

# Archaeological Studies of the Middle and Late Holocene, Papua New Guinea

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- Preface *Jim Specht*  
1–2
- Part I Ceramic sites on the Duke of York Islands  
*J. Peter White*  
3–50
- Part II The Boduna Island (FEA) Lapita site  
*Jim Specht & Glenn Summerhayes*  
51–103
- Part III The Lagenda Lapita site (FCR/FCS), Talasea area  
*Jim Specht*  
105–129
- Part IV Pottery of the Talasea Area, West New Britain Province  
*Jim Specht & Robin Torrence*  
131–196
- Part V Pre-Lapita horizons in the Admiralty Islands:  
flaked stone technology from GAC and GFJ  
*Christina Pavlides & Jean Kennedy*  
197–215
- Part VI Revised dating of Type X pottery, Morobe Province  
*Ian Lilley & Jim Specht*  
217–226
- Part VII The evolution of Sio pottery: evidence from three sites in  
northeastern Papua New Guinea  
*Ian Lilley*  
227–244
- Part VIII A preliminary study into the Lavongai rectilinear earth mounds:  
an XRD and phytolith analysis  
*Matthew G. Leavesley & Ulrike Troitzsch*  
245–254
- Part IX A stone tablet from Buka Island,  
Bougainville Autonomous Region  
*Barry Craig*  
255–261



## Archaeological Studies of the Middle and Late Holocene, Papua New Guinea

### Part I

## Ceramic Sites on the Duke of York Islands

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**ABSTRACT.** Surveys and surface collections of pottery and obsidian from 21 localities in the Duke of York Islands are reported. Test pits dug in seven of these revealed similar stratigraphies in nearly all, with pottery, obsidian, and sometimes other stone, animal bone and shell, underlying Rabaul volcanic ash dated to c. 1400 BP. The pottery decoration is extensively figured.

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This paper reports details of the 21 localities with ceramics and test pits dug at seven of these locations in the Duke of York Islands, East New Britain Province, Papua New Guinea during July 4–17 and August 9–28, 1993. Analyses of some of the material, especially from sites SDP and SEE, have already been published (White & Harris, 1997 on dating and obsidian sourcing; Thomson & White, 2000 on the pottery and resource procurement zones for tempers), and further data on these topics exist in the respective Honours theses (Harris, 1994; Thomson, 1998). These data are not duplicated here. Some sites have many dentate-stamped sherds and others have very few, even though they are of the same age. I continue to see no reason to question the dating of these two kinds of sites, and accept them as contemporary. The following account refers to the location of villages, etc. on the islands at the time of the survey.

### Background

The 12 islands and islets of the Duke of York group lie in St George's Channel some 20 km from New Britain and 8 km from New Ireland (Fig. 1). Both are clearly visible from the group. With the exception of Makada, all the islands are composed of raised coral and even the largest, Duke of York Island, rises no more than 80 m a.s.l. Makada, 120 m high, has a volcanic core which outcrops on the western side, but most of the island's surface consists of raised coral and, like the rest of the islands, its beaches are all coral sand. There are extensive reefs around the southern islands, with deep passages into sheltered water on the eastern sides of Kerawara and Mioko. There are reefs along the north side of Makada, but otherwise there are only occasional outcrops of coral in the northern part of the group.

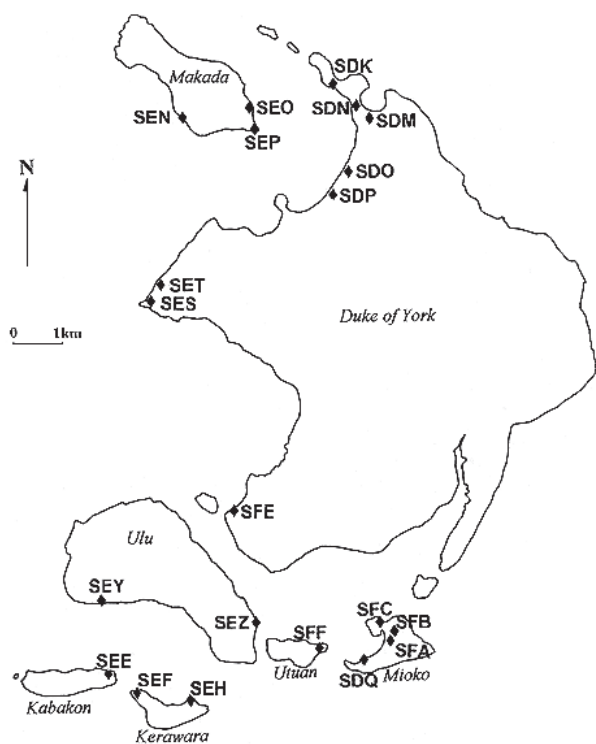


Fig. 1. Duke of York Islands, West New Britain, showing site locations.

In 1985 Lilley (1991) carried out an archaeological survey as part of the Lapita Homeland Project. He found sherds and obsidian at six locations, five on the northern side of Duke of York Island (SDK, SDM, SDN, SDO, SDP) and one on Mioko (SDQ), as well as a widespread scatter of obsidian and “much more recent” aceramic sites on the main island. He made “a number” of test excavations, quite extensively at SDK, but concluded that “the Lapita sites [i.e. all the sites listed above] ... are too severely disturbed to warrant radiocarbon dating or detailed analysis of the cultural material they contain” (Lilley, 1991: 166). Lilley characterized his sites as “Lapita” although dentate stamped sherds were found at only two sites (SDN: 3; SDK: 1). Other decoration techniques included incision (11 sherds, 2 sites), fingernail impression (5 sherds, 2 sites) and applique (1 sherd). He suggested this variation might be temporal or functional. It is not clear why all these sites were called “Lapita” other than on the basis that they contained pottery, which has not been made in the Duke of Yorks (or on New Britain and New Ireland) for at least the last millennium.

### The 1993 survey

The 1993 archaeological team consisted of Chris Gosden (then at La Trobe University), the late Baiva Ivuyo (PNG National Museum), Martin Rowney (University of Sydney), Matthew Salmon (James Cook University) and myself for two weeks based on Ulu Island, and the latter four of us for three weeks based on M.V. *Kutubu*. Every island was visited except the five smallest, which have no good landings and are not named on Fig. 1. The survey covered most of the accessible coastlines except for the eastern side of Duke of York Island, where the coastline is steeply cliffed and rough, and Foul Bay on the eastern side. We also traversed many

island interiors, with surveyors being taken particularly to new garden areas and along inter-village tracks. Random survey was not attempted since vegetation cover was heavy. Like Lilley, we found an almost continuous background scatter of obsidian in gardens and along tracks, although there was considerable variation in density between islands. This report concerns only those sites with ceramics.

Ceramics were found at 15 locations in addition to those found by Lilley, although several of these sites contained <10 sherds (Fig. 1). Ceramics occurred on the surface of only three of Lilley’s sites (SDK, SDP, SDQ). Site definition is problematic. For example, sherds and obsidian occur at the western end of Mioko Island and intermittently along the entire north side, over a distance of about 1 km. It is unclear whether this intermittent scatter relates to a series of prehistoric deposits, which should then be given different site codes, or to a single, extensive site. A similar problem exists at Nakukur 1 and 2 (SES, SET) and at Kabilomo/Urakukur (SDP, SDO). At the other end of the scale, do one (SEY) or two sherds (SEH) really constitute a “site” (cf. White, 1992)?

Surface collections were made at every site marked on the map except SDM, SDN, SDO (see above). Since all sites were in villages or modern gardens, and the survey was usually voluntarily assisted by local people, systematic or random sampling was impossible: these collections are haphazard. The sites are described here in PNG National Museum site code order. Map and grid references are to the 1:100,000 Topographic Survey Sheet 9389 Rabaul (1975).

### Site locations

All the sites are on the coast within 100 m of the present shoreline; no pottery was found inland. Among the sites there are two pairs, obvious in terms of their location on opposite sides of narrow sea channels. In each case, one site seems satellite to the other—SEF to SEE and SFF to SDQ—in the sense of having fewer sherds distributed over a smaller area. Other linkages are less obvious, and should probably await more precise dating.

At the larger scale, the Duke of Yorks sites fit within the pattern already established in the Bismarck Archipelago, in that these islands are offshore from larger, more “mainland” islands (cf. Watom, Arawes, Anir, Eloaua and Garua, although sites are present on the coasts adjacent to the latter two sites). The team also covered several score kilometres of the west coast of New Ireland. This survey located many aceramic sites where obsidian is common, but found only four pieces of pottery at two sites; one sherd is dentate-stamped (White, 1997). If ceramics were common on this coastline, more sherds would surely have been found.

### Excavations

Test pits were dug in seven sites (SDP, SDQ, SEE, SFB, SET, SEO, SEP) supplemented by augering to observe stratigraphic variation. The most extensive series of pits was dug on Mioko, where beach buildup on the northern side lies on a coral platform, the surface of which is about 1 m above present sea level and relates to a higher sea level about 5500 years ago (Beta 66497 on coral from SFB, TP2: 4820±80, C12/C13 per mill. -1.0, C13 adjusted age 5210±80, calibrated by CALIB ver. 3.0.3 to 5754 (5574) 5314 at 2σ).

Similar evidence of a raised sea level seems to exist at SEE and SET, but was not directly dated.

Test pits at sites SDP, SDQ, SEE, SET, SEO, SEP and augering at SDK produced basically similar stratigraphies. Only one major period of use was found at each site. The composite general stratigraphy is as follows:

- 1 Modern soils, usually of sandy re-worked volcanic ash.
- 2 Beneath these was 10–30 cm of bright yellow, fine ash which has been identified by B. Talai and C. McKee (Volcanological Observatory, Rabaul) as almost certainly deriving from the major Rabaul eruption of 1400 years ago (Walker *et al.*, 1981). Very careful separation of disturbed and undisturbed ash over two square metres at SEP and more general observations elsewhere demonstrated that this ash was sterile and all ceramics above it could readily have been derived from deposits below. There was no *in situ* pottery above this ash.
- 3 Beneath this ash was another of more variable thickness, ranging from a few centimetres to 30 cm. This was always more humified, yellow-brown in colour with small yellowish pumice inclusions, and clearly re-worked by human and natural vectors.
- 4 Below these ashes was sand. At most near-beach sites (SDP, SDQ, SDK, SEO, SEP, SET) this was up to 2 m thick. At SDP the upper part of the sand was slightly humified and contained occupation material of larger size, refittable in some instances, suggesting dumping in a tidal or lagoonal environment. At other sites the sand was sterile or contained clearly re-worked material.
- 5 The basal levels of the pits consisted of waterlogged sand or coral rubble.

### Dating

Radiocarbon and obsidian hydration dates are discussed in detail in White & Harris (1997: 100–101). The charcoal date from SEP reported there has been recalibrated and the result is discussed in the site report. Summerhayes (2001: 32; 2004: 154) used CALIB 4.1.2 with a reservoir correction of 402 years to revise the determination on shell sample SUA-3082 from SEE to 3000 (2847) 2740 cal. BP. Continuing research on  $\Delta R$  values, however, shows that the situation has become more complex rather than clearer. The  $\Delta R$  correction suggested by Petchey *et al.* (2004: 1011) for a *Nassarius* shell collected c. 1905 in the Duke of York Islands is  $39 \pm 68$  years, so that “correcting” of any determination seems premature. This  $\Delta R$  value suggests that the ages of the sites with shell dates lie somewhere between 3000 and 2600 years, with a greater likelihood towards the earlier end of the range, but better precision is not possible. I believe, however, that many of the sites, especially SEE which has more “classic” Lapita ware, are at least a couple of centuries older than the SEP date on charcoal, i.e. older than about 2750 cal. BP. Recent data from New Caledonia (Sand, 2000: 27), noting variation in the occurrence of decorated pottery across sites for which no long-term occupation is suspected, suggest that the plain thin ware from SDP and the highly decorated

ware from SEE, which have similar C14 determinations, could indeed be close to contemporary, as originally argued (Harris & White, 1997). However, similar patterns have not been reported from other sites in the Bismarcks.

### Obsidian technology

Very little stone other than obsidian was recovered. Margaret Harper (pers. comm., 1995) notes that most pieces are red or grey chert. All localities with pottery also produced obsidian, though not in large quantities. Nearly all the material from both excavated and surface collections consists of flakes and chips weighing less than 2 g. There are a few bipolar cores, and some flakes show that a bipolar technology was used, but this is rare. Very few pieces have any kind of cortex. The largest pieces were found in the lower levels of SDP, strengthening the notion that this material is *in situ* and was probably deposited in a littoral environment, where the pieces were not collected and re-used as seems to have been the case everywhere else. Given the density of obsidian in some surface collections—on Utuan and around Kabilomo (SDP) and northeast Duke of York Island in particular—its relative scarcity in some excavations such as at SEO, SEP and SDQ is noteworthy, although not quantifiable on the basis of our sample.

### Ceramics

Nearly all sherds have a very high percentage of apparent additions to the clay, considered to be temper added to make it workable. It is notable that black volcanic crystals occur in a majority of the sherds. Very few sherds have tiny amounts of non-clay in their composition and these may be untempered. Precise analysis on 42 sherds from SDP, SEE and SEP was carried out by Jo-Ann Thomson (Thomson & White, 2000). For the rest, four temper groups were determined by hand lens, and at present are fairly rough and ready. They are:

- (a) shelly sand, poorly sorted, often with sand grains <0.1 mm, usually with some small gravel including quartz, and a range of red and green/yellow stone, possibly volcanics, and rare black volcanic crystals;
- (b) poorly sorted, very coarse, gravelly sand, usually with a good deal of quartz and a variety of other rock types including very occasional, mostly rounded but sometimes angular, black crystalline volcanics, quartz and volcanic crystals to 2 mm, and occasional medium-sized shelly fragments;
- (c) varying amounts of poorly sorted coarse sand (generally without any fine grains) with some angular black volcanics and other rock types, best described as “mixed”;
- (d) usually well-sorted, angular black volcanic crystals, too angular for a beach deposit and varying in size from sand to 2 mm in different sherds, with sometimes a few larger quartz crystals or other gravel.

As Thomson showed, the shelly sand and some of the volcanics could be local, but the rest could be from either New Britain or New Ireland, with the former being more likely.

**Table 1.** Decorative techniques at the Duke of York Islands' pottery sites (counts). *s.stamp*, straight-line stamp; *c.stamp*, curved line stamp.

site	dentate	incision	grooving	s.stamp	c.stamp	circle	finger nail	excised	notch	scallop	punct.	relief	carving	other	total
SDK	1	—	—	—	1	—	—	—	1	—	—	—	—	—	3
SDP sur	1	—	—	—	—	—	1	—	—	—	—	1	—	—	3
SDP exc	—	1	1	—	—	—	9	—	19	—	—	2	—	—	32
SDQ sur	—	2	1	—	—	—	—	—	—	—	—	—	—	—	3
SDQ exc	13	28	3	—	1	1	—	—	4	1	1	1	—	—	53
SEE sur	105	41	11	7	12	12	1	1	31	—	—	6	—	—	227
SEE 1/1	102	45	6	8	12	14	—	—	27	2	—	1	3	—	220
SEE 1/2	110	43	10	3	11	12	—	2	18	1	—	5	—	—	215
SEE 1/3	58	23	11	4	11	7	—	2	17	—	—	2	1	—	137
SEE 1/4	32	29	10	—	6	5	—	1	10	—	1	1	—	—	95
SEE 1/5	44	27	2	1	5	3	—	—	5	—	1	—	—	—	88
SEE 1/6	10	13	2	—	2	1	—	—	2	—	—	1	—	—	31
SEE 1/7	6	—	1	—	—	1	—	—	1	—	—	—	—	—	9
SEE 1/8	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2
SEF	13	17	3	1	1	2	—	—	1	—	—	1	—	—	42
SEO	3	11	—	—	1	—	1	—	2	—	2	—	1	—	21
SEP	3	5	—	1	—	—	13	—	4	—	1	—	1	—	32
SES	5	—	1	—	—	—	—	—	—	—	—	—	1	—	9
SET	9	17	1	—	1	1	—	—	2	7	—	—	2	—	40
SEZ	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
SFA	2	2	—	—	—	—	1	—	1	—	—	—	—	—	6
SFB	11	5	1	—	4	2	1	—	4	1	—	—	—	—	29
SFE	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
SFF	19	9	2	—	2	—	—	—	2	—	—	—	—	—	34

An analysis of the dentate stamped decoration was begun on sherds from SEE using Anson's (1983: table XII) attribute list of motifs (this is why numbers are written on the SEE sherds). However, it has become apparent that there are many new motifs as well as a host of minor variations which render clear attribution difficult. Analysis of these and other aspects is being complicated by current indecision as to (a) what questions a full analysis of the decoration would answer and therefore how best to undertake it; (b) how the decorative techniques used should be described (cf. Basek, 1993), and (c) how to determine the range of forms as, with one exception from SDQ, sherds from all sites are quite small. There are many carinated shoulders and initial work on rim diameters suggests that some pots were quite large. Pot stands are definitely present, notably at SEE. Open flat platters occur at some sites. Decorative techniques include incision, grooving, dentate stamping, circle stamping, simple direct impressed notching, vertical relief strips, punctations, impressed straight lines, curved line stamping, fingernail impressions and carving. Only one probable cut-out has been noted. Despite the haphazard nature of the collections, Table 1 lists the decoration types found at each site.

Only some of the sherds are illustrated here. I have selected material which displays the range of motifs and decorative techniques, but the drawings do not try to depict precisely, for instance, the number of dentate impressions where these were used.

### Conclusion

As will be seen from the more detailed reports, there are several sites which would repay further excavation, most notably SDP and SEE, but probably also the sandy spit at the western end of Mioko Island (SDQ) and perhaps SEP on Makada. That potential aside, it is interesting that Lapita pottery is as widespread in this island group as it is in similar situations elsewhere. Some sites here have considerable quantities of pottery, others almost none, or have it spread thinly over a considerable area. Does this imply variation in settlement intensity and island use, or time, or is it simply a taphonomic effect? In other localities, similar distribution patterns occur: Kirch (2001) refers to Lapita "villages", clearly major sites (ECA, ECB, EHB), and a rockshelter with considerable pottery (EKQ), but also to a range of minor sites (e.g., EKE, EHC, EKW) with very limited quantities of pottery and obsidian. Multiple sites also occur on the eastern side of the Willaumez Peninsula and on Garua Island, and in the Arawe and Anir Island groups. Whether these consist of large and small sites, and if so what is the scale of these, has not yet been reported clearly. In several cases, notably on the smaller islands off Mussau (Kirch, 2001), pottery locations suggest that there might be pairs of sites similar to those described here.

