ARCHAEOLOGICAL FIELDWORK ON GARUA ISLAND WEST NEW BRITAIN, PNG

June-August 1996

Reported by

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NOTE: This report summarizes PRELIMINARY results compiled immediately following fieldwork. For confirmed and accurate data, please consult publications.

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This project is affiliated with the PNG National Museum and Art Gallery.

SUMMARY

The aim of our research on Garua Island is to reconstruct the history of settlement, subsistence, and trade during the past 6,000 years. The research combines archaeological studies directed by Dr. Robin Torrence from the Australian Museum, Sydney with analyses of ancient environments directed by Dr. Bill Boyd of Southern Cross University, Lismore. In 1996 they were assisted by a team of specialists and university students from Australia and Papua New Guinea and a group of volunteers from the United States. During six weeks of fieldwork we (1) made maps; (2) conducted surveys; (3) excavated 30 test pits; (4) collected soil samples for the analyses of ancient plant fossils; and (5) carried out geomorphological and soil studies aimed at reconstructing landscape history.

Six new archaeological sites on Garua Island and one on Namundo Plantation were discovered. Three sites date to the past 500 years. Four sites contain stemmed obsidian tools dating from about 6,000 to 3,500 years ago and pottery dating between about 2,500 and 1,500 years ago. At site 96-1 on Garua we found an area flattened out for a house. This is the first time that archaeologists working in West New Britain have found houses dating to the last few hundred years. The new site on Namundo Plantation is extremely important because it has an exceptionally well preserved stratigraphy which provides excellent control for dating human activities. Six layers of volcanic ash from well-studied volcanic eruptions are present. Their approximate dates are 5,000; 3,500; 1,800; 1,400; and less than 500 years ago. Obsidian artifacts were found under and between the 3 oldest ash layers. Pottery with Lapita style decoration was excavated from between the 3,500 and 1,800 year old ashes. The occurrence of pottery in a stratified context such as this is exceedingly rare in the Kimbe/Talasea region.

The Garua project has introduced a new methodology into Pacific archaeology. Archaeologists usually study 'sites,' that is, specific locations where high concentrations of artifacts have been found. In contrast, our excavations are distributed widely across the island. This new approach has enabled us to learn a great deal more about ancient settlement and subsistence practices. It seems that before 3,500 years ago, people did not live in villages. They moved often, probably collecting much of their food and/or planting small gardens which they visited from time to time. After this time, people used some places on a regular basis and may have lived in villages. From about 3,000 to 1,100 years ago, occupation was concentrated near the coast, usually on hills. Gardening took place close by. After 1,100 villages and gardens were moved away from the coast to upland regions. These preliminary results demonstrate that during the past 6,000 years there have been significant differences in the way people perceived and used the landscape on Garua Island.

Fieldwork planned for 1997 will continue the analysis of landscapes on Garua island using archaeological survey and excavation combined with geomorphological, soil, and environmental studies.

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Workers and volunteers from Garua Plantation

ITINERARY

June 23	Torrence and White travel to Port Moresby; consult with members of the National Museum; and visit the National Research Institute.
June 25-29	Torrence and White fly to Kimbe. Meet with John Namuno, Herman Talingapua and staff at the WNB Provincial Cultural Centre; Samuel Esakia; and staff at Kimbe International Primary School. Assemble and purchase food and equipment.
June 27	Mulvaney arrives to assist setting up.
June 30-31	Team discovers new site on Namundo Plantation and carries out preliminary investigations. Explain findings to Bob Wilson, manager of Namundo.
July 1	Arrival of Pavlides and Conway. Team assembles at Kimbe Bay Shipping Agencies' headquarters.
July 2	Fieldwork commences on Garua Island.
July 4	Mondol arrives.
July 13	Departure of White. Arrival of Specht, Boyd, and Charleston.
July 20	Arrival of Sullivan.
July 27	Departure of Specht, Pavlides, Conway, Boyd, Sullivan. Arrival of Earthwatch team.
August 8	Trip to Bitokara Mission and Bamba village and meeting with Martin Metta.
August 10	Departure of Charleston and Earthwatch team.
August 11	Pack equipment and finds.
August 12	Torrence, Mulvaney, Mondol leave Garua Island for Walindi Plantation.
Aug 13-14	Store equipment. Meet with staff at Provincial Cultural Centre; Nick Thompson at New Britain Oil Palm; Vince Freedman, Ivan O'Hanlon, Nick Lyons at KBSA. Visit EU sustainable forestry centre and Nature Conservancy research station. Show Namundo Plantation site to John Namuno and Max Benjamin.
August 15	Fly to POM and report findings to members of the National Museum and Dr. John Muke at UPNG.
August 16	Torrence and Mulvaney depart Papua New Guinea.

FIELDWORK IN 1996

Garua Island is an important place for archaeological research for a number of reasons: two kinds of obsidian are found on the island and were used extensively in the past; previous work shows that the island has been occupied for a very long time; and over the years our extensive geological research has provided us with an excellent understanding of the volcanic layers of ash which are very important for interpreting and dating archaeological units. Since we can use our knowledge of the stratigraphy to compare and contrast buried soils all over the island, we are pioneering some novel archaeological methods which cannot yet be applied in most other areas of Papua New Guinea.

In 1996 we began a new programme of archaeological research that aims to find out how prehistoric life on Garua Island has changed over the past 6,000 years. The archaeological layers are divided into three chronological periods which are separated by thick falls of ash from two major volcanic eruptions: Witori WK-2 eruption at c. 3,500 years ago and Dakataua at 1,100 years ago. Using these the three periods are as follows: (1) c. 6,000 - 3,500 years; (2) 3,500 years - 1,100 years; (3) 1,100 years up to the present day.

For each Period we are asking **two basic research questions**.

(1) Where did people carry out their various activities?
(2) How did they obtain their subsistence-- e.g. through collecting food, gardening and/or trade?

