NORTHERN AUSTRALIAN OFFSHORE ISLAND USE DURING THE HOLOCENE: The Archaeology of Vanderlin Island, Sir Edward Pellew Group, Gulf of Carpentaria

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Abstract
This paper presents an overview of archaeological investigations in the Sir Edward Pellew Islands in the southwest Gulf of Carpentaria, northern Australia. It is argued that Vanderlin Island, like the majority of Australia’s offshore islands, attests to a lacuna in human habitation for several thousand years after the marine transgression and consequent insulation c.6700 years ago. With the imminent threat of inundation, people appear to have retreated to higher land, abandoning the peripheral exposed shelf areas; subsequent (re)colonisation of these relict shelf areas in their form as islands took place steadily from c.4200 BP, with increased intensity of occupation after 1300 BP. Possible links between the timing of island occupation, watercraft technology and the role of climate change are investigated, with more recent changes in the archaeological record of Vanderlin Island also examined in light of cultural contact with Macassans.

Introduction

As a then young PhD candidate in the Department of Prehistory at the Australian National University, Sandra Bowdler was one of the first to take up island archaeology, focusing her attention on Hunter Island in Bass Strait (Bowdler 1984, 1988). In a subsequent summary of the then available data relating to offshore island use in Australia, Bowdler (1995) noted that most Australian islands only began to be exploited after c.3000 BP, coincident with the period of ‘intensification’ when substantial changes occur in the mainland archaeological record (cf. Lourandos 1985). Expanding beyond the baseline created by Bowdler, Sim’s (1994, 1998, 1999a) later work on the Furneaux Islands (also located in Bass Strait), led her to suggest a pan-continental model for offshore island abandonment – that under imminent threat of inundation associated with the last post-glacial marine transgression, people abandoned peripheral coastal plain territory, retreating to higher ground to avoid becoming stranded on newly-forming islands. Early European explorer’s accounts, however, clearly indicated that in the historical period, in both northern and southern regions of the continent, Aboriginal occupation of and visitation to islands was common. The antiquity of such island usage nevertheless was unclear.

Ten years on from Bowdler’s (1995) paper, current research still supports the proposition that there was an occupational hiatus of several thousand years in the archaeological records of smaller offshore islands, spanning from the initial island formation phase to approximately 4200 years ago. While Barker (2004) argued island use was continuous at Nara Inlet 1 on Hook Island in the Whitsunday Group, there are actually no radiocarbon determinations from the site (or indeed anywhere on the island) to confirm his claims for occupation between the period c.8600 and 4500 BP. Likewise on Border Island (also in the Whitsundays) there are no radiocarbon determinations between c.6600 and 3000 BP and Barker (2004:115) conceded that, at the very least, visitation during this period became ‘much more spasmodic and ephemeral’. There are only three cases with unequivocal occupation during the initial post-insulation (island) phase: Tasmania, Flinders and Kangaroo Islands, all of which are larger in size than 2000km² (Figure 1). Whether the human populations on the aforementioned islands consciously chose to remain on land that became increasingly isolated with sea-level

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rise, or whether they inadvertently became stranded is unknown. Nonetheless, only the Tasmanian population survived until European contact; after several thousand years in isolation the groups on both Flinders and Kangaroo Islands ultimately died out between 4500 and 4000 years ago (Draper 1991; Lampert 1981; Sim 1994, 1998, 1999a).

While it is clear that sea-level rise was the prime mover behind the initial Holocene abandonment of plains areas that subsequently became offshore islands, the underlying motivation for the mid-Holocene (re)colonisation of Australia’s offshore islands (as islands per se) is somewhat obscure. There is a strong chronological coincidence between the commencement of island colonisation (or visitation) about 4200 years ago, and the cessation of human habitation on Flinders and Kangaroo Islands – the two islands where habitation did not cease with insulation. While Sim (1994, 1999a) suggested that a climatic shift may have been involved in the apparent patterning in offshore island use, Bowdler (1995:956) cautiously concluded ‘we are dealing with a combination of cultural and environmental factors we do not clearly understand as yet’. In the decade since Bowdler’s review, further archaeological research on islands has been undertaken, supplemented by an increasingly sophisticated understanding of palaeoenvironments. In this paper we present the results of archaeological investigations on Vanderlin Island in the tropical north of Australia and consider them in terms of our current understanding of offshore island use and climate change.

The Sir Edward Pellew Islands Archaeological Project

When Matthew Flinders (1814) explored the Gulf of Carpentaria in 1802 he noted the presence of Aboriginal people on Vanderlin Island. It was subsequently determined that these were Yanyuwa, a group whose territory included not only the Pellew Islands – comprising five islands situated offshore from the mouth of the McArthur River (Figure 2) – but also the adjacent mainland (Baker 1999; Bradley 1988a, 1991a, 1997). It seems likely that pre-sea-level stabilisation, ancestral Yanyuwa territory may have comprised an extensive area of the now submerged continental shelf, including the rises which remained exposed following the marine transgression and which now constitute the Sir Edward Pellew Group. This area presented an ideal case study to investigate patterns of past human responses to sea-level rise and the issue of mid-Holocene island (re)colonisation, and consequently in 1999 the Sir Edward Pellew Island Archaeological Project (SEPIAP) was initiated by Sim. Vanderlin Island, the largest island in the group, provided the focus for the study as it was relatively remote from the mainland and reconnaissance verified it contained numerous archaeological sites (Sim 1999b). Importantly it also had a large permanent body of freshwater, the geological structure of which suggested its formation may have pre-dated the last marine transgression, and therefore would have been an important factor in human utilisation of the area.

