Submission No 15

INQUIRY INTO PROPOSAL TO RAISE THE WARRAGAMBA DAM WALL

Name: Dr Jim Smith

Date Received: 25 August 2019

Submission to 'Enquiry into the proposal to raise the Warragamba Dam wall'

by Dr Jim Smith.

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This submission relates to the enquiry's term of reference (d), "the adequacy of the Environmental Impact Assessment process to date" part (ii) Aboriginal Cultural Heritage.

This submission can be published in full, under my name, on your website. I am willing to appear as a witness at the enquiry.

Biographical introduction to Dr Jim Smith B Sc., Dip. Ed., M.A., Ph.D.

I am an independent researcher, not representing any organisation, however, this submission has been developed in close consultation with the Registered Aboriginal Party for the Warragamba Dam raising proposal including Kazan Brown and Taylor Clarke.

I have been exploring the Burragorang Valley for over 40 years, mostly on foot, but also including about 10 days of car journeys and three days of boat travels with Burragorang Valley Aboriginal descendents, escorted by Lake Burragorang catchment management staff. My first book on the Aboriginal people of the Burragorang Valley was published in 1991 (*Aborigines of the Burragorang Valley 1830- 1960*). This became part of a series of eight books on the history and culture of Gundungurra people, including detailed studies of their creation beliefs. I completed a Ph.D. thesis entitled 'Gundungurra Country' in 2008 which received a "Vice-Chancellors Commendation" for outstanding research. My published books most relevant to the Burragorang Valley Aboriginal people are: *Gungarlook. The Story of the Aboriginal Riley family of the Burragorang Valley*, (written in association with former Burragorang Valley Aboriginal resident Ivy Brookman nee Riley) published in 2010, and *The Aboriginal people of the Burragorang Valley. "If we left our Valley our hearts would break"*, first edition 2016, second revised edition, 2017. I have published 37 articles on Aboriginal history and culture, nearly all of them relating to Gundungurra people, including 'Aboriginal voters in the Burragorang Valley, New South Wales, 1869-1953', published in *The Journal of the Royal Australian Historical Society* in December 2012. My most recent published article is very relevant to the deliberations of your committee. This is 'Rock Art of the Burragorang Valley' published in Kelvin Knox and Eugene Stockton (eds), *Aboriginal Heritage of the Blue Mountains. Recent Research and Reflections*, Blue Mountain Education and Research Trust, 2019. A PDF copy of this article is included with this submission. I am willing to supply a copy to your committee of the book *The Aboriginal people of the Burragorang Valley. "If we left our Valley our hearts would break"* on request.

This submission is in four parts.

1. Comments on the draft 'Aboriginal Cultural Heritage Assessment Warragamba Dam Raising', document dated 26 June 2019, prepared in association with the Registered Aboriginal Party, Kazan Brown.
2. A paper outlining the cultural significance of waterholes in the Burragorang Valley, explaining what has already been lost and what is threatened by the proposed raising of the Warragamba Dam wall.
3. A PDF map entitled 'The Journey of Gurangatch and Mirragan' showing the locations of waterholes mentioned in the above paper.
4. A PDF copy of my article 'Rock Art of the Burragorang Valley'.

Part one.

Comments by Dr Jim Smith on Draft 'Aboriginal Cultural Heritage Assessment Warragamba Dam Raising', dated 26 June 2019, prepared after consultation with Kazan Brown. 11 August 2019.

1. A major omission from the report is that individual heights for each site are not stated, only whether they are within the PMF zone. If the exact heights for each site were given it would provide WaterNSW with more nuanced options during heavy rainfall events. For example, it may be that some particularly important sites, or groups of sites, could be saved from inundation by only allowing the water to rise, for example, 12 m rather than 14 m, if this could be safely done. It is recognised that an accurate height is not given by a GPS height reading alone, however when the GPS location is correlated with D.E.M. data available through L.I.D.A.R., a very accurate height is obtainable. Also, the PMF height is not the only relevant figure to be considered when assessing the impact of flooding on sites. The 'crest potential' and the 'bathtub effect' need to be taken into account. Art sites which may be above the PMF level can be damaged by spray and wave action. Sites above the PMF level will also be affected by diffusion of water through the soil and into the porous sandstone rock of art sites. Art which has stabilised in the dry soil conditions above the current level of lake Burragorang could deteriorate rapidly with increased soil moisture, increased humidity and spray from the raised level of the lake. These important factors are not referred to in the report.
2. Heritage legislation in New South Wales assesses heritage values for both Aboriginal and non-Aboriginal sites using seven criteria. It is very unusual that the consultants for this report have only assessed each site for its scientific or archaeological significance, with the other six criteria dismissed in generic paragraphs, some of which are only a few sentences in length. To my knowledge, it is unprecedented for over 300 sites to have their historical significance (criterion a) assessed as a group. A number of sites have a significant post-contact history, with for example Aboriginal communities choosing to live near culturally significant sites. Important first, and early, contact sites with non-Aboriginal people are not referred to, nor are the places where Gundungurra people met with anthropologists and other recorders of their culture and stories. Similarly, the aesthetic (criterion c), social or cultural significance (criterion d) and criteria e, f and g are summarily dealt with. The consultants have used an unusual definition for aesthetic significance, referring only to the aesthetic qualities of the Burragorang Valley landscape, with no mention of the aesthetic qualities of the Aboriginal art found. Some of the art motifs and styles are rare in the Sydney Region. There is no mention of criterion b, used to assess sites with "a strong or special association with the life or works of a person or group of persons of importance in New South Wales' cultural or natural history." It could be argued that the Burragorang Aboriginal community satisfies this criterion as "a group of persons of importance in New South Wales cultural history". Similarly, it could be argued that John Joseph Riley, with his strong association with early land rights claims, is an individual of high importance in the state's history. It is usual when assessing the cultural heritage significance of places to come to a conclusion, as required by New South Wales legislation, as to whether the site is of local or State Heritage Significance. Places of State Heritage Significance, when entered on the State Heritage Register, are given a high level of protection in state law. A full examination of the sites listed in the Burragorang Valley in this report would almost certainly find that some sites are of State Heritage Significance. State legislation also mandates the preparation of Heritage Impact Statements in a prescribed format for the damage, loss or alteration of heritage sites, whether Aboriginal or non-Aboriginal. It is not known whether these

deficiencies in the heritage assessment of the sites are due to an inadequate brief for the consultants.

3. The report contains virtually no reference to comparisons with other sites in the Sydney Region or other parts of Australia, for example data within the report relating to the overall density of sites and percentages of site types (for example in table 18) could have been compared with other areas in the Sydney region to indicate whether the Burragorang Valley has an exceptionally high density or percentage of, for example, art sites. The number of sites located is very high considering that they were found well above the prime riverside habitat of Gundungurra people. To find so many cultural sites 50 or 60 m above the original river level in the Valley is remarkable, and indicates what an important environment for Aboriginal people the Burragorang Valley was.
4. It is disturbing that the consultants have rated the scientific significance of nearly all the art sites as "low", usually because the art has faded or is in poor condition. Surely the consultants are aware that, with specialised photography and x-ray techniques, faded and damaged images can be enhanced. Some images, which are completely invisible to the naked eye can be revealed through these methods. Pigment samples from these sites can also be analysed to reveal the sources of the colours used. Aboriginal communities particularly value the locally distinctive aspects of their culture. Whereas stone tools and other artefacts, grinding grooves, scarred trees and shelters are similar throughout Australia, art styles, stone arrangements and places connected with Aboriginal stories, ceremony and 'Dreaming' have locally distinctive features. Virtually all of these locally distinctive cultural sites are dismissed by the consultants as of "low (archaeological) significance". It is an insult to Aboriginal people to assert that sites associated with the foundations of their culture, their stories, ceremonies and law, are of low significance and to summarise their concerns in a single sentence: "The Registered Aboriginal Parties (RAPs) have advised at all sites have cultural significance." It is an indication of questionable methodology that a site such as Warragamba 254, a shelter with art, deposit, artefacts and axe grinding grooves can be rated as of low scientific significance. Research by Jo McDonald indicates that this type of combination of cultural artefacts is rare in the Sydney region.
5. It is unacceptable that each site has only been evaluated individually. The maps show many clusters of sites which should have been recognised as Aboriginal cultural landscapes, where the significance of the whole group of sites is greater than that of the individual items. Two major concentrations of sites, at Gungarlook, and around the Commodore Hill area, are exceptional for their diversity of cultural sites and should have been evaluated as cultural landscapes, rather than only as individual items. Aboriginal communities take a holistic view of their cultural sites rather than looking at them in isolation as the consultants have done.
6. Commenting on the document is sometimes made difficult, for example in sections 12.4.1 and 12.4.2 where the 'Warragamba' numbers used in the other sections of the report are not cited with the descriptions.
7. There are many errors and omissions in the report. Over 30 references cited (with Harvard referencing) within the report are not listed in the bibliography. I have previously pointed out, in a letter to WaterNSW (June 2018) that there is no such reference as "Williams, R. 1914". There are numerous typographic errors throughout. It is important that the Aboriginal place names recognised by the Gundungurra people are used. The use of variant spellings, unless they are typographic errors, should be explained. Warragamba 116, claimed to be a "Niche New Site", was already on the AHIMS register and referred to in a 1989 report by Brayshaw. It is possible that other already listed sites are claimed to be "new". The wrong meaning of the placename Burragorang is listed from an inaccurate 1958 source. The true

meaning has now been established. On page 130, site 17 is dismissed as having "typical" images. My recent analysis of the site (published in the book 'Aboriginal Heritage of the Blue Mountains') has shown that some of the images are unique in the Sydney Region.

8. Survey coverage of the Kedumba Valley appears to have been minimal. There is also no reference to the cultural significance for Gundungurra people of the Camden White Gum. In addition, the importance of the grouping of scarred trees (evidence of past removal of bark and wood to create artefacts) adjacent to the Joorilands property has not been recognised, with only three scarred trees documented in the report. There are at least 10 trees in this group, making it one of the largest and best-preserved concentrations in New South Wales. These trees are also associated with some of the most extensive stone artefact deposits in the Burragorang Valley.
9. The methodology for identifying sites associated with Aboriginal ceremony and Dreaming is questionable. The cultural story of Gurangatch and Mirragan makes it clear that it is the entire course of the Wollondilly and Cox Rivers in the Burragorang Valley, and their relevant tributaries, and associated sites that were created during their journey, that is significant, not just the waterholes where Gurangatch rested. The association of the Kamilaroi Point art site (52 –-1– 0142) with a Dreaming story is not acknowledged in the document.
10. On page 129 it is stated that "This overview does not include all the places of cultural significance that occur in the area, but rather, a selection of known ones." How was this selection made? Was it a random selection? Why were a number of important cultural sites not included in the "selection"?
11. The overall impact of the dam raising is downplayed by claiming that "only an additional 34 sites would experience temporary inundation" and that 'only' three sites of "high scientific (archaeological) significance", will be affected by the new PMF. The consultants have stated that damage to Aboriginal sites is "unavoidable" (p.vi and section 15.4) and claimed that there is "no feasible alternative" to damaging the sites if the dam wall is raised. This ignores the possibility, for example, of recommending that the dam wall be raised to a lesser height than the proposed extra 14 m. The use of the word "only" could be considered objectionable to Gundungurra descendants, who suffered the devastating permanent loss of the great majority of their cultural sites in the Burragorang Valley in the late 1950s. In section 14.5 the statement: "the potential impacts of the Project can be considered relatively minor" is a gross understatement of the true level of impacts.
12. Dividing the sites into only two categories: those which will experience a "partial loss of value" and those that will experience "no loss of value" ignores the existence of what should be a third category: sites which will experience a permanent almost complete or catastrophic loss of cultural value. Submerging pigment art sites is incorrectly described as leading to only "partial loss of value". Just one episode of inundation will lead to permanent damage to the Aboriginal art. The consultants' assessment of previously flooded art sites, now exposed in the current drought conditions, shows that these have minimal pigments remaining. I find the statement in the concluding paragraph: "There is no significant detrimental effect to quality or benefit that the Aboriginal history and archaeology of the Subject Area may provide to future generations due to the infrequency of the rain events that will cause harm to Aboriginal objects" unreasonable. It will only take one such event, which could occur within decades, to provide permanent and irreparable damage to art sites. To describe such an outcome as only "a partial loss of value" is a statement by the consultants which would not be shared by the Burragorang Valley descendants.
13. Virtually all of the stone hatchet heads found by the consultants are referred to as being made from basalt. In my experience basalt axes are very rare in Gundungurra country, with

nearly all of the ones I have seen being made from hornfels (metamorphosed sedimentary rock).

14. Little consideration has been given in the report to the effect of raising the water level in Warragamba Dam on future cultural access by Gundungurra descendants. When the dam level is higher, many areas outside the current 3 km zone from the edge of Lake Burragorang, where unescorted access is presently allowed, will be off limits to independent groups of Gundungurra people. Existing roads within the current 3 km zone, which are currently available for escorted access by Aboriginal people on cultural visits, could be severely damaged or no longer accessible when the dam level rises. As an example, at present, Gundungurra people can follow the Dreamtime route of Gurangatch and Mirragan up Reedy Creek from near its junction with the Kedumba River to the Birrigooroo waterhole. Even if the latter waterhole was only rarely flooded, the access for walkers beside Reedy Creek up to it will become choked with weeds and silt. The reeds which give this creek its English and Gundungurra names are unlikely to survive periodic inundation.
15. Three maps from my publications have been included in this report without my permission. These maps are clearly marked as copyright. It is a common misconception that up to 10% of a published document can be copied without obtaining copyright permission. However, maps come under the definition of 'artworks' for which permission must be obtained before reproduction. I do not want these maps to appear in the final Environmental Impact Statement document and will take legal action if they are published without permission. These maps are premised on the recognition of, and respect for, Aboriginal cultural landscapes, and used in some cases information from Aboriginal informants. I do not wish them to appear in a report in which the significance of Gundungurra cultural landscapes is not respected by a detailed analysis.

May I recommend to the committee that WaterNSW be asked to provide individual heights for each of the Aboriginal sites located during the survey and that they provide a copy of the brief for the consultants who carried out the 'Aboriginal Cultural Heritage Assessment'.

Part two.

Potential loss of culturally significant waterholes in the Burragorang Valley with the proposed raising of the Warragamba Dam wall. By Dr Jim Smith.

The drowning of the lower Burragorang Valley in the late 1950s, after the completion of Warragamba Dam, led not only to dispossession of the Aboriginal people of the Valley but inundated culturally significant waterholes associated with the Gurangatch and Mirragan creation story, the Nulla Nulla story and the Giant Kangaroo story.

The waterhole at the junction of Byrnes Creek and the Wollondilly River, where the Giant Kangaroo tried to escape the Bullan gods, was called by the Gundungurra-speaking people 'Burragorang'. Originally applying just to a single waterhole, this name was later used by non-Aboriginal people to refer to the whole valley.

The 'Black Hole', just upstream of the Nattai River junction, was associated with the creation story of 'Nulla Nulla' and was adjacent to the biggest concentration of burial sites in the Valley. It was also near the major ceremonial ground at the junction of the Nattai and Wollondilly Rivers.

Gurangatch, when being chased by Mirragan, tried to hide from his pursuer in 15 waterholes along the Wollondilly and Cox Rivers, Reedy Creek in Kedumba Valley and Joolundoo on the upper Fish River. Their names were listed in the creation story recorded in the notebooks of RH Mathews and partially published in 1908.

Flooding of the Burragorang Valley led to the loss of 11 these waterholes, some of which now lie some 60 m below the surface of 'Lake Burragorang'.

Waterholes associated with the Gurangatch and Mirragan story which will never be seen again:

Woonggaree, Goorit, Kweeoogang, Mullindi, Boonbal, Gurrabulla, Junba, Gaung Gaung, Billagoola and Goodoomba. Karrangatta waterhole briefly re-emerged during the drought between the late 1990s and early 2000s but the 'Black Dog Rock' in the waterhole, which served as a 'signpost' for travelling Gundungurra people, had been completely buried in silt.

The only waterholes which escaped drowning were (in addition to the Murraural waterhole where Gurangatch originally lived): Doogalool, Gungarlook, Birrigooroo (on Reedy Creek) and Joolundoo on the upper Fish River.

Raising the wall of Warragamba Dam by 14 m will cause inundation of Gungarlook and Birrigooroo, leaving only two waterholes (Murraural and Dooogalool) from this Creation story surviving in the Wollondilly-Cox River catchment.

