– ARTICLE –

Jigsaw – Reconstructing the Ruisasi 1 Incised Pot

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ABSTRACT

While undertaking a detailed conjoin study of sherds from Ruisasi 1, an archaeological site located along the Caution Bay coastal plain, 19 variably weathered sherds were found to belong to one incomplete incised pot. This article details the incised pot and explores what conjoining and reconstruction of this vessel can tell us about the vessel's manufacture, fragmentation, deposition and the sherd deposit at Ruisasi 1. The site was excavated in 2010, revealing at depth a large number of highly fragmented ceramics. By examining the conjoining sherds from the incised pot, it is possible to work out whether the deposit formed as a single, archaeologically instantaneous event or as a gradual accumulation of more or less different depositional events.

Keywords: Archaeological pottery, conjoin analysis, conservation, weathered pottery, Caution Bay

INTRODUCTION

Ruisasi 1, an archaeological site located at Caution Bay, Central Province, Papua New Guinea (PNG) is located 20 km northwest of Port Moresby (for a site report, see David *et al*. this volume). In 2010, archaeological excavation of a 1 × 1 m square (Square A) revealed an unusual concentration of ceramics, totaling 19,558 sherds weighing 30.4 kg, comprising 91% of the total weight of all excavated cultural materials from that square.

Within Square A, ceramics were found through 88 cm of the excavated sequence. However, the greatest volume of sherds were found within a 26 cm-thick dense ceramic deposit extending from XU15 down to XU28 (28–54 cm depth below the ground surface), consisting of 16,311 sherds, (83% of the total sherd assemblage by number) weighing 28.6 kg (94% of the total sherd assemblage by weight) (see Figure 5 and 6 and Table 3 in David *et al*. this volume). This dense ceramic horizon can also be described as a 'pottery midden'. In this deposit, sherds occur at an average density of 63,221 sherds/m^3 or 111 kg of sherds/m^3. The question remains as to whether the sherds in the dense horizon accumulated quickly or gradually in a single or multiple events, and whether at the time of deposition they constituted more or less whole or already broken pots.

The modelled age of the village occupation at Ruisasi 1 is 1630–1220 calBP, with a duration of occupation estimated between 170 and 290 years; however, deposition of the dense pottery horizon was of a shorter duration within this span (David *et al*. this volume). Previous published ceramic studies from Caution Bay include a study of three Lapita pots lacking body decoration (David *et al*. 2013) and a study of the deterioration and conservation of two of these plain ware Lapita vessels (Jones-Amin 2014). This paper examines what the reconstruction of one vessel from Ruisasi 1 can tell us about how the Ruisasi 1 Square A assemblage was deposited. Of concern are the manufacture, use, fragmentation and deposition of the vessel's sherds.

CONJOINING AND FRAGMENTATION

In archaeology, conjoining is commonly undertaken to understand reduction sequences (Villa 1982), especially those of stone artefacts. In addition conjoining helps to understand natural versus cultural fragmentation processes (Ulm 2006), discard behavior (Chapman and Gaydarska 2006), the calculation and meaningfulness of Minimum Numbers of Individual (MNI) objects (Singer 1984), post-depositional taphonomy, site formation processes, and the stratigraphic integrity of sediments (e.g. Skibo *et al*. 1989: 402; Villa 1982: 276).

Chapman and Gaydarska (2006) introduced the important notion of 'fragmentation' to the study of conjoining artefacts, where objects were sometimes deliberately broken, with the fragments re-distributed 'after the break', causing the behavioural contexts of the parts to be spatially and socially enchained (Chapman 2013b: 8, 24). 'Enchainment' concerns social connections made by spreading fragmented parts with social values. Deliberate fragmentation has been argued for figurines, shell bracelets and ceramics of the Late Copper Age at Dolnoslav, Bulgaria; the Copper Age, at Hârşova, Bulgaria; and the Middle Bronze Age at Hirbemerdon Tepe in the Tigris River valley in Turkey, for example (Chapman and Gay-

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darska 2006; Sand *et al*. 2013; see also Abend *et al*. 2010). Conjoined artefacts found across two or more locations, such as pits or sites, can be considered as examples of such social processes and transactions.

Conjoin analyses are typically undertaken to resolve questions of chronology and site stratigraphy, bypassing in the process the possibility of deliberate fragmentation. Chapman's (2013b:7) notions premise that accidental breakage of items of material culture may not always have been the overarching cause of fragmentation among objects. Rather, acts of deliberate breakage and deposition, as opposed to the 'discard' of trash as conventionally defined, appear to have been more common than previously assumed. Nevertheless, conjoin analysis remains a valuable tool by which to examine patterns of discard and the post-depositional reworking of sediments.

SORTING SHERDS

The majority of excavated sherds from Ruisasi 1 are small to tiny fragments, with 1340 sherds, representing 6.9% of the 19,558 sherds from Square A, being ≥3.0 cm long (David *et al.* this volume). A 3.0 cm minimum length threshold was used in searching for conjoins among the undecorated body sherds. All incised sherds and rim sherds were included, regardless of length. There are six incised sherds and rim sherds <3.0 cm long and weigh 12.4 g in total. Each of the considered sherds was examined and separated into fabric types. Separation into fabric types was undertaken by laying all sherds out after temporary labelling with individually assigned sherd numbers by XU (Figure 1). Conjoins were looked for across all XUs. The process of searching for conjoins across all XUs began by eye-searching with a magnifying lamp, stereo-microscope (×30 magnification), and hand-held micro-microscope (×60 magnification) for sherds belonging to the same fabric type.

Joining rim sherds were searched for by comparing rim thickness, orientation angle and inclination angle. The measuring of orifice diameters on a rim chart further helped to determine whether rim sherds with similar attributes could or could not have come from the same vessel. There are no indications from this assemblage that any of the vessels were anything other than round in plan view (taking minor variability's typical of hand-made vessels, and post-depositional sherd distortion, into account).

Manufacturing attributes were also used to determine if sherds could join or belong to a common fabric type.

Figure 1. Sherds sorted into fabric types, Ruisasi 1 Square A, Quarantine lab, Monash University, Clayton (photograph: Holly Jones-Amin).

