin 2007), demonstrating the continuity of graphic traditions through time that was confirmed by many researchers (Rosenfeld 1993; Ross & Davidson 2006; Smith 2013a). Even recently, Mike Smith (2013a: 228–231) has argued that this continuity supports a short chronology for arid-zone art production (although see Rosenfeld & Smith 2002), partly because dating work identified a Holocene age determination for the circle motif in central Australia (Smith et al. 2009). Our research in the Western Desert challenges that orthodoxy.

Our focus on rock art and stylistic variability – and the seeking of patterning in this as part of the broader archaeological occupation evidence – has contributed to disentangling dynamic human use of the Western Desert, and argues strongly for a deep time art chronology (McDonald 2005b, 2017; McDonald & Veth 2006, 2013a, 2013b).

While the ongoing theoretical debates for desert archaeology revolve around explaining stochastic hunter-gatherer cultural trajectories and understanding extreme levels of mobility, we can see that people use symbolic behaviour differently during periods of hyper-mobility compared with how art was used to ramify social networks in less arid phases. If fluctuating dietary breadth and changes to territoriality through time are critical themes for understanding how people became arid-zone hunter-gatherers, then rock art can—and has—contributed to a more nuanced understanding of how arid-zone hunter-gatherers manage—and depict—their social identities in the face of these changes.

Karnatukul (Serpents Glen) is a place within the *Katjarra* ranges where people have lived and have illustrated their *jukurr* (dreamings) and their social affiliations through time. Its importance to the Martu was demonstrated by this being chosen for the High Court’s determination of the Birriburru Native Title claim in 2008 (**Figure 1**). The Mungarlu Ngurrarankatja Rirraunkaja Aboriginal Corporation is now this group’s Registered Native Title Body Corporate. In 2013, the entirety of this Native Title claim became the Birriburru Indigenous Protected Area. This paper plots the course of my engagement with this site, having first come into the desert with Peter Veth in 2000, to work on the rock art for the Martu Native Title claim (Veth 2001). In so doing, the aim is to show how our understanding of deep history has become more nuanced, as both the personalities of researchers and the paradigms



Figure 1: Timmy Paterson and Darren Farmer lead the dancing, watched by senior custodian Dusty Stevens and the other men, at the Birriliburru Native Title determination held at Katjarra in 2008. Photo: Jo McDonald, 2008.

under which they have operated has changed. The history of engagement with desert peoples has evolved since the earliest encounters by white explorers and surveyors; to the experiences of a ‘dogger’, employed by the government to kill dingos on this remote edge of the pastoral lands; to a range of researchers (anthropologists, historians and archaeologists). We now have a radically different understanding of how Australia’s desert peoples have known and shown connection to country.

How *Karnatukul* got its whitefella name ...

One of the first white people thought to have visited the Carnarvon Ranges was Henry W.B. Talbot, from the first Alfred Canning expedition in 1908. Early expeditions which crossed the desert further north and south were the various Forrest parties in 1869 and 1874 (well 9/Windich Springs) and the Carnegie expedition which crossed the desert further east of this southern part of the Canning Stock Route (CSR) but then intersected with it much further north around Wells 36-38 (McDonald 2018). One of the first to document his visit to this country was the legendary ‘dogger’, Peter Muir (1989 (1996)). Employed to keep the dingo population down and assist in the expansion of pastoral lands into the arid zone, Peter Muir ranged c. 100 miles between the Rabbit Proof Fence and the CSR and about the same distance north from Wiluna. Pushing vehicle tracks into this country for the first time, Muir spent 16 months around the Carnarvon Ranges in 1962. In 1965 ‘on account of the large number of snake drawings hereabouts and their obvious association with Aboriginal legends of Rainbow Serpents, (he) decided to

name this delightful place ‘**Serpent’s Glen**’ (Muir 1989 (1996): 43).