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their initial misgiving about financing a boat charter. Thanks to Richard Fullagar and Huw Barton for looking at use-wear and residue, and to Jim Specht, Robin Torrence and two referees for useful comments. The finds are currently held in Sydney, but will be returned to the PNG National Museum in due course.

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## Catalogue of Duke of York Islands sites

Sites are listed in alphabetical order of their PNG National Museum site codes.

### SDK. Rabaul 9389: 386441 (Figs 2A, 16A, 16B)

In 1985 Lilley identified a “Lapita” site at Urkuk village, Duke of York Island, primarily on the low sandy isthmus which runs north-south between two raised coral hills, but also extending northeast along the beach flat fronting Waterhouse Cove. He dug at least one test pit, and collected/excavated 176 sherds, including one with dentate stampig and three with fingernail impressions (Lilley, 1991: table 1). Close survey of the same area produced a quantity of obsidian along the eastern slope of the northern hill, one slightly rolled dentate stamped rim sherd just north of the church and 11 (29.3 g) undecorated sherds, mostly rolled.

A large pit about 1 m deep had recently been dug on the west side of the isthmus to provide sand for the church building. In section, this showed a dark, humic sandy layer some 20 cm deep overlying white sand, a stratigraphy similar to Lilley’s. A 1×1 m pit (TP1) was excavated a further metre into the sand, but proved sterile.

Two series of auger holes, five at 20 m intervals north from TP1 to the northern beach and four to a distance of 60 m east to the foot of the southern hill, showed that yellow-brown ash overlying sand was preserved only in the centre of the isthmus and at the foot of the southern hill. Elsewhere, a humified brown-grey sand some 40 cm deep overlaid white sand.

TP2, also 1×1 m, was dug some 5 m west of the auger line and 27 m from TP1 in a banana grove between the church grounds and the graveyard. The deposit was excavated in 10 cm spits and sieved through 5 mm sieves. The stratigraphy was as follows:

Spits 1–2: 0–20 cm below surface. Humified brown sand with occasional yellow-brown pumice nodules. European material was found throughout but concentrated in the upper half.

Spit 3: 20–22/30 cm. Poorly defined yellow-brown ash, mixed with sand. This could be roughly distinguished from both overlying brown and underlying grey humic ashy sand, but clear boundaries existed only in a small area.

Spit 4: 22/30–30 cm. Grey ashy sand.

Spits 5–12: 30–110 cm. Patchy grey and white sand with coral and shell fragments. Each was excavated separately in case cultural material occurred in the grey (?disturbed) sand, but no clear association was found.

Spits 13–14: 110–140 cm. White sand with coral fingers continuing to at least 175 cm, as determined by auger.

The distribution of cultural material (Table 2) shows clearly that the ceramic horizon is in the ashy sand at the top of the white sand. Where the break was clear, several sherds lay on the ashy sand, covered by the ash. Little pottery occurred in the thin, ashy levels. The quantity of cultural material declines with depth, suggesting redistribution from an original horizon, presumably both during and after occupation. This is confirmed by conjoining. Much of the *in situ* pottery is like that found at SDP, and is made of a thin, hard brown fabric. The only decorated piece is an outcurved, slashed rim on a thin hard fabric found in spit 4.

While much of the pottery in the lower levels is rolled or abraded, ten pieces in Spit 5 appear to be from the same

**Table 2.** SDK, distribution of cultural materials by count (weight in grams).

spit	pot decorated	pot plain	obsidian
1	—	5 (6.6)	4 (1.8)
2	—	9 (30.1)	3 (1.7)
3	—	4 (13.4)	3 (1.7)
4	1 (4.9)	28 (74.8)	2 (1.6)
5	—	27 (74.2)	—
6	—	9 (19.0)	—
7	—	6 (9.3)	—
8	—	8 (11.1)	—
9	—	3 (7.0)	—
10	—	3 (2.2)	—
11	—	2 (1.9)	—
12	—	1 (0.6)	—
13	—	—	1 (0.3)

thin brown vessel. All these pieces are made with the same mixed temper, with very small olivine crystals and some shell. Among them is a 3 mm-thick plain rim, and there is another piece of this in Spit 8. Two pairs of sherds from Spits 4 and 5, broken in antiquity, have been conjoined, further suggesting that this is the original horizon of deposition. There is a range of tempers, poorly sorted and mostly quartz, olivine or a mixture of these.

The quantity of obsidian is low and no bone or apparent food or artefactual shell was recovered. This may suggest TP2 was on the fringe of occupation or a dump. The stratigraphy noted above may imply a lagoon or tidal setting.

On the basis of similarity in pottery form, colour and temper, and the stratigraphic location of occupation, this site belongs to the same phase as SDP. Whether there was an earlier or more “classic” Lapita site here is unclear, but there is no evidence for it at present.

**SDP, SDO.** Rabaul 9389: SDP-386417; SDO-388418 (Figs 16C–G) Kabilomo and Urakukur are two villages on the north coast on Duke of York Island, separated in 1993 by some 30 m of tree and bush regrowth. Two sites, SDP at Kabilomo and SDO at Urakukur, were identified by Lilley (1991), but the distribution of material may be continuous. There was almost no cultural material on the surface of SDO and our attention therefore concentrated on SDP.

The main road along the north coast runs just behind the beach, here well protected and with up to 100 m of exposed sand flat at low tide. The beach may be prograding. Within each village houses occur up to 150 m inland of the road, with gardens and plantations behind. Kabilomo extends for nearly 1 km along the waterfront, Urakukur for about 750 m. Much of the ground surface throughout both villages is hard and sandy, swept bare on a daily basis, but there are more frequent patches of loose sand and rubbish around trees and in diplines further away from the sea.

Obsidian flakes, mostly very small, are scattered on the surface throughout both villages. Impressionistically, more obsidian occurs about 80–100 m inland, which is also where surface sherds of pottery are more common. With the enthusiastic aid of Kabilomo Community School children 200 sherds (595.5 g) were collected. Only three are decorated. One is a plain rim with dentate

stamped designs on a thick body. The other two are body sherds, one with parallel applied bands about 8 mm wide and 5 mm apart, and the other with a row of fingernail impressions. Most sherds were of a thin (c. 5 mm thick) hard ware, similar to that excavated. Sherds may be somewhat more concentrated around the school in the middle of Kabilomo village, but the collecting procedure did not allow a clear determination.

At the eastern end of Kabilomo, in the local section called Kabintuba, we noted that the ground mounded slightly some 60 m from the beach and that there was shell exposed on the surface at a politically convenient location for a test pit. TP1 (1 m<sup>2</sup>) was dug here. The pit was subsequently enlarged by a 0.5×1 m extension on the east side (TP1A) and then by another 1×1 m on the west (TP1B). These enlargements enabled the clear definition of a large pit into which TP1 had largely cut and which had been dug from about 35 cm below surface to a maximum depth of 112 cm. Basically round in section and still 35 cm in diameter at 90 cm below surface, this pit is interpreted as a large house-post hole. Its fill contained almost no cultural material. In the excavation of TP1 both 5 mm and 2 mm sieves were used; with TP1A and TP1B only 2 mm sieves were used and much of the deposit was wet-sieved. The overall stratigraphy of the 2.5×1 m pit was as follows:

0–18 cm: a surface mound of shell and coral, containing bottle glass, old batteries, etc.

18–28/38 cm: strongly humified volcanic ash containing a few yellowish pumice pieces. No European period material. Within this stratum occurs (a) some small patches of bright yellow-brown (2.5YR 6/4) ash, which is sterile; (b) some sandy lenses upcast from the lower part of the pit.

28/38–55/58 cm: light olive-brown (2.5YR 5/4) ash with many small rounded pieces of seemingly yellowish pumice. The ash is mottled and contains some cultural material.

55/58–60 cm: darker olive-brown ash with pumice, pottery and obsidian. This is distinct in section from levels above and below, but is disconformable only with the sand below, on which it lies, with some interdigitation. It is unclear whether the dark colour comes from humification, leaching or was the colour at original deposition, so whether this is a separately deposited ash or part of the layer above cannot be determined.

60 cm and below: well-packed beach sand continuing to at least 250 cm below surface, at which depth water is reached. Excavation of TP1 reached 270 cm but cultural material occurred down only to 130 cm, with very little below 110 cm.

**Table 4.** SDP, distribution of cultural materials in Test Pit 1 by weight (g) per unit volume.

level	plain pot	obsidian	bone
I	42.4	6.4	0
II	73.8	5.4	0
III	128.6	2.9	3.3
IV	163	9.3	15.1
V	128.2	9.2	14.5
VI	18.5	13.6	2.4
VII	1	0.2	0

Pottery and obsidian occurred from the surface through to 130 cm, but was concentrated in the upper part of the sand at about 70 cm below surface, where bone was also common. Table 3 correlates the three excavations into seven levels based on the geological stratigraphy. It gives the relative volumes of each level based on bucket counts and measured levels, and lists the absolute quantity of material recovered. It appears from Table 4, which gives the weight of finds per unit volume, that larger pieces of obsidian occurred lower in the sand than was the case with a majority of the potsherds and bone. Several large pieces of obsidian (largest 41.1 g) were found in level VI; detailed use-wear and residue analysis on one of these was undertaken by Richard Fullagar, whose report is abstracted below. Huw Barton examined a further ten tools from spits 4, 7 and 10, finding use-wear from transverse use and plant residue in the form of starch grains and cellulose tissue on four of them. He noted that residue preservation is poor because of the sandy nature of the site, but that soft plant material was being processed. He is inclined to think that this was not tubers.

Apart from ceramics and obsidian, four flakes and chips of other stone were found. One is green, probably hornfels, ground on one surface and certainly derives from an axehead; the others are of grey chert. The most unusual find was in Level V and consisted of a solid, flat, fine coral disk 94.5×84×30 mm, with rounded edges and a dark red stain on one face. It resembles in shape the *kulki* percussion stones of Australian assemblages (McCarthy, 1967: 55, fig. 41/7) and could be a hammer or grinding stone for working shell. It is now quite friable.

The plain pottery from SDP appears to be largely from round-bodied pots with narrow necks and everted rims. Many of the rims are very thin (2–3 mm) and squared off, while others are decorated with impressed notches.

**Table 3.** SDP, distribution of cultural materials in Test Pit 1 by count (weight in grams); *nc*, not counted.

level	relative volume	pottery rim+decorated	pottery plain	obsidian	pig	fish	unidentified
I (Euro)	8	2 (2.3)	239 (339.1)	169 (51.2)	—	—	—
II (Ash)	6	3 (8.7)	218 (442.8)	47 (32.5)	—	—	—
Pit	c. 3	—	73 (120.7)	21 (8.8)	—	—	—
III (sand)	3	7 (22.5)	278 (385.9)	47 (32.4)	nc (1.2)	nc (4.8)	nc (3.8)
IV	6	18 (156.2)	568 (978.2)	42 (55.8)	nc (62.8)	nc (7.6)	nc (20.2)
V	5	23 (114.0)	282 (640.9)	32 (46.0)	nc (52.6)	nc (8.7)	nc (11.3)
VI	8	17 (48.6)	99 (148.7)	32 (109.1)	nc (10.1)	nc (1.4)	nc (7.8)
VII	3	—	1 (1.4)	2 (0.8)	—	—	—



Large pieces of *Tridacna*, Nautilus and oyster, as well as whole *Anadara* and other bivalves and gastropods occurred in the sand with pottery and obsidian. Only a handful occurred in any excavation unit, thus being too few to be called a midden. However, these shells probably derive from human activity, which is certainly the case for a length of *Trochus* arm ring and two pieces of *Trochus* in Levels V and VI from which material had clearly been cut.

One radiocarbon date (SUA-3061: 2940±60) was obtained on a large chunk of *Tridacna* sp. from spit 7 (Level IV) of TP I at 75 cm below surface. This was at the level of a high concentration of pottery and obsidian and so should date the major period of use of this area of the site.

TP2 was opened 65 m inland from TP1, towards the back of the village area proper, where houses were less crowded. A nearby rubbish pit showed essentially the same stratigraphy as in TP1, but excavation revealed some differences. The top 15 cm consisted of sticky humus with European material throughout (Level I). Below this was 15–30 cm of bright yellow-brown (2.5 YR 6/4) volcanic ash, mostly sterile but mixed in some places with the material above (Level II). This was underlain by a thin layer of darker more humified ash, with small rounded yellowish pieces of pumice (Level III). This lay totally unconformably on the sand below (Level IV). We were able to peel back the ash off the sand and reveal two sherds, an obsidian flake and several small stones sitting on the sand. In each case the upper side of the object was buried in ash while the lower side was sandy. The sandy surface was a highly irregular, with bumps and hollows, ranging from 50 to 67 cm below ground surface. The upper 10–20 cm of the sand was light grey in patches, becoming increasingly white with depth. Excavation ceased c. 80 cm below surface, as the white sand contained no cultural materials.

Very little material was found in TP2 and that mostly in the top horizon, presumably derived through digging and redistribution from elsewhere. Only plain sherds and obsidian were recovered (Table 5). There is a hint in the distribution of the material that it is similar to that found in TP1, but no more than a hint. A radiocarbon determination on a carbonized *Canarium* shell, apparently resting *in situ* on the sand below the ash, was 1.15% modern (SUA-3080). This was noted in the field as possibly the product of later emplacement by crabs, but was the only material available for dating. TP3, 60 m further inland again, produced a similar stratigraphy but only one piece of pottery.

**Table 5.** SDP, distribution of cultural materials in Test Pit 2 by count (weight in grams).

Level	Plain pot	Obsidian
I	32 (44.2)	25 (9.5)
II	3 (17.0)	1 (1.8)
III	11 (15.4)	2 (1.8)
IV	3 (2.5)	4 (2.8)

## Overview

At this site it seems likely that the shoreline has been prograding for the last 3000 years, with a steady accumulation of sand over the area of what is now the dry-land village—or at least the beachward part of it. When material was deposited in the sand of TP1, the village was probably built over water or in the tidal zone, allowing the accumulation of debris with relatively little subsequent disturbance. This is particularly demonstrated by the re-assembly of six, four and two sherds, broken in antiquity, from Levels IV–VI. Such a suggestion may imply that the larger pieces of obsidian were originally deposited in the early stages of debris accumulation. On the other hand, the small quantity of material recovered suggests that either the excavations were on the edge of settlement or that it was short-term, at least at this location.

The volcanic ash lying unconformably on the sand shows the sand had only been very recently exposed—not long enough to be humified—and that it was not subsequently covered by water. This may suggest that the volcanic ashfall activity was accompanied by uplift of this part (at least) of the island, or that the water was so shallow that the ash was sufficient to raise the area above tide level. The lower, yellow-brown ash was humified and altered by human activity, though it seems curious that so little of this activity affected the ash/sand contact zone that the unconformity was generally preserved. The second, lighter yellow ashfall is only preserved patchily in its pristine form: it can be assumed that its upper part or later ashfalls form the upper, now cultivated and built-on, part of the village. The fact that pristine ash remains at all suggests that it was originally a deep fall or was quickly covered by a later one.

## Use-wear and residue analysis (Richard Fullagar)

A short, pointed thick flake from TP1 Level VI was examined. It has a steeply retouched edge around its perimeter and within the semi-detached flake scars on this are considerable quantities of residue. There are also quantities of pink material which appears quite greasy on the tool surface as well as white fibres that look like fragments of collagen since they show no birefringence. Use-wear is present as a light polish on one part of an edge and short shallow striations transverse to the edge.

A residue sample taken from under a semi-detached flake and examined at ×200 power consisted of some xylem and starch grains and much cellular tissue without cell walls, which is characteristic of animal cells. One cell appears nucleated. Thus the residue seems primarily derived from working animal tissue, perhaps for scarification.

**SDQ.** Rabaul 9389: 389318–393319 (Figs 3, 16H, 17A–E) Mioko is an island about 1 km<sup>2</sup> in area at the southeast end of the Duke of York Group. In 1985 Lilley (1991) found a surface scatter of Lapita pottery and obsidian (site SDQ) at the western end of Palpal village, which stretches along the length of the northwest coast. Our surveys confirmed this, finding weathered and rolled pottery and obsidian over an area of at least 150×100 m. We also found a further scatter at the other end of the village (sites SFA, SFB and SFC), as well as a thin scatter of obsidian over much of the island, especially its flatter eastern end towards the village of Virien.

The island is made up of two sets of deposits. The main spine, running NE-SW consists of raised coral, as does the small northern peninsula. The coral is about 12–15 m a.s.l. in the centre of the island, and several metres above sea level along the southern coast, where there is a cliff now being undercut by sea. The coral slopes down toward the western end. The second set of deposits consists of beach sands along the northwestern shore, joining the two areas of raised coral in the northeast and forming a sandspit at the western tip of the island. This sand spit is the former site of J.C. Godeffroy and Sohn's trading station (initially "purchased" in 1878) and subsequent European stations; some concrete house posts and steps still exist there. The existence of the deepwater harbour within the bay on the northwest side, the wide protective reef on the southern side of the island and Levington Passage through this on the eastern side of the island are important in making this area suitable for shipping.

Four test pits, each 1×1 m, were excavated at the western end of the island. Since these pits were exploratory, only every fifth bucket was sieved.

Test Pit 1 was some 60 m from the north coast, where the raised coral first appeared to slope down beneath the sand (Grid 393318). The strata were: 20 cm of humic soil (presumably reworked ash) on top of c. 30 cm of yellow-brown volcanic ash, somewhat clayey and containing some coral fingers. This overlay a greyish sand which became lighter, more concreted and wetter with depth. By 150 cm some *Anadara* in a natural death configuration were noted. Coral pieces, occurring throughout, became larger with depth and by 210 cm appeared to derive from an active beach. Cultural material, consisting of potsherds, obsidian and a piece of worked shell, was found in the ash; two sherds were found in the upper part of the sand (Table 6).

Test Pit 2 was dug 60 m west of TP1. It also contained about 20 cm of humic reworked ash on top of yellow-brown ash, this time with some admixture of sand. From c. 50 cm the proportion of sand increased, but with some ash; this deposit continued downward, eventually to reach large reef blocks at about 160 cm. The reef blocks, which lay at c. 1 m above the current reef flat, were surrounded by sand and coral fingers and were almost totally covered by groundwater at high tide. Cultural material occurred down to the reef, with most lying between 50 and 160 cm. All the pottery was very rolled. Two sherds and a pig tibia were found in a small, dark muddy hole between the blocks, but the sand around them was otherwise sterile.

