• 'Small, individually nondescript and easily overlooked': Contact beads from northwest Arnhem Land in an Indigenous-Macassan-European hybrid economy | Daryl Wesley and Mirani Litster

• The palaeo-environmental history of Big Willum Swamp, Weipa: An environmental context for the archaeological record | Janelle Stevenson, Sally Brockwell, Cassandra Rowe, Ulrike Proske and Justin Shiner

• A multidisciplinary investigation of a rock coating at Ngaut Ngaut (Devon Downs), South Australia | Amy Roberts, Isobelle Campbell, Allan Pring, Graham Bell, Alan Watchman, Rachel S. Popelka-Filcoff, Claire E. Lenehan, Christopher T. Gibson, Natalie Franklin and the Mannum Aboriginal Community Association Inc.

• Thy Thylocine is a thylacine | David M. Welch

• A fine-grained analysis of the macropod motif in the rock art of the Sydney region, Australia | Alandra K. Tasire and Iain Davidson

• Investigating standardisation in the form of backed artefacts at two sites in the Hunter River valley, NSW, Australia | Marika A. Low

• Mapping a millstone: The dynamics of use-wear and residues on a Central Australian seed-grinding implement | Mike Smith, Elspeth Hayes and Birgitta Stephenson

• Compliance-based archaeological heritage management and place-based participatory mapping for negotiated outcomes | David R. Guilfoyle and Myles B. Mitchell

• Attributes, preservation and management of dendroglyphs from the Wet Tropics rainforest of northeast Australia | Alice Buhrich, Åsa Ferrier and Gordon Grimwade

• Mid-Holocene exploitation of marine molluscs in the lower Mid West, Western Australia | Carly Monks, Bob Sheppard and Joe Dortch

• The archaeology of Bindjarran rockshelter in Manilikarr Country, Kakadu National Park, Northern Territory | Denis Shine, Melissa Marshall, Duncan Wright, Tim Denham, Peter Hiscock, Geraldine Jacobsen and Sean-Paul Stephens

• The Brremangurey pearl: A 2000 year old archaeological find from the coastal Kimberley, Western Australia | Katherine Szabo, Brent Koppel, Mark W. Moore, Iain Young, Matthew Tighe and Michael J. Morwood
Australian Archaeology, the official publication of the Australian Archaeological Association Inc., is a refereed journal published since 1974. It accepts original articles in all fields of archaeology and other subjects relevant to archaeological research and practice in Australia and nearby areas. Contributions are accepted in eight sections: Articles (5000–8000 words), Short Reports (1000–3000), Obituaries (500–2000), Thesis Abstracts (200–500), Book Reviews (500–2000), Forum (5000), Comment (1000) and Backfill (which includes letters, conference details, announcements and other material of interest to members). Australian Archaeology is published twice a year, in June and December. Notes to Contributors are available at: <www.australianarchaeologicalassociation.com.au>.

Australian Archaeology is indexed in the Arts and Humanities, Social and Behavioural Sciences, and Social Sciences Citation Indices of the Thomson Reuters Web of Knowledge, SCOPUS, Australian Public Affairs Information Service (APAIS), and Anthropological Literature and Anthropological Index Online.

Australian Archaeology is ranked as a tier A journal by the European Reference Index for the Humanities and French Agence d'Evaluation de la Recherche et de l'Enseignement Supérieur.

Subscriptions are available to individuals through membership of the Australian Archaeological Association Inc. or to organisations through institutional subscription. Subscription application/renewal forms are available at <www.australianarchaeologicalassociation.com.au>.

Australian Archaeology is available through Informit and JSTOR.

Design and Print: Openbook Howden

Front Cover: Studying a Nautilus shell during midden sorting (Annette Oertle, entered in the AAA 2014 Photography Competition).

All correspondence and submissions should be addressed to:

Australian Archaeology
PO Box 10, Flinders University LPO
Flinders University SA 5048
Email: journal@australianarchaeology.com
<htp://www.australianarchaeologicalassociation.com.au>

The views expressed in this journal are not necessarily those of the Australian Archaeological Association Inc. or the Editors.

