

## SITE FORMATION PROCESSES AND CULTURAL SEQUENCE AT TARAGUE, GUAM

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### INTRODUCTION

Guam, the largest high island in the Mariana Archipelago in Micronesia, has over 100 archaeological sites as identified by Fred Reinman (1977). Prehistoric settlement sites are found most extensively along the coastal zone and to a lesser extent in interior uplands and river valleys. On the northern coast of Guam, a series of archaeological scatters occurs along the beach berm at an elevation of 7-10 m (20-30 feet) above present sea level. A high density of cultural material is found near the Tarague Channel in association with remains of megalithic stone structures, locally known as latte stones. The latte stones, most of which are fragmentary, attest the presence of permanent settlement at Tarague prior to the European contact in the 16th Century A.D. In his pioneering work in the Marianas, Alexander Spoehr (1957) made use of latte as a cultural marker to distinguish the Latte Phase (9th Century A.D. - 17th Century A.D.) from the earlier, pre-latte Phase (ca. 1,500 B.C. - 9th Century A.D.), to establish the regional cultural history.

At Tarague (N13°36'; E144°54'), an archaeological investigation carried out in the 1960's by Erwin Ray (1981) produced evidence of human occupation extending well into the pre-Latte Phase. A multi-disciplinary research program has been in progress at Tarague by University of Guam scientists and students since 1980, in an attempt to date the cultural deposits, to explain possible causes of culture change from the earliest aboriginal culture (pre-Latte Phase) to that of the megalith builders of the Latte Phase, and to examine site formation processes and the uses of space and resources within the context of island ecology. In this paper, preliminary results of geoarchaeological research carried out in 1980-82 are presented with particular emphases on site formation processes and cultural sequence at the Tarague site in northern Guam.

### SITE FORMATION PROCESSES

To assess the stratigraphic sequence and ultimately determine the site formation processes at Tarague, a test excavation was carried out in an area measuring 3 m x 1 m at the South Profile. The field methodology involved visual examination of exposed geological layers with particular attention paid to sediment color, texture, grain orientation, apparent sorting, bedding sequences and types, large structural components, large lithic materials and

cultural remains (Figure 1). Sediment samples were systematically taken from all layers and analyzed in the laboratory for pH, moisture content, total insoluble residue, and particle size. In addition, sediment components and small lithic materials were identified.

The South Profile was excavated to an algal limestone pavement at a depth of 6.2 m below the site's Alpha Datum. The Alpha Datum is located 74 m inland from the high tide line and 7 m above sea level. The basal pavement has been tentatively assigned to the Holocene Merizo limestone (Easton et al. 1978). The excavated pavement was 0.45 m higher in elevation when compared with the emergent Merizo limestone found along the adjacent reef flat. However, it was not considered to be significantly different in elevation and was probably an extension of nearshore limestone.

The South Profile has 10 distinguishable layers separated by disconformities and is composed of loosely- to moderately-compacted unconsolidated bioclastic sediments (Figure 1). These sediments originated primarily on the adjacent reef flat complex and were transported to the beach ridge in periods of storm wave activity; they are characterized as backshore and washover fan deposits, being fine- to medium-grained sands composed of foraminiferal tests, coral and shell fragments and calcareous algal clasts.

Beach deposits in the vicinity of the Tarague site are lithologically similar to deposits described for Ylig Bay on Guam (Easton et al. 1978). These beach deposits both overlie Merizo limestone with a ground surface elevation of 5.3 m at the Ylig profile and 6.2 m at Tarague. A radiocarbon date of  $900 \pm 80$  years B.P. was obtained for a *Porites* coral collected 1.5 m below the ground surface at the Ylig profile (Easton et al. 1978). At the Tarague site, shell debris collected about 3.0 m below the ground surface yielded a C13 adjusted radiocarbon date of  $3,435 \pm 70$  years B.P. This date was supported by other sequentially younger radiocarbon dates obtained from organic materials collected in the overlying stratigraphic layers (Figure 1). An average radiocarbon date of 3,600 years has been reported for Merizo limestone on Guam (Easton et al. 1978). Since the encountered algal limestone in the South Profile was believed to be Merizo limestone, the entire stratigraphic sequence at Tarague can be estimated to have been deposited over about the last 4,000 years.

