Journal of Pacific Archaeology – Vol. 7 · No. 1 · 2016

– ARTICLE –

Archaeological and Palaeoenviromental Investigations Near Aitape, Northern Papua New Guinea, 2014

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ABSTRACT

The mid-Holocene period (*ca.* 7000–3000 BP) in the southwestern Pacific witnessed the activation of wide-ranging networks connecting the north coast of New Guinea and off-shore islands, possibly driven by rising population density as favourable coastal environments developed after the mid-Holocene marine highstand. Yet finding actual evidence for human occupation dating to this period in New Guinea has proven extremely challenging. We report on the results of recent fieldwork carried out to examine areas of potential mid-Holocene settlement near the modern town of Aitape. Our survey and excavations provide minor evidence for mid-Holocene settlement, but we find no evidence for obsidian or other long distance imports suggesting connection to other parts of the Pacific during this time. It remains uncertain whether this absence reflects prehistoric reality or the difficulties inherent in finding archaeology of mid-Holocene age on a coastline impacted by significant morphological change during the intervening millennia.

Keywords: Papua New Guinea, Sepik coast, mid-Holocene

PREHISTORY ON THE SEPIK COAST OF NORTHERN PAPUA NEW GUINEA

Much is now known about the prehistory of the Southwestern Pacific during the later Holocene, particularly after the first appearance of ceramics as a common feature of the archaeological record between about 3300 and 2000 BP. What occurred during the preceding early and mid-Holocene (*ca.* 7000–3000 BP) is less clear, although there is a growing recognition that this period may have been crucial for understanding later developments in the region. The recognition of wide-ranging exchange in obsidian stemmed tools as well as shared styles and traditions as evidenced by stone mortars and pestles (Torrence and Swadling 2008) reflects an uptick in interaction that presages the wide ranging networks present during further expansions into the remote Pacific after 3000 BP (Summerhayes 2009). The recent suggestion of pre-Lapita age ceramics at the Wañelek site in the eastern Highlands of Papua New Guinea (Gaffney *et al.* 2015), if confirmed, would further indicate that this period was one in which cultural innovations spread throughout the northern New Guinea region, and not just coastal areas with Lapita settlement.

Finding mid-Holocene settlement has proved extremely difficult, however. For instance, more than three decades of fieldwork on the south coast of New Guinea yielded such evidence only after a large scale salvage project allowed for survey at a scale impossible in most research projects on New Guinea (McNiven *et al.* 2011). In large part, the challenges in finding such archaeology result from the major landscape changes that have occurred throughout the Southwestern Pacific during the last 10,000 years, reflecting the joint action of post-glacial sea-level fluctuation, and on the northern coast of New Guinea, tectonic activity along the border of the Australian and Pacific plates. Swadling's (2010) work in the Sepik-Ramu Delta documents the formation of a vast inland sea during the mid-Holocene marine highstand, when relative sea levels were as much as two metres higher than present. Terrell (2002, 2004) has hypothesized that it was only after this highstand, within the last 6000 years, that productive coastal environments were able to form along the margins of the New Guinea land mass, fostering major increases in population density and connectivity.

One of the largest current coastal flats on the north coast of Papua New Guinea is centred on the modern town of Aitape, along the coastal region of West Sepik (Sandaun) province. Archaeological work on the coast by Leask (1945) after WWII and Terrell and colleagues during the 1990s (Terrell 2011; Terrell and Welsch 1997) documented occupation primarily spanning the last 2000 years, and potentially dating back ~3000 years (two surface col-

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Submitted 29/8/15, accepted 26/10/15

lected early Lapita style sherds). These sites also contained obsidian chemically attributed to all major source areas in New Guinea (the Admiralties, New Britain, and Fergusson Island) (Golitko *et al.* 2013). On present evidence, it would appear that people living in the Aitape area have been engaged in social networks comparable to those observed ethnographically for at least the last millennium (Golitko and Terrell 2012). Whether the area was an intermediary prior to that time remains an open question, but the sourcing of a stemmed obsidian tool collected on Biak Island, Indonesian Papua, to obsidian flows in the Admiralty group (Torrence *et al.* 2009) and the presence of stone mortars and pestles on the Bird's Head Peninsula suggests that mid-Holocene networks may have spanned the north coast of New Guinea and could have connected the north coast of New Guinea to Island Southeast Asia (Torrence *et al.* 2013; Wright *et al.* 2013).

This paper presents results of fieldwork carried out in the area inland of Aitape (Figure 1) over a four week period during June and July 2014 focused on studying mid-Holocene environment and settlement. The project had two principal components – a) landscape and palaeoenvironmental reconstruction targeted at identifying when coastal flats and lagoons evolved on the Sepik coast, and b) examining areas of potential mid-Holocene settlement to identify evidence for landscape usage and connection into broader networks of interaction as evidenced by the presence or absence of long-distance imports such as obsidian.

PALAEOENVIRONMENT AT PANIRI CREEK

Our survey strategy was informed by prior landscape reconstructions (Terrell *et al.* 2011) for the Aitape area based on digital elevation models, landsat imagery, and comparison to field studies carried out on the Huon Peninsula and in the Sepik-Ramu Delta (e.g., Swadling 2010) to explore the likely impact of sea-level rise during the mid-Holocene as well as the potential impact of tectonic uplift, assuming rates calculated to the west at Vanimo (O'Connor *et al.* 2011) and further east on the Huon Peninsula (Tudhope *et al.* 2000). Allowing for uncertainty in uplift rates, it is likely that modern coastal flats were entirely inundated during the mid-Holocene marine highstand around 6000 BP to or beyond the current base of the Barida Hills (see Figure 1). Subsequent stabilization of sea-level near modern levels likely allowed the formation of productive lagoons, estuaries, bays, and mangrove swamps after the mid-Holocene highstand (see Figure 1). The last several thousand years have likely witnessed the gradual infilling of these productive lagoons, swamps, and estuaries as uplift resulted in increased erosion from the Barida Hills (Terrell 2002). However, as the reconstruction presented by Terrell *et al.* (2011) is highly dependent on estimated rates of uplift, field observations are critical for understanding the local expression of these broader regional eustatic and tectonic processes.