Test Pit 3 was a further 45 m towards the western end of the sandspit. It displayed a similar stratigraphy to TP1 and TP2, grading into coarse beach sand at around 60 cm depth. This contained increasing quantities of coral with depth. Water was struck at 130 cm and the excavation ceased at 165 cm depth. Cultural material was found throughout. Above about 120 cm much of the pottery was rolled, but below this it was less eroded and here also bone was found for the first time. At about 130 cm we found four sherds comprising about one-quarter of the upper part of a carinated vessel similar to those common in "classic" Lapita sites, with triangular incised decoration and a crenellated rim, almost precisely similar in shape, size and decoration to that recovered by Gorecki *et al.* (1991) at Lemau. This pot, like other material at this level, was not rolled, but much of it was encrusted with calcium carbonate. Very little obsidian was found in any level.

Test Pit 4 was excavated about 200 m from the western tip of the island and 16 m from HWM on the Mioko Harbour side (Grid 393319) to see whether the sandy deposit occurred for any distance along the island's north coast. TP4 exhibited a similar stratigraphy to the other pits, with humified, reworked ash lying over yellow-brown ash down to about 60 cm, and an increasing quantity of sand below this. Many land crab holes were visible. Basal coral rock was struck at 1 m and the pit was abandoned. Cultural material in the form of small quantities of rolled pottery and obsidian was found throughout the depth of the pit.

We believe that the lower layers of Test Pits 1 and 2 encountered a raised reef with a beach deposit behind it. The stratigraphy of the pits is confirmed by auger holes between them. These deposits probably relate to the same mid-Holocene higher sea level dated at SFB. They contain no cultural material. The lower levels of Test Pit 3 are cut into younger sand, built up after the sea declined to its present level. This sand spit incorporates a wide range of Lapita-like material and we believe a rich site could exist here, though its exact nature remains to be determined. The local landowner, who owns the entire sand spit area, would not permit further excavation. Finds from the four test pits are listed in Table 6.

**SEE.** Rabaul 9389: 336317 (Figs 4–11, 17F–M, 18–24, 25A–C) Kabakon is the most southwesterly of the Duke of York Islands. In 1993 it had no permanent residents, being owned by Kerawara Islanders who used it for both food supply and commercial gardens. A copra dryer is located on the north coast, about 250 m from the most easterly point, on a coral beach sand platform some 50 m wide and 0.5–1 m above high water. This is the only point on the island where there is good boat access. Behind this platform, some 40 m from HWM, the ground rises abruptly a further 1 m before levelling out. Both to the west and east of this the same two levels occur, although they are both somewhat damper and perhaps slightly lower. In each case the lower areas reach some 20–30 m further inland so that there is a slight promontory of raised ground behind the copra dryer area. The main focus of site SEE is on this promontory.

An intensive one-day survey of all recently cultivated (i.e. with soil exposed) gardens—at least 100, covering perhaps 4 hectares—produced only 18 flakes (21 g) of obsidian. Site SEE however, produced the largest concentration of sherds found in the whole island group. The major concentration, estimated by eye at >5 sherds/square metre of surface, covers a roughly circular area of 90 × 90 m, starting at the seaward edge of the promontory referred to above. A lower intensity scatter of sherds (1–3/m<sup>2</sup>) is found along the back edge of the lower beach platform eastward for at least 175 m, and some rolled sherds also occur on the slope down to and along the landward edge of the beach platform behind the copra dryer. There are no surface finds to the west of the area.

TP1 (1.5×1 m) was placed towards the northwestern end of the main concentration, where it would not interfere with current gardens. It was dug in 10 cm spits to a depth of 110 cm, and sieved with 5 mm sieves. Cultural material was found in the top 80 cm only. The stratigraphy was somewhat different to that found in other sites. Below about 13 cm of highly humified, crumbly ash clearly deriving from frequent gardening, lay c. 30 cm of weathered yellow pumice nodules and some chalky white shell in a dark yellow-brown humified ash. Towards

**Table 6.** SDQ, distribution of cultural materials in Test Pits 1, 2, 3 and 4 by count (weight in grams).

pit/spit	pot decorated	pot plain	obsidian no.	other stone	worked shell	pig	fish	unidentified
TP1/1	—	3 (18.5)	1 (0.2)	—	1 (23.5)	—	—	—
TP1/2	—	3 (52.6)	5 (0.8)	—	—	—	—	—
TP1/3	1 (0.4)	1 (6.0)	—	—	—	—	—	—
TP2/1	4 (26.3)	3 (84.1)	1 (0.8)	—	—	—	—	—
TP2/2	8 (151.8)	20 (194.8)	—	—	1 (77.9)	—	—	—
TP2/3	9 (102.7)	56 (316.9)	5 (2.2)	1 (1.8)	1 (24.1)	1 (85.0)	—	—
TP3/1	2 (12.9)	5 (36.8)	—	1 (2.3)	—	—	—	—
TP3/2	1 (3.6)	8 (35.4)	1 (0.8)	—	—	—	—	—
TP3/3	5 (46.1)	32 (72.9)	—	—	—	5 (14.0)	16 (10.0)	10 (14.0)
TP3/4	7 (719.8)	24 (113.7)	2 (2.5)	—	—	2 (73.0)	—	—
TP4/1	—	13 (25.0)	1 (0.5)	1 (0.2)	—	—	—	—
TP4/2	1 (22.2)	18 (30.8)	1 (0.1)	4 (0.8)	—	—	—	—

the base of this were some small patches of sterile yellow-brown ash. The contact between this and the level below seemed fairly abrupt to the trowel in plan, but was almost impossible to discern in section. It seemed as if the humified ash lay on a very irregular surface of sticky clayey/sandy deposit, possibly humified to a dark grey-brown in colour (10YR 3/2 dry) which, when dug into, proved to be full of white flecks (?rotten coral fragments) with some fingers of coral and shell. From 40 to 75 cm below surface the matrix became gradually lighter in colour, coarser in texture and sandier, with coral fragments increasing in number and size. The deposit, however, remained very hard and both sherds and obsidian increasingly displayed carbonate concretions on their surfaces. At the base of this level the colour of the matrix was 10YR 8/1 (dry). Below this, sterile sand intensely bound together with coral fingers continued to below 110 cm.

Archaeological material consisted of sherds, obsidian and other stone, bone and some shell (Tables 7 and 8). The puzzle which arises immediately is why the largest concentration of pottery is found in the upper 25 cm of deposit above the yellow-brown ash. Table 7 shows that a high and reasonably constant percentage of the sherds are decorated, and of these a toothed stamp has been used on a high proportion (e.g., 42% in Spit 3 [Table 1]). In terms of the stratigraphy at sites such as SEO, SEP, SDQ and SDK, the primary depositional context of pottery, especially with this kind of decoration, should be below the volcanic ash and above the sand and coral fragments which, if original, may be presumed to relate to the high sea level of c. 5000 BP. That is, the primary

location of pottery should be found somewhere around Spit 5, where the majority of the bone occurs. (I note here that the apparent slight rise in sherds/bucket in Spits 4 and 5, and the decrease in mean weight of obsidian, derive from the fact of wet sieving all, rather than 25%, of the buckets in these levels and below).

It is tempting to argue that many archaeological materials have been vertically displaced upward from their original context by such activities as burrowing crabs and gardening. If that were the case, then the sherds on and near the surface should be smaller, having been reworked more frequently. To test this, we sized all plain pottery from each spit by fitting them into circles of known diameters (Table 9). This hints that the explanation may have some merit, in that there are more sherds in the 2–4 cm diameter range in Spit 3. But this rise is not matched in the larger size ranges and the trend, if it exists, has been obscured from Spit 4 down by our change in sieving techniques. The argument, on the present data, is not very convincing, and it is not obvious that it would be made more so by further analysis.

Further excavations and some augering were undertaken to clarify the stratigraphy. TP2 (1×1 m) was dug on the lower beach platform just behind the copra dryer. It consisted entirely of sand with increasing quantities and sizes of coral with depth, and without any surface ash. The only pottery found was in the upper few centimetres, though the pit was dug to well below groundwater level (1 m), with the coral pieces getting larger with depth. At the time we considered this platform to be a raised beach level of the same period as

**Table 7.** SEE, distribution of cultural materials.

layer	spit	buckets, no.	sherds, no.	percentage decorated	obsidian no.	obsidian g
Upper ash	0	8	672	19	9	4.6
	1	15	1284	19	32	12.8
Ash, pumice	2	14	1151	17	22	11
	3	16	550	24	14	7.6
	4	7.5	479	19	16	4.5
Clayey sand	5	10	454	19	40	11.2
	6	9	264	13	13	4.6
Grading to sand	7	7	56	18	2	0.5
	8	8	18	11	2	0.3
	9,10,11	22	0	0	0	—

**Table 8.** SEE, distribution of bone by count (weight in grams); unidentified: listed by weight only.

spit	fish	reptile	pig	rat	human	unidentified
1	—	—	—	—	—	—
2	—	—	—	—	—	—
3	3 (1.6)	—	—	—	—	6.5
4	67 (4.3)	1 (0.3)	—	—	—	34.7
5	187 (16.7)	2 (0.1)	—	2 (0.1)	—	42.5
6	98 (8.0)	—	2 (3.0)	—	1 (1.0)	14.1
7	14 (0.9)	—	—	—	—	1.3
8	5 (0.3)	—	—	—	—	0.2

on Mioko (see sites SDQ, SFA, SFB, SFC), which it may be. However, I am more inclined to suspect is that the original site was disturbed in a major way in the recent past, perhaps by bulldozing around the copra dryer, with the 3000-year old material being dumped above the current spits 3 and 4, followed by extensive mixing by gardening. Research in the Australian War Memorial records shows no Japanese wartime activity which could account for such disturbance, but oral history and further excavation may elucidate the situation. Summerhayes (2004: 154 n1) suggests a tsunami, which would presumably have reworked material from the lower beach platform and dumped it on top of the previous land surface (the sticky sand). This would account for the pottery distribution but not for relatively unmixed deposition of the humified ash layer. No other site in the archipelago suggests reworking in this way and the fact that the site is on the more protected side of the island also speaks against this interpretation.

Three auger holes, 30, 45 and 60 m away on a compass bearing of 190° from TP1 showed somewhat similar stratigraphies to it, each having a sticky (?clayey) sandy ash-like deposit sitting above sand and apparently below a yellow-brown ash with pumice fragments as in the other sites. No finds were recovered from these holes. Only much larger excavations, perhaps in the form of cross-cutting, long, narrow trenches seem likely to help solve this problem.

In TP1 some shells were found in Spits 4–8, but only scattered singly. The most common species was *Strombus* cf. *luhuanus*; *Tridacna*, *Anadara* and cowries were also noted. No small or fragile shells were found and while shell was chalky it was not fragmented or rolled, suggesting emplacement after any beach formation. It is curious that whereas the shell is chalky, suggesting dissolution, the bone is in good condition.

**Table 9.** SEE, plain sherd sizes (%) as per cm circles.

size spit	<2	2–4	4–6	6–8	8–10	total
surface	39.5	55.1	4.3	1	—	508
1	33.6	57.5	8.5	0.4	0.2	1026
2	37.5	58.1	3.2	0.3	0.1	750
3	15.9	68	13.5	0.3	—	422
4	43.2	48.9	6	1.5	0.3	335
5	47.2	43.2	9.2	0.6	0.3	366

A radiocarbon date on *Strombus* shell from TP 1, Spit 5 (SUA-3082: 3090±60) clarifies the dating situation slightly by showing that some of the deposit we believe to be *in situ* is dated to a reasonably appropriate time (depending on the allowance made for the marine reservoir effect). However, there are a number of sherds with very fine dentate stamped decoration and semi-cut-outs, which Glenn Summerhayes (pers. comm. October 1994) suggests on the basis of his Arawe Islands data should be quite early and should certainly be earlier than the styles from SDP, SEP and SEO, the radiocarbon dates from which are almost exactly synchronous with SEE.

The pottery from SEE has a high percentage of decoration (Table 7), mostly dentate or incised/plain impressed. Some idea of the variety can be gained from the illustrations. In terms of shape there are open platters, bowls, a number of decorated pot stands (recognized first by Summerhayes) and possibly lids. Rim shapes include elaborate flanges below the lip as well as more regular types.

One hundred and fifty pieces of obsidian were recovered from TP1, and the density of these has been determined by Mary-Noel Harris (1994). In order to achieve a reasonable sample size, the excavation spits were grouped into four levels. Her results show that a majority of the obsidian came from West New Britain sources, but with a significant minority from the Admiralties (Table 10; cf. White & Harris, 1997).

Very little other stone was recovered, and for none of it can the source be local. In Spit 3 a thin flake, finely ground on one face, is made of a fine grained homogeneous stone, possibly andesitic, with quantities of green mineral (Munsell 5Y 5/2). It is likely to be from the same source as an axe flake found in SEO TP1 spit 1. In Spit 1 a very fine grain flake of greenish stone (Munsell 5BG 4/1), but without a ground surface, may be from an axe. It is unlikely to be from the same source as the stone in Spit 3. From Spit 5 was a core of coarse-grained pink chert, coarse enough for the quartz grains to be visible and probably very hard. Two flakes had been removed.

**SEF.** Rabaul 9389: 343313 (Fig. 25D–F) Kerawara Island, at the southern end of the group, is composed of raised coral. It rises to a maximum of about 4 m above sea level along its southeastern side and slopes down gently to the north and west. There is a large, deepwater passage into Kerawara Harbour on the east side of the island. The island is currently occupied by Kerawara village at the eastern end, and the small hamlet of Ramolot at about 250 m from the western tip, which is a sandspit about 100 m long and lightly vegetated at the inner end. Near the eastern end (Grid

**Table 10.** SEE, obsidian sources by counts (%).

level/spit	New Britain	indet.	Admiralty Is.
1/0+1	32 (78)	7 (17)	2 (5)
2/2+3	31 (86)	2 (6)	3 (8)
3/4+5	33 (59)	13 (23)	10 (18)
4/6+7+8	10 (59)	3 (18)	4 (24)

356308) there are the concrete pillar foundations of a colonial period house and other buildings said by local people to be from the German period.

Survey was undertaken by walking along the island's central road and inspecting all cleared areas on either side. Obsidian occurs over the whole island. Site SEF is a thin scatter of about 100 sherds between Ramolot and the western sandspit over an area of at least 80×100 m.

With the exception of one incised sherd, all of the sherds are rolled or abraded. Of the 36 decorated sherds collected (385.6 g), 11 have dentate stamping, 19 have only incision or plain impression, five are too eroded for determination and one appears to have two bands of fingernail impressions in paired Vs. All decorated and plain sherds are tempered with a poorly sorted sand containing a medium to very high proportion of small black regularly sized volcanic crystals, mixed with quartz and other pebbles. Two decorated sherds (1 dentate, 1 incised) have some shell mixed in with volcanic temper. The similarities in temper occurrence are thus with SEE.

**SEH.** Rabaul 9389: 357312. Two rolled, plain sherds, both heavily tempered with angular olivine sand (almost pure, mostly small in size) were found on the surface of the northeast corner of Kerawara Island.

**SEN.** Rabaul 9389: 356431. On the southwest coast of Makada Island one tiny, rolled plain sherd with olivine temper and obsidian flakes were found in a steep limestone hillside garden on a track between Uraputput and Narakoi villages, above a 5 m wide beach flat.

**SEO.** Rabaul 9389: 366444 (Fig. 25G). This site was discovered as a scatter of pottery and obsidian about halfway along the road between Uraputput and Palpal villages, Makada Island. Survey in the gardens on either side of the road suggested the site basically lay between the road and the beach, here some 60 m apart, and stretched for about 230 m parallel to the coast.

Towards Palpal, on and continuing some 200 m north of a small (100 m long, c. 3 m high) limestone rise, we found occasional sherds and obsidian on the beachward side of the road. The material was always small and rolled and no concentrations were noted, so this exposure has not been given another site designation. A surface collection of 71 sherds (254.7 g) included seven decorated (six incised/plain stamp, similar to sherds found in level 3 of the test pit, and one dentate stamped rim), all made with quartz sand temper. Most of the plain sherds were also made with this temper, but five have olivine sand.

A 1×0.5 m pit was opened adjacent to the road on the beach side, in about the middle of the main concentration. The sediment was dry-sieved with 5 mm sieves. The stratigraphy was as follows:

0–10/12 cm: friable, black humic ashy soil, with many small rolled sherds and obsidian.

10/12–25/30 cm: yellow-flecked ashy soil with a larger crumb structure. In section, we observed a large chunk of bright yellow ash at c. 30–35 cm below surface.

25/30–35/45 cm: yellow-brown volcanic ash with small round pumice pieces, becoming darker and stickier (probably more clayey) towards the base.

35–40 cm: light brown sandy soil, with some yellow and white flecks, apparently a mixture of the overlying ash and underlying sand. A pit filled with mixed, darker soil had been dug down into the sand to a maximum depth of 15 cm. It contained many fist-sized cobbles, some sherds and fish teeth, and is interpreted as a small mumu (cooking) pit. Apart from this pit, the sand was sterile to 60 cm below surface.

The archaeological material is divided into the four levels described above (Table 11). The cultural material is likely to have been deposited at the time people were using the lower levels of the volcanic ash. Confirmation of this was attempted by looking at the size of the sherds within each excavation unit, on the argument that the more displaced the sherds were, the more fragmented they should be. Sizing was carried out in the field by fitting sherds into circles of known diameter. Table 12 shows that the mean size of sherds was larger in the lower levels. Level 3 is also where the larger flakes of obsidian occur, along with a majority of the bone. I therefore conclude that the original deposition occurred in Level 3, probably before the emplacement of the yellow ash, but after that of the lower ash.

Obsidian mostly occurs in the form of flakes and chips. Cortex was noted on only three pieces, two on platforms of flakes from Level 1, one on a small (4 g) blocky chunk from Level 3. Probable utilization of edges occurs on one piece from each of Levels 1 and 3. Harris (1994) determined the density of the 23 obsidian pieces from Levels 3 and 4. Twenty-one pieces are of West New Britain origin (density <2.3657), one is likely to be so (2.3681), and only one is from the Admiralty Islands (2.4010). This is quite the opposite of the picture from the *in situ* levels at SDP and supports the idea that these two sites are not synchronous.

Other stone includes chips of quartz, basalt and chert. In Level 1 there is a flake with grinding on one face; made of a green-grey stone, possibly andesite, it is almost certainly from an axe.

Most of the bone, probably including most of the unidentified pieces, is pig. The fish include reef species, none large.