He provides the first written—and perspicacious—description of the site’s recent rock art assemblage as:

‘.. a long shallow cave that faces south and across an extensive rear wall, for a distance of at least 20 feet are displayed, a profusion of remarkable native paintings. There are scores of them, animals, birds, spirit figures, miniature trees, plants and geometric designs, with vertical red and white bars drawn within oval outlines There is one solitary large concentric circle in brilliant white that forms the centrepiece so conspicuous it dazzles; in fact the majority of the paintings are white... One python sized white snake takes pride of place along the entire length of wall midway between roof and floor, while a large number of a smaller variety wriggle this way and that. These are between tortoises, lizards and pictures of weird animals I can’t identify.’ (Muir 1989 (1996): 41)

He also observed the large number of round grinders with flat millstones scattered about, and ashes of old campfires still evident. He found little surface water, but was convinced that it must exist, because of the ‘the splendid collection’ of art present (Muir 1989 (1996): 42). While finding no permanent water in the vicinity he proceeded to excavate in a patch of soggy ground – and ‘stuck soakage at four feet...’ (ibid.). He also named Billycan Spring, a couple of miles north of his camp, having found a

rusted billycan with a wire handle from a Sunshine Milk tin stamped with 'use before June 1954', which he took as proof that the local Aboriginal people had lived there until relatively recently (Muir 1989 (1996): 47).

He encountered earlier historic graffiti from Mallee Brown (in 1929) and "TOMMY" – he presumed Tommy Ingebong, who had told him about some of the Range's water sources (Muir *ibid*: 69). In addition, he created some 'historic' graffiti including the name Talbot (after surveyor Henry W.B.) who he knew had located one of these waterholes during the Canning Expedition in 1908. Evidence of Peter Muir's travels around the Ranges is plentiful (**Figure 2**). He cut what he called 'official exploration marks' (*ibid*: 43): combinations of his name and/or initials, a government broad arrow, the last two digits of the year, and number of his campsite. Many of these 'marks' are superimposed over Aboriginal paintings. He also engraved the names he gave these places or his name, in a number of locations. These represent a new generation of marking behaviour: which could be seen as graffiti, or following his rationale, official imprimatur (Clarke et al. 2017; Frederick 2017). Peter Muir later married an Aboriginal woman (Daisy) from Kalgoorlie way. He named one of his sons Talbot; and another son, Kado Muir, is now a prominent Aboriginal Politician and artist.

Initial recognition of heritage values

More conventional recording of the sites around this cultural landscape are documented by the WA Department of Indigenous Affairs (now Department of Planning, Lands and Heritage) file notes for the Carnarvon Ranges.

These records date back to the 1960s and include input from such heritage luminaries as Doug McConnell, Mark De Graaf, Harry Butler, Ken Lieberman, Mike Robinson, John Clark, Chris Clarke, Lee Sackett, Steve Brown and Kado Muir (McDonald and Veth 2012a). Mike Donaldson recently identified that he too had visited the area in the 1960s: when he worked for Western Mining this was a place that families came to for picnics. There is a black and white print in the archaeological report for the Martu determination (Veth 2001), which Doug McConnell took of Willy Ward at *Karnatakul* in 1967. In this photo, Ward (the first named claimant on the Birriburru Native Title claim) could be seen retouching one of the snakes on the main panel. Temporary Protected Area status was declared for the Carnarvon Ranges in 1979 ahead of a Western Mining planned expansion (see DAA Memo from Officer Steve Brown after a trip to the sites with *Tjapily* (Dusty) Stevens and Willy Ward). Protected Area status was granted in 1984 (**Figure 3**). This recognition affords the highest protection available in WA under the Aboriginal Heritage Act (1982, as amended). This was granted based on this area's high cultural and scientific values.

Serpents Glen had been a restricted site initially as it was noted to be where the *Wati Kutjarra* (the two men) stored their boards and conducted other secret/sacred activities. Access from Wiluna increased in the 1970s and 1980s due to nearby mining interests and pastoral leases, thanks in part to the tracks created by Peter Muir. The senior custodians Dusty Stevens and Buffer (Papalu) Reeves, recognised this increase in non-Aboriginal visitors, and they removed the sacred objects and 'de-commissioned'



Figure 2: Some of Peter Muir's 'official exploration marks'; and (top left) the inscription he made to celebrate that Henry Talbot located Kadyara waterhole in 1908.

