KEVEOKI 1:

Exploring the *Hiri* Ceramics Trade at a Short-Lived Village Site near the Vailala River, Papua New Guinea

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Abstract

Investigations at the newly discovered, once-coastal but now inland archaeological village site of Keveoki 1 allows us to characterise the nature and antiquity of ancestral *hiri* trade ceramics around 450-500 cal BP in the recipient Vailala River-Kea Kea villages of the Gulf Province of the southern coast of Papua New Guinea. This paper reports on the decorated ceramics from Keveoki 1, where a drainage channel cut in 2004 revealed a short-lived village site with a rich, stratified ceramic assemblage. It represents a rare account of the ceramic assemblage from a short duration village on a relic beach ridge in southern Papua New Guinea, and contributes to ongoing attempts to refine ceramic sequences in the recipient (western) end of the *hiri* system of long-distance maritime trade. Because of the presence of a single occupational period of a few decades at most, short duration sites such as Keveoki 1 allow for chronological refinement of ceramic conventions in a way that multilevel sites usually cannot, owing to the lack of stratigraphic mixing between chronologically separate ceramic assemblages in the former.

Introduction

Before the mid-1900s, the coastal peoples of the Gulf and Central Provinces of Papua New Guinea (PNG) participated in the Motu *hiri* system of long-distance maritime trade. From 400km to the east of the western recipient villages in the Gulf Province, annual sailing fleets typically brought 20,000 pots from the Central Province in exchange for 500 tonnes of locally produced sago. But the swampy lowlands on which the sago producers lived were devoid of stone, and stone tools were required to enable this mass production of sago; stone was imported through inland trade routes stretching into the Highlands foothills and beyond.

A dominant theme of southern lowland archaeological research in PNG has concerned the nature and antiquity of the ethnographically documented *hiri* trade system. As ceramics have been the single-most informative artefact type allowing the tracking of the *hiri* system's history, the publication of ceramic sequences remains of utmost importance for understanding southern Papua New Guinea's cultural history. Since the late 1960s, when professional archaeological investigations were initiated in southern PNG (e.g. Allen 1972; Bulmer 1971, 1978; Irwin 1985; Vanderwal 1973, 1976, 1978), research has focused on understanding ceramic sequences both within the pottery-producing (see Allen 1977a, 1977b, 1978, 1984; Allen and Rye 1982; Bulmer 1982) and -receiving (see Frankel *et al.* 1994; Rhoads 1980, 1994) ends of the *hiri* system. Despite this considerable effort – particularly concentrated through the 1970s into the early 1980s – and significant findings, including the identification of 2000 years of pottery production and trade between the Central Province in the east and the Gulf Province in the west, few excavations and ceramic sequences have been reliably radiocarbon-dated or systematically published. This situation makes it difficult to characterise, adequately model, or trace the evolution of ceramic sequences within and between the Gulf and Central Provinces. This paper aims to add to the available chronological evidence for Gulf and Central Provinces ceramic assemblages by presenting initial results from the newly discovered now-inland archaeological village site of Keveoki 1, near the Vailala River, at the recipient end of the *hiri* system in the Gulf Province. We refer to this site as Keveoki 1, after the sago swamp in which it is now located.

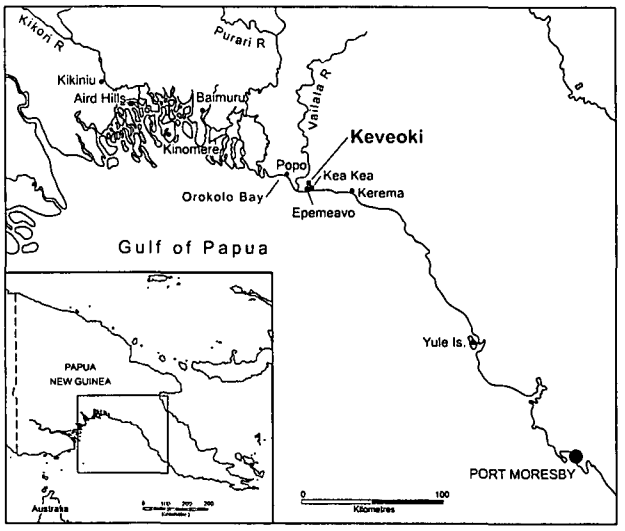

Figure 1 Map of the study area, Papua New Guinea.

Keveoki 1

Keveoki 1 is located 6.1km east of the Vailala River and 1.5km north of the present Kea Kea village, itself located on the current shoreline (Figure 1). It was discovered by Kea Kea villagers in March or April 2004 when cutting drainage channels through the swamp to convert the previously inundated swamplands into subsistence gardens. The main channel, 1m wide and 1m deep and at the time of study inundated by c.20cm of water, exposed a rich ceramic assemblage which had accumulated along the channel floor as a result of channel digging and subsequent alluvial erosion of the channel face (Figure 2). Since being drained, the archaeological site has largely remained above the watertable, and is now visible as a well-defined layer of cultural

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Figure 2 Keveoki 1, showing drainage channel after heavy rains. Magnetometer surveys in progress (Photograph: Bryce Barker).

materials some 30 to 60cm below the ground surface; it remains largely undisturbed by recent gardening activity. This cultural layer lies below the swamp's dark loamy surface sediments, and sits immediately above culturally sterile, homogeneous beach sand exposed at the base of the channel.

Our visit to Keveoki 1 with Kea Kea villagers on 27 August 2007 was an opportunistic event organised while discussing a recently discovered wrecked *bevaia* (imitation Motu *lagatoi hiri* trading vessel of the 1930s) at Upihoi along the nearby coastline (for details see David *et al.* 2008). During interviews with clan leaders and other villagers, we asked whether ancient beach sands were ever found under the ground during inland gardening activities. Answering in the affirmative, we then asked if broken pottery was ever found on or in such beach sands. The Keveoki 1 site was mentioned, and we were invited to visit the site the next day.

Geophysical Investigations

Geophysical investigations were conducted at the Keveoki 1 site with the aim of delineating the subsurface distribution of accumulations of ceramic material to gain a greater understanding of their spatial patterning and to target future excavations. The use of geophysical techniques in archaeological investigations is well-established internationally (e.g. Gater and Gaffney 2003; Witten 2006), but such methods have not been applied in Papua New Guinea.

While many geophysical techniques have the potential to contribute to archaeological investigations, a magnetometer was chosen as the most appropriate for this survey owing to its low cost, portability and ease of use in difficult terrain or in areas with numerous tree roots (Nobes 2000). The magnetometer has a long history as a tool of archaeological prospection and is used extensively for the location of ferrous metal, soil disturbance and heat-magnetised minerals in a variety of settings for all branches of archaeology (Aspinall *et al.* 2008). Magnetometry is a particularly useful tool for the subsurface location of pottery sherds because the constituent magnetic minerals become magnetised as the vessel cools following firing (Burnham and Tarling 1975), leading to a detectable disturbance in the ground's magnetic field at that location (e.g. Theocaris *et al.* 1996).

