PALAEOENVIRONMENTAL CHANGE AND
ABORIGINAL ISLAND OCCUPATION
IN TROPICAL AUSTRALIA
Integrating palaeoenvironmental proxies

• Integrating proxies for palaeoenvironmental reconstruction is a complex task

• Dependent on the aims and objectives

• Historical science disciplines develop contrasting interpretations from the same datasets

• Archaeological and palaeoenvironmental data can often be particularly difficult to integrate

• Case study of the Sir Edward Pellew Islands Archaeological project, Gulf of Carpentaria, Northern Territory
Sir Edward Pellew Islands

Vanderlin Island
Northern Australia during the Last Glacial Maximum
MODEL OF PALAEOENVIRONMENTAL CHANGE ON AUSTRALIAN OFFSHORE ISLANDS

SEA LEVEL
- LGM – sea level lower, Australia considerably larger
- Early Holocene sea level transgression ~9-6,500 BP
- Sea level stabilisation ca 6,500 BP

CLIMATE
- Change in extent of Australasian monsoon – increasing seasonality
- Onset of intensified ENSO during the mid-Holocene
Records rare due to preservation constraints

Records concentrated on Chenier Plains, Beach Ridges and Mangrove sediment facies (Woodroffe, Chappell et al)

One poorly constrained pollen record from Lake Carpentaria suggests Mangroves were dominant during the early part of the Holocene (Luly, Torgersen et al)

Mapping of mangrove facies from the large alluvial deltas of northern Australia including the McArthur River suggest mangrove stands occupied much of the coastal region until the stabilisation of sea-level post 7000 yr BP then replaced by freshwater wetlands.

The paleoenvironment and vegetation history of the Gulf after this time remains poorly understood and reliant on few pollen records - hence this study
MODEL OF ABORIGINAL OCCUPATION
ON AUSTRALIAN OFFSHORE ISLANDS

- LGM – sea level lower, Australia considerably larger
- Early Holocene sea level rise – people retracted – abandoning peripheral areas with insulation process
- Sea level stabilisation ca 6,500 BP
- Islands uninhabited until 4,000 BP
Occupation hiatus from island formation ca 7,000 - 6,500 BP to ca 4,000 BP
Offshore island occupation and visitation
4,000 BP to present
PELLEW ISLAND ABORIGINAL OCCUPATION DATES

![Graph showing the occupation dates of Pellew Island in years before present (yrs BP)](image-url)
Walala pollen percentage data  (Pollen counts n=300)

- **Depth (m)**
- **Magnetic susceptibility**
- **NanoFetra %**
- **Total Eucalypt %**
- **Pandanus %**
- **Arecaceae %**
- **Acacia %**
- **Total arboreal taxa %**
- **Shrubland herb taxa %**
- **Rhizophoraceae %**
- **Chenopodiaceae %**
- **Total Poaceae %**
- **Fern and fern ally taxa %**
- **Myriophyllum %**
- **Restionaceae %**
- **PCA sample scores**

**? post 4000**
- High organics
- Increasing arboreal taxa
- Decreasing wetland taxa

**? Pre 6500 yr BP**
- Peaks in Rhizophoraceae and Chenopodiaceae indicative of a greater coastal connection

*Note: The diagram shows changes in pollen percentages over time, indicating shifts in vegetation and environmental conditions.*
Walala diatom percentage data

- **After 6500 yr BP the diatom picture is unclear**

- **Benthic/Planktonic diatoms dominant reflecting a vegetated swamp conditions**

**Base to 6500 yr BP**

**? post 4000**
Walala pollen concentration /cc data

- Peaks in Rhizophoraceae and Chenopodiaceae indicative of a greater coastal connection
- Increases in both arboreal and wetland taxa in conjunction with a greater pollen influx
- Peaks in Botryococcus and Myriophyllum stressing the likely hood of more permanent wetland conditions throughout this period
- Fluctuating levels of arboreal taxa

5000 yr BP to top

Base to 6500 yr BP
Four Mile Billabong pollen percentage data (adapted from Shulmeister 1992; zoned based on major PCA changes)