Only 6.8% of the excavated pottery is decorated. The only dentate stamping occurs on one very rolled shoulder sherd tempered with shell in Level 1. The majority of decoration consists of sets of incised parallel lines set at angle of around 60 degrees to each other: five sherds incised this way in Level 3 and two in Level 4 seem likely to belong to the same pot. There is one shell-tempered piece with applied decoration in Level 3. Rims (4) are plain, crenellated or slashed on one side.

Temper used in the plain pottery is mostly quartz sand. Some sherds from both surface and excavation are thin and without decoration, as at SDP, but most, including all the incised sherds, are a thick coarse ware. On the basis of decoration and fabric this material seems similar to the surface material of SEP.

**Table 11.** SEO, distribution of cultural materials by count (weight in grams).

level	pot decorated	pot plain	obsidian	other stone	pig	fish	unidentified bone
1	4 (31.5)	64 (87.9)	45 (15.7)	2	—	—	—
2	4 (7.9)	95 (190.1)	45 (16.2)	2	—	—	—
3	10 (46.4)	94 (201.2)	20 (18.6)	1	5 (23.0)	10 (4.7)	16 (15.5)
4	2 (25.7)	21 (43.4)	3 (2.1)	—	—	7 (4.6)	2 (1.0)

A radiocarbon determination was made on one of the only two pieces of shell excavated. This was a *Tridacna* valve, noted as being slightly chalky on the outside, found in Level 3. The date (SUA-3081: 36,380±225) indicates that the shell does not derive from cultural deposits, but may date the time of emergence of this part of the island.

**SEP.** Rabaul 9389: 369433 (Figs 12A–B, 25H–O, 26A–C). Initial interest in Uraputput Point, Makada Island was the sandspit on which Uraputput village is built, and which resembled the sandspit where we had found a waterlogged site (SDQ) at the western end of Mioko Island. However, the pottery found on the surface differed markedly from most found elsewhere. A selective collection consisted of 19 decorated sherds, four rims and seven plain sherds. Decoration consists primarily of fingernail impressions placed in bands and small rolled strips flattened onto to the surface, with two incised pieces. The pottery seems generally to be a thick ware. Three sherds (38.5 g), two with slashed incisions, were tempered with shell, three (19.0 g) with olivine sand and the rest (25, 231.4 g) with coarse, poorly-sorted quartz gravel and some finer shell.

This pottery was found over a cleared area c. 100×30 m at the inland edge of the village, just before the underlying coral rises slightly and where sticky dark soil forms a surface layer which can be gardened. This cleared area had been recently bulldozed down to sand. Thirty centimetres or more of yellowish ash had been removed; a remaining strip could be seen under some houses just to the south and in a garden west of the area.

TP1 (1×1 m) was dug towards the eastern end of the bulldozed area. Every bucket from the upper levels was sieved, but from about 1 m depth only every fifth bucket was sieved. Under 60 cm of colonial period (European) debris, later discovered to be the bulldozer dump, there was a yellowish ashy sand about 15 cm thick (Level 1). This was underlain by sand, which was coarse and loose at the top but finer and firmer with depth, with increasingly large coral pieces from around 200 cm below surface. A thin layer apparently of volcanic ash and greenish grey in colour occurred at about 50 cm below the top of the sand at about 120 cm below surface. This was the base of Level 2. Levels 3 and 4 were each about 50 cm deep within slightly greyish sand. Material recovered is listed in Table 13.

**Table 12.** SEO, plain sherd sizes (%) as per cm circles.

level	<2cm	2–4	4–6
1	80 (71)	31 (28)	1 (1)
2	115 (58)	77 (39)	3 (2)
3	78 (47)	82 (50)	5 (3)
4	9 (43)	12 (57)	—

Pottery was found throughout the sequence. Most sherds were heavily rolled, but there was no obvious stratigraphic separation between rolled and unrolled sherds. A large shoulder sherd from Level 4, for example, is only lightly abraded, whereas most of the sherds in Levels 2–4 are heavily rolled. In Level 2 was the side of a dark red, shell tempered, open platter with a heavily scalloped rim and incised decoration clearly modelled on “classic” Lapita motifs (Fig. 12a). In Level 4 a large piece (176.6 g) of the upper body of a narrow-necked jar is decorated with free-flowing geometric designs reminiscent of some from Kreslo (White & Harris, 1997: fig. 4). Most sherds were tempered with quartz sand with a fair percentage of fine shell.

A piece of worked *Trochus* was found in Level 2 with some other large pieces of shell, but we are dubious about using these for dating as the context of their current depositional position is not clear. Limited amounts of obsidian were found throughout the sequence. In Level 3 there was a round, bi-convex basalt river pebble, clearly used as a hammerstone on about one-eighth of its edge.

TP2, originally 1×1 m and then enlarged to 2×1 m (TP2 NW), was begun 21 m west of TP1. As it was dug five weeks after TP1 and with a different group of local excavators, comparisons between the two pits are not perfect. Under an intermittent surface covering of 2–3 cm of yellow ash—not removed by the bulldozer—was damp yellowish sand. The upper 85 cm is clearly windblown. Below this is about 20 cm of unlensed sand, apparently a beach deposit. At 115 cm down about 10 cm of fine grey ash interspersed sandy streaks was encountered, and at 165–175 cm there was very fine grey sand such as might be left by a still-water environment. Nonetheless, in the intervening deposits, the sand became gradually coarser with depth, and contained coral and some small pebbles. At groundwater level, about 200 cm below surface, all finds were heavily encrusted with calcium carbonate. The sand, but not the mud or ash levels, contained a few small pieces of mostly rolled pottery down to 235 cm, at 35 cm below groundwater level. Occasional pieces are unrolled.

Material recovered is listed in Table 14. In Level 3, c. 140 cm below surface, was found a tapered *Trochus* shell nose bone or ear plug (14.7 g), ground into shape and looking like a copy of a pig’s tusk. Bone was found in all levels below 100 cm, but was heavily encrusted with concreted sand; while much can be identified, weighing it would give an entirely false impression.

One applied and fingernail impressed sherd was found in Level 1. A large unrolled sherd with quartz/shell temper from Level 5, almost at the bottom of the excavation, seems to be decorated with paddle and anvil impressions, although this may be adventitious. Only three other decorated pieces were found below Level 1, and these were all incised or plain impressed.

**Table 13.** SEP, distribution of cultural materials in Test Pit 1 by count (weight in grams).

level	pot decorated	pot plain	obsidian	other stone	glass
1	1 (2.6)	30 (59.5)	8 (8.1)	—	5 (20.1)
2	1 (57.6)	1 (34.6)	—	—	—
3	2 (6.6)	10 (41.8)	1 (0.2)	1 (278.6)	—
4	1 (178.6)	7 (19.5)	2 (7.1)	—	—

A radiocarbon sample (SUA-3062: 2730±80) of charcoal from a pit dug into the top of the sand and sealed in by bright yellow ash, 1 cm or so of which remained, came from 12–15 cm below current surface, i.e. 7–10 cm down in the sand. Using CALIB Rev 5.0.1 this CRA calibrates to 3040–2730 cal. BP with 0.991 probability at 2 SD. This dates the last accumulation of the sand, and therefore any pottery within it is older. It should also be a maximum date for the thick fingernail impressed pottery found on the surface which presumably derived from the bulldozed material. Since this date is based on charcoal from a small pit, it is probably the least contentious date of those obtained in this survey.

Much of the pottery was tempered with shelly gravel, i.e. small shell with larger gravel and olivine. One piece (10.4 g) in Level 2 was tempered entirely with a large rounded gravel, seeming to derive from a very different source.

The range of condition of the pottery, from highly rolled to completely unrolled, suggests it has been haphazardly derived from pre-existing deposits. To try to find undisturbed deposit, a series of four auger holes was drilled to the west and north. At 28 m west of TP2, at least 20 cm of yellow-brown and altered ash overlay white sand. Two square metres (TP3) were excavated to try and determine the relation of the pottery to the ash. Under the surface debris the stratigraphy consisted of bright yellow ash laterally interspersed with patches of softer, darker ash, i.e. clearly mixed material and including crab holes and roots (spits 3, 4). The two deposits were excavated separately, until all the bright yellow ash, clearly undisturbed, had been removed. This demonstrated that it varied from 12 to 30 cm in thickness, and sat on an underlying layer of dark yellow-brown ash with many rounded yellowish pumice pieces (spits 2, 4A). This layer contained small quantities of fire-cracked rock near its base, where in turn it lay unconformably on a highly irregular white sand surface at 30–58 cm below surface. No cultural material of any kind was found in the yellow ash; by contrast, pottery and obsidian in small quantities occurred in the adjacent “mixed” yellow-brown ash and, more importantly, in the yellow-brown ash which underlay the bright yellow. It

should be noted that the volume of disturbed yellow-brown is considerably larger than that of yellow-brown below the ash, which was a fairly thin layer. Only some very rolled pottery was found in the sand, some 20 cm of which was excavated (spit 5). It was not clear whether this sand was wind blown or waterlain.

The material recovered is listed in Table 15. The pottery underlying the bright yellow ash (probably the Rabaul eruption of 1400 BP) includes fingernail and impressed decoration: the only applied decoration was found in the “disturbed” material at the same level as the yellow ash. Much of the temper in the pottery from this test pit is basically shell, with some quartz gravel. The shell is, of course, particularly visible in rolled sherds, but a check on the unrolled sherds from this and other sites showed that its increased presence was not simply one of visibility.

In TP4, 30 m inland from TP3, we had clearly reached the edge of the garden zone. All of the ash above the white sand was a uniform yellow-brown. The upper part contained European material and throughout there were small quantities of sherds, obsidian and mumu stones, along with a few shells. This deposit overlies a white sand, but we did not have time to excavate this.

The stratigraphic sequence at SEP is not readily interpretable. The presence of both rolled and unrolled pottery throughout the sand suggests that its buildup occurred after an occupation but before 2730±80. Given the nature of the decoration, especially on the large sherd from TP1 level 4, it is hard to think of this as much older than the date. Possibly the site was a little inland and the excavated sands represent a beach buildup during the period of occupation, with the cultural material being a haphazard incorporation. This terminated at c. 2700 BP. Because of the haphazard nature of the accumulation, none of the shell found in the sand seems safe to use for dating the deposit.

The date of the first ashfall on this sand is not yet clear. We presume the yellow-brown ashfall with pumice will be synchronous with that found at other sites and dated at SDP to <2940±60 (SUA-3061) and here to <2730±80

**Table 14.** SEP, distribution of cultural materials in Test Pit 2 by count (weight in grams).

level/depth	pot decorated	pot plain	obsidian	pig	fish	unidentified
1/0–100	2 (86.7)	8 (12.7)	1 (1.4)	—	—	—
2/100–15	—	6 (23.1)	1 (0.4)	—	—	—
3/115–80	1 (2.5)	40 (234.0)	—	—	2	—
4/180–205	2 (20.1)	17 (214.1)	—	1	>34	>10
5/205–35	4 (84.5)	16 (82.4)	1 (0.4)	—	34	—

**Table 15.** SEP, distribution of cultural materials in Test Pit 3 by count (weight in grams).

level	pot decorated	pot plain	obsidian
Bright yellow ash	—	—	—
Yellow-brown, spits 3, 4	1 (15.7)	38 (119.5)	10 (7.5)
Yellow-brown, spits 2, 4A	3 (17.3)	26 (87.7)	8 (11.8)
Sand, spit 5	1 (10.5)	4 (29.5)	—

BP. That ashfall appears to have been considerably re-worked by human use before being covered by another ashfall, this time bright yellow. Before that later fall, recognisably from the Rabaul volcano at c. 1400 BP, fingernail impressed and applied decoration on pottery was dominant. Impressionistically, these ceramics, like those from SEO, are thicker and coarser than earlier ones. There is thus a gross contemporaneity with the SEO material. If this is so, it could be predicted that the obsidian will have been derived primarily from the Admiralties.

There is no evidence of the reoccupation of the site after the yellow ashfall until the recent period, which is when the current village is said by local people to have been established.

**SES, SET.** Rabaul 9389: SES-346395; SET-350401 (SES: Figs 12C–E, 26D–E; SET: Figs 2B, 13–14, 26F–O, 27A–E). Nakukur villages I and II are situated at the northwest point of Duke of York Island, with Nakukur II being the closer to Nakukuru Point, on which the Community School is situated. On the northern side of the Point the coast is sandy, and a metre or so deep at the shore at low tide; an extensive reef, with narrow passages, occurs about 50 m offshore. The southern side of the Point is a coral limestone coast, reefy and rocky; no houses are built on this side, where the sea is quite rough in the southeast trades season (April–October). Nakukur II merges into Nakukur I without any obvious marker. However, the division into two sites has been made on the basis of the current village boundary shown to us, SES being in Nakukur II and SET in Nakukur I.

Some surface sherds were noted throughout both villages, as was some obsidian. From surface indications the two “sites” could be considered as one scatter stretching over some 500 m and up to 150 m inland. Nonetheless, surface survey, complicated by houses, toilets and religious areas, suggested that there was a slightly greater concentration of sherds toward the eastern end of Nakukur I over an area of c. 50×100 m and 70–120 m back from the beach.

A haphazard surface collection from SES consisted of five decorated sherds (74.9 g) (three with a red slip, three dentate stamped) and 31 plain sherds (105.7 g). The butt of a oval cross-sectioned, ground stone axehead, made of very fine-grained grey stone, was found on the surface of the schoolyard, along with one obsidian flake. At SET a surface collection consisted of 24 decorated sherds and about 60 plain sherds; only the decorated sherds were kept. Nineteen flakes and a bipolar core of obsidian (total 28.1 g) were also collected.

A 1×1 m pit was dug at SET near the edge of the sherd concentration, 72 m from and about 2 m above high water mark. All buckets were sieved down to 150 cm, after which every fifth bucket was sieved; sieve size was 5 mm. The stratigraphy consisted of three basic levels:

- (1) 2–3 cm of European period surficial soil. In one corner of our pit a 15 cm diameter pit had been dug to a depth of 20 cm. Now filled with rubbish, this may have been a house post hole.
- (2a) yellow-brown ash with small rounded pumice pieces, mixed with some sand. Crumbly structure, without any apparent micro-layering. This graded into
- (2b) a lighter, looser sand at about 15 cm below surface containing occasional pumice pieces. Coral fragments and broken shells, mostly of sand dwelling bivalves, occurred throughout, but in low quantity.
- (3a) by 30 cm below surface the deposit consisted of clean white sand, still with some coral and shell and occasional cultural material.
- (3b) by 50 cm below surface only clean white sand was found and this continued, gradually coarsening with depth, until sloping coral limestone bedrock was reached at 220 cm.

Material excavated is listed in Table 16, which also shows that the original concentration of pottery was in the top of the sand, in level 2b.

This evidence of *in situ* concentration is reinforced by the fact that about half the sherds in level 2b appear likely to come from the same thin hard plain pot, to which two conjoining pieces of wavy scalloped rim may also belong, as may several rim sherds in level 3a. This is supported by the fact that all are tempered with the same very shelly sand. There are also four very thick, red fabric shoulder sherds from level 2a, which are tempered with a mixed olivine/quartz sand and almost certainly belong to another single pot. The conjoining pots/herds are plain as is nearly all the pottery in the excavation. Only four decorated sherds were recovered from TP 1: one coarsely dentate and two incised sherds, all small, in level 2a, and a larger incised shoulder sherd in level 2b.

The similarities of the *in situ* pottery in terms of both its nature and stratigraphic position are with SDP; indeed, they might even be part of the same site. Also similar to SDP is that “classic” Lapita pottery is found on the surface over a wide area, and there is no evidence as to where an actual



“Lapita” site is. We expected to find it in the sand below level 3a. It may be so, but further inland; on the basis of the current surface distribution, it is unlikely to be closer to the beach. If it is located inland, it seems unlikely to have derived from houses built over the water unless there has been much more landscape alteration than is apparent.

Two radiocarbon dates were obtained on single fragments of *Tridacna* sp. shell. SUA-3063 (3030±60) came from the lower part of level 2a, some 12cm below surface. SUA-3064 (3150±60) came from the upper sand 2b about 25 cm below surface. These dates have not been calibrated or corrected. They just overlap at one standard deviation, and both overlap at two standard deviations with SUA-3061 from SDP and SUA-3082 from SEE.

**SEY, SEZ.** Rabaul 9389: SEY-336332; SEZ-369327. SEY and SEZ are small sites on the coast of Ulu Island. SEY is almost opposite SEE, on the north side of Kerawara Harbour. It consists of a low density scatter of six pieces of obsidian in an area of c. 50×10 m between a plantation road and the coral beach rock. Poor ground visibility made survey difficult. One small sherd of pottery was also found. This is eroded on the surface, thin and hard, with a red fabric and tempered with olivine sand with a little gravel.

SEZ, on the southeast coast, is situated about 500 m south of the main Ulu Plantation buildings, along the coastal road. Like SEY, it consists of a scatter of obsidian (24 pieces) along a vegetated coral slope some 10–15 m wide between the road and a coral shelf about 5 m from HWM. Twelve small sherds were collected. One is decorated with fingernail or pointed stick jabs.

At both sites the ground-cover inland of the road is almost total and thus site dimensions and find numbers are minimal.

**SFA, SFB, SFC.** Rabaul 9389: SFA-398326; SFB-397323; SFC-395327 (SFA: Figs 27F–G; SFB: Figs 15E–H, 27H–L). SFA and SFB refer to very thin scatters of sherds and obsidian at the northeastern end of Palpal village, Mioko Island, in the areas called Ramak (SFA) and Namabuk (SFB). These scatters may all be part of a single site covering some 200×150 m. The haphazard surface collection consisted of 120 sherds, some of them rolled and abraded. The collection includes 10 rims, mostly indented and gouged, and 28 decorated sherds, half with dentate designs and half with impressed and incised designs.

One 1×1 m test pit was excavated in SFB at the rear of the present houses, some 150 m from the beach and 100 m in front of where the coral visibly starts to rise, to test for sub-surface deposits. We found only three sherds (18.8 g) and 18 pieces of obsidian (13.5 g) in the top metre and nothing below this.

The stratigraphy, however, was quite complex. Under 25 cm of humified, reworked ash and 20 cm of yellow-brown ash, we found a very dark, highly humic, sticky soil some 30 cm thick, resting unconformably on a lower brown, sandy ash. Directly below this, the top of a concreted coarse sand appeared to be burned, and this lay on a very fine white sand resting on basal coral about 160 cm below the surface. The nature of these deposits, which contained no cultural material, was not investigated, though some may derive from material washed down from the coral ridge south of the pit, and some from gardening or even ponding. All, however, are late Holocene in date since the basal coral, which lies at about 1 m above current sea level has been dated at SDQ to 4820±80 (Beta 66947). The C13 adjusted age is 5210±80.

