Keynote Address, 28th NSW Coastal Conference, Terrigal, Friday 1st November 2019

Eyewitness Accounts of Rising Sea Level Around Australia More Than 7000 Years Ago

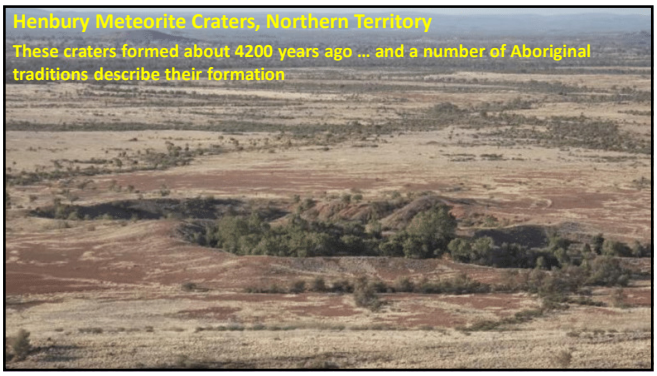
Patrick D. Nunn
Professor of Geography, University of the Sunshine Coast

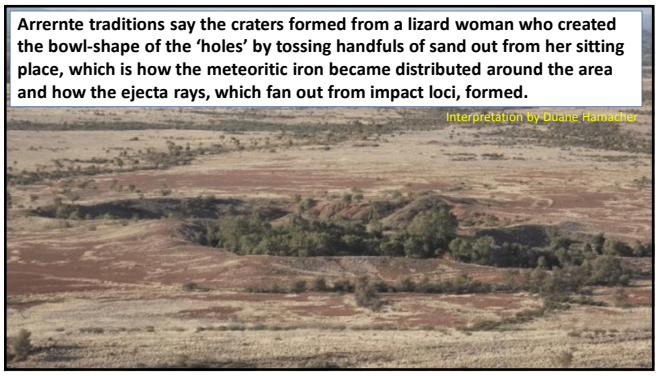
Today we are on the traditional lands of the Darkinjung peoples. The essence of this talk is that Indigenous wisdom is demonstrably millennia old, so it is doubly appropriate to acknowledge the wisdom of the First Australians and the lessons it may hold for us today.

Organisation of this Talk

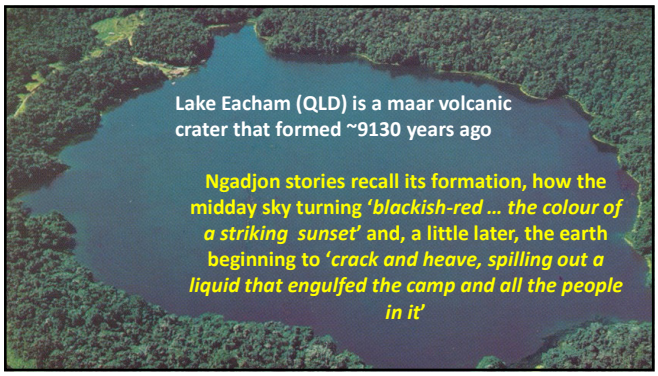
1. Ancient memories
2. Our shrunken continent
3. Calculating ages of Australian stories of coastal drowning
4. Eyewitnesses of rising post-glacial sea level
5. Are there lessons for today?


In about AD 412, this area was famed for its paganism and bacchanalia … until one evening a meteorite crashed to Earth with a resounding thump.
Whereupon the people converted to Christianity … and have never looked back … a story first written down about 140 years ago
Meteorite crater, near Secinaro, Sirente, Italy


Henbury Meteorite Craters, Northern Territory
These craters formed about 4200 years ago … and a number of Aboriginal traditions describe their formation


Arrernte traditions say the craters formed from a lizard woman who created the bowl-shape of the 'holes' by tossing handfuls of sand out from her sitting place, which is how the meteoritic iron became distributed around the area and how the ejecta rays, which fan out from impact loci, formed.
Interpretation by Duane Hamacher


Crater Lake, Oregon, USA formed as a result of the eruption of Mt Mazama 7,600 years ago
Klamath Indian stories recall the terminal collapse of Mt Mazama


Lake Eacham (QLD) is a maar volcanic crater that formed ~9130 years ago
Ngadjon stories recall its formation, how the midday sky turning '*blackish-red … the colour of a striking sunset*' and, a little later, the earth beginning to '*crack and heave, spilling out a liquid that engulfed the camp and all the people in it*'

