

Nan Madol Pottery, Pohnpei

J. STEPHEN ATHENS

*International Archaeological Research Institute, Inc.
949 McCully St., Suite 5, Honolulu, Hawaii 96826*

Abstract—Over 7,000 pottery sherds have been recently collected from the Nan Madol site on the island of Pohnpei. A formal description of the pottery is presented, and comparisons with the pottery of other Micronesian islands are made. A series of 36 radiocarbon dates provides a well-grounded chronology for the Nan Madol pottery. Distributional patterns of pottery at Nan Madol are discussed. It is concluded that 1) the pottery is likely a Late Lapita Plain Ware variant, 2) an “island hopping” mode of initial settlement in Micronesia is unlikely, 3) the original settlers may have come directly from the Southeast Solomon or New Hebrides areas, and 4) there was little contact between Pohnpei and the various Micronesian islands after initial settlement.

Introduction

With only a passing glance at the literature on Pacific island archaeology one cannot help but be struck by the enormous importance investigators attach to pottery in discussions of prehistoric societies (e.g. Bellwood 1979, Green 1978, 1979, Spriggs 1984, Kirch 1981, Kirch *et al.* 1987). Actually, this emphasis is no different than that placed on pottery in other parts of the world. Pottery is usually common, it preserves well, and because of its plastic nature and high degree of portability, it is a cultural trait useful in the study of a broad range of anthropological and archaeological questions. Though the quality and usefulness of pottery studies can be quite uneven, there is little doubt that pottery investigations often afford substantial insight into the nature of prehistoric societies. However, a prerequisite to this, as to any scientific study, is a solid, well-documented and well-described data base. To this end, the following discussion of the pottery from the Nan Madol site on Pohnpei, Eastern Caroline Islands, is offered.

Although there were at least two very brief notes concerning the existence of pottery at Nan Madol early in this century (Schurig 1930, Yawata 1932), the presence of prehistoric pottery anywhere on Pohnpei was not convincingly demonstrated until investigations were initiated by the author at Nan Madol in 1979 (Athens 1980a). Thereafter, pottery was quickly recognized at other locations by Ayres & Haun (1980) in Awak on the northeast side of the island and by Streck (unpub.) at sites in Kiti along the southwest coast. A small excavation by the author in 1982 (Athens 1984a) at Nan Madol indicated that the pottery was quite old, dating to early in the first millennium A.D. Ayres (1983) also suggested a relatively early date for the Awak pottery. Despite these interesting findings, it was not until a major fieldwork project was initiated at Nan Madol in 1984 by the author that enough information became available to properly characterize the nature of the pottery, its chronological placement, and aspects of its spatial patterning at the Nan Madol site. These factors together provide important and interesting insights into prehistoric

Pohnpeian society. The extent to which findings concerning Nan Madol pottery may be regarded as applicable to all of Pohnpei is still an open question. For purposes of this paper, however, it is likely that Nan Madol pottery is representative in its major characteristics.

The Nan Madol Site

The Nan Madol site consists of slightly over 90 artificial islets built upon the fringing reef of Temwen Island, a small, volcanic lagoon island just off Pohnpei's east coast (Fig. 1). The site, covering a rectangular area of about 80 hectares—approximately 30 of which consist of the islets themselves—is famous for its impressive megalithic architecture (Gulick 1857, Hambruch 1936, Morgan 1988, Athens 1981, 1983). Pohnpeian oral tradition relates that Nan Madol was the residential, religious, and administrative locus of the Saudeleur rulers, who governed an island-wide polity (Bernart 1977, Hadley, unpubl.). The various islets are reputed to have served numerous specialized functions, and there is archaeological evidence that supports many of the oral accounts (see Athens 1980b, 1983, 1984a, Ayres *et al.* 1983, Bath and Athens this volume, Hadley unpub., Hambruch 1936).

Archaeological Investigations

Major recent archaeological projects at Nan Madol include those by the author in 1979–1980 and 1984 (Athens 1980b, 1984b, unpub.). In addition, the author conducted smaller scale investigations in 1982 and 1987. Other substantial work has been carried out under the direction of Ayres in 1981, 1984, and 1987 (Ayres 1983, Ayres *et al.* 1983). A long history of investigations, beginning virtually with the earliest western visitors to Pohnpei in the first decades of the 19th century, is summarized in Athens (1980b, 1981).