© Australian Archaeological Association Inc., 2015
ISSN 0312-2417

Editors
Heather Burke Flinders University
Lynley Wallis Wallis Heritage Consulting

Editorial Advisory Board
Brit Asmussen Queensland Museum
Huw Barton Leicester University
Noelene Cole James Cook University
Penny Crook La Trobe University
Ines Domingo Sanz University of Barcelona
Judith Field University of New South Wales
Joe Flatman University College London
Richard Fullagar University of Wollongong
Tracy Ireland University of Canberra
Marilyn Lombard University of Johannesburg
Alex Mackay University of Wollongong
Scott L’Oste-Brown Central Queensland Cultural Heritage Management
Jo McDonald The University of Western Australia
Patrick Moss The University of Queensland
Tim Murray La Trobe University
Jim O’Connell University of Utah
Sven Ouzman The University of Western Australia
Fiona Petchey University of Waikato
Amy Roberts Flinders University
Katherine Szabo University of Wollongong
Nancy Tayles University of Otago
Robin Torrence Australian Museum
Peter Veth The University of Western Australia
Alan Watchman Flinders University
David Whitley ASM Affiliates Inc.
Nathan Woolford Nathan Woolford Consultants

Short Report Editor
Sean Winter The University of Western Australia

Book Review Editors
Alice Gorman Flinders University
Claire St George Ochre Imprints

Thesis Abstract Editor
Tiina Manne The University of Queensland

Editorial Assistant
Susan Arthure Flinders University

Commissioned Bloggers
Jacqueline Matthews The University of Western Australia
Carly Monks The University of Western Australia
Michelle Langley The Australian National University
Jordan Ralph Flinders University
Table of Contents

Editorial | Heather Burke and Lynley A. Wallis  iii

Articles

'Small, individually nondescript and easily overlooked': Contact beads from northwest Arnhem Land in an Indigenous-Macassan-European hybrid economy | Daryl Wesley and Mirani Litster  1

The palaeo-environmental history of Big Willum Swamp, Weipa: An environmental context for the archaeological record | Janelle Stevenson, Sally Brockwell, Cassandra Rowe, Ulrike Proske and Justin Shiner  17

A multidisciplinary investigation of a rock coating at Ngaut Ngaut (Devon Downs), South Australia | Amy Roberts, Isobelle Campbell, Allan Pring, Graham Bell, Alan Watchman, Rachel S. Popelka-Filcoff, Claire E. Lenihan, Christopher T. Gibson, Natalie Franklin and the Mannum Aboriginal Community Association Inc. (MACAI)  32

Thylacoleo is a thylacine | David M. Welch  40

A fine-grained analysis of the macropod motif in the rock art of the Sydney region, Australia | Alandra K. Tasire and Iain Davidson  48

Investigating standardisation in the form of backed artefacts at two sites in the Hunter River valley, NSW, Australia | Marika A. Low  60

Mapping a millstone: The dynamics of use-wear and residues on a Central Australian seed-grinding implement | Mike Smith, Elspeth Hayes and Birgitta Stephenson  70

Compliance-based archaeological heritage management and place-based participatory mapping for negotiated outcomes | David R. Guilfoyle and Myles B. Mitchell  80

Attributes, preservation and management of dendroglyphs from the Wet Tropics rainforest of northeast Australia | Alice Buhrich, Åsa Ferrier and Gordon Grimwade  91

Short Reports

Mid-Holocene exploitation of marine molluscs in the lower Mid West, Western Australia | Carly Monks, Bob Sheppard and Joe Dortch  99

The archaeology of Bindjarran rockshelter in Manilikarr Country, Kakadu National Park, Northern Territory | Denis Shine, Melissa Marshall, Duncan Wright, Tom Denham, Peter Hiscock, Geraldine Jacobsen and Sean-Paul Stephens  104

The Bremangurey pearl: A 2000 year old archaeological find from the coastal Kimberley, Western Australia | Katherine Szabo, Brent Koppel, Mark W. Moore, Iain Young, Matthew Tighe and Michael J. Morwood  112

Backfill


Thesis Abstracts - Available online

Rich Pickings: Abandoned Vessel Material Reuse on Rangitoto Island, New Zealand | Kurt Bennett

The Law of the Sea: How Ratifying the UNESCO Convention Will Affect Underwater Cultural Heritage Management in Australia | Thomas Body

Undressing the Past: A Study of the Correlation between Waistcoat Design and Broad Sociocultural Trends of Nineteenth and Early Twentieth Century Australia | Jessica Megan Boman

Socioeconomic Status in Nineteenth Century Diet at The Rocks, Sydney, Australia: The Effects of Government Regulation and Institutionalisation | Annabelle Brealey
'Inland' Versus 'Coastal': An Analysis of Archaeological Shell Remains to Determine Habitat Exploitation Patterns at Edubu 2, South Coast of Papua New Guinea | Anna Garamszegi