Fabric colour, visible inclusions and red slip were the most recognizable manufacturing attributes, along with the distribution and size of paddle marks on exterior surfaces and anvil dimples on interior surfaces. The size, scattering, frequency, shape, rounding and orientation of inclusions were used to differentiate each fabric type. The inclusions proved to be a key variable when looking at sherds that appeared to have identical characteristics at first glance, but actually represented multiple vessels.

In order to be classified, each fabric type must have two or more sherds with shared attributes, such as surface finish, inclusions or red slip, or be an 'orphan sherd' exhibiting unique characteristics such as decoration. Only old fractures were considered when assigning sherds to fabric types. New fractures found in a sherd (created during excavation, washing or transit and bagged and labelled together) were adhered, and unless the newly broken sherd joined to another sherd, it was omitted from joining results. All sets (rims and body sherds; see below) and all fabric types were given numeric identifying codes. A rim set has two or more joining rim and/or body sherds, or has additional rim sherds with the same rim thickness, orientation angle, inclination angle, orifice diameter, Munsell colour, inclusions, and sometimes red slip. A body sherd set may be made up of associated sherds (non-adjoining sherds that are likely to be from the same vessel) only, or joined sherds only, or joined and associated sherds with the same range of Munsell colours and inclusions and, when present, red slip matches. Wall thickness was discounted as a distinguishing comparative feature due to deterioration and variability found in hand-made paddle and anvil vessels.

Minimum number of vessels (MNV) was established using a method documented by Voss and Allen (2010: 1) who divide MNV counts into quantitative and qualitative assessments. Quantitative assessments are based on counts of rim sherds, bases or handles, which are useful measures for calculating mass-produced ceramics where vessel attributes are highly standardized (Voss and Allen 2010: 1). However, quantitative MNV counts may result in very low vessel counts among handcrafted and plainware vessels, as MNV usually disregards body sherds, which represent the largest number of sherds in an assemblage, and do not take clay fabric, inclusions or manufacturing technique into account (Rice 1987: 292; Voss and Allen 2010: 1). Qualitative MNV assessments subjectively count and group together sherds that are likely to have come from the same vessel. The strength of this latter approach is that it uses multiple attributes, can be used for body sherds and is thus less likely to undercount handcrafted and undecorated vessels (Rice 1987: 292).

Out of 1340 ≥3 cm long sherds, 140 conjoined. There is one incised pot (based on 17 conjoining sherds and two associated incised sherds). Other joining sets represent 23 separate vessels with 49 conjoining rims (some with additional body sherds) (see Table 1). There is one isolated incised 'orphan' rim sherd (see Figure 11, David *et al*. this volume). There are also 22 other vessels (based on 63 conjoining body sherds) (see Table 2). These conjoining body sherd sets could be counted as individual vessels based on distinctive fabric colour, visible inclusions and red slip.

There are a total of 145 different Fabric Types (based on 665 sherds, including conjoined rim and body sherd sets), each Fabric Type being distinctive. The 145 Fabric Types include 217 sherds that conjoin or cross-mend, and 448 associated sherds which could not be physically joined but that arguably came from those same vessels as determined by macro-morphological features. The sherds are on average small (*c*. 40 × 30 mm long). The number of sherds per Fabric Type ranges from two to 26 (Table 1).

Using qualitative MNV analysis, the MNV of vessels is 47 (based on the sum of conjoined sets, an incised orphan sherd and an incised vessel). However, the sum of conjoined sets and associated sherds gives a maximum number of 146 (conjoining sets plus non conjoining sets of distinctive fabric types). Eleven per cent of sherds ≥3 cm long conjoin. Forty-two per cent of sherds ≥3 cm long were sorted into fabric types (this includes conjoined rim sets, body sherds and an incised pot). Fifty percent of the sherds were excluded from analysis because they could not be sorted into fabric types due to post-depositional surface and sherd edge weathering. No complete or semi complete vessels were identified during conjoining. The majority of the vessels at Ruisasi 1 are represented by joining sets of only 2–3 sherds, in most cases representing no more than 5% of the original vessels. The three largest conjoin sets with three or more sherds are an incised pot; a rim conjoin set #7 (see David *et al*. Figure 9B, this volume), consisting of four conjoined sherds; body sherd set #2 consisting of a set of five conjoining sherds and a set of two conjoining sherds, it is improbable that the deposit represents a set of intact pots.

INCISED POT – FINDING MISSING PARTS OF THE PUZZLE

Incised sherds were examined for conjoins. During initial sorting, 12 incised sherds were identified. One of these sherds is an 'orphan' rim sherd (XU20, sherd #66) (see David *et al*. Figure 11, this volume). All but two of the other incised sherds conjoined into two separate sets that belong to a single vessel. One set consists of nine sherds from XU19, XU20, XU22, XU23 and XU26, while the other has six sherds from XU18, XU19, XU27 and XU28 (Figure 2).

After all possible joining had been achieved from sherds ≥3.0 cm long, sherds <3.0 cm long from all XUs that included the two joining sets (XU18-XU28) were checked against the partially conjoined vessel. Sherds from adjacent XUs were also examined to determine whether there were additional body sherds that may join. During this exercise, two additional joining sherds were found: the most important puzzle pieces, a triangular sherd (XU19)