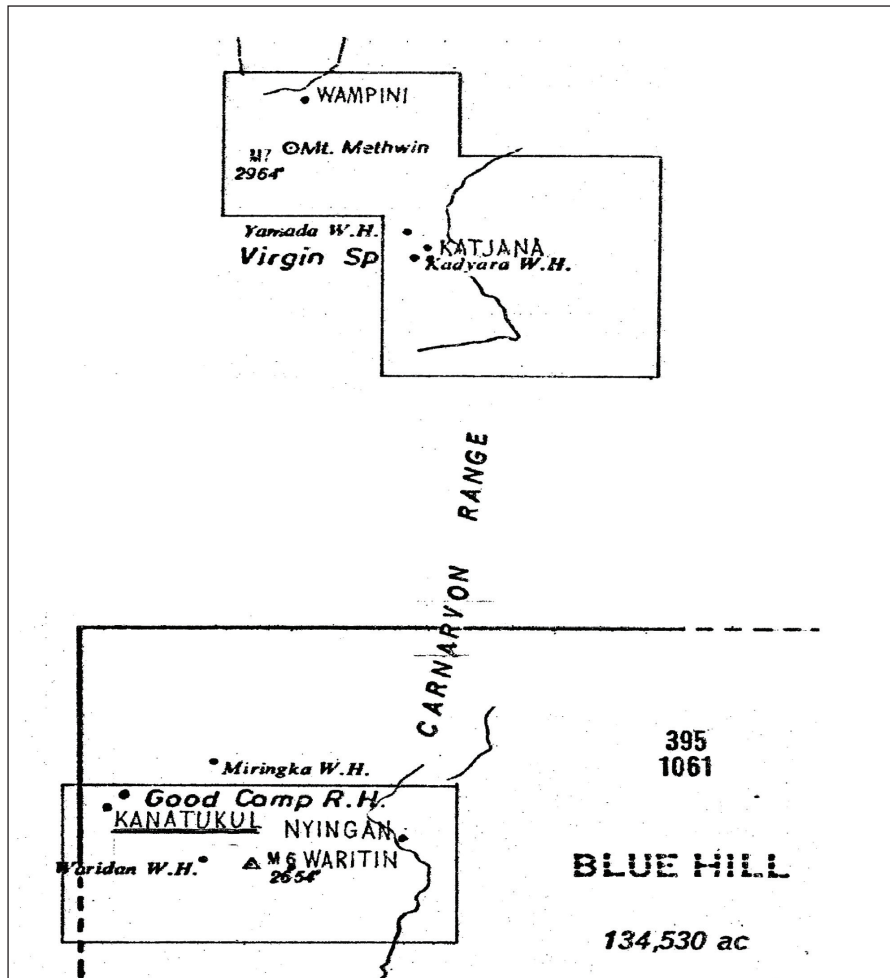


Figure 3: The boundaries on the Protected Area as declared in 1984.

the site to be 'open access' to accommodate the increased level of tourist visitation. Indeed, Mitchell Bilyabu – the bi-lingual headmaster at the remote *Punmu* community – brought Martu children here along the CSR in the 1990s as part of cultural awareness trips (Mitchell Bilyabu, pers. comm. to Peter Veth in 1992).

During his first visit to the site in 1992, Peter Veth was shown a small pool several hundred metres east from the pigment art panels at *Karnatakul* – described by the custodians as a Seven Sisters (*Minyiburu*) site and a women's site. It showed, metamorphosed, the women and *Nyiru*, the old man who was pursuing the women. In 1995, Veth and O'Connor and 25 custodians visited Serpent's Glen *Karnatakul* (but also referred to as *Katjarra* and *Kanaji*: see Liberman notes 1977; W0148R DIA Site 3506). While no systematic inventory of the intangible or tangible values of the Carnarvon Ranges had been completed at this time, it was argued in 1996 that the highest protection available – such as National Heritage Listing – was urgently needed (McDonald and Veth 2012a).