Who Were the People of Ancient Vilabouly? Exploring Origins and Relationships through the Study of Ge | Catherine Livingston

Understanding Australia’s Cultural History through Archaeological Geophysics | Kelsey M. Lowe

Communicating Cultural Complexity: The Interpretation of a Physically Impacted Aboriginal Shell Midden at Point Lookout, North Stradbroke Island, Queensland | Anna Nelson

What You Lookin' At?: An Archaeological Analysis of Graffiti and Inscripton at Fremantle Prison, Western Australia | Bgeela Romano

A Woman’s Place …: An Historical Archaeological Investigation of Identity and Power on the Nineteenth Century Pastoral Landscape of Southeast Queensland | Linda Terry

Understanding a Contested Heritage Place | Anna Weisse

Assessing Mid- to Late Holocene Predation of Conomurex luhuanus and Tectus niloticus at Lizard Island, Northeastern Australia | Samantha Aird

An Archaeobotanical Analysis of Macrobotanical Remains at Riwi Cave in the South-Central Kimberley Region, WA | India Ella Dilkes-Hall

The Economic Impact of Convict Transportation on the WA Economy 1850–1900: An Archaeological Investigation | Alyce Haast

An Analysis of the Risk Hypothesis and its Application to Hunter-Gatherer Toolkits Using an Australian Dataset | Emma Rehn

Cultural Competition: A Darwinian View of Cultural Evolution as it Applies to the Early Development and Interaction Between Rome and Etruria | Matilda Vanessa Stevens

Disembodied and Displaced: An Archaeological Enquiry into the Historical Colonial South Trade of Indigenous Human Remains and Artefacts, and the Contemporary Repatriation and Rehumanisation of Indigenous Australians from South Africa | Tahlia Stewart

Book Reviews - Available online

First Footprints: The Epic Story of the First Australians by Scott Cane | Douglas Bird

Historical Archaeologies of Cognition: Explorations into Faith, Hope and Charity edited by James Symonds, Anna Badcock and Jeff Oliver | Edwina Kay

The Science of Human Origins by Claudio Tuniz, Giorgio Manzi and David Caramelli | Iain Davidson

Australia’s Fossil Heritage: A Catalogue of Important Australian Fossil Sites by the Australian Heritage Council | Judith Field

Art and Archaeology: Collaborations, Conversations, Criticisms edited by Ian Alden Russell and Andrew Cochrane | June Ross

A Companion to Rock Art edited by Jo McDonald and Peter Veth | Ken Mulvaney

Working With Rock Art: Recording, Presenting and Understanding Rock Art Using Indigenous Knowledge edited by Benjamin Smith, Knut Helskog and David Morris | Sven Ouzman

The Death of Prehistory edited by Peter Schmidt and Stephen Mrozowski | John Giblin

Archaeological Dimensions of World Heritage: From Prevention to Social Implications edited by Alicia Castillo | Ian Lilley

An Archaeology of Institutional Confinement. The Hyde Park Barracks, 1848–1886 by Peter Davies, Penny Crook and Tim Murray | Susan Piddock
The archaeology of Bindjarran rockshelter in Manilikarr Country, Kakadu National Park, Northern Territory

Denis Shine1, Melissa Marshall2, Duncan Wright2, Tim Denham2, Peter Hiscock3, Geraldine Jacobsen4 and Sean-Paul Stephens5

1. Irish Archaeological Field School, Number 1, Brendan Street, Birr, County Offaly, Ireland <denis.shine@iafs.ie>
2. School of Archaeology and Anthropology, The Australian National University, Canberra ACT 0200, Australia <melissa.marshall@anu.edu.au> <duncan.wright@anu.edu.au> <tim.denham@anu.edu.au>
3. Department of Archaeology, School of Philosophical and Historical Inquiry, Faculty of Arts and Social Sciences, The University of Sydney, Sydney NSW 2006, Australia <peter.hiscock@sydney.edu.au>
4. Institute for Environmental Research, The Australian Nuclear Science and Technology Organisation, New Illawarra Road, Lucas Heights NSW 2234, Australia <geraldine.jacobsen@ansto.gov.au>
5. 1/383 Alma Road, Caulfield North Vic. 3162, Australia <sean.paul.stephens@gmail.com>

Abstract

Archaeological excavations at Bindjarran rockshelter in Kakadu National Park, Northern Territory, have revealed evidence of human settlement on the East Alligator River floodplain from the terminal Pleistocene through to the twentieth century. This excavation report summarises the archaeological, ethnographic and rock art research from the site, focusing on dated distributions of stone artefacts. The findings from Bindjarran conform to archaeological findings from previously investigated sites in the region and contribute to a greater understanding of Aboriginal society in this region during the Big Swamp phase, Freshwater phase and in the last 600 years.