While maps of the water level of Lake Burragorang show that Gungarlook is at the extreme end of the Lake when the dam is 100% full, this is quite a rare event and has a minimal effect on this waterhole. The surrounding landscape is in close to its original condition, and includes a traditional and post-contact camping site on Murphy's Flat, two Aboriginal reserves, a kangaroo hunting site and the location of the 'Jumping Woman' story. Raising the dam wall will cause partial alteration of this landscape and its associated sites.

As well as the loss of the waterholes themselves, cultural sites associated with them were also lost. Beside Woonggaree waterhole was 'Slippery Rock' where the two protagonists fought. The area between Kweeoogang and Mullindi waterholes was an important meeting place of clans, with the Thurrawal people from the Shoalhaven River and people from the upper Wollondilly at Goulburn

meeting there with the Gundungurra people for ceremonial activities. This area also included one of the most culturally significant places in the Burragorang Valley the 'Hands on the Rock' art site. Burragorang warriors prepared for their revenge ritual raids by bathing in Mullindi waterhole.

Goodoomba waterhole was associated with the creation story of the edible fern roots and was beside the culturally important 'Face Rock'.

The strategically located Karrangatta waterhole was a 'signpost' showing the way to the Megalong Valley, as well as the place where Gurangatch tunnelled away from the Cox River, leaving behind the ochre derived from his blood at Meeoowun.

Petroglyphs were an extremely rare art form in the Burragorang Valley. The best known of these, the Bustard carving on Byrnes Creek, is now lost under silt and water.

Post-contact sites important to the Burragorang Valley people that went under Lake Burragorang included St Joseph's Farm and Saint Paulinus church, where Gundungurra people were baptised, confirmed, married and had their burial services. Also lost was the cemetery near the junction of Greenwattle Creek and Cox River where many Burragorang Aboriginal people were buried. Living places lost included two of the Valley's Aboriginal Reserves, as well as many farm properties where Aboriginal people lived and worked. All of the school sites attended by Aboriginal children in the Valley were lost.

The Camden White Gum was a culturally significant tree to the Gundungurra people. Gundungurra man Billy Russell (c.1835-1914), in his memoirs, remembered the population on the Victoria Park property which was cut down in his time. It is the only tree species he refers to in his memoirs, and he gave the Gundungurra name for it as *Durrum-by-ang.* This tree has a very restricted distribution. Over 95% of the known former distribution was within Gundungurra territory. Stands of *Durrum-by-ang* were important distinctive landmarks within their country. Many were lost during the early years of settlement and Gundungurra descendants are concerned that more will be killed when the major population in Kedumba Valley is inundated.

This partial list of culturally significant places of the Burragorang Valley that were inundated by the original Burragorang dam gives some indication of the magnitude of the loss sustained by the Gundungurra speaking people. It is understandable that, after losing eleven of the waterholes associated with the Gurangatch and Mirragan story, the descendants of the Valley people are determined not to lose Gungarlook and Birrigooroo waterholes.

References.

Jim Smith, *Gundungurra Country*, unpublished Ph.D. thesis, Macquarie University, 2008.

Jim Smith, *The Aboriginal People of the Burragorang Valley*, second edition, Blue Mountains Education and Research Trust, Lawson, 2017. (Note: this second edition shows the true location of the Burragorang waterhole, which is incorrectly shown in the first edition of 2016.)

W. Russell, *My Recollections*, Camden News, 1914.

THE JOURNEY OF GURANGATCH AND MIRRAGAN

FROM MURRAURAL TO JOOLUNDOO THROUGH THE LAND OF THE GUNDUNGURRA PEOPLE IN THE GUNYUNGALUNG (DREAMTIME)

COUNTRY OF THE WYWANDY

Upper Cox R.

LITHGOW

COUNTRY OF THE THERABULAT

GREAT DIVIDING RANGE

WANDAKMALOI WALLS BUILT BY MIRRAGAN TO PREVENT GURANGATCH ESCAPING

Fish R.

BINDO

Joolundoo

HERE MIRRAGAN'S DIVING BIRD FRIENDS TRY TO CATCH GURANGATCH BUT ONLY BILLAGOOLA THE SHAG SUCCEEDS IN GETTING A PIECE OF GURANGATCH

Joolundoo

OBERON

Duckmaloi R.

MIRRAGAN FOLLOWS THE TRACKS OF GURANGATCH AND HIS FRIENDS AWAY FROM THE CAVES

Jenolan or Harry's River

BINNOOMUR (JENOLAN) CAVES
GURANGATCH MEETS HIS FRIENDS BUNYAK, WAGUR AND MURRIN-GUDAMANG HERE

GURANGATCH BLEEDS FROM HIS WOUNDS HERE, FORMING A MOUND OF OCHRE

Mee-oo-wun

MEE-OO-WUN MOUNTAINS

GURANGATCH AND MIRRAGAN HAVE A FIERCE BATTLE HERE

Koonangoorwa (Kanangra) Ck

Kowmung River

GURANGATCH GOES UP BILLAGOOLA BLACK HOLLOW) CREEK THEN TURNS BACK

KATOOMBA

MUNMIE (SOLITARY))

Kedoombar Ck.

GURANGATCH BURROWS UNDERGROUND

GURANGATCH RESTS FOR A WHILE IN A WATERHOLE ON REEDY CREEK (BIRRIGOOROO)

Karrangatta

Goodoomba

Billagoola

GURANGATCH STARTS TO MAKE THE COX RIVER CHANNEL

Gaung-Gaung

Junba

Warragamba River

Gurrabulla

Boonbal

Mullindi

Kweeoogang

"SLIPPERY ROCK"
GURANGATCH AND MIRRAGAN FIGHT HERE MAKING THE ROCK SLIPPERY

Tonalli River

Goorit

Woonggaree

Nattai R.

Jorilan Ck.

GURANGATCH AND MIRRAGAN FIGHT ALL THE WAY DOWN THE WOLLONDILLY

Gunggalook

Doogalool

MIRRAGAN CATCHES UP WITH GURANGATCH HERE

MIRRAGAN'S FAMILY LIVES HERE. HIS WIFE TRIES TO STOP HIM CHASING GURANGATCH

COUNTRY OF THE NATTAI

GURANGATCH EXCAVATES JOCK'S CREEK AND THEN BURROWS UNDERGROUND TO THE CAVES

WAMBEEANG (WOMBEYAN) CAVES

MIRRAGAN DIGS HOLES ON TOP OF THE CAVES AND POKES A LONG POLE DOWN TRYING TO GET GURANGATCH OUT. YOU CAN STILL SEE THE POTHOLES HE MADE

GURANGATCH HAS TO TRAVEL ROUND THIS LOOP BECAUSE THE ROCK IS SO HARD

GURANGATCH BURROWS UNDERGROUND TO "ROCKY WATERHOLE"
Birrimbunnungalai
AND HIS TONGUE FLASHES LIKE LIGHTNING

GURANGATCH STARTS TO GO UP GUINEAGO (GUINEACOR) CREEK BUT STOPS, FORMING A WATERHOLE, THEN TURNS BACK AS THE ROCK IS TOO HARD

COUNTRY OF THE BURRA BURRA

TARALGA

Murraural

MIRRAGAN TRIES TO CATCH GURANGATCH WITH MILLEWA (WATTLE BARK) POISON. YOU CAN STILL SEE THE PIECES OF BARK HERE WHICH HAVE TURNED TO STONE

JOADJA

Wollondilly River

Wingecarribee R.

COUNTRY OF THE METTAGANG

BOWRAL

COUNTRY OF THE BONG BONG

10 km

DHARUG PEOPLE

PENRITH

Deerubbin (Nepean) River

COUNTRY OF THE CANNABAYGAL

N

MAP 3

Gunggalook — NAMES SHOWN THUS ARE WATERHOLE NAMES, GURANGATCH'S RESTING PLACES

Compiled by J. Smith
Artwork by P. Bliss

Part four. PDF copy of article 'Rock Art of the Burragorang Valley'.

Rock Art of the Burragorang Valley

Jim Smith

Abstract

This paper describes the rock art in four shelters in the Burragorang Valley. Two of them, the 'Hands on the Rock' site and a cave on Laceys Creek, were submerged beneath Lake Burragorang in the late 1950s. The other two, 'Murro-lung-gulung' and a shelter near Kerswell Hill, are currently above the high-water level of Lake Burragorang but the art in them is threatened by a proposal to raise the Warragamba Dam wall. (Figure 1).

Introduction

The rock art of the Sydney Basin is one of the most intensively studied in Australia. The Basin is a region of sedimentary rocks, covering about 3.6 million ha, extending from Port Stephens in the north to Durras in the south. On the east it is bounded by the Pacific Ocean, and the western boundary is near Lithgow, Rylstone and Ulan. About half of the Sydney Basin's area is comprised of Hawkesbury Sandstone. McDonald published a detailed analysis of the rock art of this subregion.[1] The specific language groups referred to in her book are Darug, Darkingung, Eora, Guringai and Tharawal. However, there is another language group whose country includes part of the Hawkesbury Sandstone area. The Gundungurra (also spelled Gandangara) speaking people lived in the catchments of the Wollondilly-Cox's river system and some adjacent areas west of the Great Dividing Range. McDonald makes no specific references to their art. The Gundungurra were neighbours of the Darug, Darkingung, and Tharawal. McDonald's map of the Hawkesbury Sandstone region, (Figure 2) shows the now flooded portion of the Burragorang Valley known as Lake Burragorang.[2] Besides filling a gap in the extensive published literature on the rock art of the Sydney Basin, this chapter describes motifs which are unique or rare in the Sydney Basin and provides information rarely available in New South Wales on the cultural associations of Aboriginal people with their art sites.

Review of Gundungurra pigment art sites

This brief review excludes sites remote from the Burragorang Valley such as the upper Cox and upper Wollondilly Rivers.[3] As well as the four main shelter sites discussed in this paper, there are two charcoal drawings of anthropomorphs

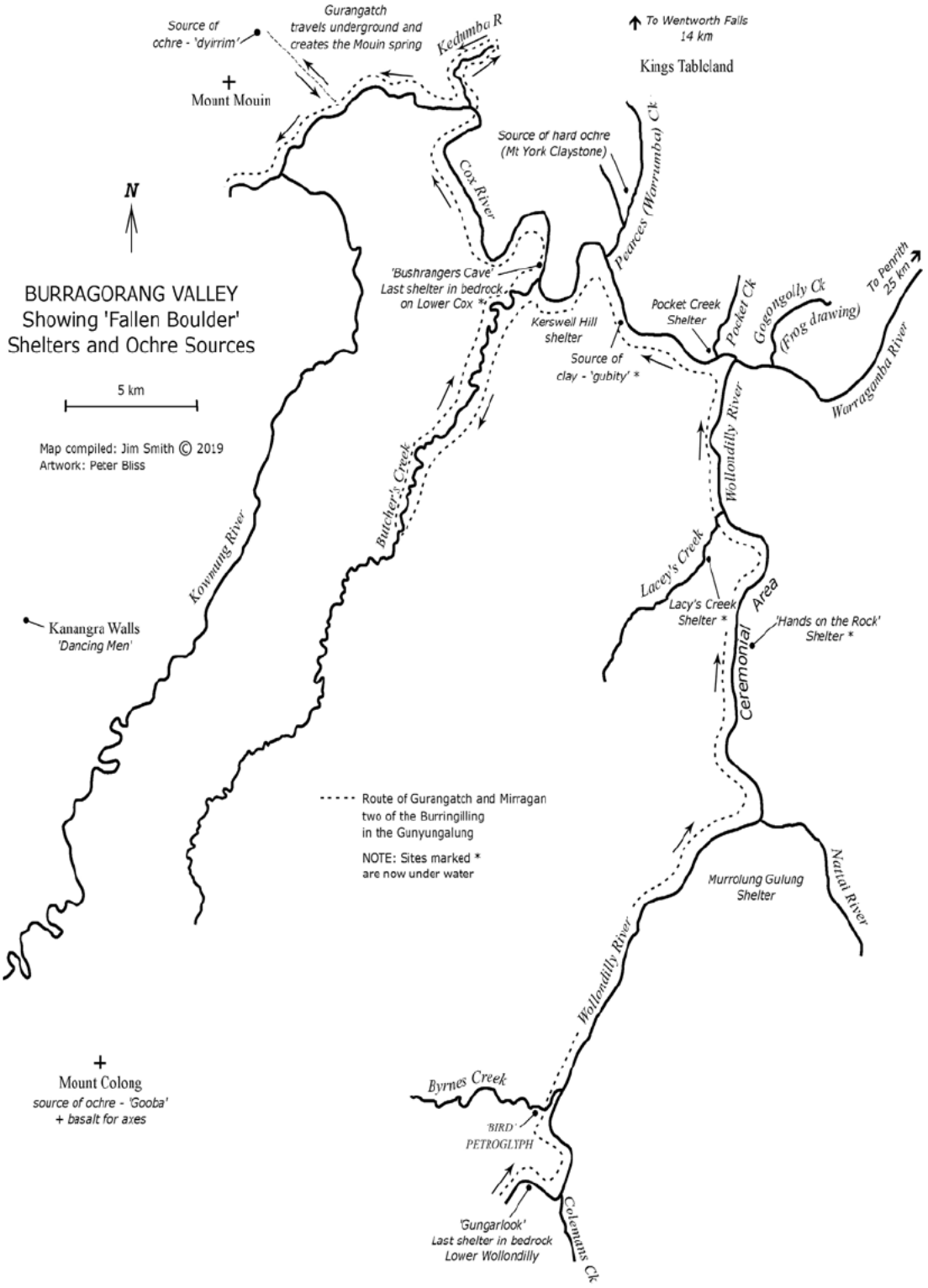


Figure 1. *Map showing spatial relationships between the Cox, Wollondilly and Kowmung Rivers, art sites, ochre sources and the journey of Gurangatch and Mirragan.*

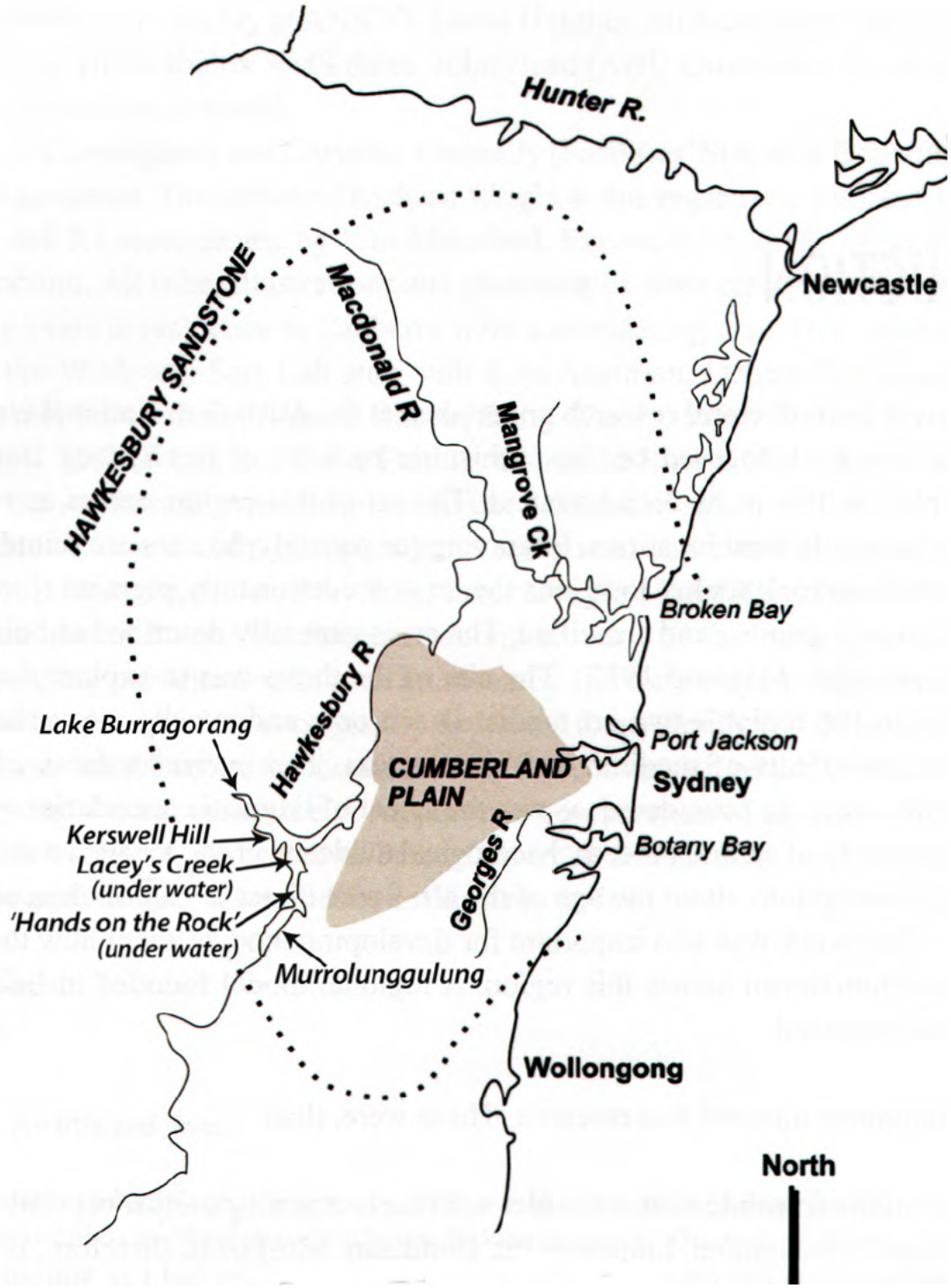


Figure 2. *Map from* Dreamtime Superhighway *by Jo McDonald (published by ANU E Press, Canberra 2008) with arrows added to show locations of art shelters in relation to distribution of Hawkesbury Sandstone.*

near the middle Wollondilly River. One of these is at Murphy's Flat.[4] Art has been recorded from shelters along the following tributaries of the Wollondilly-Cox Rivers: Nattai River, Werriberrie Creek, Brimstone Gully, Cedar Creek, Jenolan River and Greenwattle Creek. Sites in the Burragorang Valley hinterland include the complex of sites on Kings Tableland, and scattered sites in the Southern Highlands, Kanangra Walls, Gangerang Range, Debert Knob, Mount Colong and Laceys Gap.

