ARCHAEOLOGICAL RESEARCH ON GARUA ISLAND

WEST NEW BRITAIN PROVINCE, PNG

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Prepared by

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

The project is affiliated with the National Museum and Art Gallery and the Department of Anthropology and Sociology, University of Papua New Guinea.

SUMMARY

A second programme of fieldwork and excavation was carried out on Garua Island, near Talasea, in West New Britain Province between June 7 and July 29, 1993. The team was composed of seventeen members from five Australian and three PNG institutions, assisted by local residents. The team members and their affiliations are listed at the end of this report. The aims of this continuing reseach are to learn about how obsidian tools were made and used in the past and to examine the effect of obsidian trade on the lives of the island's prehistoric residents.

In 1993 four objectives were achieved. Firstly, excavations were carried out at nine archaeological sites and observations were made at seven further sites. This work has significantly increased our knowledge about where people lived on Garua Island at different times in the past and how the size and layout of their settlements has changed. We also obtained an excellent sample of pottery and stone tools for reconstructing changes in subsistence and trading patterns. The discovery at site FEK of waterlogged plant remains which may date to as early as 6,000 years ago is especially important because very little is known about this period.

Secondly, the large number of soil samples collected will be used to reconstruct patterns of prehistoric land use and subsistence. To assist this study, comparative samples of modern soils and plants were also gathered. Thirdly, much new evidence concerning relative sea level changes and the erosional history of the island were obtained.

Finally, six copies of the soil layers at three archaeological sites were made using latex peels. Four peels have been donated to various institutions in Papua New Guinea. An exhibition displaying two peels was opened to an enthusiastic audience at the WNB Provincial Cultural Centre in Kimbe on July 27.

TEAM MEMBERS

Dr. Robin Torrence	Australian Museum
Dr. Sarah Colley	University of Sydney
Michael Therin	University of Sydney
Michael Bennett	University of Sydney
Michael Hanslip	Australian National University
Glenn Summerhayes	La Trobe University
Dr. Bill Boyd	University of New England, Lismore
Ruth Henderson	University of New England, Lismore
Carol Lentfer	University of New England, Lismore
Robert Mondol	National Museum and Art Gallery
John Namuno	WNB Provincial Cultural Centre
Michael Reupana	University of Papua New Guinea
John Tahiano	University of Papua New Guinea
Roy Inia	University of Papua New Guinea
Nancy Tati	Volunteer, Port Moresby
Robert Watson	Volunteer, Melbourne
Deborah Gilkes	Volunteer, Melbourne

FIELDWORK IN 1993

The results of the 1993 fieldwork on Garua Island will be summarized below in terms of the four major components:

1. Excavations at nine prehistoric sites combined with preliminary investigations at seven further sites;
2. Reconstruction of prehistoric subsistence and land use patterns;
3. Study of Holocene sea level and landscape changes;
4. Construction of latex peel replicas of archaeological sites for educational institutions in Papua New Guinea.

RESULTS OF ARCHAEOLOGICAL EXCAVATIONS

The aims of the 1993 excavations on Garua were

a. to investigate the nature of spatial patterning within the settlements at FSZ, FAO, and FAQ;
b. find deposits contemporary with those buried under unit 3 in Malaiol stream (i.e. older than 5,000 years);
c. search for low-lying, coastal settlements to compare with the hill-top sites previously excavated.

In order to achieve these objectives, excavations were carried out at nine locations using one meter square test pits: FSZ (9 m^2); FAO (20 m^2); FAQ (1m^2); FQY (3m^2); FAS (1m^2); FRD (1m^2); FEK (1m^2); FOV (2m^2); FYS (2m^2). The location of all the sites investigated in 1993 is illustrated in Figure 1. The results are summarized below in terms of the aims.

a. Spatial Patterning of Settlements (FSZ, FAO, FAQ)

Very little is known about what prehistoric villages in Papua New Guinea looked like because archaeologists rarely have the resources necessary to excavate large enough areas. Fieldwork on Garua Island over the past two years has attempted to obtain samples adequate for estimating the size and layout of the various settlements occupied at FSZ, FAO, and FAQ. Although detailed analysis of the artifacts has not yet been undertaken, some very intriguing patterns have already begun to emerge from the excavations.

FSZ

The 1992 excavation concentrated on recovering a large sample of pottery and obsidian from one period only: between the Dakatau and Witori eruptions and contemporary with Lapita style pottery. Shovel pits positioned at the base of the hill also determined that the discard of cultural material was restricted to the crown of the hill. In 1993 we attempted to locate the edges of the artifact distribution and to look for evidence of differential discard across the site. Eight test pits were laid out along a north-south and an east-west transect across the area which has not been disturbed by bulldozing. A further pit was placed to the west of the 1992 trench. The location of the excavations is shown in Figure 2.