A predictable sequence of erosional and depositional processes occurs in periods of storm activity. Peak storm wave activity causes removal of the upper sediment layers and associated vegetation along the berm. Dependent on the storm wave size and duration, a portion or all of the A soil horizon and sometimes part of the B horizon can be eroded. As the storm wave height decreases,

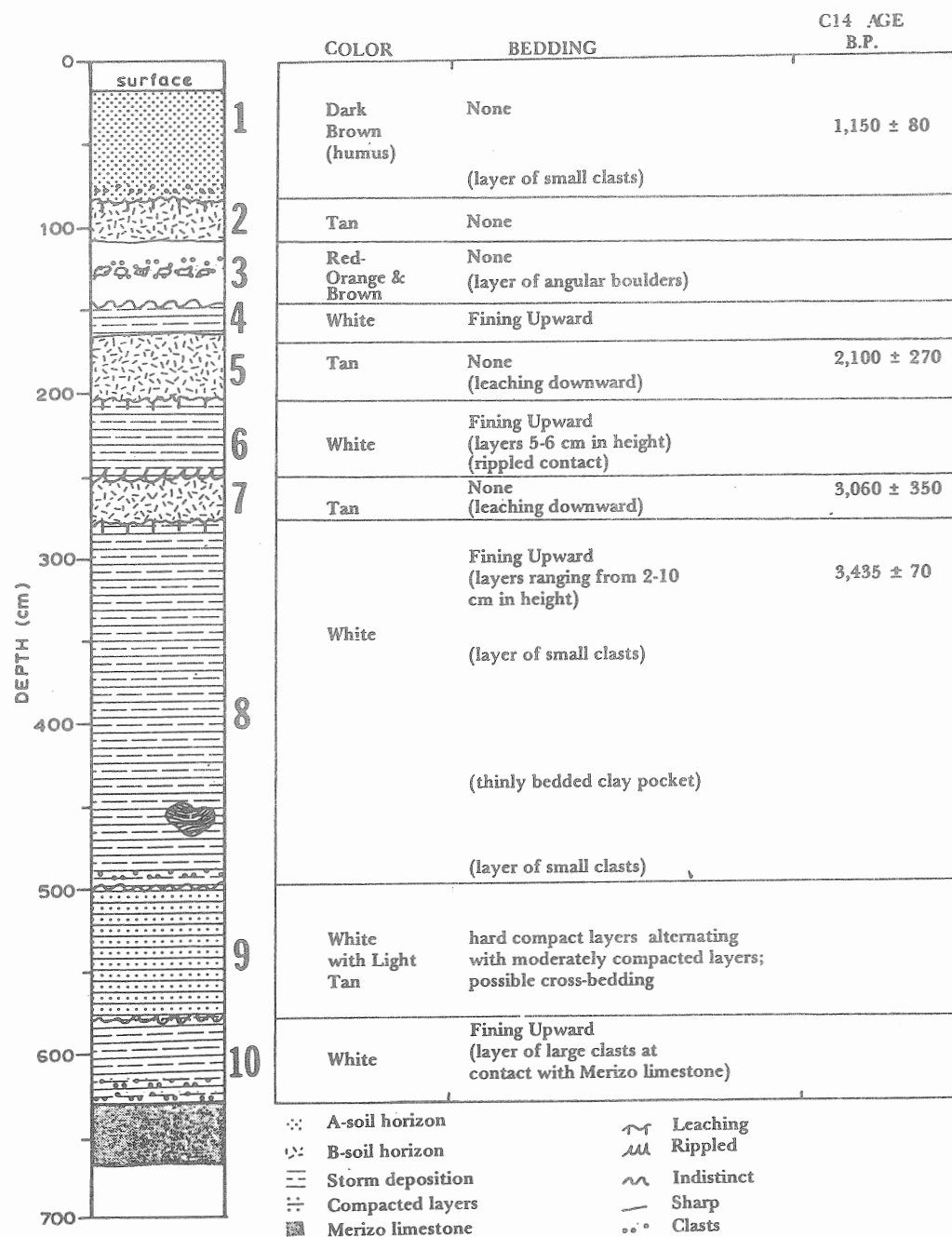


Figure 1. Stratigraphic Sequence at Tarague South Profile.

the berm and backshore area is subjected to sediment deposition. These sediments are derived from the reef flat and foreshore environment. The sediments which spill over the berm crest are deposited in horizontally laminated beds which show a fining-upward sequence of sediment grains. This depositional type is seen in Layers 4, 6, 8, and 10 at Tarague. At some period of time after the storm event, the coastal vegetation strand re-establishes along the berm. This vegetation strand in conjunction with natural weathering processes produces new soil layers: a dark brown organic A horizon, and a tan B horizon which is produced by leaching and chemical processes. The tan B horizon loses its structure by a combination of chemical, biological and physical alterations. The C horizon is the original storm deposited sediments, which still retain bedding sequences. As a result of this formational process, the stratigraphical facies alternates between white bedded layers and tan non-structured layers with a typical surface soil development. It can be anticipated that a future intense storm event will cause extensive erosion of surface sediment (A soil horizon) and removal of the coastal vegetation strand and subsequent deposition of new sediment derived from the existing foreshore environment.

