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– ARTICLE –

Diversity in Early New Guinea Pottery Traditions: north coast ceramics from Lachitu, Taora, Watinglo and Paleflatu

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ABSTRACT

The initial appearance of pottery on New Guinea has been an elusive and sometimes controversial topic. A range of factors contribute to this conundrum including landscape transformation and disturbance where relevant archaeology may be undetectable or misinterpreted, along with a lack of sound, site-specific evidence and comparative analysis. Moreover, the preeminence of the Lapita pottery sequence has set regional expectations and perceptions concerning early pottery on New Guinea, which can substantively affect the interpretations of local evidence, sometimes resulting in scanty finds being interpreted on *a priori* conceptual grounds. Presented here is a description of hitherto unreported pottery recovered in 2004–05 from the Papua New Guinea (PNG) north coast sites of Lachitu, Taora, Watinglo and Paleflatu. Pottery from Lachitu and Taora was previously claimed as among the earliest in New Guinea. However, the dating results presented in this study suggest a late Holocene and broad context for the introduction and manufacture of pottery, with a variety of diagnostic attributes pointing to regional uniqueness, implying a complex involvement of diverse peoples.

Keywords: Pottery; New Guinea north coast; Sepik coast; Red slip; Lapita; Vanimo style; Aitape sequence

INTRODUCTION

This article presents new data and analysis of pottery excavated during 2004–05 from four co-located cave and rock shelter sites on the Vanimo coast of north mainland PNG. Two of these sites, Lachitu and Taora, had been previously excavated with ceramics recovered ostensibly dating to 5,500 BP (Gorecki *et al*. 1991), profoundly predating the earliest Lapita pottery. In part, these claims prompted a re-examination of the sites in 2004 and 2005 (O'Connor *et al*. 2011). During this fieldwork, Watinglo and Paleflatu were also identified, and excavated in 2005.

How and when pottery came into use on mainland New Guinea has been a focus of archaeological enquiry for several decades. The claimed early pottery from Lachitu and Taora is one of a number of PNG finds that have subsequently been reconsidered, primarily where chronostratigraphic integrity was shown to be dubious. Such occurrences underscore the issues associated with many New Guinea locations where environmental dynamism and landscape change mean that the archaeological record may be disturbed or absent, particularly for significance periods from the mid-Holocene. The question of when pottery first appears on New Guinea remains enigmatic largely because there is a dearth of archaeological pottery in securely dated contexts from sites and regions across this continental island. With this issue foremost, the analysis given here of new ceramics from sites on the Vanimo coast, seeks to promote the investigation of technology transfers and usage. The recognition of the essential attributes and diversity of regional pottery in New Guinea further illuminates the prehistory of distinct areas, already known as multifarious in culture, languages and traditions. In future studies this may assist in developing a better understanding of population movements and interaction networks into, and along, the north coast of New Guinea during the late Holocene.

The deficiency of reliable sampling is an ongoing obstacle that obscures the range of prehistoric pottery on New Guinea. However, coupled with this is the overriding

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tendency to view what is mostly meagre archaeological evidence from the perspective of conceptual constructs and pan-regional models that exert a dominating affect on interpretation. The highly distinctive and sophisticated ceramics of the Lapita complex has afforded unsurpassed clarity in tracking and understanding the movement, settlement and interaction of peoples into Remote Oceania. Although it has been conventionally anticipated that pottery marking the arrival of so-called Neolithic immigrants and influence would be found on New Guinea (cf. Denham in press), there has been no immediate or contemporary corollary on the mainland of Early Lapita as found in the Bismarck Archipelago. Nevertheless, the conceptual gravity of the regional Lapita complex has set a framework whereby all pottery on New Guinea is essentially evaluated in terms of its connections with Lapita and whether it is part of the overall complex, or from within the largely unresolved search for its antecedents. To date, the most consequential Lapita finds on New Guinea come from Caution Bay and represent middle to late Lapita (McNiven *et al*. 2011), along with a small number of sherds from the highlands site of Wanelek that reflect Austronesian influence (Gaffney *et al*. 2016).

Although it is likely that Lapita pottery from the Bismarcks is the fundamental background for some mainland coastal ceramics, pottery was being manufactured in the Wallacean islands to the west of New Guinea within timeframes comparable to the appearance of Lapita in the Bismarcks. Island Southeast Asia (ISEA) cannot therefore be discounted in considering early pottery precursors and influences along the New Guinea north coast. Similarly, the western half of New Guinea comprising the Indonesian provinces of Papua and Papua Barat is undoubtedly pivotal in understanding the relationships and interactions between ISEA, New Guinea as a whole, and beyond, yet it remains largely unexplored archaeologically and little reliable information is presently available. Of the ceramics that have been described, only a few are associated with securely dated contexts and it is uncertain how the various styles compare to neighbouring sequences (Wright *et al*. 2013). Describing, dating and disentangling the ceramics of western New Guinea could greatly increase understanding of the region in the late Holocene and shed light on the processes at play in all adjacent locations (Kirch 1997).

The development of pottery on New Guinea, its timeframes, styles and the processes of technological transfer, may be multifarious and unique with localised variations needing to be recognised rather than necessarily being regionally conceived. More archaeological sampling is needed and the contribution of archaeological ceramics from specific sites like Lachitu, Taora, Watinglo and Paleflatu provides additional comparative data towards a greater explanation of the complexity of technological change and transfer in New Guinea.

EPP AND LAPITA ON NEW GUINEA

Modern archaeological consideration of PNG pottery initially focused in the south. In the 1970s, Bulmer (1978) developed a pioneering typology of Port Moresby ceramics (Allen 2016; Shaw 2016) leading to a broader identification of red slip pottery along the south coast (Bulmer 1999). Further research by various scholars culminated in the establishment of the Early Papuan Pottery (EPP) sequence (Summerhayes & Allen 2007), which came to be regarded as the best-known pottery sequence in Melanesia (Sutton 2016:1). Bulmer (1999:548) had recognised that PNG is 'very complex ceramically' and pottery moved extensively in some provinces while in others it was entirely local. However, the consistency entailed in EPP and its archaeologically instantaneous appearance around 2,000 BP at sites from the Massim in the east through to the Gulf of Papua, prompted questions about its exogenous origins and strongly suggested a sea-borne colonisation of the south coast (Allen *et al*. 2011:80). Speculation over whether ceramics came to mainland New Guinea from ISEA, where several sites recorded early pottery ranging between 4,000–3,000 BP (Bellwood 2007; Spriggs 2007; O'Connor 2015), or from the Bismarck Archipelago where Lapita pottery appears at around 3,400 BP (Kirch 1997) became the persistent question that called for region-wide explanations.

The spatial distribution and characteristics of EPP compelled many scholars to associate it with Austronesian seafarers and predict that Lapita pottery would be found along the south coast (Bulmer 1999; Allen 2010). Nevertheless, it was commonly accepted that Lapita sites did not exist on New Guinea (Lilley 2008), given the earliest EPP was too modern for any connection with the appearance of Lapita ceramics elsewhere in Near Oceania from 3,300 BP (Sutton *et al*. 2016). But new discoveries on the south coast at Caution Bay between 2008–2010 (Richards *et al*. 2016) provided extensive evidence that fulfilled the expectations of many researchers as well as renewing debate on the emergence of ceramics on mainland New Guinea. The Caution Bay sites revealed aceramic human occupation from around 5,000 BP. However, the most radical result was the discovery of apparent Lapita pottery and settlement dating from 2,900–2,600 BP (McNiven *et al*. 2011; David *et al*. 2016; Richards *et al*. 2016). With stratigraphic integrity and precise dating unlike other PNG early pottery sites, Caution Bay proclaimed the earliest pottery found on mainland PNG, and that this pottery was Lapita.