Table 1. *Conjoined rims and associated sherds*

Sherd #	Red-slipped/painted - External	Red-slipped/painted - Internal	Rim length (mm)	Angle (degrees)		Orifice		Conjoins	Associated sherds
				Orientation	Inclination	Diameter (mm)	% of diameter present		
1		1	19.2	45	110	21	10	XU24 #3 + XU25 #10 + XU27 #7	
2		1	22.4	40	90	21	20	XU23 #3 (3C) + XU23 #3 (3C) + XU23 #1	
3		1	20.5	30	90	21	25	XU25 #55 + XU24 #73 + XU24 #72	XU25 #53
4		1	17.1	40	100	29	10	XU24 #76 + XU24 #75	XU25 #61
5	1	1	18.0	40	110	26	10	XU22 #92 +XU28 #1	
6			18.7	45	85	19	10	XU20 #8 + XU21#3+XU22 #91	
7		1	16.3	40	95	28	10	XU23 #161+ body sherds XU23 #160 + XU23 #37 + XU23 #26	XU23 #153
8			15.6	40	80	23	10	XU18 #56 + XU25 #48	
11	1	1	17.6	50	100	18	20	XU20 #10 + XU20 #11	
12		1	17.9	40	100	21	15	XU24 #77 + XU24 #78	
13		1	19.5	50	110	22	10	XU22 #13 + XU22 #4	
16		1	14.1	30	125	26	10	XU24 #62 +XU23 #157	
18		1	14.7	40	135	19	15	XU25 #58 + XU24 #59	
19	1	1	15.9	50	140	20	20	XU24 #63 + XU23 #158	
20	1	1	15.2	40	95	27	10	XU24 #67 + XU24 #6	
21	1	1	23.1	40	80	23	20	XU22 #87 + XU25 #52	
22	1	1	21.6	55	85	25	20	XU22 #6+XU23 #7	
24		1	12.8	30	140	21	20	XU24 #69+XU24 #1	
25		1	20.0	30	140	21	10	XU24 #70+XU24 #71	
26	1	1	25.6	70	135	23	25	XU18 #2 +XU18 #1	
27		1	15.2	40	105	22	10	XU24 #64 +XU24 #65	
28	1	1	17.8	40	110	18	10	XU26 #72 + XU25 #49	
29	1	1	17.2	45	95	17	10	XU25 #10 + XU25 #11+ body sherds XU25 #5 + XU25 #7	XU25 #8

decorated with an incised line, which joins two rim sherds from XU19 and XU20, each with an incised line; and a body sherd from XU22 that was found to join onto two plain body sherds from XU20 and XU22. No associated sherds were found in the sherds <3 cm long from XU17, XU25 and XU28.

The incised pot is made up of 17 conjoining sherds and two associated sherds representing *c.* 30% (on visual inspection only) of the original vessel (Figure 3). The reconstructed sherd set has four or more missing incised sherds that have not been located (see gaps in the incised zones of the pot Figure 3). Five of the conjoined sherds are plain body sherds ≥5 cm long; 12 are incised sherds of which five are <3 cm long (all *c.* 1 × 1 cm is size). The incised pot has more conjoining sherds than any other joining set from Ruisasi 1; it is the only vessel with joining incised sherds in the entire assemblage. An additional 26 non-incised, red slipped body sherds that appear to be associated but have not physically joined to the vessel may indicate that the conjoined set was slightly larger than the sherds conjoined representing *c.* 30% of the vessel. These associated sherds range from 0.6–5.2 cm in length, with 20 of these associated sherds being <3 cm long. The incised pot join set weighs 96.4 g. The two associated sherds with identical incised decoration weigh 5.0 g (XU19 sherd #107) and 7.2 g (XU19 sherd #203).

Figure 4 illustrates that sherds belonging to the incised pot were scattered over 11 XUs, (XU18-XU28), from 34.9 cm to 54.2 cm depth below the surface, with a thickness of 19.3 cm (see Table 1 in David *et al.* this volume). Eight sherds are from XU19, and no sherds belonging to this join set were found from XU21, XU24 and XU25.

Table 2. *Ruisasi 1 Square A conjoined Fabric Types and associated body sherds*

Fabric Type	Red slip internal	Red slip external	'Finger' dimple impressions on inner surface	Munsell colour exterior	Munsell colour interior	Wall thickness (mm)	Joins	Associated sherds
1		Weak red 10YR 4/4	Y	Pale brown 10R 6/3	Pale brown 10R 6/3	4.9–6.5	XU26 #15 + XU26 #40	XU21 #4, XU23 #135
2		Red 2.5YR 5/6	Y	Light brown 7.5YR 6/3	Light brown – gray 7.5YR 6/3–5/1	1.8–5.6	XU26 #69 + XU26 #69 + XU26 #5 + XU23 #95 + XU23 #82 XU26 #10 + XU25 #37	XU21 #38, XU23 #59, XU23 #71, XU23 #139, XU24 #15, XU24 #39, XU24 #42, XU24 #54, XU25 #38, XU26 #63, XU26 #117
3			Y	Pinkish white-pink 7.5YR 8/2–7/4	Pink 7.5YR 7/4	3.2–3.6	XU19 #151 + XU19 #172	XU18 #91, XU25 #13, XU25 #27
4		Weak red Hue 10R 4/4	Y	Pinkish gray-brown 7.5YR 6/2–5/2	Brown 7.5 YR 5/3	3.4–4.8	XU18 #48 + XU18 #130 + XU19 #144	XU17 <3 cm, XU19 #94, XU20 #31, XU21 #61, XU21 #120
5		Red 10YR 5/8–4/8	Y	Light brown 7.5YR6/4	Light brown 7.5YR6/4	8.7 neck 5.2 body	XU23 #20 + XU22 #82	XU23 #108 XU23 #97 XU26 #5
6			Y	Light gray to red 7.5YR 7/1–2.5YR 6/8	Red 2.5YR 6/8	5.5–9.6	XU26 #36 + XU26 #13 + XU26 #97 XU26 #30 + XU26 #105	XU17 #38, XU18 #37, XU19 #46, XU22 #49, XU25 #20, XU25 #18, XU26 #23, XU26 #56
7		Dusky red 2.5YR 4/4	Y	Light brown to brown 7.5YR 6/4–5/4	Light brown to brown 7.5YR 6/4–5/4	3.5–4.4	XU19 #117 + XU19 #80 + XU19 #144 + XU18 #5 + XU18 #130	XU19 #3
8			Y	Red 2.5 YR 5/6	Red 2.5 YR 5/6	2.6–4.3	XU21 #103 +XU21 #141	
9			Y	Pale brown 10YR 6/3	Pale brown 10YR 6/3	Neck 8.5 Body 5.0–7.7	XU26 #51 + XU26 #3 + XU26 #101	
10			Y	Pale brown to brown 10YR 6/3–5/3	Pale brown to brown 10YR 6/3–5/3	Neck 8.5 Body 5.6–6	XU23 #103 + XU23 #76	
11	Red 7.5R 4/6		Y	Pale brown 10R 6/3	Pale brown 10R 6/3	Neck 10.2 Body 5.7–7.2	XU24 #27 + XU26 #68 + XU26 #109	
12			Y	Dark gray 10YR 4/1	Pink 7.5YR 7/3	3.3–4.9	XU21 #24 + XU21 #147	