During our 2014 fieldwork, we collected samples from river cuts along the suspected mid-Holocene shoreline to analyze palaeoenvironmental proxy data (grain size, measures of organic content, diatoms, and geochemistry). The

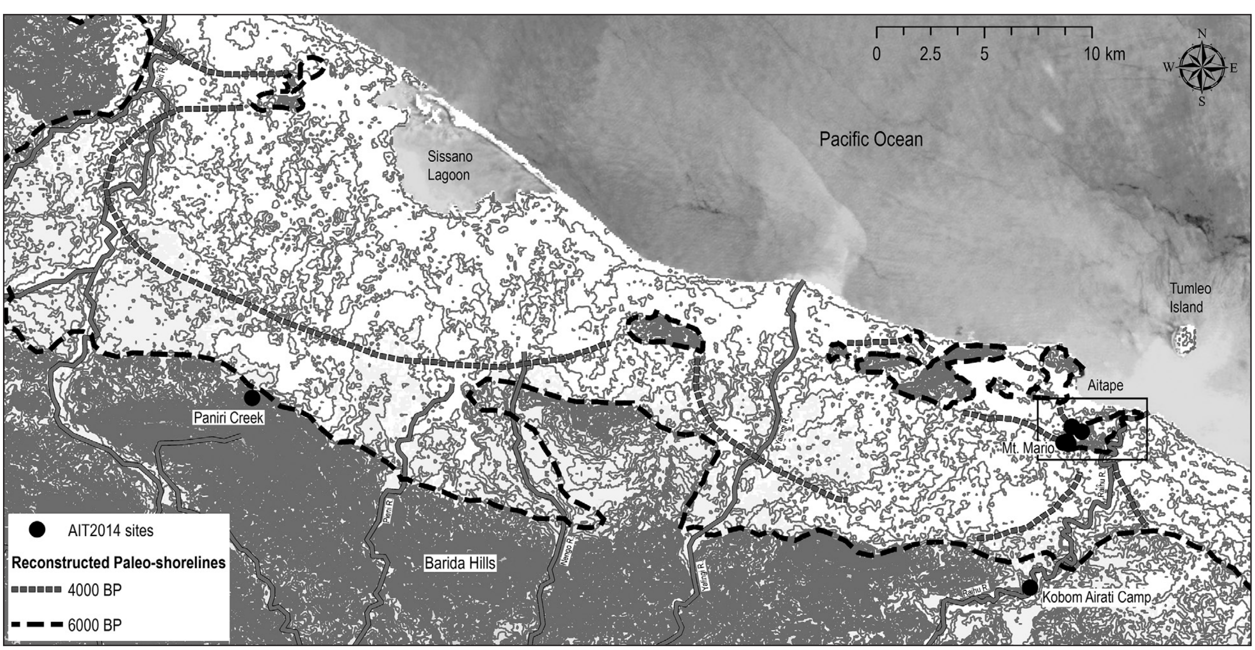

Figure 1. The Aitape area of northern Papua New Guinea, with 2014 fieldwork locations indicated. Mount Mario area sites are enclosed within a box.

primary focus of our sampling was a place called Paniri Creek, where the geologist Hossfield (1949, 1965) found a human calvarium in mid-Holocene age (*ca.* 6000–5000 BP) deposits he interpreted as reflecting a former tidal scour within a mangrove swamp. The location we examined was, as far as can be determined from his publications, within approximately 10m of the place from which he collected the so-called 'Aitape skull.' As this location is now 70m asl, average uplift on the order of 14m/1000 years is indicated.

Our field observations largely match the sequence documented by Hossfield (1965: figure 2), although the profile we sampled (Figure 2) was not as deep (*ca.* 3.5 metres vs. 12 metres) and may not have exposed some of the deeper deposits he observed. In total, nine stratigraphic units were recognized:

Unit 1 (314–324 cm below present surface): Sandy loam with rounded pebbles and cobbles in 25–35 cm size range with smooth abrupt upper boundary.

Unit 2 (294–314 cm): Loamy sand with small pebbles and cobbles with smooth abrupt upper boundary.

Unit 3 (279–294 cm): Sand and small pebbles (2 cm size range) with smooth abrupt upper boundary.

Unit 4 (272–278 cm): Sandy clay interspersed with shell fragments, wavy abrupt upper boundary.

Unit 5 (204–272 cm): Fine laminated clay loam, clear and smooth upper boundary.

Unit 6 (190–202 cm): Loamy sand with small pebbles (2 cm size range) with abrupt and wavy upper boundary.

Unit 7 (176–190 cm): Loamy sand without pebbles, abrupt and wavy upper boundary.

Unit 8 (154–169 cm): Clayey loam with pebbles and cobbles in 10–20 cm size range, upper boundary abrupt and wavy.

Unit 9 (0–154 cm): silty and sandy clay with small pebbles in upper half.

Radiometric dates were obtained on bulk carbon extracted from select soil samples (taken across the profile at 2 cm intervals) at the University of Georgia Center for Applied Isotope Studies (CAIS). As is evident in Figure 2, these dates do not form a continuous ordered sequence, and reflect redeposition of material. However, the dates do indicate a late Pleistocene-early Holocene age for the gravels in Units 1–2, and with one exception (from Unit 4), an early-mid Holocene age for units 3–5. Preliminary analysis of diatoms in the Paniri sequence indicates a predominance of freshwater species in Units 1 and 2, with marine and brackish water species dominating units 3 and 4. Unit 5 contains low frequencies of marine species in the bottom few centimetres of sediment, but primarily appears