Introduction

A small sandstone outlier called Bindjarran is located in a portion of Manilikarr Country within Kakadu National Park (KNP), approximately 2.2 km south of the East Alligator River and 2.7 km south-southwest of the Ubirr rock art complex (Figure 1). The Bindjarran outlier measures approximately 60 m in diameter and contains two rockshelters positioned 30 m apart which are connected by a shallow overhang. Bindjarran rockshelter measures ca 26 x 5 x 3.5 m and the smaller Nabarebarde rockshelter measures ca 10 x 3.5 x 2 m. Both rockshelters have been formed through disintegration or undercutting of the sandstone outlier's eastern face. Rock art stretches continuously along this face with a break of approximately 3 m between the two shelters. A third rock art gallery on the southern face completes the site complex.

The name Bindjarran is derived from the Kunwinjku name for the eel-tail catfish (Neosilurus sp.), a fish with distinctive barbells or ‘whiskers’ (Taçon 1989). Nabarebarde is the Kunwinjku name for the bony bream or herring (Nematalosa erebi). As outlined below, these species are reflected in the rock art images throughout the site complex (Figure 2).

During late 2011, archaeological excavations were conducted at Bindjarran as part of community-led doctoral research by DS (see also Shine et al. 2013). Bindjarran was selected for excavation by NaGodjok, the former senior traditional owner of Manilikarr Country (NaGodjok has since passed away and is referred to throughout this paper by his skin name). NaGodjok was succeeded by his son, Alfred Nayinggul, early in 2012. Both NaGodjok and Alfred supported a program of doctoral rock art research at Bindjarran by author MM.

Previous Research in Manilikarr Country

Manilikarr Country is a clan estate that lies south of Gunbarlanja (Oenpelli) on both sides of the East Alligator River. Most of Manilikarr Country lies in western Arnhem Land (declared an Aboriginal Reserve in 1931), although it also extends into KNP (proclaimed in 1979, 1984 and 1987) (Davis and Weiler 1992).

The currently reported excavations were the first in Manilikarr Country since the 1960s (Schrire 1982; White 1967; White and Peterson 1969) and the first in KNP since the early 1980s (Jones 1985). A number of rock art surveys have been conducted in the Manilikarr estate (e.g. Brandl 1968; Earth Sea Heritage Surveys 2009; Edwards 1979; Gunn 1992; Jelinek 1976, 1978, 1979), including a partial recording of theBindjarran site in the 1980s (Taçon 1989), while further rock art research is currently nearing completion. Ethnographic information pertaining to Manilikarr Country has also been previously recorded (e.g. Berndt 1982, Chaloupka et al. 1985, Mountford 1966).
A total of 816 images (paintings, drawings, stencils and prints) were recorded at the Bindjarran complex. Within the Bindjarran rockshelter itself, 703 images were documented, including 647 paintings, 11 stencils, 40 prints and five instances of beeswax. Nabarebarde contained 84 rock art images, including 72 paintings, two stencils, six prints and four drawings. The remaining 29 images were located in two smaller galleries. Nine paintings were adjacent to Nabarebarde; 19 paintings and one stencil were recorded on the southern side of the outlier.

Preliminary analysis of the rock art indicated that, in addition to previously recorded fish species (Taçon 1989), many other animals were depicted, including goannas, macropods, magpie geese and other bird species, turtles and snakes. There are numerous paintings of human figures, some of which form parts of large scenes, including headdresses, dilly bags, pubic coverings, clubs, shields, numerous types of spears and spear throwers. Many are painted as stick figures, whilst others are larger, more solid images. Numerous sorcery figures are identified by distorted limbs and barbs emanating from joints. Additionally, there are a number of Contact period images, including guns and European figures (identified by their ‘hands on hips’ pose).