The ceramic assemblages comprising the Lapita complex show a continuous and uniform progression in styles deriving from one to the next (Spriggs 2011:521). The question therefore followed that if the Caution Bay ceramics were of Lapita origins, what sort of Lapita was this? For some, the finds lack definitive dentate-stamping and are depauperate in motif and vessel forms (Sheppard *et al*. 2015:76). However, the stylistic and temporal interpre-

tation of the collection as a regionalized and simplified, middle-late Lapita assemblage (McNiven *et al*. 2012b: 21) that departs from dentate-stamping, points to secondary colonizing processes. The delayed appearance of Lapita at Caution Bay suggests isolation from the typological sources in the Bismarck Archipelago (Irwin 2012) and that ceramicists along the south coast were not part of the initial colonizing pulses driving eastward into Remote Oceania. Caution Bay represents a westward extension of apparent Austronesian-Lapita colonisation into areas that were occupied by indigenous communities. Yet whether more widespread colonisation to the west of the Bismarcks occurred remains open to speculation (Skelly *et al*. 2014). Without the opportune circumstances for archaeology that brought about the extensive surveys and excavations of the open-sites at Caution Bay, it is likely that it would have remained archaeologically unknown. It is therefore plausible that Lapita settlement occurred more broadly on New Guinea, despite current archaeological invisibility.

The Caution Bay sequence effectively provides a missing link between the Lapita complex of Island Melanesia and mainland New Guinea. It also incorporated and disaggregated EPP (David *et al*. 2012), resulting in almost two thousand years of ceramic continuity. A feature of the Caution Bay landscape is its combination of shoreline settlements with inland sites indicating broad-scale integration of Lapita communities with pre-existing, pre-ceramic local populations (McNiven *et al*. 2012a: 144). Although the ethnicity of the putative settlers that introduced ceramics at Caution Bay is not certain, it is clear that Lapita traditions arrived and evolved there with colonists able to introduce new technologies, practices and ideology in co-existence with indigenous inhabitants.

NORTH COAST OF NEW GUINEA – PREVIOUS WORK

The occurrence of archaeological pottery on New Guinea is spatially irregular and regionalized due to a range of factors including an intrinsic diversity in populations, culture and historical experience whereby the uptake of pottery is inconsistent. Researchers have long speculated that New Guinea's north coast is the prime contender for a hypothesised link between ceramics from ISEA and Lapita (Terrell 2011). However, the north coast specifically is an inherently unstable environment, prone to dynamic landscape disturbances and catastrophic natural events of many kinds. Consequently, generating truly representative archaeological data is problematic as tectonic variability and local geomorphic processes, along with coastal progradation and major post-depositional landscape change since the mid-Holocene high sea stand, means that archaeological sites are likely to be deeply buried or highly disturbed (Specht *et al*. 2014; Golitko *et al*. 2016). Paradoxically, the north coast and its hinterland have seen more debatable claims for the first appearance of pottery than other mainland regions. In some cases, the interpretation of identified sequences or isolated artefacts has been based more on conceptual grounds than genuine empirical data.

In the 1970s at Wanelek, Bulmer (2007) found pottery in levels radiocarbon dated at over 5,000 BP. Although Wanelek is a highlands site, the mid-Holocene Sepik-Ramu inland sea extended close by. Swadling also worked around the shorelines of the ancient inland sea and identified areas of dense settlement with pottery found in middens at Beri and Akari dated to about 5,600 BP (Swadling *et al*. 1989: 109). Subsequently, both claims were disregarded due to recognition of site disturbance and doubts over stratigraphic integrity. However, redating of samples at Wanelek have subsequently resulted in new claims for early ceramics and pointed to the effect of the Sepik-Ramu inland sea in transmitting material culture. Among twenty small sherds analysed, one featuring red slip and incised decorations was associated with a securely dated 3,000-year-old context (Gaffney *et al*. 2015: 2). Furthermore, petrographic and geochemical analysis indicates that one sherd was manufactured on the northeast coast with the remaining sherds made from inland materials (Gaffney *et al*. 2015: 1). The Wanelek pottery currently predates any accepted finds on the north coast by 1,000 years and is also earlier than Caution Bay, making it the '…oldest securely dated pottery from an archaeological context on the island of New Guinea.' (Gaffney *et al*. 2015: 1).

In 1990, Gorecki and colleagues surveyed the uplifted coral terraces of the western end of the PNG north coast. Given apparent prehistoric deposits in caves and rockshelters, Gorecki's team excavated Lachitu and Taora providing the first archaeological record from the Vanimo coast (Gorecki *et al*. 1991; Gorecki 1992). The Taora excavations produced cultural deposits with radiocarbon age ranges from 6,000–5,400 BP, and then from 2,250 BP onwards (Gorecki *et al*. 1991: 120). Pottery sherds were found mostly in the upper layers but a total of 35 sherds were recovered from the mid-Holocene levels, leading to the commentary and claim that 'We are aware of the importance of these dates and of possible vertical displacement of artefacts, yet we are confident that pottery first appears at Taora about 5400 years ago.' (Gorecki *et al*. 1991: 121). Like Bulmer and Swadling, Gorecki promoted a claim for the appearance of pottery on New Guinea that essentially ran contrary to the orthodox model of the Austronesian-Lapita expansion. Swadling (1997) suggested that the evidential development of ceramics on the mainland played a role in the emergence of Lapita in the Bismarck islands, yet the high archaeological profile of Lapita was dominating debate. Gorecki (1992: 27) similarly argued that the very intensity of Lapita research was distorting the significance of other cultural events that took place before its existence.

Near the north coast town of Aitape, a very small sherd proclaimed as dentate-stamped Lapita was found after WW2 (Lilley 2008; Golitko 2016). For several decades, this single unverified piece sustained an expectation that New Guinea was part of the Lapita expansion and was the

marker of its western most reach. In 1993–94, Terrell and Welsch (1997) extensively surveyed Aitape district. Despite recovering over 10,000 sherds, only one dentate-stamped piece measuring just 22 mm long was recovered off Wewak (Terrell & Welsch 1997: 558–9). Although Lapita pottery proved to be '…nearly absent on the Sepik Coast…' (Terrell & Welsch 1997: 560), analysis of the collection by Terrell and Schechter (2007; 2011) led to the identification of a distinct Aitape sequence dating from around 2,000 BP (Jones 2011).

NORTH COAST OF NEW GUINEA – LACHITU, TAORA, WATINGLO AND PALEFLATU

The sites excavated in 2004 and 2005 cluster along the coast between the provincial town of Vanimo and the border with Indonesian Papua (Figure 1). Lachitu (also identified by PNG National Museum code RIQ) is a cave approximately 150 m from the shoreline and 25 m above mean sea level (Gorecki *et al.* 1991; O'Connor *et al.* 2011, 2017). The Taora rockshelter (Museum code RIU) is 450 m from the coast and 11 m above sea level (Gorecki *et al.* 1991). Watinglo is located west of Wutung village and close by the PNG-Indonesia border. The rockshelter is less than one kilometre inland and sits at 110 m above sea level (O'Connor & Dickinson 2010). Paleflatu cave is five km east of Wutung and 20 m above sea level (Helgen *et al.* 2010). All sites are within the inner margin of the Oenake Range's coastal plain, an area of tectonically uplifted karstic terrain backed by the Bewani-Torricelli mountain chain (Gorecki *et al.* 1991; O'Connor *et al.* 2011, 2017).

The 2004–05 excavations indicated that the stratigraphic sequences of all four sites share characteristics that complicate the precise dating of the cultural material (Table 1). The re-excavation of Lachitu shows that the site has a hiatus from 6,700–300 calBP, however it is unclear whether sediments have been lost from the cave due to an erosional episode, or if Lachitu was largely unoccupied during this time (O'Connor *et al.* 2011: 9). Available information on Paleflatu suggests a similar chronostratigraphic hiatus from about 5,000–2,500 BP (see also Helgen *et al.* 2010). At Taora, a sequence broadly the same as reported by Gorecki was found: cultural deposits had accumulated rapidly between 6,800–6,300 calBP after sea level stabilization but '…the period between *c.* 6,300 calBP and the recent past seems either to be missing from the Taora chronostratigraphy or incorporated into a palimpsest assemblage representing the last 6,000 years.' (O'Connor *et al.* 2011: 12). Pottery occurred mainly in upper late Holocene layers but some sherds were recovered in layers with mid-Holocene dates.