Investigations by the author have resulted in the preparation of detailed instrument maps for 29 islets. This work includes descriptions of all surface features and systematic surface collection of artifacts with point provenience data. Approximately 8 hectares of surface area have been investigated. A preliminary analysis of associational and distributional surface artifact data from 4 islets is presented in Athens (1984a).

Excavations were conducted on 14 islets. A total of 22 units were placed both within structural features and in islet fill. This work resulted in the processing of 36 radiocarbon samples. Midden materials recovered and analyzed from the excavations include 188 kilograms of shell, 6 kilograms of fishbone, 2 kilograms of non-fish bone, and 3.3 kilograms of charcoal. In addition, skeletal remains—mostly fragmentary—from an estimated 33 individuals have been studied. With respect to artifacts, 826 non-ceramic artifacts were collected from the surface. Not counting shell beads, historic materials, and pottery, there were a total of 80 excavated artifacts. Preliminary analyses of all materials have been completed at this time. A particular emphasis of the excavation methodology was to obtain well-documented density information on various classes of midden and artifactual materials to assist in comparative studies between islets and features.

Before continuing the discussion, it should be noted that all charcoal and bone dates presented in this discussion have been calibrated at a 95 percent confidence interval ac-

Table 1. Nan Madol pottery, Dapahu islet, TP-2.

Cat. #	Layer/ Level	Depth B.D. cm.	Screen Size in.	Sediment Volume m ³	RIM SHERDS				BODY SHERDS		SHERD FRAGMENTS		Total Sherds	Sherd Density per/m ³
					Decorated		Plain		CST	No CST	CST	No CST		
					CST	No CST	CST	No CST						
16	I/1	15-28	¼	0.025	—	—	—	—	1	7	—	1	9	360
17	I/1	15-28	⅛	0.045	—	—	—	1	—	12	—	1	14	311
18	I/2	28-36	¼	0.04	—	1	—	—	—	12	—	—	13	325
19	I/2	28-36	⅛	0.04	—	—	—	—	—	18	—	—	18	450
20	I/3	36-52	¼	0.0375	—	3	—	—	—	56	—	—	59	1,573
22	I/3	36-52	⅛	0.05	—	—	—	—	—	26	—	—	26	520
76	old fill	15-52	—	—	—	3	—	—	—	4	—	—	7	—
77	I/4	52-71	⅛	0.0466	—	1	—	—	—	62	—	48	111	2,382
78	I/4	52-71	¼	—	—	—	—	—	—	36	—	4	40	—
79	I/5	71-90	⅛	0.04	—	—	—	1	8	48	1	18	76	1,900
80	I/5	71-90	¼	0.04	—	—	—	—	2	42	—	16	60	1,500
81	I/6	90-109	⅛	0.0525	—	—	—	2	2	80	—	67	151	2,876
82	I/6	90-109	¼	0.0533	—	—	—	—	1	54	—	17	72	1,351
83	I/7	109-129	⅛	0.0466	—	1	—	—	2	60	1	66	130	2,790
84	I/7	109-129	¼	0.035	—	—	—	—	1	27	—	10	38	1,086
85	II/8	129-150	⅛	0.04	—	—	—	—	2	67	1	50	120	3,000
86	II/8	129-150	¼	0.04	—	—	—	1	6	37	4	13	61	1,525
87	II/9	150-169	⅛	0.04	—	—	—	—	4	15	2	26	47	1,175
88	II/9	150-169	¼	0.03	—	—	—	1	6	10	3	8	28	933
89	II/10	169-189	⅛	0.04	—	—	1	—	43	29	12	24	109	2,725
97	II/11	189-210	⅛	0.05	—	—	1	—	37	8	15	10	71	1,420
98	II/12	210-222	⅛	0.05	—	—	1	2	34	4	11	2	54	1,080
TOTALS				0.8415	—	9	3	8	149	714	50	381	1,314	

¹ North corner surface of Grid 2 is 19 cm. Below Datum; west corner surface is 13.5 cm. Below Datum.

² CST = Calcareous Sand Temper.