One of the principal aims of SEPIAP was to establish a chronology for habitation in the Sir Edward Pellew Islands to test both the abandonment model and further investigate the antiquity of the more recent island occupation in a northern Australian context. Although Yanyuwa people have been the subject of anthropological, linguistic and musicological studies (Baker 1999; Bradley 1991a, 1997; Bradley et al. 2003; Kirton and Nero 1982; Mackinlay 2006; Mackinlay and Bradley 2007), prior to the commencement of SEPIAP only very limited archaeological investigations had been undertaken in their country (Baker 1984; McLaughlin 1977). As such, the SEPIAP research programme commenced with a systematic site location survey guided by Yanyuwa traditional owners and custodians – permanent residents with an intricate knowledge of the entire island. Particular emphasis was placed on exploring areas with the potential to contain rockshelter, cave or open midden/mound sites with stratified deposits. In order to establish a robust chronology and to identify changes in occupation patterns, cultural remains from a range of both surface and subsurface contexts in all environment zones across the island needed to be dated, necessitating extensive excavations, the results of which are summarised below. Two complementary projects were carried out in conjunction with SEPIAP: the survey, recording and analysis of rock art on Vanderlin and nearby Centre Islands by Chris Grasswell and Ken Mulvaney and a palaeoenvironmental investigation of the sedimentary sequence preserved in Walala (aka Lake Eames; Prebble et al. 2005); the specific results of these projects are not included below.

Environmental Background

Vanderlin Island is the largest of the five main islands that comprise the Sir Edward Pellew Group. It measures approximately 30km north-south by 15km east-west and covers approximately 260km² (Figure 3). It is also the outermost island of the group, requiring an open sea crossing of at least 6km to access it from either the adjacent mainland or by island hopping. The Pellew Islands are generally all of low relief with a maximum elevation of 84m asl on Vanderlin Island. The sheltered western side of the latter is fringed by extensive tidal saltlans and mangrove embayments. This contrasts markedly to the more exposed...
Vanderlin Limestone Formation; the latter contains a number of chert river cobbles observed 15km upriver from the mouth of the McArthur River on the adjacent mainland (Pickering 1990) and the Barkly Tablelands (Archie Johnston, pers. comm., 2003).

Plant communities on the Pellew Islands strongly reflect the underlying geology, with sandstone areas covered by relatively open woodlands dominated by Eucalyptus, Acacia or Callitris intratropica with a spinifex understorey (Latz and Thomson 1991). Surrounding sand plains and gullies are predominately vegetated by Melaleuca nervosa woodland with a Leptocarpus sp. understorey. There is marked variation in vegetation in the extensive coastal dune areas but most generally fall into one of the following categories; Acacia thicket, open Pandanus-dominated woodland, open spinifex or foredune grasslands. Island embayments host extensive, botanically diverse mangrove stands with some 26 mangrove species recorded on Vanderlin Island alone, with freshwater wetland plant communities including sedges and vine thicket taxa associated with Walala and drainage channels. On Vanderlin Grevillea pteridifolia (a small tree) is especially indicative of disturbance, usually attributable to introduced stock grazing and anthropogenic firing over the last century.

Vertebrate fauna recorded for the Pellew Group include 21 terrestrial native mammal species, comprising seven marsupials (including bandicoots, quolls and wallabies), four bats and nine rodents (Johnson and Parsons 1991); in addition, there is a large range of avifauna, reptiles, amphibians, fish, crustaceans and shellfish. The majority of these represent potential food resources, with marine resources and in particular the dugong being a focus of contemporary Aboriginal hunting activities (Bradley 1988b, 1991a). Feral animals on Vanderlin Island currently include horses, cattle, goats and cats, all of which are having a substantial impact upon the island’s ecology and integrity of archaeological sites.

Climatically, the Gulf region is typical of the northern tropical regions of the continent, experiencing a short wet season generally between October and April and a long dry season across the winter months (Stern et al. 2004). The more stable weather in the dry season affords most opportunities for small boat travel to the Pellew Islands, although knowledge of the local weather patterns enables contemporary island residents to make regular trips to the mainland throughout the year.

Survey and Excavation Results
Following a preliminary community liaison and reconnaissance trip in 1999, three major field seasons focused on Vanderlin Island were carried out between 2000 and 2004, with some ancillary work also undertaken on nearby Centre Island. On Centre Island two sites (an open midden site and a rockshelter containing midden deposit) were recorded at East Neck in the immediate vicinity of a previously-documented Macassan trepang processing camp (Baker 1984). Because of their possible potential to contribute to our understanding of the cultural contact between the Macassan trepangers and the immediate vicinity of a previously-documented Macassan trepang processing camp (Baker 1984). Because of their possible potential to contribute to our understanding of the cultural contact between the Macassan trepangers and the

Figure 3 Detailed map showing locations of archaeological sites with radiocarbon dates on Vanderlin Island.

eastern coast, which has long stretches of open sandy beaches, mobile coastal dune formations and lower topographical relief. Although ephemeral springs exist on all five of the islands in the group, only Vanderlin has a permanent body of freshwater, Lake Eames, commonly known by its Yanyuwa name Walala. Walala is a centrally-located, spring-fed freshwater lake covering c.1.5km². Lake depth varies seasonally between about 2.0–2.5m depending on the quantity of monsoonal precipitation it receives. The sill height between Walala and the east coast is less than 8m asl.