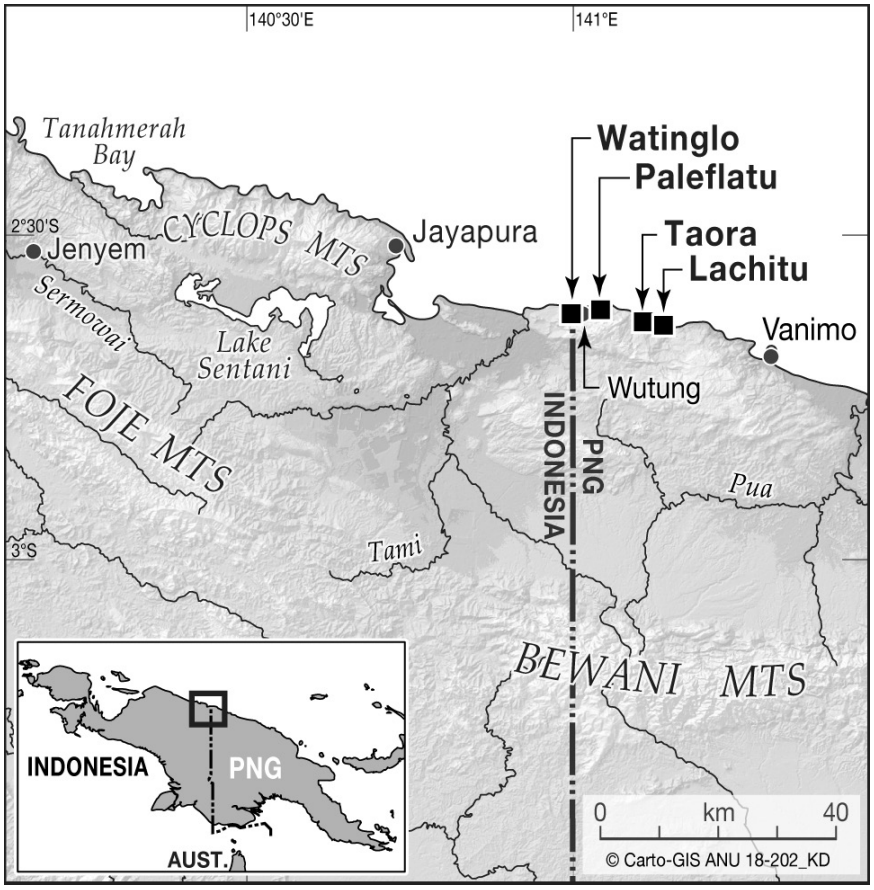

Figure 1. Location of sites on Vanimo coast of northern New Guinea

Table 1. *Radiocarbon dates relating to pottery-bearing layers, calibrated using OxCal v4.3.2 (Bronk Ramsey 2017), with IntCal13 used for terrestrial samples and Marine13 for marine shell samples (Reimer* et al. *2013). DeltaR for calibrations on marine shell was set to zero as no estimate for the western PNG north coast is currently available. (* indicates that age is beyond calibration range. # only one square was excavated at Taora. Two dates bracketed with spits are presented along with the stratigraphic code for in situ samples shown in the section drawings following O'Connor* et al. *2011).*

Site	Spit ref.	Material	Lab. Code	Conventional Age BP	Age 2σ cal BP
Lachitu–RIQ	A:2	charcoal	Wk 16532	132 ± 34	280–171 (40.0%) 152–56 (40.4%) 45–7 (15.0%)
	A:4	charcoal	Wk 16533	160 ± 34	287–243 (16.7%) 232–124 (46.1%) 119–65 (14.4%) 38-…* (18.2%)
	A:7	shell-*Turbo* sp.	Wk 16524	6,399 ± 45	6,998–6,742
	A:10	shell-*Turbo* sp.	Wk 16523	6,519 ± 46	7,155–6,900
	A:10	shell-*Turbo* sp.	Wk 16525	6,842 ± 48	7,445–7,259
Taora–RIU#	4	charcoal	Wk 47060	363 ± 15	495–427 (59.2%) 377–323 (36.2%)
	17	nut-canarium	Wk 17902	5,655 ± 41	6,531–6,317
	West 1	shell-*Turbo* sp.	Wk 15548	6,038 ± 34	6,562–6,355
	West 2	shell-*Turbo* sp.	Wk 15549	5,988 ± 31	6,480–6,305
	West 3	shell-*Turbo* sp.	Wk 15255	5,955 ± 51	6,484–6,267
	West 7	charcoal	Wk 15256	5,853 ± 41	6,777–6,764 (1.7%) 6,755–6,553 (93.7%)
	North 1	shell-*Turbo* sp.	Wk 15547	6,067 ± 32	6,594–6,396
	North 2	shell-*Turbo* sp.	Wk 15254	6,122 ± 41	6,657–6,438
Watinglo	A:6	bone-pig	KIA 35648	265 ± 25	429–375 (28.1%) 364–360 (0.5%) 325–281 (59.2%) 169–152 (7.6%)
	A:6	shell-*Turbo* sp.	ANU 9418	865 ± 25	530–445
	A:8	bone-pig	KIA 35649	220 ± 20	305–271 (40.8%) 187–150 (43.9%) 12-…* (10.7%)
	A:9	shell-*Turbo* sp.	Wk 17254	2,178 ± 38	1,880–1,667
	A:10	bone-pig	KIA 35650	290 ± 25	451–449 (0.4%) 437–350 (62.9%) 334–290 (32.1%)
	A:10	shell-*Turbo* sp.	Wk 17255	5,248 ± 51	5,720–5,485
	A:14	shell-*Turbo* sp.	Wk 17253	6,932 ± 65	7,558–7,314
	C:4	shell-*Turbo* sp.	ANU 9423	800 ± 35	502–334 (93.4%) 347–335 (2.0%)
	C:4	shell-*Turbo* sp.	ANU 9424	895 ± 35	590–580 (0.9%) 565–448 (94.5%)
	C:4	charcoal	ANU 9425	270 ± 25	429–374 (36.1%) 367–360 (1.2%) 326–283 (53.7%) 168–154 (4.4%)
	C:7	shell-*Turbo* sp.	ANU 9426	6,755 ± 40	7,388–7,190
	C:10	shell-*Turbo* sp.	ANU 9427	880 ± 35	551–440
	C:13	shell-*Turbo* sp.	ANU 9430	6,810 ± 45	7,418–7,246
	C:14	shell-*Turbo* sp.	ANU 9432	6,295 ± 40	6,867–6,647
Paleflatu	A:6	charcoal	Wk 47059	482 ± 16	535–505
	A:10	shell-*Turbo* sp.	Wk 21050	2,834 ± 34	2,708–2,468
	A:20	shell-*Turbo* sp.	Wk 17258	7,124 ± 72	7,744–7,460

Lastly, the excavation of Watinglo also revealed a temporal gap between 5,500–2,000 calBP (O'Connor *et al.* 2011:17) and pottery was found in layers with marked disjuncture of dates. While the apparent hiatus at Watinglo is shorter, '…it nonetheless adds to the growing sense of widespread abandonment of, or disruption to, the sedimentary sequences of, local cave sites across the study area, starting in the mid-Holocene and continuing until sometime after 2,000 calBP.' (O'Connor *et al.* 2011:17).

All obtained dates relating to ceramics layers from the 2004–05 excavations of Lachitu, Taora and Watinglo along with hitherto unpublished radiocarbon dates for Paleflatu are presented in Table 1. In addition, radiometric dates targeting the spits bearing the highest concentrations of pottery for Taora (4 – Wk 47060) and Paleflatu (A:6 – Wk 47059) were obtained specifically for this analysis. Full details on excavation procedures for Lachitu, Taora and Watinglo are published elsewhere (O'Connor *et al.* 2011), and details on Paleflatu are taken from Ken Aplin's excavation notes. Excavation squares at all sites were 1 m², with spits averaging between 2 and 5 cm in depth. A single test pit was excavated at Taora. At the other sites excavation squares are labeled by letters (i.e. A, C). All excavated deposits were sieved through 1 mm mesh in combination with flotation to the <0.25 mm level to ensure maximum recovery of cultural materials.