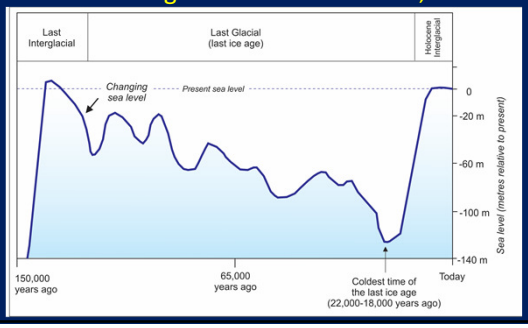

Backstairs Passage (between Kangaroo Island and the Fleurieu Peninsula (SA)), Australia
Jaralde stories recall when people were able to cross this passage without getting their feet wet.
Backstairs Passage
Today's depth: 32-35 metres.
People could have last walked across dry Backstairs Passage 9800-10,650 years ago.
Painting by Anne Christie


Ancient stories (in the absence of literacy)
• METEORITE FALLS
• 1600 years ago (Italy)
• 4200 years ago (Australia)
• VOLCANIC ERUPTIONS
• 7600 years ago (USA)
• 9130 years ago (Australia)
• COASTAL DROWNING STORIES
• >9800 years ago (Australia)

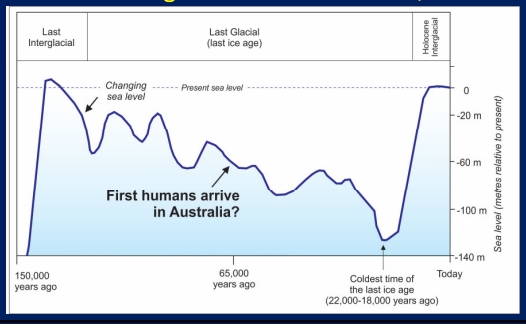

Flinders Island, Bass Strait, painted by John Skinner Prout (1846)
Part 2
Our shrunken continent

- The ancestors of the Indigenous Australians living on Flinders Island and Tasmania when Europeans first encountered them likely walked most of the way from the Australian mainland.
- The 'land bridge' was submerged at least 11,960 years.
- There are Aboriginal stories plausibly alluding to this event.
- This situation is representative of what happened at the time all along Australia's fringes.

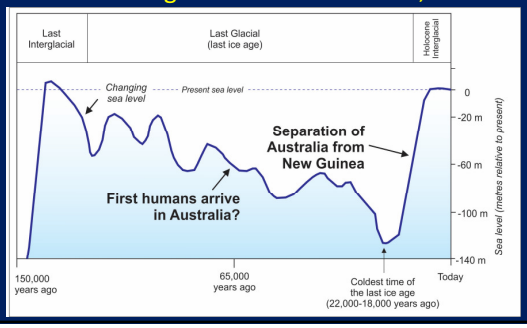
Sea-Level Changes within the Past 150,000 Years



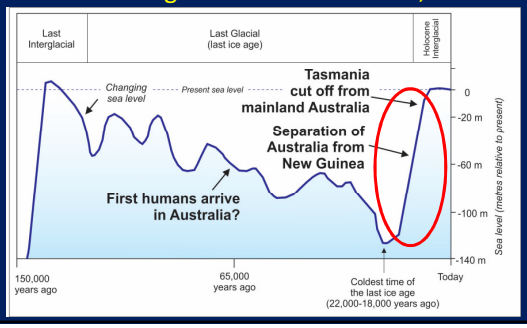
Sea-Level Changes within the Past 150,000 Years



Sea-Level Changes within the Past 150,000 Years



Sea-Level Changes within the Past 150,000 Years



About 15,000-7000 years ago around Australia, coastlines were "drowned" by a sea-level rise of about 120 metres.

Shorelines receded, at times in places by perhaps as much as five kilometres a year.[1]

Peninsula necks were severed, forming offshore islands.

Places that had been familiar to Indigenous Australians for millennia were submerged, forcing a fundamental realignment of people's activities.

[1] 5 km/year maximum off Arnhem Land (Flood, 2006, *The Original Australians*); 1 m/week off Nullarbor (Cane, 2001, *The Great Flood*).

Australia lost almost a quarter of its entire land area (about 23%).

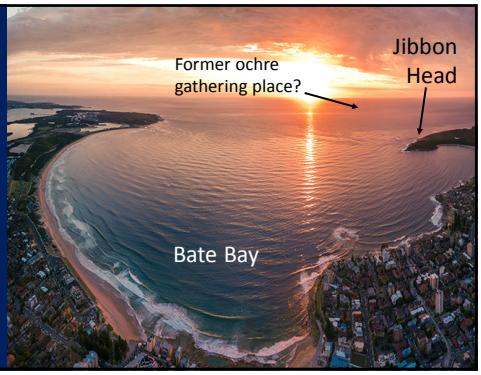
In places, thousands of kilometres of coast was submerged islands were created.