Test pits placed on the northernmost end of the transect provided evidence that the top of the hill had been kept clean and that the artifacts were either discarded or swept just over the edge of the hill. A concentration of pottery and obsidian then piled up in a dip in the slope, which is represented by the area where the 1992 excavations had been concentrated. In 1993 the test pits were dug slightly deeper than in 1992, but again the WK-2 tephra was found to be absent, except for a thin patch which was preserved on the easternmost end of the transect in trench 27/83. A small stemmed tool was recovered from underneath the WK-2 tephra in 27/83.

The spatial limit of the scatter of artifacts was detected on the southern and eastern sides, but not on the west (where the hill has been quarried). The work also revealed that obsidian has a wider spatial distribution than pottery. It seems likely on the basis of a preliminary study of the finds that pottery and small pieces of obsidian were swept downhill from the main area of settlement, but large pieces of obsidian were systematically carried to the edge of the midden area and dumped.

FAO

FAO was extensively sampled in 1993 because in 1992 it was found that deposits from the three main periods represented on Garua are very well preserved at this locality. Twenty test pits of one square metre were excavated, mainly along a north-south and an east-west transect. A plan of the test pits is given in Figure 3. Like FSZ the densest distribution of finds for the period with Lapita style pottery and for the most recent deposits is on the slope immediately below the brow of the hill. The evidence suggests that at these times settlement was restricted to the highest point on the hill and rubbish was swept downhill behind the houses. Obsidian artifacts from the pre-Witori deposits were more evenly spread over the hill although there is a slight tendency for them to be more abundant at the highest elevation. A large dump of obsidian waste from this period was recovered from square 1000/1010 Further study of the finds should lead to a better understanding of how people used this hill at different times in the past.

FAQ

Due to contraints on time, we were unable to expand the spatial sampling at FAQ. Only one test pit was dug at square 95/210. This position was chosen because the 1992 excavations indicated almost no overlap in space between material from the most earliest and the most recent periods at the site. It was therefore important to test this pattern by excavating within the densest distribution of the surface material collected in 1992. As in most test pits at FAO almost no material was recovered from between the two tephras, confirming the absence of decorated Lapita style pottery on Garua Island away from the coast, but obsidian artifacts were present in the earliest level. Furthermore, a dense deposit of Canarium sp. nutshells was found under the Witori tephra and extending below the distribution of obsidian artifacts. The species has not been determined as yet. A more detailed study of the patterns of breakage should help determine whether the nutshell was exploited by humans or is natural.

b. Search for Early Sites (FSZ, FAO, FEI, FEK, FXN, FOU, FRF)

Excavations at FAQ and FAO in 1989 and 1992 uncovered obsidian tools stratified beneath the WK-2 tephra. Radiocarbon dates obtained during the past year have dated these

horizons to between about 3,800 and 3,500 years bp, which means they are contemporary with similar deposits excavated by the Australian Museum at Bitokara Mission in 1988. However, much earlier obsidian scatters are also known from Garua Island. Webb's 1992 stratigraphic study of the units exposed by Malaiol stream demonstrated that the intensive period of obsidian quarrying discovered there in 1989 (unit 2a in Webb's sequence) was buried under a distinctive bedded tephra (unit 3) that is considerably older than the WK-2 tephra (unit 7). A radiocarbon date of around 5,200 years bp was obtained from charcoal associated with two stemmed tools in unit 2a, just downstream from the main obsidian-working area. Since the obsidian assemblages from Malaiol Stream are the result of obsidian quarrying and tool manufacture, they are not strictly comparable to the types of activities that are likely to have created the later assemblages recovered from FAO and FAQ. The problem, then, is how to find early sites which are located away from the obsidian sources.

In 1993 two strategies were employed to search for sites contemporary with the localities in Malaiol Stream sites but located in a different setting. To begin with, deep soundings were carried out at FSZ and FAO. At FSZ a one meter square (17/100) was excavated down 2.4 metres. The 1992 trench at FAO was enlarged to two metres square. Surrounding squares were excavated as steps so that a deep sounding could be made in the original one meter square (100/100 changed in 1993 to 1000/1000). Although a depth of 3.3 metres was reached, we were unsuccessful in linking this trench or the test pit at FSZ with the stratigraphy in Malaiol Stream. Very few artifacts and no organic material suitable for dating were recovered from the highly-weathered, homogeneous red clays that underly the artifact-bearing levels at each site. Minor differences in soil texture can be discerned in the sections, but these are not gross enough to permit cross-correlation with Malaiol Stream. If deposits contemporary to unit 3 are preserved on either of these hills, they are too deep to be recovered efficiently by traditional archaeological methods. Given these results, a deep sounding was not undertaken at site FAQ as originally planned.

The second approach proved more fruitful. In 1992 Torrence noted the presence of a stemmed tool in the collections stored in the National Museum at Port Moresby which were made by Specht in 1974 at site FEI. Field inspection in 1992 confirmed the occurrence of stemmed tools on this beach. Survey in 1993 further substantiated the presence of stemmed tools on beaches at FEI and FEK and located abundant obsidian artifacts on the beach directly below site FXN. This last area was identified by Boyd as an outwash fan for a seasonal stream. Consequently, none of the material is in its original context. The source for the numerous obsidian artifacts present on the FXN beach cannot be identified without a great deal of survey on the adjacent hillslopes. Such a search is unlikely to be successful since large scale erosion has already removed a sizeable portion of the adjacent hillslope; the current stream flows within a very broad gulley whose walls are up to 20 metres high.

