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Prehistoric Use of the Interior of Southern Guam

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Abstract—The current interpretation of evidence for the prehistoric use of the interior of Southern Guam derives primarily from the work of Fred Reinman. On the basis of survey and excavation Reinman hypothesized that inland settlement on Southern Guam began late in prehistory and/or was infrequent and/or seasonal. Reinman did not comment on the broader issue of how the interior may have been used throughout prehistory. More recent surveys of portions of the Ugum and Inarajan River valleys and published accounts of Reinman's excavations at coastal and river valley sites yield evidence for a more extensive use of the region than adduced by Reinman, possibly beginning over a millennium ago.

Introduction

The current model for the nature and timing of prehistoric inland settlement on southern Guam, proposed by Reinman (1977: 154), postulates a relatively unintensive use of inland regions in which "occupation was either quite late, infrequent (seasonal) or both." Reinman's model is based primarily on three sets of data collected during his pioneering survey and excavations in 1965 and 1966; earlier surveys (Hornbostel n.d.; Thompson 1932; Osborne 1947; Reed 1952) yielded insufficient data with which to propose a model for inland settlement. The first set of data that contributed to the inland settlement model is the distribution of archaeological sites in the region. Reinman (1977: 18) recorded 47 sites in the interior of southern Guam, most of them monumental *latte* sites, but also including "areas of dark colored soils and shallow middens" many of which "were located on the tops of badly eroded knolls." The distribution of these sites, represented on a large scale map as small, sharply bounded areas (Reinman 1977: Fig. 1), produces an impression of fairly restricted prehistoric occupation at widely scattered, discrete sites. The second data set consists of observations on the general "lack of evidence for extensive midden deposits" at the Pulantat site (MaGYO-1), a cluster of *latte* structures on an upland plateau near the town of Yona excavated by Reinman, and at other inland sites discovered during the survey. The third data set consists of two relatively recent radiocarbon dates from the Pulantat excavations, one (GaK-1371) a modern date from the upper level of the site and the other (GaK-1370) a 180 ± 60 BP estimate from charcoal in the lower level (Reinman 1977: 51), which yields a calibrated two sigma calendar range of AD

1531-1950. [Radiocarbon dates were calibrated with CALIB (Stuiver & Reimer 1986) using the calibration curves presented by Stuiver & Becker (1986).]

With the hindsight provided by a quarter century of archaeological work in the Pacific since Reinman's work on Guam, the absence from this list of data for environmental change is striking. In the last decade archaeologists in the Pacific have developed sensitive techniques for collecting and interpreting data related to environmental change (Hughes *et al.* 1979, Spriggs 1981, Kirch and Yen 1982, Schilt 1984). Southern Guam, with its broad expanses of savanna grassland scarred by badlands and creased by tropical forested valleys, is an area where the archaeological record appears likely to have been altered by erosion. Herein we present data from surveys of portions of the Ugum and Inarajan River valleys and from Reinman's excavation of coastal and river valley sites that support the hypotheses 1) that the prehistoric Chamorro people made extensive use of the inland regions of southern Guam and 2) that this use of the inland regions began over a millennium ago, perhaps as early as the first centuries AD. While we have little direct data for settlement *per se*, we will argue that a consideration of inland settlement must be set within the broader context of inland use because this use appears to be positively correlated with increased erosion, and hence increased impact on the archaeological record of inland settlement. Following the method of multiple working hypotheses (Chamberlin 1965), the hypotheses implicit in Reinman's scenario are explicated and a set of alternative hypotheses proposed. Though the data at hand are insufficient to reject either set of hypotheses, they support the plausibility of the alternative hypotheses sufficiently that a model of prehistoric use of inland Southern Guam, comprising a set of interrelated and archaeologically testable hypotheses, is proposed.

Multiple Working Hypotheses

Reinman's model is based on three implicit hypotheses, which may be stated as follows: 1) The corpus of archaeological sites recorded for the interior of southern Guam approximates the cumulative distribution of prehistoric settlement there; 2) The small amount of midden material at inland sites today directly reflects the low intensity of settlement during prehistory; and 3) The two radiocarbon age estimates from the Pulantat site constitute a representative sample of the population of potential age estimates from the interior of southern Guam, at least insofar as the range of age estimates is concerned. Alternative hypotheses may be stated as follows: 1) The corpus of archaeological sites recorded by Reinman underestimates the extent of prehistoric settlement in the interior of southern Guam; 2) The small amount of midden material at inland sites today is a function of post-depositional processes; and 3) The two radiocarbon dates from the Pulantat site do not accurately estimate the range of potential age estimates from the interior of southern Guam.