Early archaeological understandings: *Puntutjarpa* and Serpents Glen

Excavation of a one metre square at Serpent's Glen took place in July 1995 with full support from Wiluna custodians (**Figure 4**). Sue O'Connor and Peter Veth's excavation was one of a series they completed across the Western

Desert in collaboration with Canning Stock Route traditional custodians. The primary focus of their excavation addressed what was, then, a central debate in arid-zone archaeology: demographic restructuring during the Last Glacial Maximum (LGM), and the mechanisms by which people reincorporated marginal habitats into a broadly-based desert adaptation with climatic amelioration (O'Connor, Veth & Campbell 1998: 12). This excavation provided the first Western Desert Pleistocene sequence with a basal date of c. 25,000 calibrated years ago. Eight strata were identified, with the top six being late Holocene. The ephemeral Pleistocene assemblage (32 artefacts) and 'clear sterile hiatus' during the LGM was seen as demonstrating flexible settlement strategies to cope with resource stress at different scales of time' (O'Connor, Veth & Campbell 1998: 21). This interpretation of the site did not consider its rock art or the role that this may have played in settlement strategies. The pigment assemblage was dealt with in a single sentence '... a range of polychrome paintings of geometrics, anthropomorphs with headdresses, and a range of striking serpentine figures' (O'Connor, Veth & Campbell, 1998: 12).

The vast majority (98%) of the Serpents Glen stone artefacts came from the late Holocene/indistinguishable from modern strata (O'Connor, Veth & Campbell 1998: 14), and this late Holocene record included a small but diverse faunal assemblage. Their excavation report focussed on the



Figure 4: Sue O'Connor and Peter Veth excavating the site in 1995. Photo: Colin Campbell; reproduced with permission of Peter Veth.

fragmentation of these remains, responding to the dietary stress debate ignited by Gould's and Archer's (1977) *Puntutjarpa* analyses. Gould explained the 9kg of highly fragmented bone throughout the entire *Puntutjarpa* Holocene sequence using the index of fragmentation (IOF) achieved by dividing the number of fragments in each unit into the total bone weight from that same unit. He saw this in terms of long-term dietary stress, preferring the extraction of marrow by Indigenous Australians as the favoured explanation over a range of taphonomic factors initially suggested by Michael Archer (Archer 1977: 164): rock fall, trampling, burning, predators, weathering, soil compaction or a combination of these possibilities. Gould's 1996 paper broadened this consideration back to taphonomy. At Intitjikula (James Range East) there was a 3.3 kg late Holocene faunal assemblage with an even higher IOF (Webster 1982) than *Puntutjarpa*. Gould (Gould 1996: 72) concluded that a combination of taphonomic factors 'probably account for extreme fragmentation at both sites'.

The original Serpent's Glen faunal assemblage (1,807 fragments; weighing only 183.4g) was analysed by Colin Campbell. Roughly, half of the bone was burnt (O'Connor, Veth & Campbell 1998: Figure 5). A number of smaller animals: dasyurid species, possums, bandicoots, lizards (*Varanus*) and snakes were identified as were a number of smaller macropods identified by their teeth (all but one of the 63 were broken). The Serpents Glen faunal assemblage was seen as evidence for this human population being so protein-stressed, that they 'extract(ed) every vestige of edible meat and marrow from the vertebrates captured' (O'Connor, Veth & Campbell 1998: 16).