The artifacts at FEI may also be redeposited on top of a very old outwash fan, since the artifacts exposed on the beach appear to be lying on top of a coarse gravel. A more detailed examination of the site is needed to determine its geomorphological history.

In contrast, at FEK obsidian artifacts, including one stemmed tool, were found in a stratified context. The artifacts are currently lying on top of a mudflat that dates to a time when the relative sea level was higher. Below the soft mud is a layer of hard, consolidated mud, which is impermeable. The mudflat was later sealed by slopewash deposits laid down when the sea level fell. The slopewash is comprised mainly of eroded bedrock but also contains tephra, particularly in the most recent phases. The mudflat has since been eroded

back by wave action, which has created a bank about a meter high. Presumably, the large number of obsidian artifacts lying on the current beach result from this recent erosion.

A one metre square test trench was excavated into the current wave cut terrace at FEK in order to examine the state of preservation of the site. A large number of plant remains, including tree branches and a nutshell, have been preserved in the waterlogged mudflats created by the presence of groundwater running along the top of the hard layer underneath. The artifacts lie amongst the plant material.

Since the mudflat is now about 0.40 m. above current high water mark, it could either be the result of uplift, such as was detected by Webb in 1992, or could represent the last time that the sea level was slightly higher than today, at around 6,000 years ago. If the radiocarbon dates substantiate the latter hypothesis, then the assemblage at site FEK makes a good comparison with the Malaiol Stream material and markedly extends the chronological sample of sites on Garua Island and the surrounding region.

Finally, a single stemmed tool was found at site FOU protruding from the wall of a small gulley which is located in the interior of the island near the head of the large baret which empties near sites FYS and FXO. On the basis of preliminary observations at this site, it appeared that the tool and the light scatter of obsidian debitage which accompanied it had been overlain by a thick band of redeposited tephra, possibly equivalent to Webb's unit 3 in Malaiol stream. Further study of this location might yield information about the source of the stemmed tools now redeposited on the beach below site FXO and possibly also at FEI and FEK.

A second stemmed tool was recovered from a homogeneous red clay which had been exposed by a road cutting located just above the streambed which has been assigned the site code of FEF. Given the absence of any recognizeable stratigraphy at this location, further investigation is unlikely to produce useful results. Nevertheless, both sites FOU and FEF provide evidence for human use of the landscape in the earliest period. It is significant that stemmed tools had been discarded in an 'off-site' context, i.e. within very thin scatters of obsidian artifacts which occur away from the obsidian source areas such as site FAP and also are apart from the manufacturing areas such as those uncovered at FAQ in 1992 and at FAO in 1993.

c. Settlement Change (FQY, FAS, FYS, FOV, FRD, FRG, FEM, FEN)

The radiocarbon dates obtained from the 1992 excavations at FSZ have confirmed the proposal made in the preliminary report that the site belongs late in the period during which pottery with Lapita style decoration was made. Since pottery with an identical style was also recovered from FAO, it seems reasonable to suggest that around 2,200 years ago, people on Garua Island were occupying easily defended hilltops. One of the aims of the 1993 programme of fieldwork, therefore, was to test this hypothesis by demonstrating that sites with late Lapita-style pottery are found only on hilltops, whereas low-lying sites with pottery date to an earlier time. To achieve this goal, we tried to establish the date of all sites on Garua where pottery had previously been found in situ. In addition to the work at FAO and FSZ described previously, test pits were excavated at FQY, FAS, FYS, FOV, and FRD; survey was also conducted at FRG, FEM, FEN.

The results of the excavations demonstrate that it will be critical to understand the erosional history of the island in order to test ideas about how and when settlement change has occurred on Garua Island. Support has been obtained for the hypothesis for a shift to hilltops late in the sequence of the Lapita style of ceramic decoration. The results obtained from the individual sites studied in 1993 are summarized below.

FQY

In 1992 Jo Mangi conducted a preliminary investigation of the stratigraphy of the site by clearing off the walls of a modern drainage ditch running through this site and excavating a series of small test pits. He found potsherds with Lapita style decoration and abundant charcoal within a dark soil which had been sealed by the Dakatau tephra. The Witori tephra was stratified under the pottery-bearing unit. The site was therefore considered to be a prime candidate for a low-lying village contemporary with Lapita style pottery.

Two one metre square test pits were excavated in 1993 to a depth of 2.1 metres (100/100) and 2.4 metres (90/100). Again pottery with Lapita style decoration was found stratified beneath the Dakatau tephra and in the second case lying above the WK-2 tephra. However, a detailed study of the stratigraphy of the site by Boyd helped clarify why the deposit appeared to be mixed and poorly sorted and both the pottery and the obsidian artifacts were quite rolled and weathered. In brief, the pottery and obsidian artifacts have been redeposited during slopewash. In 90/100, one can observe a reversed sequence of the natural weathering of the bedrock. In other words, poorly weathered bedrock lies on top of well formed soil. The erosion took place after the Wk-2 tephra was deposited and stopped after the Dakatau tephra fell.