Oral histories for the Bindjarran site were provided by NaGodjok, Alfred Nayinggul and several other traditional owners. NaGodjok was the last of his family to camp at the outlier and recalled sleeping in Nabarebarde during the wet season. NaGodjok stated the site was used as a water buffalo hunting camp in ‘more recent times’, presumably after ca 1891 when Paddy Cahill commenced water buffalo hunting in the East Alligator River region (Berndt and Berndt 1970; Cole 1975:15; Mulvaney 2004). Two images at Bindjarran are recalled in Aboriginal narratives. The first, a figure with braided hair and a rifle (Figure 3), is remembered as a member of a water buffalo hunting party by Tamisha Williams, Kaylene Djangomerr and Marcus Dempsey. They identified this figure as ‘Yellow Charlie’s’ father—Yellow Charlie being a mixed race Chinese man who lived in the area adjacent to the current Border Store café (approximately 1.8 km northeast of the site). The second image shows a male human figure with approximately six multibarbed spears penetrating his body, neck and legs (Figure 4). It was recollected that this image represents a payback event that occurred in the late 1800s.
Excavations

Excavations consisted of a single 1 x 1 m and two 50 x 50 cm squares. Square 1, the larger square, was excavated within a camping area identified by NaGodjok, 12 m east of the Bindjarran overhang (see Figure 5). The two smaller squares, Squares 2 and 3, were excavated 5 m apart within Bindjarran, in close proximity to the main panels of rock art and a concentration of grinding hollows (Figure 6). Appropriate locations for excavation were restricted at Bindjarran because bedrock was present at or near the surface in several places.

Excavation was completed in arbitrary excavation units (XUs) that averaged 2.2 cm in thickness in Squares 1 and 2, and 2.1 cm in Square 3. In Square 1 XUs increased in thickness to a mean of 4.7 cm from XU51 down into culturally sterile alluvium. Excavations reached depths of 230 cm (76 XUs; Square 1), 44 cm (20 XUs; Square 2) and 75 cm (35 XUs; Square 3) (for further excavation and laboratory methodologies see Shine et al. 2013).

Stratigraphy and Chronology

Five basic stratigraphic units (SUs) were observed in Square 1, consisting of a series of loamy sands overlying a set of well-sorted alluvial deposits. Bedrock was encountered under the alluvium at a depth of 230 cm below surface (bs) (XU76) (Figure 7).

Squares 2 (three SUs) and 3 (four SUs) exhibited similar stratigraphies to the upper strata of Square 1, comprising a series of sands. Large rocks were encountered below XU6 in Square 2, significantly reducing the excavation area and excavation was abandoned in XU20 at a basal depth of 44 cm bs. Owing to the presence of rocks, excavation in Square 3 concluded in XU35 at a depth of 75 cm bs.

A total of 18 pieces of charcoal at Bindjarran were AMS radiocarbon dated (Table 1). With the exception...
Figure 6 Bindjarran rockshelter viewed to the north with Square 2 (background) and Square 3 (scale is in 20 cm units).

Figure 7 Section drawings of Square 1, Bindjarran, with XUs back-plotted.
of the alluvium in Square 1 and a single inversion in Square 3, radiocarbon dates are in chronostratigraphic order, indicating relatively good stratigraphic integrity. The radiocarbon dates from Bindjarran range from 13,140–12,771 cal. BP to, effectively, the present.

In Square 1, two samples of charcoal (from XU13 and XU23) were collected in situ, while the others were recovered from the sieved fraction. The dates from Square 1 are in sequence from SU1–3 (XU1–42), which date from 6956–6670 cal. BP to present. Attempts to obtain reliable ages for the alluvium (SU4–5) have been unsuccessful, partially because charcoal was extremely sparse in these levels. The minor amounts of charcoal from SU4 4 and 5, recovered during sieving (from XU43, XU46 and XU51), have not provided reliable ages and are likely to be intrusive.

In Square 2, four dates were obtained on sieved charcoal. The age of the stratigraphy in Square 2 increases rapidly with depth, and sediments below XU10 date to in excess of 7434–7291 cal. BP. The oldest date for the square (from XU19) is 8358–8178 cal. BP.

In Square 3, six dates were obtained on sieved charcoal. These dates indicate a broadly similar chronology to Square 2, although Square 3 is of greater antiquity (dated in XU33 to 13,140–12,771 cal. BP), potentially because it was excavated to a greater depth. A chronological inversion was observed between XU19 (7164–6936 cal. BP) and XU27 (5592–5532 cal. BP). The consistency in other radiocarbon dates at the site suggests that the charcoal dated from XU27 is intrusive (Table 1).