People were here.

Is it any surprise that they produced stories about sea-level rise?

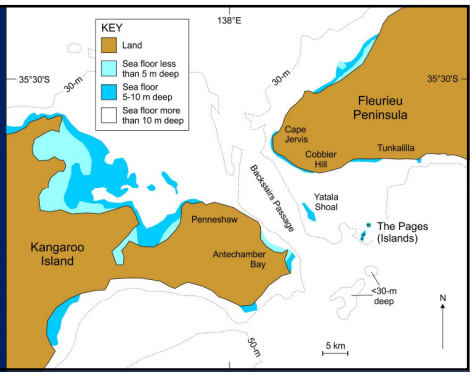
Places around the Australian coast for which exist groups of Indigenous stories (plausibly) recalling post-glacial sea-level rise.

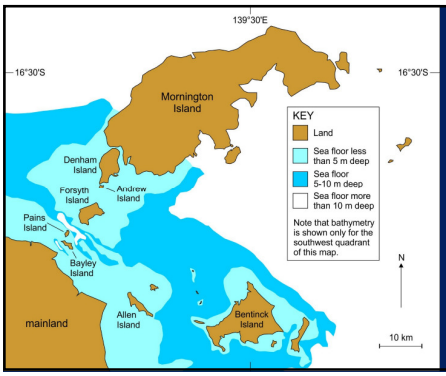
The man named Mister, possibly the last of the Gunnamatta Aborigines, passed on his reminiscences in the 1920s … one of which recalled when "the sea was a lot further out, and his people used to gather ochre" at a place about four kilometres east of Jibbon Head.



'A tall powerful man', Ngurunduri, had two wives who fled from him, crossing Backstairs Passage by 'walking and wading'.

Angered, he summoned the waves to rise up and drown them. Their bodies were washed south and became The Pages (islands).



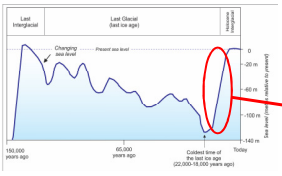


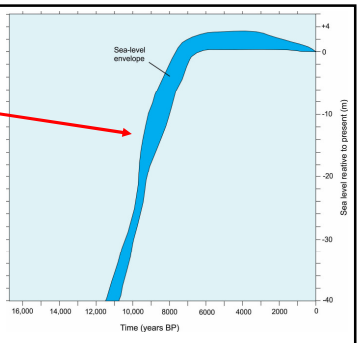
"… in the beginning, our home islands, now called the Wellesleys were not islands at all, but part of a peninsula running out from the mainland" …
… our people say that the channels were caused by Garnguur, a sea-gull woman who dragged a big *walpa* or raft, back and forth across the peninsula …

Source: Dick Roughsey (1971) *Moon and Rainbow*

Part 3

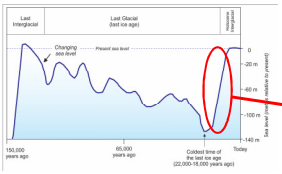
Calculating ages of Australian stories of coastal drowning

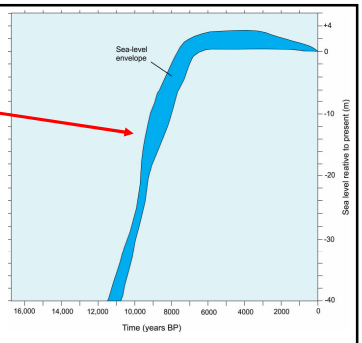




The nature of post-glacial sea-level changes around Australia is well known – this shows the last 11,000 years or so.

Sea level was ~40 metres below its present level 11,000 years ago.

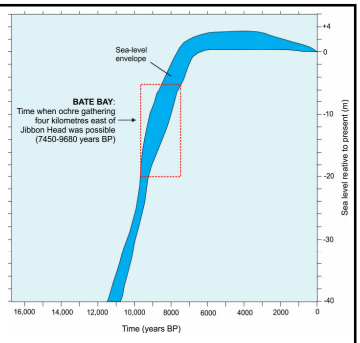




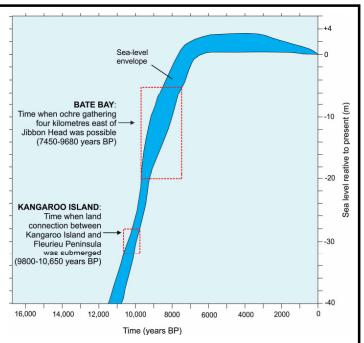
Note that sea level reached its present level about 7000 years ago, so that all stories recalling a time when sea level was lower than present must therefore be more than 7000 years old.