The art at most of these sites consists mainly of charcoal drawings or stencilled hands. The 'Murro-lung-gulung' and Kerswell Hill sites described in this paper contain a significant proportion of surviving figurative art done in ochre by the Gundungurra-speaking people. The only previously published work on Gundungurra rock art is by Gresser, who described the ochre drawings at Kanangra Walls, and the paper by Smith and Jennings, which discussed the two known petroglyph locations (in the Bindook area and beside Byrnes Creek in the Burragorang Valley).[5]

Geological context

The middle and lower Wollondilly River and lower Cox River flowed through alluvial flats overlaying Permian marine sediments of the Berry Formation.[6] Outcrops of bedrock which can form shelters through erosion do not occur along the lower reaches of these rivers. There is a sandstone outcrop near the Butchers Creek junction with the Cox and another near the Colemans Creek junction with the Wollondilly. Along the 38km distance (by river) between these two points there were no known rock shelters in the bedrock near the rivers. These only occurred where a large sandstone boulder had broken off from the cliffs above and rolled down towards the river. Only a few of these fallen boulders had an eroded hollow orientated in such a way as to provide a shelter. They would have been regarded by local Aboriginal people as a rare resource. This article describes the artwork of the four known 'fallen boulder' shelters of the Burragorang Valley.[7]

Methodology for descriptions and interpretations of the art in the Burragorang Valley shelters

The interpretations of the art motifs discussed below are based on the examination of a large number of photographic exposures, both unprocessed and enhanced by D-stretch software. Some of the details referred to, which are discernible on high-resolution scans on a computer screen, may not be obvious in the reproductions in this paper. The author's speculations about the cultural significance of these motifs are offered for discussion purposes and further analysis of the images may suggest other interpretations.

Early local Aboriginal sources claimed that the images of hands in two of the shelters were not made by people but by their 'gods' in the far distant past. The Gundungurra name for this creation time was *gunyungalung* and the mythical characters active during it were the *burringilling*. These words will be used in this article when referring to Gundungurra beliefs, rather than the 'generic' terms 'Dreaming' and 'Dreamtime'.

Kerswell Hill shelter

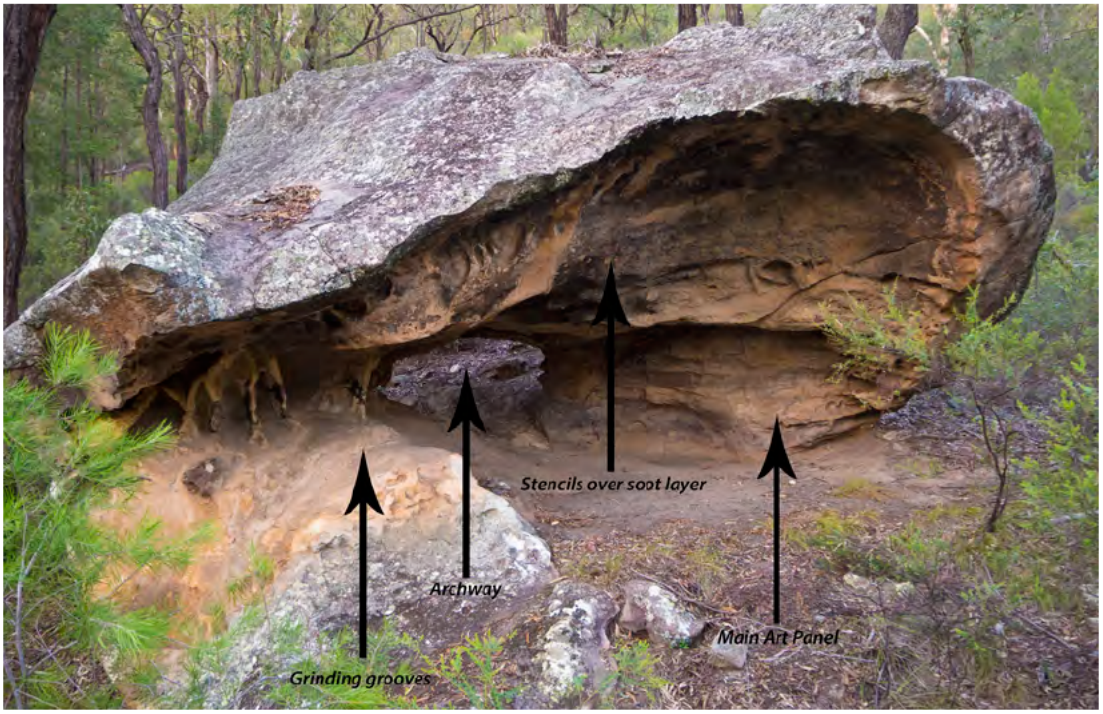


Figure 3. *The northern face of the Kerswell Hill shelter showing the relationship between the main art panel and the rest of the rock.*

Figure 4. *A view looking northwards through the archway of the Kerswell Hill shelter. The water in the distance is part of the Cox River arm of Lake Burragorang.*

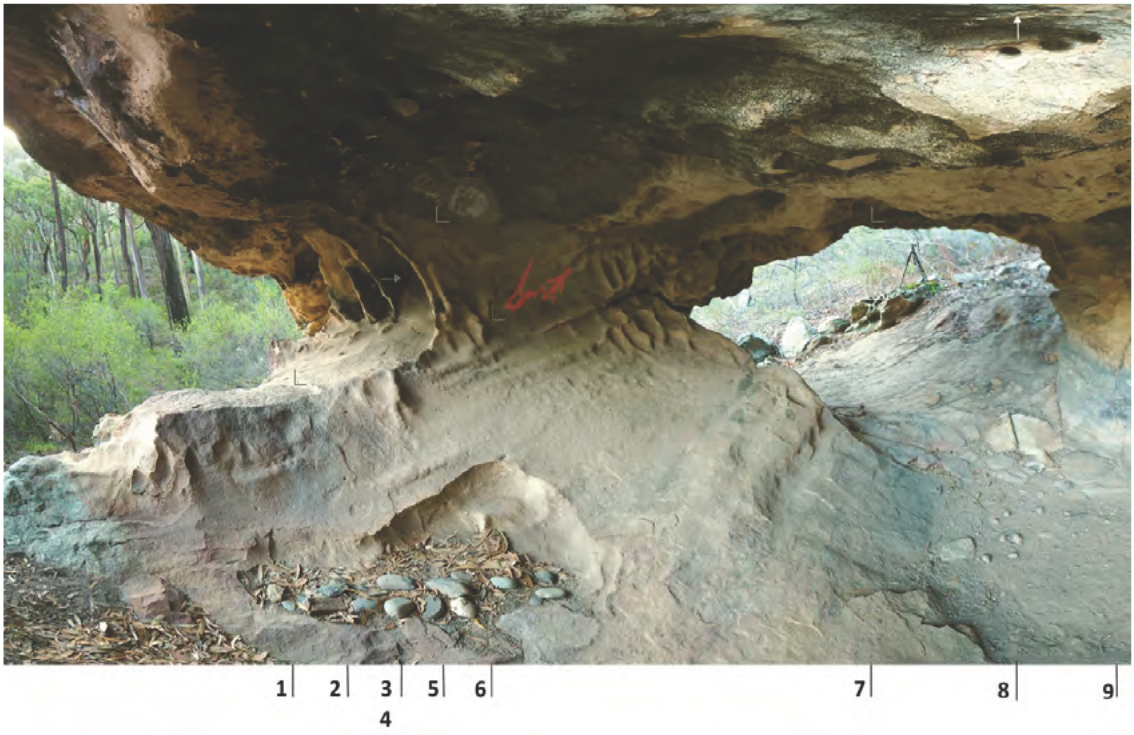
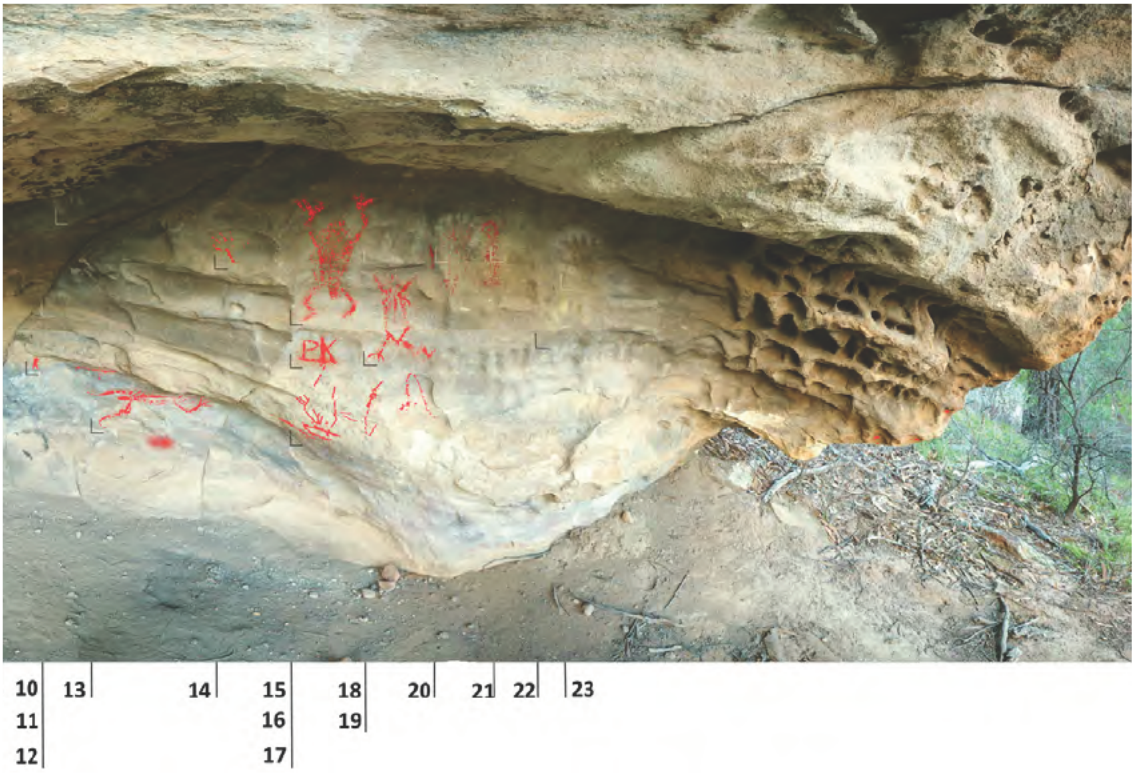


Figure 5. *Northern face of Kerswell Hill shelter showing art and associated features. Panorama created by Peter Ridgeway. This photo has the artwork enhanced by D-stretch software.*

Table 1: Key to Figure 5

1.	Possible ritual rubbing area and axe grinding grooves.
2.	Collection of stone hatchet heads.
3.	Indeterminant charcoal lines above grinding site (1), possibly including quadruped legs.
4.	Indeterminate ochre lines above grinding site.
5.	White stencilled hand.
6.	Two ochre drawings of geckos.
7.	Area for further investigation which may include a small anthropomorph (at bottom of arch).
8.	Group of 13 white stencilled hands over soot layer. (Above the arch, not shown in this exposure).
9.	Area for further investigation on the bottom of the right-hand side of arch, possibly including a turtle drawing.
10.	White hand stencil.



11.	Small white hand stencil.
12.	Small ochre drawing of anthropomorph.
13.	Ochre drawing of horizontal anthropomorph, with an indeterminate line to the left, possibly part of an arm with fingers, and indeterminate shape below.
14.	Ochre hand print.
15.	Ochre drawing of vertical anthropomorph partly outlined in charcoal, drawn over white hand stencils.
16.	Ochre graffiti.
17.	Indeterminate ochre lines including possible parts of arms and fingers.
18.	Faint white stencilled hand under charcoal graffiti.
19.	Ochre figure of a frog lying on its back, outlined in charcoal.
20.	White hand stencil, with indeterminate ochre lines superimposed.
21.	Faint white hand stencil, with indeterminate ochre lines superimposed.
22.	Yellow hand stencil.
23.	White hand stencil, with white stencil superimposed on it, overlaid with a red ochre hand print.

Historical graffiti probably by non-Aboriginal people

(a) Row of deeply incised, now eroded, letters and numbers, including 'MAR...' and ending with '86'. (Under images 20 to 23). This may record the date of an 1886 visit to the cave. The amount of weathering of this lettering indicates that there may have originally been art which has disappeared from this more exposed lower right-hand end of the art panel.

(b) Row of charcoal letters, including 'BLATT...'. (Beside image 7). This was almost certainly done by a member of the Blattman family of Burragorang Valley settlers.

(c) Charcoal initials, 'WA'. Drawn over image 18.

(d) Ochre initials, 'PK'. Included in the list as image 16.

(e) Row of lightly scratched letters. Above image 13.

Description of the images and other features at the Kerswell Hill shelter

1. Grinding grooves. (Figure 6). On the sloping rock surface at the north-eastern edge of the shelter is a group of broad, smooth, shiny axe-grinding grooves. In the centre of this group is an unusual highly reflective, mirror-smooth area which may have been where the final stage of the sharpening was done or where ritual rubbing of the surface took place. It is less likely that seeds were ground here as they do not appear to have been a significant part of the diet of Burragorang Valley people. Below this group, in a position that is more exposed to the weather, are more conventional narrower and deeper grinding grooves now colonised by lichens. (Figure 7).

The grinding grooves here, and on small boulders within a few metres of the shelter, total about 40. According to McDonald this is a rare situation in the Sydney Basin.[8] She found that grinding grooves were only found within, or very close to, 5% of the shelter art sites in her study.

2. (Figure 8) This group of pebble chopper tools and ground-edge hatchet heads are on a small ledge above the floor of the cave. These were collected decades ago from other parts of the Burragorang Valley by Water Board staff and relocated to this shelter by a Sydney Catchment Authority staff member after being surrendered on request.[9] With these stone tools is a well-worn steel wedge, used by settlers for splitting timber, which may have been one of the early pieces of metal traded into Gundungurra country.