Environmental Setting

The southernmost island in the Marianas chain, Guam is the largest island in Micronesia, with a land mass of 549 km^2. The island is geologically complex, with a flat to undulating northern half of upraised limestone joining a dissected, primarily volcanic, southern half. This geological complexity is due, at least in part, to tectonic activity along the Marianas Trench, located 113 km southeast of the island (Tracey *et al.* 1959, 1964). Despite a rapidly rising world ocean during the Holocene, relative sea level has fallen near Guam since the end of the Pleistocene (Easton *et al.* 1978), indicating substantial local tectonic uplift. Though little is known about the dynamics of this uplift, the twice daily occurrence of recordable seismic shockwaves (Tracey *et al.* 1964: 12) suggests that the process is continual and relatively gradual on a human time scale, rather than episodic or catastrophic.

On southern Guam the massive basalt block of the Bolanos pyroclastic member of the Umatac Formation, whose backbone forms the peaks that run the length of southern Guam, has tilted to the west as it has risen, steepening the intermittent streams that tumble down its western flanks, while stretching the courses of the few perennial rivers of the east coast over a fringe of upraised reef limestone. In the long term, this tilting means that the rivers of southeastern Guam have probably down-cut more rapidly than those of the west coast. Accordingly, sequences of alluvial deposition on the east coast will likely record events of greater magnitude than will those of the west coast. If natural explanations for recent alluvial deposition sequences are advanced they must invoke either varying rates of tectonic uplift, with periodic episodes of stream infilling, or a local geological process, such as faulting, that would radically alter the regimes of local streams. Failing this, alluvial deposition sequences, especially on the east coast, must be explained by changes in the nature of the drainage systems themselves.

Archaeological Surveys In Southern Guam

Three and one-half weeks of intensive surface surveys in the Ugum (Dye *et al.* 1978) and Inarajan River drainages (Dye 1979), carried out by B. P. Bishop Museum under contract to the U.S. Army Corps of Engineers, yielded more detailed evidence for the distribution of pottery than did Reinman's more extensive survey. The two survey areas, a ca. 259 ha area of the Ugum River drainage, comprising portions of the Ugum and Bubulao Rivers, and a ca. 286 ha area of the Inarajan River drainage, including portions of the Inarajan River and its tributaries the Pasamano, Yledigao and Laolao Rivers, are located in Figure 1. In the Inarajan River drainage and, to a lesser extent, the Ugum River drainage, scatters of volcanic sand tempered (VST) pottery (Reinman 1977) and other artifacts were found widely distributed on ridges and valley sides, often far from the nearest known *latte* site. Field observations indicate an inverse correlation between the amount of pottery found on ridges and the intensity of erosion on the ridge as measured by the extent of remnants of Atate or Asan clay (Stensland 1959). The presence of a few sherds on ridges with negligible remnants of these two soils suggests that the soils and pottery were once distributed more widely, since there would appear to be little reason for the Chamorro people to carry out activities that could lead to the deposition of pottery on bare ridge crests, while Atate and Asan clays would conceivably attract prehistoric horticulturalists. The pertinent survey results are briefly described below.