All islands in the Pellew Group consist of outcrops of Lower Proterozoic sandstone fringed by more recent alluvium (Smith 1963). On the eastern side of Vanderlin Island there are extensive tracts of alluvial dune formations, including cemented older dunes along with some small localised outcrops of the Vanderlin Limestone Formation; the latter contains a number of rockshelters and at least one karst cave formation. Sandstone outcrops of the Masterton Formation dominate the western side of the island, forming gullies and escarpments that fringe the salt pans and shorelines, and containing numerous rockshelters suited to human occupation.

The Masterton Formation includes medium- and fine-grained, quartzitic and ferruginous sandstones that exhibit varying degrees of metamorphism; some of the more indurated siliceous rock has been utilised as a material for flaked artefacts, while the poorer quality rock has been employed for use as grinding stones, hammer stones and edge-ground implements (Sim 2002, 2005). Although some areas of conglomerates have been observed amongst the sandstone, there are no known sources on the Pellew Islands of fine-grained siliceous cherts, silex, and indurated mudstone or other rock types with conchoidal fracture qualities suited to retouched implement types (Brown 1908; Paradice 1923–1924; Archie Johnston and Steven Johnston, pers. comm., 2002). The nearest known sources of such rocks are chert river cobbles observed 15km upriver from the mouth of the McArthur River on the adjacent mainland (Pickering 1990) and the Barkly Tablelands (Archie Johnston, pers. comm., 2003).
Yanyuwa (cf. Macknight 1969, 1972, 1976), excavations were also undertaken at the East Neck sites, though their results will be discussed elsewhere. In total, more than 115 sites were recorded on Vanderlin Island, including various types of shell middens (including scatters and mounds), stone artefact scatters, isolated artefacts, rockshelters, painted and stencilled art sites, and stone arrangements. Sites were located in all environmental zones, although coastal middens were by far the predominant site type. Surface shell scatters and stratified midden sites were also common in the numerous sandstone rockshelters fringing gullies, coastal flats and tidal salt pans along the west and southwest coasts. Shell mounds were also recorded in several west coast localities. Middens were similarly common in limestone outcrops along the central east coast dune country. The only sites where shellfish remains were absent were isolated stone artefact finds and some rockshelter art sites.

The selection of sites for excavation and dating reflected the general distribution and types of sites on Vanderlin Island. The sample thus included sites from low energy embayments, open exposed coastal environs, inland dune systems and saltpan contexts (Table 1, Figure 3). Radiocarbon dates were obtained from 16 sites including two with stratigraphic sequences extending from the pre-marine transgression phase to the recent island phase. Excavations were undertaken at 12 sites: nine rockshelter sites (one limestone and eight sandstone); one limestone karst cave site; one shell mound; and one open shell midden with subsurface remains. In order to obtain a representative sample from all site types and environments, shellfish remains were collected from a further four open shell scatters: Investigator Bay, Wobuya Creek, Vanderlin Creek 2 and the Walala Dune sites, all of which comprised surface shellfish scatters varying in area from 2 to 30m².

The two excavated open sites consisted of a series of shell scatters at Kedge Point and the Barbara Cove Mound. The 10 excavated rockshelter and cave sites primarily contained surface and stratified shellfish remains. The exception to this was Victoria Bay III, where a scant scatter of surface *Anadara granosa* shells overlay a deposit containing comparatively numerous flaked stone artefacts.

### Table 1 Summary of sites excavated or dated on Vanderlin Island.

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Site Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babangi (VB1)</td>
<td>Sandstone rockshelter containing midden deposit and art</td>
</tr>
<tr>
<td>Mushroom Rock (VB17)</td>
<td>Sandstone rockshelter containing midden deposit and art</td>
</tr>
<tr>
<td>Worungulumba (BP)</td>
<td>Limestone karst cave containing midden deposit and stone artefacts</td>
</tr>
<tr>
<td>Boimamura (Johnnie’s Shelter)</td>
<td>Sandstone rockshelter containing midden deposit and art</td>
</tr>
<tr>
<td>Victoria Bay III</td>
<td>Sandstone rockshelter containing artefacts, with scant shell scatter on the surface</td>
</tr>
<tr>
<td>Barbara Cove Mound</td>
<td>Open shell mound</td>
</tr>
<tr>
<td>Turtle Shelter</td>
<td>Sandstone rockshelter containing midden, stone artefacts and art</td>
</tr>
<tr>
<td>Kedge Pt (BB)</td>
<td>Open shell scatters of <em>Anadara</em> (with more than &gt;15cm subsurface deposit)</td>
</tr>
<tr>
<td>Komandarri-naboya (KN)</td>
<td>Sandstone rockshelter containing midden deposit and art</td>
</tr>
<tr>
<td>Wobuya Shelter (WS)</td>
<td>Sandstone rockshelter containing midden deposit and stone artefacts</td>
</tr>
<tr>
<td>Scissibar Creek (SC)</td>
<td>Limestone rockshelter containing midden deposit and stone artefacts</td>
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<tr>
<td>Walala III</td>
<td>Sandstone rockshelter containing midden deposit, stone artefacts and art</td>
</tr>
<tr>
<td>Investigator Bay</td>
<td>Open shell scatter with stone artefacts</td>
</tr>
<tr>
<td>Wobuya Creek</td>
<td>Open shell scatter</td>
</tr>
<tr>
<td>Vanderlin Creek 2</td>
<td>Open shell scatter</td>
</tr>
<tr>
<td>Walala Dunes</td>
<td>Open shell scatter</td>
</tr>
</tbody>
</table>