Investigations were conducted using a Geometerics G-856 proton precession magnetometer with data collected on a regular grid with 1m line and station spacing in areas of the Keveoki 1 site where the vegetation had been cleared sufficiently to allow access. Data were processed to remove erroneous points, diurnally corrected from a base station, gridded using Magpick software and overlain on a site plan.

The magnetometer data show a positive monopolar anomaly centred on the area of the channel found to be most promising for ceramic material (Figure 3, Feature M1), with a continuation of this anomaly downstream (Feature M2). This feature has a lower intensity diffuse lobe which extends west for approximately 10m (Feature M3). An additional smaller, though distinct, positive monopolar anomaly is located approximately 12m to the east (Feature M4). A negative monopolar anomaly is located to the southeast of the principal anomaly (Feature M5).

The results of the geophysical survey suggest that the channel has fortuitously been cut through the highest concentration of ceramic material in the area surveyed (Feature M1). The continuation of this anomaly downstream along this channel (Feature M2) is probably the result of fluvial transport of the pottery sherds. The westward continuation of this feature (Feature M3) probably represents an additional, though less dense concentration of pottery material, as does the discrete smaller positive anomaly to the east (Feature M4). The negative anomaly to the southeast (Feature M5) probably does not represent a pottery accumulation but is more likely to be a local change in sediment. This feature may be the result of anthropogenic activity but this conclusion cannot be considered robust without direct investigation.

The results of the magnetometer survey suggest that despite the removal of the pottery sherds analysed in this paper, a significant amount of material remains both in the creek bed and *in situ* in the creek bank. The locus of greatest magnetic intensity is centred on Features M1 and M2 (see Figure 3), which suggests that excavation on the edges of the creek in this area may yield a more complete collection of artefacts. Despite the possibility of further anomalies, the limited spatial distribution of the magnetic anomalies suggests that the Keveoki 1 site was short-lived, as the distribution of subsurface pottery appears to be limited to a small, restricted area within the extent of the geophysical survey. This interpretation is consistent with the radiocarbon evidence (see below).

The Surface Collection

Thousands of ceramic sherds, and a small number of stone artefacts, had accumulated within a c.20m-long section of the drainage channel. Over the space of approximately half an hour the authors together with a small number of Kea Kea villagers manually searched through the accumulated sherds, collecting all the decorated sherds we found and a random selection of undecorated rim and body sherds. The channel's western face was also slightly cut back to expose the stratigraphy. Two *in situ* charcoal samples were collected from this cleaned channel face: Wk-22221 coming from within the stratified ceramic layer

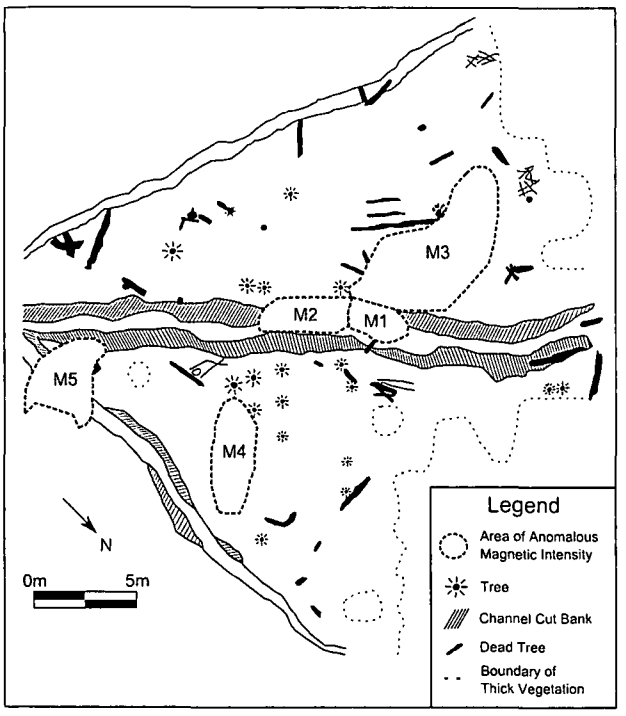

Figure 3 Map of areas of anomalous magnetic intensity, Keveoki 1.

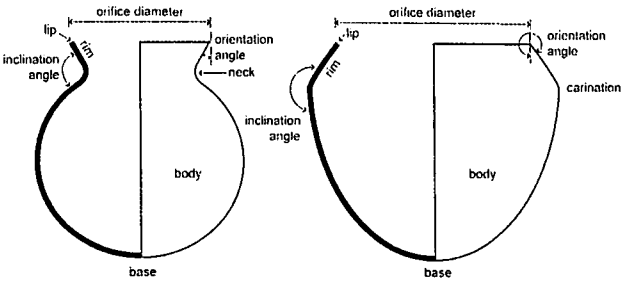

Figure 4 Description of terms used for vessel parts.

12cm above its base, and Wk-22222 from its very base (Table 1). The radiocarbon determinations indicate that Keveoki 1 was occupied for a short period of time probably lasting a few decades sometime between c.440 and 510 cal BP (with median ages of 457 and 468 cal BP respectively, or c.500–550 years ago). The location of a coastal village at Keveoki 1 at this time implies that the coast has been prograding at a mean rate of 3m per year since that time. This is consistent with Sam Nao's (of Kea Kea village) account that the old people used to say that the present coastline, including today's coastal villages eastward to 'The Bluff' (17km east of Kea Kea village), were in the past located under the sea, the old coastline being found shortly south of Belepa some 5km inland (Sam Nao, pers. comm., 2007; see Rhoads 1994:53 for similar claims of a sand ridge representing an ancient shoreline at Popo 2.5km inland, 23km northwest of Kea Kea). Based on fieldwork undertaken between 1923 and 1937, F.E. Williams (1940:28) also reported that 'the coast of Orokolo Bay has evidently been making ground in recent times, and the population, who are so attached to beach life, have moved forward with it. Indeed the sites of the present villages were mostly, within living memory, under the sea'.

The vast majority of sherds at Keveoki 1 are undecorated (we cannot give an exact proportional value as no systematic collection involving plain sherds was made). Here we present an analysis of the collected sherds, focusing on vessel shapes and sizes, rim and lip shapes, and decorative conventions. Petrographic analyses of sand tempers and clays are in progress and will be reported elsewhere. We use the term 'dish' to refer to a flat vessel of any width – the orifice diameters of dishes are larger than their depths; 'jar' to a vessel of greater depth than orifice width; and 'bowl' to a vessel of approximately equal depth and orifice width. Because in many cases it is difficult on the basis of small sherds to determine whether a bowl or jar is represented, we use the term 'pot' to refer to an undifferentiated bowl or jar. We use orifice diameter (measured from the outside of the lip wall) rather than maximum diameter of a vessel as a reference for 'width' because the former is more often measurable on the relatively small sherds which do not always include the vessel's shoulder (typically widest point). All of the dishes identified here were unambiguously identified as such. Similarly, carinations and necks were always clearly demarcated, and therefore posed no problem for the identification of carinated and everted indirect vessels respectively (see Figure 4 for description of terms used for vessel parts). Carinations were defined as noticeable shoulders where body-rim walls changed angles on a vessel's external wall; sometimes this was effected through the presence of a keel created by wall thickening at the shoulder, but this was not always the case.