POTTERY OCCURRENCE AND DIAGNOSTIC SHERDS

The total number of sherds recovered from the four sites is 1,690 weighing 4,442 grams. Taora has the greatest number of sherds at 713 or 42% of the overall assemblage. Each of the other sites, taking into consideration the two Watinglo excavations separately, has lower but similar numbers of sherds ranging between 178 (Paleflatu) and 333 (Watinglo sq. C). A diagnostic sherds reference list is provided in supplemental materials (S1). The total number of diagnostic sherds is 109 (Table 2) representing 6.4% of the combined assemblage. Maximum measurements show the generally fragmented nature of the assemblages with average heights (measured with rim edge uppermost) and lengths (parallel to rim and between longest points) mostly under 30 mm (see S2). Ninety segments of rims, vessel necks, shoulders or carinations have been identified as sherds informative of vessel forms. The majority of rim sections are small and lack apparent curvature. Consequently, only a limited number of diameter estimations and vessel projections are possible, leaving vessel types largely unknown. However, the vessel projections undertaken indicate restricted and globular vessels (Figure 2). A catalogue record and description of each rim is available at S3. One probable handle

Table 2. *Diagnostic sherd counts. (N/S/C–neck, shoulder, carination).*

	Rims	N/S/C	Attachment	Decorated
Lachitu–RIQ	23	0	0	0
Taora–RIU	17	13	1	16
Watinglo	21	6	0	6
Paleflatu	5	5	0	5
Total	**66**	**24**	**1**	**27**

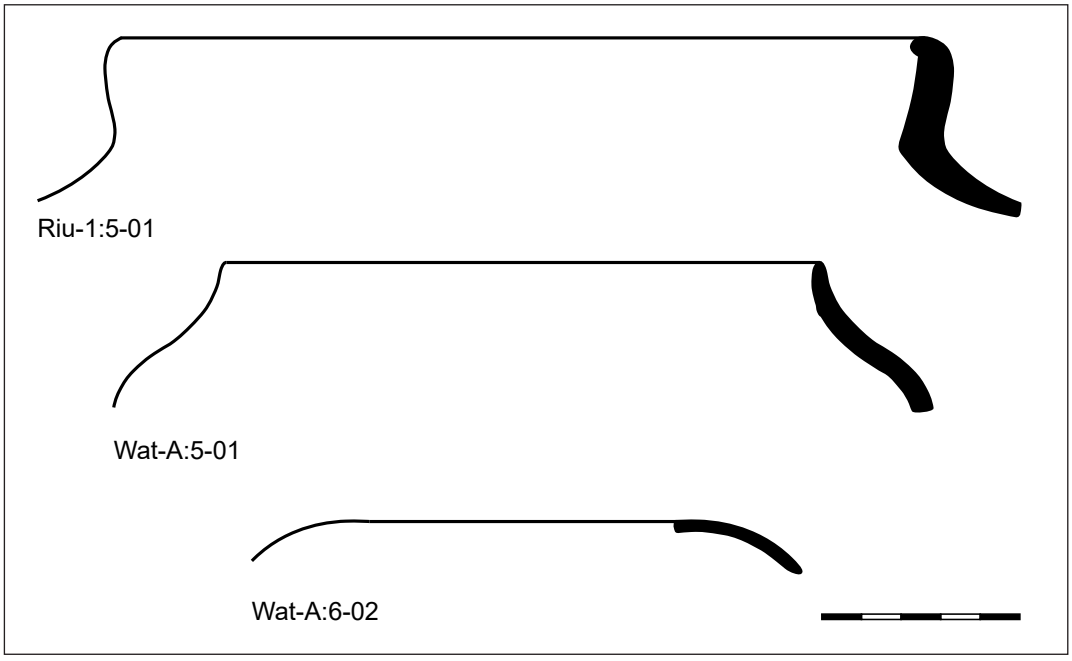

Figure 2. Vessel projections

segment has been identified as an attachment. Twenty-seven sherds display decorative features or markings and are detailed in S4 (nine of which also provide information about vessel form). In addition, 51 red slipped sherds have been identified or slightly over 3% of the overall assemblage (S5). The number of diagnostic sherds may appear low but is not atypical and is comparable to other documented PNG assemblages (Sutton 2016; Shaw 2014; Skelly *et al*. 2014; David *et al*. 2012).

Lachitu

The vertical distribution of the Lachitu sherds suggests a relatively undisturbed stratigraphy with the highest concentration of pottery in spit A:4 and to a lesser extent in spit A:5 (Table 3). The dates from A:4 and A:2 at around 280 BP suggest a modern deposition. The Lachitu pottery was not available for direct examination and all observations are based on photographs and other records (see S3). The average measurements of the sherds are larger relative to the other sites, with all rim profiles deemed to be direct (except for one outcurving, reference Riq-A:1–01). Most have rounded (43%) or flat (35%) lips. The Lachitu sherds show a high degree of uniformity in fabric appearance. The fabric of virtually every sherd is characterised by a medium to medium-fine texture, which is either dark-grey or grey-brown. The Lachitu rims appear similar to the Watinglo collection, as well as sherds from the uppermost layers at Taora and Paleflatu.

Taora

The greatest concentration of pottery at Taora occurs between spits 3 and 5 from which 56% of the total number of sherds and 63% of total weight was recovered (Table 4). The distributions of sherds above and below these spits diminish in a steady fashion suggesting little disturbance to the stratigraphy. However, a high concentration also

Table 3. *Sherd features by spit and corresponding dates for pottery layers and immediately below. (*Age is outside of calibration range. Att.–attachment; Dec.–decorated; R.S.–red slip).*

Lachitu–RIQ									
Spit	**Age cal BP**	**N**	**W(g)**	**Body**	**Rim**	**N/S/C**	**Att.**	**Dec.**	**R.S.**
A:1		8	22	7	1				
A:2	280–7	11	31	9	2				
A:4	287–…*	111	756	99	12				
A:5		54	271	47	7				
A:6		8	9	8					
A:7	6,998–6,742	9	12	8	1				
A:9		1	1	1					
A:10	7,155–6,900 7,445–7,259								
Totals		**202**	**1102**	**179**	**23**	**0**	**0**	**0**	**0**

Table 4. *Sherd features by spit and corresponding dates for pottery layers and immediately below.*

Taora–RIU									
Spit	**Age cal BP**	**N**	**W(g)**	**Body**	**Rim**	**N/S/C**	**Att.**	**Dec.**	**R.S.**
1		104	145	98	2	2		3	1
2		81	89	78	1			2	1
3		136	185	132		2		3	2
4	495–323	171	266	156	7	4		5	5
5		93	253	88	3	1		1	1
6		75	109	69	2	1	1	2	2
7		24	24	22		2			3
8		17	31	14	2	1			2
9		12	11	12					
Wk 15548	6,562–6,355								
Totals		**713**	**1113**	**669**	**17**	**13**	**1**	**16**	**17**

occurs at the surface in spit 1. The date range at spit 4 of 495–323 calBP indicates a relatively modern deposition for most of the Taora pottery.

The majority of Taora rims are direct (76%) with variation occurring in lip profiles. Notably, round lips occur in spit 4 and above while flat-horizontal lips occur in spit 4 and below, exclusively (Table 5). The predominant decoration technique is incision with 11 of 16 sherds featuring incised lines. There are two primary decorative patterns or styles. Four sherds feature an incised pattern of long diagonal lines forming a V shape with smaller interspersed vertical lines or cuts (Figure 3). These neck-shoulder or rim sherds share a common red-brown, medium-coarse fabric and although not conjoining, it appears highly probable that they originate from the same or two very similar vessels. A second recurring pattern occurs on two sherds and comprises small, deep incised lines arranged in a V shape, along with a series of regular punctations (Figure 4). Both sherds are body fragments that do not conjoin but are of the same grey, medium texture fabric. There is a range of other discrete patterns and markings occurring on single sherds including simple or irregular lines, crossed lines, indentations and impressions, as well as some raised lines that may be the edges of shallow impressions or grooves. One body sherd of red-brown and medium-coarse fabric features a distinct incised line, cross-hatch pattern (Figure 5). Quartz and feldspar inclusions outnumber calcareous in the uppermost layers, however in spit 3 and below, calcareous inclusions are clearly dominant. Overall, calcareous grains are the most abundant inclusion type, featuring in 85% of all sherds.