Continued over

Table 2. *Continued*

Fabric Type	Red slip internal	Red slip external	'Finger' dimple impressions on inner surface	Munsell colour exterior	Munsell colour interior	Wall thickness (mm)	Joins	Associated sherds
13	Red 10R 4/6		Y	Light brown to reddish yellow 7.5YR 6/4–6/6	Light brown to reddish yellow 7.5YR 6/4–6/6	Neck 7.1–8.3 Body 4.8 – 5.1	XU25 #4 + XU26 #112	
14			Y	Light brown to red 10R 5/8–7.5YR 6/3	Light brown to red 10R 5/8–7.5YR 6/3	Neck 8.0 Body 4.0–5.9	XU27 #22 + XU26 #83 + XU25 #33 + XU26 #58	
15		2.5 YR 5/6 red	Y	Pale brown 10 YR 6/4	Pale brown 10 YR 6/4	3.1	XU23 #113 + XU23 #112 + XU23 #100 + XU23 #25	
16			Y	Pink to reddish yellow 5YR 7/4–7/6	Pink to reddish yellow 5YR 7/4–7/6	Neck 8.2 Body 4.2	XU18 #92 + XU18 #35	XU17 #35, XU18 #33, XU18 #47, XU18 #98, XU18 #109, XU19 #60, XU19 #101, XU19 #138, XU21 #13
17		Weak red 10R 5/4–4/4	Y	Brown 7.5 YR 5/4	Brown 7.5 YR 5/4	4.2–6.9	XU18 #23 + XU19 #119	XU23 #23, XU24 #30, XU27 #29
18		Red 10R 5/6	Y	Light brown 7.5YR 6/4	Light brown 7.5YR 6/4	3.9–6.4	XU26–50 + XU23–16	
19		10R 5/6 red		Light brown 7.5YR 6/4	Light brown 7.5YR 6/4	3.0–3.5	Sherds < 3cm from XU19 + XU21	XU19 #144, XU22 #58, XU23 #77, XU23 #92, XU25 #42, XU27 #10, XU27 #21
20				Reddish gray to dark reddish gray 5YR 5/2–4/2 2.5YR 5/6–6/6	Reddish gray to dark reddish gray 5YR 5/2–4/2 2.5YR 5/6–6/6	4.9–7.9	XU24 #17 + XU26 #26	
21				Reddish brown 5YR 5/3	Pinkish gray 7.5YR 6/2		XU18 #123 + XU18 #106	
30		Red 10R 4/6		Light reddish brown 5YR 6/4	Light reddish brown 5YR 6/4	4.2–5.9	XU21 #24 + XU24 #21	

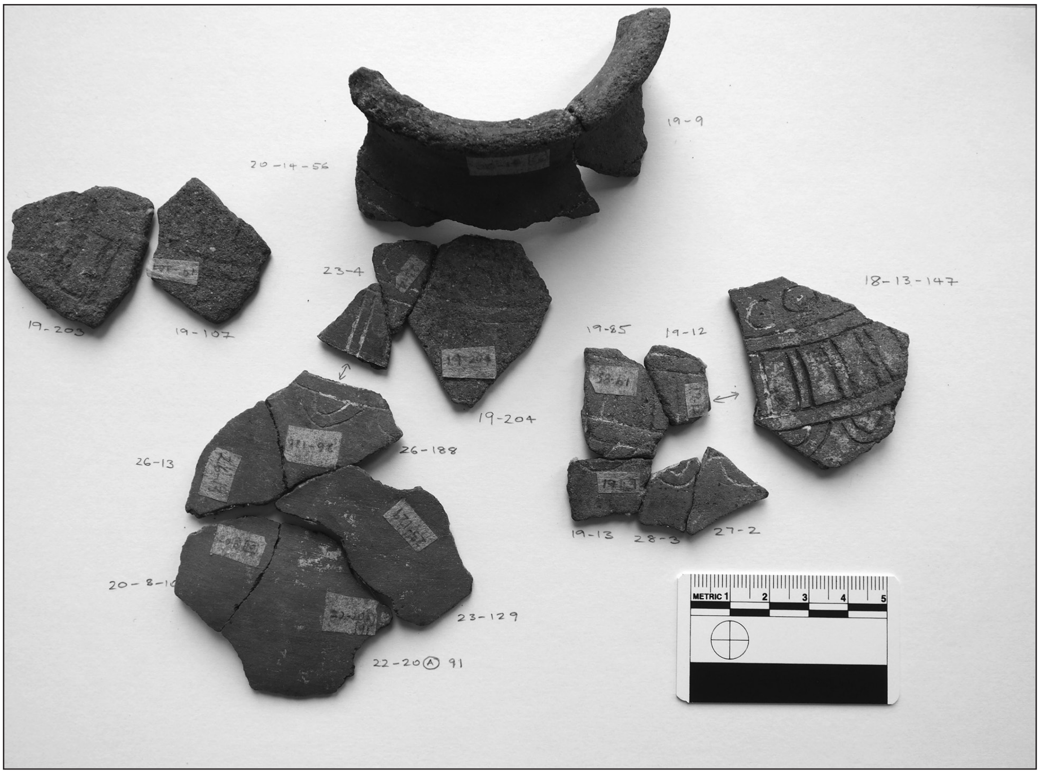

Figure 2. Incised pot during treatment. The white tape documents details of the sherds' provenance (e.g., XU, excavator's in situ artefact code, etc.) (photograph: Holly Jones-Amin).

Figure 3. Incised join set after joining and conservation (photograph by Steve Morton).