Kerryn Walshe weighed into the dietary stress debate, claiming that the high fragmentation indices of these three arid-zone faunal assemblages was most likely a taphonomic combination of 'pre and post depositional modification by Indigenous people and predators' (Walshe 2000: 79). While focussing largely on taphonomic effects and sample-size issues with the three known arid zone sites she was critiquing, she made the claim that the 'most significant factor in modification of cultural assemblages in Australia has been the Tasmanian Devil (*Sarcophilis* sp.)' (ibid.) This brought a swift response from Gould (et al. 2002), who argued strongly that many of Walshe's generalised claims were baseless, pointing out that none of the sites in question had any *Sarcophilis* remains, nor indeed any likely overlap with the time frame for these animals living in the desert. They concluded that the dingo was the more likely predator involved in post-depositional fragmentation at all of their sites (Gould et al. 2002). Brian Coddling's (2011) interest in the foraging strategies of Western Desert peoples included a reanalysis of faunal remains from *Puntutjarpa*, firmly grounded in the behavioural ecology frame. He found that the fragmentation rates were constant through time, but that there was a decline in larger macropods throughout the Holocene (replaced in the historic past by rabbits). Coddling concluded (2011: 247) there was a broad-spectrum dietary revolution driven by risk-averse foraging decisions (by discounting taphonomy and butchering patterns), and that this was supported by the patterning in exotic tool stone, grinding equipment and formal tools (see also Coddling et al. 2014). He concluded that the ethnographic pattern of Martu lifeways emerged in the late Holocene as a mosaic

of characteristics (2011: Table 6.15) and this, and the recent reappraisal of *Puntutjarpa* (Smith et al. 2017), have definitely removed 'key field evidence for the 'Australian Desert Culture' (Smith et al. 2017: 29).

Native Title work

Native title work at Serpents Glen involved a large group of traditional custodians, archaeologists and anthropologists in 2004 and 2005 (Veth and McDonald 2005). In 2004, permission was sought from the assembled custodians to undertake radiocarbon dating of the pigment art (**Figure 5**). At this time the first detailed recording was made of the Serpents Glen rock art assemblage and the nearby Wirrili Shelter (named *Bella Vista* on that trip).

We undertook direct-dating of the art, because we were particularly interested in trying to constrain the rock art production to the lithic assemblage which had been dated to the indistinguishable-from-modern period (O'Connor, Veth & Campbell, 1998: Table 2). There was also the evidence that custodian Willy Ward had retouched the iconic snake motif in 1967 (**Figure 6**). As Native Title evidence requires the demonstration of continuity of traditional use, we were interested in understanding the age of the most recent art in this complex assemblage, and how this related to the most recent occupation evidence. There was no 'contact art' present in the assemblage; but we were not necessarily expecting to find a change in subject content to early contact subjects e.g. (Frederick 2000); contra (Smith et al. 2018). Along the entire Canning Stock Route, there is no evidence of Martu or Walmajarri peoples

producing post-contact subjects (e.g. horses, camels or cars) as rock art in traditional techniques.

The contemporaneity of rock art and occupation evidence

Our long chronology of Western Desert (WD) art production is based on correlating stylistic phases with archaeological evidence and climatic phases more broadly (McDonald, 2017; McDonald & Veth 2013b). Direct dating of *Karnatukul's* most recent pigment art phase revealed an apparent disjunct between the art production and the most recent dated occupation evidence. The most recent art at *Karnatukul* (white and black bichrome motifs) was produced between 300–900 years ago (McDonald et al. 2014: Table 3), while the most intensive last phase of occupation was indistinguishable-from-modern (O'Connor, Veth & Campbell 1998: Table 4). The 2014 excavation aimed at directly testing the contemporaneity of rock art and occupation evidence at this site.

Our opportunity to re-examine the *Karnatukul* rock art and occupation evidence came as part of the heritage assessment undertaken to assist in the declaration of the Birriluburru Indigenous Protected Area (McDonald & Veth 2012b). The custodians planned to open up tourist facilities near the site.

Revisiting *Karnatukul* has confirmed the contemporaneity of its art and occupation evidence (see McDonald et al. 2018b: Fig 4). The occupation evidence for the most intensive recent occupation is dated to the same age ranges and 78% of the artefacts at the site derive from this



Figure 5: Jeffrey Stewart (behind) Bob Tonkinson and Billy Patch (Mr P) at *Karnatukul* in 2004, discussing the proposed dating work, watched by Jo McDonald and Bill Kruse. Photo: Peter Veth. Reproduced with permission of the photographer.