Previous archaeological research on Garua Island cannot adequately address the first question because in our previous work the location of archaeological material was not studied systematically. Only sites exposed accidentally by road building, quarrying, or erosion have been recorded and excavated. Our new work aims to go far beyond the information from these incidental finds. By searching across the entire island for ancient villages and fields that have been buried by ash from previous volcanic eruptions from Dakataua and Witori, we will gain a better picture of where people carried out their various daily activities. In 1996 we began this task by excavating 29 small test pits which are distributed widely across the Mt. Hamilton side of the island (Figure 1). The pits were also chosen to represent the range of environments in this region. The quantity and nature of stone tools, pottery, plant fossils, and soil micromorphology in each of the layers in these excavations provide the data for understanding where people were living and working.

In order to answer the second question concerning subsistence, we have sampled soils from the newly excavated units. These samples will significantly broaden the study of ancient plant fossils begun in 1993. The previous reconstruction of phases of soil erosion from natural processes and human gardening was also expanded. Additionally, we undertook a pioneering study of the micromophology of soils as a way of reconstructing the nature of human activities in the buried sites. Finally, we continued the important tasks of making a contour map of the study regions and monitoring coastal regions for evidence of new sites.

In the remainder of the report the results of our work are summarized in terms of the major activities carried out in June-August 1996:

(1) Mapping and Surveying;
(2) Test pit sampling;
(3) Soil sampling;
(4) Geomorphology;
(5) Soil micromorphology.

The areas investigated in the 1996 field season as well as other sites mentioned in the text are shown on Figure 1 Sampling areas used in 1996 are shown in Figure 2a.

Mapping and Surveying

Detailed topographic maps are essential for comparison and interpretation of the stratigraphy found in our widely-spaced test pits. In 1995 Peter White began a contour survey of Areas A and B. In 1996 he plotted the location of test pits and/or established base points for plotting pits, extended the contour maps in these areas, began mapping Areas C and D, and surveyed in a number of key locations so that contour surveys carried out in previous years can be incorporated into the large base map of the plantation. During the next year, he will be putting all the new information together onto a single map of the plantation.

During every field season surveys are made along Malaiol Stream (FAP) and around parts of the coast in order to monitor the nature and scale of artifacts deposited as a result of continuing erosion from stream action. In 1996 we expanded the collection of artifacts from several sites and discovered a new locality where scarce pottery and abundant stemmed tools have been washed out onto the beach from an actively eroding stream. Jim Specht also discovered a new site (96-2) where a very long stratigraphic profile of interbedded tephras and soils with artifacts was exposed. The locations for the newly discovered sites on Garua Island are given in Figure 1 and are described in more detail below First, we describe an extremely important site which we discovered on the mainland.

<u>Namundo Plantation</u>

While taking a break from fieldwork preparations, Torrence, White, and Mulvaney discovered an extremely well stratified site on a recently cleared hill on Namundo Plantation. The site was reported to Bob Wilson, manager of Namundo, who later visited it to discuss the finds with us. Towards the end of the trip, the site was revisited with John Namuno (Provincial Cultural Centre) and Max Benjamin (Tourist Board) who have agreed to monitor the surface finds which are eroding as a result of terracing and planting on the hill. After discussions with Namuno and Nick Thompson, Managing Director of New Britain Oil Palm Ltd., which owns the land, it has been decided to restrict information about the site because it is quite close to the road and is an easy target for unsystematic collection and digging by well-meaning amateurs.

Survey was limited to the southern and western flanks of the hill. Obsidian artifacts and occasional pieces of undecorated pottery were observed around the bases of newly planted oil palms especially toward the western end. It appears that the tephra layers at the site are dipping down towards the west, so that the older, artifact-bearing layers are closer to the surface in this region. A concentration of pottery and obsidian was observed eroding from the walls and head of a gully at the western, seaward end of the site. Decorated pottery with very rough dentate stamping, impressed circles, and incision along with a number of plain pieces were represented in our surface collection. A few pieces of plain sherds were given to Bob Wilson so that he could keep an eye out for more material while planting continues on the northern side of the hill.

A north facing section was cleared at the head of the gully for study and recording of the stratigraphy. The section revealed the presence of as many as six layers of volcanic tephra interbedded with soils of varying degrees of development. Based on similarity in colour and texture with the type section at Kimbe, the tephras can tentatively be identified as follows: W-K1 (c. 5,000 BP); W-K2 (3,500 BP); W-K3 (1,800 BP); W-K4 (1,400 BP); two of the ?W-H series. All except W-K2, which has been redeposited in this part of the hill, appear to be in situ.

In the process of clearing a section, an area of about 0.5m wide and 0.4m thick was removed from the soil under W-K2 and about 0.5m by 0.2m below W-K3. One obsidian flake and two potsherds (one rim with rough dentate stamping on both the interior and exterior surfaces and two plain pieces, one of which is from the shoulder of a vessel) were recovered from between W-K3 and W-K2 and a number of obsidian artifacts were found in the soil between W-K2 and W-K1. No other artifacts were observed in the section, although a poorly developed soil was noted between W-K3 and W-K4 and a well developed soil has formed on an unknown tephra above W-K4. Samples of the tephras were collected so that field identifications can be verified by chemical analyses of glass shards within them. On our return visit to the site, a stemmed obsidian tool was found in the floor of the gully near the section. It has been deposited at the Provincial Cultural Centre.

The site is extremely important for West New Britain prehistory because of the abundance of both pottery and obsidian, as determined by the survey, and due to the presence of a complete sequence of Witori tephras. Although pottery has been found sealed between the W-K3 and W-K2 tephras at Walindi Plantation, the Namundo site has a much longer and more complete sequence of tephras. Furthermore, this is the first low-lying, coastal site from the north coast of West New Britain where pottery with Lapita style, dentate stamp decoration been found in a stratified context. It is also the only site outside the Talasea area where obsidian stemmed tools have been found and where it is likely that contemporary material is also preserved in its original context.

Clearly, the site should be carefully monitored to prevent serious damage from oil palm planting and management and/or unsystematic collecting of surface finds. Further archaeological research at the site as well as environmental studies within the surrounding area in order to reconstruct the history of sea level and the coastal plain would be highly desirable.