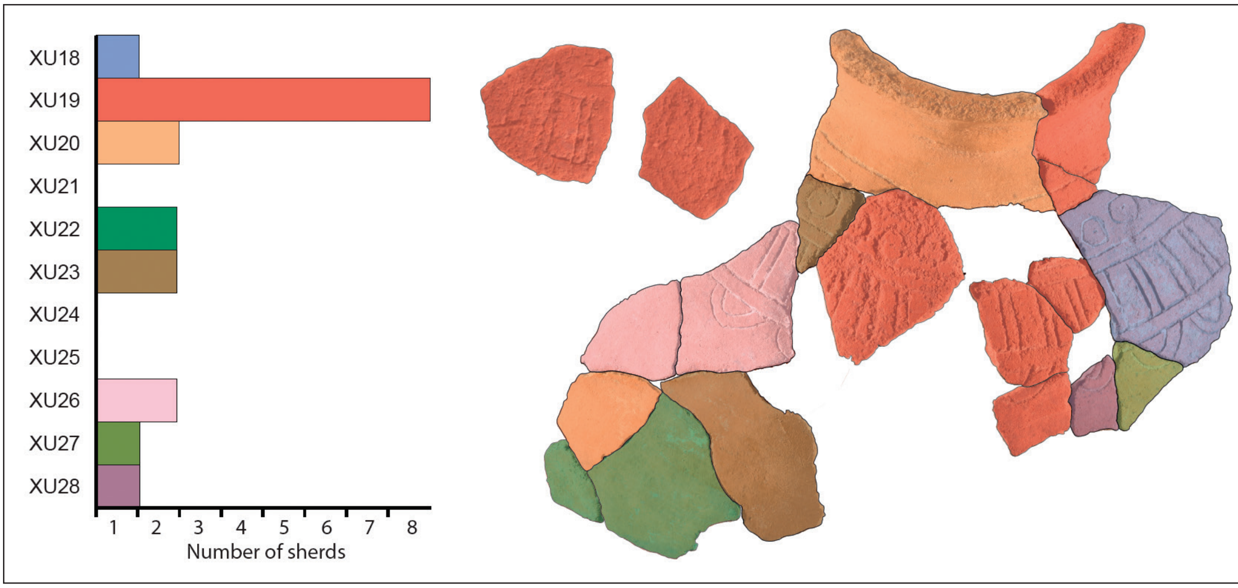

Figure 4. The colour-coded sherds of the incised join set identify which XU each sherd came from.

PROPOSED PRE-EXCAVATION 'LIFE' OF THE INCISED POT

Conjoining made it possible to reconstruct the 'life' of the incised pot into eight stages:

- Manufacture
- Use
- Fragmentation
- Deposition and burial
- Excavation
- Archaeological analysis
- Conservation
- Future museum display

A review of the first four life stages below will begin to create an understanding of the incised pot's pre-excavation history. Table 3 summarizes this information and indicates topics that are part of ongoing or future research.

MANUFACTURE

The incised pot is a well-made globular vessel with a small 9 cm orifice diameter and indirect everted rim. The orifice diameter is much smaller than the average size of the 23 conjoined rim sherds which have orifice diameters ranging from 17 to 29 cm, with a median frequency of 21 cm (Table 1), (David *et al.* this volume). The incised pot is noticeably finer in manufacture than the vast majority of the other excavated sherds from Ruisasi 1. The pot has less visible inclusions than in any other conjoined sherds and Fabric Types from Ruisasi 1. The sizing and shape of inclusions was taken from Orton and Hughes (2013: 281), and is based on the USDA (United States Department of Agriculture) standard sizes for sand grains. The surfaces that have mainly lost the red slip have very fine (up to 0.1 mm) white, black and mica inclusions. On highly weathered sherds (XU19 #20, XU19 #107 and XU19 #203) larger internal inclusions are visible, ranging from medium sized (0.25 to 0.5 mm) to coarse (0.5 to 1 mm) red, pink and white grains (see fragmentation and deposition below for a discussion on sherd weathering). On the whole inclusions are very angular to sub-angular. The natural minerals found in PNG clays (i.e., the bulk, natural clay raw materials used to make pottery, prior to the addition of tempers) include quartz, calcite, feldspar, limonite, haematite, mica and fragments of mica (May and Tuckson 2000: 22). Analysis of the clay and inclusions from the incised pot is part of ongoing research and will be reported at a later stage.

The incised pot has exceptionally thin walls, one well-preserved sherd being as thin as 3.2 mm in width, and the average maximum body thickness of the sherds being 3.6 mm. Distinctive dimple anvil marks occur on the interior surface, indicating paddle and anvil manufacture or finishing (Figure 5). No voids are visible under ×60 magnification within the break edges. Vertically oriented voids are a diagnostic feature of paddle and anvil made vessels (see Jones-Amin 2014; Rye 1981: 85). The absence of voids could be attributed to the lack of very coarse inorganic or organic inclusions. Paddle and anvil manufacture can also contribute to the closure of voids in pottery.

Red slip covered the exterior of the vessel and extended *c.* 2.1 cm down the interior of the rim. Very fine, regular horizontal textural lines are visible under the slip; the slip is darker red within the textural recesses. The textural lines were produced with a brush or similar tool while the clay was leather-hard prior to the application of the slip. The decoration consists of incised linear designs around the upper body of the vessel just below the neck. The incision in all cases occurs over the red slip. The margins of

Table 3. *Proposed 'life' of the incised pot.*

Stage of life history	Observations	Deductions	Analysis/source of information
1. Manufacture			
Clay source	Different to all other fabrics within the assemblage.	Non local?	Thin sectioning/ provenance studies (ongoing research).
Forming/ shaping	Circular impressions on interior surface.	Paddle and anvil manufacture.	Visual empirical evidence.
Slip	Red slip.	Applied prior to firing and before incised decoration.	Visual empirical evidence.
Decoration	Incised line margins are chipped.	Incised decoration was applied after the red slip when the vessel was very dry.	Visual empirical evidence.
Firing	Sharply defined central core visible on a new break edge.	Open fired followed by rapid cooling. Low-fired.	Visual empirical evidence
2. Use			
Physical use	Not visible.	Sherd wet sieving in PNG and rinsing in water in Melbourne prevents results from residue/ biomolecular analysis.	
3. Fragmentation	Broken into 17 joining pieces and two incised associated pieces. Additional associated sherds are feasible.	Intentionally discarded? The missing section of the vessel could be in a non-excavated portion of Ruisasi 1. Or part of the object could have been kept and enchained.	
4. Deposition	Found over 9 separate XUs, with no sherds in XU21, XU24 and XU25.	The vessel may have broken into more pieces during deposition? XU19 had the largest number of sherds (eight).	
5. Excavation	The incised pot was excavated between 8 and 15 of January 2009		
6. Archaeological Analysis	The distinct fineness and decoration found on the incised pot made sorting of this vessel into one fabric type possible.	Despite thorough sorting, all the pieces joining to this vessel may not have been located.	
8. Museum Display	The PNG National Museum and Art Gallery.		