3 and 4. (Figure 9) Within the niches between fluted rock columns above the grinding grooves is a series of indeterminate red ochre and charcoal lines. Two pairs of the latter could represent the rear legs of a quadruped such as a wombat. The tracing of a charcoal drawing on Kings Tableland (bottom of figure 10) of the front end of a wombat shows the stylised depiction of the front legs. The charcoal lines (top of Figure 10) could include the remnants of a drawing of the rear end of a wombat with a similar stylisation of the legs. The semicircular line above the legs may represent the young in the backward facing pouch which,

Figure 6. *Broad, shallow depressions possibly created by ritual rubbing.*

Figure *7. Typical axe grinding grooves, much narrower than the depressions in figure 6, now colonised by lichens.*

Figure 8. *Stone hatchet heads and chopper tools placed in this position by a Water Board staff member. The metal splitting wedge is on the far left of the picture.*

Figure 9. *Tracing from photograph of lines above the grinding area. To the left the lines are drawn in ochre and on the right in charcoal.*

Figure 10. *Top: an interpretation of some of the charcoal lines in figure 9 which may have portrayed the rear end of a female wombat. Bottom: tracing from photograph by Michael Jackson of a charcoal drawing in Gogongally Creek of the front end of a wombat.*

from about six months of age (typically in midwinter), often have their head and feet showing at the entrance to the pouch.[10]

5. (Figure 11) A high, white hand stencil.

6. (Figure 12) Ochre drawings of two geckos.

Parts of these drawings are missing, however the remaining details of the right-hand figure show that it is a portrait of the Southern Leaf-tailed Gecko (*Phyllurus platurus*). This species is only found in the Sydney Basin. Bulges in the location of the large eyes of this species are drawn. Unfortunately, the most diagnostic feature, the large tail of this species, resembling the shape of the head, is missing due to loss of the underlying rock, although there are a few remaining ochre lines indicating that a tail had been drawn. Much of the pigment of the figure to the left is missing but there are sufficient details to indicate that this was the same species. The portrayal of two geckos together may have been intended to represent a male following a female, as individuals are normally territorial. In this species mating occurs in the autumn and: 'The sperm are stored in the female reproductive tract until the following spring when the eggs are ovulated and fertilised'.[11] The appearance of mating Leaf-tailed Geckos in Gundungurra shelters would have been one environmental indicator of approaching cold weather. The main habitat of this gecko species is along the cliff tops above the Valley where they live in caves, and in crevices formed by exfoliated sandstone rocks. The Kerswell Hill fallen boulder provided a scarce rock shelter along this section of the Cox River for both Aboriginal people and geckos.

Figure 11. *Stencil of a right hand. Only part of the 'ring' finger is visible and the little finger can't be seen.*

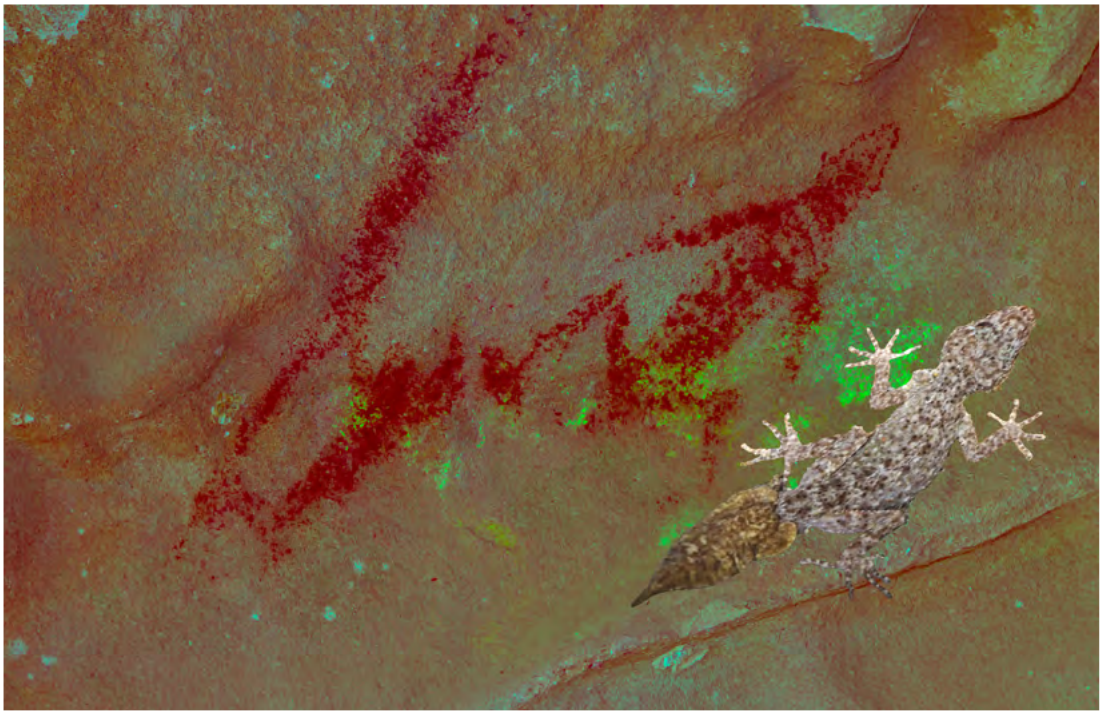


Figure 12. *Digitally enhanced photo of Southern Leaf-tailed Gecko from another area superimposed on the Kerswell Hill gecko paintings. Photoshop by Peter Ridgeway.*

Figure 13. *Some of the stencilled hands on the soot layer above the archway.*

Above the two geckos is an indeterminate ochre line.

Clegg has suggested that animal portrayals in rock art 'are drawn in positions representative of their natural habitat.'[12] Aquatic creatures are often shown at the lowest level of panels of art and flying animals at the top. The position of the gecko drawings on the roof of this shelter is exactly the type of place where these lizards are active at night.

7. (No image available) At the base of the archway may be a small anthropomorph about 10cm high, along with some scratched graffiti probably done by a member of the Blattman family before the flooding of the Valley.

8. (Figure 13) This is a group of white hand stencils over an old soot deposit from Aboriginal fires. The soot colour varies from very black, above what must have been the main hearth area, to grey on the western side of the roof. A group of 13 white hand stencils has been applied over this grey area. These hand stencils may have been made relatively recently. McDonald agreed with McCarthy and other authors who postulated that white hand stencils were one of the latest Aboriginal artistic developments in the Sydney sandstone area.[13] They have not been in position long enough for subsequent campfire smoke to obscure them.

9. (Figure 14) Area for further investigation, possibly including a freshwater turtle drawing. To the east of the 'horizontal anthropomorph', and on the same band of grey rock, may be the remains of a faint drawing (Not visible to the naked eye) of a wide-bodied animal with a small head and short front legs. The common turtle of Gundungurra country is the Eastern Long-necked Turtle (*Chelodina longicollis*) called *warrumba*. It may be the underside of the turtle that

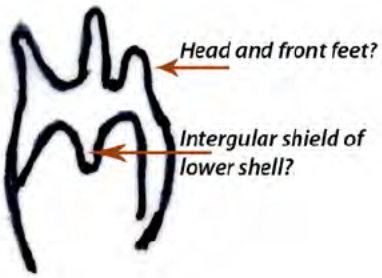


Figure 14. *A tracing from a film print of image 9 at the Kerswell Hill shelter showing lines suggestive of an image of the lower shell of an Eastern Long-necked Turtle.*

Figure 15. *Charcoal drawing of the back of an Eastern Long-necked Turtle in a shelter at Bundanoon. From Thorpe, 1909 op. cit. The detailing within the outline of the shell represents some of the costal scutes.*

is depicted, as the internal detailing within the outline includes what could be a depiction of the intergular shield. Figure 15 shows a depiction of this species from Bundanoon.

On the opposite side of the Cox River to the Kerswell Hill shelter is the outlet of Warrumba (Pearces) Creek. This creek was named by the Gundungurra for its association with this species, possibly for its abundance there or commemorating an event of the *gunyungalung*. The turtle image in the shelter may be part of this story. If it is confirmed to be an image of a turtle it would also be an example of Clegg's hypothesis that aquatic animals are portrayed on the lowest parts of rock art panels.[14]

10. (Figure 16) A white stencilled hand just below the roof of the shelter.

11. (Figure 16) A single small, white hand stencil, less than half the size of the stencils on the roof. It is within the range of size of a child's hand.[15]

12. (Figure 17) A small red ochre anthropomorph about 10cm high.

13. (Figure 18) Horizontal anthropomorph.

McDonald does not give a breakdown of the orientation of anthropomorphic images in shelters in the Hawkesbury sandstone region. McCarthy wrote that 'very few figures of men lying down are illustrated'.[16] He listed only two, both located in the same shelter at Kuringgai

Figure 16. *To the right of the pen is a hand stencil (image 10). In the lower left-hand corner of the photo, just below the diagonal crack, is the 'small' hand stencil (image 11).*

Chase. Another example is at Wilton.[17]

Figure 17. *Digitally enhanced photo of the small anthropomorph.*

Near the base of the Kerswell Hill art panel is a band of grey rock sandwiched between layers of yellow-brown sandstone. The horizontal anthropomorph has been drawn up against the top fault line between the grey and yellow stone. It could be interpreted as being in the act of emerging from this crack. McCarthy recorded petroglyphs of partial figures which had been portrayed to give the illusion that they were emerging from natural crevices in the rock. However, similar images in painted art appear to be much rarer, with McCarthy listing only one example, where the head of a snake is drawn emerging from a crack in the wall of a cave.[18]

The lower arm of this anthropomorph is raised above the head and has four digits shown. The outline of the head has been infilled with a series of diagonal lines. The rounded body, muscular moulding of the lower limbs and the shape of the feet are suggestive of amphibian characteristics. However, there is a penis or pubic covering between the legs. Amphibians do not have external genitalia. The figure may have been intended to show both human and frog features. Gundungurra Riley family descendants Kazan Brown and Taylor Clarke interpret this anthropomorph as depicted while swimming. Below the figure is an amorphous patch of red pigment. There is a similar anthropomorph to this one (no photo available) on the roof of the tunnel through the shelter (south of image 7).

Figure 18. *Digitally enhanced photo of the horizontal anthropomorph.*

Figure 19. *Digitally enhanced photo of the ochre handprint, showing remnant of imprint of left-hand side of palm.*

Figure 20. *For comparison with figure 19 is this ochre image of a hand at Cedar Creek, near the Cox River, about 15km (as the crow flies) upstream of the Kerswell Hill shelter. It may be a hand print or painted with a 'brush'. It has been applied over existing charcoal artwork. The photo was taken by Ben Esgate in 1989.*

To the left of the horizontal figure is an indeterminate red line, possibly an arm with fingers, which appears to be emerging from the same crack.

14. (Figure 19) This ochre print of a left hand is one of only two images in this shelter created with wet red pigment (the other is part of image 23). The middle knuckle of four digits can be clearly seen in high resolution, along with the left-hand side of the palm. Only a small fleck of pigment remains of the thumb. For comparison Figure 20 shows a hand print or painting from Cedar Creek, a tributary of the Cox upstream of the Kerswell Hill shelter.

15. (Figures 22 and 23) Vertical Anthropomorph.

This figure has been drawn over the top of two white stencilled hands, of which only part of the white spray remains. Black lines beside the left lower torso and knee indicate that the figure was outlined in charcoal. It is about 36cm in height and is quite different to the typical 'dancing men' found at Kanangra Walls and Lithgow. The former were first described in the late 19th century: 'There are about a dozen different sketches representing human beings in the most fantastic attitudes, varying in height from 6 inches [15cm] to 2 feet [63cm]'.[19]

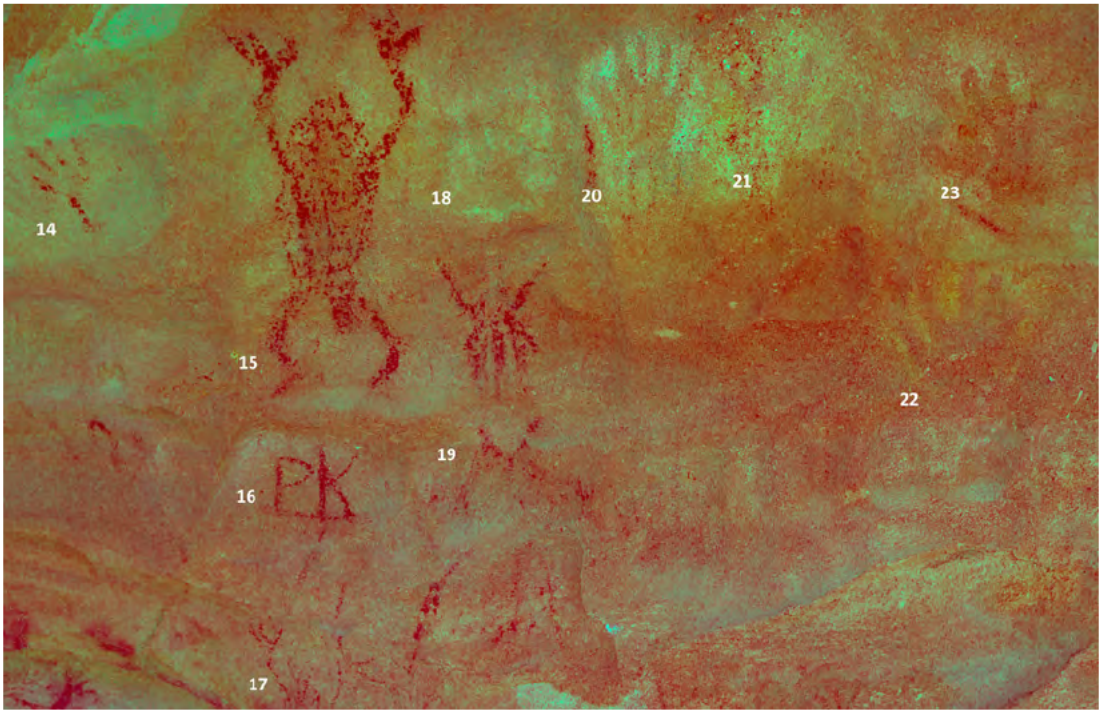


Figure 21. *Shows the placement of images 14 to 23.*

Figure 22. *Unprocessed reproduction of a print from 35mm film of the vertical anthropomorph showing the 'U'-shaped charcoal line which may represent a bag.*

Figure 23. *Digitally enhanced image of the vertical anthropomorph.*

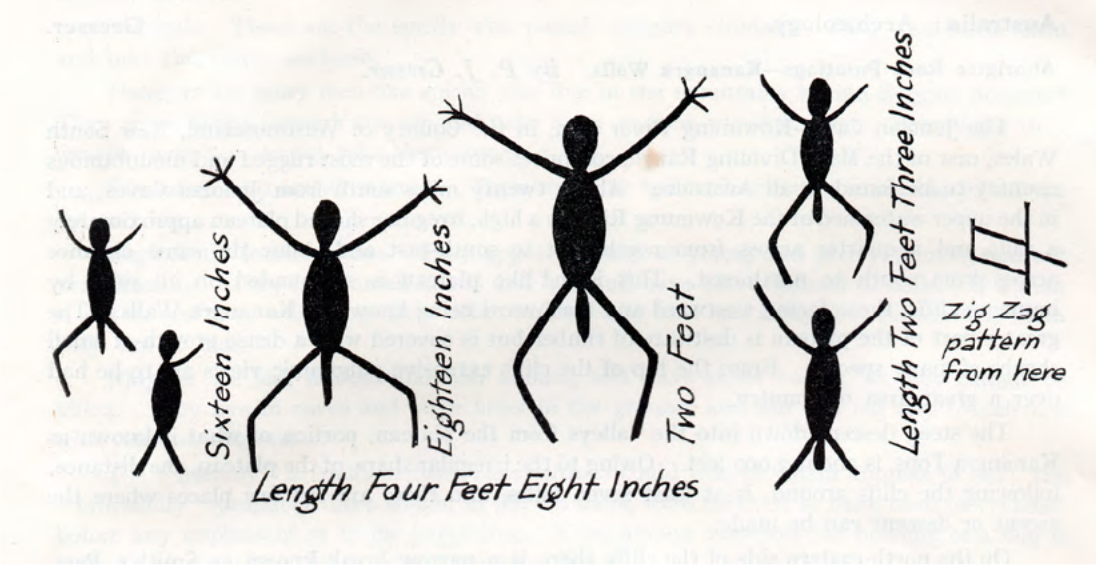


Figure 24. *Drawings of 'dancing men' at Kanangra Walls. From Gresser, 1965 op.cit.*

Gresser illustrated a selection of these motifs[20] (Figure 24). These anthropomorphs have spread legs with sharply bent knees, and arms held upwards, without a bend at the elbow, at an angle of 45° to the neck area. Four fingers on each hand are usually shown, but there are no toes or feet. The heads are oval-shaped. Hanging between the legs is a probable 'pubic tassel', although this pendant device has sometimes been interpreted by non-Aboriginal people as a penis.'[21]