0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05 1.1 1.15 1.2 1.25 1.3 1.35 1.4 1.45 1.5 1.55

Depth (m)

Ch4 AMS dates Magnetic susceptibility Melaleuca % Total Eucalypt % Pandanus % Arecaceae % Acacia % Total arboreal taxa % Total shrub & helophyte % Restionaceae % Uropodophyllaceae % Fens % Orites % Myrophylum % Pandanales % Restionaceae % Total polynomorph count Charcoal particles mm2/cc PCA sample score 1

3000 yr BP to present

- increase in organics
- rise in Eucalyptus (EP marker) and Arecaceae palms
- rise in Restionaceae
- decrease in Melaleuca
- Generally few major changes

9000 to 7500 yr BP
Four Mile Billabong pollen concentration data

3000 yr BP to present
• probable lake conditions

9000 to 7500 yr BP
• probable intermittent lake conditions

- decreasing arboreal taxa
  - low pollen influx
  - low concentrations of wetland indicators
Prior to 6,500yr BP
- Walala a seasonal swamp with drainage open to northern bays.
- Stands of mangroves surrounded by expansive salt flats dominated by Chenopodiaceae and Poaceae reached their greatest extent.

After 6,500 yr BP
- Intensified coastal dune building and mobility impounds Walala swamp impeding drainage to the coast
After 5,000 yr BP
• Lake/swamp drainage and inland estuary channels blocked along the coastal drainage routes by mobile sand from the surrounding dunes.
• Impeded drainage led to more permanent wetland/lake conditions at Walala.
• Mid to Late Holocene dune mobility prevalent with large depositional periods recorded in the archaeological record.
What are the lake v swamp indicators?

- **Indicators of seasonal or permanent lake**
  - *Botryococcus* algal colonies
  - *Myriophyllum* (Haloragaceae)?
  - Peaks in Cyperaceae and Restionaceae

- **Indicators of seasonal or permanent swamp**
  - High concentrations of *Melaleuca* (Paperbark)
  - Peaks in Cyperaceae and Restionaceae

What are the other consistencies amongst the two records?

- Charcoal particles peak during periods of high organic deposition – this has previously been utilised as an indicator of human presence on Groote Eylandt

**Effective precipitation indicators?**

*Eucalyptus* pollen % are used by Shulmeister as an indicator of EP rising from 7500 and peaking at ca. 4000 yr BP. At Walala this taxa fluctuates from around 5000 to peak sometime after 4000 yr BP.
WOBUYA
limestone rockshelter excavation

Section Drawing Square C 75 x 75 cm

Archaeological hiatus between 6500 and 4000 yr BP

Early-Mid Holocene local debris and dune sand deposit

Mid-late Holocene dune sand deposit

Local debris

Limestone Bedrock

728 yr BP

3800 yr BP

6850 yr BP

7940 BP

7940 BP
What is happening in the paleoenvironment during the archaeological hiatus between 6500 and 4000 yr BP?

• **At Walala**
  - high deposition of organic material/pollen influx
  - increasing arboreal taxa including *Melaleuca*
  - increasing seasonal or permanent wetland indicators (pollen & diatoms)

• **At Four Mile Billabong (a reinterpretation)**
  - decreasing arboreal taxa
  - low pollen influx
  - low concentrations of wetland indicators

• **At the Atherton Tablelands**
  - precipitation increase through much of the mid-Holocene peaking between 5000 and 3500 yr BP
CONCLUSIONS/HYPOTHESES

- Uncertain if human occupation patterns correlate directly with major palaeoenvironmental shifts

- People living in the Pellew region abandoned with imminent insulation

- Marine transgression brought a phase of coastal dune building activity in the early Holocene lasting to ca 6,500 BP

- Islands remained uninhabited until people began making sea crossings ca 4,000 BP – related to watercraft development more marine focus to economy and palaeoclimatic changes associated with ENSO onset

- Post 4,000 BP: vegetation changes with dune mobility evident in archaeological and paleoenvironmental sequences

- Palaeoenvironmental and archaeological evidence from Vanderlin fits well with Groote Eylandt (Shulmeister and Clarke) and the broader region
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