### Dating

All marine or estuarine shell dates discussed below are the midpoint of the one sigma (68.3%) calibrated age-ranges and have been corrected for oceanic reservoir effects for the Gulf of Carpentaria region (Ulm 2002, 2006). Both calibrated and uncalibrated dates are given in Table 2. Dates were calibrated using the CALIB 5.0.1 programme (Stuiver and Reimer 1993). Determinations on charcoal were calibrated using the SHCal04.14c southern hemisphere calibration dataset (McCormac et al. 2004). Dates on marine samples greater than 448 BP were calibrated using the marine 04.14c calibration dataset (Hughen et al. 2004) with an east coast ΔR correction value of 12±7 (Ulm 2002) to account for very broad differences in regional correction factors.

Dating results from 46 samples are provided in Table 2 and are plotted in Figure 4. With four exceptions, all dates were obtained from cultural shell deposits or hearth charcoal samples, and hence their anthropogenic derivation was unequivocal. In the absence of such samples in two sites (Walala III, Spit 7, and Spits 2, 6 and 12 at Victoria Bay III), charcoal fragments found in stratigraphic association with stone artefacts were dated. While recognising the limitations of such samples in providing occupation dates per se, and the fact that the upper deposit at Victoria Bay III was clearly disturbed by introduced animals, the two lower dates at least provide a *terminus post quem* for cultural remains found above these dates. Below the surface midden level in the Walala III site charcoal was all but absent except for Spit 7, from which the dated sample was recovered – along with six (from a total of eight) stone artefacts. Should this charcoal fragment have been the result of natural, non-anthropogenic firing events it would be expected that charcoal would have also been recovered from other levels of the deposit, which was not the case. Hence it is considered highly probable that the lower date from the Walala III site accurately reflects the antiquity of stone tool use at the site.

When the radiocarbon determinations are considered as a single dataset, there are two periods during which there is no evidence of human occupation on Vanderlin Island (Figure 4). The earliest gap in occupation spans 2500 years beginning about 6700 BP probably marks the initial period of island formation, and continues through until about 4200 BP when evidence of...
human occupation reappears. There is a second, more recent, shorter gap in the record from about 2500 to 1700 BP after which dated evidence of occupation becomes increasingly apparent through to modern times, most markedly after c.1100 BP (Figure 4).

Arguably the increased number of occupation dates falling in the last millennium may be in part a reflection of preservation and visibility rather than a real variation in intensity of human occupation over time. However, shellfish remains from surface contexts were in some instances 700 and 800 years old and appeared equally as well-preserved as both younger remains and those from subsurface contexts up to c.8000 years old. This would suggest that preservation is not an important factor in the patterning of the dates and the variation in the distribution of

<table>
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<tr>
<th>Site</th>
<th>Context</th>
<th>Sample</th>
<th>Lab. No.</th>
<th>(^{14} \text{C Age (years BP)} 1 \sigma)</th>
<th>Calibrated Age BP 1 (\sigma)</th>
<th>Calibrated Age BP 2 (\sigma)</th>
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<td>312-1*</td>
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<td>735-1*</td>
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<tr>
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<td>Spit 19</td>
<td>P. erosa</td>
<td>Wk-14685</td>
<td>7550±48</td>
<td>8042-7934</td>
<td>8134-7907</td>
</tr>
<tr>
<td></td>
<td>Spit 21</td>
<td>T. palustris</td>
<td>Wk-15277</td>
<td>7424±63</td>
<td>7941-7812</td>
<td>7998-7726</td>
</tr>
<tr>
<td>Scissibar Creek</td>
<td>Spit 2</td>
<td>charcoal</td>
<td>Wk-14651</td>
<td>461±41</td>
<td>515-454</td>
<td>535-326</td>
</tr>
<tr>
<td></td>
<td>Spit 5</td>
<td>G. tumidum</td>
<td>Wk-14652</td>
<td>1388±33</td>
<td>961-888</td>
<td>1021-821</td>
</tr>
<tr>
<td></td>
<td>Spit 8</td>
<td>charcoal</td>
<td>Wk-14653</td>
<td>1126±39</td>
<td>1051-933</td>
<td>1058-926</td>
</tr>
<tr>
<td></td>
<td>Spit 13</td>
<td>Saccostrea sp.</td>
<td>Wk-14664</td>
<td>3091±41</td>
<td>2989-2781</td>
<td>2958-2745</td>
</tr>
<tr>
<td>Walala III</td>
<td>Spit 1</td>
<td>A. granosa</td>
<td>Wk-14740</td>
<td>1301±35</td>
<td>885-790</td>
<td>914-740</td>
</tr>
<tr>
<td></td>
<td>Spit 3</td>
<td>charcoal</td>
<td>Wk-14738</td>
<td>294±38</td>
<td>439-157</td>
<td>447-152</td>
</tr>
<tr>
<td></td>
<td>Spit 7</td>
<td>charcoal</td>
<td>Wk-14739</td>
<td>3390±43</td>
<td>3631-3484</td>
<td>3688-3454</td>
</tr>
<tr>
<td>Investigator Bay</td>
<td>Surface</td>
<td>P. erosa</td>
<td>Wk-14743</td>
<td>808±34</td>
<td>482-412</td>
<td>498-333</td>
</tr>
<tr>
<td>Wobuya Creek</td>
<td>Surface</td>
<td>A. granosa</td>
<td>ANU-12173</td>
<td>510±60</td>
<td>225-1*</td>
<td>247-1*</td>
</tr>
<tr>
<td>Vanderlin Creek 2</td>
<td>Surface</td>
<td>P. erosa</td>
<td>Wk-14741</td>
<td>519±35</td>
<td>226-70</td>
<td>244-1*</td>
</tr>
<tr>
<td>Walala Dunes</td>
<td>Surface</td>
<td>P. erosa</td>
<td>Wk-14742</td>
<td>483±33</td>
<td>118-1*</td>
<td>226-1*</td>
</tr>
</tbody>
</table>
dates is therefore considered to serve as a crude approximation of the intensity of human occupation on the islands.