Table 5. *Key features Taora rims.*

Rim Direction	Lip Profile	
direct	flat-horizontal	42%
direct	round	30%
incurving	flat	11%
outcurving	flat	11%
everted	round	6%

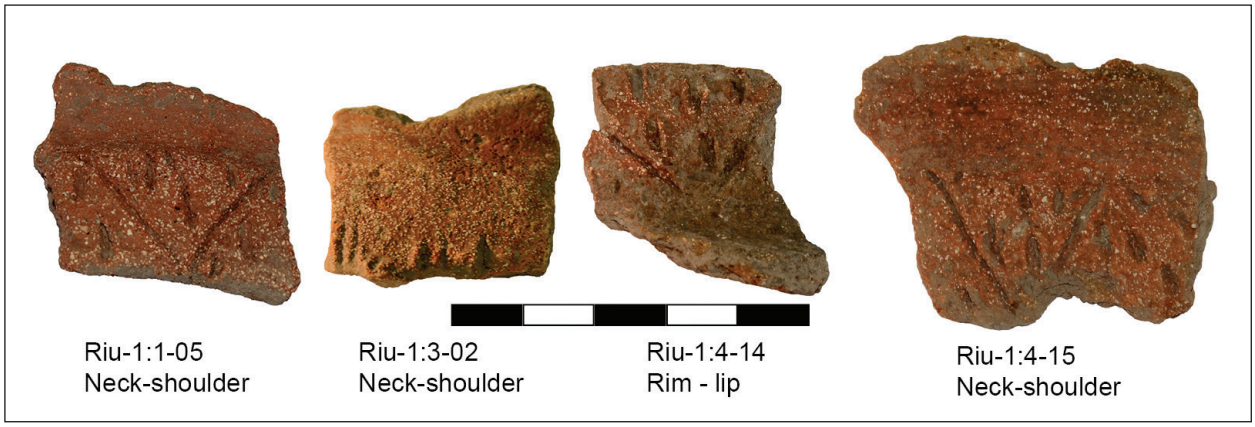

Figure 3. Taora long V-shaped pattern.

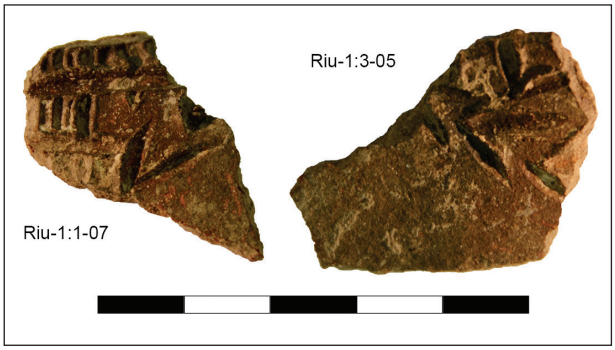

Figure 4. Taora short V-shaped pattern.

Figure 5. Taora cross-hatch pattern.

Watinglo

The two excavation squares at Watinglo exhibit contrasting ceramic concentrations in relation to the chronostratigraphy (Table 6). Pottery is concentrated through spits A:5–8 in Square A where similar sherd numbers and weights are recorded. There are two dates for spit A:6 on bone and shell, with further dates on bone from A:8 and A:10. All dates on bone fall within a range from about 450 BP to the present. The date on shell from spit A:6 indicates a range of 530–445 calBP, with further shell dates of 1,880–1,667 calBP for spit A:9, and 5,720–5,485 calBP at A:10. The ceramic concentrations of Square C are generally spread across a number of spits with lower spits such as C:13–9 showing higher counts and cumulative weights. Mid-Holocene dates around 7,400–7,200 BP have been obtained at spit C:13 and C:7. A date of 551–440 calBP is registered at C:10. Whilst C:10 has relatively low numbers at 20 sherds (6%) and 46g (4%), the spits immediately above and below show high counts and weights; spit C:9 has 16% of the sherds and spit C:11 25%. By weight, spit C:9 has 21% and spit C:11 almost 20%. Although the broad distribution of sherds across most levels, coupled with dates that do not conform to stratigraphic ordering may point to bioturbation, the date at C:10 of around 450–550 years ago does sit squarely within the band of highest ceramic concentration.

Rims profiles are chiefly divided between direct (48%) and incurving (43%) with two outcurving. There is a large range of rim direction and lip combinations across both excavation units and all spits, summarized in Table 7. Four sherds are clearly decorated with a broadly similar wavy-line motif but a different technique applies to each. Wat-A:6–01 is a rim sherd with compelling decoration and surface treatment (Figure 6). Its inside surface has a bright

Table 6. *Sherd features by spit and corresponding dates for pottery layers and immediately below. (*Age is outside of calibration range).*

Watinglo									
Spit	**Age cal BP**	**N**	**W(g)**	**Body**	**Rim**	**N/S/C**	**Att.**	**Dec.**	**R.S.**
A:3		4	2	4					
A:4		5	12	5					1
A:5		43	155	38	4	1			
A:6	429–152 530–445	41	157	35	5			1	1
A:7		62	121	60		1		1	9
A:8	305–…*	76	137	75		1			6
A:9	1,880–1,667	29	32	29					1
A:10	451–290 5,720–5,485	1	1	1					
A:12		3	1	3					
A:14	7,558–7,314								
Sub-		**264**	**618**	**250**	**9**	**3**	**0**	**2**	**18**
C:1		2	3	2					
C:2		6	43	5	1				
C:4	502–334 590–448 429–154	4	11	4					
C:5		8	34	8					
C:6		27	92	23	4				
C:7	7,388–7,190	13	122	13					
C:8		19	101	19					
C:9		52	220	46	3	1		2	
C:10	551–440	20	46	20					
C:11		82	208	76	3	1		2	9
C:12		35	70	33	1	1			1
C:13	7,418–7,246	65	107	65					
C:14	6,867–6,647								
Sub-		**333**	**1057**	**314**	**12**	**3**	**0**	**4**	**10**
Totals		**597**	**1675**	**564**	**21**	**6**	**0**	**6**	**28**

Table 7. *Key features Watinglo rims.*

Rim Direction	Lip Profile	
incurving	flat	38%
direct	flat	29%
direct	round	9%
direct	pointed	9%
incurving	pointed	5%
outcurving	round	5%
outcurving	pointed	5%

red finish, which may be a slip or paint, or could be the result of organic paste or polish (Pétrequin & Pétrequin 2006; Gaffney 2018). In contrast the external face appears unpolished and browner. The decoration appears to have been impressed leaving raised lines bordering slight depressions. One line is straight and runs parallel to the rim with a wavy line beneath it. (The rim is in two pieces having been previously sectioned for sampling.) Wat-C:11–04 has a set of wavy lines running around the inflection point between neck and shoulder (Figure 7). The lines appear to have been made with a stiff brush. Wat-C:9–05 and Wat-C:11–05 are conjoining body sherds with a band of incised, wavy lines (Figure 8). The set of parallel lines may have been scored with a multi-tined tool. Quartz/feldspar inclusions appear in 90% of the Watinglo sherds and dominate the assemblage.

Paleflatu

Although pottery is found almost continuously from the surface to spit A:13 at Paleflatu, a concentration occurs at spit A:6 (Table 8). This spit returned a date of greater than 500 years calBP, while a lesser concentration of pottery is associated with an age range of 2,708–2,468 calBP at A:10. Rim direction and lip profile combinations are summarised in Table 9. The most notable decorative feature among these sherds is rim notching. Two sherds carry notches that have been impressed with the side of a rounded tool (Figure 9). The notches on both sherds have essentially the same shape and size, with consecutive notches on one sherd suggesting notching around an entire rim. Other decorated sherds feature rough incised lines in very coarse surfaces. Fabrics are generally coarse and show a relatively even spread of various mineral inclusions with quartz/feldspar appearing in 69% of sherds, calcareous in 62%, iron oxides in 46% and igneous also in 46%. Quartz/feldspar without calcareous occurs exclusively in the upper spits of this assemblage (A:4 & A:6) with calcareous combinations dominating the layers below.

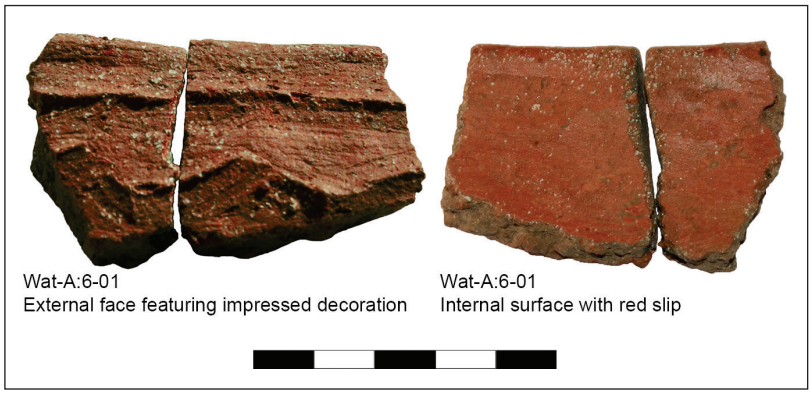

Figure 6. Watinglo impressed wavy line pattern and red slip rim.