The interpretation of the artifacts at FQY as incorporated within redeposited slopewash is substantiated by a third test pit which was placed on the top of the hill just behind the low-lying area where the pottery had first been observed. At the FQY hill site, the Dakatau tephra is lying unconformably on top of an eroded soil containing a very few obsidian artifacts and 11 small, undecorated sherds. The cause of the erosion, which post-dates the deposition of pottery on the hill-top, is not known, but may be due to human activity, possibly gardening. Further work is needed to assess why heavy erosion took place at FQY after the time of Lapita style pottery, but did not occur at FSZ and FAO where the ceramics are still in place.

FAS

When the site was first recognized in 1989, a very unusual sherd with relief decoration was found. One of the aims of the 1993 test was to discover the source of this highly unusual pottery. A one metre test pit was dug to a depth of 1.7 metres near a streambed where Lapita style pottery was found in 1993. The excavation yielded a deep set of poorly sorted layers of eroded bedrock mixed with varying degrees of tephras consistent with the modern setting of a floodplain or delta alongside a seasonal stream. No pottery was recovered from this excavation. The pottery collected from the streambed therefore must be assumed to have been redeposited from another locality. A search along the banks of the stream, however, did not yield the source of the pottery. The excavation did serve to confirm the absence of a low-lying site with Lapita pottery on the coastal plain at this locality.

FOV

In 1992 decorated pottery was found on the beach in a very small cove and assigned the site code FXO. The land behind the very narrow beach at this location rises steeply up to a hill which has been recently quarried for roadfill. Given the investigations at FQY, it seemed likely that the sherds at FXO had been redeposited from the hill behind the site. Consequently, two one metre test pits were undertaken at site FOV. In both pits a degraded bedrock was reached at about 1.2 m in depth. In Test pit 2 bedrock was overlain by a deposit of soil which had formed in place and which contains a mixture of flaked obsidian and unworked Hamilton obsidian. No organic material suitable for radiocarbon dating was recovered.

The site confirms that evidence at FQY for a period of heavy erosion sometime after the Witori incident and before the Dakatau eruption. Both the Witori tephra and some unknown depth of soil had been removed before the implacement of the Dakatau tephra which blanketed the hilltop and which lies uncomforably on top of the artifact bearing soil in Test pit 2 and directly on degraded bedrock in Test pit 1.

The results give support to the proposition that the pottery at FXO has been redeposited. Given the amound of erosion observed at FOV, tt also seems highly unlikely that in situ pottery-bearing deposits have been preserved in this part of the island.

FYS

Two one metre test pits were excavated at this low-lying setting in order to find the source of the pottery eroding from the wave cut terrace that was first observed by Specht and relocated in 1993. The terrrace is comprised of a raised coral platform on which tephras and slopewash have accumulated. In both cases pottery with Lapita style decoration was found in a soil between the Witori and Dakatau tephras. The pottery was deposited on dry land which was well above the current sea level. In Test pit 1 a small stemmed tool was found in association with pottery and in Test pit 2 a fragment of a small ground stone axe also occurred with pottery. Small amounts of obsidian were also recovered from underneath the Witori tephra but not in recent deposits.

At site FAO it had previously been noted that pottery does not occur directly beneath the Dakatau tephra but is at least 10 cm. below it. Furthermore the soil which formed on the Witori tephra has an usual layering with a lighter colour on top of a darker one. The same pattern occurs at Bitokara Mission and so since 1988, it has been suspected that an additional tephra had been deposited in the Talasea region between the Dakatau and Witori WK-2 events. The stratigraphy at FYS confirms the presence of the suspected tephra. It lies directly on top of a soil containing pottery and obsidian which formed on the Witori tephra. Samples of the 'new' tephra have been submitted to Machida and Jackson for identification. The most likely candidates are either the Witori WK-3 or WK-4 tephras which were identified in the excavations at FRI at Walindi Plantation. Very few finds have been recovered from this layer at any of the sites where it is preserved (e.g. FAQ, FAO). The dating of the tephra is important because the period after it fell represents a time on Garua Island when human occupation and use appears to have been quite reduced from the previous period. FYS has also provided abundant information about the history of sea level change and erosion on Garua as summarized later in this report.

FYS is now the only setting on Garua Island where a coastal settlement has been found in situ. The location of the site--on a platform behind a well-developed coral reef with a very

narrow coastal plain (only about ten metres wide)-- has probably contributed to its preservation. Clearly, the date of this site is critical to the hypothesis for a change in the location of settlement late in the period in which Lapita style pottery occurred. Samples of nutshell recovered from the Lapita layers in Test pit 2 have been submitted to the AMS lab in New Zealand for dating.