Throughout this analysis, we analysed the Keveoki 1 sherds independently of previous studies of Gulf and Central Province ceramics. Our reason for doing so was to allow classification of these sherds on their own merit. Once analysis was completed, where it appeared warranted we standardised our terminology and undertook preliminary comparisons with existing regional assemblages, in particular studies by Frankel *et al.* (1994), May and Tuckson (1982), Rhoads (1980, 1983, 1994), Vanderwal (1973) and Bulmer (1978) – each undertaken in the region of ethnographic Motu *hiri* trade – and, to a lesser degree, Irwin's (1985) Mailu ceramics further to the east. Jim Allen (pers. comm., 2007) also kindly supplied us with numerous images of unpublished Motupore ceramics to enable comparison of design conventions.

Table 1 Radiocarbon determinations, Keveoki 1. All ^{14}C dates are AMS, on charcoal. Calibrations undertaken using OxCal 3.10 (Bronk Ramsay 1995, 2001) and the Southern Hemisphere calibration dataset (McCormac *et al.* 2004).

Distance above Base of Cultural Layer	Lab. No.	$\delta^{13}C$‰	% Modern	^{14}C Age (years BP)	Calibrated Age BP (1σ probability)	Calibrated Age BP (2σ probability)
12cm	Wk-22221	-25.5±0.2	94.9±0.2	421±30	495-450 (53.8%) 354-338 (14.4%)	504-436 (61.6%) 405-326 (33.8%)
0cm	Wk-22222	-24.8±0.2	94.7±0.2	434±30	500-452 (61.2%) 350-342 (7.0%)	510-439 (72.2%) 400-392 (0.9%) 377-328 (22.3%)

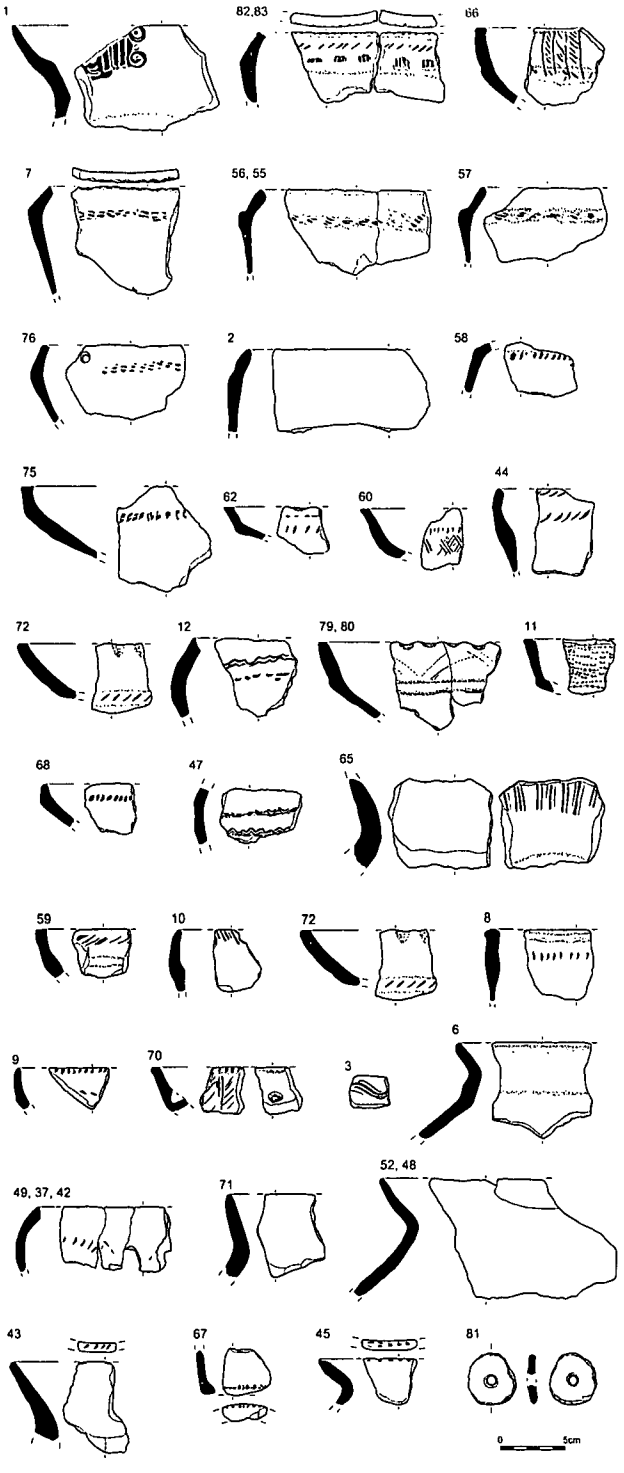

Figure 5 Drawings of selected rim, decorated and neck sherds (with sherd reference numbers marked).

Vessel Shapes and Sizes

The collected Keveoki 1 ceramics consist of 51 rim sherds and 32 body sherds, 13 of which conjoin into six conjoin sets (Figure 5). Of these 83 sherds, the shapes of the original vessels could be identified from 46 sherds large enough to allow determination. These sherds came from five vessel shapes: inverted carinated (or shouldered) dishes; everted carinated (or shouldered) dishes; inverted carinated (or shouldered) pots; everted indirect (with neck) pots; and inverted (globular) bowls (Figure 6). However, three vessel shapes together account for 91.3% of the identifiable sherds: 20 sherds (43.5%) from everted indirect pots; 12 sherds (26.1%) from inverted carinated pots; and 10 sherds (21.7%) from everted carinated dishes. One sherd (2.2%) comes from an inverted carinated dish, and three conjoining sherds (6.5%) come from an inverted globular bowl.

Despite the fact that inverted carinated dishes are represented by only one sherd, the distribution of orientation angles amongst all the carinated dishes (everted and inverted) supports the presence of two dish forms, as the orientation angle of the inverted dish (335°) is discontinuous and clearly separates out from the distribution of orientation angles amongst the everted dishes (5-30°; Figure 7). These everted dishes include both small (orifice diameter 12-18cm) and large (26-33cm) forms, the absence of dishes with orifice diameters between 18 and 26cm suggesting the further subdivision of everted dishes into two subtypes based on size. The inverted dish is from a small (17cm) form.

The inverted carinated pots have orientation angles between 315° and 355°, and range from 16-42cm in orifice diameter. The distribution of orientation angles relative to orifice diameters indicates that small pots with orifice diameters <24cm tend to have relatively closed mouths (orientation angles <325°), while the large pots (orifice diameters ≥24cm) have more open mouths with orientation angles ≥325°, although there are exceptions to this trend. This general association of distinctive orientation angles for small and large inverted carinated pots indicates the presence of two distinct subtypes differentiated by size (i.e. small versus large inverted carinated pots, the former usually possessing relatively closed and the latter relatively open orientation angles), rather than metrical continuity of a single vessel type.

One inverted carinated pot (rim sherd #76) has a post-firing, bifacially drilled hole, 4.8mm in diameter, 8mm below the edge of the lip (Figure 5). Another everted carinated sherd (#70) has a partial hole 26mm below the edge of the lip; this hole originates from the interior surface but does not penetrate right through the wall of the sherd (Figure 5).