Ochre gathering by the Gunnamatta people east of Jibbon Head would last have been possible some time between 7450 and 9680 years ago.

The range comes from uncertainty in the precise position of sea level. Uncertainty also comes from the imprecision of the place of ochre-collecting that makes its present depth below sea level difficult to determine.

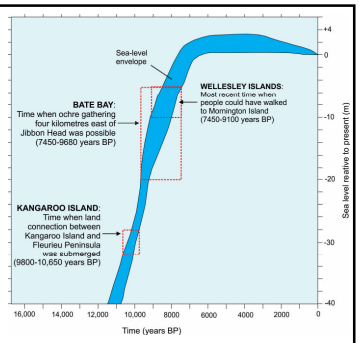


The last time that anyone could have walked or waded across Backstairs Passage to reach Kangaroo Island would have been some time between 9800 and 10,650 years ago.



The last time that anyone could have walked from the Australian mainland to Mornington Island would have been some time between 7450 and 9100 years ago.

It is worth contemplating that "*what science has discovered in the last 100 years or so about postglacial sea-level rise confirms the eyewitness accounts of our ancestors, not the other way round*" (*The Edge of Memory*, page 202).



Eyewitnesses of post-glacial sea-level rise

Having persisted for ~8000 years, the rising sea level would have been noticeable, its cumulative effects doubtless recorded in oral traditions.

People may have been concerned that perhaps the whole country would be inundated.

It is likely that people decided to respond, to try and stop the continued rise of sea level.

It is plausible to suppose that responses were both practical (tangible) and spiritual (intangible).

Indigenous Australian stories contain details about the former.

Eyewitnesses of post-glacial sea-level rise

Some such stories come from the Indigenous people of northeast Australia where "*many tribes … have stories recounting how the shore-line was once some miles further out … where the barrier reef now stands*".
(Dixon, 1970, The Languages of Australia).

One Gungganyji story recalls that a man named Goonyah (Gunya) climbed a mountain with his people to escape the rising waters, lit a bonfire and heated rocks within it, which were then thrown down onto the ocean. This "*succeeded in checking the flood*".
(Gribble, 1932).

A Djabuganydji story recalls that a man "*threw a hot stone into the sea to stop it coming up any further*". (McConnel, 1930).

Eyewitnesses of post-glacial sea-level rise

Other stories come from the Indigenous peoples of the Nullarbor Plains and apparently reflect their concern at the pace of land movement of the coastline below the cliffline.

The Wati Nyiinyii people "*rushed to the water's edge at the base of the cliffs*" and began "*bundling thousands of [wooden] spears to stop the encroaching water … these bundles were stacked very high and managed to contain the water*"
(Cane, 2002, *Pila Nguru*).

Eyewitnesses of post-glacial sea-level rise

A similar story from the Nullarbor explains that it was feared that the '*sea flood*' would '*spread over the whole country*' but that it was prevented from doing so by interventions from '*various Bird Women*' who gathered masses of the dense intertwined roots of the ngalda kurrajong tree (probably *Brachychiton gregorii*). They arranged these along the foot of the Nullarbor cliffs to create a barrier that is said to have "*restrained the oncoming waters*".

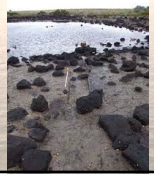
Story told by Sugar Billy Rindjana, Jimmy Moore and Win-gari (Andingari people) and by Tommy Nedabi (Wiranggu-Kokatato people) to Ronald Berndt in 1941.

Eyewitnesses of post-glacial sea-level rise

Indigenous stone arrangements along the coasts of Australia may once have had a complementary purpose – part of a spiritual response to sea-level rise.

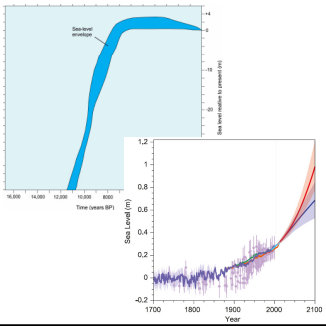
Similar phenomena have been interpreted this way in Europe – at the site of Lepenski Vir (Serbia) and burials of weapons and bodies along eroding coasts.

Fish God statue, Lepenski Vir, ~8500 years ago



Part 5
Are there lessons for today?