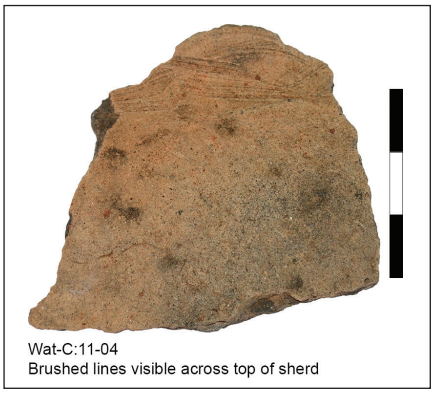

Figure 7. Watinglo brushed wavy line pattern.

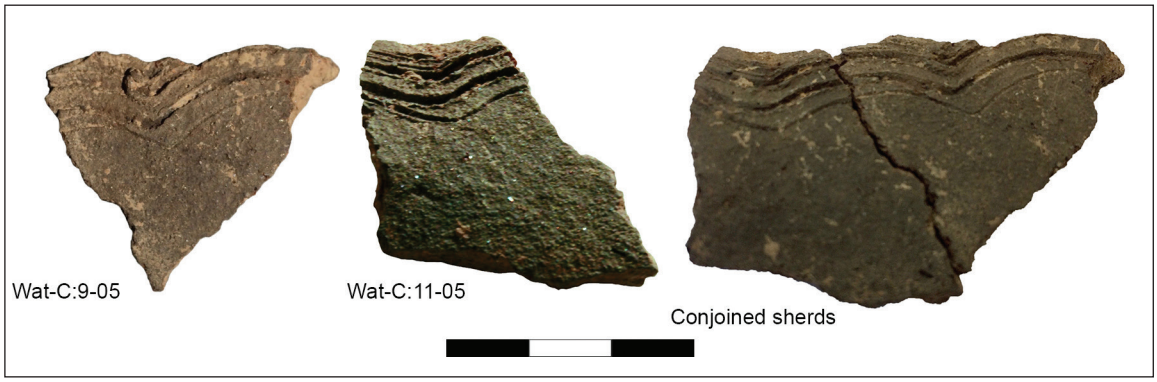

Figure 8. Watinglo incised wavy line pattern.

Table 8. *Sherd features by spit and corresponding dates for pottery layers and immediately below.*

Paleflatu									
Spit	**Age cal BP**	**N**	**W(g)**	**Body**	**Rim**	**N/S/C**	**Att.**	**Dec.**	**R.S.**
A:1		4	6	4					
A:2		3	8	3					
A:4		10	38	8				2	
A:5		14	26	14					
A:6	535–505	73	243	71	2				1
A:7		23	83	22		1			1
A:8		11	22	10		1		1	
A:9		8	38	5	1	2		1	1
A:10	2,708–2,468	6	15	6					
A:11		13	28	11	1			1	
A:12		5	30	3	1	1			3
A:13		3	1	3					
A:19		5	14	5					
A:20	7,744–7,460								
Totals		**178**	**552**	**165**	**5**	**5**	**0**	**5**	**6**

Table 9. *Key features Paleflatu rims.*

Rim Direction	Lip Profile	
direct	flat-horizontal	40%
direct	round	20%
outcurving	flat-horizontal	20%
incurving	pointed	20%

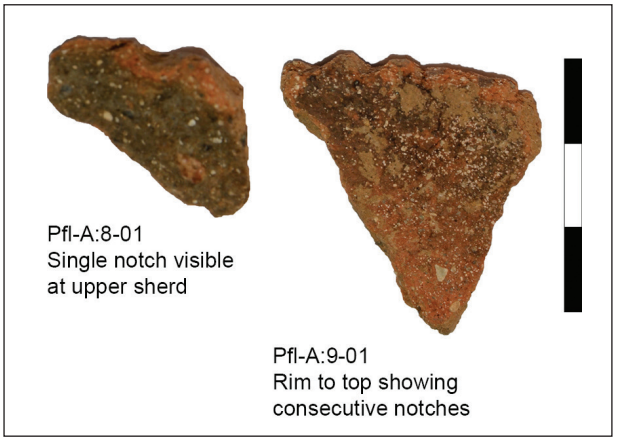

Figure 9. Paleflatu rim notches.

DIAGNOSTIC SHERDS COMPARISONS

No rim form clearly predominates across sites or any particular site. However, the most prevalent form is a direct rim profile with a flat or flat-horizontal lip (Figure 10). This categorisation encompasses a range of diversity such as various rims sizes and thickness. Similarly, rather than commonality of decorative technique and style, the analysis shows that each site is represented by a distinct decorative approach and pattern. Taora has the most examples of decorated sherds and its motifs are the most developed. At least three styles are discernible, all featuring incised lines of varying lengths that produce V-shape patterning, as well as the inclusion of rectangular punctations in some cases. The probable repetition of this patterning around the shoulder or neck of a vessel may in effect produce a version of a W or even wavy line motif. In this regard there may be some stylist relationship to the patterns found at Watinglo. The consistent pattern from Watinglo is a band of multiple and wavy lines, either impressed, brushed or incised. Paleflatu is more unique and is the only site exhibiting rim notches.

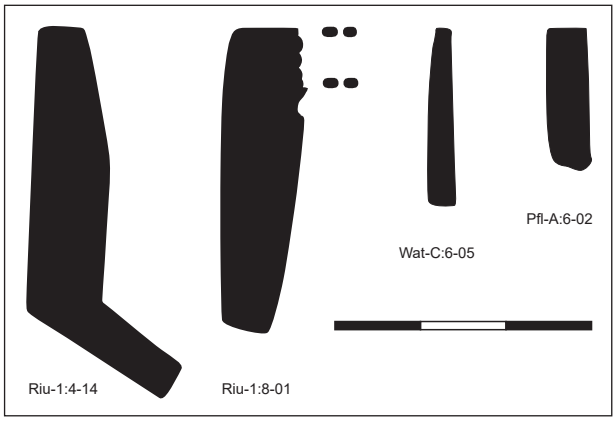

Figure 10. Examples of direct rim with flat lip profiles.

Red slipped sherds are identified mostly at Watinglo (28) and Taora (17), with six at Paleflatu. Relatively high concentrations of red slip in single spits might be interpreted as deriving from a limited number of vessels, for example at Watinglo (Figure 11). However, it is apparent in the Watinglo red slip assemblage that there is variation in the nature of the surface treatment, the wall thickness and the fabrics, which implies origins from different vessels. Although red slip pottery is found throughout the pottery bearing levels at each site, it does not correlate with the greatest ceramic concentrations, but rather appears mostly in older contexts.

Even though all sherds feature mineral inclusions in various combinations, certain minerals appear more prevalent and characterise particular sites. The Lachitu assemblage appears to have a relatively consistent medium to fine dark grey fabric throughout. Watinglo also has a distinct, fine-medium, grey to dark grey fabric that dominates the site assemblage. Rims with medium to fine grey fabrics are also present at Taora and Paleflatu but only in the uppermost layers. In mid to lower spits at Taora and Paleflatu, and to a more limited extent at Watinglo, coarser red-brown fabrics are prevalent. Low magnification microscope analysis of fabrics was carried out in order to gain preliminary identifications (S6), particularly with reference to a petrographic report on Watinglo and Lachitu by Dickinson (2009).

Overall, the fabrics exhibit two variability characteristics. A) Calcareous inclusions are found at all sites. However, they are most abundant or even dominant in the lower ceramics layers. Terrestrial inclusions of quartz/feldspar, and to a lesser degree igneous grains, occur more frequently in higher layers. Such a change in fabrics may indicate a possible shift in production centres, a phenomenon noted in areas including the Bismarcks and the south coast where pottery manufacturing relocated from offshore islands to the mainland (Summerhayes 2000; Sutton *et al*. 2016; Vilgalys & Summerhayes 2016). B) The distinction between terrestrial inclusions and marine derived calcareous tempers also accounts for the major difference between sites. Taora is largely characterised by red-brown fabrics containing calcareous grains. Paleflatu also has a high proportion of calcareous inclusions in combination with all other mineral categories. In contrast, Watinglo features a different profile characterised by quartz/feldspar inclusions. The assessment of the Lachitu records indicates fabric similarities with Watinglo.