The everted indirect vessels are all pots (one indirect pot with unusual decoration – sherd #1, see below – appears to be everted but may be inverted or straight; the circumference of its rim is too short to be certain). Orientation angles range from 15° to 45°, and orifice diameters range from 17 to 35cm. Again there appear to be two distinct subtypes based on size, with the distribution of orifice diameters indicating a bimodal distribution (small pots with orifice diameters ≤24cm, and large pots with orifice diameters between 28 and 35cm). There does not appear to be a correlation between orientation angles and orifice diameters.

The only direct globular bowl represented has a relatively closed, inverted mouth, and at 30cm a large orifice diameter (conjoining sherds #37, 42, 49).

One small 'rim' sherd may be part of a pedestal instead of a rim; the sherd is too small to be certain (sherd #67, with an orientation angle of 350°; see Figure 5).

In addition to the above, one perforated ceramic disc measuring 4.1cm in diameter, and with a bifacially drilled central perforation measuring 6.6mm in diameter, was recovered (sherd #81). The disc (and central hole) was made after firing of the clay, and is likely to be a gaming piece or net weight, but potentially may be a fly wheel weight for a pump drill (pump drills or drill points are known from southern PNG ethnographic and

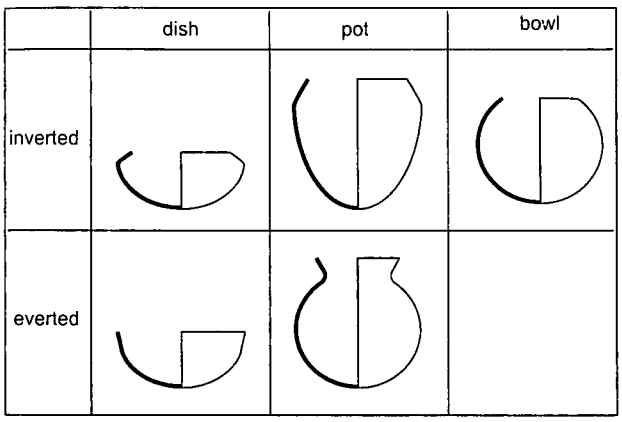

Figure 6 Keveoki 1 vessel shapes.

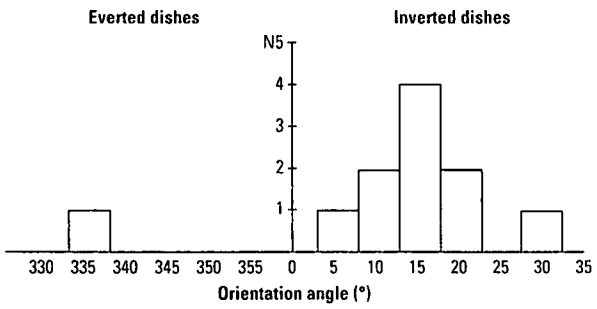

Figure 7 Frequency distribution of carinated dish orientation angles.

archaeological assemblages, including Motupore – Allen *et al.* 1997; see Figure 5).

Rims

We have analysed three characteristics of the rims: length, course, and profile (see Frankel *et al.* 1994 for definitions). The rim course refers to the curvature of the rim, while rim profile refers to the shape of the rim's cross-section (see Frankel *et al.* 1994 for illustrations of rim course and rim profile types).

Rims are between 13.9 and 57.9mm long. The only inverted carinated dish sherd at Keveoki 1 also has the smallest rim in the collection (13.9mm long), further testifying to earlier results that inverted carinated dishes are not simply part of the morphological continuum of a single (and predominantly everted) carinated dish type (see above). Of the five everted carinated dish rim sherds where both the rim length and the orifice diameter were able to be determined, there is a direct correlation between the two variables (i.e. rim lengths increase with orifice diameter); however, sample size is too low to determine whether or not this correlation is truly meaningful for Keveoki 1's dishes as a whole.

Among the inverted carinated pots, rims can be divided into two size classes, 21–27mm and 31–38mm; there does not seem to be any general correlation between rim length and orifice diameter, the exception being that very large pots (>30cm orifice diameters) tend to have relatively long rims (>34mm length). Inverted carinated pots with small orifice diameters do not necessarily have short rims.

Among the everted indirect pots, again rim lengths fall into two groups: 22–29mm and 36–46mm (Figure 8), with a single outlier (the unusual sherd #1 mentioned above; see below) at 58cm possibly representing a third category. All of the large everted indirect pots previously identified in the bimodal distribution of orifice diameters (those with 28–35cm orifice diameters see above)

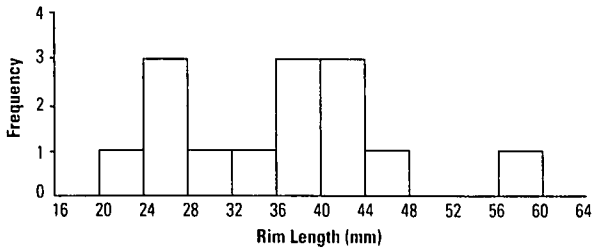

Figure 8 Keveoki 1 everted indirect pot rim lengths.

have long rims (36–42mm); however, indirect pots with small orifices do not necessarily have short rims.

All artefacts, except for one rim sherd, have straight or concave rim courses. Among the everted carinated dishes, 60% of rim sherds are straight and 40% are concave; among the inverted carinated pots, the proportion is 75% straight to 25% concave; and among the everted indirect pots it is 60% straight, 33% concave, and 7% convex. There thus appears to be a slight predominance (two-thirds to three-quarters) of straight to concave rims across the board, and the carinated vessels do not possess convex rims.

The majority of rim profiles are either parallel-sided, or demonstrate gradual thinning or gradual thickening towards the lip. Rims with external swelling are rare and restricted to a single inverted carinated pot; no rims with internal swelling have been recorded.

All of the carinated dishes possess parallel-sided (70% of the everted) or gradually thinning (30% of the everted, and the only inverted) rims. Among the inverted carinated pots, there is a predominance of gradually thinning rims (42%), followed by parallel-sided or gradually thickening (25% each) rims and rims with external swelling (8%). Among the everted indirect pots, gradually thinning rims also predominate (62% of rims), with parallel-sided rims accounting for the rest (38%).

The three conjoining direct globular bowl sherds each possess gradually thickening rims (a rim profile also seen only on one inverted carinated pot sherd).

Lips

Eight lip profiles have been identified from the 51 rim sherds (Figure 9); all identifications fitted neatly into the lip profile categories, without ambiguity.

The everted carinated dishes possess mainly flat lip profiles (60%), with externally (folded over) swelling, and internally (folded over) swelling, profiles each representing 20% of lips. The only inverted carinated dish has a flat lip profile, not seen in any of the everted carinated dishes (and further in support of the notion that everted carinated dishes are a separate vessel type to the inverted carinated dishes).

The three conjoining direct globular bowl sherds each have flat lip profiles.

The inverted carinated pots show a broad range of lip profiles, with 33% of lips being flat, 33% externally swelling, 17% rounded, 8% concave, and 8% stepped externally swelling.