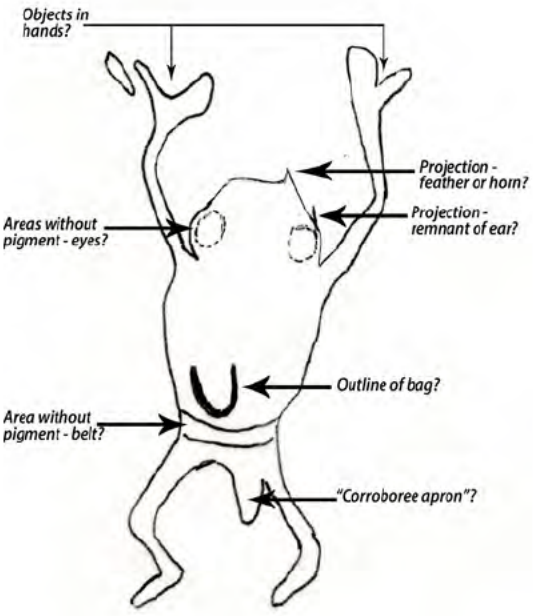


Figure 25. *A tracing incorporating information from many images of the vertical anthropomorph.*

These tassels, which have also been termed 'corroboree aprons', were made of either braided hair or strips of animal skin, and were sometimes shown in colonial-era illustrations of Aboriginal men dancing. The Gundungurra anthropomorphs at Kanangra walls and Lithgow are portrayed in groups, suggesting that they are engaged in a communal social activity. Etheridge described the pose of similar figures as the 'corroboree jump', with 'the arms elevated above the head and the legs drawn up'.[22] More recently, Welch has described elements of rock art that allow us 'to recognise scenes depicting Aboriginal ceremony'. Among these elements are 'figures with bent knees', 'figures with arms raised above their heads' 'figures with synchronised, choreographed alignment' and

figures holding boomerangs.[23] Etheridge contrasted the poses in depictions of 'Daramulan or Baiamai' with the figures shown in 'ordinary corrobories'. These sacred figures are shown performing 'magic dances, i.e. dances forming an integral part of the Bora'. These have their arms raised above the head in contrast to the human dancers whose arms are 'simply extended'.[24]

This anthropomorph appears to have a pair of eyes, indicated by some outlining of the eye shape around areas free of red pigment. At about waist level there is a dark U-shaped line which may represent a bag. In the Sydney Basin the fingers drawn on anthropomorphic figures are usually disproportionately large. However, what appears at first glance to be the fingers of this anthropomorph are so big in proportion to the size of the arms that they may have been intended to represent objects such as boomerangs being held in the hands. The shape of the head is suggestive of a frog, and what seem to be objects in its hands could be depictions of webbed feet. This anthropomorph may have been intended to combine both human and animal characteristics. What appears to be small attachments to the top of the head could actually be 'overruns' of the artist's crayon when drawing the outline. There is a gap in the red pigment at the waist level which may represent a belt. (Figure 25)

The differences between the Kerswell Hill anthropomorph and the typical 'dancing' figures of Gundungurra country are summarised in table 2.

Table 2: Comparison of Kerswell Hill anthropomorph with Kanangra Walls dancing figures.

Kerswell Hill anthropomorph	Kanangra Walls dancing figures
A single figure	Part of synchronised alignments
Arms raised straight above the head	Arms raised at a 45° angle to the body
Arms bent	Arms straight
Relatively large head with straight sides	Relatively small oval head
Eyes possibly drawn within head	No facial features shown
Small projections on top of head?	No additions to head
A' bag' drawn within the body outline The figure may be wearing a belt Hands may be holding objects	No accoutrements other than the 'corroberee apron'
Legs with a rounded bend	Legs with a sharp bend at the knee

McDonald described the characteristics of rock art depictions of 'culture heroes' in the Hawkesbury sandstone area.[25] These include their large size (measuring on average 1.25m in height, compared to typical anthropomorphs which average 46cm in height), infilled decoration, attachments to the head, depictions of eyes, and accoutrements such as bags and weapons.

Although the Kerswell Hill anthropomorph is only about 36cm in height, it satisfies some of the criteria for identification as a 'culture hero', or in Gundungurra terminology, one of the *burringilling*. A.L. Bennett recorded the names of the *burringilling* who created the first humans, protected them from destruction by evil 'gubbas', devised the initiation ceremony and left their hand prints at the 'Hands on the Rock' shelter, as Dulmang and Burreung.[26] Dulmang may be a Gundungurra version of Daramulan, the one legged 'culture hero' who is always shown in profile in rock art depictions in the Sydney Basin.[27] It is possible that the Kerswell Hill anthropomorph is a depiction of Burreung, and the equivalent of the Biame depictions elsewhere in the Sydney Basin.

McDonald found only comparatively small numbers of culture hero depictions in the Sydney region.[28] In this context, the location of a possible 'culture hero' image in the country of Gundungurra speaking people, in the southwest of her study area, is significant.

McDonald also concluded that 'the horned anthropomorph characteristic form is extremely localised'.[29] Her study area included all, or parts of, the country of Darug, Darkingung, Eora, Guringai and Tharawal speaking people. 'Horned anthropomorphs' were located only in Darkingung and Darug country. There were 18 of these motifs among 14,424 images analysed. They occurred in only 1.6% of sites.[30] There may be a north to south gradation in the frequency of these images. McDonald recorded nine sites with these images in Darkingung country, and three sites in Darug country to the south. If it can be confirmed that this Kerswell Hill anthropomorph was drawn with 'horns' it may provide some evidence that there was a north to south diffusion of this type of image and its associated stories. Some authors have suggested that the creation of some images of 'culture heroes' by Aboriginal people was a post-contact development influenced by their interpretations of Christian beliefs.[31] For example, images of 'horned' anthropomorphs could reflect Christian iconography of the 'devil'.

The fact that this figure has been drawn over hand stencils suggests a comparison with other sites in the Sydney Basin where similar small anthropomorphs with a 'stocky' physique and relatively large 'straight-sided' rather than rounded heads have been drawn over existing artwork. At Square Rock, not far from the Wollondilly River (3km to the southeast of Mt Colong, a small red ochre anthropomorph has been superimposed on part of the kangaroo image. A similar figure is beside McKeon's Creek near Jenolan Caves. At 'Blackfellows Hands' near Lithgow there is a small charcoal anthropomorph drawn over hand stencils. At the Wilton site previously referred to, and at Avon Dam on the Upper Nepean River, large and small anthropomorphs have been drawn over existing artwork. At the 'Emu Cave' near Glenbrook a charcoal anthropomorph has been superimposed on the Emu drawing. It could be hypothesised that these images reflect a new cultural belief or 'cult', perhaps even from the post-contact period.

16. The initials 'PK', appear to have been made with the same hard Mount York Claystone 'crayon' used by the Aboriginal artists. It was on the floor of the shelter at the time of the author's first visit. This graffiti could provide a research opportunity to compare the rate of weathering of the initials compared with the

Figure 26. *Digitally enhanced image of ochre lines (image 17).*

Figure 27. *Digitally enhanced image of the 'frog' figure (image 19). The vertical line in the centre of the body outline may represent one of the dark lines on the lower body of the Red-crowned Toadlet.*

Aboriginal drawings.

17. (Figure 26) A row of indeterminate ochre lines beneath images 16 and 19 possibly including a pair of arms with fingers.

18. A faint white right-hand stencil. Charcoal graffiti has been written over this hand.

19. (Figure 27) Ochre drawing of a frog.

Black lines around parts of this drawing, including the top of the head, lower left torso and part of the black ventral stripe, indicate that it was outlined in charcoal. This is a realistic drawing of a frog in the genus *Pseudophryne* laying on its back.[32] These frogs, two species of which live in Gundungurra country, have the habit of 'playing dead', displaying vivid black and white colours on their ventral (lower) surface to predators, warning that they are poisonous (Figures 28 and 29). The Aboriginal artist has drawn the

Figure 28. *Red-crowned Toadlet. Photo by Peter Ridgeway.*

Figure 29. *Ventral surface of Red-crowned Toadlet showing contrasting black and white pattern.*

outline and central stripe of the frog's ventral surface in red and may have added white pigment between them. If further investigation of this image shows that there is white pigment, this will put the painting in a rare category of Sydney Basin art that includes three colours. McDonald estimated that 'polychrome' images, with three or more colours, comprised only about 1% of her large sample in the Sydney sandstone area.[33]

Michael Jackson located a panel of charcoal drawings in the Gogongolly Creek catchment, on the escarpment above the Burragorang Valley, six km from the Kerswell Hill shelter.[34] This includes a drawing of a frog which is so anatomically precise that it can be positively identified as one of the two local *Pseudophryne* species. Maynard described the 'simple figurative' style of Sydney Basin rock art as one in which 'fine details of anatomy and body contours are not shown', where objects were represented by 'simplified silhouettes', with images having a 'lack of character'.[35] She claims that, for Australian rock art in general, the 'correct zoological identity' of art subjects is very difficult to determine.[36] However, the Gogongolly Creek frog drawing has a lifelike pose and accurately depicts the subtle contours of the shoulder glands and other body parts, with each of the toes accurately shaped and proportioned. The original Kerswell Hill frog image may have been more detailed before the loss of much of its pigments. The Gogongolly Creek frog image, and the gecko images in this shelter (image 4) appear to represent a development beyond the normal criteria for 'simple figurative' art, perhaps even having some characteristics of the 'complex figurative' style described by Maynard as 'more sophisticated than crudely naturalistic'.[37]

This raises the question of why local Aboriginal artists were interested in drawing these tiny (maximum size 3cm long) non-edible frogs in such detail. McCarthy noted that, in the Sydney region, smaller animals are 'very rarely portrayed'.[38] The *Pseudophryne* species depicted at Gogongolly Creek is more likely to be the Red-crowned Toadlet *(P. australis)* than Bibron's Toadlet *(P. bibronii)*. The former is restricted to the Sydney region. The tributaries of the Wollondilly and Cox Rivers coming through the Burragorang Valley escarpment, important travel routes for Gundungurra people, are prime habitat for it. Its colour pattern, with bright red splashes and blotches of colour over its head and legs, is the most vivid of all the frog species in Gundungurra country. The far more widely distributed Bibron's Toadlet has much plainer colours. In Aboriginal mythology patches of red colour on birds and animals are often interpreted as originating in wounds they received during the creation period. These frogs' unusual behaviour, in turning over onto their backs rather than trying to escape predators, would have also had an interpretation relating to events in the *gunyungalung*.

Throughout Australia the great majority of rock art images of animals are of edible species. Frogs may not have been a significant item in most Aboriginal diets. Michael Tyler, Australia's foremost authority on frog ecology, wrote:

> In Australia the greater abundance of other vertebrate animal food such as marsupials, birds and reptiles, probably almost eliminated the need for Aborigines to eat frogs.[39]

Only a few scattered records of frogs being eaten have been located.[40] Most of the frogs of southeast Australia are quite small and it would usually be difficult to locate in sufficient numbers to form a meal.[41] In addition, many have toxic secretions on their skins.

Frogs do appear in Aboriginal mythology, with a number of stories explaining the association between frogs and water. Some of these were summarised by Chris Hill who wrote:

> 'Dreamtime stories about ancestral frog beings have been recorded from the wetlands to the sandy deserts of Australia, and in most cases a frog ancestor is symbolically associated with the seasonal arrival of freshwater.'[42]

W.E. (Bill) Harney described the 'Nindjeri, the men of the storms, the gecko and frog men associated with rain and lightning and fertility.'[43] The Arrente of central Australia had a frog totem ceremony.[44] Billy Russell told a Gundungurra frog story about Jerrogorat (the Green and Golden Bell Frog) whose call sounds like the painful cries it made when it was speared as punishment in the *gunyungalung*.[45]

Frogs provided an ever-changing acoustic background to Aboriginal camps at night giving information on changing conditions in the local environment. For example, opportunistic breeders such as the Red-crowned Toadlet can call in large numbers a few weeks after rains fill the pools along non-perennial streams. This could have been a signal to Aboriginal people that journeys could be taken through parts of their country that lacked permanent waterholes. This species also has the unusual habit of calling out when people walk by their pools.[46]

The role of frogs in Aboriginal mythology, and in providing environmental information, suggests why they could be subjects of artwork, despite not being significant food items. However, ock art images of frogs are rare across Australia.

Layton listed six northern Australian art complexes which include frog motifs.[47] Davidson recorded petroglyphs of frogs at Delamere, in the Northern Territory and paintings of frogs at Cape York Peninsula, Central Queensland and Blunder Bay, Northern Territory.[48] McCarthy recorded a painted 'young frog' at Depuch Island.[49] He also lists five amphibian images in his catalogue of Cobar Pediplain art.[50] However, his interpretation was disputed by Layton who thought that they could be flying foxes.[51] McDonald does not list frogs in her catalogue of Hawkesbury Sandstone rock art motifs, although they may be included in her 'other land animal', 'unidentified', or 'anthropomorph' categories.[52] Thorpe reproduced a charcoal drawing at Bundanoon he described as 'probably a frog with its mouth agape'.[53] McCarthy, in his surveys of the rock art of the Sydney Basin, sometimes had difficulty in distinguishing between images of frogs and anthropomorphs. In the Royal National Park, south of Sydney, he described a 'frog-like man'.[54] He found a series of anthropomorphs at Cordeaux which ranged 'from typical human figures on the left to frog-like figures on the right'.[55] At St Ives, a northern suburb of Sydney, he located 'a short-armed man, five foot long, resembling a frog'.[56] This figure has a relatively small triangular shaped head and a wider and more rounded body than a typical anthropomorph, but it does have a projection between the legs resembling the usual male genitalia or pubic covering often found in male figures. The petroglyph at Delamere, that was identified by a local Aboriginal person as a frog, has a similar projection suggesting that these images could have been intended to combine human and amphibian characteristics.

There is such a wide range of anatomical variation in the anthropomorphic figures of the Sydney Basin that some images, possibly intended by Aboriginal artists to represent frogs or 'frog-men', have been interpreted as anthropomorphs. Mountford, in central Australia in 1940, was shown a painting said by his Aboriginal informant to represent a frog.[57] This image (illustrated in his plate 15) is so amorphous that it would almost certainly have been classified as an 'indeterminate' figure if there had not been a local Aboriginal informant. A number of the figures that McCarthy classified as 'men' at the New South Wales South Coast site of Conjola could be interpreted as having amphibian characteristics.[58] Similarly, Bindon, in his survey of the rock art of the Shoalhaven River tributaries did not interpret any of the figures as frogs, despite a number of his anthropomorphs having frog-like features.[59]

It is possible that the shape of the Kerswell Hill shelter inspired the production of frog-themed artworks within it. When the boulder that forms the shelter is viewed from the south, it has a similarity to a squatting frog. (Figure 30) The passageway through the rock may have been interpreted as an event of the *gunyungalung* such as the spearing of the frog. Jennifer Isaacs made the observation at an art site in Western Australia called 'Crocodile Cave': 'At many sites, rocks have uncanny physical resemblances to the creation ancestors they

Figure 30. *The Kerswell Hill shelter photographed from the south-east, showing its possible resemblance to a frog.*

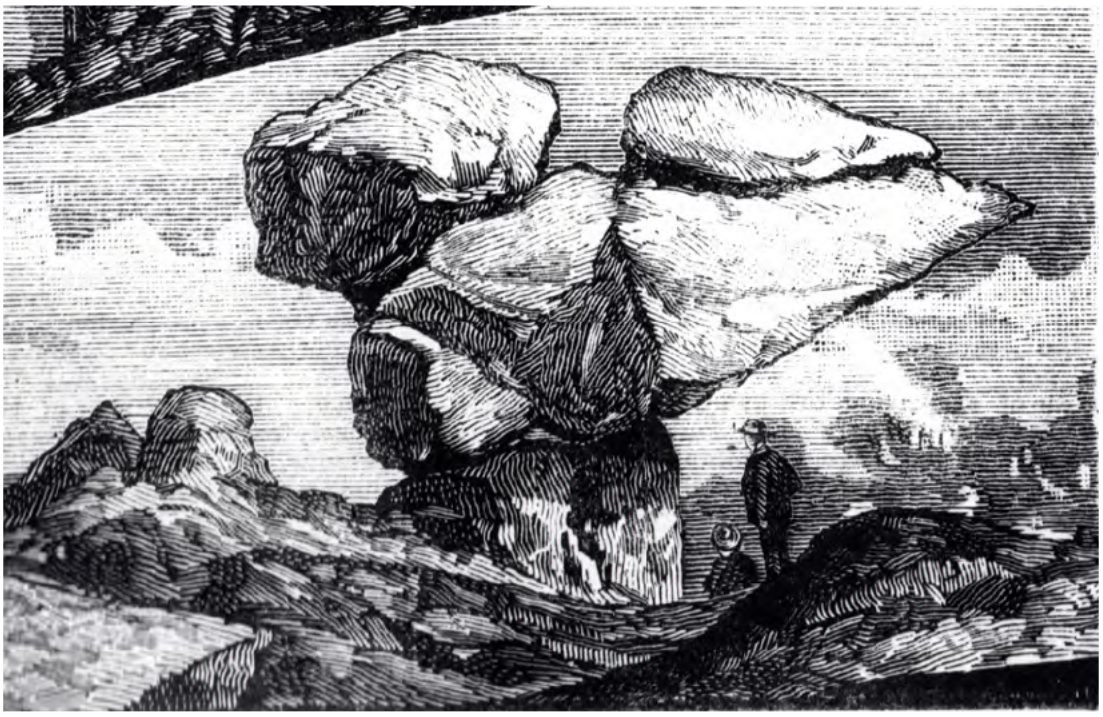


Figure 31. *Sketch by William Cooper of 'Toad Rock' beside the Cox River. From* The Town and Country Journal, *4 October 1884.*

represent and to which the paintings refer.'[60] Other examples of 'frog-shaped' rocks are the 'Tiddalik' rock near Wollembi[61] and the 'frog dreaming' rock near Borroloola.[62] Other well-known 'frog-shaped' rocks include 'Frog Rock' on the Ulan Road Mudgee and 'Toad Rock' in Gundungurra country beside the Cox River. (Figure 31) Neither of these have a published Aboriginal story recorded about them.[63]

Aboriginal people have provided a wealth of information about the associations between the shapes of rocks and events during the 'Dreaming'. This association may have been reinforced by the artwork within the shelters of these rocks.