FAP

At the beginning and again at the end of the field season on Garua Island, survey along Malaiol Stream yielded a large number of stemmed tools. As in previous years bladed forms were the most common find, but two examples of a very rare form with pecked, rather than chipped, handles were found near the major obsidian source, not far from the collection site of the only other artifact with this unusual manufacturing technique. We also observed that erosion has slowed considerably at the lower reaches of the stream, resulting in very few finds. In contrast, in the vicinity of the ancient coral reefs, between Webb's localities 14 and 17, erosion working back along the sides of the stream is very active. For the first time, a large number of stemmed tools and blades were collected in this vicinity and tools were found in reasonable quantities as far upstream as locality 22, up to the base of the second level of raised coral.

A reconnaissance was therefore made along the western side of the stream between localities 14 and 17 to see if the source of the artifacts could be determined and/or if there was potential for a test excavation. The banks of the stream were found to be actively eroding and very unstable as much as 10-20 metres back from the edge. Obsidian was observed to be eroding from the small tributary that empties at Webb locality 17 in an area of some flat ground where an excavation would be feasible (site of a taro garden in 1993). However, the absence of recognizable tephras would make chronological control difficult. The team concluded that there is no obvious strategy for finding the seemingly abundant bladed stemmed tools in situ in order to determine the date of their manufacture and use.

FAR

Another large collection of stemmed tools, mainly bladed forms, was collected by Mondol and Mathew from the beach where the gully designated FAR empties onto the beach, about 50 metres southeast of site FEL. Surveys in 1989, 1993, and 1995 have found stemmed tools in situ along the walls of this gully, but the absence of tephras makes it difficult to determine their stratigraphic context. Nevertheless, it seems worthwhile to continue monitoring this location.

FEK

Site FEK, Area B, where in 1993-1996 a plantation worker, Mathew, has collected several potsherds with classic Lapita dentate stamping as well as obsidian and ground stone artifacts, was revisited on several occasions. There is abundant obsidian on the beach at this locality, but there is no obvious source for the axes and pottery because they were found to the south of the currently active stream. The site sits about 100 metres west of a large hill which could be a source, but it seems unlikely that the large potsherds and axes found on the beach would have been washed so great a distance. More likely as a source is the narrow coastal plain. However, the area immediately behind the collecting locality on the beach has been bulldozed and planted with coconuts in recent memory. This would also account for the apparent movement of the active stream. This new information fits with the results of excavation in 1993 at FEK, Area A, which revealed one metre of sediment overlying a deposit dated to c. 1950 AD. It seems likely that if there had been a site in this region, it has been seriously disturbed. No test excavations are planned for the near future at this locality although Mathew will continue to monitor the beach for artifacts.

FXO

Survey along the beach at the eroded locality designated FXO recovered 29 potsherds, among which were 6 notched rim sherds from very similar vessels with restricted necks and broad outcurved rims. All the rims have squared lips; 4 are notched on one side and 1 has been notched on both the inner and outer sides. In 1992 and 1993 only 3 small undecorated sherds were found at this locality and so we suspect that erosion of the site has increased. Further searching did not locate in situ deposits for the finds. Surprisingly, no pottery was found on the beach directly below test pit D3 where a concentration of pottery was found. We had thought that D3 might be a source for the pottery at FXO although it is c. 100 meters to the west of FXO. As in 1993 we are still unable to determine whether the source of the pottery is site FOV, where excavation in 1993 showed that the Period 2 deposits had been eroded away, or from a level platform which is above the beach and which has been disturbed during road construction. A planned test excavation on a raised coral platform about 100 metres south of the pottery find area was prevented by lack of time and is delayed until 1997.

FEI/FCY

Survey along the beach in this area did not locate a raised coral platform, although heavy ground cover hindered the search. Fifteen plain sherds were collected from the beach at FEI and 1 at FCY, again representing a substantial increase from previous years. A test excavation is planned for 1997 in order to examine the raised beach in this locality.

96-2

Site 96-2 is a new site discovered by Specht. The locality is defined as a low-lying ridge running southeast from the flanks of Mt. America (Figure 1). The ridge has been dissected by a stream revealing a very deep stratigraphy of inter-bedded tephras and related soils overlying a pyroclastic flow incorporating burnt logs. Samples of the logs were taken, although they are likely to be too old for radiocarbon dating. Boyd and Specht mapped and described the stratigraphy in 4 profiles along the stream; samples of all the layers were taken to see if glass is preserved in the tephras so that they can be matched to known eruptions. Under the Witori WK-2 tephra a series of six stone lines were detected, in which blades and stemmed tools were observed. Since WK-2 is close to the surface at this locality, it would be an ideal place to investigate deposits pre-6,000 years, which are very deeply buried elsewhere. An attempt was made to relate the stone lines to the very poorly defined stratigraphy of soils and tephras located between WK-2 and a distinctive hard, yellow tephra which forms the base of the stream. Samples were also taken for obsidian hydration dating.

Further upstream to the east and higher on the ridge, Specht and Mondol excavated a small test pit (1 x 0.5m). Several pieces of plain pottery had been found in the lower streambed and so it seemed likely that Period 2 would be present on the hill. Specht chose a location adjacent to a thick deposit of Dakataua tephra revealed in the stream section. The test pit contained a reasonable quantity of pottery including two rims, one with notching, and a sherd with finger-nail impressed decoration. The relationship between 96-2 and the pottery found on the beach at FEI and FCY will need to be further investigated in 1997. A large quantity of large obsidian artifacts were also recovered, including some blades which we assume had been scavenged from the older deposits under the WK-2 tehpra, as well as a very unusual handle of a flaked stone tool. Similar examples of broken handles from what appear to be non-obsidian stemmed tools have been found from surface contexts at FCS on the mainland and on Kaula Island FEN.