Figure 6: Karen Steelman collecting a charcoal sample (#2005-23) from the snake motif, where the black drawn outline is likely the result of Willy Ward retouching this motif in 1967. This sample had insufficient carbon to allow an age determination. Photo: Jo McDonald, 2005.

most recent assemblage (McDonald et al. 2018b: 27; Table 2). The visible alternation in the upper sequence between highly enriched anthropogenic residues (SU2 and SU4) and more natural layers (SU1 and SU3) is interpreted as episodic intensive occupation events between 500–700 years ago and then 0–300 years ago interspersed with less intensive occupation (see McDonald et al. 2018b: Figures 6–9). These are the age ranges returned for the production of the grey *mamu* (anthropomorphic figures) and black and white phytomorphs that were dated here (McDonald et al. 2014). Interestingly, DStretch analysis (image enhancement) has shown that the grey *mamu* dated on Panel 3 overlies a number of red motifs, including a headdress figure. The background sample collected next to this *mamu* returned an age determination 3,550–3,160 cal. years BP and similar to the estimated age for the phase of headdress figure production (see McDonald et al. 2018b: Figure 7).

Superimpositions observed on all 13 panels demonstrate the episodic nature of the art production (McDonald et al. 2018b: Figure 5; Table 1). Both the stylistic discontinuities between the art phases and the changed placement of these within the site support the interpretation that these productions are temporally discrete (McDonald et al. 2018b: Figure 17; Figure 18; and see Rosenfeld & Smith 2002).

The earliest pigment art is interpreted as contemporaneous with the mid-Holocene occupation phase: Bayesian modelled between 8,160–2,330 cal. BP. At this time, the shelter was occupied by people undertaking a generalised range of multifunctional and flexible stone tool activities. The artists who produced pigment art at this time

signalled a narrative intent. Their highly visible complex composition was emblematic (Wiessner 1984). A similar style (but not the same composition) occurs in nearby *Wirrili*, linked to occupation dated between 4,500–5,500 cal. BP (McDonald et al., 2018a).

The subsequent pigment production phase – the distinctive headdress figures – represents a switch to signalling corporate identity for the broader *Katjarra* region. This signalling vocabulary is found widely across the Western Desert (McDonald 2005b), but the style found at this site are exclusively the distinctive *Katjarra*-style fern-shaped headdress (Figure 8). The elongated symmetrical fern design peculiar to this rangeland is distinguishable from the headdresses worn by other territorially tethered groups (McDonald 2017). This phase of art production is superimposed directly over the earlier composition suggesting intentional symbolic replacement, not coincidence (Re 2016). The presence of only *Katjarra*-style headdress designs suggests a group asserting their identity in this territorially circumscribed desert upland and flanking lowland: this is not an aggregation locale for larger social gatherings (contra Jillakurru, and to a lesser extent Kaalpi, where headdress styles indicate a broader mixed social group (McDonald and Veth 2012b). This suggests a different type of occupation focus during this period, with domestic activities perhaps located on the sand plain outside the rock shelter locale. Alternating site use has resulted in pulses of contemporaneous art and occupation evidence followed by intervening periods when art and/or occupation were not produced as dual actions within the rock shelter.

The most recent phases of art production signals local-group identity. The spatial distribution of this art