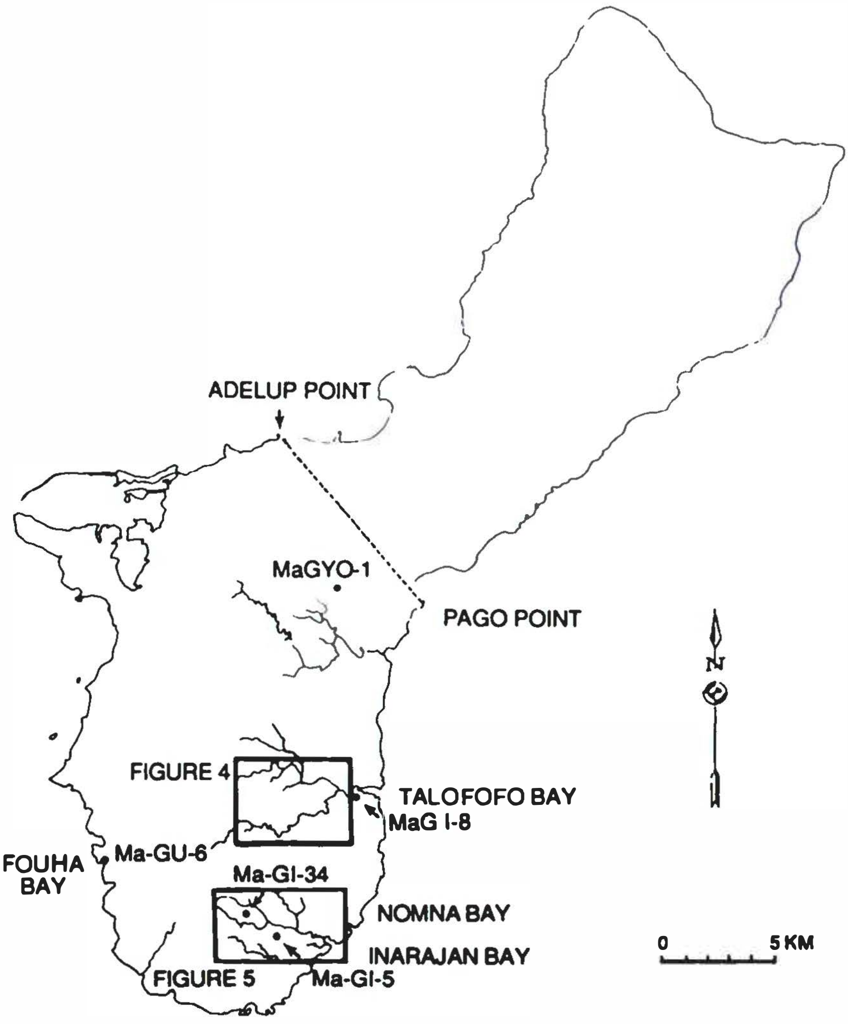

Figure 1. Map of Guam with archaeological sites and places mentioned in the text. The dashed line from Pago Point to Adelup Point is the approximate boundary of Southern Guam. Site numbers are coded: e.g., Ma = Mariana Islands, G = Guam, T = Talofofo District, YO = Yona, I = Inarajan, U = Umatac.

Results of the Ugum River Survey

Eight areas of prehistoric activity located during reconnaissance survey in the Ugum River survey area were assigned four site numbers (MaGT-25 through 28) (Fig. 2). Two ridges, each with three loci of prehistoric activity, were designated as single sites because no clear break between loci, evidenced either by lack of archaeological features or by presence of any outstanding physiographic feature, was apparent. These two sites, MaGT-25 and MaGT-28, are described below and may be contrasted with the small, bounded sites described by Reinman (1977).

SITE MAGT-25

This site is a complex of three prehistoric activity loci located along the crest of a ridge that runs roughly E-W between the Bubulao River and an unnamed intermittent tributary of the Ugum River (Fig. 2). The three loci, labelled A, B, and C are defined as follows. Locus A, located in a heavily forested area dominated by breadfruit (*Artocarpus* sp.), betel palm (*Areca catechu*), pandanus (*Pandanus* sp.), banyan (*Ficus* sp.), and coconut palm (*Cocos nucifera*), is a cluster of ten *latte* structures and six mortar stones. Each *latte* structure has between six and ten basalt uprights, most still standing, with basalt capstones lying nearby. The mortar stones, generally found near individual *latte* structures, are also fashioned of basalt and exhibit either one or two well-defined, smooth depressions. Pottery, a plain, thick, VST ware, was found in soil disturbed by an uprooted