FRD and FRG

A one metre square test pit was excavated on the top of Mt. Baki at FRD in order to confirm observations made by Baker in 1992 that pottery was stratified between the Dakatau and Witori tephras on this hilltop. Four potsherds, one of which has a notched rim, were recovered from the test pit. Unfortunately, no carbonized material was found, but the notched rim suggests that the site may be contemporary with the other hilltop settlements at FAO and FSZ. Obsidian was present in all soil layers. Surprisingly, it is clear that even this very elevated position has been used repeatedly throughout the prehistory of Garua Island. Oral tradition recalls the presence of a few houses on Mt. Baki in recent times when refuge from warfare was the primary factor in the location of settlements. Several shells were collected from the surface of the site, but given that surface shell from FAQ could only be dated as 'modern' by radiocarbon, the technique is unlikely to provide a satisfactory date for the most recent use of Mt. Baki.

Oral tradition describing a settlement on the tallest peak on Garua, on Mt. Hamilton (now generally called 'Garua mountain' by local people), can be supported by the presence of abundant shell, obsidian, and nut cracking stones at site FRG. In contrast, Boyd's survey of the hill and several shovel probes adjacent to the survey marker on the peak did not find the Dakatau tephra in situ. If Lapita style pottery had been deposited on this hilltop, it has since been eroded.

FEM and FEN

In 1988 and 1989 Specht attempted to identify the source of the Lapita-style pottery on Garala island (FEM) but his shovel pits placed several metres inland behind the southeastern point of the island yielded no archaeological deposits. The island is currently undergoing uplift and consequently areas previously covered by mangroves are becoming sandy beaches. Pottery with Lapita style decoration is even more prevalent on the beaches than in the past, probably also because of the erosion resulting from the uplift. It is therefore important to discover the source of the pottery before the site is totally destroyed.

In 1993 a small test pit placed on just behind the wave cut, raised beach on the south side of the island directly behind the densest scatter of pottery revealed a very thick deposit of Dakatau tephra in situ. It therefore seems likely that archaeological deposits may be preserved at this location. Given the heavy use of the island by both tourists and local people, a rescue excavation at this locality should be given a high priority. Furthermore, the scientific investigation of a site with early Lapita style pottery would be extremely important for the prehistory of the Talasea region because no other well preserved sites of this period have been located.

A very brief suvey of site FEN on Kaula Island confirmed the presence of obsidian artifacts on the north side of the island. No ceramics have been found at this site. It looks as if the artifacts have been brought up by crabs rather than eroded down from the rocky interior

of the island. One very unusual bifacially retouched artifact flaked from a nonobsidian, volcanic stone was found on the beach.

SUBSISTENCE AND LAND USE

The analysis of prehistoric subsistence and land use on Garua Island is being carried out with the aid of three techniques: (1) thin-sections of soils; (2) chemical analysis of soils; and (3) study of phytoliths ('plant fossils'). The various methods are all designed to help study how people used and modified their environment in the past. This information in turn will assist us to reconstruct past subsistence practices. Dr. Tony Koppi (University of Sydney) will conduct an analysis of the micromorphology of samples collected from buried soils on Garua Island. The aim is to detect the degree and kind of human interference of soils and by inference to determine the intensity of land use and especially gardening in the three main periods. In 1993 we collected additional samples for this ongoing analysis.

During 1992/3 Michael Therin (Sydney University) carried out a pilot study using soils from site FSZ to assess the potential of PH and phosphate analyses for detecting activity areas on sites. He later extended the sample to see if differences in the intensity of land use could be detected among the three periods using these chemical tests. The results of his work were ambiguous because of the unknown effects of the initial composition of the tephra on which the soils were formed and possible variations in leeching. It was decided, however, that it would be a worthwhile exercise to collect a much larger suite of samples and to increase the number of elements to be analyzed. Therin therefore supervised the collection of contiguous samples from all the test pits excavated in 1993 at the following sites: FSZ, FQY, FAO, FAQ, FOV. Boyd, Henderson, and Lentfer took over the soil sampling from Therin toward the end of the season. It is hoped that the much finer sampling will enable better results in future work.

At the same time as the soil samples for chemical analysis were taken, a second set of continuous samples taken at 5 cms intervals were collected for the study of phytoliths. Phytoliths are a structure made of silica which are found in many plants. They are nearly indestructable (unlike pollen which is not preserved on Garua Island) and therefore provide an opportunity to study past environments and by inference human use of landscapes. Carol Lentfer and Bill Boyd will be carrying out analyses of the phytoliths from the extensive set of samples collected in 1993.

In order to assist the identification of prehistoric phytoliths, it was necessary to collect a sample of modern material from a wide range of different environments which have been modified in varying ways and intensities by human activities. Lentfer, Henderson, Boyd, and Therin therefore made an extensive collection of plant species and associated soils on Garua, Kaula, and Garala Islands from a wide range of settings. Lentfer, Boyd, Henderson, Torrence, Therin, and Namuno were also forunate to be able to sample modern gardens at Garu village on the mainland. The soil samples taken from the gardens will be an invaluable aide in identifying land use types on the basis of phytolith assemblages from prehistoric contexts on Garua. Two types of sampling procedures were used to gather soil samples. Carol Lentfer will use these to carry out an assessment of sampling methods.