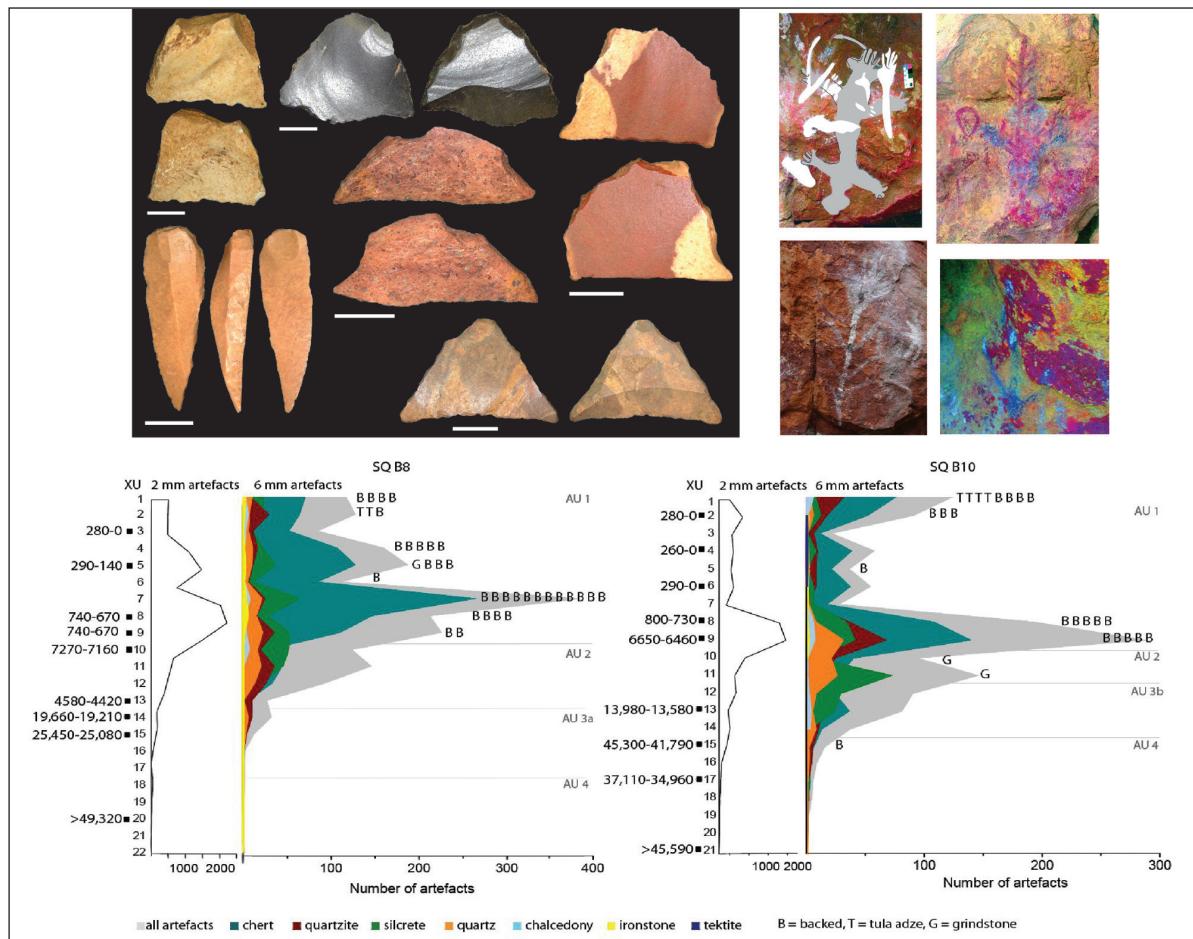


Figure 7: *Karnatukul's* occupation in the last millennium included backed artefact production and woodworking with *tulas* as well as white pigment art production including *mamu* figures (top) and phytomorphs (bottom).



Figure 8: Katjarra-style headdresses found around the Ranges and in the mid-Holocene phase of production at *Karnatukul* (from (McDonald, 2017): Figure 10).

(McDonald et al. 2018b: Fig 18) demonstrably associated with similarly intensive occupation evidence reflects a domestic focus during the shelter's most recent phase of use. The combined lines of rock art and occupation evidence during the last millennium demonstrates this was a localised home base: people were producing paintings here as one of a range of activities. The focus on this place for habitation is demonstrated by a conspicuous increase in its use for artefact manufacture both in terms of density and the nature of the activities documented. Amongst this most recent occupation evidence is the largest known backed artefact assemblage in the Western Desert – more

than 100 from the three excavated squares (Hiscock & O'Connor 2005; Hiscock 2014; Smith 2013b; Veth 1993). These artefacts demonstrate a surprisingly diverse range of geometrics and backed points (Hiscock 2014), as well as *tulas* indicating woodworking activities (McDonald et al. 2018a). The use-wear on the backed artefacts indicate that not only are their shapes highly variable, but that their functional uses were also highly variable. Five classes of use-wear indicate that backed points were used for cutting and scraping both soft tissue and harder materials, and piercing. Only one of these has been used as a projectile point, i.e. a spear barb (McDonald et al. 2018a,

Figure 6). The high artefact discard rates and richness indices, combined with the local group identifying behaviour, demonstrates lower residential mobility. *Karnatukul* is also unique in the Western Desert for containing both *tulas* as well as backed artefacts in this intensive period of site use (Figure 7: cf. Hiscock 2014). Interestingly, these combined tool types are only found in the most recent occupation pulse: i.e., in the last 300 years.