**Stone Artefacts**

Relatively few flaked stone artefacts were recovered from excavated sites on Vanderlin Island (Table 3). Only the Victoria Bay III rockshelter deposit contained more than 50 artefacts (n=149), and interestingly this was the only site where subsurface shellfish remains were absent. From the density and distribution of the artefacts in the deposit it appears use of Victoria Bay III between c.3400 and 500 BP was associated with hunting or maintenance activities. Relatively high rates of artefacts were also recovered from the lower/basal levels at Wobuya Shelter, with 18 of the total 48 stone artefacts from this site occurring in the four basal spits; that is, deposits older than 7879 BP.

There was a consistent pattern in the chronological distribution of flaked stone artefacts recovered from rockshelter deposits suggesting that the use (and/or discard) of stone artefacts was very rare in the last 450 years or so. With the exception of Victoria Bay III where the dating of occupation is inherently less precise, all flaked stone was recovered from deposits pre-dating 450 BP. Nonetheless, even at Victoria Bay III the majority of artefacts were recovered from deposits dated to 572 cal BP or older (that is, Spit 6 or below), and the distribution pattern strongly suggests that this site conforms to the dominant distribution pattern outlined above.

Of the open midden sites dated, only Investigator Bay, where occupation was dated at 447 cal BP, had flaked stone artefacts present (the other three open sites contained no stone artefacts and were all dated to less than 200 cal BP). This site was one of a series of shell midden sites with numerous flaked artefacts present that were recorded in mobile dune contexts in the Investigator Bay area of northern Vanderlin. Artefact types on these sites included retouched and unmodified flakes, backed microliths, debitage, unifacial and bifacial points and cores (Fullagar 1999). Like all highly retouched implements found on Vanderlin Island, these artefacts were made from stone types not found on the Pellew Islands.

The evidence strongly suggests that the use of flaked stone artefacts was more common during, if not entirely restricted to, occupation periods prior to c.450 BP on Vanderlin Island; and the vast majority of flaked artefacts were made from stone transported from mainland sources. As discussed below, the former pattern may reflect to some degree the supplanting of introduced metal implements through contact with Macassans and is worthy of further investigation.

**Shellfish Remains**

There is a direct correlation between shellfish species range and composition evident in sites on Vanderlin Island and the environmental context within which they are situated (Table 4). Sites located along the western side of the island, with its sheltered tidal embayments, were consistently dominated by either *Anadara granosa*, *Marcia hiantina* or a combination of

<table>
<thead>
<tr>
<th>Site</th>
<th># Stone Artefacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria Bay III</td>
<td>149</td>
</tr>
<tr>
<td>Wobuya Shelter</td>
<td>48</td>
</tr>
<tr>
<td>Turtle Shelter</td>
<td>23</td>
</tr>
<tr>
<td>Babangi</td>
<td>13</td>
</tr>
<tr>
<td>Walala III</td>
<td>7</td>
</tr>
<tr>
<td>Worrungulumba</td>
<td>3</td>
</tr>
<tr>
<td>Boimarmnda</td>
<td>3</td>
</tr>
<tr>
<td>Mushroom Rock</td>
<td>2</td>
</tr>
<tr>
<td>Scissibar Creek</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>249</strong></td>
</tr>
</tbody>
</table>
both. However, on the more environmentally diverse, exposed east coast sites contained both a greater range of species and *Terebralia palustris* was more prevalent, along with rock oyster (*Saccostrea* sp.). Faulkner (2006) has observed a similar pattern in the Blue Mud Bay area on the mainland Northern Territory coast.

As discussed earlier, the dating of the midden sites suggests there may have been two phases of occupation on the island when Vanderlin actually was an island, that is 4200–2500 BP and post-1700 BP (Figure 4). There was a distinct change in depositional rates and/or shellfish species within midden deposits that spanned both phases. Furthermore, significant decreases in, or cessation of deposition of cultural remains occurred in the period between these two phases in several sites. For example, shellfish deposition declined markedly at Wobuya Shelter and Worrungulumba, while in Scissibar Creek and Walala III there was evidence of an occupational hiatus indicated by the presence of sterile deposits between the two midden phases. At Babangi there was a sharp contrast in species composition between the upper and lower midden levels, with *A. granosa* clearly replacing *M. hiantina* as the predominant species after c.2500 BP. At Mushroom Rock the mid-Holocene midden phase was entirely absent, with the basal pit of the midden deposit dated to 1614 cal BP directly overlaying a diverse low density shell deposit dated at 7640 cal BP (the pre-island formation phase; see Table 4).