HOLOCENE CHANGES IN THE COASTAL ZONE

In 1992 Dr. John Webb undertook a study of uplifted coral reefs in the Talasea area. Radiocarbon dates obtained in 1993 have shown that coral has been uplifted about a metre during the past few hundred years. Contrary to his expectations, the uplifted reefs do not represent the higher sea level of about 6,000 years ago as has been observed in the Arawe Islands and Kandrian region. Dr. Bill Boyd continued the analysis of coastal environments and relative sea change in 1993. In addition, Boyd examined the geomorphological history of all the excavated sites and provided very useful advice in the field.

Boyd's work focused on trying to reconstruct the sedimentological history of the coastal plain on Garua Island. He chose this topic for two reasons. Firstly, coastal environments are usually quite rich in resources exploited by humans. Changes in the structure of the coastal zone can therefore have important implications for human settlement. Secondly, because the plain is largely comprised of sediments derived from the uplands, the nature of this zone reflects conditions throughout the wider catchment. An analysis of the sedimentary development therefore yields important information about human land use as well as the effects of changes in relative sea level.

Relative Sea Level Changes

Evidence for higher relative sea levels probably of Holocene date was observed on Kaula, Garuala and Garua Islands at a number of localities. The data have not yet been fully synthesized and what follows are preliminary observations. It is clear from the complexity of the data that sea level change has taken place at various times in the past and have had a major effect on coral reef growth, coastal erosion, and beach formation.

On Kaula coral and bored bedrock can be observed at about one metre above current high water mark. On the southern side of Garala Boyd identified a raised beach at about 75 cm above current high water mark. Since the beach was composed of clean sand made purely of obsidian, the beach must have been exposed to wave action. One can therefore infer that at the time the beach was formed, the coral reef had not yet recovered from the rise in sea level. Parallel evidence was revealed at the northwest corner of the island. At this location the following sequence can be proposed: (1) mid Holocene--erosion of clayey soil to form a small cliff against which coral sand was deposited; (2) deposition of coral sand as sea level rose, reef present but not yet well established in the intertidal zone; (3) deposition of sandy mud on intertidal flats which are currently about 0.5 metres above high water mark; (4) mid-late Holocene?-- erosion of sediment as sea level fell to form a sloping surface; (5) late Holocene?-- deposition of sand and shell debris on a beach similar to present conditions.

Evidence of sea level change on Garua Island was primarily observed at sites FEK and FOV. At FEK exposures along a gulley combined with a one metre square test pit revealed that an inter-tidal mudflat is present at about 0.4 metres above current high water mark. Lying on top of the mudflat are numerous obsidian artifacts including stemmed tools and water-logged plant remains including tree branches and a Canarium sp. nut. After the deposition of the mudflats the sea-level fell and the mudflats were covered by slopewash composed of various mixes of eroded bedrock and tephras. In the early phases of the fall in sea level, the slopewash was reworked into an upper tidal sandy beach. The presence of stemmed tools lying on the mudflat suggests that the site preserves the evidence of the higher relative sea level at about 6,000 years ago. On the other hand, the absence of recognizeable tephras at this location may suggest that the uplift is quite recent. If radiocarbon dating of the

nutshell proves the latter hypothesis, then the stemmed tools are likely to have been redeposited.

A higher sea level was also preserved in Test pit 1 at site FYS. In this case coral revealed at the base of the excavation is over one metre above current sea level. Tests are currently being conducted to determine if the coral can be dated by the radiocarbon method. Boyd has interpreted the history of the site as follows: (1) growth of a coral reef with deposition of coral and shell debris followed by (2) lowering of sea level so that the coral was partially covered by sandy, mudflat sediments and gravel and eroded bedrock probably reworked from a delta were deposited further inland; (3) continued input of sediment throughout the latter half of the Holocene; (4) redeposition of a thick layer of Witori tephra; (5) continued slopewash and alluvial deposition; (5) implacement of an airfall tephra (source unknown); (6) enhanced alluvial sedimentation; (7) implacement of the Dakatau tephra. The process which took place as the sea level rose is being mirrored in the current shoreline at FYS.

The chronological relationship between the various higher relative sea levels observed in 1993 and the raised coral studied by Webb in 1992 needs to be further analysed. The most important data will come from radiocarbon dating of the raised coral at FOV and the mudflat at FEK. Nevertheless, it is clear that the history of sea level change in the past 6,000 years or so in the Talasea area is extremely complex. The unstable coast line should have had quite an impact on human landuse and settlement in the area. Many coastal sites will have been either eroded away as sea level fell or are buried, like FYS, under slopewash which itself is also a product of the lowering of the sea level. For example, the absence of sites belonging to the early part of the Lapita pottery style may well be due to sea level change and the removal or burying of stilt villages which had been placed on the shoreline, rather than to avoidance of the island by people at this time.