96-4

One of the aims of survey in 1996 was to complete a search of beaches on the steep, rocky eastern side of the island. Undecorated potsherds had been found in 1993 at site FOW, which we assume had washed down from the coastal cliffs above. No sherds were found in 1996, although obsidian artifacts are present at the small beach here. This place is significant because there is a break in the reef close by. Further south, at new site 96-4, a very large concentration of stemmed obsidian tools and 2 plain potsherds was located on the beach at an area representing the outwash fan of an active stream. We did not, however, continue survey up the stream since access is very difficult and no artifacts were observed to be eroding from the exposed sections. The location is likely to be identical to the outwash fan of Malaiol stream and site FXN and to represent artifacts washed down from a relatively large catchment area. The catchment of this stream will be targeted for test pit excavations in 1997.

Among the extensive collections of both flake and blade stemmed tools, a very unusual bifacial point was found. The tools also seemed to be much smaller than those from Malaiol Stream and many had been worked down to small stubs. It therefore seems likely that there are significant differences in tool manufacture and use as one moves away from the obsidian source, even on such a small scale as Garua Island.

Other New Sites

Collections of surface material were made at three additional new sites. Localities 96-1, 96-3, and 96-5 are surface scatters of obsidian which are likely to belong to Period 3. At 96-1 large clam shells were observed on the surface and at 96-3 an axe sharpening flake with a ground surface was collected. Test pit A5, which was dug at 96-1, revealed the possible edge of a house mound also dating to Period 3 but at some time before the surface scatter was deposited. Further excavation at this locality would be merited. Test pits C1-3 were placed at 96-3 and contained large quantities of obsidian, but very shallow stratigraphy and no features. Finally, at 96-3 where a diffuse surface scatter of obsidian was observed, test pit C5 did not add further information as the deposits were very shallow.

The new site at Namundo Plantation as well as 96-1 through 96-5 will be reported to the National Museum in Port Moresby and assigned three letter site codes.

Test Pit Sampling

In a paper presented by Torrence in 1994 at the Indo-Pacific Prehistory Association conference in Chiang Mai and in a grant proposal to the Australian Research Council in 1995, we proposed that there were major changes during the past 6,00 years in the way the landscape was used. In particular, it was argued that shifts in obsidian technology as well as in the spatial patterning of material in excavated sites FSZ, FAO, and FAQ indicated a change from a highly mobile way of life in which there were no 'villages' or long-term occupations to one with 'villages' that were settled for increasingly longer periods of time. The major shift was seen to occur between Periods 1 and 2 with a minor reorientation between Period 2 and 3. The primary causal factor put forward for these changes was a slow, gradual intensification in subsistence, defined as a decrease in the amount of land exploited per consumer. One of the primary aims of the current fieldwork is to test these hypotheses through the excavation of test pits spread throughout all environmental zones on Garua Island.

In order to excavate test pits in as wide a range of physiographic and topographic settings as possible with restricted resources and in the limited time available, we have designed a sampling strategy. To begin with, the island was divided into two parts, each of which has a separate geological history. The larger part surrounds the caldera in which the current Mt. Hamilton sits and Mt. Baki forms the core of the smaller part. In 1996 we concentrated our efforts on the Mt. Hamilton part of the island. Next we selected 3 catchments which contained one or more sites excavated in 1992-3, so we could compare sediments, plant fossils and archaeological remains from a putative 'village' with those from points in its hinterland: i.e. Area A (FSZ); Area B (FAQ, FYS); Areas C-D (FOV) (Figure 2a). Area C-D was expanded to obtain a sample running from Mt. Hamilton to the sea and to include newly discovered sites 96-2 and 96-3.

The island can also be characterised in terms of physiographic zones, as illustrated in Figure 2b. Since previous research and excavation on Garua Island has been concentrated in the coastal regions, we deliberated weighted the locations for our sample test pits toward the inland plain, which also represents by far the largest physiographic region on the island. The final distribution of the sample test pits is presented in Figure 1.

In 1996 twenty nine pits measuring one square metre were excavated in Areas A-D (Figure 1). To maintain comparability, the hand digging and sieving methods used were identical to previous years. Excavation was by hand within natural stratigraphic units dug in 10 cm. thick arbitrary units. All soil was sorted by hand since the heavy soils cannot be dry sieved.

Table 1 shows the distribution among physiographic regions and topographic settings for the 1996 pits, summarises the archaeological results, and indicates where soil (s) and micromorphological (m) samples were taken. After examining the distribution of obsidian counts for Areas A and B, the quantity of obsidian was lumped into 3 classes to assist with the selection of layers for soil sampling: 0-6 pieces = Low; 6-60 pieces = Medium and >60 pieces = High (L, M, H in Table 1). These classes are also used in the preliminary analysis of changes in spatial distribution presented below. As a basis for checking on our sampling and for future locational analysis, all the pits excavated in 1996, the gully profiles, and the locations of previous excavations were visited and scored according to the following variables: physiographic region, topographic setting, altitude, distance from sea, base geology, aspect, slope gradient, slope shape, adjacent topography, and visibility of the middle horizon. Data collected from 68 localities will be analysed during the next year.

Several very significant observations can be made on the basis of the preliminary data presented in Table 1 and partly summarised in Table 2. To begin with, the prehistoric landscapes on Garua Island are covered with reasonably large quantities of material. Everywhere we excavated, we found obsidian artifacts. Only in one valley sample (B1) were there consistently Low values for artifact counts and only two arbitrary excavation units within a larger stratum (A4 Period 2 and D1 Period 3) had no artifacts at all. Given these results, one might be tempted to call the entire island one archaeological site, but that would be to ignore the very interesting variability in the data recovered. Although in every period at least one obsidian artifact was deposited in all the test pits, there were major changes in the way the different landscapes were used during the past 6,000 years or so.