As described in the SDQ report, this area of Mioko appeared to consist of extensive sand deposits, and we noted a long sandy ridge about 50 cm high running northeast and continuing the northern beach line in the area between the two coral ridges. This may be a relatively recent deposit, since local people told us that there used to be a sea water swamp between Namabuk and the small ridge to the north, on which we found a few surface sherds (site SFC). Nonetheless, the flat area behind this, where SFA and SFB are located, may well be sand deposits built up since the time of the mid-Holocene high sea level.

**SFE.** Rabaul 9389: 365352–368358. This site is at the southern tip of Foul Bay on Duke of York Island. It is some 300 m NE of the north end of Rukanda airstrip and about 30 m inland. There is currently no occupation in this area, which is under coconut plantation and grass. Survey occurred shortly after grass slashing, but even so visibility is estimated at <5%.

Four small pieces of plain pottery (8.5 g) were collected, two thin and hard, and all with a very fine black olivine sand temper. Eighteen pieces of obsidian (14.1 g) were also collected, some from along the east side of the airstrip (Grid 365348). Two pieces have some cortex; one is a small pebble fragment, and the other is a broken bipolar core. There is one other core and fifteen flakes. Some bright yellow volcanic ash was noted in some small eroding sections, but its stratigraphic relation to the finds could not be determined. The pottery at this site is similar to that of SDP. There is no current reason to suspect deposits exist, but we did not excavate.

**SFF.** Rabaul 9389: 384323 (Figs 15A–D, 28). Utuan Island, about 1.2 km long, rises slowly from west to east along most of its length, to a maximum height of some 12 m a.s.l. about 300 m from its western end. A large church is located at this point. From there to the eastern

**Table 16.** SET, distribution of cultural materials by count (weight in grams).

level	pot decorated	pot plain	obsidian	pig	buckets, no.	mean pot wgt
1	—	2 (6.1)	—	—	6	1
2a	2 (9.9)	31 (125.7)	7 (4.6)	—	13	10.4
2b	5 (86.4)	40 (331.8)	3 (2.4)	2 (6.5)	5	83.6
3	1 (10.1)	12 (90.7)	—	—	29	3.5

point there is first a declivity and then a 5 m steep drop to a gradually narrowing coral platform covered with sandy soil and some houses about 4 m above sea level. This platform drops at its eastern extremity to a sand spit pointing towards Mioko.

Considerable quantities of obsidian, but no sherds, were found over the whole unvegetated landscape west of the church. We found sherds east of the church on the coral platform, mostly toward the northern side and western end. We found no obsidian whatever in this area.

With the enthusiastic (and inescapable) help of many children 179 sherds were collected, 32 (18%) of which were decorated. We believe this to be a total surface collection. A recently dug rubbish pit showed that sandy soil overlay and underlay a patchy bright yellow ash, but we had no opportunity for excavation. Nearly all the 147 plain sherds were abraded or rolled; a 50% sample (76 sherds, 530.8 g) was kept. It is very noticeable that all the pottery is thick and heavy: there is no fine thin ware as at SDP, nor is there any very fine dentate decoration although there is a clear red wash over a number of the sherds.

Of the decorated sherds, 12 have dentate impression, 14 have only incision or plain impression and six are too eroded to determine. The decoration on nearly all sherds

has been much eroded, probably by long-term gardening and house building in the sand.

The temper in this collection varies to some extent from that found in other sites, having more fine sand included with all temper groups. The decoration is not related to temper type, with approximately equal numbers of each of the two major decoration types occurring with each of the two main temper classes present.

The figures, apart from Fig. 1, illustrate sherds from the various sites. The scale in all pictures is 10 mm unless otherwise noted. I have illustrated all sherds larger than 30 mm in maximum dimension, except those which were too rolled or consisted of only a few incised lines or impressions. The orientation of the sherds is based on curvature where this is visible, but note that for many smaller sherds a reverse orientation is equally likely. In all rim views, the inside of the pot is to the right; in section views, the inside is towards the plan view. For SEE sherds, "(S)" after the number refers to thin-sectioning (Thomson & White, 2000); the numbers are written on the sherds. In Figs 2–15 zigzags on sections designate breaks, random dots on views designate eroded or broken areas, black-shaded areas indicate carved-out patches that leave the pattern in relief, and slashes indicate raised nubbins.

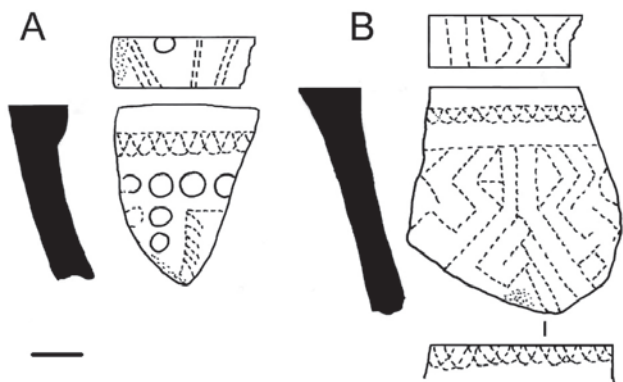


Fig. 2. SDK and SET. *A*: SDK, rim sherd with decoration on top of rim. *B*: SET, rim sherd, with decoration on top of and inside rim.

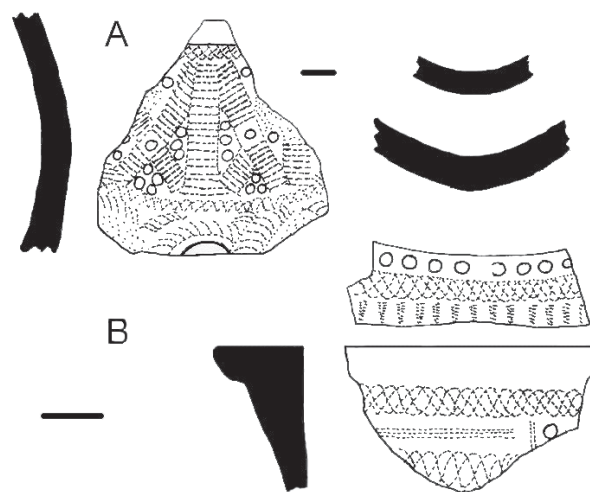


Fig. 4. SEE. *A*: 76, pot stand. The "ladders" are actually dentate, but the impressions are very deep and the teeth hard to see, as if the body of the tool had met the clay. The decoration is very elaborate but a bit casual. *B*: 50, rim with a thin, brick red surface and grey core. Note different scale.

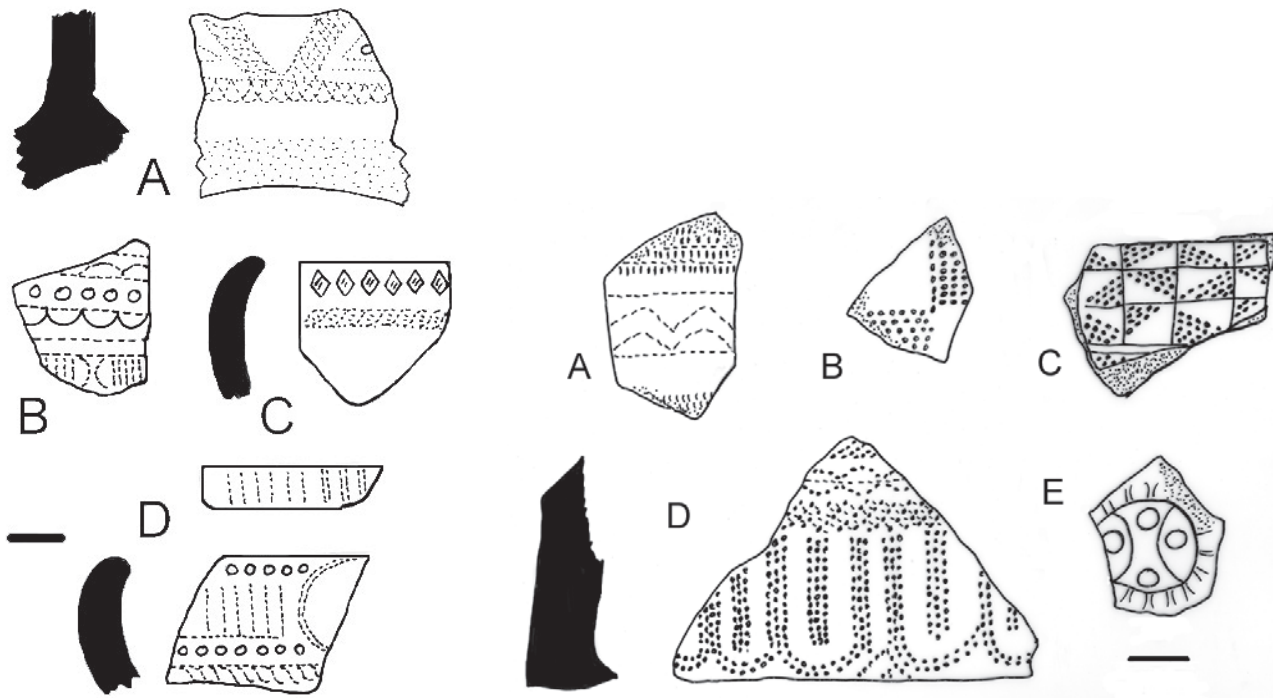


Fig. 3. SDQ. *A*: a curious piece of unclear orientation. The "base" curves in both dimensions as shown. It may be a pot stand or shoulder, but is not clearly either. Random dots in plan view are the broken area on the left side of the section. *B*: body sherd, with both dentate and plain impressed decoration; traces of white shell infill in several places may be post-depositional. *C*: rim with diamonds raised from the surround by carving. *D*: rim with dentate stamping on top, and impressed circles and dentate on body.

Fig. 5. SEE. *A*–*C*: 239, 264, 71, body sherds, with dentate decoration. *D*: 77, possibly a pot stand foot, but the "base" is not very flat. *E*: 65, body sherd with plain impressed decoration.

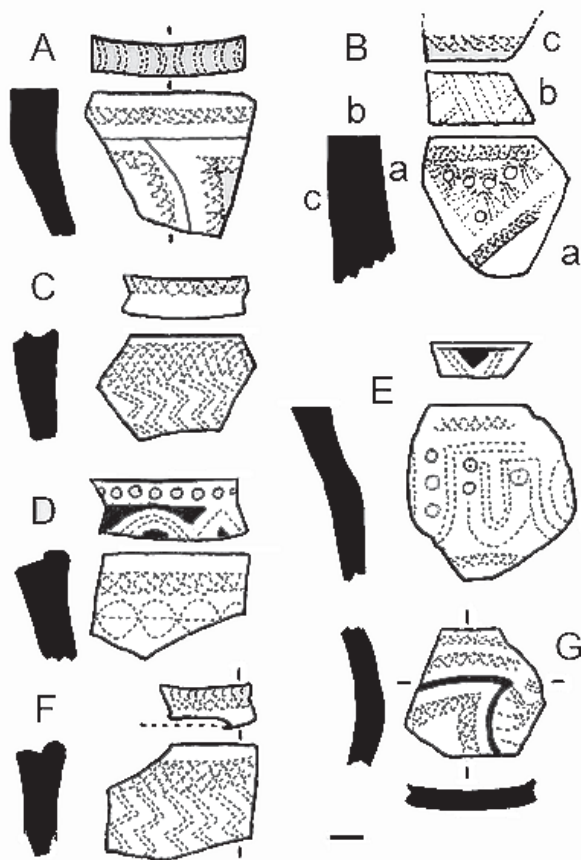


Fig. 6. SEE. *A*: 29, rim. *B*: 183, rim, very thick and decorated on all sides. Top view is interior, lower is exterior. *C*: 101, rim with a markedly V-shaped lip, colour a bright red "slip" over creamy surface and grey-black core. *D*: 52, rim with black areas carved out to put arc design in low relief. *E*: 181, rim of an open bowl with red "slip" eroded everywhere except within decoration depressions. *F*: 25, rim with only the inner, taller part of the lip is decorated. *G*: 237, body, curved in both dimensions, possibly part of a pot stand.

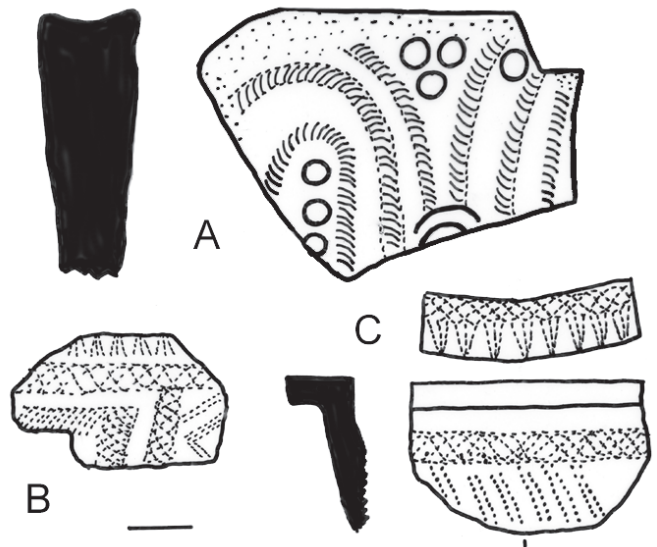


Fig. 7. SEE. *A*: 91, body of a very large pot, decorated with impressed circles, dentate lines and rather broad impressions, perhaps fingernail impressions. Broken at the top, where two slabs of clay joined. *B*: 212, body. *C*: 75, rim with the external diagonal impressions sharper and deeper than standard dentate; may be punctations.

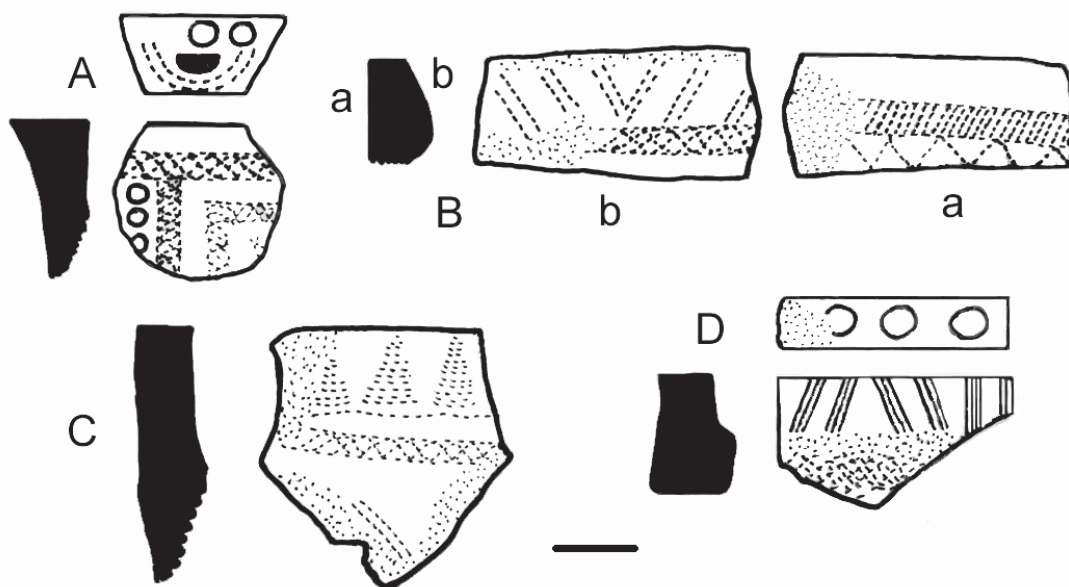


Fig. 8. SEE. *A*: 66, rim; lack area is a cut depression. *B*: 203, rim with thickening below lip; external view on right. *C*: 535, rim with the dentate lines on the "pyramids" running across the pattern rather than the more usual vertical emplacement. *D*: 557, rim; the parallel lines are probably impressed, possibly incised.

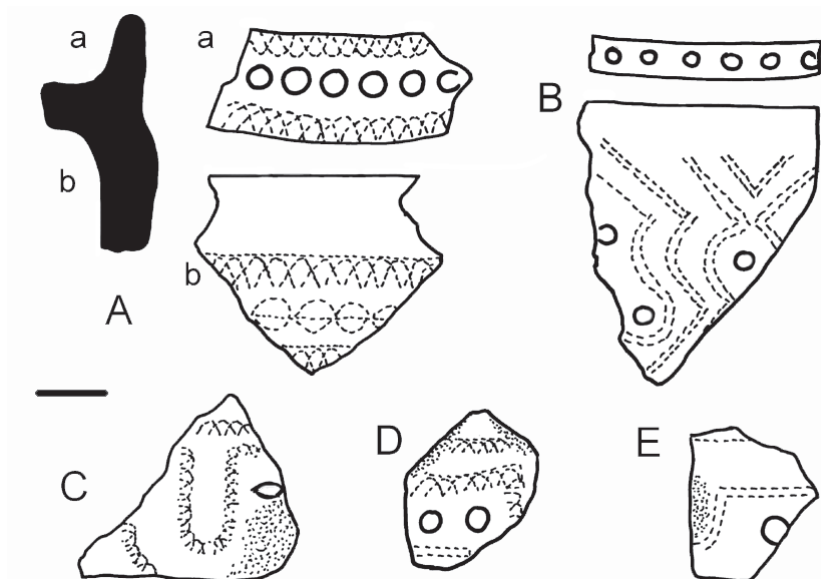


Fig. 9. SEE. *A*: 84, rim, decorated above and below the flange. *B*: 89, rim with dentate stamping and circle impressions. *C-E*: 244, 199, 255, body sherds with portions of possible face-like decoration.