³ Sherd fragments are less than 1 cm. in maximum dimensions and/or they lack the inner or outer surface.

⁴ Sherds from "old fill" were encountered during re-excavation of backdirt inside pit in order to complete excavation of earlier (1982) test unit. It is likely that the sherds were scraped from the top of Layer 4.

found, indicates that through the course of tectonic subsidence and sea level rise, natural sand islets gradually became submerged. However, instead of ceasing to occupy the islets, the residents of Nan Madol began to build up the natural surfaces with coral rubble fill and retaining walls. Eventually, this method of enhancing the available area for occupation was expanded by the Saudeleur rulers in a spectacular fashion over a broad area of the reef. The pottery distributional study, therefore, suggests that the oldest part of Nan Madol, occupied and built upon long before the advent of megalithic architecture, was along its central axis (in a northeast-southwest direction).

The ongoing process of coastal submergence is further suggested by the fact that many of the central islets at Nan Madol are subject to daily tidal flooding. Because of the difficulty such flooding would pose for habitation, it is almost certain that these islets were originally high enough to remain dry during even the highest tides. It should be emphasized, however, that surface features on these central islets—mostly stone house platforms—are not necessarily older than features found on the other Nan Madol islets; it is only the previously occupied substrate on which they are built that is older.

Chronology of Pottery Use at Nan Madol

Two excavation units on the islet of Dapahu—one placed near the islet's periphery and the other near its center—provide the basis for chronological inferences concerning pottery use at Nan Madol. Dapahu is located in almost the exact center of the site. A total of 4 radiocarbon dates was obtained from the two units (1 date from TP-1 and 3 dates from TP-2). Grid 2, near the islet's center, extended slightly over 2 meters below the surface and approximately 1 meter below the low tide water level. Basal charcoal samples provide dates of A.D. 20–445 in the shallower TP-1 and 5 B.C.–A.D. 240 in the deeper TP-2. These dates were from levels 9 and 12, respectively. Test Pit 2 also had a mid-level (level 7) date of A.D. 650–920 and an upper level (level 1) date of A.D. 820–1060. Though the density of pottery dramatically decreases in the upper levels—falling from an average of about 1,100 to 2,500 sherds per cubic meter to about 300 to 400 sherds per cubic meter—pottery was apparently still in use at the latest radiocarbon dated level (see Table 1).

Three radiocarbon dates from a platform hearth feature and underlying islet fill on Likinpei (just northwest of Dapahu) demonstrate that pottery was still in use during the A.D. 900 to 1200 time range. This islet contained abundant pottery, and dates from the upper fill and hearth feature proved to be essentially the same.

However, by about A.D. 1200, judging from a series of dates from the Idehd mound (located southwest of Dapahu; the mound is composed of coral residue from earth ovens), pottery was no longer being made at Nan Madol (it was also definitely lacking below the mound in the islet fill, which consisted mostly of relatively large coral rocks). Though pottery might be absent from such a specialized feature due to functional considerations, other islets and features dating roughly in this time range or slightly later are also without pottery. These include Pahndauwas with 2 dates on a platform in the range of A.D. 1025–1320 and 1230–1510, and a date on Palakapw fill ranging between A.D. 1350 and 1495. A large number of later dates are also without pottery associations. It is therefore concluded that pottery use ceased at Nan Madol by about A.D. 1100. This was prior to the time of megalithic architecture and, presumably, of the Saudeleur period of occupation,

both of which were apparently initiated about A.D. 1200 (Athens 1984a; Bath & Athens this volume).

The condition of the pottery within the archaeological deposits is of some interest. Generally the sherds were in relatively good condition (see Figs. 2 and 3), though a good deal of erosion and rounding characterized many of the sherds in the deepest levels of the Dapahu test pits. All of the sherds, however, tended to be quite fragmented, though there were a few larger pieces. Figures 2, 3, 4, and 5 provide a good indication of the condition and size range of most of the pottery. In Level 3 of TP-2 on Dapahu a well-cemented piece of reef conglomerate contained at least 10 sherds (Fig. 5), suggestive of a submerged depositional environment. Finally, a small but significant number of sherds had a thick coating of soot on their exterior surface. This probably indicates use of pottery vessels for cooking rather than for food storage, serving, or eating.