The everted indirect pots are predominantly represented by rounded lips (80%), followed by a minority of flat (13%) and externally tapering (7%) lips. These statistics indicate that rounded lips are overwhelmingly the province of everted indirect pots, which have 80% of all the rounded lips in the collection,

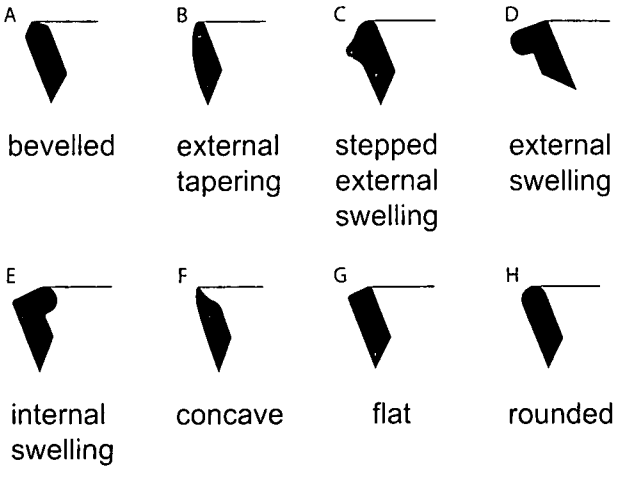

Figure 9 Keveoki 1 lip profiles.

and which are, unlike the everted carinated dishes, inverted carinated pots and direct globular bowls, poorly represented by flat and externally swelling lips.

There is no clear correlation among any vessel shape between lip profile and vessel size as represented by orifice diameter.

Manufacturing Marks

The Keveoki 1 ceramics were produced by paddle and anvil technique, as is evident by ribbed paddle patterns on a few sherds, and paddle edge marks on the external surfaces of the necks of the everted indirect pots (Figure 5). One sherd from an everted indirect pot (sherd #52) has extensive anvil dimple impressions on its internal surface (Figure 5). This sherd also features paddle edge marks on its external neck surface. The external and internal surfaces of vessels were generally smoothed prior to firing (e.g. sherd #6), sometimes possibly involving combing of the external vessel wall. No sherd evidences the use of coil technique.

Body Decoration

None of the Keveoki 1 sherds shows any evidence of painting, and none is red slipped. Thirty-four sherds have body decoration (Figure 5); two of these are too faded to determine technique or design, and have thus been left out of the following analyses. Of the 32 sherds with diagnostic body decoration, 40 spatially discrete designs (of 23 different types) have been identified. All body decorations are on exterior surfaces, except for sherds #1 and #65 where decoration is on the interior surfaces of the rims. All decoration was made while the clay was still wet (i.e. prior to firing). Decoration techniques include the incision or stamping of a carved design (there is uncertainty as to the method of decoration of sherd #1; Figure 5); impressions (10 varieties, using shell [sherds #66, 82, 83], fingertip [sherd #2], comb [dentate] [sherd #11], shell or comb [sherds #64, 79, 80], and indeterminate tools [sherds #2, 7, 12, 44, 50, 55-57, 60, 62, 63, 75, 76]); comb (multitined) incisions (4 varieties [sherds #12, 47, 65, 68, 75]); and freehand incisions (6 varieties [sherds #3, 8-10, 49, 59, 70, 72, 82, 83]; Figure 5). Table 2 presents the frequency of each. Given the small sample size, here we analyse body decoration by vessel form but not size; we include the decoration from sherd #1, the unusual long-rimmed indirect pot with uncertain orientation angle, with the everted indirect pots (the most likely orientation angle), although this sherd may come from a straight-rimmed or slightly inverted indirect pot.

Impressions with shells, 'combs' with two or more tines, or indeterminate tools (some of which are probably dorsal ridges of bivalve shells) banded around a vessel's shoulder or rim, and simple non-figurative freehand incisions (predominantly rows of short parallel slashes), are the most common techniques of body decoration (accounting for 57% and 27% of determinate decorations respectively). This is followed in frequency by comb incisions (14%) and fingertip impressions (3%). There is no clear-cut preference for body decoration type by vessel form. However, in contrast to the carinated vessels where most collected rim sherds are decorated, everted indirect pots are rarely decorated, with only one sherd demonstrating body decorations. It is of interest to note that six sherds show combinations of determinate design conventions, in particular impressions (with an indeterminate tool) and comb-incisions (sherd #12, 58, 75), impressions (with an indeterminate tool) and fingertip impressions (sherd #2), and shell impressions and freehand incisions (sherds #82, 83). Figure 5 shows most of the body-decorated, and some plain, sherds.

Lip Decoration

Fourteen of the 51 rim sherds have decorated lips (sherd #67 had two forms of decoration, paired punctuations and notching on its interior surface; Table 3, Figure 5). The most common lip decorations are small incised or impressed notches (sherd #43); and pinched, cut or impressed rows of semi-circular notches (e.g. sherd #72). The four instances of pinched, cut or impressed rows of semi-circular notches were found on everted carinated dishes. Lip decorations include forms also found on body decorations (e.g. multiple narrow oval impressions with indeterminate shell or tined tool [e.g. sherd #45]).

Discussion

Based on the above analyses, eight distinct vessel types and subtypes have been identified from the small collection of Keveoki 1 sherds:

1. Small inverted carinated dishes (sherd #68).
2. Small everted carinated dishes (e.g. sherd #62).
3. Large everted carinated dishes (e.g. sherds #79, 80).
4. Small inverted carinated pots (e.g. sherd #9).
5. Large inverted carinated pots (e.g. sherds #82, 83).
6. Small everted indirect pots (e.g. sherds #6, 45).
7. Large everted indirect pots (e.g. sherd #71).
8. Large inverted globular bowl (sherds #37, 42, 49).

These types represent varied associations between vessel shapes, rim and lip forms and decorative conventions, as discussed above and summarised in Tables 2–4. It is of interest that no everted direct (uncarinated or without neck) vessel has been identified. This differentiates the Keveoki 1 assemblage from both the ethnographically documented Motu assemblages of Boera, Porebada, Manumanu and other nearby pottery-making centres, and from pre-ethnographic period archaeological assemblages of Central Province ceramic production centres (e.g. Yule Island, Nebira) and Gulf Province recipient villages (e.g. Kinomere, OEB, OFC, OFF, Kikiniu) where such direct vessel forms have been noted.

Table 2 Number of body decorations, by decoration type and vessel form.