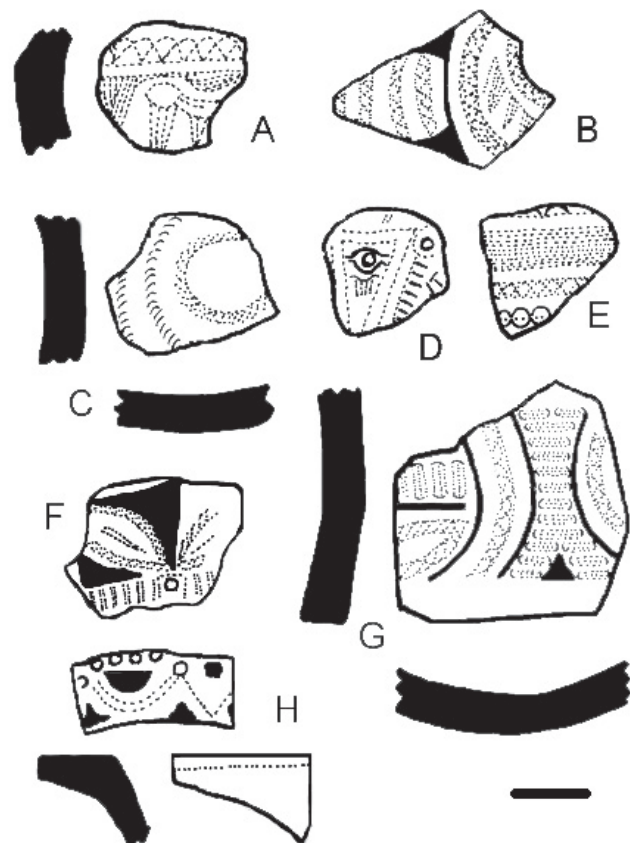


Fig. 10. SEE. *A*: 200, possibly a shoulder; the lenticular decoration to the right of the “eye” is very heavily impressed. *B*: 28, body, with black indicating carving putting decoration in relief. *C*: 335, body, possibly part of pot stand; traces of red “slip” on a very rubbed surface. *D*: 38, body, design considerably eroded. *E*: 101, body with the fine central panel appearing to have been done with a roller, not a tool with a single line of teeth. *F*: 214, body, with black denoting heavily carved out areas; red “slip”; slab formation visible in section. *G*: 388, pot stand with the base (or top) solid, flat and undecorated. *H*: 12, rim, no decoration on outer surface. Black denotes carved out areas.

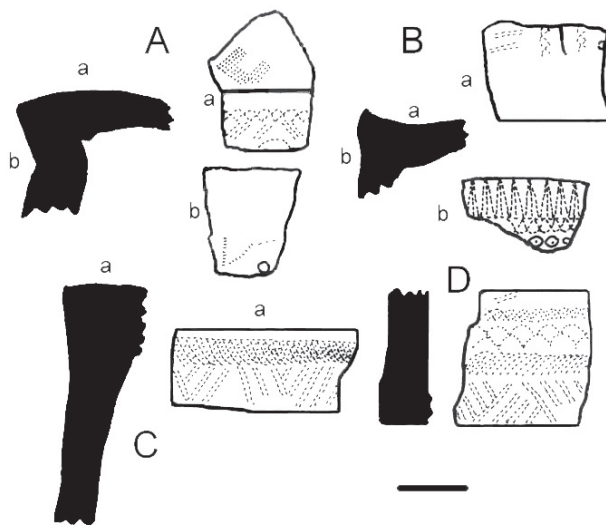


Fig. 11. SEE. *A-C*: 18, 15, 182, shoulders of very large and heavy pots, similar to some found in New Caledonia. *D*: 82, possibly a shoulder, but the “base” or area below the carination is very flat and so a stand of some form is also possible.

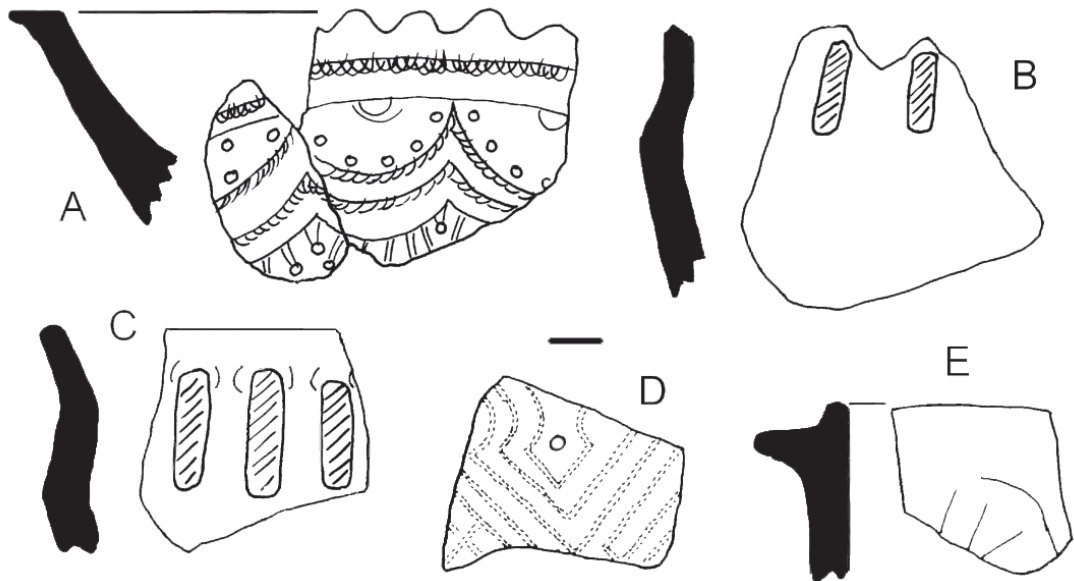


Fig. 12. *A–B*: SEP; *C–E*: SES. *A*: TP2/1, rim of an open platter. Apart from stamped circles, all decoration is incised, quite finely but not very precisely. The rim is heavily crenellated. The decoration is filled with white deposit, which is also scattered on the flat surface of the sherd. Broken in antiquity, the pieces were found separately but in the same layer (cf. White & Harris, 1997: fig. 4). *B*: TP2/1, lower neck and top part of a globular pot decorated with two applied strips. *C*: neck with applied strips (cross-hatched) and fingernail impressed. *D*: body. *E*: incised rim with the upper surface of the external flange apparently flattened by pressure.

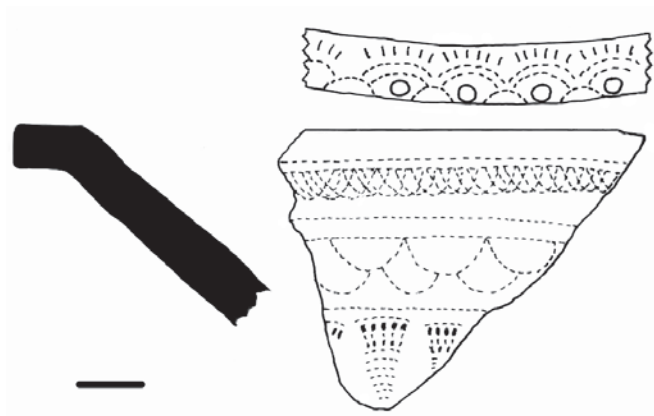


Fig. 13. SET. Rim of an open platter with decoration on the outside. There is clear variation in tooth size in the dentate rays at the base of the view.

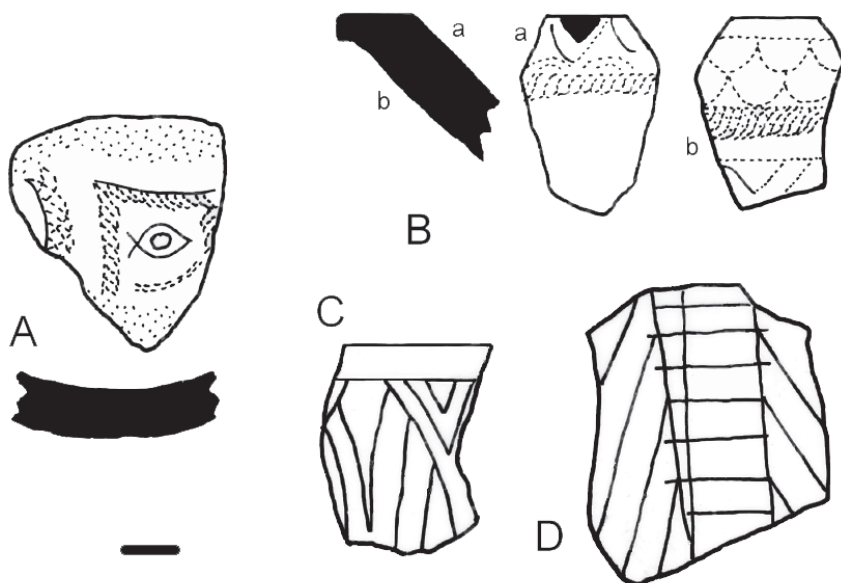


Fig. 14. SET. *A*: possibly part of a pot stand, may be a face motif, with incision, dentate and plain stamps. *B*: rim of an open platter, with the black indicating a carved triangle. *C–D*: incised body sherds. The incisions on *D* are very narrow.

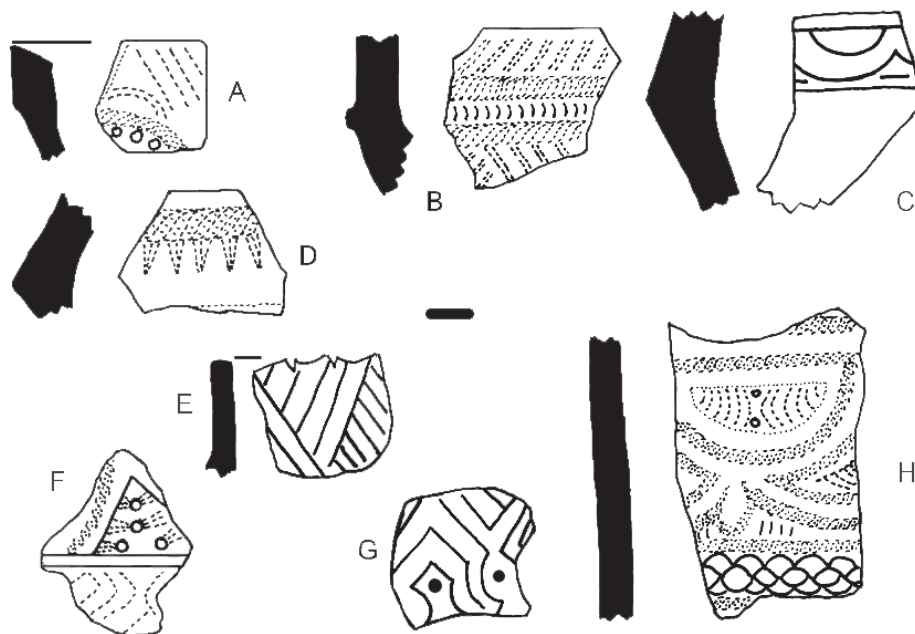


Fig. 15. *A–D*: SFF; *E–H*: SFB. *A*: an inward sloping rim. *B*: shoulder with a clearly raised band at the point of inflexion. *C–D*: shoulders. *E*: incised rim. A tool has been dragged through the clay raising levees on either side. The rim is impressed from the outside with a 2 mm wide stick every 10–12 mm. *F*: body, the dots are full impressions, not tube ends, and the “incision” looks like a plain stamped line. *G*: body sherd. *H*: large, flat body sherd, light grey on both surfaces. The vertical strokes on either side of the “pendant” in the lower left are fingernail impressions; the lower arcs are plain impressed. The orientation of this sherd is not clear.





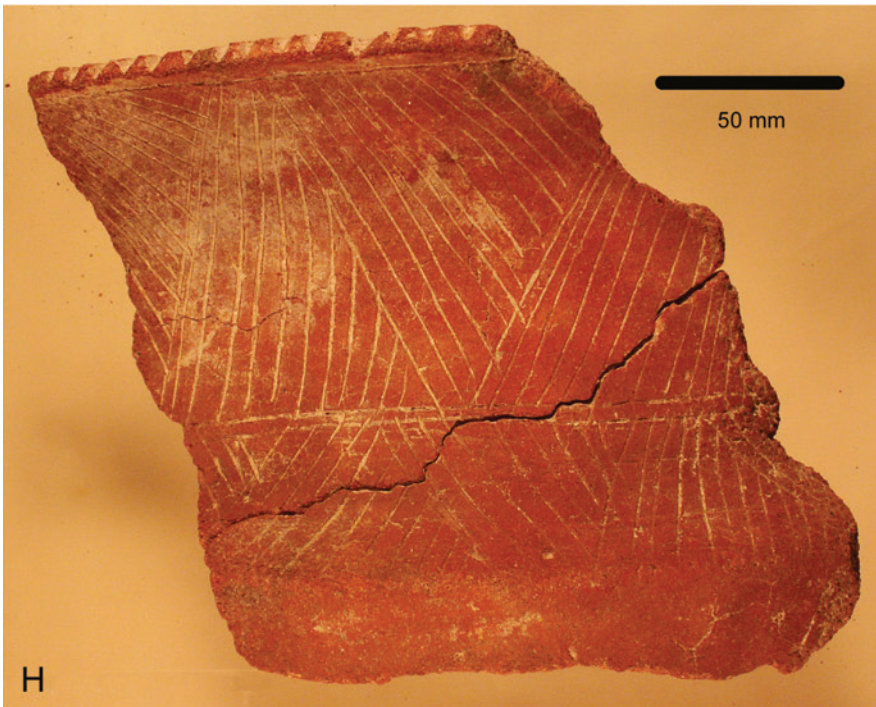
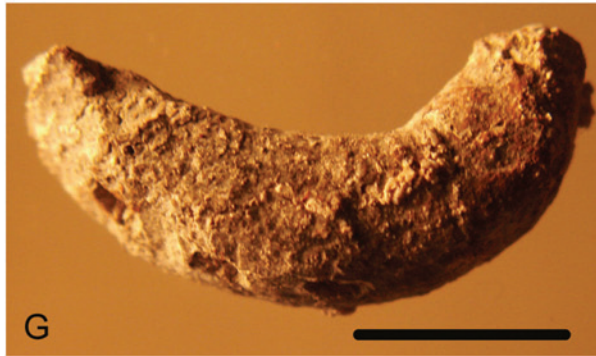
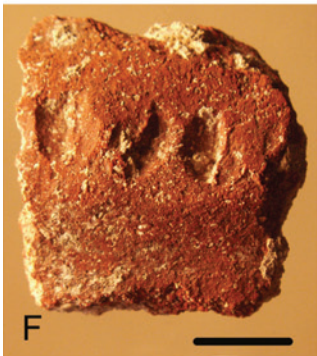
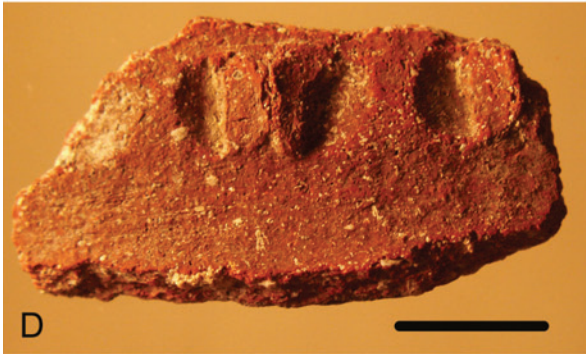
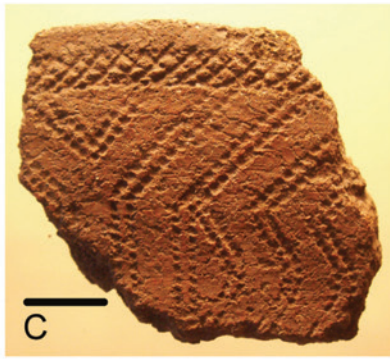


Fig. 16. *A–B*: SDK; *C–G*: SDP; *H*: SDQ. *A–B*: rim, dentate and plain impressed, in plan (*A*) and vertical (*B*) views (also Fig. 2A). *C*: flat rim of an open bowl, dentate. *D*: 1B/level V, body, fingernail impressed. *E*: flat rim, inturned, gouged incision. *F*: 1B/level IV, body, fingernail impressed. *G*: 1B/level V, side view of bent clay roll, possibly to apply as decoration. *H*: rim and shoulder, very large incised pot, crenellated rim.

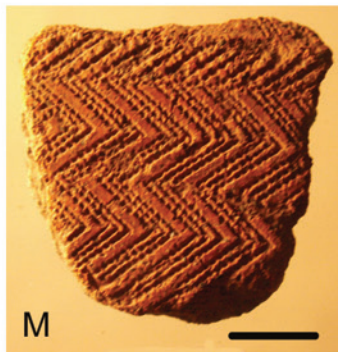
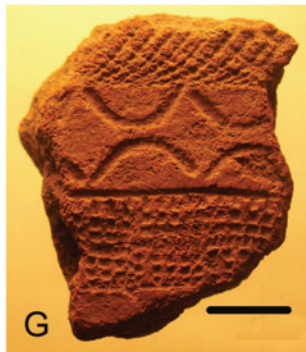
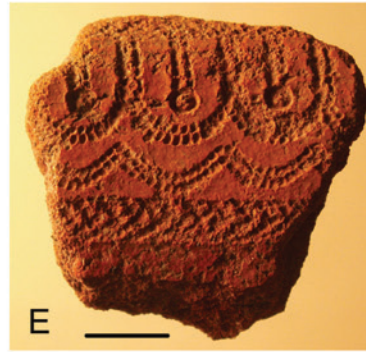
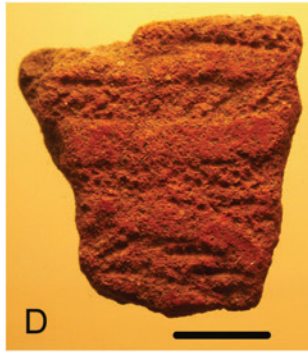
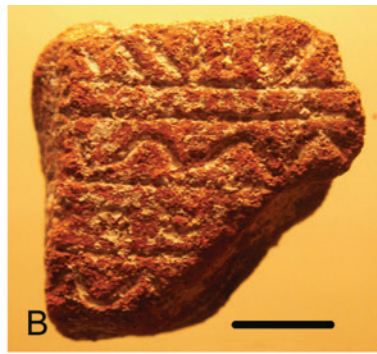
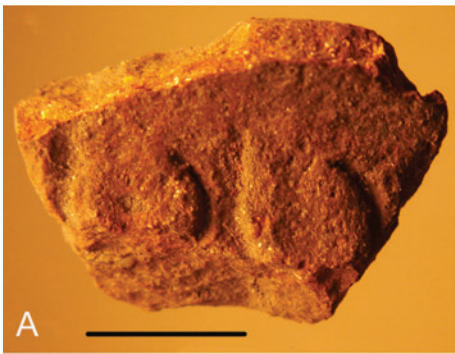


Fig. 17. *A–E*: SDQ; *F–M*: SEE. *A*: body, fingernail impressed. *B*: body, dentate. *C*: body, incised. *D*: rim, dentate, heavily rolled. *E*: body, dentate and impressed circles. *F*: 01, body, fine dentate. *G*: 03, body with unusual dentate on lower part. *H*: 05, body, dentate and plain impressed arcs. *I*: 12, rim of large straight-sided pot, viewed from inside. *J*: 17, body, dentate and plain impressed circles. *K*: 19, body, dentate. *L*: 21(S), probable pot stand (cf. White & Harris, 1997: fig. 2). *M*: 35, body, very fine zigzag dentate. *N*: 30, body, dentate.