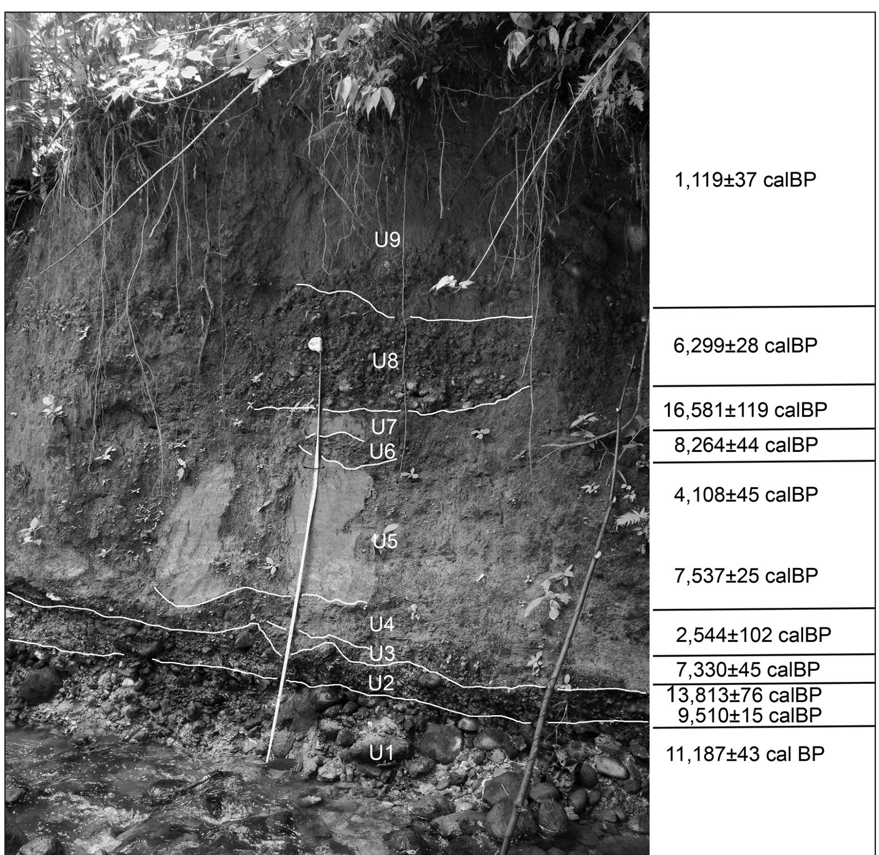

Figure 2. Profile sampled at Paniri Creek with strata and associated dates indicated.

to represent a brackish-fresh water environment for most of the duration of its formation.

Preliminarily, we suggest that these lower units at Paniri document the development of this area at the base of the Barida Hills from a relatively high energy late Pleistocene-early Holocene river bed into near-shore deposits by around 7500 calBP, after which the area transitioned into a low energy lagoonal or mangrove swamp environment, as reconstructed by Hossfield (1965). The presence of occasional diatom-free samples within the upper centimetres of Unit 5 indicate that by around 4000 calBP, the Paniri area was periodically dry and may have transitioned into a seasonal back swamp. We interpret Units 6, 7, and 8 as reflecting redeposition of older material via erosion, possibly reflecting a period of substantial uplift after 4000 calBP. Unit 9 in turn reflects yet more recent erosion (within the last millennium or so), during which the present river down-cut through older units to expose the current river bed. These observations broadly confirm the reconstructed palaeoenvironmental sequence indicated in Figure 1, at least for the area immediately around Paniri Creek, though indicating marine transgression to the base of the Barida Hills slightly earlier than modeled. Coring work closer in to the modern coast line will be required to further document the development of coastal flats in the Aitape area during the later Holocene.

ARCHAEOLOGICAL SURVEY AND EXCAVATION

Our archaeological work focused on two primary areas – survey in garden clearings along the suspected mid-Holocene shoreline, as well as test excavations in rock shelters located on uplifted limestone hills nearer to the present coast, areas that were considered to be likely areas of settlement during the mid-Holocene based on the reconstructed landscape. Survey of garden clearings along the base of the Barida Hills produced no archaeological evidence at all, however, our observations at Paniri demonstrate how deeply buried most strata of this age are likely to be in the absence of river cuts. We also examined a palaeo-terrace along the Raihu River at Kobom Airati Camp, along an area reconstructed as a mid-Holocene palaeo-estuary that had been previously surveyed by Welsch and Summerhayes. Finally, we conducted test pitting at rock shelters on Mt. Mario (Figure 3), an uplifted limestone hill some 2 km inland from the modern coastline on the grounds of the Catholic mission at Aitape (St. Martin's and St. Ignatius Primary School).

These rock shelters are wave-cut notches formed along palaeo-shorelines, however, their formation likely well predates their human use. Reconstruction of Holocene shorelines suggests that Mt. Mario should have been an island during the mid-Holocene highstand (Figures 1, 3), and might have been located on or near a lagoon or bay edge as the present coastline began to form, and may therefore have been an attractive location for settlement. Two sites (AIT2014–5 and 6) were located during surface survey, but were likely settled only during the last several hundred years based on the presence of Wain ware (Terrell and Schechter 2011b) ceramics. Test pits were dug at four rock shelters, AIT2014–11, AIT2014–12, AIT2014–13, and AIT2014–14, with cultural material recovered at all except