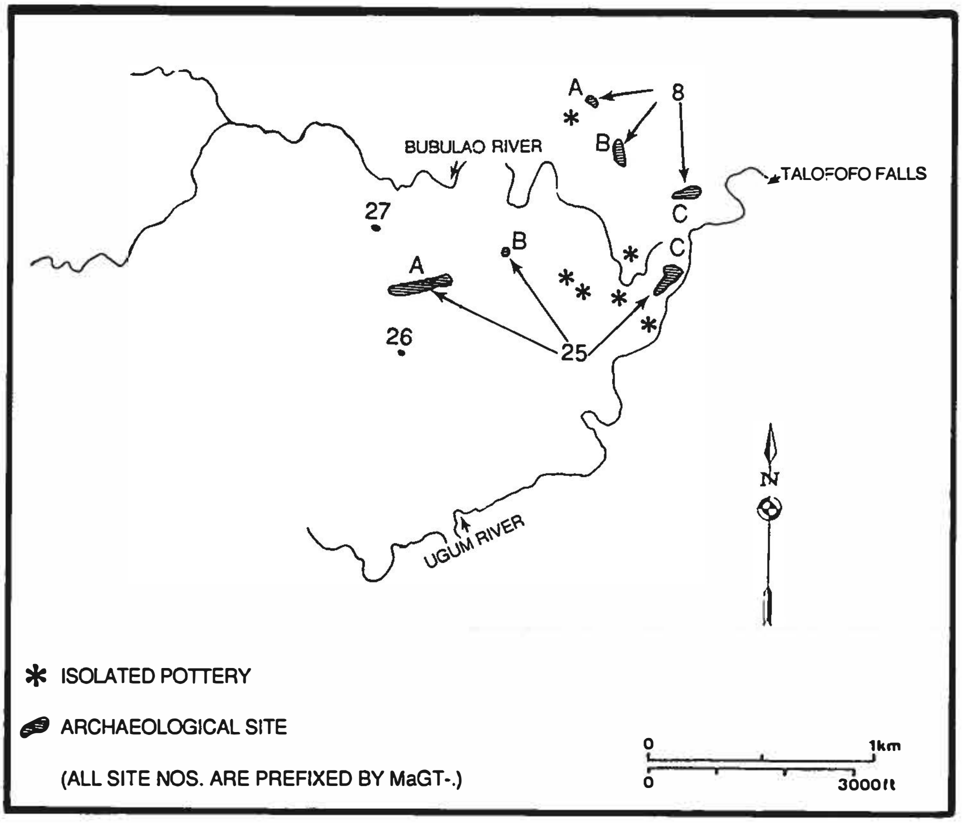

Figure 2. Location of archaeological sites and activity loci within the Ugum River survey area.

tree; its absence on the surface elsewhere within this locus may be a function of the depth of deposit and/or the lack of erosion, which might expose buried deposits, on this heavily forested portion of the ridge.

Locus B is an *in situ* deposit of plain VST pottery eroding out of the crest of a savanna-covered knoll. Pottery sherds here are quite large, with one exceptional sherd representing perhaps a third of a complete vessel.

Locus C is an apparently *in situ* deposit of plain, VST pottery of undetermined extent, located on a small level area of the ridge crest that is heavily forested with pandanus and betel palm with a thick understory of limeberry (*Triphasia* sp.). Dense vegetation precluded determination of the areal extent of what appears to be primarily a subsurface deposit.

Scattered potsherds were found along the ridge between Loci B and C and in the backdirt of a large historic-era pit on a toe of a ridge near the north bank of the Ugum River. While no intact areas of primary deposit were located in these areas, simple slopewash is an inadequate mechanism for transporting material such a long distance over uneven terrain. It is possible that these potsherds were displaced from known *in situ* deposits during construction of a jeep road through the area, though it is likely that *in situ* pottery deposits in the area remain to be discovered.

SITE MAGT-28

A complex of three prehistoric activity loci is located on a ridge running NW-SE on the north side of the Bubulao River. The three loci, labeled A, B, and C, are described as follows.

Locus A is a concentration of *in situ* and secondarily deposited plain, VST, pottery exposed in the eroded edge of a jeep road that follows the crest of the ridge.

Locus B consists of at least five *latte* structures located in an area forested with pandanus, Federico palm (*Cycas circinalis*), breadfruit, betel palm, and hibiscus, and in the adjacent savanna. Each *latte* structure has between four and ten uprights of basalt, breccia, or coral, and capstones of the same range of materials are found nearby. A single mortar stone and four pestles were found on the surface, as were pottery sherds, both plain and decorated, and worked chert flakes. A possible source of chert nodules was found in what appears to be an old stream bed situated on the slope below Locus B and above the active bank of the Bubulao River. Waterworn nodules of chert were observed in an eroded portion of this slope.

Locus C is a scatter of apparently *in situ* pottery, a mortar stone, at least two pestles, and a basalt chisel, in a savanna-covered area overlooking the confluence of the Bubulao and Ugum Rivers. Several large, scattered basalt boulders may be the remains of *latte* structures, though their irregular shapes makes this possibility unlikely. Pottery here is plain, rather thick, VST ware. Large sherds are abundant on the surface and include a good sample of rims.

Results of the Inarajan River Survey

Three extensive areas of prehistoric activity, evidenced by ridge-crest pottery scatters, and a single scatter on an alluvial terrace, were located during reconnaissance of the