Basal dates from Squares 2 and 3 inside the rockshelter are of much greater antiquity than those obtained from Square 1. They provide a terminus ante quem of much greater antiquity than those obtained from Square 1, although Square 3 is of greater antiquity (dated in XU33 to 13,140–12,771 cal. BP), potentially because it was excavated to a greater depth. A chronological inversion was observed between XU19 (7164–6936 cal. BP) and XU27 (5592–5532 cal. BP). The consistency in other radiocarbon dates at the site suggests that the charcoal dated from XU27 is intrusive (Table 1).

Cultural Materials

Cultural materials recovered during the excavations include 600 stone artefacts, 800 g of charcoal >2.1 mm, 0.01 g of bone (n=1), 41.3 g of worked ochre (n=8), and 90.3 g of unworked ochre (n=43). Given the paucity of other cultural materials (including no European-era artefacts) this report focuses on dated distributions of stone artefacts.

Of the 600 flaked stone artefacts recovered at Bindjarran, 251 came from Square 1, 89 from Square 2 and 260 from Square 3. Flaked stone artefacts were distributed throughout all XUs of Squares 2 and 3, but in Square 1 none were found below XU149. As the chronologies and stone artefact densities of the external (Square 1) and internal squares (Squares 2 and 3) differ significantly, they are described separately.

In Square 1, 94% of the stone artefacts were recovered from XUs 1–28, levels which date from 5265–4865 to 2918–2762 cal. BP to post-304 cal. BP. Peak densities of stone artefact deposition occur between XUs 26–28 (n=37, 15% of the total count from Square 1) and XUs 11–13 (n=40; 16% of the total); XU13 dates to 1270–1075 cal. BP. The incidence of macrocharcoal is greatest from XUs 13–23, peaking in XUs 15–16. Few stone artefacts were found below XU28 (n=16; 6% of the total count of stone artefacts), with none noted below XU49. The density of stone artefact deposition in Square 1 (n=0.1 artefacts/kg excavated sediment) is significantly less than in Squares 2 and 3.

Stone artefact deposition densities show no distinct cultural trends in Square 2. However, two slight peaks are recorded in XUs 1–3 (n=21; 23% of the total count from Square 2) and in XUs 15–17 (n=24; 27% of the total count). XU13 dates to 500–316 cal. BP and XU15 dates to 8014–7858 cal. BP. An increase in mid-Holocene stone artefact deposition in Square 2 aligns with an increase in macrocharcoal. In total XUs 9–18 (dating from approximately 7434–7291 cal. BP to 8358–8178 cal. BP) contain nearly 77% of the total macrocharcoal from Square 2 (in 40% of the excavated sediment weight). A broadly contemporary peak in burning (17% of the total macrocharcoal in 6% of the excavated sediment weight) was recorded in Square 3 in XUs 25–27, which dates to approximately 8410–8346 cal. BP. Stone artefact deposition densities were significantly higher in Square 2 (n=0.8 artefacts/kg excavated sediment) than Square 1 and less than that recorded in Square 3 (n=1.3 artefacts/kg excavated sediment), suggesting more intense human activity inside the overhang than outside.

In Square 3 the highest densities of stone artefacts post-date 622–510 cal. BP (between XUs 1–11; n=150; 50% of the total count from Square 3). Within XUs 1–11, stone artefact densities peak in XUs 3–6, dated in XU5 from ca. 304 cal. BP to modern. A dramatic increase in charcoal (29% of the total charcoal in 15% of the excavated sediment) is recorded from XUs 3–6. The peaks in XUs 3–6 imply that increased flaking and burning activity at Bindjarran continued until the recent past, as recalled by members of the local community. No clear trends in stone artefact deposition are recorded in Square 3 below XU11. Two minor peaks of stone artefacts occur in XUs 19–22 (n=36; 14% of the total count) and XUs 33–35 (n=25; 10% of the total count). These levels date to approximately 7164–6936 (XU19) and 13,140–12,771 cal. BP (XU33).

Discussion

Excavation results, oral histories and rock art suggest that Bindjarran was used from the terminal Pleistocene, commencing at least 13,140–12,771 cal. BP, through to the twentieth century. Site use (based on an increase in lithics and burning activity) appears to increase from ca 8014–7858 to 7164–6936 cal. BP, after a series of roof-fall events ended. More intense site use in the mid-Holocene follows a cessation in alluviation some time before 6956–6670 cal. BP.