the incised lines are 'chipped', indicating that the clay was hard when the incisions were made. The upper zone of decoration consists of circles, each *c.* 9 mm in diameter, exhibiting a dot in their centre. On either side of the alignment of dots are two parallel lines that act as zone markers. The middle field consists of paired vertical lines, each *c.* 15 mm long and *c.* 5 mm apart, with the two lines of each pair *c.* 8 mm apart. The vertical lines span the full distance between the lowermost of the paired zone marker above them, and the upper line of a similar set of paired zone markers below. The bottom zone of incisions consists of a row of paired semicircles connected to the lower of the paired zone markers above them. The internal semicircle is typically *c.* 9 mm in diameter, the external being *c.* 15 mm wide (Figure 3) (David *et al.* this volume).

The vessel was earthenware. Based on the appearance of the core centres of the individual sherds, firing probably took place in a low temperature, partly reducing environment. On a new break edge (XU26 incised body sherd #120), the central core colour is sharply defined; it exhibits Munsell colour GLEY dark grey N4/. The outer core is 7.5YR brown 5/4. The sharply defined interior core margin is a diagnostic feature of open firing followed by very rapid cooling (Rye 1976: 117–118). Open firing indicates that the vessel was low-fired.

USE

As this object is unique at Caution Bay, we have no other similar sherds or vessels to compare it with. Since it was found fragmented into sherds over 11 XUs, there was no trapped soil within the vessel from which to analyse

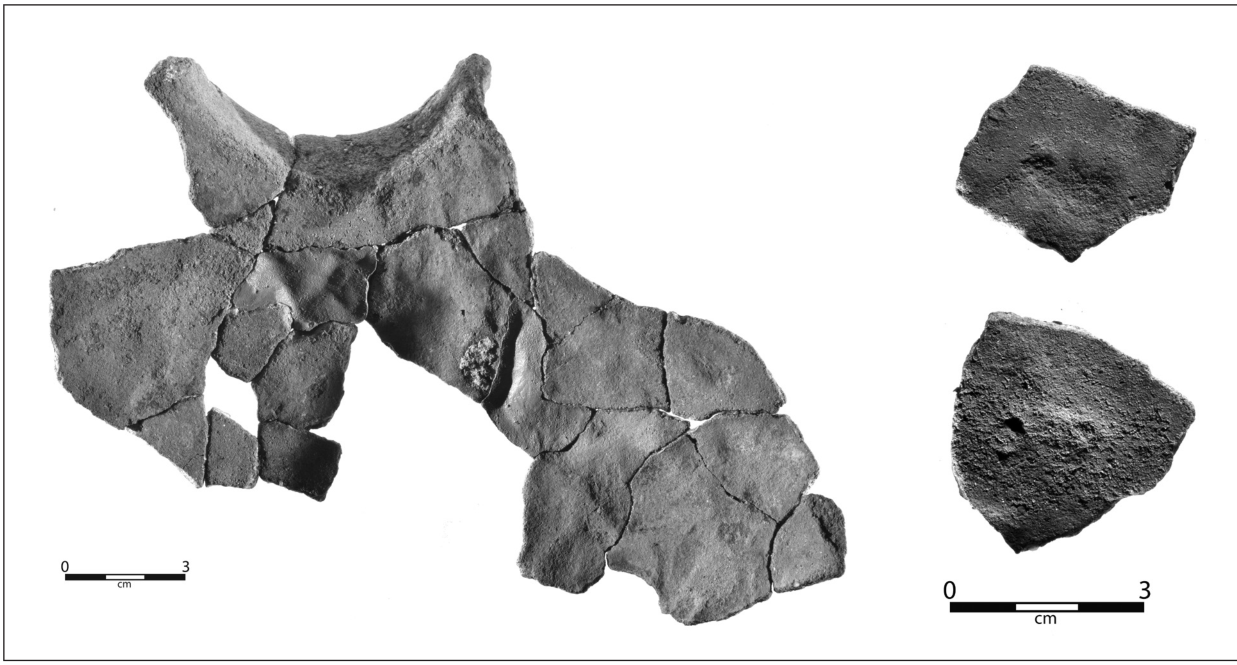

Figure 5. Dimple marks found on the interior of the incised sherd set (left) and the interior of the associated incised sherds (right) (photograph Steve Morton).

remnants of contents and all Ruisasi 1, Square A sherds were wet sieved in the field laboratory at Caution Bay and lightly rinsed in the Monash University Quarantine laboratories in Melbourne (Australia). Therefore the use and purpose of this incised pot cannot be established based on typology or soil or organic residue analysis.