Pottery Typology

Only 2 closely related types of pottery have been recognized in the Nan Madol collection. The separation of these types is primarily based on tempering materials, and they are designated as either "CST" or "Non-CST" for the presence or absence of calcareous sand temper (see also Athens 1984a). Differences in vessel thickness and exterior colors correspond to these types; however, vessel form, rim form, lip form and decorative elements are essentially the same. Of particular interest is a demonstrated chronological separation in the emphasis of CST versus Non-CST pottery. The former is definitely an older type, though Non-CST pottery was apparently used in small quantities contemporaneously.

The deepest levels of both test pits on Dapahu show a preponderance of CST pottery, with the slightly older TP-2 deposits having about 70 to 85 percent CST sherds in these levels (Table 1; and see Athens 1984, Table 9). This apparent chronological separation of the types is confirmed by the excavations on Sapwenpwe where an early date of A.D. 150–510 was obtained in deposits having 60 percent CST sherds.

A small 7.7 gram sample of dispersed small charcoal chunks was initially radiocarbon-dated from Sapwenpwe, TP-11, Level 5 (the lowest level excavated with 60 percent CST pottery). The resulting date was A.D. 1045–1340 (calibrated Klein *et al.* 1982 and adjusted for isotopic fractionation). Upon completing the pottery analysis, it was discovered that such a date appeared to be much too late considering the pottery sequence documented by the Dapahu excavations; with a preponderance of CST pottery, Level 5 should be quite early. Therefore another radiocarbon sample was submitted. This consisted of a single *Lambis lambis* shell that had a breakage pattern consistent with its use for food (i.e., it was definitely midden, not natural, shell). The resulting date of A.D. 150–510 (not calibrated or adjusted for isotopic fractionation—see Athens 1986: 9–11 for method of handling shell dates), is perfectly consistent with the Dapahu results and is therefore considered to be a correct age determination for this level. It is assumed that the dispersed charcoal from the other sample infiltrated through the corraline sand, gravel, and coral debris from the islet surface through bioturbation (e.g., crab burrows, tree roots).

As suggested by the available radiocarbon evidence, CST pottery nearly ceases to be made after about A.D. 400–500 (level 7 of TP-2 dates to A.D. 650–920, with the CST sherds being dominant from level 10 and below—see Table 1).