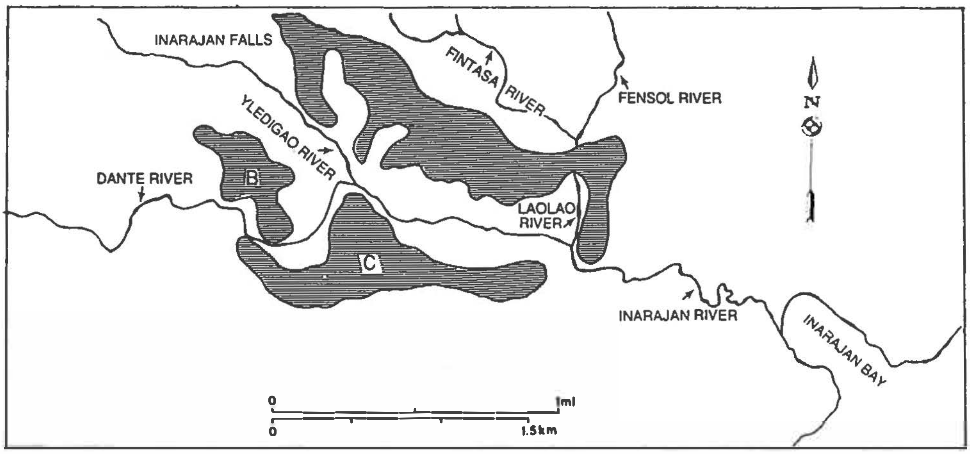

Figure 3. Location of prehistoric activity loci within the Inarajan River survey area.

Inarajan River survey area (Fig. 3). A portion of one of these areas was reported by Reinman as Site 66-05-0103 (Guam Historic Preservation Plan 1976: 64). The sites described below have been assigned temporary designations until further work delimits their full extent. The description of Site 66-05-0103 may be expanded with further study to reflect more fully the true extent of this activity area. These three large areas are each designated as single sites on the basis that no clear break between individual pottery deposits within them is evidenced, either by lack of surface artifacts or by the presence of any outstanding physiographic feature.

SITE A

Site A, which includes Reinman's 66-05-0103, is an extensive scatter of rim and body potsherds, chert, and slingstones, found *in situ* in Atate clay on erosionally isolated mesas and in Asan clay on ridge crests, and secondarily deposited on hillsides and in erosional basins. The site extends from the crest of the 442-ft (135 m) hill north of Inarajan Falls, east along the ridge crest, to the survey boundary at Guatata and follows both the heavily eroded ridges that fall from the main ridge to the river and the two knolls immediately east of the Laolao River. Pottery is a plain, VST ware.

SITE B

Site B is an extensive scatter of both *in situ* and secondarily deposited pottery on savanna-covered ridges between the Yledigao and Pasamano Rivers. This scatter of artifacts is probably associated with Site 66-05-0107, a large *latte* site in forest to the west (Guam Historic Preservation Plan 1976: 52). Similar site configurations were noted at Site MaGT-25 and -28 in the Ugum River survey area. Pottery sherds examined were plain VST ware that varied in thickness from 5 to 17 mm.

SITE C

Site C is an extensive scatter of *in situ* and eroded pottery, and a single stone adze, located both in savanna and ravine forest along the south side of the Pasamano and Inarajan Rivers. The distribution of pottery along the ridge crest is similar to that of the savanna north of the river, i.e., *in situ* in erosionally remnant Atate Clay and diffusely scattered on ridges that have only small remnants of Asan clay. Pottery is also present on small forested ridges from 3 to 15 meters above the river level and on an alluvial terrace at Geugao. Drainage along these small forested ridges is very poor and pottery is usually found on the crests of knolls where drainage is improved.

The Environmental Implications of Reinman's Excavation Data

Three of the 5 sites excavated by Reinman (1977) on Southern Guam—the Inarajan Village site (MaGI-1), the Talofofo River Valley site (MaGI-8), and the Fouha Bay site (MaGU-6) (Fig. 1)—yield evidence for changes in the rate of deposition of eroded inland soils. The inland Pulantat site (MaGYO-1) is located in an area of net erosion, and the Nomna Bay site (MaGI-23), with its confusing suite of radiocarbon dates, is too distant from the inland hills to yield data sensitive to changes in the deposition of inland soils. Though Reinman's excavations were not designed to collect environmental data it is possible to develop simple models for environmental processes with the published information from the Inarajan Village and Fouha Bay sites. These models point to an onset of erosion beginning either late in the first millennium AD or early in this millennium. In the absence of detailed analyses of the excavated deposits it is necessary to make simplifying assumptions, primarily about the continuity of soil deposition over time, to develop these models. We recognize that future research may show these assumptions to be wholly or partially false, but regard simplifying assumptions as a necessary evil of all model building.