Vessel form	Incised or scratched	Impressed	Impressed or excised	Design		Inverted carinated dish	Everted carinated dish	Inverted carinated pot	Direct globular bowl	Everted indirect pot	Unknown	Total
					Shell	0	0	0	0	1	0	1
					Shell	0	1	0	0	0	0	1
					Shell	0	0	1	0	0	0	1
					Single lines	0	0	1	0	0	0	1
					Single lines	0	1	0	0	0	1	2
					Single lines	0	1	2	1	0	0	4
					Comb	0	0	0	0	1	0	1
					Comb	0	0	0	0	0	1	1
					Comb	0	0	1	0	0	0	1
					Comb	1	1	0	0	0	0	2
			Impressed or incised		Comb or ribbed paddle	0	0	1	0	0	1	2
					Comb (dentate)	0	0	1	0	0	0	1
					Comb or shell dentate	0	2	0	0	0	0	2
					Comb or shell dentate	0	1	0	0	0	0	1
					Fingertip	0	0	1	0	0	0	1
					Indeterminate row	0	1	0	0	0	2	3
					Indeterminate row	0	1	1	0	0	1	3
					Indeterminate row	0	1	0	0	0	0	1
					Indeterminate row	0	1	5	0	0	1	7
					Shell	0	1	0	0	0	0	1
					Shell	0	0	2	0	0	0	2
			Incised or scratched		Shell	0	0	0	0	1	0	1
						0	0	0	0	1	0	1

The late nineteenth and early twentieth century ethnographic records from Motu pottery manufacturing villages identify a number of pottery types, predominantly *uro* cooking pots morphologically akin to the Keveoki 1 everted indirect pots, *hodu* water jars (some of which appear to have also been morphologically like the Keveoki 1 everted indirect pots, but deeper than the *uro*) and *nau* dishes morphologically comparable to the Keveoki 1 everted carinated dishes (Arifin 1990:31). As Arifin (1990:31-39) notes, however, other forms were also documented ethnographically, with Chalmers (1887:122) documenting 10 named vessel types, Barton (1910:114) seven, and Finsch (1914:270) eight; more recent, mid-twentieth century commentators have documented up to 12 Motu pottery types. Not all of these pottery types are said to have been traded by the Motu. The predominance of everted carinated dishes and everted indirect pots at Keveoki 1 is consistent with the predominance of Motu *uro*, *nau* and perhaps *hodu*, and the less common large inverted globular bowl at Keveoki 1 is also consistent with the lower frequency presence of the morphologically comparable *kibokibo* inverted globular bowls of Motu ethnography (see also Bulmer 1971). Furthermore, a number of pot shapes were further subdivided into size classes by the ethnographic Motu to create distinctive vessel types (Arifin 1990:35), as appears to be the case also with the Keveoki 1 archaeological ceramics. However, two characteristics of the Keveoki 1 archaeological and Motu ethnographic ceramic assemblages differ significantly:

- the absence of direct (non-composite/non-carinated) vessels at Keveoki 1, with the exception of the large inverted globular bowl, but their common presence, such as with *oburo* pots in Motu ethnographic assemblages (see also May and Tuckson 1982:Figure 3.3, for large numbers of direct dishes of two sizes ready for *hiri* trade in a Motu village); and
- the frequent representation of inverted carinated pots at Keveoki 1, but lack of their explicit reporting from Motu ethnographic assemblages.

Here we limit ourselves to noting the above major points of similarity and difference, which we suggest are useful ways to explore historical junctions and disjunctions of *hiri* trade and its antecedents at Keveoki 1.

Similarly, comparisons between the Keveoki 1 assemblage and those of other archaeological sites of the Gulf and Central Provinces reveal points of similarity and difference. Let us begin by documenting that no reported assemblage from the Gulf-Central Provinces is quite like that of Keveoki 1, although the individual components of the Keveoki 1 assemblage tend to be represented within other archaeological traditions. For example, Vanderwal's Urourina pottery from Yule Island evinces 3-tined wave comb-incised body decoration akin to that of Keveoki 1 (e.g. Vanderwal 1973:Figure VI-12); one of Rhoads' Popo bowls is decorated by combing (Rhoads 1994:Table 12); and Bulmer's Styles IV-VI of the Port Moresby area contain a number of similarities (Bulmer 1978). In other words, the short-lived Keveoki 1 assemblage does not neatly equate with any of Allen's, Bulmer's, Vanderwal's, Rhoads' or Irwin's previously established archaeological ceramic 'styles', 'traditions', 'assemblages', 'attribute groups', 'types' or 'phases' from other parts of the southern PNG lowlands, although significant points of overlap do occur.

Most archaeological assemblages from the PNG southern lowlands are poorly dated (and indeed, some ceramic typologies – such as Bulmer's [1978] from the Port Moresby region – were not developed via temporally well-defined assemblages), and it is worth remembering that all of the reported chronologies were undertaken prior to the advent of AMS dating, which enables spot-dates on individual pieces of charcoal. For this reason, we initially undertook the following comparative analysis without being guided by established temporal frameworks. Keveoki 1 belongs chronologically to the early part of the late ceramic phase in the Gulf Province (see David 2008 for discussion), the one immediately following the so-called 'Ceramic Hiccup' on the southern Papuan coast (see Summerhayes and Allen 2007), and located at the beginning of the ceramic sequence that then continues uninterrupted to the period of the ethnographic *hiri*. As a short-lived village dating to the commencement of the ceramic sequence directly leading into the ethnographic *hiri* period, Keveoki 1 holds significance for better understanding the evolution of ceramic and trade relations across the Central and Gulf Provinces.

The closest published site to Keveoki 1 is Popo, an ancestral village of oral tradition located in a degraded sand ridge shortly inland of Orokolo Bay to the west of the Vailala River, some 22km northwest of Keveoki 1. Between 1974 and 1976, Rhoads (1994) undertook surface collections and excavations at Popo, retrieving 254 sherds and a radiocarbon age of 410±80 BP (ANU-2181) (in uncalibrated radiocarbon years) on wood from

Table 3 Number of lip decorations, by decoration type and vessel form.

	Impressed: indeterminate tool			Indeterminate incised or impressed		Indeterminate Pushed Out or Impressed	
Vessel form	Shallow ovals	Paired punctates	Row of horizontal impressions	Row of short vertical strokes	Small notches	Row of semi-circular notches	Notching on lip outer surface
Everted carinated dish	0	0	0	0	1	4	0
Inverted carinated pot	0	0	1	1	3	0	0
Everted indirect pot	1	0	0	0	1	0	0
Unknown	0	1	0	1	0	0	1
Total	**1**	**1**	**1**	**2**	**5**	**4**	**1**

the upper part of the sediment sequence. Given the sample's stratigraphic position, Rhoads (1994:55) tentatively suggested that some of Popo's excavated ceramics may slightly pre-date the radiocarbon age.

Rhoads (1994:56) notes that 'a clear uniformity is quite evident throughout the pottery sample' from Popo. Straight-rimmed pots (with 0° orientation angles) are relatively common, in contrast to Keveoki 1 where they are absent. Everted indirect pots are common in both assemblages, and each possesses similar rim and lip characteristics and orifice diameters. However, at Popo everted direct (uncarinated) bowls are common while they are absent from Keveoki 1, and generally the decoration on the Keveoki 1 sherds appears to demonstrate a greater incidence of shell and other tool impressions, while the drag-relief decorative technique appears to be well represented at Popo (but definite examples are not apparent at Keveoki 1). Rhoads (1994:62) concludes 'that a highly diverse trade ware arrived at the Popo site', in contrast to the highly standardised trade ware of Keveoki 1 presented here. In short, and some significant similarities notwithstanding, the Keveoki 1 assemblage of c.500 cal BP cannot be said to fit neatly into the neighbouring Popo assemblage uncertainly pre-dating 286–539 cal BP (see Table 1 caption for calibration method).