20. (Figure 32) A white stencil of a left hand with indeterminate ochre lines drawn over it. There has been some underspray beneath the finger joints creating the illusion that a variant short-fingered hand stencil has been superimposed on it. It is similar to the 'normal' hand motif stencil reproduced in Wright.[64] The Aboriginal artist, if he had intended to create this impression, could have directed the stencil spray from the side, rather than from directly above the hand. Wright hypothesised that variant hand stencils conveyed similar information to that of the hand signals used for communication by Aboriginal people.[65] Alternatively, a hand with short digits may have been intended to resemble an animal's foot, with the artist demonstrating his relationship to a totemic animal.

21. (Figure 32) A faint white hand stencil. Indeterminate ochre lines have been drawn over it.

22. (Figure 32) A hand stencil created with yellow spray pigment.

23. (Figure 32) This is the final hand image in the row of four extending to the right from the vertical anthropomorph. It is composed of three elements: the first is a white stencil of a right hand. Superimposed on this is another hand stencil with only a few fingertips now visible. The two stencils are offset vertically, with the fingertips of the second stencil about 7 to 8cm below the tips of the first stencil. Over the top of these is a red print of a right hand. Only the tips of four digits and part of the palm can now be seen. The combined effect of these hand images could be interpreted as creating the appearance of an animal's foot. (Figure 33) This may be the only example in the Sydney Basin where three hand images have been superimposed. While superimposed images are very common in Australian rock art, superimposed hand stencils are not referred to in the reviews of Sydney region art by McCarthy or McDonald. The people who made these three hand images on top of each other may have been engaged in a ritual demonstrating totemic or kinship relationships.

Summary of the motifs in the Kerswell Hill shelter

There is no obvious connection between the images in this shelter. Some art panels in other areas show interactions between figures which can suggest an underlying story. Whatever narratives may have linked the anthropomorphs, the geckos, the frog and the superimposed hands remain a mystery.

There is a total of only 22 white stencilled hands associated with this shelter,

Figure 32. *A digitally enhanced close-up photo of the four hand stencils (images 20, 21, 22, 23) on the right-hand end of the art panel. Image 20 is on the top left-hand side. There is very little detail of image 21. Image 23, on the middle right of the photo, includes three superimposed hand images (only visible on computer screen). The fingers of hand image 22 are on the bottom right.*

Figure 33. *A digitally enhanced close-up of the composite hand image 22 showing a possible resemblance to an animal's foot.*

including a superimposed pair. Thirteen of the stencils are in a group above the main art panel. Depending on whether the pair of superimposed stencils was done by one person or two, that means that a maximum of only nine individuals made hand stencils on the main art panel. It could be less if the same person made more than one stencil, or more if some stencils have disappeared. This small number contrasts with the large numbers of hand stencils in some locations in the Sydney sandstone, for example at Red Hands Cave near Glenbrook (30km north-east of the 'Hands on the Rock' and Lacy's Creek shelters), where some 70 stencils have been recorded. It has been postulated that leaving hand stencils had a social function, for example indicating that particular individuals had visited the shelter. This was confirmed by a 'karadji' who was taken by Enright in 1936 to a

location with red hands near Port Stephens. Enright was told that: 'They were used to indicate the number of people that passed by the place where they were marked and the direction in which they had gone.'[66]

The small number of hand stencils within the Kerswell Hill shelter could indicate that access to it was limited to people with higher degrees of initiation. Alternatively, the most recent period of the cave's occupation may have been just before, or soon after, white settlement in the Valley.

The number of motifs in this small shelter is high in comparison with shelters used by people of some surrounding language groups. There is a total of 32 identifiable images in this shelter plus about six indeterminate images. A recent survey of Wollemi rock art (created by Darkinjung speakers) compared the average number of motifs per shelter for the Darkinjung people (49.4) with the Darug (36), Guringai (19.3), Eora (13) and Tharawal (24.1).[67]

Artefacts in the Kerswell Hill shelter

(a) Stone tool technology.

In addition to the stone hatchets and pebble choppers on the shelf above the cave floor, six more were found by the author within a 5m radius of the shelter. In addition, an unusual stone 'chisel' (20cm long, 4cm thick, with a 3cm long ground edge on one end) was found 2m to the west of the art panel.

The floor of the shelter is littered with a very large number of retouched stone artefacts and debitage. These were described by an archaeologist who made a brief visit:

> Raw materials observed on the surface included quartz, chert, mudstone, quartzite and siltstone, and indications of heat treatment were observed. Backed blades, blade cores, redirecting flakes and pebble chopper tools were among Aboriginal artefact types represented.[68]

The shelter was clearly a heavily used occupation site. This is consistent with the finding of McDonald that the association of rock art and occupation sites is very common.[69]

(b) Pigment sources.

Before describing the pigment material found within the shelter, the types of pigments used by Gundungurra people will be reviewed.

Powdered ochres could be obtained from various sources in Gundungurra country. Chalybeate springs contain dissolved iron compounds. When this solution comes into contact with oxygen at the surface, hydrated iron oxides precipitate out, forming a mound. This ochre powder was mixed with a little water and formed into balls which were put onto hot coals. The heat removed the crystalline water bound to the iron oxide, brightening the red colour. These mounds were widespread in Gundungurra country but relatively uncommon in neighbouring areas. This type of ochre may have been a trade item for Gundungurra people. There is a known source of this ochre 18km to the north-west of the shelter, near Mount Mouin. It is likely that Gundungurra people believed that this was formed in the *gunyungulung* from the blood of the 'Rainbow

Serpent' Gurangatch, who surfaced there while bleeding from his wounds.[70] The Gundungurra people may have called this ancestral blood *dyirrim*. Powdered ochre could also be obtained from decomposed basalt rock. This was called *gooba*. A major source of this was the top of Mount Colong. Mount York Claystone, or other red varieties of shale, could also be ground into powder. Powdered ochres were mixed with a carrier such as grease for use as a wet paint.

A hard ochre used for dry pigment drawing is Mount York Claystone. Pieces of this were used in the same way as crayons. One of the sedimentary layers of the Blue Mountains cliff strata, it outcrops on the surface at Mount York. As this layer tilts towards the east it occurs well below the clifftops in the Wentworth Falls and lower Cox River areas. It could have been accessed by Aboriginal people where the clifflines have been cut by waterfalls such as that on Pearces Creek on the opposite side of the Cox River to the Kerswell Hill shelter. Goldbury lists its constituents as quartz, kaolinite, clay minerals and ferruginous minerals.[71] It is the latter, varying in percentage from 1% to 25%, which gives the claystone its red colour. Goldbury notes that this mineral 'often feels greasy'.[72] This is probably due to the kaolinite (clay) content which varies from 26% to more than 50%. This natural lubricant would have made the pigment easier to apply and possibly aided absorption into the rock. Mount York Claystone is a highly variable mineral and Aboriginal people would have been able to select a desired shade and clay content. It is very abundant in Gundungurra territory but scarce in neighbouring areas and may have also been a trade item. Another possible source of hard ochre for drawing is the 'concretions' that form in the centres of chalybeate spring mounds.

White and yellow pigments were obtained from clay (*gubity*). The main components of clays are hydrated aluminium silicates such as kaolinite. Deposits of clays are classified as either residual or transported. Residual clays are found in the places where the rocks that decomposed to form them were located. Transported clays occur where the minerals composing it have been moved by the action of water, for example in layers within sedimentary deposits. The Burragorang Valley is at the bottom of an eroded sedimentary landscape and there are a number of layers of clay above the valley floor. However most of these were inaccessible due to their being covered with debris from erosion of the upper layers, called the talus slope. Clays vary greatly in their plasticity, colour and grit content. Many of the clay deposits in sedimentary layers below the Blue Mountains cliffs are low in plasticity and can be high in grit content. In contrast, the residual deposits of clay associated with the decomposition of granites 'are plastic, have a good body feel, work well and are smooth of surface.'[73] The variation in clay colours, from pure white to yellow and red, is caused by the differential infiltration of iron oxides. Hard dry clay could be used as a crayon for drawing. Alternatively, mixed with water it could be used as a wet paint, for example for creating white, red or yellow hand stencils.

Pigment sources found in the shelter. (Figure 34)

There were about a dozen balls of red, yellow and white pigment on the

Figure 34. *Yellow and white clay nodules and balls of processed ochre found near each other on the floor of the Kerswell Hill shelter. The lump of white clay on the lower left is about 4cm across.*

floor of the shelter, varying in size from one to four cm in diameter (they could not be located on the author's last visit). Most were together in the north-eastern corner of the shelter, below the shelf with the hand tools. It is possible that they were transported together to this place by an Aboriginal artist in a fibre bag which has since disintegrated. The red pigment balls are granular on the surface and appeared to be powdered ochre (iron oxide). It may be possible to chemically test the balls of ochre at the shelter to determine if they came from the 'Gurangatch blood' site or another location. It is important to note that none of the stencils or drawings in the shelter were made with 'wet' red ochre 'paint'. The red drawings were done with a hard dry 'crayon' and the stencils are all white or yellow. There are only two red hand prints created with liquid red paint. The balls of red ochre may have been bought to the shelter mainly to decorate peoples' bodies or artefacts.

The yellow and white balls are clay. There is a source of clay near the cave. Former Burragorang Valley resident Lionel Kill described the location of a 'residual' deposit of clay beside the Cox River, about one km to the east of the shelter.[74] (Figure 35) Contemporary Arnhem Land artist John Mawurndjul said that the White clay pigment he uses originated as the excrement and eggs of the local 'Rainbow Serpent'.

> I find the white ochre at Kudjarnngal… I dig it out of the ground with a crowbar. White clay was placed there by the Rainbow Serpent, it is the shit of the Serpent. It defecated and left the white clay in the ground.[75]

Gundungurra people may have believed that the Cox's River clay originated as the 'shit' or eggs of Gurangatch. It varied in colour from pure white to yellow. White and yellow clay, as well as being the pigments used to create hand stencils in this shelter, could have been also used for body and artefact decoration. William Russell described the use of yellow and white clays on performers in Gundungurra ceremonies.[76]

Mathews wrote that, near a cave at Singleton which included a depiction of 'Baiamai or the Great Spirit', there was a large level area:

> ...well suited for a *Bora* ground, and I think it more than probable that *Boras* were held here and that the figures in the cave are connected with the ceremonies which took place on such occasions.'[77]

Figure 35. *A late 1950s photograph by Jim Barrett, taken from McMahons Lookout south of Wentworth Falls, showing the location of the Cox's River clay deposit. The lower part of the Valley has been cleared of trees prior to its flooding.*

It could be speculated that the Kerswell Hill shelter was used as a 'backstage' area for Aboriginal dancers who decorated themselves there before proceeding to the large flat area below the cave (called by the settlers 'Hunts Flat') for ceremonial gatherings. These ceremonies may have been re-enactments of the stories depicted in the artwork in the shelter. There was possibly a 'sacramental' aspect to these rituals involving the performers anointing their bodies with substances they believed to be derived from the blood and excrement of their sacred creation ancestor Gurangatch.

'Hands on the Rock'

(Figure 36)

This site, which is now submerged beneath Lake Burragorang, was first investigated in 1891 by Robert Etheridge junior of the Australian Museum.

> The "rock" consists of a huge mass of Hawkesbury Sandstone about seventeen feet in breadth and length, hollowed out on the side overlooking the river to the extent of six feet. It is perched on the side of a gentle rise from the Wollondilly, having rolled from the high ground above... The cavernous front of the rock is fifteen feet broad [4.6m] and twelve feet [3.7m] high. On the back wall are depicted a number of red hands, both right and left. The principal ones [are] arranged roughly in a sigmoidal curve… with the extended fingers invariably pointing upwards. The other hands are irregularly scattered to the right and below those just referred to, and altogether there may be as many as seventeen. Under the principal hands are four white curved bands, resembling boomerangs or ribs, the whole of the hands being relieved, as is usually the case with these representations, by white splash-work. The hand-marks in this shelter differ, however, from any I have seen before by an unquestionably previous preparation of the rock surface for their reception by incising the surface to the shape of each hand, thus leaving a slightly raised margin around each.[78]

Figure 36. *Artwork at 'Hands on the Rock' being recorded by Frederick McCarthy and John Beeman in 1958. Photo by Howard Hughes, courtesy of Australian Museum archives. The waterhole on the Wollondilly River in the background was called Kweeoogang by Gundungurra people. It was one of the resting places of Gurangatch during his pursuit by Mirragan. The area around the rock, including the flat area beside the river where ceremonial activities took place, has been cleared of trees prior to its flooding.*

William Cuneo, who accompanied Etheridge on his 1891 trip to the Burragorang Valley, published this description of the site.

> ...on close examination, I am led to believe that the face of the rock, which is of a dull grey colour, was prepared to receive the impression of the pigmented hands that were then placed upon it. One of these hand impressions had a portion of the arm attached to it, but, owning to disintegration, it was now rather indistinct. On the right hand side, low down, the faint outline of a human figure was determinable, particularly the ribs.[79]

Another visitor who came at about the same time as Etheridge and Cuneo observed:

> a careful examination of these impressions leads to the belief that they are not paintings at all, but stainings, the grain of the rock being distinctly visible through the red colour, and an attempt to scrape off any paint or pigment with a penknife fails to do so. The residents in the neighbourhood even go so far as to say that the paintings, as they call them, go right through the rock.[80]

These hand images were relatively rare examples of red hand prints surrounded by white stencilling. As late as 1937, the red pigment of the handprints was still bright, with a visitor describing them:

> The hand shapes are filled in with a deep red colouring, suggesting that the blacks smeared the pigment on their hands, and pressed them against the surface of the rock. An outline in white appears around the hands.[81]

Mathews described how these were created:

> A variation of this method of drawing was to impress the hand in the manner described [for making 'impressions' or hand prints] and before removing it from the rock to squirt a different colour around its margin. This may be more correctly called a combination of the impression and stencil methods.[82]

White borders around paintings could also be created by using a brush with a liquid pigment or drawing with a hard, white 'crayon'. McCarthy described red paintings of animals within a white outline at Cordeaux, 60km south-east of the Wollondilly River.[83]

Some visitors saw an interesting optical illusion created by the handprints which may have been intended by the Aboriginal artists. Cuneo wrote:

> The most peculiar thing about them is the property contained in the pigment used, and which causes the imprints of the red coloured human hands to stand out from the stone face… This I found by actual measurement to be about three chains [61m] distant. As you draw nearer, the hands grow indistinct, but not so as to be indiscernible.[84]

This illusion was still apparent in the 1930s when a journalist wrote:

> ...looking at them from a distance of some thirty or forty yards [27m to 36m] away, they appear to stand out like bas-reliefs. Approaching closer they became more and more indistinct, until when we stood beneath them we could only distinguish a vague outline.[85]

Etheridge described the 'white curved bands' in the shelter as 'resembling boomerangs or ribs'. Cuneo claimed that he saw evidence that these 'ribs' were part of a large human figure. This seems unlikely, as any human figure with ribs this size would have taken up more than the available space on the rock surface.