The petrographic report on Watinglo and Lachitu confirms the two sites have similar fabrics (Dickinson 2009). Dickinson identifies three distinct inclusions or temper sands: hornblendic volcanic; quartzo-feldspathic non-volcanic; and calcareous reef detritus. Whilst the calcareous grains are necessarily of coastal origins, the quartz/feldspar inclusions are consistent and suggest a common fluvial origin (Dickinson 2009: 2). However, Dickinson considered the source of these identified tempers as problematic and further complicated by the presence of hornblendic volcanic inclusions because the immediate region is devoid of volcanic deposits. He noted the inferred possibility of exotic origins and ceramic transfer. Dickinson (2009: 4)

Figure 11. Red slip body sherds, Watinglo C: 11.

commented that 'Facing such challenges for temper interpretation is unprecedented for Melanesia, where tempers at most sites derive from readily identifiable nearby geologic sources.'

SIMILARITIES WITH KEY NORTH COAST SEQUENCES

In considering the four site assemblages individually and collectively, it is clearly appropriate to compare with the main documented sequences of the PNG north coast and recognise key attribute similarities. In the first instance, Gorecki (1992) assigned a distinct sequence to the Lachitu and Taora ceramics comprising the Fichin tradition from 5,400 BP followed by the Vanimo tradition from 1,200 BP. Documented examples from Taora assigned to Middle Fichin or around 2,600 BP (Gorecki 1992: 38), show wavy line motifs that correspond closely to the Watinglo decorations described in this analysis as well as the rim notching found at Paleflatu. Furthermore, the Middle Fichin period relates to the oldest associated ceramic date from Paleflatu but Gorecki (1992: 43) also provides details on rim forms and decoration for the later Vanimo tradition that correspond to the Taora examples presented here. Changes in fabrics over time are noted, as similarly observed in this analysis, and that '…pottery using two distinct clay sources appears towards the end of this period.' (Gorecki *et al.* 1991: 122).

The survey work carried out along the Sepik Coast by Terrell and Welsch in 1993–94 (Terrell 2011), and the Aitape area by Summerhayes during 1996 (Terrell 2011: 66), led to the subsequent development of the Aitape sequence (Terrell & Schechter 2007; 2011). Documented examples from these initial surveys (Terrell 2011) show many diagnostic forms and decorations that can be found among the four site assemblages including rim notching (p.43 fig. 5.4-C; p.44 fig. 5.5-A; p.45 fig. 5.6-C,E), scored wavy lines under rim (p.42 fig. 5.3-G,H), and incised cross-hatch patterning (p.40 fig.5.1-C; p.65 fig.25-A,B). The Aitape sequence is made up of four distinct wares of chronological delineation (Terrell & Schechter 2011): Nyapin from around 2,000–1,500 BP; Sumalo 1,350–1,200 BP; Aiser 1,000–500 BP; Wain from 500 BP. Essentially, this chronology fits with the ceramics found at the four north coast sites in layers dating from around 2,700–1,700 BP but more commonly from about five to six hundred years ago. Nyapin, Sumalo and Aiser wares are commonly characterised by red slip. However, Wain is not but is rather characterised by linear incisions, punctate or incised herringbone designs, and direct rims with flat lips (Terrell & Schechter 2007: 65; 2011: 90). Such characteristics are in keeping with many of the examples found at the four sites where red slip wares appear earlier in the sequences, with some pottery from the last 500 years or so featuring incised decorations but not commonly red-slipped.

DISCUSSION

Although Lachitu, Taora, Watinglo and Paleflatu are sites that have much in common, the pottery recovered in 2004–2005 exhibits a range of variability and particular distinctions. These cave or rockshelter sites are co-located within a 20 km stretch of coast and as such are subject to the same broad environmental factors and context, as well as proximity to a coastline that represents a strategic element in movements of peoples and cultures, on both large and smaller scales. It might therefore be expected that there would be a high degree of consistency among the ceramic assemblages coming from these sites given the likelihood that similar factors of environment, people and culture have been at play. However, the pottery assemblages do not display sameness but rather differing backgrounds and diversity.

Lachitu, Taora, Watinglo and Paleflatu share temporal characteristics that have previously confounded pottery age estimations and which continue to present a challenge. At each site, there is an apparent interruption in cultural deposits from the mid-Holocene lasting as long as 5,000 years or more, with radiometric dates resuming in a couple of instances around 2,000 BP but more generally from 600–100 calBP (see Table 1). This chronostratigraphic hiatus in the archaeological record beginning at around 6,500 BP is also observable in other rockshelter sites on the north coast and within wider Melanesia (O'Connor *et al.* 2011: 18) and remains unexplained. It may be the result of environmental changes such as increased precipitation in the early to mid Holocene causing deposit loss due to erosion. Alternatively, it may reflect disuse of caves and shelters following a change in settlement patterns such as a move to sedentary village dwelling. Whatever the cause, the consequent doubts surrounding deposit disturbance and dates present problems for interpretation of the archaeological record.

Essentially, the timing of the appearance and occurrences of pottery at these sites is equivocal. The lowest pottery at Lachitu is associated with radiocarbon dates approaching 7,000 calBP yet the overwhelming concentration of pottery is dated from less than 300 years ago. All pottery from Taora appears immediately above a radiocarbon date range of 6,562–6,355 calBP (Wk 15548), yet the spit where over half the number and weight of total sherds is centred is dated at 495–323 calBP. The two Watinglo excavation units show slightly differing temporal qualities. Square A indicates a relatively consistent pottery deposition with radiocarbon dates ranging from 530 BP to the present, with some pottery corresponding to dates of 1,880–1,667 calBP and generally above 5,720–5,485 calBP. Square C on the other hand has pottery spread across several spits that return radiocarbon dates between 590–154 calBP as well as dates around 7,400–7,200 calBP non-consecutively. Paleflatu dates between 2,708–2,468 calBP are associated with one of the lower ceramic bearing spits but the spit

of greatest pottery concentration has an associated date of 535–505 calBP. Such temporal patterning, whereby the chronostratigraphy beginning around 7,000 or 6,000 years ago until the relatively recent past seems to be missing, is likely to indicate the incorporation of archaeological materials spanning several thousand years of deposition into a palimpsest assemblage (O'Connor *et al.* 2011). At each site, pottery is mainly found in upper layers corresponding with dates within the last 600 years. However, there is some evidence from Watinglo suggesting pottery from around 1,800–1,700 BP and from before 2,400 years ago at Paleflatu. Such ages are not inconsistent with dates associated with ceramics from further to the east along the Sepik Coast from Aitape to Wewak, or the Sepik-Ramu region and adjacent highlands. More irregular occurrences associate some sherds with mid-Holocene dates. But there is a high probability that disturbance and bioturbation has caused downward movement of such sherds, which renders many cave sequences unreliable for recording the initial appearance of pottery (O'Connor 2015). On balance, it appears that the ceramic history of each site is similar in respect of wider occupation timeframes, with intense pottery usage only within the last few centuries but with a possibility that pottery was introduced in this area within a thousand year period from 2,700–1,700 BP.

Although a broad pottery timeframe may be applied to all sites, the analysis of ceramic fabrics implies change over time and site distinctions. Relatively coarse, red-brown fabrics with calcareous inclusions appear at all sites, fitting comfortably with the coastal locations. This sort of fabric is most abundant at Taora, with Paleflatu also having a high proportion. Taora and Paleflatu also show some quartz/feldspar inclusions in upper layers. However, Lachitu and Watinglo are notably characterised by quartz/feldspar inclusions, with relatively modest numbers of calcareous inclusions in sherds from lower layers only. Overall, a broad difference in fabrics from sherds in lower to upper levels can be observed suggesting a change over time from marine based to terrestrial inclusions.