FRAGMENTATION AND DEPOSITION

The conjoining sherds of the incised pot were found in a non-contiguous vertical distribution (Figure 4), the lip and neck parts were found in XU19 and XU20, the upper body parts distributed between XU18-XU19, XU23, XU26-XU28 and lower body parts were found in XU20, XU22 and XU23. The incised joining sherd set is made up of 19 sherds, 12 sherds are in excellent condition and seven sherds are highly weathered, the pot sherds exhibit major differences in their preservation. The more weathered sherds in the set exhibit visible matrix dissolution, exposing larger inclusions than those exposed on the outer surface of the 12 sherds in excellent condition. Matrix dissolution occurs as material is extracted from the ceramic body, changing the chemical composition and weakening its ceramic structure, resulting in complete or partial surface loss (Purdy and Clarke 1987). Ruisasi 1 is located on a floodplain, and burial was largely from alluvial sedimentation (David *et al.* this volume). Light brownish grey soil (Munsell colour 10YR 6/1) and carbonate accretions accumulated on sherd surfaces and break edges during burial. The break edges are characteristically curved, weathered, and smooth without hackly edges. Hackly fracture edges have sharp irregular points, are jagged, assist in securing positive conjoins and are found in low-fired pottery. The incised pot exhibits no evidence of paddle and anvil sherd delamination. Strong lamination, horizontal weakness and elongated voids visible on break edges are diagnostic features of the paddle and anvil-made pottery at Ruisasi 1. The lack of elongated voids and sherd delamination further distinguishes the incised pot from the other Ruisasi 1 sherds. The incised sherds are very fragile and in one instance during careful handling, a sherd snapped along an incised line (XU26 sherd #120) in a similar way to scored glass.

The incised pot's fragmented state stimulates a number of questions:

- Does the rest of this vessel remain buried in situ at Ruisasi 1?
- When did the incised pot break and could its fragmentation have taken place during burial, or did breakage occur prior to burial?
- The vertical distribution of the conjoined incised sherds is not continuous (Figure 4), what does this tell us about how the incised pot fragmented?
- Was the incised pot purposefully positioned in the deposit as more than trash?
- Are the missing sherds, representing *c.* 60–70% of the vessel, scattered around the non-excavated areas around Square A, or could this conjoined set signal an enchained landscape?
- Where are the four missing incised sherds from the incised set?

- Why are there no sherds from this vessel in XU21, XU24 and XU26, each of which contains a dense sherd assemblage made up of 1944 (3278.8 g), 1334 (1983.4 g) and 838 (2495.5 g) sherds respectively (see Table 3 in David *et al*. this volume)?

Many factors affect how pottery breaks. Fragmentation of the incised vessel could have occurred during use, discard, abandonment, post–abandonment and burial. The environmental conditions present at the time that the pot was manufactured may have contributed to the vessel's fragmentation. The low-fired incised pot was made in an environment where there was high precipitation, therefore the pot may have had inadequate time to dry prior to firing and the result may be a more friable vessel that is likely to break in use and deposition (Chapman 2013b: 13).

As the incised decoration represented by this joining set of sherds is unique for this site and for the Caution Bay region, the pot could have been brought to the site as a whole or as a fragmented object. If the whole incised pot was dropped during discard, it could be conjectured that the sherds would be distributed in a relatively shallow, continuous vertical distribution. Instead, the sherds from the incised pot were found scattered from XU18 to XU28 in no particular pattern (Figure 4). The jumbled vertical distribution of only part of the vessel strongly indicates that the incised pot was broken before discard and only some of the sherds were later discarded at this location. Further fragmentation of the low-fired incised pot would have occurred during discard into the pottery midden, potentially resulting in the further fragmentation of both the newly dropped incised sherds and other discarded vessels.

The wall thickness and low-firing of the pot most certainly contributed to the vessel's fragmentation. Seven of the conjoining sherds are <3 cm in length. This small sherd size could indicate that the pot broke into very small pieces during and/or after deposition as a result of the vessel's thin walls, low-firing and high level of compression in the dense sherd deposit. There may be many more plain, small sherds < 3 cm long belonging to this vessel that were not identified during conjoining. In addition, the incised lines in conjunction with thin walls may have contributed to further fragmentation, as described above for XU26 sherd #120.

The majority of sherds were found in XU19, a small number in XU20, XU22-XU23, XU26-XU28, but sherds were absent in XU21, XU24 and XU25 (see Figure 4). This distribution would appear to indicate that sherds slid when they were deposited, as would be found if they were discarded onto the uneven surface of a pre-existing sherd pottery midden at this location. It may also indicate that the vessel was broken and discarded elsewhere, and then later gathered together with other pottery refuse and deposited at the pottery midden. This would account for the missing pieces that could well be in areas surrounding Square A, with some sherds possibly remaining in the primary discard location. The conjoining sherds of the incised pot are variable in weathering, colouration and visible inclusions, yet can be physically conjoined. Highly weathered surfaces are present on the interior of one rim sherd from XU20 and on the exterior of three sherds from XU19. In contrast five sherds from XU19 are not weathered (Figures 3, 4 & 5). The sherds from XU19 are an excellent example of the variable condition of one group of sherds found in one deposit. There does not appear to be any consistency in weathering evidence between interior versus exterior sherd surfaces that could contribute to a better description of deposition. Studies by Skibo and Schiffer (1987: 93) indicate that abrasion through cultural or natural processes results in significant sherd attrition and that wet depositional environments can abrade pottery at high rates. Low-fired and under-fired pottery is most vulnerable to post-depositional damage, due to their porous nature that effectively means high internal surface areas with a high potential for corrosion. Porosity is a key factor in the weathering of ceramics as it provides access to soil solutions. Ruisasi 1 was exposed to a combination of environmental conditions, including burial from alluvial sedimentation, high precipitation along with seasonal inundation in loamy soils that allow for high infiltration of water. Alluvial activity can remove coatings such as slips and use residues from vessel surfaces. The sherds of the incised pot were damaged differently during burial, due to high precipitation and micro-environments with different decay potentials. Different decay potentials explain the major differences in degrees of preservation within the incised pot (Schiffer 1987: 146). The orientation of the sherds during deposition is another factor to consider, however due to the sheer volume of highly fragmented pottery recovered from Square A, sherd orientation was not recorded for sherds belonging to the incised pot during excavation.

CONSERVATION OF THE INCISED POT

Conservation treatment was fundamental for the reconstruction and conjoin analysis of the incised pot. Accretions found on break edges prevented proper alignment and adhering of conjoining sherds. The conservation treatment was straightforward but meticulous.

Tests were performed to determine the least damaging method of dirt and accretion removal on one sherd. The red slip is soluble in water. It was found that damage to the slip could be avoided by cleaning the red slipped sherd surfaces under magnification, using a size 15 scalpel blade to cut and abrade soil and accretions deposited on sherd surfaces, in combination with a swab barely dampened with deionised water. The thin walls and smooth break edges made conjoining challenging and required conservation expertise to achieve correct sherd alignment during adhering.