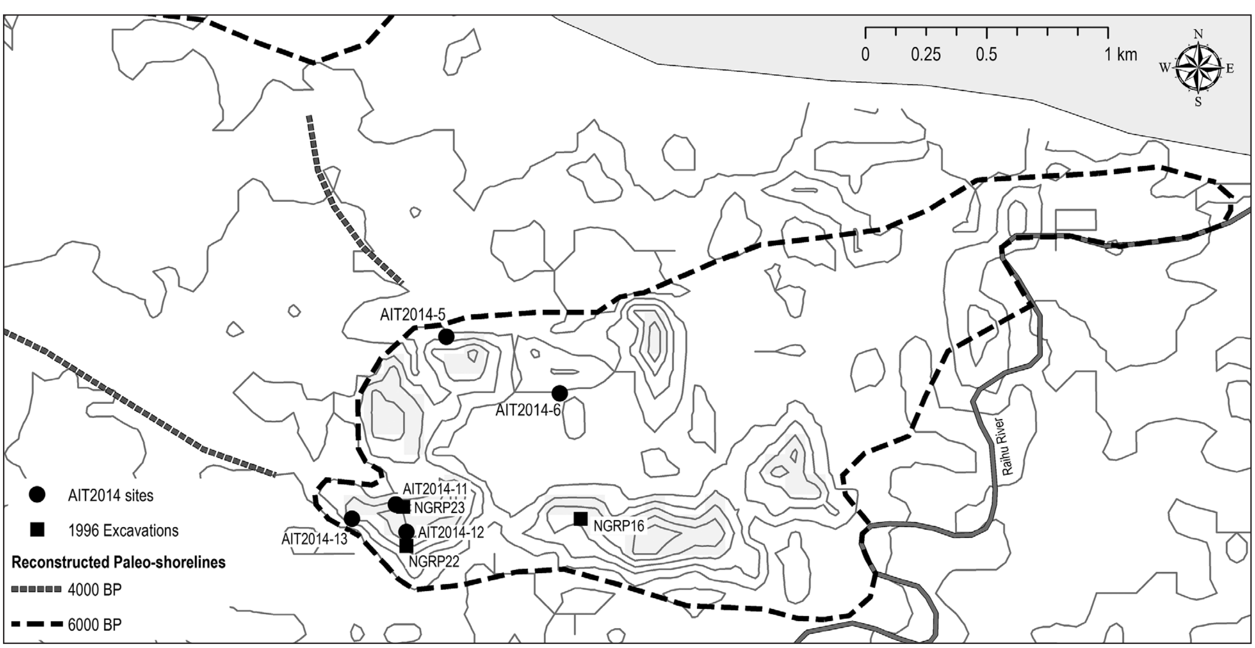

Figure 3. Detail of Mt. Mario showing location of archaeological sites excavated in 1996 as well as sites surveyed or excavated during 2014. Hypothetical reconstructed shorelines are indicated. Contours are drawn at 10-metre intervals.

for AIT2014–14. These shelters provide tentative evidence for mid-Holocene settlement, but also primarily date to the last two millennia.

KOBOM AIRATI CAMP

Kobom Airati Camp is a small hamlet previously visited by Welsch during his field work in the area in 1993–1994 and by Summerhayes in 1996. They collected a surface lithic assemblage there consisting of large chert and obsidian flakes. Along with a nearby collection location (NGRP25) visited by Summerhayes, these assemblages are unusual in both their metric properties (large average flake size) and obsidian source assignments – much of the obsidian collected there was sourced to the Kutau/Bao source on New Britain, in contrast to other Aitape area assemblages, where most of the obsidian was obtained from Admiralty source flows (Golitko *et al*. 2013).

Both find spots are located on a raised terrace that may have been part of a mid-Holocene near-shore estuary. We revisited Airati Camp, and likewise were able to surface collect relatively large chert and obsidian flakes in the hamlet clearing. However, two 0.5 × 0.5 m test pits placed at areas of high collection density failed to recover any cultural materials down to a depth of *ca.* 50 cm, where we began to encounter decomposing bedrock. A one metre deep profile cleaned on the edge of the village clearing revealed *ca.* ¾ m of undifferentiated sterile sediment grading into loose bedrock fragments and ending in bedrock at a depth of *ca.* 1 m. The current owner of Airati Camp, Paul Saike Tamas, stated that he had sometimes found ceramics in a garden on the modern river terrace level, but that heavy rains had since washed out the field. Attempts to relocate NGRP25, which is located in thick vegetation on a terrace to the south of Airati Camp, proved unsuccessful. While Airati Camp is certainly located on a palaeo-terrace, the present surface there does not appear to preserve any cultural deposits. It is possible that erosion and repeated sweeping of the village area has largely removed evidence of earlier occupation, which remains of uncertain age.

AIT2014–11

AIT2014–11 (Figures 3, 4) is the largest rock shelter investigated during our 2014 fieldwork. The shelter is a limestone overhang some 10 m in width by 5–6 m in maximal depth situated on the northern slope of Mt. Mario, at an elevation of *ca.* 45 m asl. It is situated approximately 30 m to the NW of NGRP23, a single component Sumalo ware age site excavated by Terrell and his colleagues during 1996 (Terrell 2011). The hill drops off sharply as a cliff along the northern edge of the shelter. At the back of the shelter, there is a narrow entrance about 1 m above the shelter floor to a small cave. Two 0.5 × 1.0 m test pits were placed into pockets of sediment between limestone outcrops towards the back of the shelter, where it seemed that depos-

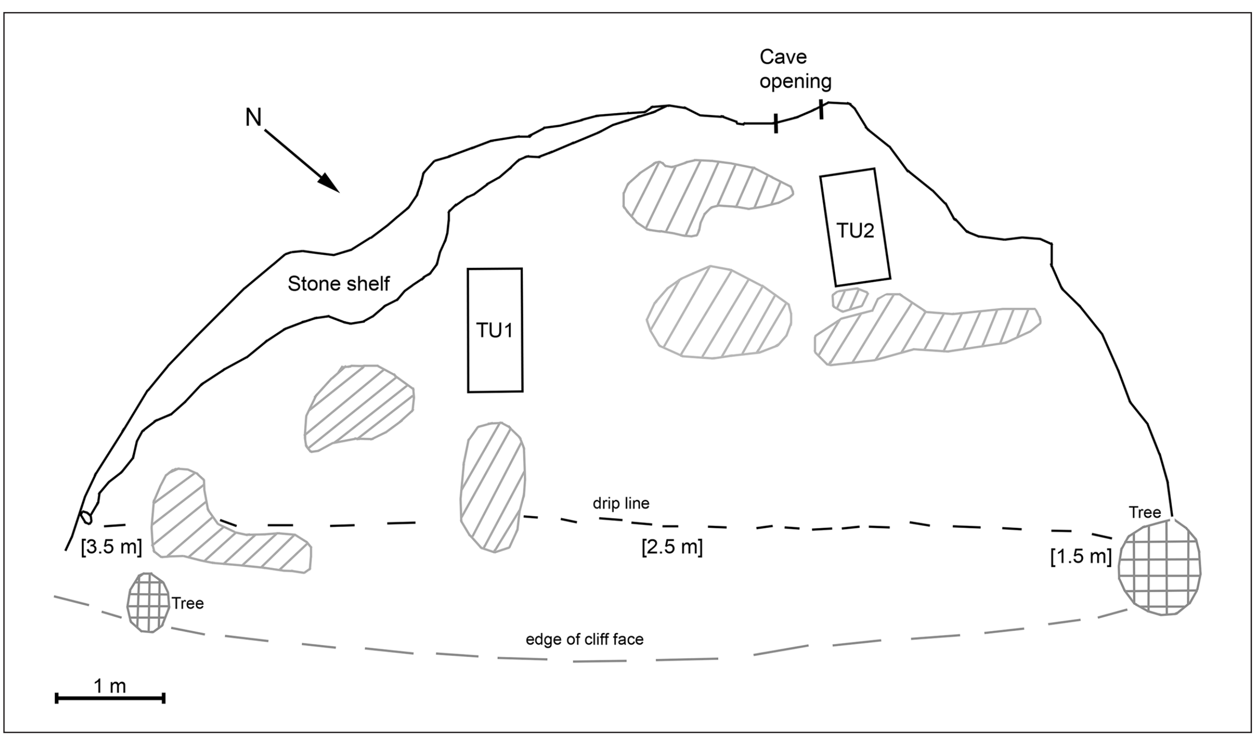

Figure 4. Sketch map of AIT2014–11. Areas with grey hatching are limestone outcrops. Numbers in brackets indicate roof height measured at the drip line. Magnetic north indicated.

its might be deepest.