Increased use of Bindjarran during the mid-Holocene is broadly contemporaneous with a regional environmental change known as the ‘Big Swamp’ phase, characterised by the emergence of mangrove/swamp environments across the lowlands of western Arnhem Land between 8000 and 6000 years ago (e.g. Allen 1987, 1989; Brockwell et al. 2009; Hope et al. 1985; Woodroffe et al. 1988). More intensive occupation during this period has previously been documented at several rockshelters close to mangroves, including Nawamoyn at 8182–7679 cal. BP (ANU-53), Malangangerr at 7231–6490 cal. BP (GaK-627), Malakunanja II at 7679–6664 cal. BP (SU-A-264) (Allen and Barton 1989; Kammenga
and Allen 1973; Schrire 1982). Increased intensities of human activity at Bindjarran in the mid-Holocene appear to be a localised expression of a regional trend whereby rockshelters were more intensively occupied to enable foraging in newly established mangroves.

A second period of increased site use at Bindjarran, signalled by increased stone artefact discard and macrocharcoal, commenced sometime between 5265–4865 and 2918–2762 cal. BP and peaked ca 1270–1075 cal. BP. Peak activity at Bindjarran, approximately 1200 years ago, is broadly contemporary with the Freshwater phase, when the current hydrological environment is thought to have stabilised. While a general increase in both the quantity and extent of site use on the freshwater floodplain has been observed from at least 2000 years ago (e.g. Hiscock 1999; Jones 1985; Meehan et al. 1985), considerable geographical variation in floodplain settlement is likely to have occurred (e.g. Allen 1987, 1989; Allen and Barton 1989; Jones 1985), as different landforms and parts of the landscape variably adjusted to the new freshwater conditions (e.g. Clark and Guppy 1988; Hiscock 1997, 1999).

The final period of peak occupational intensity at Bindjarran post-dates 622–510 cal. BP. The highest levels of flaking activity occur after this date, peaking in the protohistoric

### Table 1

Radiocarbon dates on charcoal from Bindjarran (Squares 1–3). Calibration with OxCal 4.1 (Bronk Ramsey 2009) using the IntCal09 dataset (Reimer et al. 2009). Bindjarran lies at the southern boundary of the Inter-tropical Convergence Zone (ITCZ), an area that may be influenced by northern hemisphere air masses (Hogg et al. 2013; Hua et al. 2012). For this reason the calibrations were performed using the IntCal 09 dataset of Reimer et al. (2009). * The value of δ^13C is assumed, as a measure was not available.

<table>
<thead>
<tr>
<th>Square</th>
<th>Laboratory Code</th>
<th>XU</th>
<th>Depth Below Surface (cm)</th>
<th>δ13C (%o)</th>
<th>Radiocarbon Age (BP)</th>
<th>Calibrated Age (95.4% Probability) (cal. BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OZP012</td>
<td>4</td>
<td>6</td>
<td>-25.7±0.1</td>
<td>200±30</td>
<td>304–260(25.5%)</td>
</tr>
<tr>
<td></td>
<td>OZP010</td>
<td>13</td>
<td>27</td>
<td>-25.5±0.1</td>
<td>1245±35</td>
<td>1270–1075(95.4%)</td>
</tr>
<tr>
<td></td>
<td>OZP011</td>
<td>23</td>
<td>48</td>
<td>-25.7±0.1</td>
<td>2735±30</td>
<td>2918–2910(1.5%)</td>
</tr>
<tr>
<td></td>
<td>Wk-32916</td>
<td>34</td>
<td>73</td>
<td>-26.5±0.2</td>
<td>4411±33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OZP013</td>
<td>42</td>
<td>92</td>
<td>-25.0*</td>
<td>5980±60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wk-32914</td>
<td>43</td>
<td>95</td>
<td>-29.0±0.2</td>
<td>107±0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wk-32915</td>
<td>46</td>
<td>102</td>
<td>-25.7±0.2</td>
<td>2025±31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OZP014</td>
<td>51</td>
<td>116</td>
<td>-25.0*</td>
<td>2820±45</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>OZP017</td>
<td>3</td>
<td>4</td>
<td>-25.4±0.1</td>
<td>360±30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wk-32913</td>
<td>10</td>
<td>20</td>
<td>-26.4±0.2</td>
<td>6460±38</td>
<td>7434–7291(35.4%)</td>
</tr>
<tr>
<td></td>
<td>OZP015</td>
<td>15</td>
<td>31</td>
<td>-25.5±0.1</td>
<td>7120±40</td>
<td>8014–7920(75.9%)</td>
</tr>
<tr>
<td></td>
<td>OZP016</td>
<td>19</td>
<td>41</td>
<td>-24.6±0.1</td>
<td>7435±45</td>
<td>8358–8178(95.4%)</td>
</tr>
<tr>
<td></td>
<td>OZP021</td>
<td>5</td>
<td>8</td>
<td>-25.4±0.1</td>
<td>200±30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wk-36358</td>
<td>12</td>
<td>23</td>
<td>-25.7±0.0</td>
<td>521±25</td>
<td>622–609(5.6%)</td>
</tr>
<tr>
<td></td>
<td>OZP018</td>
<td>19</td>
<td>38</td>
<td>-25.2±0.1</td>
<td>6145±40</td>
<td>7164–6906(95.4%)</td>
</tr>
<tr>
<td></td>
<td>Wk-36359</td>
<td>25</td>
<td>47</td>
<td>-26.0±0.0</td>
<td>7561±25</td>
<td>8410–8346(95.4%)</td>
</tr>
<tr>
<td></td>
<td>OZP019</td>
<td>27</td>
<td>52</td>
<td>-24.6±0.4</td>
<td>4775±35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OZP020</td>
<td>33</td>
<td>67</td>
<td>-25.7±0.1</td>
<td>11,110±50</td>
<td>13,140–12,771(95.4%)</td>
</tr>
</tbody>
</table>