Parallels between today and the past



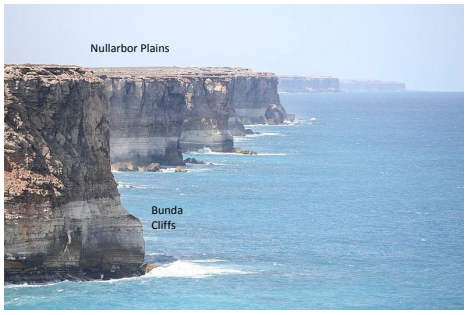
- There is a memory of past sea-level changes
- There is a good understanding of the effects of recent sea-level rise
- There is solid evidence that sea level will continue rising for the foreseeable future
- There is an understanding of the causes of sea-level rise
- There is a growing resolve to stop sea-level rise
- So can we learn anything from the past?

What we can learn today from the past – Lesson #1

- Today there is vacillation about how to respond, even whether we need to respond.

What we can learn today from the past – Lesson #1

- Today there is vacillation about how to respond, even whether we need to respond.
- 7000 years ago, did 'people power' (represented by the "*rush*" of the Wati Nyiinyii to the sea) eventually win through?



What we can learn today from the past – Lesson #1

- Today there is vacillation about how to respond, even whether we need to respond.
- 7000 years ago, did 'people power' (represented by the "*rush*" of the Wati Nyiinyii to the sea) eventually win through?
- As it might today?

Lesson #1

People take action to survive when they perceive their leaders are not doing enough.

What we can learn today from the past – Lesson #2

- Today climate change is acknowledged as a global issue. There is no question that the causes of climate change (through *mitigation*) should be addressed globally.
- But global *adaptation* action, when scaled down to local contexts is often ineffective … and ignores local knowledge.

What we can learn today from the past – Lesson #2

- What Australians did 7000 years ago was to DESIGN their own adaptation strategies (heating rocks, building palisades) … and then IMPLEMENT these.
- Scientists are belatedly realising today that LOCAL AUTONOMOUS adaptation is most effective.


Mitig Adapt Strateg Glob Change
DOI 10.1007/s11027-012-9407-1

Local knowledge and adaptation to climate change in natural resource-based societies of the Asia-Pacific

Louis Lebel

nature climate change ARTICLES

Small-island communities in the Philippines prefer local measures to relocation in response to sea-level rise

ORIGINAL ARTICLE

The future is behind us: traditional ecological knowledge and resilience over time on Hawai'i Island

Heather McMillen · Tamara Ticktin · Hannah Kihalani Springer

Lesson #2

Adaptation is most effective when designed and sustained locally.

What we can learn today from the past – Lesson #3

- All ancient Australian stories that talk about responses to rising sea level (hot rocks, wooden palisades etc.) recall their success.
- This suggests they were implemented around 7000 years ago when sea level stopped rising around Australia.
- But elsewhere, the situation was different.

La Fuite du Roi Gradlon painted by Évariste-Vital Luminais (1884)

Ys is just one of several allegedly submerged cities off the coasts of northwest Europe.

The incidence of these stories in northwest Europe can be explained by this being one of the very few places in the world where sea level has been rising almost constantly since the end of the Last Ice Age.

What we can learn today from the past – Lesson #3

- In many of the northwest Europe stories, the cities are said to have become inundated by the sea only after the floodgates were wrongly opened at high tide.
- This implies that the city already had quite advanced flood protection; that it had been under threat from rising sea level for some time.

What we can learn today from the past – Lesson #3

- What we can learn from this is that in an era of long-term sea-level rise, short-term adaptation works only when this era is at its end. As in the Australian stories of Gunya and the Wati Nyiinyii.
- What we can learn from the European stories (and presumably from numerous Australian stories now lost) is that short-term fixes do not work.

What we can learn today from the past – Lesson #3

- This is something scientists are slowly learning once again – that in the long term transformational adaptation is more desirable than incremental adaptation.

Lesson #3

Transformational adaptation is cheaper and less disruptive.

The Aboriginal stories discussed in this presentation all come from published sources. It is believed that the original owners of these stories came from the following groups. I acknowledge these informants with respect and gratitude.

- Backstairs Passage – *Jaralde*
- Bate Bay – *Gunnamatta*
- Cairns – *Gungganyji*
- Henbury meteorite craters – *Arrernte*
- Lake Eacham – *Ngadjon*
- Northern Queensland – *Djabuganydji*
- Nullarbor - *Wati Nyiinyii*
- Nullarbor – *Andingari, Wiranggu-Kokatato*
- Tasmania - *Palawa*
- Wellesley Islands - *Lardil*

THANK YOU FOR LISTENING