The petrographic report by Dickinson (2009) confirms a mineralogical similarity between Lachitu and Watinglo and indicates a common but unidentified fluvial origin. The quartz/feldspar inclusions characterising the Lachitu and Watinglo ceramics are also present in the Taora and Paleflatu assemblage, but in smaller numbers and only in the uppermost layers. The ceramic timeframes for Lachitu and Watinglo are more recent than those of Taora and Paleflatu. The most recent limits of the date ranges at Lachitu and Watinglo are within the last one or two hundred years, whereas for Taora it is 323 calBP and Paleflatu 505 calBP respectively. The use of quartz/feldspar inclusions therefore appears as a more modern phenomenon, prevalent among the newer ceramics of Lachitu and Watinglo and more characteristic of the younger levels at all site. The petrographic analysis of the terrestrial inclusions from Lachitu and Watinglo also noted volcanic hornblendic grains, which were not sourced locally on mainland PNG (Dickinson 2009). The exotic origin of these inclusions remains unknown yet clearly demonstrates ceramic transfer occurring in the more recent periods of pottery deposition at these sites. This is a phenomenon also observed by Dickinson (2011; Terrell 2011: 39) in considering sherds from the Sepik Coast where certain fabrics did not group well with any of the other specimens making provenance ambiguous. The contrasts between the pottery fabrics recovered from newer versus older spits, distinctly demonstrated by the more recent Lachitu and Watinglo sites relative to Taora and Paleflatu, points to divergent material origins driven by different human agency or choice, such as changing procurement practices in manufacturing, or importation of different ceramics, or both. Whatever the reason, pottery traditions in this area were not static or conservative, and new influences and change is apparent mostly within the last 500 years.

The highly fragmented nature of the sherds and the limited number of rims means that vessels forms are difficult to determine. Although the available rims show a variety of forms, there are no consistent stylistic similarities corresponding across the sites or in relation to particular fabrics or other variables. There is also a general combination of fine-grained fabrics, most suitable for water storage vessels, along with coarser textures appropriate for cooking (May & Tuckson 2000; Lape *et al.* 2016). A utilitarian pottery kit would certainly have accompanied those using caves as transitory shelters like hunting, collecting or foraging parties, which is a pattern of usage that appears to have persisted through to historical times (O'Connor 2015).

Decorated sherds are generally uncommon, again implying utilitarian purpose. However, each of three sites exhibits a relatively defined and characteristic decorative technique and style. Decorated sherds are most abundant from Taora, predominantly featuring incised lines with at least three decorative patterns identifiable. The decorated sherds from Watinglo represent a generalised wavy line motif made using various techniques. While the decorated sherds from Paleflatu exhibit rim notches. Each of the decorative patterns and techniques can be essentially found in the documented assemblages from around PNG (May & Tuckson 2000). The Caution Bay sequence, for example, shows a progressive simplification of design culminating in a final period characterised by a varied incised tradition featuring diagonal lines and increasing rim notching (McNiven *et al.* 2011; David *et al.* 2012: 75). While there are evident similarities between assemblages from the south and north coast and elsewhere, immediate and unstructured comparison with the pottery recovered from Lachitu, Taora, Watinglo and Paleflatu is necessarily speculative and basic. Impressionistic assessments resting on specific attributes and selective use of data may result in facile comparisons, which effectively diminishes a more authentic recognition of diversity (Szabo & O'Conner 2004; Swete-Kelly 2017). The decorative features of the four sites are diverse but

taken as a whole do bear a high degree of commonality with ceramics along the Sepik Coast, and particularly the later Aitape sequence. It is therefore well reasoned to associate the four sites with the most proximate documented examples in the first instance. By the same token, such associations may be drawn with less well documented ceramics in similarly close by areas such as the Jayapura District and Lake Sentani (Simunjuntak 1998), inviting speculation of connections and influence further to the west.

The prevailing and orthodox consideration of all early New Guinea pottery tends to ascribe '…a common ancestry in the Lapita world of highly skilled and specialized seafaring ceramicists' (Skelly & David 2017:523). However, this should not be the end of the story. Not every archaeological pottery find is simply Lapita of one variant or another as more detail comes to light of locally evolved and locally focussed interaction spheres where pottery, among a range of things was diffused. Caution Bay is such a precedent whereby Lapita roots give rise to a more localised ceramic and trade tradition that ultimately, after a period of hiatus, is the antecedent for yet more recent maritime exchange networks. At around 600 BP, a number of interaction and trade spheres like the Hiri, Kula Ring, and the Vitiaz Strait 'Super-system' are operative along regional coasts and between offshore islands (Skelly & David 2017). Although much more is known about the networks and ceramic manufacture and spread that occurred within the south coast Hiri, north coast interactions are coming to be regarded as equally complex and extensive (Gaffney *et al*. 2017). Furthermore, these maritime interaction spheres were not hermetically sealed and people and goods moved from one system to another and beyond, with the margins of each system merging and difficult to delineate (Skelly & David 2017:515).

Ceramic exchange along the Sepik Coast is likely to have begun between production centres as early as 2,000 years ago, and spanned its length by at the latest 1,000 BP (Golitko 2011). The Sepik area is known for its intense cult and ritual activity as well as inherent diversity, with over 60 languages spoken (Swadling 1997; Terrell & Welsch 1997; May & Tuckson 2000). But the Sepik Coast, spanning some 700 km from Jayapura to Madang, is also noted for the remarkably extensive networks of relationships between these culturally and linguistically diverse communities who participate in the exchange of material goods, among other things (Terrell & Welsch 1997). This regular contact and exchange is manifest in a commonality of material culture, despite profound language and other differences (Terrell 2011). But involvement in maritime interaction spheres extending across New Guinea and merging with ISEA that facilitated trade and exchange, for example in bird-of-paradise plumes and other forest produce (Swadling 1996; Donohue & Denham 2010; Wright *et al*. 2013) may have equally accounted for the movement of pottery. The agency of dynamic and changeable exchange relations and networks provides the key to understanding the arrival and use of ceramics at various locations and times throughout New Guinea.

CONCLUSIONS

The pottery from Lachitu, Taora, Watinglo and Paleflatu does not constitute a homogenous assemblage. These sites are spatially close yet the selection of pottery analysed and compared from each site exhibits differing characteristics. However, as a combined assemblage, these ceramics do exhibit overall characteristics relating to an immediate and documented tradition along the New Guinea north coast; the Aitape sequence.

The chronostratigraphy of the sites, although presenting a deep record of human occupation and usage overall, is characterised by a problematic archaeological record from the mid-Holocene up until more definitive dates are established at around 500–600 years ago or more recently. Bioturbation within the cave and rockshelter environments has probably contributed to some pottery sherds having been vertically displaced from higher layers. This situation has led to pottery being found ostensibly in association with radiocarbon dates ranging from over 7,000 BP, and led to the previous claim of very early pottery at 5,500 BP. There is some evidence from Watinglo and Paleflatu that pottery may have been introduced between 2,700 to 1,700 years ago, which is consistent with early finds of red slip pottery, particularly in ISEA (Bellwood *et al*. 1998). However, dating of spits where ceramic finds are concentrated and where stratigraphic integrity and deposition is more reliable, associates the bulk of the pottery with dates within the last five hundred years.

Although the pottery from each site is broadly contemporary, there are distinctions that point to differing phases. The dates obtained for pottery bearing spits of high concentrations suggest the ceramics from Lachitu and Watinglo are more recent, dating from around 100–300 years ago, whereas ceramics from Taora and Paleflatu fall generally within a range of 300–500 BP. Coupled with this are distinctions in the characteristic fabrics of the two, paired sites. Lachitu and Watinglo exhibit inclusions derived from an inland source in contrast to the beach sands that are most prevalent at Taora and Paleflatu. In addition, the fluvial sand inclusions in the Lachitu and Watinglo ceramics are not local and indicate importation from an exotic source. These variations highlight differing origins and point to the involvement of generations of potters changing materials over time, in tandem with the entry of contrasting ceramic traditions.

There is also distinction in decorative forms between the sites. Although stylistic attributes may be justifiably compared with other documented and regional archaeological assemblages and be seen as deriving from a fundamental background, commonality could only be superficially inferred and would not of itself indicate with certainty coevality, high degrees of interaction, or shared

culture or identity. The drive to broader explanation may detract from the recognition of variation, particularly where there is a dearth of overall comparative archaeological evidence and where the occurrence of prehistoric ceramics is spatially and temporally irregular. The analysis of pottery from Lachitu, Taora, Watinglo and Paleflatu highlights a range of variables that indicates the involvement of a diversity of people, either through time or with distinctive ceramic traditions.

Acknowledgements

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