Importance of Erosional History

Boyd's analysis of sedimentology at the sites excavated in 1993 has clearly demonstrated that erosion was as important a feature of the landscape history of Garua Island as was the implacement of tephras. A much more detailed understanding of how erosion has effected the presence or absence of archaeological remains at various locations will be required before we can confidently ascribe certain zones as preferred by the people in the various periods in the past. The impact of sea level change has been mentioned previously. In addition, it is clear that most of the locations where pottery has been found on the coast on Garua Island represent redeposition from higher ground. The 1993 excavations clearly demonstrated that pottery from the surrounding hills was redeposited on low-lying ground at FQY sometime before the emplacement of the Dakatau tephra. AT FQY the erosion was quite severe since fresh eroded bedrock overlies a soil that had previously formed on top of the bedrock. Erosion at FOV was also extremely marked. It would be extremely interesting to know if the increased erosion that took place at FQY and FOV after the period in which pottery was used represents a natural or a human induced phenomenon. Additional fieldwork would be needed to identify the cause of erosion at these locations, especially since a very different pattern has emerged from FAO and FAQ, and to a lesser extent at FSZ.

Although no pottery was found in situ at FAS, the deep deposit of slopewash and deltaic sediments excavated near the location of surface finds of ceramics also strongly suggests that the pottery has been redeposited by the nearby stream. It therefore seems

extremely likely that pottery at FXO was originally deposited at FYS; FEL and FRH at FAO; FQZ at FSZ; and FOW is derived from the hills above the beach. Only site FOV has evidence for the primary deposition of pottery in a low-lying, coastal setting. It is important to note, however, that although FOV is located near the shore, the site is on a raised coral platform well above the tidal zone.

Future work should attempt to date the history of erosion more carefully in order to investigate whether the patterns observed can more clearly be linked to changes in relative sea level or to human interference. Inferences about changes in settlement patterns on Garua Island will need to take into account the possible deleterious effects of erosion on the location of archaeological deposits.

LATEX PEEL MODELS

Latex peels are exact copies of the walls of an archaeological excavation. They have been used effectively in Australia by museums and local culture centres to illustrate the layers of an archaeological site to the wider community. We therefore wished to introduce this technique to Papua New Guinea. Dr. Sarah Colley joined the team on Garua Island because she has had extensive experience at making latex peels. Colley arranged the transport of all the materials to West New Britain and also trained John Namuno (WNB Provincial Cultural Centre) and Robert Mondol (National Museum) in the techniques of applying the latex glue and cloth. Two peels were pulled off the walls of a trench in the presence of the children from Kimbe International Primary School. Two further peels were removed with the assistance of a number of local people on Garua Island. We found that by involving people in making the peels, they became much more interested in learning about the archaeology and what the layers meant.

After the completion of the fieldwork, peels were donated to the WNB Provincial Cultural Centre, the National Museum and Art Galley, and the University of Papua New Guinea. The surplus equipment was deposited at the National Museum so that it could be used to make further examples to be chosen by local scholars.

On November 3, 1993 an exhibition entitled "Lukluk Bek Long Taim Bepo: Community Archaeology in Papua New Guinea" will be opened at the Macleay Museum, University of Sydney and will feature two latex peels from Garua Island. The exhibition will also provide information about the archaeology of Garua Island and West New Britain in general. After it is closed, part of the exhibition will travel to the WNB Provincial Cultural Centre for permanent display.

SUMMARY OF RESULTS

The 1993 investigations have greatly added to our understanding of the prehistory of Garua Island. In particular the combination of archaeological and sedimentological studies have revealed the complexity of natural and human modifications of the landscape. This year's fieldwork has produced much useful information about the spatial layout of settlements and the manufacture and use of ceramics and obsidian artifacts during the past 3,800 years or so. Combined with the artefactual data the very extensive series of soil samples which were collected in 1993 will provide the basis for a comprehensive analysis of prehistoric land use on Garua Island.

Evidence for a shift in settlement during the time of Lapita style pottery has been given a large measure of support by the new data. The presence of Lapita style pottery on top of Mt. Baki represents the highest elevation for a site of this period in island Melanesia and markedly extends the types of landscape in which sites with this kind of pottery have been found. The implication of the location of a site in such an unusual setting is that either Garua Island was occupied in a very different manner from other islands or that archaeologists need to expand their analysis of sites to an considerably larger range of landscape types.

In contrast, apart from the extraction and manufacture of obsidian, occupation of the island prior to 3,800 years is becoming increasingly difficult to study. Concentrations of stemmed tools and associated artifacts which are currently exposed on beaches situated on the southeastern and southern sides of the island are likely to have been redeposited, possibly as a result of the lowering of the sea level after 6,000 years ago. Furthermore, since the nature of landuse at this time appears to have been very diffuse, archaeological deposits containing concentrations of material are unlikely to be recovered and a different strategy of fieldwork will be required to obtain significantly large samples of material for analysis.