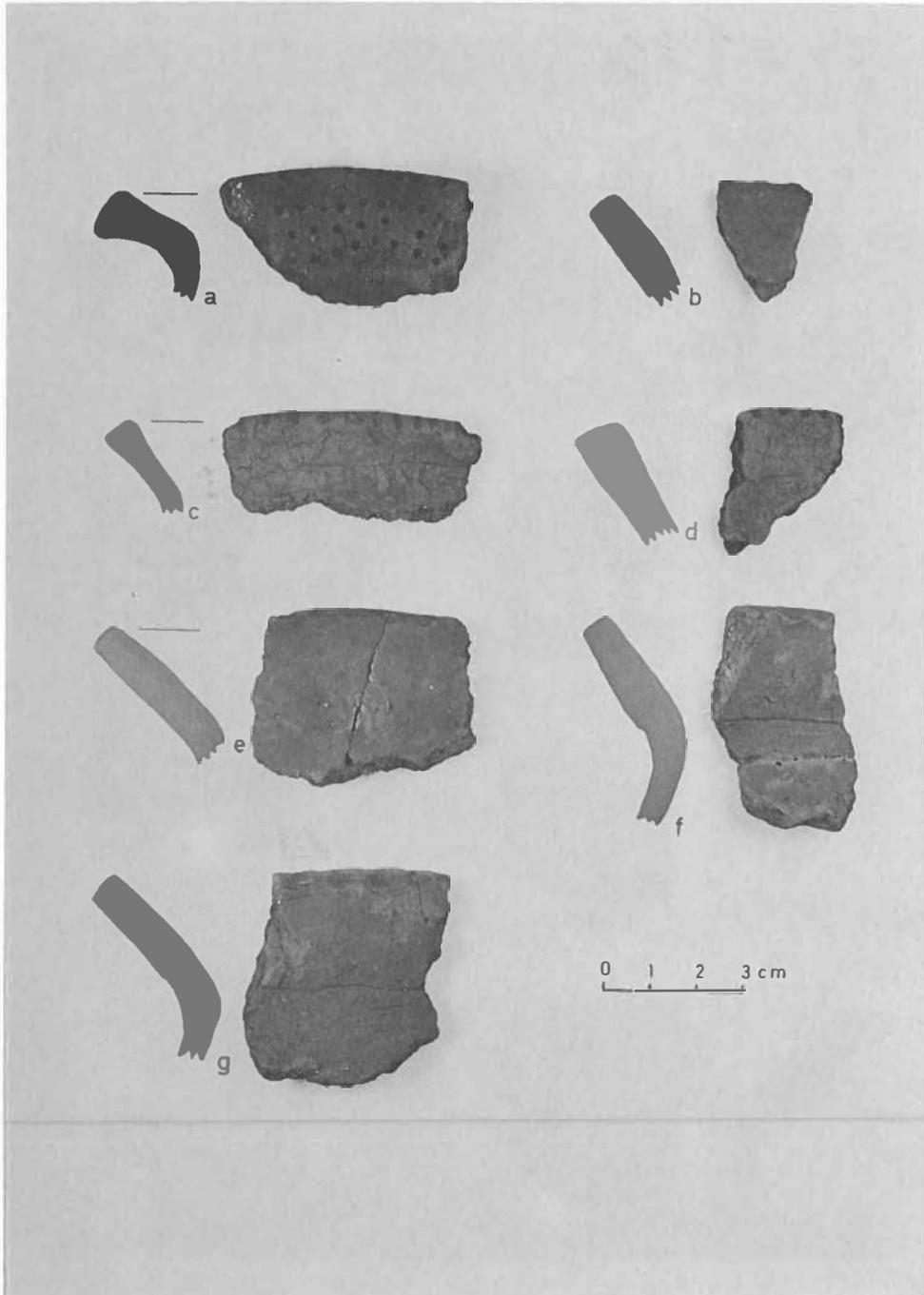


Figure 2. Notched rim pottery, non-CST, from Nan Madol, Dapahu islet, TP-1 and TP-2.