### Discussion

The available archaeological evidence summarised above suggests there were three major phases of human occupation on Vanderlin Island, with a hiatus between the first and second phases:

1. a pre-6700 BP, early Holocene phase during times of lower sea-level when the Pellew Islands were still part of the coastal plains of the Gulf of Carpentaria, followed by an occupational hiatus from about 6700 BP to 4200 BP;
2. a mid-Holocene island occupation phase that commenced about 4200 BP and persisted until 2500 BP, followed by a period of possible abandonment or reduced visitation until 1700 BP; and,
3. a period of more intensive island use in the recent late Holocene after c.1300 BP.

The occupation pattern is schematised as Table 5 and includes the distribution of basal occupation dates from all sites investigated. Basal dates here are useful as ‘initial occupation’ markers for individual sites and, when considered as a suite, provide a broader island-scale pattern; additional upper and

### Table 4 Summary of shellfish recovered from archaeological sites on Vanderlin Island.

<table>
<thead>
<tr>
<th>Site</th>
<th>Present Environment</th>
<th>Approximate Age (cal BP)</th>
<th>Context</th>
<th>Dominant Shell Species</th>
<th>% of Most Dominant Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kedge Pt</td>
<td>West coast bay/ headland</td>
<td>modern</td>
<td></td>
<td>A. granosa</td>
<td>99</td>
</tr>
<tr>
<td>Mushroom Rock</td>
<td>West coast bay/ headland</td>
<td>1600</td>
<td>Upper midden</td>
<td>A. granosa</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7500</td>
<td>Lower midden</td>
<td>G. coaxans</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T. telescopium</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T. palustris</td>
<td>19</td>
</tr>
<tr>
<td>Boinmarnda</td>
<td>West coast bay/ escarpment</td>
<td>2700</td>
<td></td>
<td>A. granosa</td>
<td>98</td>
</tr>
<tr>
<td>Babangi</td>
<td>West coast mangrove-fringed open sandflats</td>
<td>2500</td>
<td>Upper midden</td>
<td>A. granosa</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3600</td>
<td>Lower midden</td>
<td>M. hiantina</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Saccostrea</em> sp.</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>T. palustris</em></td>
<td>13</td>
</tr>
<tr>
<td>Turtle Shelter</td>
<td>West coast mangrove-fringed open sandflats</td>
<td>800</td>
<td></td>
<td>A. granosa</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>M. hiantina</em></td>
<td>33</td>
</tr>
<tr>
<td>Barbara Cove Mound</td>
<td>West coast mangrove-fringed open sandflats</td>
<td>900</td>
<td></td>
<td><em>M. hiantina</em></td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A. granosa</td>
<td>27</td>
</tr>
<tr>
<td>Komandarri-naboya</td>
<td>West coast mangrove-fringed open sandflats</td>
<td>1200</td>
<td></td>
<td><em>M. hiantina</em></td>
<td>73</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A. granosa</td>
<td>14</td>
</tr>
<tr>
<td>Worrungulumba</td>
<td>West coast mangrove-fringed open sandflats</td>
<td>4200</td>
<td></td>
<td><em>M. hiantina</em></td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>T. palustris</em></td>
<td>35</td>
</tr>
<tr>
<td>Scissibar Creek</td>
<td>East coast dune and swamps/tidal sandflats</td>
<td>2800</td>
<td></td>
<td><em>T. palustris</em></td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Saccostrea</em> sp.</td>
<td>23</td>
</tr>
<tr>
<td>Walala III</td>
<td>East coast open dunes</td>
<td>3500</td>
<td></td>
<td>A. granosa</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Wobuya Shelter (WS)</td>
<td>East coast open dunes/tidal sandflats</td>
<td>modern</td>
<td></td>
<td><em>T. palustris</em></td>
<td>84</td>
</tr>
</tbody>
</table>
basal dates for midden units are included in Table 5 where distinct midden units were evident. It is recognised that undated remains younger or older than those on which the age-ranges for the various phases have been determined may exist in other sites as yet to be investigated. As it stands, however, this suite of dates gives a comprehensive synthesis of the dated occupation evidence and provides a sequence for human occupation on the outer Pellew Islands through the Holocene. As discussed below this sequence fits remarkably well with the abandonment and island colonisation model indicated for other Australian offshore island contexts (Bowdler 1995; Rowland 1999b; Sim 1994, 1999a).

**Early Plains Occupation Phase Pre-6700 BP**

At Wobuya Shelter stone artefacts were found in spits underlying shell-bearing deposits dated to 7877 cal BP. This evidence suggests that people had been in the then coastal plains area and using this shelter probably as a hunting base for some period prior to availability of marine resources in the vicinity. Palaeogeographic changes wrought by the post-glacial sea-level rise are evident in the appearance of shellfish remains in sites on both sides of the island between 7500 and 8000 BP. Early Holocene occupation of Vanderlin Island appears to have been truncated by the post-glacial marine transgression, with people apparently abandoning the area just prior to the final severance of the Pellew Group from the adjacent mainland about 6700 years ago (Chappell and Shackleton 1986; Chappell and Thom 1986; Chappell et al. 1996; Chivas et al. 2001).