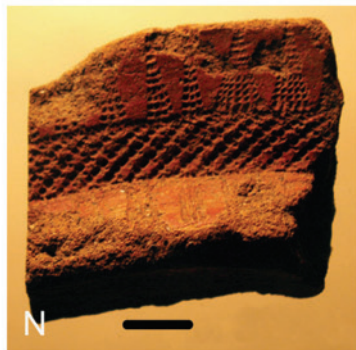
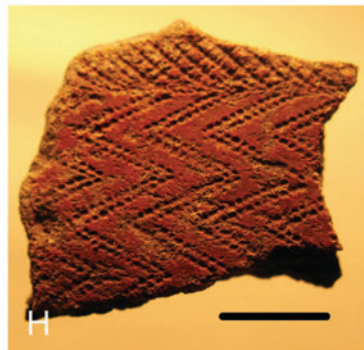
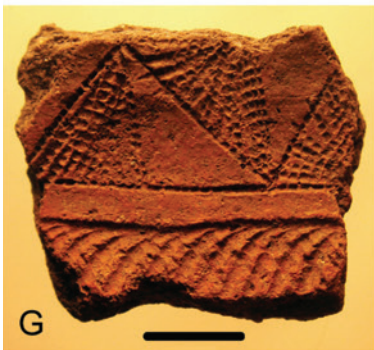
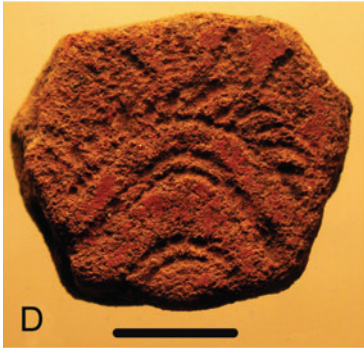
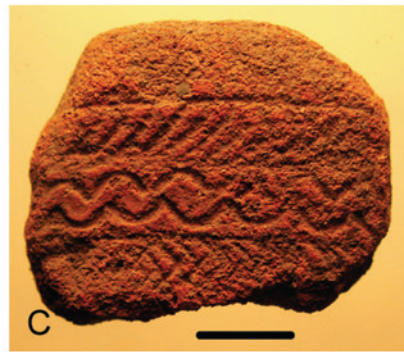


Fig. 18. SEE. *A*: 37, body, dentate. *B*: 38, body, main “eye” and arcs around it are impressed, otherwise dentate. *C*: 44, body, plain impressed arcs and dentate. *D*: 45, dentate, very rolled. *E*: 47, body, deeply incised curved lines. *F*: 54, body, dentate. *G*: 62, body, dentate stamped rays do not appear to be single line impressions. *H*: 67, body, fine zigzag dentate. *I*: 74(S), rim of open mouthed pot, dentate and plain impressed arcs. *J*: 79, rim, very fine horizontal dentate, rolled. *K*: 79, vertical view of *J*. *L*: 80(S), outcurving rim, dentate and plain impressed outside. *M*: 80(S), inside view of *L*, carved diamonds with circle impressions in relief. *N*: 83(S), rim with external flange, red slip, dentate. *O*: 87, body, dentate superimposed on incised.

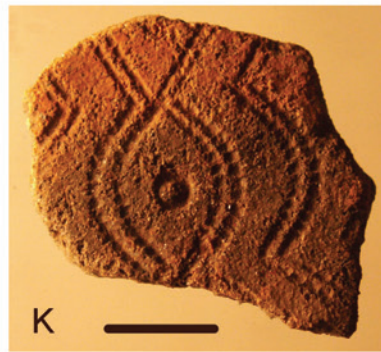
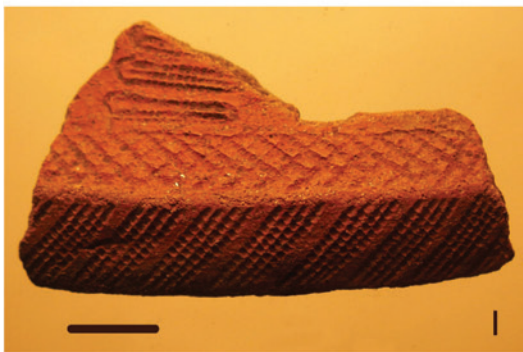
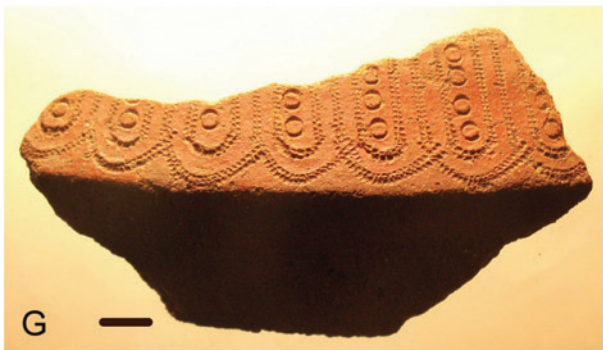
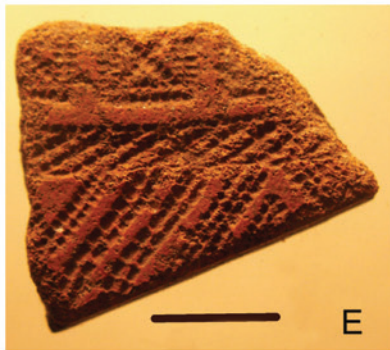
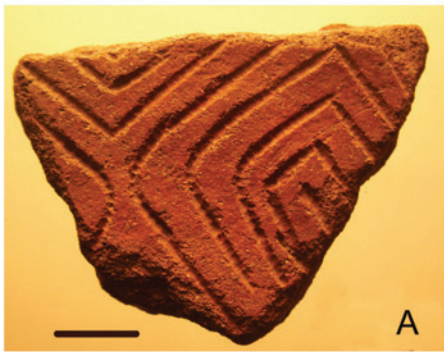


Fig. 19. SEE. *A*: 88, body, dentate. *B*: 94, body, orientation of decoration unusual but clear. *C*: 98(S), pot stand, dentate and carved. *D*: 111, body, dentate at top, otherwise plain impressed straight lines. *E*: 114(S), body, dentate. *F*: 133(S), body, incised, possibly corner of eye motif. *G*: 190(S), shoulder, dentate, decorated on upper side only. *H*: 195, body, dentate. *I*: 196(S), pot stand, dentate. *J*: 198, probable pot stand, dentate and carved in relief. *K*: 251, body, dentate and circles. *L*: 347, rim, notched on both edges, incised decoration. *M*: 387, pot stand, with dentate and carving. *N*: 390, rim and neck, with paired dentate lines across top. *O*: 392, rim of very large straight-sided pot (see vertical view Fig. 20B).



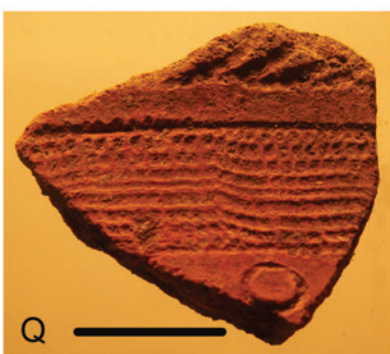
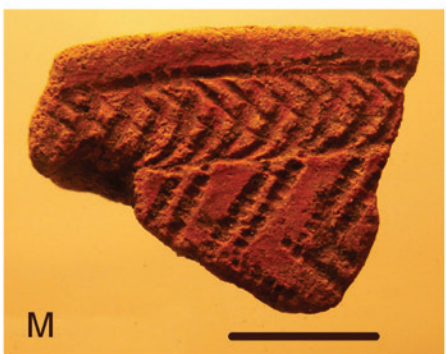
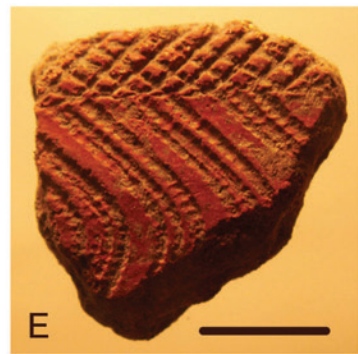
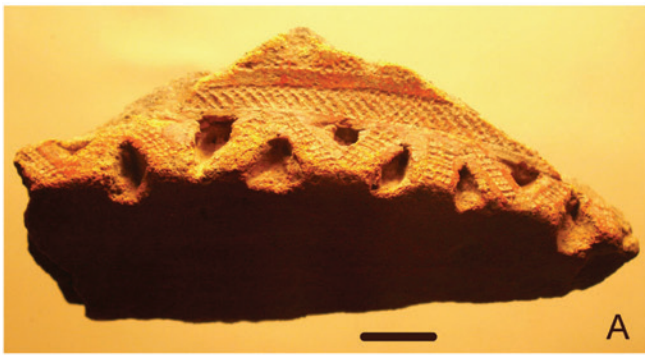


Fig. 20. SEE. *A*: 391, base of large open dish, heavy red slip externally, dentate and carved. *B*: 392, vertical view of Fig. 19O. *C*: 398, body, very fine dentate, similar to fabric impression. *D*: 406, rim, vertical view of impressed circles. *E*: 406, rim, dentate. *F*: 407, body, dentate. *G*: 409, body, very fine dentate "eyes". *H*: 410, body, fine dentate. *I*: 418, body, dentate and plain impressed lines at top creating arcs. *J*: 419, possible pot stand, carved and dentate, very rolled. *K*: 420, body, dentate, impressed circles. *L*: 426, rim, dentate on top. *M*: 426, rim of straight-sided pot, dentate. *N*: 427, body, dentate, rolled. *O*: 430, body, dentate, impressed circles with plain impressed arcs around them. *P*: 431, body, dentate. *Q*: 436, body, very fine dentate, similar to fabric impression. *R*: 520, body, incised.

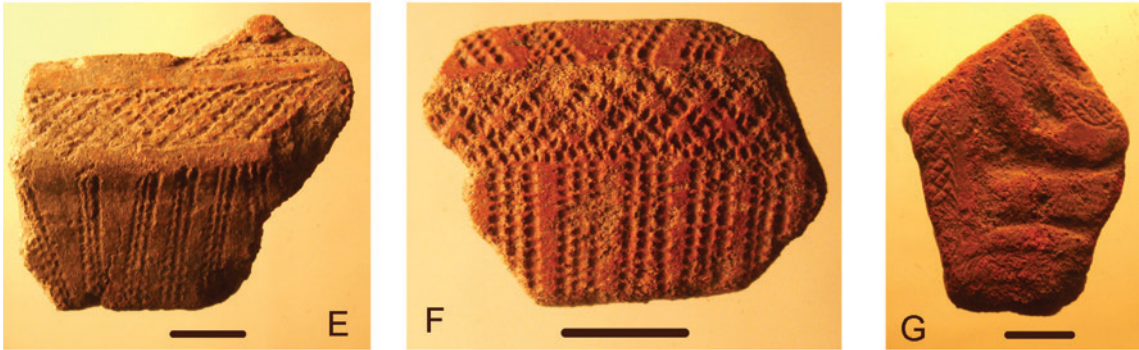
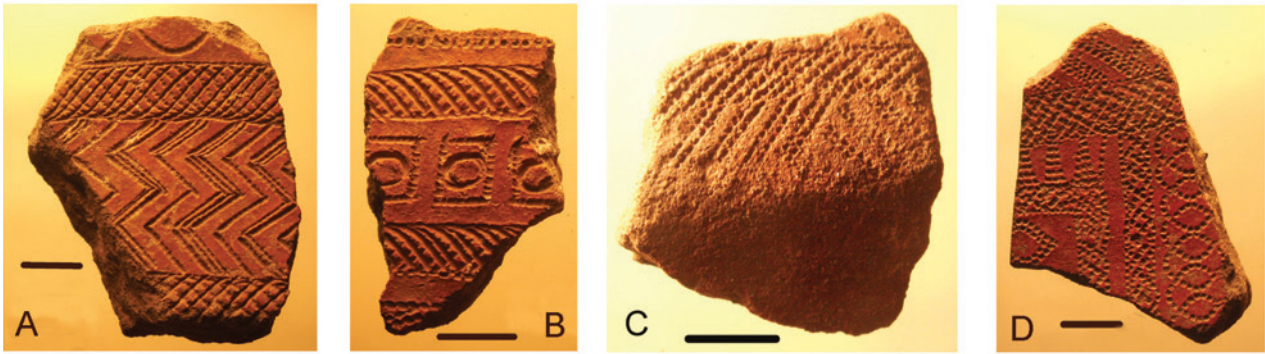


Fig. 21. SEE. *A*: 530, body, very fine dentate. *B*: 533, body, dentate and plain impressed circles. *C*: 535, shoulder, dentate. *D*: 536, body, heavy red slip, dentate, possible corner of face motif. *E*: 537, pot stand, dentate. *F*: 538, body, dentate. *G*: 540, body, very rolled, carved and dentate decoration. *H*: 539, outcurved rim, dentate, rolled. *I*: 539, top of H. *J*: 541, body near rim with flange, dentate. *K*: 42, shoulder, dentate, no decoration below shoulder angle. *L*: 547, body, dentate on carved relief. *M*: 549, body, heavy red slip, dentate and plain impressed arcs. *N*: 548, body, dentate and impressed arcades, dentate lines and zigzags with very coarse teeth. *O*: 550, possible base of open platter, dentate and carved triangles. *P*: 551, body, dentate.

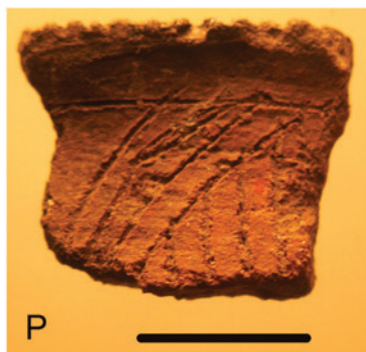
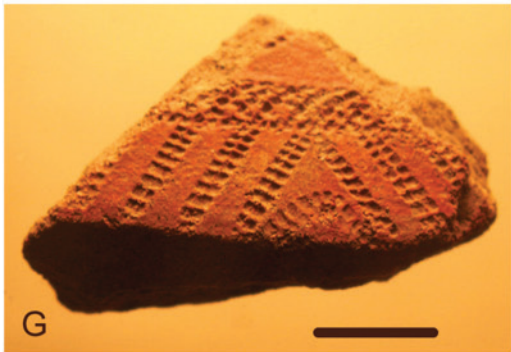
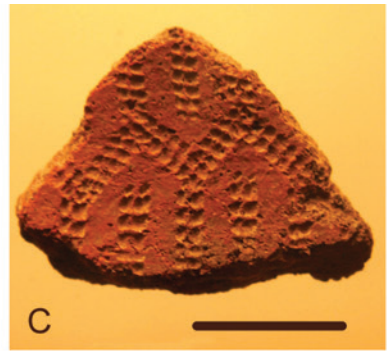
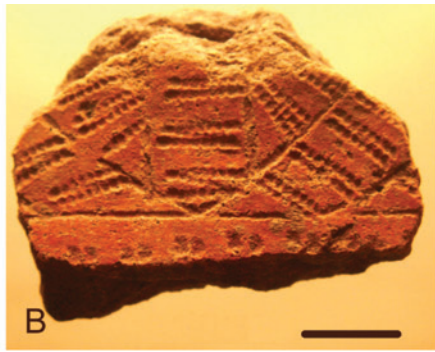
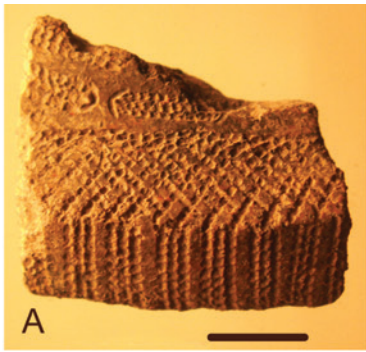


Fig. 22. SEE. *A*: 552, pot stand, dentate. *B*: 553, body, dentate. *C*: 555, body, dentate. *D*: 564, body, plain impressed straight lines. *E*: 565, body, very rolled, possible face motif. *F*: 568, body, dentate. *G*: 574, shoulder, dentate. *H*: 575, shoulder, dentate and plain impressed arcs and circles, no decoration below shoulder. *I*: 576, body, very fine dentate. *J*: 577, body, dentate. *K*: 589, rim, dentate. *L*: 589, rim, vertical view of *K*. *M*: 589a, body, plain impressed arc, not dentate. *N*: 590, rim and neck, with series of paired dentate lines across rim top. *O*: 603, rim with internal notching. *P*: 604, outcurving rim, incised. *Q*: 604, vertical view of *P*, slashed lines on outer edge. *R*: 605, rim notched on outer edge.