The changes in land use can be illustrated through a period by period description of how artifact discard is distributed through space. Deposits belonging to Period 1 are very well preserved throughout the island and are equally well represented in all physiographic zones and in all topographic settings. In general, Period 1 deposits contain much higher quantities of obsidian artifacts than do deposits from Periods 2 and 3. Whether the higher density of material can be explained by a longer period of exposure for the Period 1 landscape, or reflects a major difference in the rate or strategies of stone tool manufacture and use in Periods 2 and 3, cannot be determined until an extensive programme of dating is carried out. Not only are Period 1 deposits ubiquitous, but there is very little difference in the quantity of material represented in each shovel pit: nearly all the samples are scored as High. The single case of a Low score (B1) is located in an undesirable place, in a valley where there is a heavy runoff of water. Low scores were also obtained for the other periods in B1.

These data suggest that there is a very even spread of material across the Period 1 landscape, possibly reflecting a pattern of land use characterised by very little differentiation in terms of the location of activities. There are, for example, no obvious places that were occupied longer than anywhere else and therefore seemingly no 'villages.' Although this is undoubtedly the case when viewed on the large scale, it is worth remembering that extremely high densities of obsidian debitage, representing several orders of magnitude higher than the 1996 pits, were recovered from two previous test pits at sites FAQ and FAO, suggesting that tool manufacture at least, if not tool use and maintenance, might have occurred at specific locations. At this stage of analysis, these data lend support to the original hypothesis of land use characterised by high mobility at this time.

Turning to Period 2, we observe almost the direct opposite pattern of artifact discard. This drastic shift in spatial patterning must indicate a significant change in the pattern of settlement and land use. Densities of artifacts during Period 2 are predominantly Low or Medium with only 5 test pits scored as High. This pattern could be interpreted as a very focussed pattern of artifact discard at specific locations, possibly resembling what we understand as a 'site' or a 'village.' Pottery was recovered from all the locations with high quantities of obsidian, but only two test pits (D3, 96-2) contained significantly large amounts of pottery. It seems likely that the pits with high obsidian and low pottery counts relate to the same activities as those with high pottery counts, but these pits represent samples taken from the periphery of the 'site.' Only further excavation could test this hypothesis, although it is interesting to note that this same pattern was observed in some test pits excavated at site FAO in 1992-3. This scenario seems especially plausible for pits B7-9 because they are located relatively near the major Lapita pottery site at FYS. It also seems likely that the Medium scores for D1 and B5 were obtained because they are relatively close to locations with high densities of Period 2 material: D3 and FAQ, respectively. On the other hand, it is also possible that differences in densities of artifacts are not solely explainable in terms of *less* activity taking place at greater distance from 'sites,' but represent *different* activities, each of which generated different quantities of obsidian and pottery: e.g. settlement; garden; gathering.

Whereas in Period 1 physiographic and topographic variability seems to have little effect on patterns of artifact discard, in Period 2 activities are almost entirely restricted to the coastal regions. Among the pits with a High score for obsidian counts, only 1 (C4) is not located on a ridge either within the coastal cliffs or at the margins between inland plain and coastal escarpment. The anomalous position of C4 might merit further investigation. Another interesting observation is the absence of dentate stamped design among the pottery collected and the presence of finger-nail impression and notched rims. This pattern fits previous research on Garua Island which has detected a shift in settlement from low-lying coastal areas to coastal hills and ridges late in the period of Lapita style pottery. It is also notable that only Low scores have been assigned to the test pits A1-5, which are located furthest from the coast of all the sampling areas undertaken in 1996.

The change to Period 3 also appears to have involved a major reorganisation of land use. Like the previous period, there are very few localities with High counts of obsidian and a relatively even distribution of the Medium and Low categories. Once again one might infer the places with heavy use represent long term occupations, whereas the remainder of places were used for different activities such as gardening, gathering bush foods, short-term camps, etc. In contrast to Period 2, the location of places with High obsidian counts has shifted from the coastal to the inland regions. A similar move from coast to inland about this time has been noted by Christopher Gosden for sites on the south coast in the Arawes region. Furthermore, whereas the Period 2 locations with High counts were distributed throughout the sampling areas, in Period 3 they are restricted to Areas A, C, and the pit D4, which is on the edge of Area C. This may not be too meaningful a distinction, however, because a very high concentration of obsidian artifacts belonging to Period 3 has previously been found at site FAQ in Area B.

At this stage we can conclude that there are significant changes in the distribution of archaeological material, particularly obsidian artifacts, between each subsequent period. Whether these are caused by an intensification in the use of plants and a reduction in mobility, as proposed by Torrence, cannot yet be determined with this data alone. A number of planned analyses of the obsidian technology, dating, plant fossils, etc. should help to further interpret the spatial patterns witnessed in this preliminary data set and to test further our hypotheses for changes in how the landscape was perceived and used during Periods 1-3.

Soil Sampling

Analyses of ancient starch grains and phytoliths, which are microscopic remains of plants, will be used to assist in the reconstruction of past environments; to determine the use of an area as bush, garden or village; and to reconstruct subsistence patterns. They will also help assess the nature of gardening practices in different Periods and various places on the island. In 1996 soil samples were taken by Boyd and Torrence from the pits noted in Table 1. The samples were chosen to represent examples of levels with Low, Medium, and High densities of artifacts for each of the three periods in each sampling area. Soils were collected either as an intact monolith which will be further subsampled in the laboratory or as loose soil from within 2 mm. thick units within a column located along one wall of an excavated square. Paired samples were taken for starch grain and phytolith analyses.

Geomorphology

Previous geological work by Webb and Jackson in 1992 and 1995 has provided a good understanding of the long-term volcanic history of Garua Island. This forms the background against which to study human history. Current geomorphological research on Garua Island is directed to understanding the interaction between people and their physical setting during the past 6,000 years. For this purposes an analytical division between coastal and inland settings has been made. To begin with, very broad scale environmental changes are most likely to be reflected by changes in relative sea level. A study of coastal sediments also provides a good understanding of the timing of local erosional events because sediments accumulate in these regions. Since the exact source of the sediment cannot be determined, however, the spatial scale of erosion cannot be reconstructed from coastal settings. In contrast, the analysis of inland stratigraphies provides data on the spatial distribution and patterning of erosion, although the exact timing of the event is often difficult to establish. By putting these two sources of information together, a full picture of geomorphological history can be obtained.