**Occupational Hiatus Phase 6700 BP to 4200 BP**

By about 6700 years ago all evidence of human habitation disappears from the archaeological record on Vanderlin Island, a state that persisted for the next 2500 or so years. Sites that had previously been occupied, such as Wobuya Shelter, recorded their last evidence of human use c.6712 cal BP, with reoccupation only occurring c. 3836 cal BP.

**Mid-Holocene Occupation Phase 4200 BP to 2500 BP**

From c.4200 BP there was a steady increase in evidence for human use of all environmental contexts on the island, apparent through the appearance of previously unoccupied sites. For example, a date of 4167 cal BP was obtained from the basal level of cultural deposits overlying sterile sand more than 1.8m deep in the Worrungulumba cave site in the south of the island.

The obvious inference to be drawn from the evidence associated with this phase is that by c.4200 years ago watercraft technology was sophisticated enough for people to safely undertake open sea crossings to access Vanderlin Island. Palaeoclimatic and
palaeoenvironmental evidence from the Gulf region and beyond support the proposition that the timing for the first use of Vanderlin as an island c.4200 to 2500 years ago coincides with a climatically more stable period with lesser storm activity and lower effective precipitation (Mayewski et al. 2004; McGlone et al. 1992; Prebble et al. 2005; Shulmeister 1992, 1999).

If indeed conditions being more conducive to watercraft use from about 4200 years ago (cf. Rowland 1999b) prompted the (re)colonisation of Vanderlin Island, then it could be expected that in periods when there is reduced or no evidence of watercraft manifested by island habitation, there were perennially inclement regimes. One would expect therefore some correlation with palaeoclimatic records in the period post-2500 BP, where the data suggest a decrease, if not cessation, in Vanderlin Island occupation for a period.

Low Intensity or Abandonment Phase 2500 BP to 1700 BP
Following the mid-Holocene (re)occupation of Vanderlin Island there is a gap in the archaeological record from c.2500 BP to c.1700 BP, followed by a few hundred years of very low intensity occupation until 1300 BP. In sites with cultural deposits that both pre- and post-date this time (e.g. Boinmarnda, Scissibar Creek and Babangi) there was either an occupational hiatus or marked stratigraphic changes combined with lower sedimentation or depositional rates evident. It is unclear whether this gap represents an occupational hiatus or if there was continual but low-level island occupation or visitation throughout this period.

This low intensity occupation phase coincides with a steady increase in ENSO events, the frequency of which peaked about 1300 BP (Allan et al. 1996; Gagan et al. 2004; Shulmeister 1999). In some sites there is also a decline in mangrove shellfish species in the post-2500 BP phase with a change to more open sand and mudflat species in overlying midden deposits, replicating patterns seen elsewhere in northern Australia (cf. Bourke et al. 2007). As documented by Haberle (2000) mangroves are storm sensitive communities; increased cyclone activity in the last five decades has been witnessed locally causing the permanent destruction of mangrove stands (Steve Johnston, pers. comm., 2002). Hence the archaeological decline of mangrove-dwelling shellfish species in sites on Vanderlin Island further supports the advent of increased and more frequent ENSO activity. Such a shift in climatic regime could also explain the decline in occupation intensity on Vanderlin between c.1700 and 1300 BP as weather conditions became more variable and inclement, rendering conditions less suited to open sea travel in bark canoes.

Recent Occupation Phase 1300 BP to Modern Times
After 1300 BP occupation intensity, as indicated by shell midden evidence, increased both markedly and steadily, with no significant variation in occupation intensity discernible during this phase. Nevertheless, there was a marked change in stone artefact distribution during this phase, with scant evidence for the use or manufacture of flaked stone implements in the last 500 years or so. There are numerous explanatory scenarios that might account for this change, such as shifts in economic exploitation strategies, decline in terrestrial hunting on the islands, changes in the role of the islands generally in Yanyuwa ceremonial and economic cycles, and reduced access to mainland stone sources. Nevertheless, the timing of this change is probably the key explanatory factor as it accords with a suite of archaeological changes at this time occurring across northern Australia. In Arnhem Land, and particularly in the Blue Mud Bay area on the western coast of the Gulf of Carpentaria, archaeological changes such as the cessation of shell mound deposition by 500 BP have been interpreted as behavioural responses to climatic shifts (Bourke et al. 2007:97; Faulkner 2006; Faulkner and Clarke 2004). Clearly a climatic change affecting weather conditions could have a major influence on sea travel, and consequently affect access to mainland stone sources by island occupants. There is, however, yet another phenomenon which could account for the cessation of stone artefact use and which warrants consideration – that is the arrival of Macassan trepangers in the Pellew Island region.