Excavations were carried out in 10 cm spits (levels) noting natural stratigraphic changes as different layers with all excavated sediment screened through ¼" mesh. In both test pits, the first *ca.* 20–25 cm of sediment (layer I) consisted of unconsolidated ashy, organic rich sandy clay-sandy clay loam. An abrupt, smooth boundary separates layer I from layer II, consisting of structureless sandy clay/sandy clay loam containing decomposing limestone bedrock. In test unit 1 (TU1), a maximal depth of 47 cm was excavated (level 5) at which point limestone bedrock was exposed throughout the unit, rising in depth towards the back of the shelter wall. The stratigraphy in test unit 2 (TU2) was identical down to the layer I/II boundary, however, layer II extended down to a depth of nearly 90 cm in many parts of the unit. At that point, excavations were stopped as no further cultural material was identified and only small pockets of unexcavated, and difficult to access, sediment remained within the limestone bedrock. Cultural material was much denser in TU1 then in TU2, but in both units, we recovered abundant shell, ceramic sherds, small quantities of chert and other lithic material, bone, and charcoal (artefact weights are displayed in Table 1).

Radiometric dates

^{14}C dates were run on a number of charcoal, seed, and shell samples spanning the stratigraphy in both test units. Shell samples were taken only from freshwater species that tend to live in shallow water near the heads of rivers to minimize the likelihood of reservoir effects. All samples were run at the University of Georgia Center for Applied Isotope Studies (CAIS) using standard procedures for the dating of charcoal and calcium carbonate materials. Dates were calibrated in OxCal using the SHCal13 southern hemisphere curve (Table 2).

The results of dating indicate potential occupation of the shelter as early as *ca.* 5900 calBP (TU2/II/7), however, this early date was obtained on a seed endocarp from a level that is otherwise mostly culturally sterile, and may pre-date human activity. The earliest clear occupation date is between 5033–4850 calBP (95.4% probability), from TU2/II/5, on freshwater shell that must have been brought to the site. The precise dating of the formation of layer II remains somewhat uncertain, however, as this early date was found at a depth that also produced a much younger date of around 2000 calBP in TU1. At present, we can only suggest that this unit formed during the period between about 6000 and 2000 calBP. More detailed understanding of early occupation will require further excavations.

Dates for layer 1 are more consistent, and suggest primary formation of that layer between 1600–1200 calBP, with subsequent disturbance during the last few hundred years. These dates are generally consistent with the ceramic sequence excavated from these units, which contain Su-

Table 1. *Artefact weights by layer and level at rock shelters excavated during the 2014 field season.*

Site	Test Unit	Layer	Level	Ceramics (g)	Lithic (g)	Shell (g)*	Charcoal (g)	Bone (g)	Coral (g)
AIT2014-11	1	I	1	65.00	5.29	129.20	6.80	9.10	–
AIT2014-11	1	I	2	222.85	130.60	240.79	0.25	6.43	–
AIT2014-11	1	II	3	184.30	127.34	82.61	0.50	2.80	–
AIT2014-11	1	II	4	97.20	1.44	74.39	0.20	1.20	–
AIT2014-11	1	II	5	125.70	–	30.53	–	–	–
AIT2014-11	2	I	1	36.80	–	66.02	0.58	4.60	–
AIT2014-11	2	I	2	77.85	–	35.40	–	1.74	–
AIT2014-11	2	II	3	3.70	23.15	34.36	–	–	0.80
AIT2014-11	2	II	4	0.70	–	3.00	–	–	42.00
AIT2014-11	2	II	5	2.90	–	3.38	–	0.70	52.25
AIT2014-11	2	II	6	–	–	8.13	–	0.50	125.00
AIT2014-11	2	II	7	–	–	2.90	–	0.08	6.70
AIT2014-11	2	II	8	–	–	0.70	–	0.65	–
AIT2014-11	2	II	9	–	–	2.30	–	–	–
AIT2014-12	1	I	1	5.90	–	–	0.46	–	–
AIT2014-12	1	I	2	5.60	–	–	0.03	–	–
AIT2014-12	1	I	3	0.80	–	1.30	0.06	–	–
AIT2014-12	1	I	4	–	–	–	–	–	–
AIT2014-13	4	I	1	2.50	–	–	0.41	–	–

* excludes terrestrial species

Table 2. *Radiometric dates from AIT2014–11 and AIT2014–13. Dates calibrated relative to the SHCal13 southern hemisphere atmospheric curve.*

ID	Site	Unit	Layer	Level	Material	$\delta^{13}C$ ‰	Date (BP)	Error	CalBP (95.4%)
UGAMS20055	AIT2014-11	1	I	2	seed endocarp	–12.6	1420	20	1330–1262
UGAMS20408	AIT2014-11	1	I	2	*Melanoides punctatus/ tuberculatus* shell	–14.0	1610	20	1522–1387
UGAMS20056	AIT2014-11	1	II	3	charcoal	–29.7	220	20	298–147
UGAMS20405	AIT2014-11	1	II	3	*Neritina subsulcata* shell	–10.9	430	20	502–335
UGAMS20057	AIT2014-11	1	II	5	charcoal	–29.1	280	20	425–153
UGAMS20407	AIT2014-11	1	II	5	*Neritodryas cornea* shell	–13.5	2060	20	2035–1884
UGAMS20406	AIT2014-11	2	II	3	*Neritodryas cornea* shell	–5.6	4410	20	5033–4850
UGAMS20059	AIT2014-11	2	II	7	seed endocarp	–16.5	5200	30	5989–5752
UGAMS20058	AIT2014-13	4	I	1	charcoal	–25.7	2190	20	2300–2003

malo and Aiser ware (dated to ~1400–1200 and 1000–500 calBP respectively at other nearby sites) ceramics.