#### CULTURAL SEQUENCE

The sedimentary accumulations at Tarague represent one of the deepest archaeological occurrences in the Marianas. The cultural deposits, measuring more than 3 meters in depth from the present ground surface, have yielded evidence of human habitation from the 2nd millenium B.C. onward to the post-Contact period. In terms of the Mariana prehistoric cultural sequence as defined by Alexander Spoehr (1957), Latte Phase occupation horizons are seen in the upper portion of Layer 1 while traces of pre-Latte Phase occupations are found from the lower portion of Layer 1 down to Layer 8.

A preliminary assessment of the Tarague ceramic remains reveals that main pottery types characteristic of the Marianas, such as the "Marianas Plain Ware", "Marianas Red Ware", "Lime-filled Impressed Trade Ware" and their variants, are all present. The ceramic assemblages exhibit temporal variations in rim form, rim diameter, wall thickness, shape, surface finish, and decorative motifs. Layer 8 is the lowest artifact bearing deposit at Tarague, and this has yielded pottery sherds originating from thin walled (2.5 mm - 12 mm), small vessels. The sherds appear to be well fired and show exterior colors which range from reddish orange to dark grey. One body sherd exhibits a distinct corner point. A shell adze made from the umbo section of Tridacna cf. gigas has been found in Layer 8. The adze is almost completely polished, but the bit is bifacially flaked. Another almost completely polished Tridacna cf. gigas shell adze has been found in Layer 2 at the Tarague South Profile. These adzes are extremely rare finds as Tridacna gigas has

not been known to occur in the Holocene in the Marianas (Barry Smith, personal communication). Since these adzes must have been imported from elsewhere, they could indicate possible trade or communication networks with islands where Tridacna gigas is known to have been present in the prehistoric context. Marine shells, primarily limpets, collected in the upper portion of Layer 8 give a C13 adjusted radiocarbon age of  $3,435 \pm 70$  years B.P. (Beta-4897).

Layer 7, a compacted tan sand layer representing an occupation horizon, has produced several pottery sherds which have clearly defined corner points and round bottoms. Pottery sherds are relatively thin and do not exceed 20 mm in wall thickness. A reddish slip is suggested by at least one sherd. A radiocarbon date of  $3,060 \pm 350$  years B.P. (UCR-1475B) has been obtained from a sample of fish bone found at 2.7 m below the site datum.

The Lime-filled Impressed Trade Ware, as originally defined by Spoehr (1957), is represented in Layer 6 by a single rim sherd with criss-cross incisions filled with lime making multiple diamond designs on the lip. The rim sherd is reddish brown in color and appears to have a thin red slip. The temporal distribution of Lime-filled Impressed Trade Ware seems to be restricted to Layer 6. The geographic distribution of Lime-filled Impressed Trade Ware in the Marianas has been reported for the islands of Saipan (Spoehr 1957:120-121), Tinian (Pellett and Spoehr 1961), Rota (Takayama and Intoh 1976:13-14), and Guam (Leidemann 1980). This highly distinctive technique for decoration has also been reported from the central Philippines (Solheim 1968) and a link between the Marianas and the Philippines is suggested around 1,000 B.C. (Bellwood 1979:282; Craib 1983). The Lime-filled Impressed Trade Ware has several shared morphological attributes with the Lapita pottery of Melanesia and Polynesia. The infilling of incised or stamped designs with lime, application of a red slip, and certain vessel forms are characteristics common to these ceramic traditions (Green 1979).

Fish bone in Layer 5 has been radiocarbon dated to  $2,100 \pm 270$  years B.P. (UCR-1474A). Pottery decorations appear on lips in the form of opposed triangular impressions or a series of circular stamps. Traces of possible red slip are present on at least one of the decorated pottery sherds found in this layer.

Layer 3 is a distinctively reddened deposit which has an artificially deposited limestone boulder and clasts zone found toward the top center of the layer. Rich in well-preserved pre-Latte phase cultural material, this layer represents intense human occupation as reflected in the high density of archaeological remains. An almost complete shallow vessel with a rim diameter of 36 cm has been recovered. There appears to be an increase in

robusticity of the pottery vessels and some sherds approach 40 mm in wall thickness. Designs which appear on the lip of some sherds are finely executed. Two rows of impressed triangular or rectangular designs are found on several rim sherds. A sign of red slip is evident on one sherd. Stone flakes with utilization signs are also present.

The ceramic assemblage of Layer 2 includes simple rim sherds with impressed designs on the lips. A drilled rim sherd has been found with a hole diameter of 6 mm. Drilled or perforated pottery sherds have been reported from other sites on Guam (Reinman 1977: Figure 21) and elsewhere in Micronesia including Rota (Takayama and Egami 1971; Takayama and Intoh 1976), Yap (Gifford and Gifford 1960) and Palau (Osborne 1966; 1979; Hidikata 1973; Dave Snyder, personal communication). Although drilled perforations have been interpreted as suspension holes (Spoehr 1957:109), the specimen from Tarague does not show sign of wear which might have been caused by friction from the suspending substance.