Macassan Influences?
Potentially the decline in stone artefact use after 450 BP may be attributable to their replacement by metal tools obtained from Macassan trepangers. Archaeologically this is difficult to ascertain given both the absence of direct evidence of cultural interchange in sites in this region, and the uncertainty surrounding the antiquity of Macassan contact itself (Clarke 2000; Macknight 1969, 1972, 1976). It has been argued, however, that the marine focus of the Indigenous northern Australian coastal economies intensified with the introduction of Indonesian dugout canoes and metal implements (Mitchell 1995, 1996). Thus, because of the well-documented Macassan presence in the Pellew Islands (Baker 1984; Macknight 1969), it could be expected that similar intensification of marine exploitation would be manifest by a marked increase in intensity of occupation on the Pellew Islands.

No evidence of intensification of either island use or marine resource exploitation, however, was found in the relevant time span in the archaeological record from Vanderlin Island. Interestingly there was no excavated archaeological evidence found of direct contact between the Yanyuwa island inhabitants and Macassan trepangers despite linguistic, rock art motifs and other legacies such as dugout canoe technology attesting to such contact (e.g. Baker 1988; Bradley 1991b, 1997; Chris Crasweller, pers. comm., 2005; Evans 1992). Three flaked glass artefacts, including one bifacial point, were recorded during surveys on Vanderlin, but the antiquity and original provenance of these is unknown, and they equally may be from the post-European contact period given the island’s recent history of non-Indigenous occupation. In summary, there was no change in the archaeological record of Vanderlin Island apart from the decline in stone artefacts that could possibly indicate the arrival or presence of the Macassan trepang gatherers. Further, the proposition that the stone changes might be attributable to Macassan contact is equivocal given the current accepted date of AD 1700 for first Aboriginal–Macassan contact, and the timing of stone artefact cessation some 250 years earlier c.450 BP.

Summary and Conclusion
Archaeological investigations on the Sir Edward Pellew Islands have revealed an occupation sequence that accords well with our current understanding of offshore island use (cf. Bowdler 1995; Sim 1994, 1998). Excavations were undertaken at 12 sites
which, in conjunction with remains sampled from four surface sites, provide sequences of past human occupation at both site and island scales. At two sites sequences span the early Holocene, prior to the island formation phase, thus demonstrating people had been based in the area for at least 1000 years prior to the separation of the Pellew Group from the adjacent mainland. The absence of evidence of human use of Vanderlin Island from c.6700 until about 4200 BP concurs well with the broad pattern of mid-Holocene, small offshore island abandonment elsewhere in Australia. Because these changes in past land/island use patterns occurred at about the same period in various geographically- and culturally-isolated regions, a broad-scale factor independent of cultural processes must underlie them. Whereas the post-glacial marine transgression was clearly the driving factor behind the abandonment of peripheral coastal plain areas, the more recent mid-Holocene island (re)occupation and preceding lacunae is less easily explained. However, there is now a growing body of both archaeological and palaeoclimatic evidence suggesting that island occupation was a pan-continental human response to changing climatic regimes. The advent of island visitation and subsequent increased occupation is interpreted as a direct human response to weather regimes becoming more conducive to coastal habitation and watercraft travel.

Furthermore, the synthesis of data concerning past human occupation patterns of offshore islands sheds light on one of the more contentious issues in Australian archaeology. As stated at the start of this paper, heated debate concerning the ultimate fate of Tasmanian Aboriginal populations followed Jones’ (1976) assertions that this population was not viable owing to the long-term effects of cultural isolation. From a perspective tempered by time and more data it is now clear that isolated island population viability is more an issue of environmental biodiversity than island size per se or biomass of the island environment as suggested by island biogeography theory (MacArthur and Wilson 1967). What island research now demonstrates is that scale, both geographical and chronological, are the critical factors for human survival and fundamentally so because they facilitate cultural choice. Environmental biodiversity is vital in the longer term as it provides humans with alternatives when climatic or other stress renders particular environments unsuitable for human habitation.

Uniquely, Australia represents the largest island of all and was successfully colonised more than 40,000 years ago. Tasmania as an island qua island was ‘colonised’ (albeit unwittingly), by a relict group stranded by the terminal Pleistocene–early Holocene sea-level rise. The viability and resilience of the isolated Tasmanian population is attested to by their being witness to the arrival of Europeans more than 8500 years later.

The ultimate fate of relict human populations stranded on Flinders and Kangaroo Islands was not so fortuitous. Evidence of human occupation on both these two latter islands, Australia’s third and fifth largest islands respectively, disappears from the archaeological record about 4200 years ago. Evidence now strongly suggests a mid-Holocene climatic shift with drought-like conditions proved fatal in both these contexts. The difference between these smaller island populations, and those in Tasmania and mainland Australia was environmental diversity, and more importantly the cultural choices such diversity afforded. These islands represent not so much unviable populations as unviable environments for long-term human habitation. The possibility of isolation and thus extinction in the late Holocene was no longer an issue because the use of watercraft post-4000 years ago not only facilitated island inhabitation, but also provided a means of abandonment should conditions deteriorate.

Evidence from Vanderlin Island concurs with the abandonment and post-4000 BP island colonisation model being tested, further supporting broader patterns of island population viability as described above. Clearly the principal avenue for further testing of these findings will be archaeological investigations on the Tiwi Islands; that is Bathurst and Melville Islands, located immediately north of Darwin. In terms of geographic scale, these islands represent the next in line between Tasmania (a viable environment) and Kangaroo and Flinders Islands (where populations died out).

Acknowledgements

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MORE UNCONSIDERED TRIFLES:
Papers to Celebrate the Career of Sandra Bowdler

Jane Balme and Sue O’Connor (eds)
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