Geographically, the next-closest assemblages come from Kerema, 34km east of Keveoki 1. Frankel *et al.* (1994) obtained surface collections and undertook excavations at six sites (OEA, OEB, OEC, OFA, OFC, OFF), each poorly dated but apparently dating within the last c.500 years (here we exclude site ODR near Murua, dated to greater than 700±120 BP [SUA-1726], details of which have not been published; see Frankel and Vanderwal 1985:114-115). From a large sample of 15,247 sherds, vessel forms include those predominant at Keveoki 1 – inverted carinated pots and dishes (which Frankel *et al.* 1994 have identified as undifferentiated bowls), everted carinated dishes, everted indirect pots, and inverted globular bowls – as well as everted direct bowls/dishes and indirect pots with straight rims which have not been documented from Keveoki 1. The chronological order of the Kerema sites indicates that the vessel forms most alike those of Keveoki 1 date to the earlier part of the sequence (and therefore apparently near-contemporary in age), in particular site OFF, which has significant numbers of inverted carinated pots, everted carinated dishes, and everted indirect pots.

Body decorations at the Kerema sites do not quite match those of Keveoki 1, although a range of tools were used to create impressions, incisions and combing, as was the case also at Keveoki 1. The reported designs (Frankel *et al.* 1994:22-23) show a lower incidence of shell impressions and shell-like '3-narrow oval' impressions, and a greater range of linear incisions, at the Kerema sites. Thus while some design similarities are apparent, the Keveoki 1 assemblage cannot be said to correspond precisely with any of the Kerema assemblages presented by Frankel *et al.* (1994).

Further to the west, site OAP at Kinomere on Urama Island, midway between the Purari and Kikori Rivers and 114km west of Keveoki 1, was excavated by Frankel *et al.* (1994). The site revealed 1379 ceramic sherds which, according to oral traditions and by stratigraphic association with a single radiocarbon age, largely date to less than 410±80 BP (SUA-1879), and are thus

Table 4 Summary characterisation of Keveoki 1 vessel types. Note: Orientation angles for small versus large vessel forms may be of a narrower range than discussed in text for that vessel form of undifferentiated size, because in some cases orifice diameters were indeterminate and therefore it was unclear which orifice diameter category a particular orientation angle should go into. The % of rim courses is for some vessel forms divided into small versus large vessels; hence values are slightly different from those on undifferentiated vessel size discussed in text.

Vessel Type	Size	# of Sherds	Orifice Diameter (cm)	Predominant Orientation Angle (°)	Predominant Rim Length (cm)	Predominant Rim Course (% representation)		Predominant Outer Rim Profile (% representation)			Predominant Lip Profile (% representation)				Lips Decorated (%)
						Straight	Concave	Parallel	Gradually Tilting	Gradually Thickening	Externally swelling	Internally swelling	Flat	Rounded	
Inverted carinated dish	small	1	17	335	1.4	100	0	0	100	0	0	0	0	100	0
Everted carinated dish	small	2	12-18	10-20	?	100	0	100	0	0	0	50	50	0	50
	large	5	26-33	5-15	2.5-4.9	80	20	60	40	0	20	20	60	0	60
Inverted carinated pot	small	4	16-22	315-325	2.4-3.6	75	25	50	25	25	25	0	0	25	50
	large	7	24-42	325-345	2.1-3.7	75	25	13	50	25	43	0	57	14	50
Everted indirect pot	small	10	17-24	15-45	2.2-4.5	67	33	50	50	0	0	0	10	80	10
	large	4	28-35	15-30	3.6-4.2	50	50	25	75	0	0	0	25	75	0
Inverted globular bowl	large	3	30	n/a	n/a	33	67	0	0	100	0	0	100	0	0

likely to be more recent than the Keveoki 1 assemblage (Frankel *et al.* 1994:11, 13). The vessel forms from Kinomere are comparable to those of Kerema. However, the incised and comb-impressed zig-zag motifs repeatedly illustrated in Frankel *et al.* (1994:22) are not represented at Keveoki 1.

Further to the west again are the sites of the Kikori River excavated by Rhoads (1980) and Bowdler (in Rhoads 1980, 1983). The Aird Hills sites (including Samoa) are either undated or of uncertain age, but include pottery sherds dating to sometime between 1850±95 BP (I-6153) and 2430±370 BP (ANU-2061A) as well as later assemblages (Rhoads 1983). Here the sample size is small. Everted indirect pots are represented in the Aird Hills, as are direct rim forms. However, it is uncertain whether or not inverted carinated pots or everted carinated dishes are present.

Along the mid-Kikori River, the site of Kikiniu (Rhoads' Kulupuari), whose early phase dates to 1500-1000 cal BP (David 2008), has revealed a large number of sherds. All of the vessel forms found at Keveoki 1 are well represented here, although in the main the orientation angles of the everted carinated dishes at Kikiniu (some of Rhoads' 'simple composite bowls') appear to be straighter (closer to 0°, i.e. more closed) than those of Keveoki 1 (which range from 5° to 20°).

Many of the Kikiniu sherds are red slipped or painted, unlike those of Keveoki 1. The Kikiniu and other Kikori River sherds also show a very broad range of incised, gashed and gouged decorative forms, mostly linear but including also a broad range of triangular, circular and hemispherical motifs, as well as rope-like designs all generally unlike those of Keveoki 1 (Rhoads 1980).

To the east, Vanderwal's (1973) Yule Island and Hall Sound assemblages show the presence of all the Keveoki 1 vessel forms, but again include significant numbers of forms absent from Keveoki 1, in particular everted direct dishes and bowls. Body decorations are again significantly different from those of all phases, despite similarities with some Urourina comb-incised sherds.

We estimate that approximately 40 to 50 individual morphologically diagnostic vessels are represented by the Keveoki 1 assemblage reported here; not a large sample size, but one with which we can begin to characterise the site's ceramic conventions. Perhaps the greatest difference between the Keveoki 1 ceramic assemblage and many of the other archaeological assemblages of the Gulf and Central Provinces is the total absence of red slipped or painted sherds and the very narrow (standardised) range of vessel forms and decorative conventions at Keveoki 1. We await a larger sample size from Keveoki 1 before engaging in a more detailed comparative assessment of all variables, in particular how these relate to ceramic assemblages from potential Central Province source locations.

Conclusion

The Keveoki 1 surface collection represents a relatively homogeneous assemblage with respect to vessel shapes, rim and lip characteristics, and lip and body decoration. This implies that either most or all of the ceramics came from a limited and established source – perhaps even a single village – or from a broader region with restricted variability in conventions of manufacture of ceramic tradeware. In either case, the implication is of the presence of a ceramic industry that is already specialised in the manufacture of quantities of trade vessels of a limited range of techniques, vessel forms and decorative conventions. In itself the existence of specialised ceramic industries at Keveoki 1 implies the presence of established trade relations with presumably Motu (or ancestral Motu, but possibly Yule Island) ceramic manufacturers and long-distance mariners c.450–500 cal BP. It is interesting that the ceramic assemblage from this short-lived village does not exactly match ceramic assemblages from elsewhere, indicating that ceramic conventions – in particular decorative styles – rapidly changed through time. The Keveoki 1 assemblage may also offer a further avenue of enquiry into such questions, with the presence of long everted rims apparently carrying makers' marks (possibly Keveoki 1 sherd #1) – see Arifin (1990) for ethnographic details, including gender specialisation – that we tentatively suggest may signal intra-community social differentiation, with long-distance trade by specialised (male) seafarers carrying women's ceramic products necessitating the creation of makers' marks for purposes of recognition. Tracking the history of rim lengths and symbols may be one proxy measure of such processes of craft specialisation in long-distance trade by specialised members of ceramic manufacturing and seafaring communities. Such processes – both from archaeological and ethnographic case studies – remain open for investigation.