The most unusual feature of Etheridge's description is the reference to each hand painting having 'a slightly raised margin' around it. If the rock surface had been literally 'incised', or cut into, prior to the prints being made, the artwork at this site would be a rare Australian example of intaglio, or low relief, petroglyphs of hands which have been infilled with red pigment and highlighted by white stencilling around the hands. Etheridge was an experienced recorder of rock art, who produced a number of publications on the subject including a review of hand paintings across Australia.[86] Painted petroglyphs are known from Cape York Peninsula but not from southern Australia.[87]

Thomas Simpson made enquiries about the cultural significance of this site at the St Joseph's Farm settlement in 1892: '…it is a very singular thing that the aborigines at the Government Camp on Cox's River, about three miles away, can give no explanation whatsoever of these pictures.'[88]

Etheridge was informed by Maurice Hayes, who had known the site since the early 1840s and lived near it since the 1850s, that he had tried to question local Aboriginal people about the hands but that it was:

> ...difficult to obtain reliable information from the Aborigines regarding them; they expressed ignorance, but ultimately gave him to understand that the "hands were the imprints of those of their Deity, when on earth."[89]

The Gundungurra people believed that these hands were made by the

burringilling in the *gunyungalung*. It is rare in New South Wales to have Aboriginal testimony that their artwork was not produced by people but by their mythical ancestors.

Moore discusses the 'so-called positive stencil or handprint':

> Positive stencils seem almost invariably to be done in red ochre. It is possible that positive stencils were considered to be actual hands on the wall, in the way that the Wandjinas in north-western Australia are considered to be the actual impressions left by the ancestral spirits when they disappeared into the rock shelters at the culmination of their earthly activities, whereas the negative stencils are 'shadows' of human hands.[90]

In Moore's typology, such images were classified as 'hand prints left by the totemic ancestors of the Dreaming and obviously especially sacred.'

Another very unusual feature of this art site is that a local white settler became one of its 'custodians'. The 'Hands on the Rock' site was located on land (Portion 45, Parish of Werriberrie, County Camden) originally occupied in 1869 by James Pippin (1818-1917). Pippin appears to have established good relationships with the local Gundungurra people. His descendants claimed that he 'was a blood brother to the local native tribe'.[91] Raphael Doyle (1894-1972), who married Pippin's granddaughter in 1920, said that Pippin had been 'initiated into the Burragorang tribe' and 'was protector of the Red Hand Cave in lower Burragorang.'[92] Pippin, rather than undergoing a Gundungurra initiation, may have been incorporated into a clan or totemic relationship with the local Aboriginal people who had responsibility for the site. The Aboriginal custodians may have thought this was necessary as Pippin controlled access to one of their most important cultural sites. There is some evidence that there was a spiritual link between the 'Hands on the Rock' art site and a nearby waterhole in the Wollondilly River called Mullindi. (There are variant spellings of this placename.)

On two separate occasions when Gundungurra people gave the location of this waterhole to R.H. Mathews it was described as being near this art site. Mullindi was said to be 'near cave paintings'.[93] Another more detailed description was: 'There used to be a gurangaty in a waterhole called Mullandi, called the "deep water", opposite the "Hands" – these hands are on a little creek which runs down into Mullandi'.[94]

Gurangaty (or Gurangatch) was a 'Rainbow Serpent' type of *burringilling* who, while being pursued by Mirragan (a 'native cat' or quoll), created much of the Wollondilly and Cox Rivers.[95] When he became tired, Gurangatch would try to hide in deep waterholes along these rivers. The names and locations of eighteen of these waterholes were recorded by Mathews. Mullindi was one of these. The waterhole immediately upstream of it was called (in Mathews' spelling) Kweeoogang. Maurice Hayes called his property beside this waterhole 'Queahgong' after it.

Mathews recorded part of the ceremonial significance of this area. 'Mullindee waterhole – before going on a Pirrimbir expedition the men used to go and swim in this hole, to make them strong and clever'.[96]

Mathews recorded the *Pirrimbir* revenge ritual from 'Thoorga' (i.e. Dhurga)

informants in the Narooma area.[97] *Pirrimbir* is not a Gundungurra word, *gure* was the local term. Similar rituals after unexplained deaths occurred throughout Australia. When the person whose malign magic was supposed to have caused the death was identified, an expedition was undertaken to that person's territory to kill him or another member of his group.

Mathews' informant described a physical connection, 'a little creek', between Mullindi waterhole and the 'Hands on the Rock' art site. There may have been a spiritual connection between them as well, with local rituals involving both places. In a 1931 article, the 'Hands on the Rock' art site was described as 'a ceremonial rock'.[98] The hand images there may have been in the category described by Moore: 'hand prints made in sacred places to derive spiritual strength from the ancestors.'[99]

Etheridge wrote, quoting Hayes, that:

> The large alluvial flats' around the 'Hands on the Rock' site were 'great gathering grounds for the various tribes from many miles round, even those of Goulburn and Shoalhaven participating.[100]

The Goulburn people were Gundungurra speakers but the Shoalhaven people spoke Dharawal. Mathews recorded that the Dharawal and Gundungurra had the Bunan initiation ceremony in common.[101] The 'gathering grounds' around the 'Hands on the Rock' art site may have been used for these initiations. It is possible that the artwork in this shelter played a role in the rituals.

The special relationship of the Pippin family with the 'Hands on the Rock' site continued after James Pippin's death. In the mid 1950s, when it became apparent that the site was going to be submerged by the rising waters of Lake Burragorang, Raphael Doyle, James Pippin's 'grandson in law', contacted the Australian Museum and urged it to photograph the artwork. (Figure 38) McCarthy carried out a detailed survey.[102] It is interesting to compare the museum's 1958 photo (Figure 38) with the 1892 sketch by Etheridge. (Figure 37) Etheridge wrote that there were 'up to 17' hand prints. He illustrated twelve of these. Comparison of his drawing with the museum photo shows that it is very diagrammatic. The hand with forearm attached (Cuneo wrote that there was only one) appears to have been moved by Etheridge from the position shown in the photograph because it would have been behind the tree in front of the cave from the perspective of his drawing. After the Australian Museum's survey, other visitors tried to chip off chunks of rock with the hand paintings before they were submerged.[103] The 'Hands on the Rock' art site re-emerged, after half a century under water, during the long drought of the late 1990s to mid-2000s and was photographed in 2006 by Sydney Catchment Authority staff, but no close examination was made to see if the hands were still visible. The shelter was submerged again after heavy rains in the following year.

Figure 37. *Australian Museum draughtsman G.H. Barrow created this drawing of the 'Hands on the Rock' from the 'rough sketches' of Robert Etheridge. From* Records of the Australian Museum *Vol 2(4), February 1893.*

Figure 38. *1958 photo by Howard Hughes of hand and boomerang stencils in the 'Hands on the Rock' shelter. This scan from the original print supplied by Australian Museum Archives. It was first published in the* Australian Museum Magazine, *Vol 8(1), March 1959, p.25.*

Figure 39. *This photo by Tony Kondek shows the small size of the shelter at Murro-lung-gulung in relation to the huge boulder it is part of. Within the shelter are three members of the Gundungurra Riley family and Jim Smith.*

Murro-lung-gulung

(Figure 39) This site is above the current level of Lake Burragorang. It consists of a massive boulder, about 20m long, which has a small shelter, about 4m high, towards its northern end. This shelter has two hand prints, a foot stencil and possible images of flowers. (Figure 40) The Gundungurra man Werriberrie, or William Russell (c.1835-1914), in his memoirs, described this site:

> Luke Gorman, who was John Gorman's father, lived at Upper Burragorang, at a place called "Murro-lung-gulung" which means that a Hand was stamped on a rock cave at this place. I never knew what was the meaning of the hands on the rocks, but old natives said that they were very, very old indeed, and were in some way connected with the Bulan-Aboriginal God.[104]

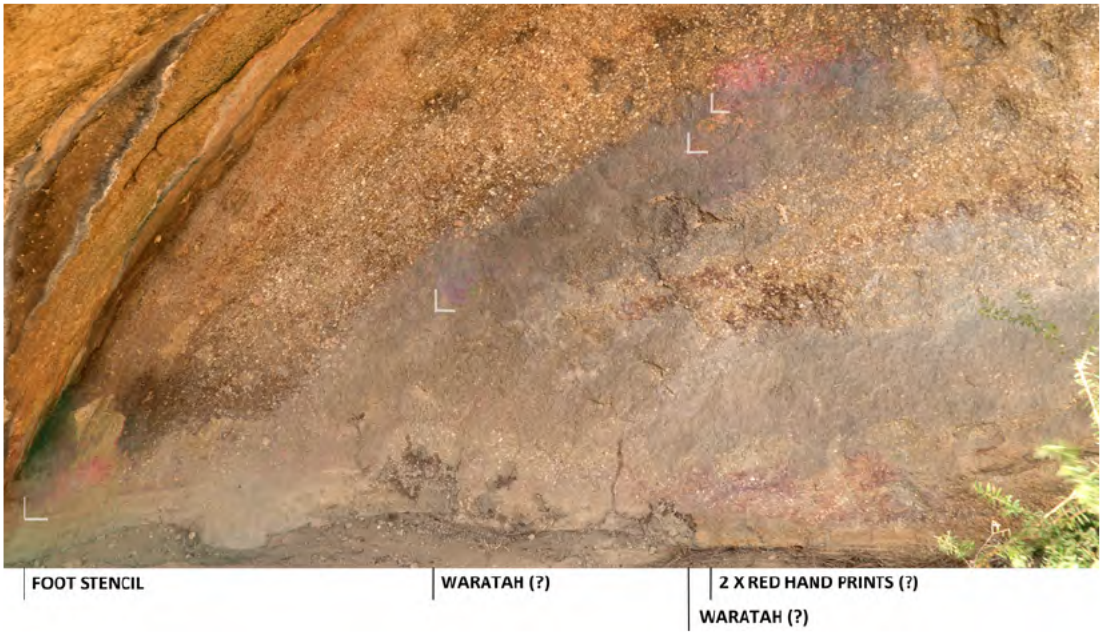


Figure 40. *The art panel at Murro-lung gulung showing the locations of faint images. Photoshop by Peter Ridgeway.*

Figure 41. *Gundungurra Riley family descendant Kazan Brown points to a possible Waratah image, above and to the right of her fingertip. Some details of a handprint can be seen near the centre of the photo.*

Luke Gorman's land was Portion 52, Parish of Nattai, County Westmoreland. There is only one 'rock cave' on this land, allowing a precise identification of its location.

The Gundungurra believed that Aboriginal people were created by two brothers they called Bulans. Mathews published accounts of some of the adventures of the Bulans.[105] Russell's description of the origin of the hand at *Murro-lung-gulung* is similar to that of the Aboriginal informants of Maurice Hayes who understood that the 'Hands on the Rock' were made by their 'Deity', rather than Aboriginal people.

The word *marrola* was recorded independently as one of the Gundungurra words for 'hand'. The word for a cave was not separately recorded, however *gulung* was a name for a rock. As this placename appears to have been constructed by combining the ordinary words for hand and rock, it is likely that it was a generic term for any cave with hand art. It is rare in southeast Australia to have the local Aboriginal placename for an art site. It may be significant that Russell used the word 'stamped' to describe the hand print at this site, distinguishing it from stencilled hands.

After World War I, Charles Peck (1875-1945) visited the *Murro-lung-gulung* shelter. As well as noting the hand print described by Russell, he wrote that there was also a 'faint' drawing of a Waratah flower.[106] He claimed to have obtained the Aboriginal story of the origin of the two images, but did not give the source or indicate whether it came from an Aboriginal person, or second-hand from a local settler. The author first visited this shelter in 2011. As well as the single hand print some faint marks which could have represented part of the Waratah drawing were seen. (Figure 41)There are actually two hand prints, with the second one barely visible to the naked eye but discernible on photographs enhanced by 'D stretch'. It is likely that only one of the pair was obvious during Werriberrie's youth in the mid-19th century. On later visits another marking which could have been a stylised Waratah was noticed, and a foot stencil was found near the floor of the shelter.

It is rare in southeast Australia to have a traditional Aboriginal story recorded about a rock art site. Peck recorded numerous cultural stories from the Sydney region. Many of these featured the Waratah. In common with most people who published versions of Aboriginal beliefs at the time, he only occasionally named the Aboriginal informants, and very rarely gave the dates the stories were recorded. Peck's story of the origin of the *Murro-lung-gulung* art was entitled 'The Hand That Tried to Draw the Waratah'. It relates how one of the *burringilling*, Wannara, encouraged by a woman, repeatedly tried to draw a Waratah at various places. Not being satisfied with the results, he always erased the pictures. One night, he slept at the *Murro-lung-gulung* rock, which was at that time on the clifftops above the valley. In the morning he prepared the surface where he was going to paint.

> 'With a suitable stone taken from fallen basalt of the slope of Coolong [sic] Mountain he scraped and scraped until he had as good a surface in the hollow as a school blackboard.'[107]

Mount Colong (1046m), whose Gundungurra name was Gillingyang, is a basalt-capped mountain 32km to the southwest of this shelter. The volcanic rock from its peak and slopes may have been quarried for hatchet blanks. The weathered rock was a source of ochre for Gundungurra people.

Another *burringilling* came into the hollow, took the Waratah Wannara was trying to draw and pressed it against the prepared surface, creating an image of the flower. The woman brought back other members of the tribe to admire the painting. There was then an earthquake which caused the rock to sway. Wannara 'rushed into the hollow and placed his hand against the smooth surface to prevent the great rock from falling.' However, after a more severe tremor, the rock fell from the clifftops and rolled down to its present position. When the tribespeople walked down to it, they found the imprint of Wannara's hand near that of the Waratah.

The story provided an explanation of how the sandstone boulder, of a rock type characteristic of the clifftops, came to be near the valley floor. It explains the variation in the texture of the rock surface inside the hollow. It is mostly conglomerate sandstone, with a rough surface containing densely-packed, small quartz pebbles. Within this there is a section of smooth grey sandstone. The story gives the origin of how this smooth area was created by Wannara grinding it with a piece of basalt. Both the legend recorded by Peck of the origin of the hand at *Murro-lung-gulung* and Cuneo's description of the 'Hands on the Rock' site referred to the rock surface being smoothed by grinding before the hand prints were made. Physical alteration of a rock surface prior to the application of pigment does not appear to have been observed in N.S.W. Artist Hector Jandary, of the Kimberley region of northern Australia, described how his grandfather 'would smooth the surface of a rock face with a stone before painting on it'.[108]

Review of flora in Aboriginal rock art

Images of plants in Australian rock art are much rarer than those of animals.[109] Edible roots and tubers such as yams and waterlilies are the commonest plant subjects. Fruits, seeds, fern fronds and occasionally whole shrubs, trees or vines are also portrayed. McDonald has not documented plant motifs in her surveys of the Hawkesbury sandstone rock art.[110] McCarthy wrote that in the Sydney region 'plant motifs are very rare'.[111] Davidson gives examples of 'floral' motifs in other parts of Australia, but, in every case, they are actually representations of the vegetative parts of plants or of fruits.[112] Elkin, in his survey of petroglyphs in Australia, has probably used the term 'floral' in a similar way, to refer to 'flora' rather than flowers.[113] The only motifs in Australian rock art which have been interpreted as 'flower-like' are petroglyphs in the Olary region of South Australia. These consist of 'a ring of dots around a larger, circular intagliated disk'.[114] However, these highly stylised abstract images could be interpreted in very different ways.

It is likely that some rock art images, if examined by botanists, could be recognised as flowers. For example, two of the images at Olary could be accurate representations of some flowers of the genus *Eremophila*.[115] These flowers are sometimes eaten whole, or their nectar is sucked.[116] They are also important

medicinal plants in arid areas.[117] This is a more likely interpretation than the only other obvious alternative, that they represent human feet with six or seven toes.