In 1993 Boyd's preliminary study, which focussed primarily on coastal settings on Garua Island, established a sequence of periodic erosion for the island. Further work was required to determine to what degree the erosional history was a product of local human agencies or was due to more widespread natural causes. The 1996 project continued the analysis of depositional environments and coastal processes, but placed most emphasis on determining the sedimentation, weathering, and erosion in the inland regions where most of the archaeological excavations were located.

Coastal change

One of the research aims of the project is to determine where people were living in each of the various periods. Previous excavations on Garua in 1992-3 have led to the hypothesis that there was a shift in the location of sites during Period 2 (the time of Lapita style pottery) from off-shore islands (such as Boduna) and the coastal plain (e.g. FYS) to coastal hills (e.g. FSZ, FAO, FQY) and even inland hills (FRG). In order to test this hypothesis, it is necessary for us to reconstruct the history of shoreline change during the past 6,000 years. Although the sea level supposedly had reached its current level at this time, local changes in sea level at around 4-5,000 years and 600 years ago have been detected on Garua in our previous work in 1992-3. Since this is an active volcanic region, localised uplift is to be expected from time to time.

Along these lines surveys were made primarily along the south coast of Garua Island. Large amounts of recent silting around the north coast, as evidenced by excavations at FQY in 1993 and the complete filling up of the bay by Malaiol Stream, mean that older coastlines in this region have been deeply buried. Furthermore, excavations on the coastal plain below site FQY revealed nearly two metres of colluvium on top of ancient mudflats. As evidenced by the excavations at FYS in 1993, at least part of the coastal plain sits on a coral platform, which is about 1.5 metres above current sea level and dated by radiocarbon to around 6,400 years ago. We therefore tried to trace the position of the raised coral and associated old beach lines. Although there was not enough time to map these features in detail, survey work by Boyd, Specht, and Torrence did identify several areas which would merit further investigation and test excavation in 1997. In particular we hope to test the putative raised coral platform close to FAS, where pottery has been found in a secondary, redeposited setting, and on raised coral platforms near FXO and FEI/FCY, sites where pottery has also been found in a secondary context.

Boyd and Specht carried out a more detailed investigation of coastal history at Malakuka Beach since previous work in the Pacific region would predict the presence of a site with Lapita pottery in this vicinity, given its sheltered location and access through the coral reef. The area represents the infill of a bay bordered to sea by a sandy beach. The ancient bay is bounded by cliffs on the east and west, from which colluvial fans have been formed, and rises steeply to the north up to a saddle between the Hamilton and Baki sides of the island. Six sections (3 spade holes and 3 gully sections) were examined and a profile was surveyed from the beach to the saddle.

The results of their work show that the shoreline relating to buried beach sands detected in the sections is only about 30 metres inland of the current beach line. This is overlain by colluvial weathered bedrock deposited in waterlogged conditions (e.g. as an alluvial fan) and is further overlain by colluvial tephra on which soils have developed. Projecting a 2 metre higher sea level would still restrict the inland limit of the shoreline to this region because of the steeply rising level of the land. In summary, it seems likely that the Period 2 beach is not far removed, if at all, from the current beach. However, it may be buried under up to 2 metres of alluvial and colluvial weathered bedrock and tephras. Further shovel testing along the ancient shoreline may be carried out in 1997 to obtain material to date the sequence of events, but given the depth of deposits, it is not a high priority goal.

Inland erosional history

Boyd's study of erosion this year concentrated on sections located in inland settings. Thirty six sediment exposures were analysed. In addition to the sections at Malakuka, these include 4 gully sections and 21 test pits in Areas A-D as well as 4 gully profiles and one test pit at site 96-2. Monolith and stratigraphic soil samples were collected from the test pits noted in Table 1 as well as gully profile II in Area B. Sketch profiles summarising some of results of Boyd's analyses are presented in Figures 3-5. A comparison of the phases observed in 1993 and 1996 is presented in Table 3.

Several observations are worth emphasising. To begin with, compared to 1993 a very high proportion of the sections observed in 1996 represented interbedded tephra and soils layers that were in situ and showed no evidence of erosion having taken place. Furthermore, the in situ deposits were generally located away from places with High obsidian counts in Period 2 or 3. It therefore seems quite plausible that the erosional episodes noted in 1993 (where the sections were primarily on 'sites' with concentrations of pottery and obsidian) have a very limited spatial scale and are more likely to represent the effects of human clearance or other forms of soil destabilisation, rather than 'natural' events such as changes in relative sea-level or severe storms. A good example of this line of reasoning is to compare the erosional data from the opposing sides of Mt. Hamilton as represented in Areas A and C (Table 3 and Figures 3,5). The major period of erosion for which evidence is preserved in Area C took place *after* the fall of the DK tephra, although it may have obscured a previous phase before DK for which there is evidence in C3. In contrast, Area A has more evidence for erosion *prior* to the fall of the DK tephra. Both periods were observed by Boyd on the top of Mt. Hamilton itself in 1993. Following our line of reasoning, then, we would predict that the erosion prior to the DK tephra is more likely to represent a wide scale phenomenon, whereas the post-DK erosion in Area C can be ascribed to localised clearance.

The localised nature of the erosion in Area C is especially interesting given that it did not occur on the much steeper, adjacent slopes of Mt. America where the stratigraphy is still intact at test pit C4 and stratigraphic profile CI as well on the western side of Mt. America at 96-2 (Figure 5). It seems reasonable to suppose that the cause of the erosion is human land use and probably gardens similar to those currently surrounding pit C6. It is also significant that large quantities of obsidian artifacts were recovered from Period 3 contexts in Area C and an axe fragment was collected from the surface. Whether the area was used as a village as well as gardens can not yet been determined.