Artefact assemblages

Artefacts consist primarily of ceramic sherds (Figure 5) and a handful of lithic flakes and debitage. In both test units, artefacts were constrained to the top five levels (*ca.* 50–55 cm) of deposit, and are thus associated primarily with dates extending back approximately 2000 years. The earliest dates would therefore be contemporaneous with the Nyapin ware ceramic style (Terrell and Schechter 2011b), to date identified only at NGRP46, a multi-component site on Tumleo Island excavated during 1996 (Terrell 2011). However, the decorations and forms that can be reconstructed are generally consistent with Sumalo and Aiser wares (Terrell and Schechter 2011b). In particular, many sherds are red-slipped, a practice that evidently ceased in the Aitape area after about 500 BP, while the broad scored decoration (Figure 5b, c, f) found on some ceramics from layer II at AIT2014–11 is diagnostic of Sumalo ware. Other characteristic features of these ware types include strongly everted rims and the production of platters (Terrell and Schechter 2011b), both of which are evident at AIT2014–11 (Figure 5d, h). Sherds excavated from the upper 10 cm of layer I are generally less elaborately decorated, and red-slipping is largely absent.

Lithic implements were recovered only from layer I in both test units, and consist of small flakes and debitage produced on brown or tan chert, cobbles of which are available from the nearby Raihu River. A larger core on the same brown-tan chert (Figure 6) was recovered from TU1/I/2, and a grinding stone fragment was excavated from TU1/II/3. Many fragments of quartzite crystals were also recovered, particularly in TU2, however, these naturally occur in the limestone walls of the shelter, and may be unrelated to human occupation. No obsidian was recovered at AIT2014–11.

Invertebrate remains

Invertebrate remains were by far the most abundant material recovered during excavations. Shells were sorted and counted both by weight and minimum number of individuals (MNI) after the procedures reported in Gerber and Schechter (2011). The majority – more than 70% by both MNI and weight in both test units – of invertebrates represented at AIT2014–11 are of species that live in freshwater, brackish, or near shore marine environments (FBM). By weight, the next most abundant genera are marine species (M), although by MNI, terrestrial (T) species are second most abundant. FBM and M species must have been brought to the site by its human occupants. Divided by layer (pooled across both test units and normalized only relative to FBM and M species) there is no significant difference in representation of different genera (Table 3) either by weight or MNI across the two layers, suggesting a relatively constant pattern of invertebrate exploitation at the site.

The most frequently represented FBM genus is *Melanoides*, the species of which typically inhabit slow moving water such as ponds or the lower reaches of rivers. The species of the second most frequent FBM genus, *Neritina*, typically occupy the middle reaches of rivers but may also live in somewhat brackish water. The represented species of the most common marine genus, *Nerita*, typically occur in the inter-tidal zone, as do many of the other marine species recovered at the site. Depending on the environmental location of the site during its occupation, many of these species may have been available near the base of Mount Mario or within a relatively short walk of the site. Other species represented in small numbers include marine crustaceans and crabs, while in TU2, large concentrations of non-fossil branch coral were excavated, beginning in at the top of layer II and extending down to level 7. While this coral was likely brought to the site, it is unclear for what purpose it was used – there is no evidence that it was worked into beads or ornamentation, for instance.

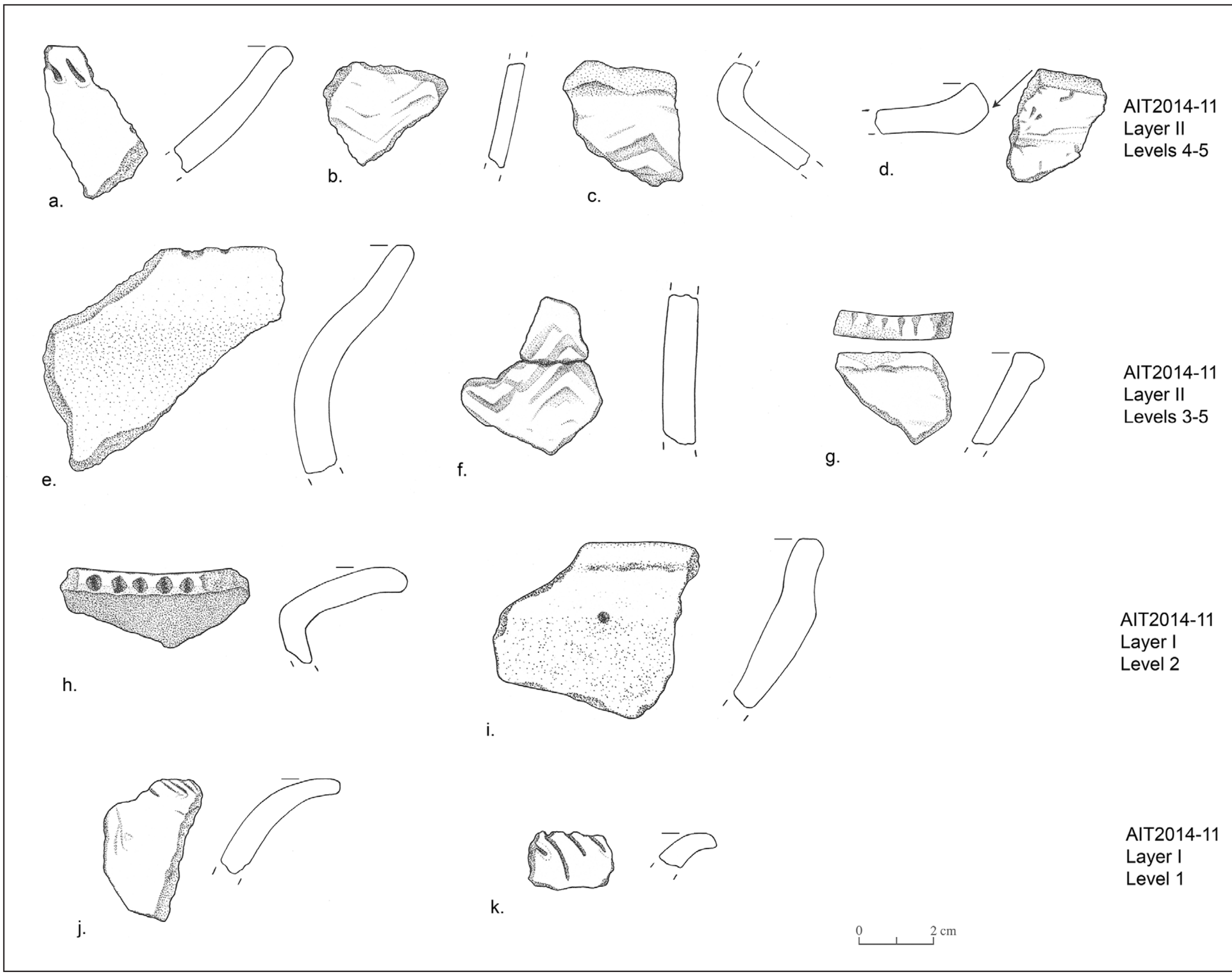

Figure 5. Decorated sherds and larger ceramic rim fragments excavated at AIT2014–11. Drawings by Jill Seagard (Field Museum).