Finally, the continued collaboration with geomorphology has proved to be extremely fruitful. The new evidence acquired in 1993 for the timing and role of relative sea level changes in the past combined with information concerning the history of erosion in the wider catchment of the island will be invaluable for interpreting the presence or absence of archaeological deposits at different points in the landscape over the past 6,000 years. For example, it is now clear that the absence of sites with early style Lapita pottery may well be a function of preservation rather than a change in human use of the island. In order to maximize research efforts, the erosional history of the island should be clarified before further fieldwork aimed at locating new sites is undertaken.

FUTURE DIRECTIONS

At this stage there are no funds for further fieldwork on Garua Island. Research in the next two years will concentrate on analyzing the large amount of material that has been recovered during the two field seasons in 1992 and 1993. Specialist studies of the soils, phytoliths, shell, obsidian, and pottery have already been initiated but there is a great deal of work still to be undertaken. Analysis of ground temperature recorded in 1993 at sites FAO and FQY should help improve on the obsidian hydration work initiated by Stevenson and Ambrose. It is hoped that Boyd's project on dating phytoliths will open the way for dating the earliest obsidian working in Malaiol stream.

The results of the 1993 season, however, have been so successful and have raised so many important questions that it may be possible to raise sufficient funds for a limited amount of excavation in 1994. Specific proposals for continued work will depend to a large extent on the results of radiocarbon dating now in progress. In particular, if dated to 6,000 years ago, site FEK merits detailed investigation because of the good quality of plant preservation in association with stemmed tools. If, however, the site turnes out to represent redeposition on a more recent mudflat, then it becomes very important for reconstructing the early prehistory of Garua Island to investigate site FOU, since a single stemmed tool may have been preserved in situ and to determine the origin of the obsidian at FEI. Finding the source of the probably early Lapita sherd collected on the beach at FEK is also a high priority because so far all the sites with pottery date late in the time of the Lapita style.

It has become increasingly clear during the course of the 1993 fieldwork that major changes have taken place in the landscape on Garua Island, especially within the past 6,000 years. Although previous work has considered the effects of the various falls of tephra, not enough consideration had been given to environmental and human induced alterations of the landscape. Not only has there probably been a relative fall in sea level during the past 6,000 years, consistent with the rest of the western Pacific region, but recent uplift has modified this trend in ways that are not yet fully understood. Added to these physical changes, human modification must also have added to the cycles of erosion and redeposition which have been detected on Garua, most notably at FQY, FYS, FOV, FAS, and FEK. The most important avenue for future research is to improve our understanding of the effects of erosion on the preservation of prehistoric landscapes so that predictions can be made about where archaeological deposits of particular ages can be found. This is essential if we are to further investigate changes in the patterns of human settlement and land use.

In order to achieve this aim, a detailed contour map of the island, or at least samples of it, are required. Once an accurate map is obtained, various techniques using Geographical Information Systems computer programs can be applied to investigate why erosion appears to have occurred in some areas and not others. Fieldwork will also be required to test out the predictions based on the GIS studies. It may be possible to undertake a limited programme of field surveying and shovel pitting in 1994 as a pilot study in advance of a major season of fieldwork would then take place in 1995, if fund raising is successful.

COMMUNICATION OF RESULTS

In West New Britain Torrence met with a number of officials to explain the work: Acting Administrative Secretary, Mr. Alois Kantoniu; Administrative Secretary, Mr. Sebulon Kulu; Provincial Member for Kimbe town, Mr. Gabriel Bakani; Acting First Assistant

Secretary for Social Services, Mr. Poliap Kisokau. Grades 5 and 6 from the International Primary School made a visit to Garua Island. The students watched the removal of a latex peel, the excavation of an old village, phytolith sampling, and the changeover of thermocells and they also handled some of the finds. Torrence later visited the classroom to discuss the trip with the students and to answer questions. Torrence also spoke to Grades 6 and 7 at Mai Community School.

On July 28, a new exhibition created by members of the project was opened by Mr. Sebulon Kulu at the WNB Cultural Centre to an audience composed of government officials and local guests. Mr. Gabriel Bakani gave the closing speech. The occasion received publicity in *The Times* and *The Post Courier*. The exhibition features two latex peels, exact copies of archaeological excavations from Garua Island. The peels were made by John Namuno and Robert Mondol under the supervision of Dr. Sarah Colley. The peels have been mounted and labelled for display in the Cultural Centre. Panels explaining how the peels were made and what they mean have also been prepared for the Cultural Centre's permanent display.

After the fieldwork Torrence, Summerhayes and Hanslip visited the Department of Anthropology and Sociology at the University of Papua New Guinea to discuss their work with students and staff; Summerhayes presented a lecture to undergraduate students. In addition, Torrence and Summerhayes both presented seminars at a morning workshop held at the National Museum and Art Gallery. At this time two latex peels made on Garua Island were also displayed and discussed by Sarah Colley. One peel has been donated to the National Museum and another to the University of Papua New Guinea.

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The enormous amount of work that was achieved in the 1993 field season is due largely to the enthusiasm and dedication of the volunteers, who dug through pouring rain and under hot sun with remarkably little complaint. I am extremely grateful for the strong backs, good jokes, and the lovely meals created by the excellent multi-national team, whose names are listed at the front of this report.

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