Keveoki 1 has the potential to allow archaeologists to determine the nature of ceramic characteristics for a very narrow period of time, unencumbered by the reworking of ceramic sherds between different strata that is a common problem at multilevel sites (especially in village sites where postholes tend to be abundant, or where gardening activities have disturbed deposits). Because the Keveoki 1 village site was short-lived, its ceramic assemblage can be treated as indicative of the received traded ceramics of that time for this specific area.

With this advantage of short duration in mind, Keveoki 1 possesses stratified information relevant to understanding trade partnerships between source locations (villages) from the vantage point of a single recipient village for a specific time in history, c.450-500 cal BP. Given the pulsating nature of long-distance maritime trade and village locations (the two appear to be connected; see David 2008), our ability to identify accurately ceramic conventions for specific points of time and place at both recipient and producing ends of the *hiri* system (and its antecedents) will allow us to investigate the dynamics and sociality of local land-use and of regional processes of change through time, and connections between these factors.

Previous archaeological researchers across the Gulf and Central Provinces noted that the *hiri* system of long-distance maritime trade, as recorded ethnographically, has a limited time depth not exceeding 300 to 500 years. Based on 99 new AMS radiocarbon determinations and rich ceramic assemblages from the Kikori River in the distal western recipient end of the *hiri* system, David (2008) has recently refined this chronology by suggesting that trade partnerships relating to the ethnographic *hiri* began to be established some 500 cal BP, in general agreement with the earlier observations of Allen, Bulmer, Frankel *et al.*, Rhoads, and Vanderwal, each founded on large regional ceramic databases but only a few conventional radiocarbon dates, often of limited chronostratigraphic certainty. However, earlier periods of long-distance maritime trade between the Central and Gulf Provinces have also long been documented (e.g. Rhoads 1982, 1983). In Samoa, in the Aird Hills, the earliest (imported) ceramics

date to between 1850±95 BP (I-6153) and 2430±370 BP (ANU-2061A), and at Kikiniu (Rhoads' Kulupuari) a rich early ceramic assemblage dates from 1597±38 BP (Wk-18906) to 1145±33 BP (Wk-18903) (following its recent re-excavation and redating; see David 2006). The paucity of ceramics dating to between c.950 and 500 cal BP in this part of the Gulf Province, and to some degree also in the Central Province (although the few radiocarbon dates available in the latter requires further dating refinements; e.g. Bulmer 1978), certainly suggests a period of major ceramic transformation at the end of what Summerhayes and Allen (2007) call the Early Papuan Pottery (EPP) phase. Indeed, in the Central Province the relationship between the end of the EPP (the age of which is presently difficult to determine, but which we suggest is likely to be c.950 cal BP based on the expanded Kikori River radiocarbon database) and the commencement of Motupore around 650–700 cal BP (800 BP) remains equivocal (but see Bulmer 1978).

The paucity of known ceramics dating to between c.950 and 500 cal BP in the recipient Gulf Province region suggests a number of possibilities. There may have been a cessation of long-distance maritime trade, or a change in the location of Gulf Province villages targeted for trade of pottery by Central Province mariners (e.g. during the periods of ceramic hiatus in the Kikori River, maritime trade with Central Province pottery manufacturers may have been restricted to more proximal trading relations), or, as Rhoads (e.g. 1980) has argued, there may have been a continuation of long-distance trade but changes in settlement systems and the location of regional Gulf Province trade centres through time (with ceramic-receiving villages occurring in the Gulf Province between c.950 and 500 cal BP but not yet having been found). There may also have been a combination of these factors. While Rhoads (1980) favours shifts in settlement locations, David (2008) has suggested that Gulf Province archaeological history should be considered in terms of pulses in settlement systems *and* long-distance trade partnerships, the two being causally connected. The establishment of formal and inherited trade partnerships between Gulf and Central Provinces traders – for the acquisition of copious amounts of sago and canoe logs by Central Province mariners, and ceramics and shell valuables by Gulf Province sago producers – necessitated the growth of trade centres in the destination regions of the Gulf Province (see also Frankel *et al.* 1994). Frankel *et al.* (1994) have suggested that the ethnographically recorded large delta villages of the Gulf Province probably emerged as trade centres as a result of the *hiri* system within the last 400 to 500 years. The paucity of archaeological evidence for ceramics and village settlements in the Kikori River area and other parts of the Gulf Province between c.950–500 cal BP thus signals a reorganisation of settlement systems and domestic social configurations coupled with broader shifts in trade relations with long distance maritime partners. As Allen (e.g. 1984) and Bulmer (e.g. 1979, 1982) have each noted in their separate ways, these archaeological pulses from the Gulf Province are matched by population increases, shifts in hinterland-coast social relations, and an increased specialisation and centralisation of ceramic production (e.g. at Motupore) within the pottery-producing region of the Central Province (e.g. Bootless Bay). It is within such broader frameworks of socio-geographical connectivity that the archaeological evidence from the Gulf Province, and in our case Keveoki 1, needs to be seen. The Keveoki 1 finds of c.450–500 cal BP position Keveoki 1 right at the beginning of this late phase of ceramic production and trade in the Central-Gulf Provinces following the end of the EPP and the 'Ceramic Hiccup'. This was a strategic chronological moment in the evolution of *hiri* trade ceramics leading directly to the ethnographic period.

Why there should be major differences between the Keveoki 1 and other archaeological ceramic assemblages of the southern PNG lowlands remains to be determined. Keveoki 1 might represent an archaeological 'moment', rather than a time-averaged assemblage containing the sum of ceramic conventions from longer temporal phases as may be the case with other archaeological assemblages. Alternatively, the results from Keveoki 1 may reflect the small sample size at this site. Still another possibility may be that the Keveoki 1 assemblage represents a very particular and short-lived instance of trade between specific trade partners. It could also be that the source village for Keveoki 1's ceramics was itself short-lived and therefore failed to register significantly in other archaeological assemblages dominated by other source ceramics. Whatever the reason, Keveoki 1's status as a short-lived village rich in ceramics at the recipient end of the *hiri* trade system (and its antecedents) identifies it as an important site for interpreting the historical and social dynamics of long-distance maritime trade in southern lowland PNG. This is particularly so given the apparently pulsating nature of exchange relations between seafaring Central Province Motu (ceramic) traders and Gulf Province sago producers, including transformative phases during which ceramics appear to be absent or poorly represented in the Gulf Province (e.g. akin to Irwin's 'Ceramic Hiccup' phase, 950-500 cal BP; see David 2008; Irwin 1991; Summerhayes and Allen 2007 for discussion). Further research at Keveoki 1 and other nearby sites should help to elucidate these questions.

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