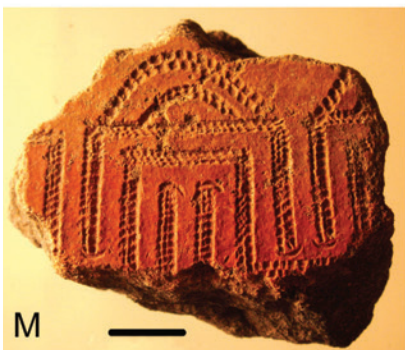
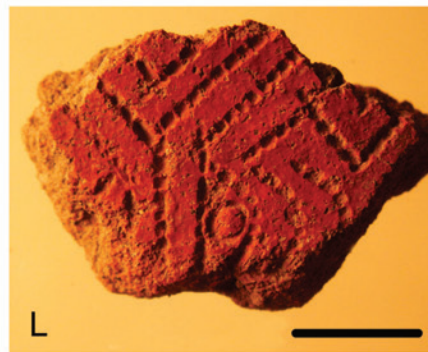
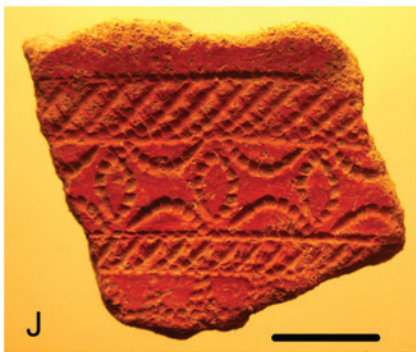
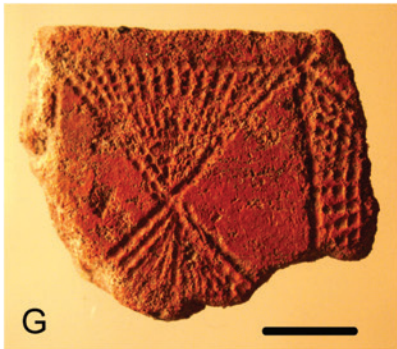
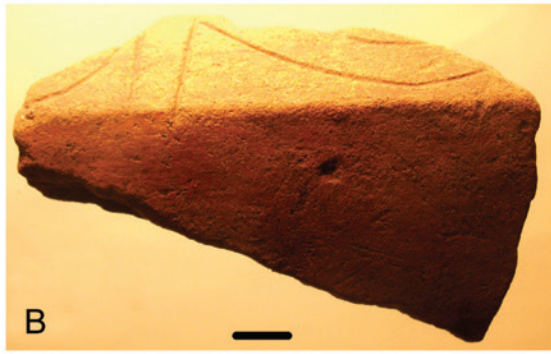


Fig. 23. SEE. *A*: 612, incurving stepped rim with two lines of circle impressions. *B*: 613, shoulder, incised. *C*: 614, body, incised with double pointed tool at top. *D*: 623, outcurving rim, incised. *E*: 646, stepped rim of a straight-sided pot, dentate. *F*: 646, rim, top view of *E*, dentate on both steps. *G*: 651, rim with dentate rays. *H*: 651, rim, vertical view of *G*. *I*: 652, body, impressed circles and straight line, dentate. *J*: 662, rim, heavy red slip, dentate. *K*: 662, rim, vertical view of *J* with both steps decorated. *L*: 663, body, dentate and plain impressed. *M*: 664, body, dentate. *N*: 669, body, dentate. *O*: 680, rim, slashed lines inside.



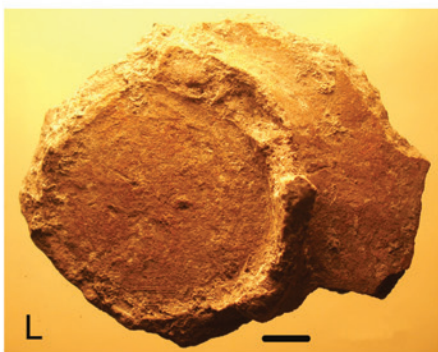
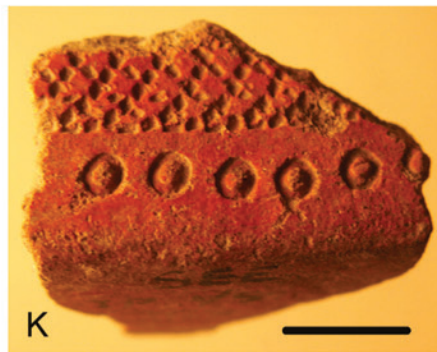
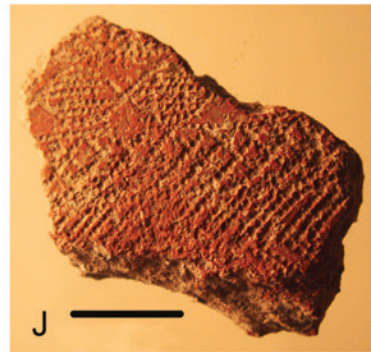
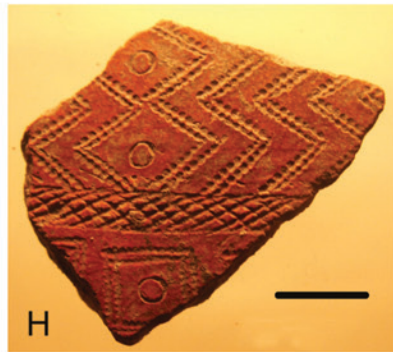
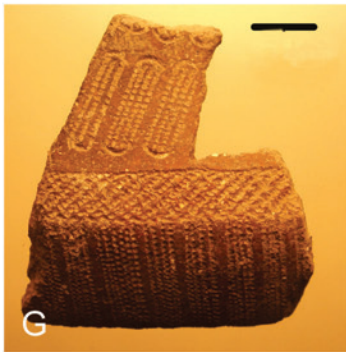
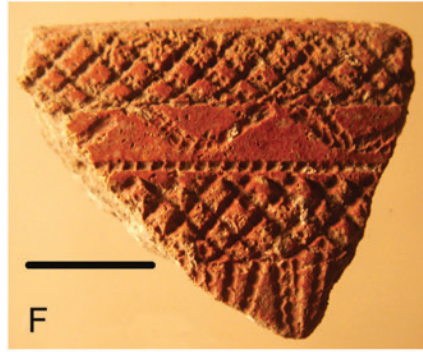
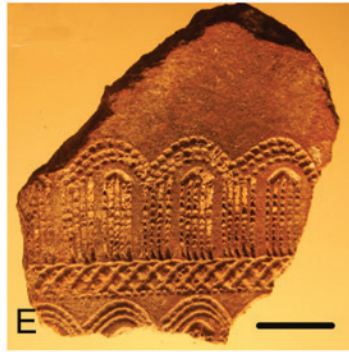
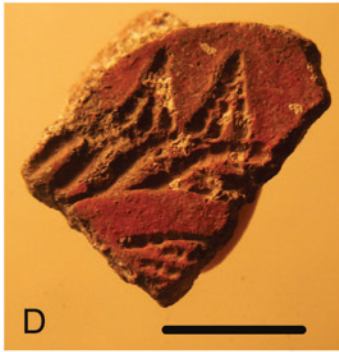
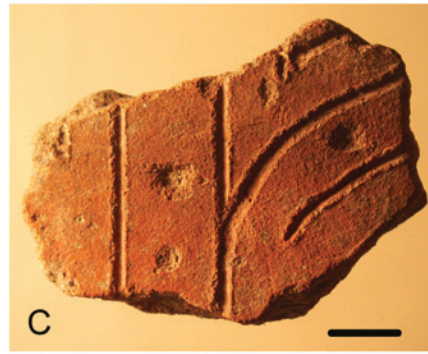
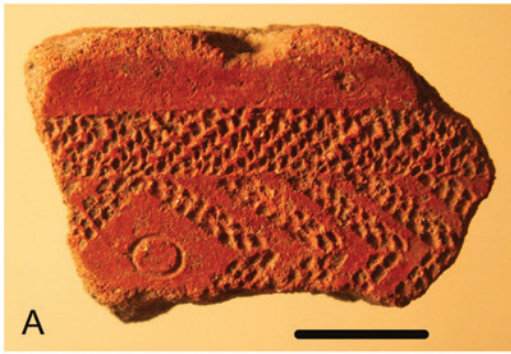


Fig. 24. SEE. *A*: 670, rim, carved areas, dentate and plain impressed. *B*: 670, rim, vertical view of *A*. *C*: 681, body, dentate. *D*: 708, body, dentate. *E*: 742, body, dentate arcades. *F*: 747, rim, slashed lines on inner side, dentate. *G*: 749, pot stand with cut-out section. *H*: 752, body, dentate and plain impressed circles. *I*: 754, body, very fine overlapping dentate. *J*: 757, body, dentate. *K*: 758, possible shoulder, heavy red slip, impressed circles and dentate. *L*: 800, foot base of large pot. *M*: TP1-3, "brushed" surface.

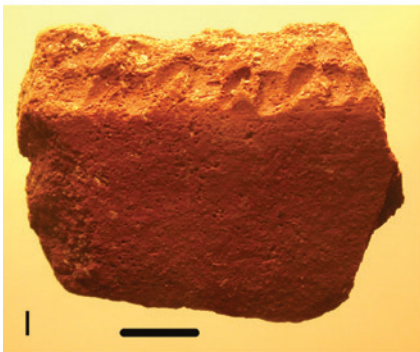
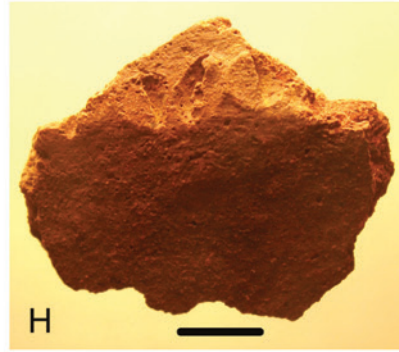
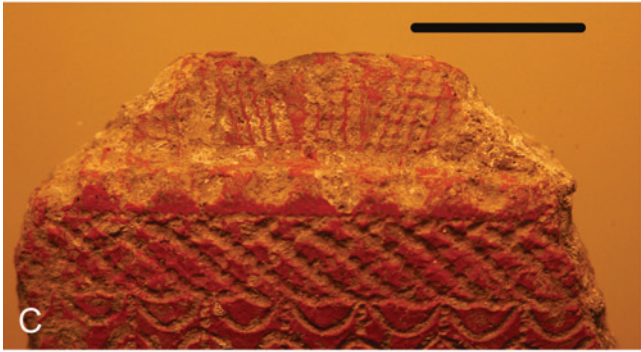
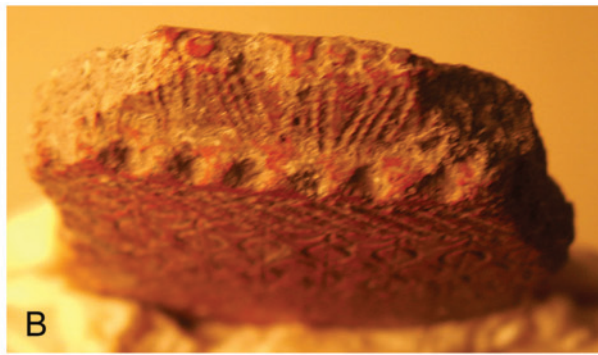
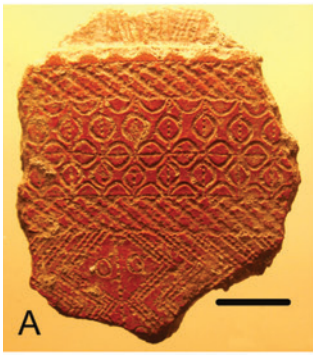


Fig. 25. *A–C*: SEE; *D–F*: SEF; *G*: SEO; *H–O*: SEP. *A–C*: 812, rim, stepped, very fine dentate, with two views of rim top. *D*: possible pot stand, dentate and carved. *E*: shoulder, dentate. *F*: body, dentate, rolled. *G*: shoulder, incised. *H*: shoulder, fingernail impressed. *I*: shoulder, fingernail impressed. *J*: body, incised. *K*: body, incised. *L*: rim, dentate, with applied strip on edge of flat rim. *M*: body, applied band with fingernail impressions. *N*: body, applied bands. *O*: body, applied band and punctate dots.

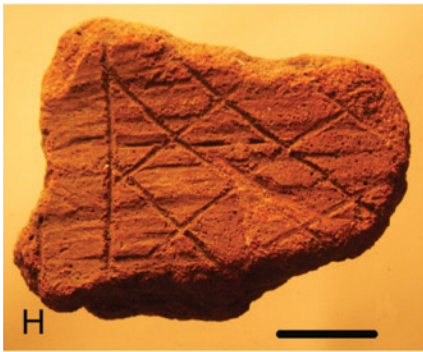
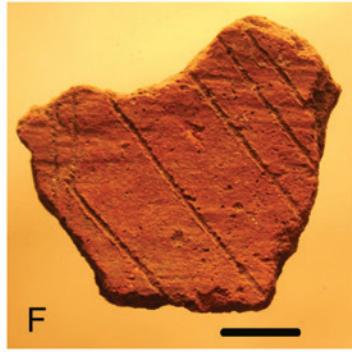
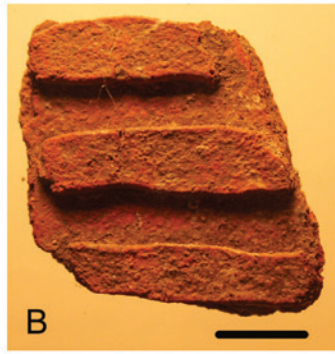
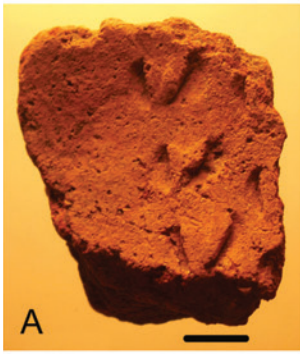


Fig. 26. *A–C*: SEP; *D–E*: SES; *F–O*: SET. *A*: possible pot stand, curved in both dimensions, fingernail impressed. *B*: rim, applied bands below plain rim. *C*: level 4, body, fingernail impressed. *D*: rim of straight-sided pot, dentate. *E*: flat top of *D*, dentate. *F*: body, incised. *G*: body, incised. *H*: body, incised. *I*: body, incised. *J*: flat rim, incised. *K*: outcurved rim and neck, incised. *L*: inside of *K*, incised. *M*: flat rim with small indentations, incised. *N*: body, incised and dentate. *O*: shoulder, plain impressed.

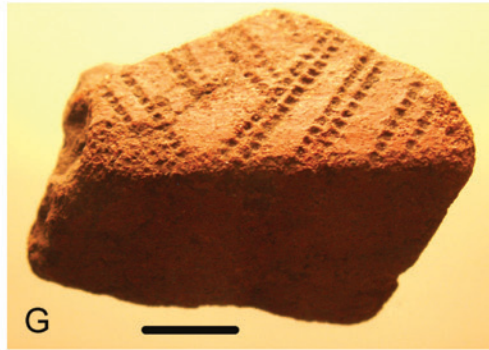
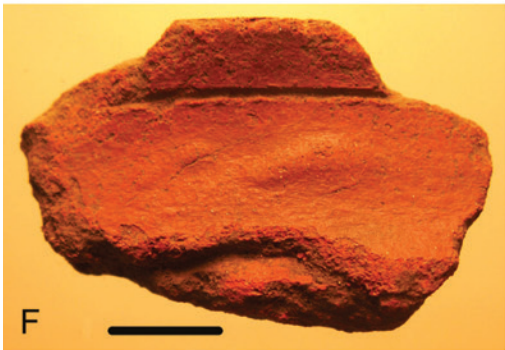
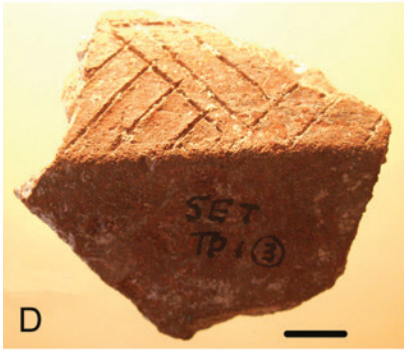
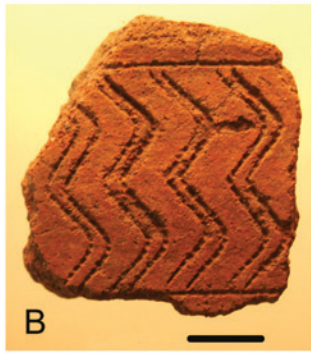


Fig. 27. *A–E*: SET; *F–G*: SFA; *H–L*: SFB. *A*: body, dentate and plain impressed circle. *B*: rim, dentate and incised. *C*: rim, impressed. *D*: shoulder, incised. *E*: rim, scalloped. *F*: outcurved rim, incised. *G*: shoulder, dentate. *H*: rim, notched, incised. *I*: body, incised and plain impressed. *J*: body, no curvature visible, dentate and circle impressed (also Fig. 15H). *K*: body, incised, plain impressed and circle impressed. *L*: body, dentate, incised, plain impressed and circle impressed.



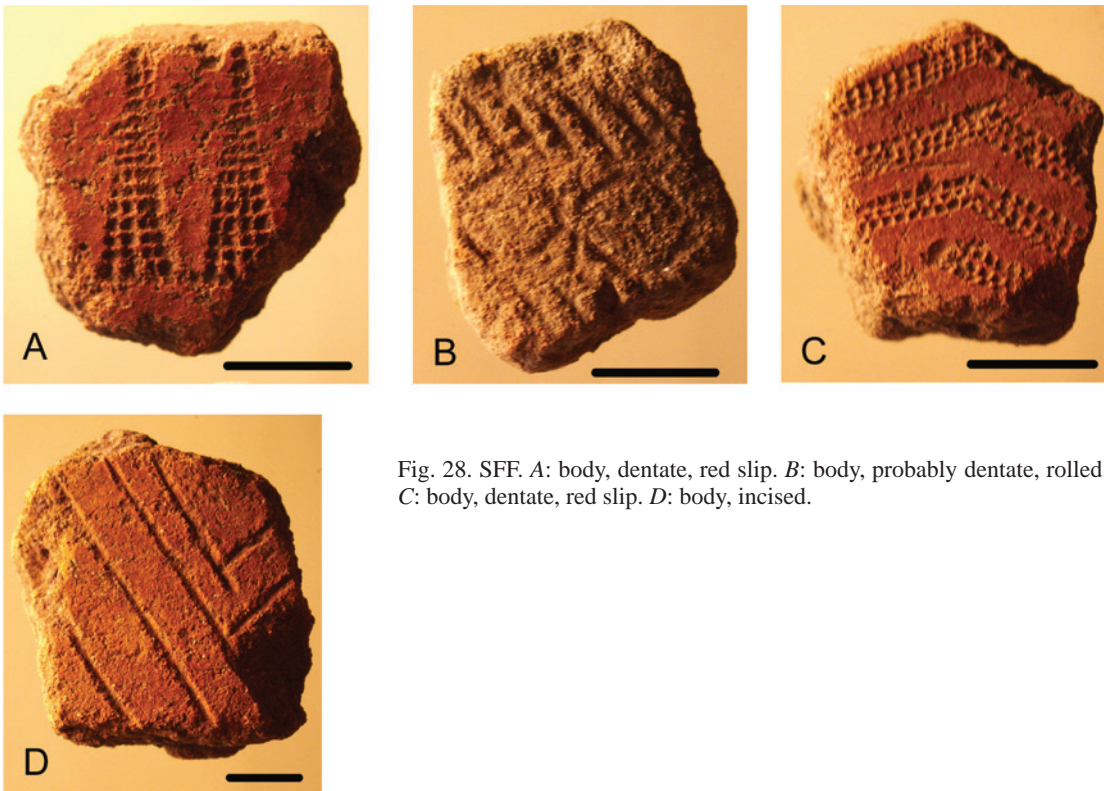


Fig. 28. SFF. *A*: body, dentate, red slip. *B*: body, probably dentate, rolled. *C*: body, dentate, red slip. *D*: body, incised.