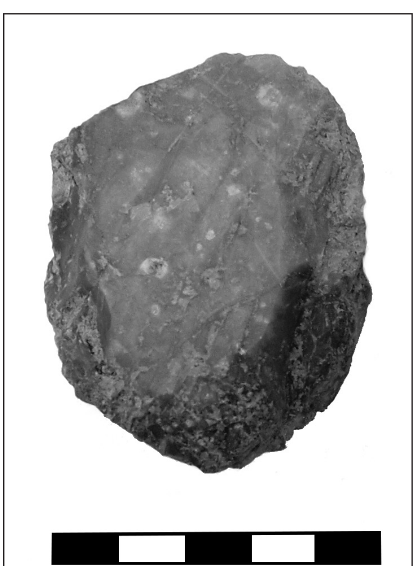

Figure 6. Chert core excavated from Test Unit 1, layer I, level 2 at AIT2014–11.

Vertebrate remains

A small amount of vertebrate bones and other remains were excavated from AIT2014–11. However, as most remains were highly fragmented, they could often only be identified broadly to the genus level. Represented taxa include nectar-eating (*Syconycteris*) and insectivorous (*Hipposideres*) bat species, marsupials (probably cuscus), as well as scattered remains of *Rattus exulans*. Most of these species occur within the top three levels in both test units, but fragmented faunal remains are present down to approximately 80 cm. While some processing or consumption of these species may have occurred on site (some of the marsupial bones are burnt, as are many of the highly fragmented remains), others likely found their way there independent of human activity. All identified species are currently common on the Sepik coast.

Table 3. *Representation of invertebrate taxa by excavation layer at AIT2014–11. Where species designations were not possible, only genus is provided.*

		Layer I				Layer II			
Genus/species	**Habitat**	**MNI**	**%**	**Weight (g)**	**%**	**MNI**	**%**	**Weight (g)**	**%**
Batissa violacea	FBM	0	0.0%	0	0.0%	1	0.4%	1.81	0.8%
Bellamya	FBM	1	0.2%	0.18	0.0%	1	0.4%	0.1	0.0%
Faunus ater	FBM	6	1.3%	13.1	2.8%	2	0.7%	2.1	0.9%
Geloina batissa, erosa	FBM	7	1.5%	91.1	19.3%	8	2.9%	52.3	21.9%
Melanoides plicarius, punctatus, tuberculatus, subgradatus	FBM	329	70.8%	203.9	43.3%	202	73.5%	104.4	43.7%
Neritia unigensis	FBM	0	0.0%	0	0.0%	6	2.2%	4.1	1.7%
Neritina purligera, subsulcata, waigiensis	FBM	79	17.0%	73.8	15.7%	22	8.0%	20.45	8.6%
Neritodryas cornea, subsulcata	FBM	9	1.9%	11.4	2.4%	9	3.3%	13.23	5.5%
Tarebia granifera	FBM	2	0.4%	1.4	0.3%	0	0.0%	0	0.0%
Terebralia palustris	FBM	1	0.2%	7.5	1.6%	0	0.0%	0	0.0%
Thiara mirifica	FBM	0	0.0%	0	0.0%	1	0.4%	0.27	0.1%
Anadara granoso	M	1	0.2%	7.6	1.6%	0	0.0%	0	0.0%
Clypemorus	M	1	0.2%	0.5	0.1%	0	0.0%	0	0.0%
Clypeomorphus fascita	M	0	0.0%	0	0.0%	1	0.4%	0.4	0.2%
Cypraeidae	M	0	0.0%	0	0.0%	1	0.4%	1.64	0.7%
F. unioneida	M	1	0.2%	0.9	0.2%	0	0.0%	0	0.0%
Modulus tectum	M	0	0.0%	0	0.0%	1	0.4%	0.3	0.1%
Morula granulate	M	1	0.2%	2.4	0.5%	0	0.0%	0	0.0%
Nacrous	M	2	0.4%	0.9	0.2%	0	0.0%	0	0.0%
Nassarius	M	0	0.0%	0	0.0%	1	0.4%	0.33	0.1%
Nerita rumphii	M	15	3.2%	23.42	5.0%	13	4.7%	19.2	8.0%
Ostreidue	M	1	0.2%	1.3	0.3%	0	0.0%	0	0.0%
Polyplacophora valves	M	6	1.3%	26.1	5.5%	3	1.1%	13.1	5.5%
Ranellideas	M	1	0.2%	0.37	0.1%	0	0.0%	0	0.0%
Trochidae	M	0	0.0%	0	0.0%	1	0.4%	2.4	1.0%
Turbo chrysostomus, operculum	M	2	0.4%	5.5	1.2%	1	0.4%	2.1	0.9%
Turritela terebra	M	0	0.0%	0	0.0%	1	0.4%	0.4	0.2%
Albersia	T	1		0.5		0		0	
Chloritis	T	3		1.47		3		1.17	
Coliolus thrix	T	0		0		4		0.7	
Cyclotus hebraicus	T	94		0		2		0.7	
Dendrotrochus	T	1		0.06		0		0	
Dominamaria heretica	T	1		0.06		0		0	
Geodiscus lomonti	T	2		0.48		2		0.4	
Palaina	T	0		0		2		0.01	
Planispira cornicula	T	7		1.81		27		5.27	
Pupinella tapparonei	T	3		0.48		2		0.21	
Rhychotrochus taylorianus	T	3		0.98		10		3.41	
Total		**580**		**477.21**		**327**		**250.5**	
	FBM	434	74.8%	402.38	84.3%	252	77.1%	198.76	79.3%
	M	31	5.3%	68.99	14.5%	23	7.0%	39.87	15.9%
	T	115	19.8%	5.84	1.2%	52	15.9%	11.87	4.7%

AIT2014–12 AND 13

AIT2014–12 and 13 are smaller rock shelters located on the south side of Mt. Mario. AIT2014–12 is located at an elevation of *ca.* 64 m asl, immediately to the north and uphill from NGRP22, a highly distributed Sumalo ware age site excavated during 1996 (Terrell 2011). One small (0.5 × 0.5 m) test pit was dug there. Low density cultural deposits were excavated from a dense, undifferentiated clay-rich matrix, with bedrock encountered at 38 cm. Recovered materials consist of charcoal, shell (including one FBM species) and a handful of undiagnostic ceramic fragments.