Two further examples of possible humanly-induced erosion can be detected by comparing the patterns of sites FYS and FAQ with the surrounding area as represented by the test pit and gully sections in Area B. As seen in Table 3 erosion events 1- 3 occur almost exclusively at these sites. The earlier period is probably not represented in the test pits because excavation was terminated 20 cm below the W-K2 tephra. However, it is notable that event 2 is unknown outside of the two sites, which have large concentrations of obsidian artifacts and in the case of FAQ a possible knapping area. It seems likely that we could be detecting very localised human disturbance. Secondly, event 3 is also restricted to the region around site FYS and Area B. Since FYS is the only site on Garua Island that is known to have been occupied shortly after the W-K2 eruption, again it seems highly plausible that the erosion is caused by human land use practices.

In summary, the study of erosional events is providing a very important independent source of information about changes in possible human land use practices. The preliminary results from the 1996 fieldwork support the hypothesis that localised occurrences of erosion can be accounted for by human behaviour rather than natural causes.

Soil micromorphology

Dr. Leigh Sullivan visited Garua Island for the first time to assess the potential of undertaking micromorphological analyses of the properties of the buried soils for reconstructing the nature of human activities at specific locations. Microscopic analysis of soil thin sections; analysis of individual grains using a scanning electron microscope; and analysis of phosphates will be applied to determine if the soil properties have been seriously disrupted by perturbation, i.e. mixing through the action of earthworms, other insects, and roots.

Sullivan's initial conclusions are that despite abundant evidence for perturbation, the gross stratigraphy of inter-bedded soils and tephras is still reasonably well intact, although the boundaries have been blurred. The pre-Witori soils (Period 1) appear to lack good structural properties, whereas the Witori soil (Period 2) deposits may be in reasonable condition despite some evidence of earthworm and other insect activity. For example, the boundaries between the Witori topsoil and subsoil and between the Witori subsoil and overlying tephra were found to consist mainly of interpenetrating tubules from burrowing beetle larvae. In contrast, the more recent soils formed on the Dakataua tephra (Period 3) have been heavily reworked and would be unlikely to provide the desired information. This is best demonstrated by the presence of a lighter coloured soil in the top 10-15 cm of the soil profiles which is due to the accumulation of earthworm casts on top of a previous land surface, represented below by a darker horizon.

Samples of earthworms were collected for identification since it seems likely that the species currently responsible for so much mixing is a recent introduction to Garua Island, probably as a result of plantation activities. If the earthworms are modern arrivals, then there is a greater likelihood that the deeper, older Witori soil has been less effected.

On the basis of his field observations, Sullivan decided to concentrate his initial laboratory work on samples of Period 2 deposits taken from the following locations: (1) square 1000/1000 at site FAO (excavated in 1992-3 and reopened in 1996 for his analysis); (2) B8; and (3) B2. The squares were chosen to represent very high intensity of use at a possible village (FAO); high intensity use possibly relating to a garden (B8); and very low intensity use representing uncultivated bush (B2) (cf. Table 1). Since the stratigraphies of B8 and B2 are almost identical, the major differences in artifact density is especially suggestive of different patterns of land use at these locations. Undisturbed monolith samples were cut from the Witori topsoil. Secondly, a series of 40 mm. diameter cores were taken from all horizons in each pit, although emphasis was placed on the Witori soils. Thirdly, 2-4 mm thick loose sediment samples were collected to supplement the monolith samples.

Sullivan will be undertaking analyses during 1996-7 at Southern Cross University in Lismore, Australia. If he determines that the Witori soils are well enough preserved and that micromorphology is an appropriate methodology for studying past land use on Garua Island, his work will be expanded to include a wider range of sample localities.

FUTURE PLANS

During 1996–7 Torrence, Boyd, and Sullivan will study samples collected during the fieldwork in order to undertake analyses of obsidian technology and sourcing, geomorphology, and soil micromorphology and to carry out a locational analysis of all the samples from 1992-6 using the coding system described previously. We also hope to use White's contour map in a

GIS analysis of artifact distributions for the full data set using 1992-6 excavations. Samples from as many test pits as possible, given funding constraints, will be sent for radiocarbon and obsidian hydration dating. These data will assist in testing hypotheses about the nature of changes in land use that have been put forward as a result of our previous work and given support by the 1996 fieldwork.

Fieldwork in 1997 will continue the basic aims of the project. We hope to expand significantly the number of test pits excavated to reach our target of 70-80. Once again soil samples for phytolith and starch grain analyses will be taken from a sample of pits representing all areas, physiographic regions and classes of artifact density. Depending on the condition of the roads and groundcover, we would like to sample at least 2 areas on the Baki side of the island as shown in Figure 2a. Area E has been selected to test the hinterland of the important FAO site, as well as to search for intact deposits containing the bladed stemmed tools which are relatively common within the FAR gully. It also contains previously untested site FOW and the stream which has deposited numerous stemmed tools at locality 96-4. Area F has never been seriously surveyed, although a scatter of obsidian was observed in 1988 at FRE on a road which has since been abandoned and is completely overgrown.

In addition, the east-west transect running from Mt Hamilton to the sea and passing through Areas C and D needs to be completed with additional inland pits in Area D as well as several pits on the coastal plain. Similarly the north-south transect between FSZ and FYS requires a couple of test pits at the northern end. Also in Area A a sample from within the caldera is needed to complete the sample of topographic types in this region. We would also like to investigate old beach lines in the vicinity of sites FCY/FEI, FOV/FXO, and FAS to look for intact deposits preserved on the raised coral platform since our previous sample of the coastal plain is mainly comprised of recent alluvial sediments. Further exploration in the Malakuka Beach area may be warranted if time permits.