The top layer, Layer 1, is uniformly dark brown-black in color and is largely humus soil rich in organic residues. The top 70 cm of Layer 1 contains typical Latte phase elaborated rim forms. In addition, triangular shaped shell adzes made from Tridacna maxima, basalt adzes, fish hooks/gorges, and numerous burnt fist-sized limestone fragments are found in this layer. The lower portion of Layer 1 contains material which may be considered the terminal part of the pre-Latte Phase and a transition to the Latte Phase. A 20 gram charcoal sample collected from the 70 cm level has a radiocarbon age of  $800 \pm 80$  years A.D. (UCR-1472). The age is comparable to the radio-carbon date from Blue I on Tinian,  $845 \pm 145$  A.D., which has been commonly regarded as the lower age limit of the Latte Phase (Spoehr 1957:85, 171).

#### DISCUSSION

The geoarchaeological research carried out at Tarague in northern Guam has revealed that the antiquity of human settlement in the Marianas extends to the 2nd millenium B.C. The stratigraphic layers reach to 6.2 m below the ground level at the South Profile. These layers are separated by disconformities and are composed of loosely- to moderately- compacted unconsolidated biolastic sediments. At the base of excavation in the South Profile is an algal limestone pavement of shallow reef origin, which is tentatively assigned to the Merizo limestone. Since the top of the Merizo limestone on Guam has been dated to a maximum age of about 5,000 years B.P. and an average age of 3,600 years B.P., the entire stratigraphic sequence at the South Profile can be estimated to have been deposited over the last 4,000 years. A series of radiocarbon dates obtained for Layers 1, 5, 7, and 8 at Tarague provides a chronological framework for better understanding Marianas cultural

history. Charcoal, bone, and marine shells have been dated to calibrate the age of deposits at Tarague at two radiocarbon laboratories in the United States. The results of the dating are consistent with cultural and geological events as portrayed in the South Profile and make Tarague one of the most securely dated archaeological sites in the Marianas. Furthermore, the two radiocarbon dates in association with the lowest artifact-bearing deposits of the pre-Latte Phase, Layers 8 and 7, establish Guam as one of the earliest islands colonized by people in Micronesia.

In the Marianas, the absolute chronology of early prehistory was developed based on radiocarbon dates from a relatively limited number of archaeological sites on Pagan, Saipan, Tinian, Rota, and Guam. References to the date of  $3,479 \pm 200$  years B.P. obtained from Chalan Piao on Saipan by Spoehr (1954; 1957) have been frequently made by authors as the oldest age of human settlement in the Marianas or in Micronesia (Clark 1977; Craib 1983; Howells 1973; Intoh 1982; Shutler 1978). This date was initially calibrated on an oyster shell (*Ostrea cucullata* Lamarck) found at Chalan Piao at a depth of 0.45 m and was first published in *Science* by Libby (1952). According to Spoehr (1957:169), the levels contemporaneous with and below the dated oyster shell yielded Marianas Red Pottery, the earliest known ceramic tradition in the Marianas. However, re-examination of the Chalan Piao sample designated as University of Chicago No. 669 was conducted by L.J. Kulp in January 1953 employing a "new" conversion factor (Cloud et al. 1956:87). The corrected age for the Chalan Piao oyster sample was  $1,730 \pm 450$  years B.P. Assuming that the recalibrated age was valid, it makes the revised date some 1700 years younger than the original date published by Libby. Aside from the  $1,485 \pm 70$  B.C. date obtained for Layer 8 and the  $1,000 \pm 350$  B.C. date for Layer 7 at Tarague, the only other radiocarbon date extending to the 2nd millennium B.C. comes from the site of Nomna Bay in south-eastern Guam. A radiocarbon age of  $1,320 \pm 170$  years B.C. (GaK-1364) was obtained by Reinman (1977:39) for the 6"-12" level in Stratum I in Test Pit 6-1-1 at Nomna Bay. The chronological reversal of this date with the  $880 \pm 70$  A.D. (GaK-1697) date obtained for the 12"-18" level in the same test pit presented interpretive difficulty.

The new geoarchaeological information from Tarague and existing data from Micronesia suggest that human colonization of the high islands of western Micronesia took place before the low islands or atolls. Though an age estimate of 4,000 B.C. - 2,000 B.C. has been given in the model advanced by Howells (1973) for the antiquity of human occupation on these high islands, the work at Tarague indicates a somewhat younger time frame. Since the incipient pre-Latte phase occupation layers at Tarague overlies Merizo limestone, the antiquity of other coastal sites on Guam, with similar geologic situations, is predicted to be younger than 3,000 B.C., the maximum age of Merizo limestone.

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