Table 1 Radiocarbon dates on charcoal from Bindjarran (Squares 1–3). Calibration with OxCal 4.1 (Bronk Ramsey 2009) using the IntCal09 dataset (Reimer et al. 2009). Bindjarran lies at the southern boundary of the Inter-tropical Convergence Zone (ITCZ), an area that may be influenced by northern hemisphere air masses (Hogg et al. 2013; Hua et al. 2012). For this reason the calibrations were performed using the IntCal 09 dataset of Reimer et al. (2009). * The value of δ^13C is assumed, as a measure was not available.
period. This period of site use most likely incorporates the ethnohistorically recorded use of Bindjarran, for example as a water buffalo hunting camp, when several of the contact period rock art images (including Yellow Charlie) were painted.

The rock art at Bindjarran supports the archaeological findings and is consistent with the periods described above. The earliest layers of rock art observed throughout the site complex are representative of the Estuarine Period (8000–1500 years ago) as defined by Chaloupka (1993). This stylistic phase includes imagery described as ‘Naturalistic’, such as estuarine fish species, crocodiles, different types of spear throwers, as well as ‘Intellectual Realism’ evidenced by complex x-ray and beeswax designs (Chaloupka 1993). Subsequent imagery is also present from Chaloupka’s ‘Freshwater Phase’ (from 1500 years ago), including magpie geese and complex spearthrowers, as well as the ‘Contact Period’ (from 300 years ago), as evidenced by contact imagery.

Collectively the archaeology and rock art from Bindjarran conform to archaeological findings from previously investigated sites in the East Alligator River region and contribute to a greater understanding of Aboriginal society in this region during the Big Swamp phase, Freshwater phase and in the last 600 years.

Acknowledgements

We thank NaGodjok for leading these excavations and supporting us throughout the fieldwork. We would like to acknowledge the Nayinggul family, particularly Lawrence Nayinggul and Hilton Garnarradji who worked on the excavations, as well as Alfred Nayinggul and the various visitors to site who narrated oral traditions. KNP provided accommodation and logistical support; a depth of gratitude is owed in particular to Anne O’Dea and Gabrielle O’Loughlin. Thanks also to Sally May and Paul Tacon for an engaging discussion on the rock art as well as Terry Marshall and Kaylene Yates for invaluable assistance recording the paintings themselves. The template used for Figure 7 was provided by Bruno David and Ian McNiven. Finally, many thanks to the summer scholars who completed archaeological sorting post-excavation, Elissa Teperman and Kim Parker.

This field research was supported by a Monash Research Accelerator grant awarded to TD and ongoing analyses are partially funded by an Australian and Pacific Science Foundation grant awarded to TD and DS. Support for radiometric dating and archaeological sorting was provided by AINSE (Grant 12/111) and the Student Summer Scholarship Scheme at Monash University. Internal support for radiometric dating was also provided by the Indigenous Australian Archaeology Section of the School of Geography and Environmental Science. DS’s PhD is supported by a Monash International Postgraduate Research Award Scholarship, Faculty of Arts Scholarship and internal support from the School of Geography and Environmental Science; MM is funded through an Australian Postgraduate Award and ANU field research funds programme. This publication was prepared with assistance from a Monash Postgraduate Publication Award.

References