A new history for the oldest desert site

Karnatukul provides evidence for the earliest occupation of the Australian Western Desert, at a modelled age of 50,010 – 45,190 cal. BP, pushing back our understanding of the initial occupation of this Western Desert site by more than 20,000 years. This dated sequence derives entirely from C_{14} dates and sits at the edge of the radio-carbon barrier. It is consistent with early dates obtained by combination OSL and C_{14} sequences from the wider arid zone (Veth 2009; Veth et al. 2014; Wood et al. 2016). We now have evidence for the earliest human occupation of Australia's arid zone from contexts as varied as the maritime desert coastline, the savannah desert interface and now rangelands amongst interior linear sand dunes.

This new analysis of *Karnatukul*'s earliest evidence offers increased understanding of early arid zone human behaviours. An assemblage of 41 artefacts (and 384 pieces of micro-debitage) confirms episodic occupation throughout the Pleistocene. The LGM assemblage has 48 artefacts and 322 pieces of micro-debitage. There is a raw material shift from the pre-glacial assemblages, with proportions of chert and quartzite declining, but quartz and silcrete increasing (McDonald et al. 2018b: 24, Tables 10, 11). A single geometric backed artefact dated to c. 42 kcalBP provides the earliest evidence in Australia for experimentation with this specialised technology. There is an even earlier tool, a retouched ironstone scraper, recovered from the pre-glacial deposit (two XU's below a charcoal sample dated to 47,860 cal. BP). Early technological innovation registered in this assemblage highlights the resourcefulness of the first Australian's adaptive culture. The revised *Karnatukul* sequence provides the first unequivocal evidence for occupation of the Western Desert during the Last Glacial Maximum (contra O'Connor, Veth & Campbell, 1998; Smith 2013a), as well as an occupation pulse during the late Pleistocene/early Holocene transition. Unfortunately, the recent excavations revealed too small a faunal assemblage to refine the questions raised (Coddling 2011: 254) about an apparent decline in macropod abundance in the late Holocene. There are two different proliferation events identified in the Holocene: during the mid-Holocene and in the last millennium. Superimposition and style analyses using Harris matrices and spatial placement demonstrate a robust sequence of stylistic change in pigment art production at this site in the recent past.

The excavated sequence and direct dating of the pigment art confirms the contemporaneity of multiple social actions during the last millennium. The combined art and occupation sequences suggest that as well as the

occupation focus of this place having changed through time and that the types of signalling behaviours deployed during the Holocene changed.

This classic desert site demonstrates a changing focus of human symbolic practice in the recent past and confirms the complexity of desert peoples through deep time. These discoveries irrefutably overturn Gould's (Gould 1977) conclusions that a distinct society emerged 10,000 years ago and that this persisted, unchanging, until the present day. It also addresses a question Gould raised in his early work: which was thwarted because of a lack of chronological control. He said, 'there is no way, at present, to estimate the importance of visual motifs pertaining to sacred geography in the prehistoric rock art of the Western Desert' (Gould 1990: 138).

Karnatukul's lithic assemblages show changing modes of site use and mobility supported by changes in the pigment art revealing social and territorial mediation. Australian arid-zone hunter-gatherers validate their attachment to Country by inscribing their social identities. This attachment to country continues. The Mungarlu Ngurrakatja Rirraunkaja peoples continue to visit, protect and manage this place in the Birriluburru Indigenous Protected Area. Their quest to develop tourism here is as much about developing sustainable economies as it is about ongoing opportunities to travel to and engage with all parts of their remote country.

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Competing Interests

The author has no competing interests to declare.

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