AIT2014–13 is a slightly larger rock shelter located near the current base of Mt. Mario at *ca.* 12 m asl. The site was visited by Terrell and colleagues in 1996, and a core taken just to the west of AIT2014–13 produced evidence of lagoonal deposits dated to the mid-Holocene (Terrell 2011). Currently, the rock shelter contains a small wooden shelter and evidence for recent usage by locals working in nearby sago swamps. Four small test pits were dug, but only one of them produced cultural material. In addition to a few undiagnostic ceramic fragments, charcoal recovered there produced a radiometric date (Table 2) falling between 2300–2003 calBP (2127±73 calBP, 95%). While the ceramics and charcoal were found in close association, the fact that both came from the upper 10 cm of a shelter that is still being used suggests that disturbance is highly likely. It does however indicate that the current base of Mt. Mario was likely already exposed above present ground level by this date, suggesting that the other rock shelters higher up the hill were also at more or less their present elevations by this date.

DISCUSSION AND CONCLUSION

Our 2014 fieldwork sought to address the issues of landscape and environmental evolution, human settlement, and the extent of mid-Holocene period social networks in the Aitape area. While detailed palaeoenvironmental analysis is still underway, preliminary results suggest that prior landscape reconstructions for the area are essentially correct – marine intrusion occurred during the early Holocene back to the base of the present day Barida Hills, after which northward coastal progression commenced and the area around Paniri was the site of a lagoon or similar environment. By 4000 calBP, periodic dry episodes in the Paniri sequence suggest that the region was a seasonal back swamp, and thereafter, uplift blanketed the mid-Holocene shoreline in thick erosional deposits.

The 2014 excavations, though limited in scope, add new evidence as to the duration of human occupation and activity in the area near modern day Aitape. Excavations at AIT2014–11 demonstrate at least low intensity occupation by about 4900 calBP, and possibly earlier. However, the bulk of evidence we recovered dates to the last 2000 years, when evidence for settlement is more readily available both in the Aitape area and elsewhere on the coast. This limited evidence for occupation on Mt. Mario during the mid-Holocene is consistent with the only good long-term sequences available for the Sepik coast, documented in excavations at Taora, Watinglo, and Lachitu caves, first by Gorecki and colleagues (1991), and then later by O'Connor and colleagues (2011). These caves, some 150 km to the west of Aitape between modern day Vanimo and the PNG/Indonesian border contain evidence for occupation dating as far back as 33,000 BP, and continuous sequences from about 14,000–5,000 years ago, followed by a chronological gap and reoccupation around 2000 BP (O'Connor *et al.* 2011). It is possible that this gap can be attributed to resettlement along lagoons like those that formed in the Paniri area, and that the areas of primary occupation for much of the mid-Holocene are now buried under metres of erosional deposits. Our inland surveys demonstrate the challenges of locating sites of great antiquity on such a dynamic and changing landscape, and we are only beginning to understand how the Sepik coast changed over time to assume its present form. In short, we may simply do not yet know where to look for occupation dating to the mid-Holocene on the north coast.

While the lack of obsidian recovered from the rock shelter sites we excavated might be taken to indicate a general lack of connection between the Aitape area and the broader world of the western Pacific, this finding too should be treated with caution. For instance, obsidian is present in archaeological sites excavated during the 1990s on Mt. Mario associated with Sumalo ware, yet none was recovered at AIT2014–11 in contemporaneous deposits, and its absence at the site may reflect the specific activities carried out there rather than general absence. Whether obsidian reached the Sepik coast earlier than 2000 years ago therefore also remains an open question in our estimation. It is possible that evidence for obsidian transport is simply buried under metres of more recent deposits. However, the absence of obsidian may reflect prehistoric reality. At present, the distribution of material culture linking the New Guinea mainland to the islands of the Bismarck Archipelago is largely restricted to the former Sepik-Ramu inland sea and areas of the highlands connected by ready river transport to the lower reaches of the Sepik (Torrence *et al.* 2013). As Swadling (2010) notes, the north coast in historic times was more articulated to the upper and middle reaches of the Sepik, and it remains conceivable that the north coast was even more isolated from materials originating in the Bismarcks prior to the late Holocene, when population densities along the Sepik-Ramu shores were likely much higher than at present, and these areas of high population density may have so heavily utilized obsidian moving along the coast that little if any reached further to the west. This 'isolation by density' effect could explain why the distribution of materials that link much of the Bismarck Sea into a mid-Holocene interaction network have yet to be discovered in the Aitape area.

Acknowledgements

We would firstly like to offer our respect and thanks to the late Herman Mandui. Without his help during 2011–2012 planning trips, none of the work reported here would have been possible. We also thank Anne Ford and Matthew Leavesley for inviting us to participate in this issue. This research was greatly assisted by John Edward Terrell, Alois Kuaso, Joe Mangi, Andrew Moutu, Thomas Winter, James Goff, Shaun Williams, Jochen Gerber, Lawrence Heaney, Alan Resetar, Robert J. Speakman, Alexander Cherkinsky, Georgia Kaipu, Jim Robins, Father Michael and Bishop Otto Separy (Aitape Archdiocese), John Sairi, Paul Saike Tamas, Casper Foingi, Raphael Seki, John Akove, Denis Wena, Job Mango, and Awareh Ltd. This research was funded by the United States National Science Foundation (award BCS1155338) and the Field Museum Regenstein Fund.

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