Reinman (1977) excavated two test pits at the Inarajan Village site. The stratigraphy of each pit was similar, a clayey cultural deposit sandwiched between a modern, shallow sandy topsoil and a basal sand mixed with large blocks of coral and reef rock. The clayey cultural deposit was thickest in Test Pit B, located at the base of the inland hills, where it was over 150 centimeters thick. In contrast, the clayey cultural deposit of Test Pit A, located some 60 meters closer to the bay, was only 61 centimeters thick. Soils eroding off of the inland hills should be thickest at the base of the hills and should tend to thin out toward the bay, as is apparently the case at the Inarajan Village site. A charcoal sample (GaK-1357) collected from the cultural deposit 15 to 30 centimeters above the contact between clay soil and the basal calcareous sand in Test Pit B returned an age estimate of 620 ± 80 BP (Reinman 1977: 25), which, when calibrated, yields multiple intercepts between AD 1315 and AD 1386, with a two sigma calendar range of AD 1260–1430. (Sample GaK-1356 returned a modern date and is useless for this analysis.) Using this calibrated age range it is possible to produce a first-order estimate of the range of depositional rates at the Inarajan site, and from these to derive an estimate of the interval during which the erosion of inland soils began (Fig. 4). An estimate of the minimum rate of deposition is derived by placing the older age range (AD 1260) at its highest possible stratigraphic position and extrapolating back along a straight line to the present ground surface. Here we assume that deposition at the site has been continuous. Extended in the

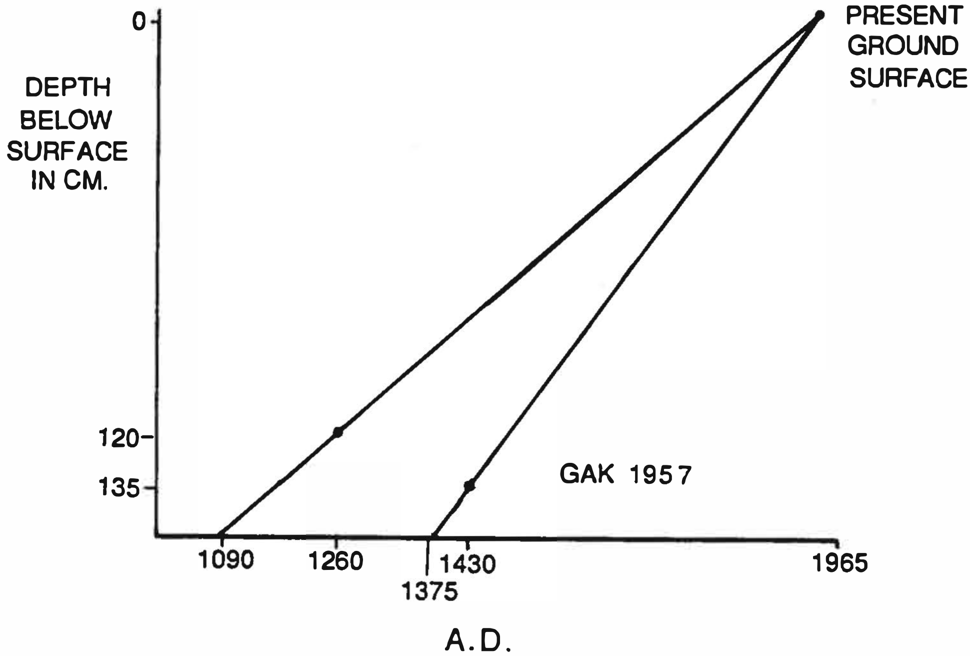

Figure 4. Two models for the rate of soil deposition at the Inarajan Village Site. The x-axis intercepts yield an estimated range for the onset of clay soil deposition at the site.

opposite direction this line provides an early estimate (AD 1090) for the onset of soil erosion off the hillslopes immediately inland of the excavation. An estimate of the maximum rate of deposition is derived in a similar fashion by placing the younger age range (AD 1430) at the lowest possible stratigraphic position. This procedure yields an estimate of AD 1375 for the onset of soil erosion. Thus, estimates derived from available data suggest that soil erosion off the hills inland of the Inarajan site began somewhere between AD 1090 and AD 1375.

Reinman excavated in two rockshelters and near *latte* structures on the alluvial flat at the Talofofo River Valley Site. Of these, only the rockshelter excavations, one of which yielded evidence for flooding of the Talofofo River, are of interest here. In Rockshelter 1 three major strata were exposed. A basal calcareous sand was overlain by a red-brown sandy soil with pebbles and oyster shells, which was topped by a black, ashy soil. In Rockshelter 2, located some 0.6 to 1.2 m below the elevation of Rockshelter 1 and closer to the river, large boulders forced termination of the excavation in the red-brown sandy soil with pebbles and oyster shells, before the presumed basal layer of calcareous sand was reached. The upper stratum, however, exhibited two facies. The lower portion consisted of fine, alternating lenses of ashy black soil and sterile red clay. The upper portion was like the ashy black soil found in Rockshelter 1. Two charcoal samples from the red-brown sandy soil with pebbles and oyster shells in Rockshelter 1 returned early dates. GaK-1358, from the upper portion of the stratum, yielded a calibrated two sigma range of 356 BC to AD 322 with multiple intercepts between AD 4 and AD 45. GaK-1359, from the middle of the deposit, yielded a calibrated two sigma range of 476 BC to 55 BC, with multiple intercepts between 356 BC and 233 BC. A charcoal sample collected from the base of the lensed stratum of Rockshelter 2, immediately above the red-brown sandy soil with pebbles and oyster yields a calibrated two sigma calendar range of AD 1410 to AD 1660 with an intercept at AD 1476.