Break edges were consolidated to prevent sherd edge crumbling, with 5% B-72 (w/v solution, 90:10 acetone/ethanol v/v). Joins were adhered together using a solution of 40% B-72 (w/w solution in acetone).Two areas where sherds were missing were infilled with a plaster based filler to structurally support voids and prevent joins failing (Figure 3).

Without reduction of the accretion found on break edges the profile of the reconstructed incised pot would have been inaccurate and without consolidation the adhered joins would have failed.

DISCUSSION

The incised pot has 17 joins, the most of any rim or fabric type set found at Ruisasi 1. The largest join set represented by the only set of incised sherds is consistent with Orton and Hughes's (2013: 266–267) statement that 'recognition of sherd-links [conjoins] will be confined to the more distinctive vessels in the group, and in practice this often means the finer decorated wares or other rarer vessels – often "imports" to the site'. However, contrary to Orton and Hughes' argument that searching for conjoins within body sherds can be fruitless, this was not the case for Ruisasi 1. The incised pot includes plain body sherds and this assemblage includes 22 separate vessels based on conjoining body sherds. This indicates that joins can be found in highly standardized assemblages.

The sherds from the incised pot were found spread across much of the depth of the dense sherd horizon. Small sherds <3 cm long belonging to the incised pot are found in XU19, which starts at 36.1 cm depth as well as in XU27 (50.5 cm depth at bottom) and XU28 at a maximum depth of 54.2 cm. Villa (1982: 279) argued that sites disturbed by trampling will have the larger sherds occurring close to the surface and the smaller pieces pushed down into the earth. Based on Villa's arguments, the distribution of large and small sherds from the incised pot (see Figure 4) suggests that the sherds were not significantly disturbed by trampling prior to burial. Rather, the sherds may have slid on the uneven surface of a sherd midden while the pottery was exposed at ground level. Alternatively, the sherds may have been deposited, along with sherds from other broken vessels, in this location as a secondary refuse deposit; this could also explain the jumbled vertical distribution and incompleteness of the incised vessel, as well as the variable weathering of sherds – the more weathered ones were exposed on the surface at the original deposition location. In any case, the lack of evidence for trampling, in conjunction with conjoining evidence presented in David *et al.* (this volume), indicates that the assemblage was an instant dumping of already broken pots (even if some of those pots may have originally been dumped elsewhere first). The MNV of vessels is 47 and the maximum number of vessels is 146, no complete or semi complete vessels were identified during conjoining, the majority of conjoining sets consist of 2–3 sherds only.

Deterioration in the form of weathering can aid or hinder conjoining. The incised join set illustrates that sherds belonging to the same vessel can be differently weathered or have undergone diverse trajectories as detached pieces prior to or during deposition (Blanco-González *et al.* 2014: 148) (see Figure 3). The incised decoration present on the incised pot facilitated a search across a range of deteriorated red slip body sherds for conjoins. The joining XU22 <3 cm long sherd has much less red slip than the rest of the incised pot, and it was not apparent until that sherd was conjoined that it belonged to the incised pot. This makes it necessary to search very carefully for conjoining based on criteria other than macroscopic morphological features, and caution must be taken not to identify a fabric type from patterns of deterioration. Despite variable weathering the unique features of the incised pot distinguished its sherds from other fabric types, enabling conjoining.

Chapman and Gaydarska (2006) have pointed out that in some circumstances sherds were purposely fragmented and enchained across space and or behavioural contexts. For example Fontana (1998) studied the Neolithic site of Fimon, Molino Casarotto, Italy, finding that particular vessel types were placed in different discard locations. It is possible that the fragmentation of the incised pot is an example of deliberate breakage and deposition, as opposed to 'discard' of trash. One of the key premises of Chapman's fragmentation theory is that, in closed contexts, missing parts can be a good indication of deliberate fragmentation and re-use of parts. A complete conjoining study has been undertaken for Ruisasi 1 Square A, but as the site was not fully excavated, and therefore only some of the cultural materials were sampled for study, adequate arguments for what happened to the missing parts of the incised pot are not possible. These missing parts could lie in situ outside the boundaries of the excavated 1 m × 1 m square. As argued by Chapman (2013b: 25), there needs to be more archaeologists building fragmentation into their research designs. In the Pacific, the complete excavation of sites and inter-site studies for conjoins would greatly widen our understanding of Lapita and post Lapita cultural complexes, although in most instances complete excavation of a site is neither practical nor warranted. One of the basic principles of archaeology being to leave behind enough parts of a site unexcavated for future archaeologists.

A proposed 'life' for the incised pot contributes to a better grasp of the behavioural chain related to manufacture, use, deposition and fragmentation (Abend *et al.* 2010: 159). Sherds from the incised pot were not found consecutively, but scattered over 11 XUs. These sherds were not therefore sitting in a single dumped pile, suggesting that the sherds were deposited in a single event and that some sherds slid between spaces on the surface of an existing uneven pottery midden, or that the sherds were secondarily deposited at this location along with other pottery refuse.

CONCLUSIONS

The incised pot demonstrates that sherds belonging to one vessel from the same deposit can exhibit noticeably different amounts of weathering. Although this may also be indicative of the sherds being secondary refuse, having been discarded previously, partially exposed to weathering and then finally deposited in the pottery midden found in Square A. During any conjoin analysis, sherds should be carefully examined for joins, and weathered sherds should be compared to sherds in good condition. The fragmentation of the incised vessel is likely to have occurred prior to burial, during discard and burial. The technology employed to produce the incised pot and the burial conditions that the incised pot were exposed to contributed to fragmentation and weathering of the vessel.

Conjoined sherds from an incised pot were found over a vertical span of 11 XUs, including major gaps without joins between some XUs. This is not what you would expect if the vessel was broken after burial, but it is if a set of already broken sherds from a pot were dumped together at Ruisasi 1 onto an existing pottery midden. The incised pot was deposited in a single event and the pottery midden itself was built up by a series of similar discard events.

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