Waratahs have a bright red, large and conspicuous inflorescence, made up of hundreds of small individual flowers surrounded by crimson bracts, on a stem up to several metres high. Settlers in Australia's 1788 'first fleet' soon saw Aboriginal people seeking out these plants, with this first description being published in 1793: 'It is moreover a favourite with the latter [the natives], on account of a rich honeyed juice which they sip from its flowers.'[118]

The Waratah (*Telopea speciosissima*) belongs to the plant family Proteaceae. This family includes several genera mainly pollinated by birds. Many species of Banksias, Grevilleas and Hakeas produce copious amounts of nectar to attract honeyeaters and other nectar feeding birds. Their flowers were an important source of sugars for Aboriginal people throughout Australia.[119] In some areas whole flowers were eaten.[120] Many bird-pollinated plants flower in winter, when birds, but not insects, are active. This provides an energy-rich food source during the coldest months. The only flowers documented by McCarthy in Sydney region rock art were four images of inflorescences of the Gymea Lily, another prodigious producer of nectar.[121] In view of the significance of flowers in Aboriginal nutrition, it is surprising that so few cultural stories about their origin, and very few rock art sites with unambiguous images of flowers have been recorded from southeast Australia.

There is a possibility that Peck could have made up the Waratah story and even added a Waratah drawing at this site. Russell only mentioned the hand image in his description. Peck was a prominent lobbyist for the adoption of the Waratah as Australia's National floral emblem, being secretary of the Waratah League in the 1920s. This organisation was in passionate opposition to the Wattle Day League. It is noteworthy that many of Peck's stories contain derogatory remarks about wattles, supposedly sourced from his Aboriginal informants. Peck's use of Aboriginal cultural material, or stories purporting to be of Aboriginal origin, as propaganda for a debate in the non-Aboriginal community is a possible reason for casting doubt on the authenticity of his stories and his discovery of a Waratah flower painting at *Murro-lung-gulung*.

However, there is evidence from another source that the Waratah did have a role in Gundungurra mythology. The Blattman family was one of the earliest to settle in the Burragorang Valley, with Michael Blattman (1815-1875) arriving in the Laceys Creek area in the early 1860s.[122] His grandson, Owen Blattman (born 1913), told Jim Barrett in the early 1990s a Waratah story, set in the Burragorang Valley and the nearby Southern Highlands area, that had been passed down his family from Burragorang Aboriginal people.[123] The story is quite different to those recorded by Peck.

Artefacts, stone tools and raw materials at Murro-lung-gulung

This was a heavily used occupation site. The archaeologist who made a brief survey there described it:

> Artefacts were observed on the surface of this deposit, on the road above the shelter and extending more than 10m down the slope below the shelter. Raw materials observed included chert, silcrete, quartzite and good quality quartz. Particular artefacts noted were fine quartz bladelets, and a backed blade and a geometric microlith of silcrete.[124]

The Laceys Creek Shelter

(Figure 42) The final 'fallen boulder' art site in this area was on the property of George Blattman (1864-1940).[125] Pearce described their land as 'one mile up Lacey's Creek'.[126] This cave is usually under water but reappears when the lake level is low. The shape of this boulder may have had significance to Gundungurra people. It was described in the 1930s as looking like 'the head of a prehistoric dinosaur'.[127] A visitor in 1931 described it as a 'ceremonial rock'.[128] No description of the art in the shelter has been located other than that there were hand stencils there.

History of access, management and threats to the Burragorang Valley 'fallen boulder' art sites

The four art sites discussed in this paper became the 'private property' of non-Aboriginal people in the mid to late-19th century, making it difficult for Aboriginal custodians to continue to care for them. Local Aboriginal people 'co-opted' one of these owners, James Pippin, to assist in the 'management' of one of the shelters, 'Hands on the Rock'. This site became a well-known tourist attraction. A postcard of it was published in the early 1900s.[129] Readers of a 1906

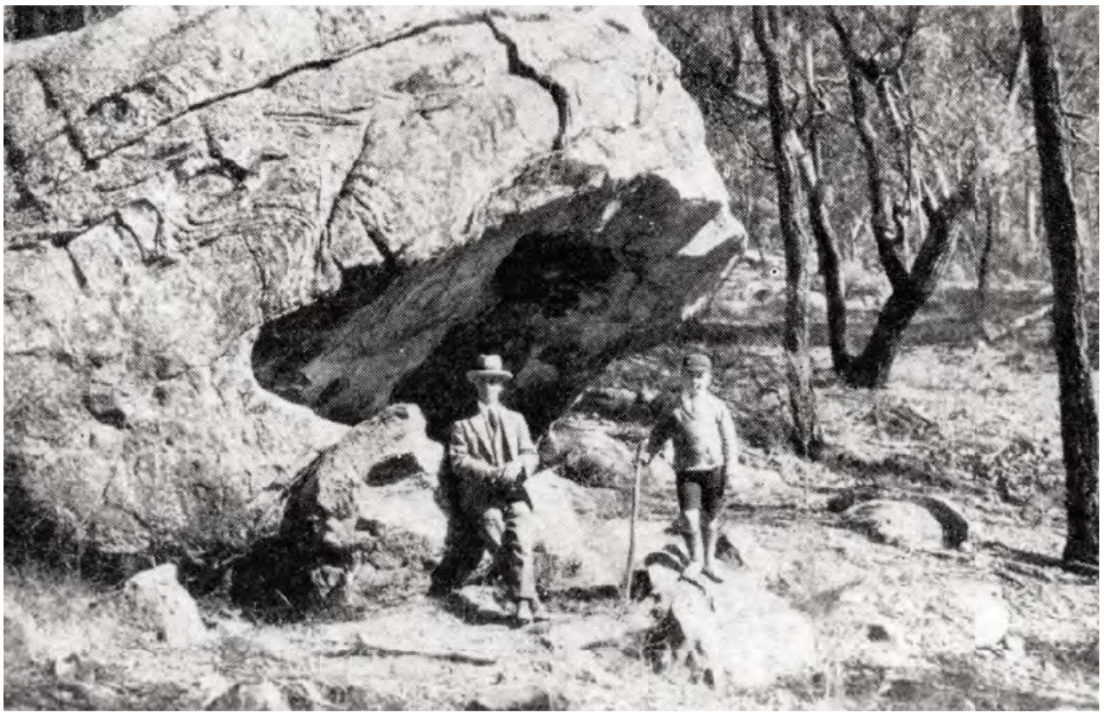


Figure 42. *The Laceys Creek shelter. [Original caption] 'Ancient Aboriginal Rock Carvings in Burragorang Valley'. Photo by E. Davidson in* Sydney Mail, *18 March 1931, p.17. Note: Aboriginal cave paintings were often referred to in popular media as 'rock carvings'.*

tourist guidebook were advised 'Do not miss it'.[130] Between 1927 and 1948 the land containing this shelter was leased to the NRMA as a camping ground.[131] This led to increased visitation, with graffiti inevitably appearing. It was claimed in 1931 that 'A few years ago the hand-pictures of the red hand rock in Burragorang Valley were in a state of perfect preservation. The Rock has since been so damaged by visitors to this popular motor camp that hardly any sign of the paintings can now be found.'[132] Wollondilly Shire Council, after receiving a report that: 'The carvings are being defaced, and the rock smoked by campfires', resolved in September 1937 to spend £7 to build a chain wire fence to protect it and also 'erect a notice board directing attention to the carvings' on the condition that 'the permission of the owner of the property, Mr Pippin is first obtained'.[133] Mr Pippin may have withheld his permission as the fence and notice board were never put in place.

There is no evidence of graffiti at the *Murro-lung-gulung* site. The Laceys Creek site was in a remote area but, even here, it was noted that 'the vandal has been at work with chisel and hammer and destroyed most of the markings'.[134] It is possible that the damage was caused by the landowner George Blattman himself. In a report of a fire that burnt down his home in 1935 it was said that his collection of Aboriginal rock art was destroyed.[135]

When, after the prolonged drought of the mid-1930s to early 1940s, the New South Wales Government made the decision to flood the Burragorang valley for Sydney's future water supply, no objection was made that Aboriginal cultural sites would be inundated. By the late 1950s, the 'Hands on the Rock' and Laceys Creek shelters were under water. The Kerswell Hill and *Murro-lung-gulung* sites were above the high-water level but came under threat in the 1990s. Assessments were made of the risk of extreme high rainfall events that could lead to the failure of Warragamba Dam and catastrophic flooding downstream. It was decided to raise the height of the dam by 23m for flood mitigation purposes. Due to a strong campaign by conservation groups and a change of government this plan was abandoned and a new auxiliary spillway was constructed instead. If the dam had been raised, the Kerswell Hill and *Murro-lung-gulung* shelters would have been in the zone expected to be 'rarely flooded', for no longer than seven days.[136] In 2012, the idea of raising the Warragamba Dam wall, this time by 14m, was revived.[137] At the time of writing an environmental impact study is being prepared. When this is released in mid-2019 there is likely to be debate about the effect on Aboriginal sites, including these two art sites. Kerswell Hill shelter is at an elevation of 135.65m and the art panel at *Murro-lung-gulung* is at 128m.[138] The current 'Full Supply Level'(FSL) of the dam is 116.72m. This is the height that water reaches just below the top of the dam wall. However areas of the Valley are regularly flooded above this level, as water 'backs up' during heavy rain. Water heights in the catchment can significantly exceed the height of the dam wall during serious rain events. The 'crest height' of water during these floods, if the proposed raising of the dam wall proceeds, is estimated at 128.45m, enough to inundate the *Murro-lung-gulung* art, causing permanent damage. The other figure to be considered is the height reached by rare extreme floodwaters. This 'Probable Maximum Flood' (PMF) level is estimated at 144.41m, high enough to

submerge both of the surviving Burragorang Valley art shelters. Although the likelihood of such a major flood is less than 0.01% annual probability, it is likely to occur at some time during the life of the dam. Even much lower floods could affect the art as winds create waves which will blow spray into the shelters.

There is no public access allowed to the area three km around Warragamba Dam, which is patrolled by WaterNSW staff. This gives the two surviving art sites described in this paper a very high level of protection from casual unauthorised visitors.

Conclusion

The Kerswell Hill shelter art has a number of features which make it rare at both the regional and national level. The image of a frog laying on its back in a pose displaying its warning colouration is unique, with no similar artwork being recorded from Australia. Superimposed hand stencils are rare in the Sydney Basin and could represent a totemic identification ritual. The three superimposed hand images may be unique. The realistic portrayals of the frog, and of the two geckos, are more complex artworks than the 'simple figurative' images characteristic of the Sydney sandstone. Geckos are very rarely represented in Sydney region art, with the only other example known to the author being at the 'Eagle's Reach' site in the northern Blue Mountains.

The large vertical anthropomorphic figure is likely to represent a 'culture hero' and may be the only surviving such portrayal in Gundungurra country. The enigmatic elongated, horizontal anthropomorph, apparently emerging from a crack, is a unique portrayal unlike any other regional Aboriginal artistic images. The group of broad grinding depressions surrounding a surface which has been rubbed mirror-smooth could represent a ritual rubbing site. It is likely that these rituals were part of a larger series of ceremonial activities which took place in the cave and on the nearby flat beside the Cox River. The association of this art complex with a large number of grinding grooves is also a rare occurrence, with only 5% of art sites in the Sydney sandstone region combining these cultural activities.

The *Murro-lung-gulung* shelter was the only art site mentioned by Gundungurra elder Billy Russell, who said in his memoirs that the hand images were 'connected with the Bulan-Aboriginal God'. It is rare to have the original Aboriginal name for an art site in the Sydney Basin. It is also very rare in southeast Australia, and possibly unique within the Sydney district, to have a recorded 'legend' explaining the origin of rock art images. This traditional story refers to a picture of a Waratah on the rock. If this can be confirmed by further photographic analysis it would be in one of the rarest categories of rock art depictions nationally, that of flowers. The archaeological consultant who visited this cave, and did not find any art, noted that 'the archaeological deposit could be highly significant.'[139] The research potential of this site, now that art and an associated legend have been identified, is clearly much higher than it was understood to be in 1989.

The flooding of the Burragorang Valley in the late 1950s led to the permanent

loss of two of the four known shelter art sites in the Valley. One of these, the 'Hands on the Rock' site, was arguably one of the most culturally important sites in Gundungurra country. Its loss is a major blow to surviving people of Gundungurra descent. The possible irreversible deterioration of the two remaining shelter art sites is clearly of great concern to them. From a purely scientific perspective, the Kerswell Hill and *Murro-lung-gulung* sites have a very high potential for research. Much of the culturally significant curtilage of these two surviving shelters was lost with the initial flooding of the Valley. The proposal to raise the dam wall will bring about a further loss of the cultural landscape which provided some of the meaning to these places.

Reflection

In the Sydney region, interpretation of rock art must now almost always be speculative as we lack detailed knowledge of its context within the natural events, creation stories, seasonal cycles, movements, social life, ritual and ceremony of its Aboriginal creators.

Burragorang people told enquirers that the 'Hands on the Rock' area was associated with a specific ritual and intertribal gatherings and that the hand stencils in the shelter were made by their creation ancestors, the *burringilling*. They related how the art in the *Murro-lung-gulung* shelter had a similar genesis in these early creation times and told the story of how the rock came to be in its location. This type of information on the cultural context of rock art is very rarely available in southeast Australia. I will now suggest how we can deepen our understanding of rock art that depicts animals by understanding the life cycles of the species.

Aboriginal people occupying the Kerswell Hill shelter in autumn, when they saw Leaf-tailed Geckos mating on the roof of the cave, were reminded that cold weather was approaching. They began to plan their journeys up through the clifflines onto Kings Tableland to harvest the abundant winter nectar flows of the Banksias and other bird pollinated shrubs. While in the high country above the Burragorang Valley they would hunt Ringtail Possums when their pelts, which were sewn into cloaks, were at their thickest.

They knew that any female Wombats they saw on these journeys were carrying young which would soon begin to look out of their pouches. There was probably a 'closed season' on hunting these mothers until their babies were independent.

When they crossed the Cox River and travelled up its tributaries in late autumn they would have seen many juvenile Eastern Long-necked turtles hatched from eggs laid in the previous spring.

January and February are the wettest months on Kings Tableland, with regular violent thunderstorms that swell the semi-permanent creeks that flow down into the Valley. These heavy flows wash the dormant eggs of Red-crowned Toadlets into pools where they develop into adults over the next month or two. When Gundungurra people travelled up their passes along tributaries such as Pearces and Gogongolly Creeks they were 'greeted' by the calls of the newly

emerged Toadlets who responded to their chatter.

The changing seasonal behaviours of the animals (that may be) depicted at the Kerswell Hill shelter: the Toadlet, Turtle, Wombat and Gecko gave signals to Gundungurra people of the cycles of resource availability that motivated their travels.

George Kill settled in the Kedumba corner of the Burragorang in 1889, when there was still a large Aboriginal community in the Valley. His sons went to school with Gundungurra speaking children. George's grandson Lionel (1926-2013) wrote, referring to the Kerswell Hill shelter: 'My brothers and I had entered that cave several times when we lived in the valley. I cannot explain it but we always felt it was a very special place and we never touched a thing'.[140] The descendants of the Burragorang Valley Aboriginal community are now asking that a similar level of respect is shown today and that no risk should be taken which could lead to possible further deterioration of the signs and stories left by their ancestors.

Acknowledgements

The Sydney Catchment Authority provided access to the two above-water sites mentioned in this paper. WaterNSW employee Tony Kondek facilitated this access and provided valuable advice. I travelled with Gundungurra elders and I am grateful for their encouragement of my research. Information on frogs was provided by Danny Wotherspoon and Peter Ridgeway. Michael Jackson supplied images of Gogongilly Creek art. Max Hill and Peter Ridgeway provided photographic services. Jim Barrett gave advice on the Gundungurra language and Burragorang Valley history. Val Attenbrow provided comments on a draft of this paper and parts were discussed with Paul Jennings and Peter Ridgeway who provided assistance in interpreting the art.

Endnotes

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[2] Ibid, figure 1.1, p.2.

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[4] Site number 52-1-0179. The exact location of the other drawing seen by the author, showing a small anthropomorphic figure with a tall 'headdress', was not recorded.

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[8] McDonald, op. cit. p.56.

[9] Personal communication from a former member of the Sydney Catchment Authority staff. When Gundungurra elder, the late Jean Murphy, was taken to this site she found a ground edge hatchet head about 5 m in front of the shelter and added it to the collection on the ledge.

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[30] Ibid, pp. 329, 336.

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