The lack of precise description makes it difficult to correlate the stratigraphy of the two rockshelters at the Talofofo River Valley site. If the correlation of the red-brown sandy soil with pebbles and oyster shells in the two rockshelters is correct and the age estimates are not in error, then depositional rates either changed radically during the prehistoric period or the stratigraphic sequence contains a major unconformity between the red-brown sandy soil with pebbles and oyster shells and the overlying red clay and ashy soils. Whatever the case, the lensed red clay and ashy soils uncovered in Rockshelter 2 point strongly to a period around the 15th century AD when the Talofofo River repeatedly overflowed its banks, depositing red clays, eroded from upstream, into Rockshelter 2, but leaving Rockshelter 1, which is on higher ground, unaffected.

Reinman excavated five test pits at the Fouha Bay site on the southwestern coast of the island, the stratigraphic profiles of which show a change from basal beach sands to clay soils eroded down from the hills above (Reinman 1977: 43 ff). Radiocarbon age determinations were made on charcoal samples from Test Pits 3 and 5, but uncertainty over the stratigraphic position of the Test Pit 5 samples makes them impossible to interpret with confidence. In Test Pit 3, a meter of clay soil overlay a basal sand layer the top of which formed the original surface of the site. Samples of pottery and charcoal (UCLA 1232A,B) collected from the clay soil 15 to 30 centimeters below surface yielded statistically identical age determinations, as did another two samples collected from the clay soil 61 to 76 centimeters below the surface. [Recent work on the radiocarbon dating of pottery sherds suggests that residual organic matter in the clays used for potting has only a minor effect on age determination, and thus that radiocarbon dates from sherds are reliable sources of chronological data (Gabasio *et al.* 1986).] The calibrated two sigma range for the pooled upper samples is AD 1327 to AD 1618 with an intercept at AD 1433, while the calibrated two sigma range for the pooled lower samples is AD 980 to AD 1220 with multiple intercepts between AD 1035 and AD 1148.

The procedure for estimating rates of deposition at the Inarajan Village site, outlined above, may be extended, with the addition of a second age estimate from the stratigraphic column, to yield three specific models for changes in the rate of soil deposition at the Fouha Bay site, and an envelope within which the actual depositional sequence most probably lies (Fig. 5). Two of the models show relatively rapid soil deposition in the first half of this millennium with some moderation in the last 500 years. In the third model deposition rates increase very slightly in the last 300 years. The range of estimated dates for the onset of erosion provided by the models is fairly great, spanning the millennium from AD 170 to AD 1170, with an estimate of AD 850 extrapolated from the weighted average intercepts.

Discussion

Data from surveys of portions of the Inarajan River and Ugum River valleys and from Reinman's excavations at the Inarajan Village, Talofofo River Valley, and Fouha Bay sites