SIGNIFICANCE OF THE PROJECT

The Garua Island research project is important because it is the first systematic study in Papua New Guinea of prehistoric communities who quarried and traded obsidian. We are also collecting much new information about how people lived in West New Britain from about 6,000 to 200 years ago. Thus far, our work is especially significant because marked changes in settlement patterns have been shown to have occurred between each of the three periods. We can confidently infer, therefore, that there were major shifts in how the landscape was used and perceived by people in the past. Although Pacific archaeologists have suspected that the ancient past was different from the recent past, this is the first time that concrete evidence has been collected and has allowed us to make detailed reconstructions of settlement patterns during Periods 1 and 2. Furthermore, our results seriously challenge previous models for settlement patterns during the time of Lapita pottery. On Garua Island, at least, there was a fundamental shift in sites from low-lying beach settings to coastal hills and cliffs. In addition, sites with ceramics were only one of several kinds of place where artifacts were discarded at this time. This discovery allows to offer several interesting alternatives to previous models for land use during the time of Lapita pottery.

Our work on Garua Island represents the first time in Papua New Guinea that archaeologists have conducted large scale, exploratory excavations that are not directed to discovering settlement sites but are aimed at understanding whole landscapes. To achieve this aim, we have undertaken a range of relatively new methods in Pacific archaeology including: studies of coastal change and the effects of human-induced erosion as well as studies of phytoliths, starch grains, and soil micromorphology. The results of our work, therefore, are not limited to Garua Island or West New Britain but have importance for the whole discipline of archaeology in the Pacific region.

COMMUNICATION OF RESULTS

At the beginning of the field trip Torrence and White discussed the research with Samuel Esakia, Acting District Administrator for Talasea; Herman Talingapua, Acting Coordinator of the Provincial Cultural Centre and Secretary of the Cape Hollman Corporation Pty, Ltd; and John Namuno, Provincial Cultural Centre. A brief visit was also made to Kimbe International Primary School. Torrence later met with Martin Metta, Acting Station Manager for Talasea. During the field season a teaching kit containing representative artifacts was assembled on Garua Island to be used by school children when visiting the island.

Before leaving West New Britain, Specht, Boyd, Sullivan, and Pavlides described their work and preliminary results with Herman Talingapua and John Namuno. A radio interview by John Namuno with Christina Pavlides was broadcast in August. Team members also assisted John Namuno in the preparation of a video recording about archaeology on Garua Island. Filming took place both on Garua Island and at the Cultural Centre in Kimbe.

At Walindi Plantation, Torrence gave a brief talk to a group of tourists about archaeology in West New Britain and assisted Max Benjamin in writing a statement about archaeology for a brochure describing proposed activities for the Research Centre. Torrence also met with Nick Thompson and Bob Wilson of New Britain Palm Oil to describe the results of exploratory fieldwork at the new site on Namundo Plantation.

On completion of the field trip, Torrence met with members of the Departments of Ethnography and Prehistory at the National Museum. She also discussed the results of the fieldwork with Dr. John Muke, University of Papua New Guinea, and made plans for inclusion of senior students in next year's project.

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TABLE 1: TEST PIT RESULTS

Test pit	**Physiographic Region** (Figure 2b)	**Topographic Setting**	**Obsidian Counts (by period)** 1	2	3	**Pottery Counts**	**Samples** (Soil, Micromorphology)
A1	Inland plain	Ridge spur	H	L	H		S
A2	Inland plain	Ridge slope	H	L	H		
A3	Inland plain	Ridge slope	M	-	-		
A4	Inland plain	Saddle	M	L	L		
A5	Inland plain	Ridge top	H	L	M		S
A6	Inland plain	Hillslope	M	-	M		
A7	Inland plain	Hollow	H	M	L		
A8	Inland plain	Ridge top	H	-	H		
A9	Inland plain/coastal esc	Ridge slope	H	H	M	1	S
A10	Inland plain	Ridge top	H	L	M		S
B1	Inland plain	Valley	L	L	L		
B2	Inland plain	Ridge top	M	L	M		S, M
B3	Inland plain	Ridge slope	H	M	L		
B4	Inland plain	Ridge spur	H	L	L		
B5	Inland plain	Ridge top	H	M	M		
B6	Inland plain	Ridge slope	M	-	-		
B7	Inland plain/coastal esc	Ridge slope	H	M	M	1	S
B8	Inland plain/coastal esc	Ridge slope	M	H	L	1	S, M
B9	Coastal cliffs	Ridge spur	M	-	-	1	
C1	Inland mountain	Hillslope	M	-	M		
C2	Inland mountain	Hillslope	H	-	L		
C3	Inland plain	Saddle	H	-	M		
C4	Inland plain	Saddle	H	H	H	2	S
C5	Inland hill	Hilltop	-	-	M		
C6	Inland mountain	Hillslope	M	-	H		

D1	Coastal escarpment	Saddle	H	M	L		S
D2	Inland plain	Hill/ridge slope	H	L	L		
D3	Coastal escarpment	Ridge top	H	H	L	13	S
D4	Inland plain	Hillslope	H	M	H	1	S
96-2	Coastal escarpment	Hillslope	-	H	M	20	S

TABLE 2: SUMMARY OF OBSIDIAN COUNTS
(Based on Table 1)

OBSIDIAN COUNTS	NUMBER OF TEST PITS					
	Period 1		**Period 2**		**Period 3**	
	No.	**%**	**No.**	**%**	**No.**	**%**
High	18	64	5	25	6	22
Medium	9	32	6	30	11	41
Low	1	4	9	45	10	37
Totals	**28**		**20**		**27**	

TABLE 3: SUMMARY OF EROSION EVENTS
(Based on fieldwork in 1993 and 1996)

EROSION EVENT	TIMING	LOCATIONS OBSERVED (1996 data in bold)
9	20th Century	FEK, FQY, FAS, FAO, **96-2, BIV**
8	Latter part of last millenium	**C1, C2, C3, C5**
7	Sometime since DK tephra	FRG, FQY, **C6**
6	Shortly after DK tephra	**B6**
5	Shortly before DK tephra	FAQ, FYS, FQY, FAO, FOV?, **B4**
4	Sometime between DK and W-K2	FRG, FOV, **A3, A4, BIV, C3**
3	Shortly after W-K2	FYS, **B9, BI**

2	Shortly before W-K2	FYS, FAQ
1	Before W-K2	FQY, FYS, FAQ