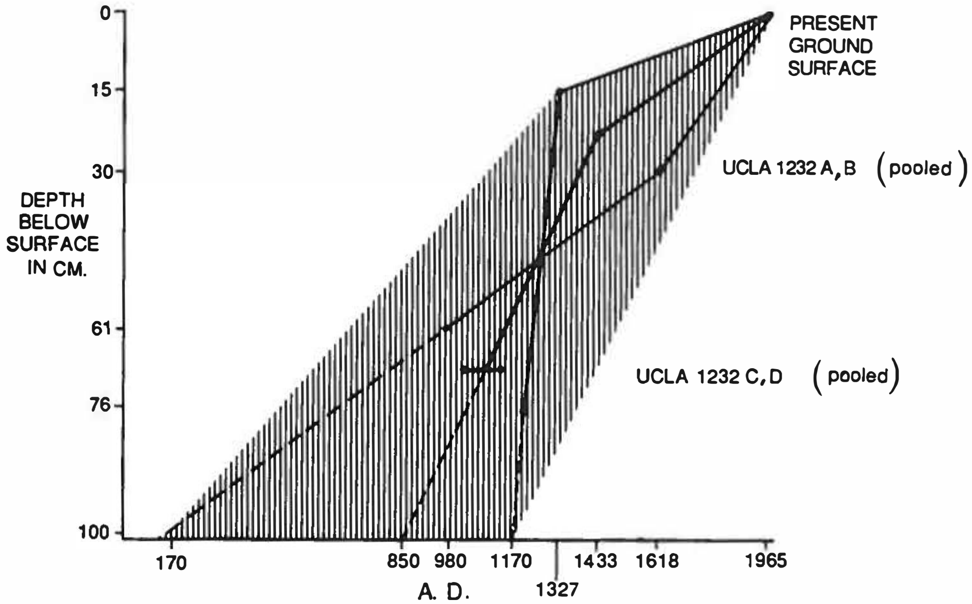

Figure 5. Three models for changes in the rates of soil deposition at the Fouha Bay site. The two extreme models define an envelope (shaded) within which the actual depositional sequence most probably lies.

may be interpreted to support alternatives to Reinman's three implicit hypotheses. The distribution of pottery in portions of the Ugum River and Inarajan River valleys is more widespread than indicated by Reinman's survey. The correlation noted during survey between the amount of pottery on the surface and the extent of Agat and/or Asan clay soils suggests that the activities that led to pottery deposition may have been associated with the presence of these soils. The discovery of scattered potsherds on ridges where these soils are almost completely eroded away suggests that the distribution of pottery may have been more widespread than is now reflected in the archeological record, since it is unlikely that such small soil remnants would have attracted enough interest to become loci for pottery deposition in prehistory.

It is uncertain what type of activity is represented by these extensive pottery scatters. If they represent areas of settlement then Reinman's hypothesis that the corpus of archaeological sites that he recorded for the interior of southern Guam approximates the cumulative distribution of prehistoric settlement there would be judged incorrect. The association of pottery deposits with settlement has yet to be demonstrated, however, so the most that may be said is that the alternative hypothesis, that the corpus of archaeological sites recorded by Reinman underestimates the extent of prehistoric settlement in the interior of southern Guam, seems plausible.

The evidence from excavation of coastal sites suggests that erosion of clay soils off the hills immediately inland of the Inarajan Village site began between AD 1090 and AD 1375, while at the Fouha Bay site this process began between AD 170 and AD 1170, though most probably toward the more recent end of this range. The finely lensed red clay and black ash deposits in Rockshelter 2 of the Talofofo River Valley site indicate a time in the 15th century AD when the Talofofo River repeatedly overflowed its banks. A possible unconformity between the lensed stratum and the underlying stratum may relate to an earlier period of more intense flooding, when the net effect in the rockshelter was the removal rather than the deposition of soil. While the evidence at each of these sites may relate to local, small-scale processes, the inference that they are small pieces of large-scale changes in the environment of inland Southern Guam is certainly plausible. Although there is no direct proof, a likely mechanism for a widespread increase in the rate of erosion of soils is the activities of man, especially the clearing of inland forests and grasslands for gardening postulated by botanists (Fosberg 1960, Stone 1970). If future investigations prove this to be the case then it is likely that the two radiocarbon dates from the Pulantat site do not accurately estimate the range of potential age estimates from the interior of southern Guam and that the small amount of midden material at inland sites today is a function of post-depositional processes. The alternative hypotheses are thus plausible.

Testing and refinement of the tentative sequence for prehistoric use of Southern Guam outlined here would involve two strategies. 1) Excavation of a series of test pits at coastal sites, similar to Reinman's excavations at the Inarajan Village site and the Fouha Bay site, in order to yield data on the initiation of soil deposition over basal calcareous sand deposits, and on changes in the rates of deposition, and hence erosion, over time. A sufficient sample of excavated coastal sites from southern Guam would, if properly dated, resolve the question of the extent of prehistoric environmental change, and yield the spatial and temporal framework for a regional sequence of inland expansion. 2) Excavations at river valley sites, while more difficult to analyze due to the many variables that may influence the behavior of hydrological systems, have the potential to yield important data. Banded red and black deposits like those discovered by Reinman at the Talofofo River Valley site are especially intriguing. Sedimentological analyses of the culturally sterile red sediments could yield crucial data on the nature of, and changes in, prehistoric floods. Careful dating of the intervening ashy layers, perhaps with the aid of modern accelerator techniques to compensate for the small amounts of carbon in the samples, would yield data for the onset of flooding cycles and for the periodicity of major events. Once established, these data will be crucial to a reconstruction of the prehistoric Chamorro people's exploitation of the rich alluvial environment.

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