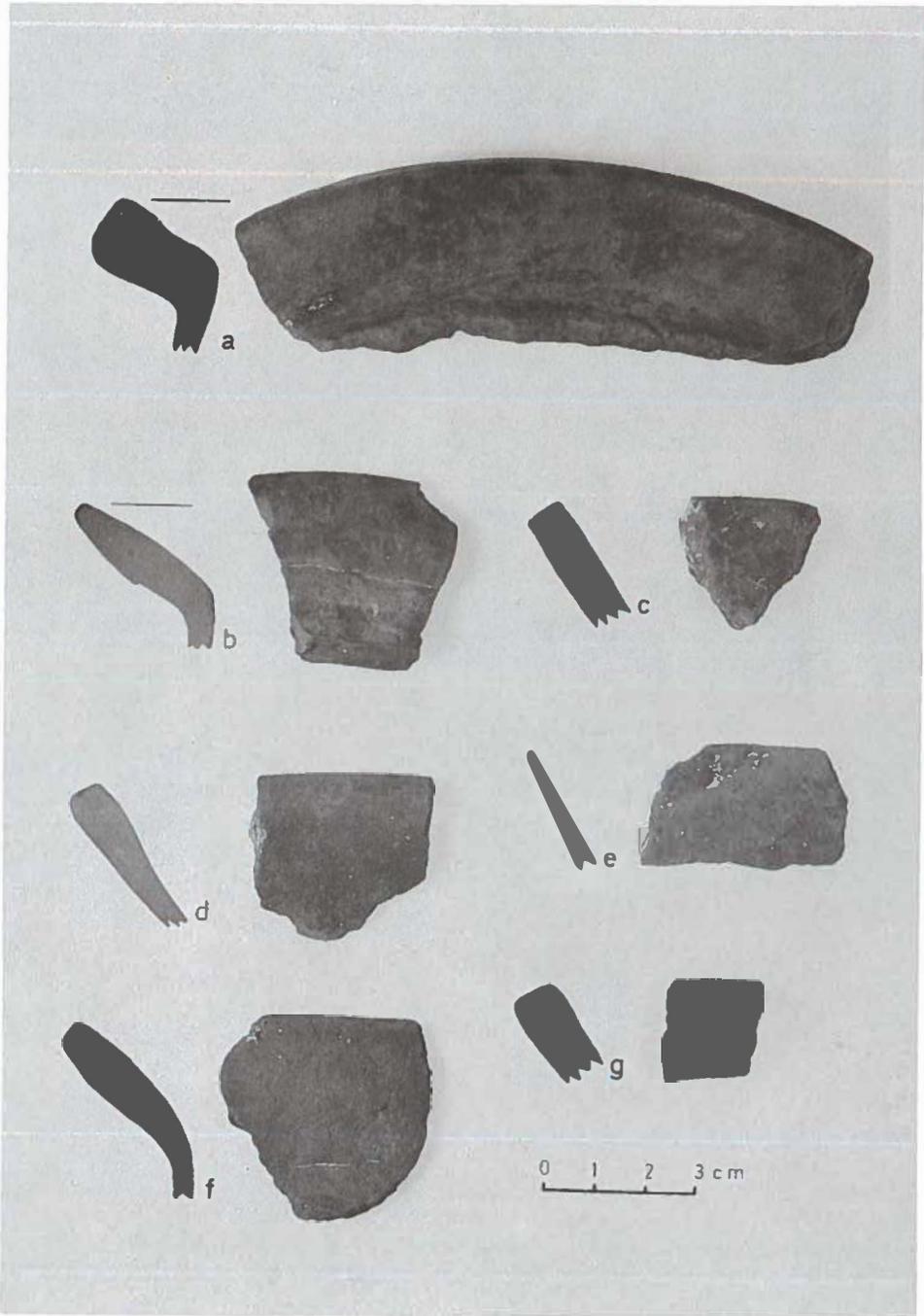


Figure 3. Plain rim pottery, non-CST, from Nan Madol, Dapahu islet, TP-1 and TP-2.

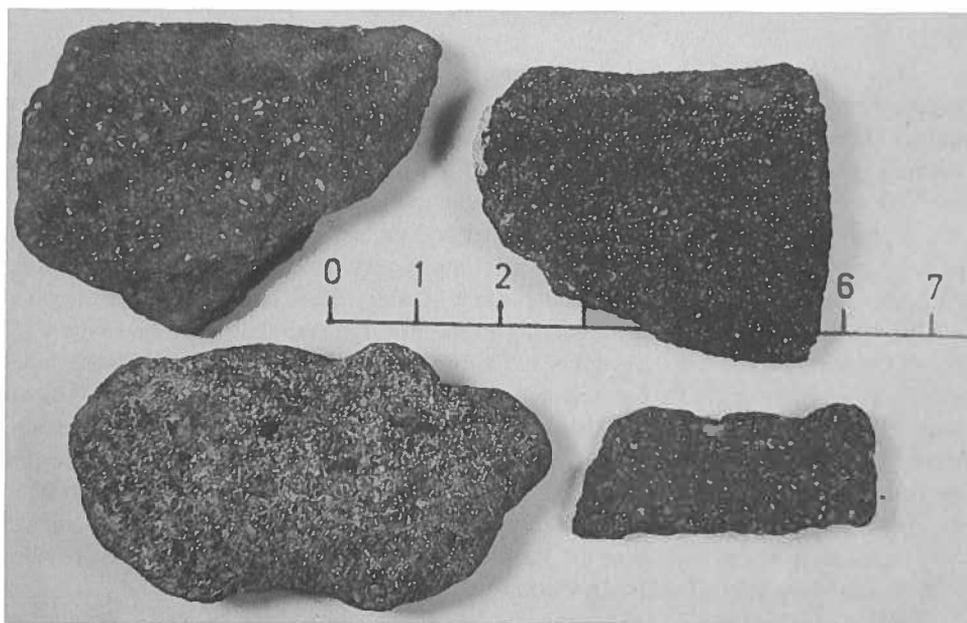


Figure 4. CST pottery from Nan Madol, Dapahu islet, TP-1, Level 9.

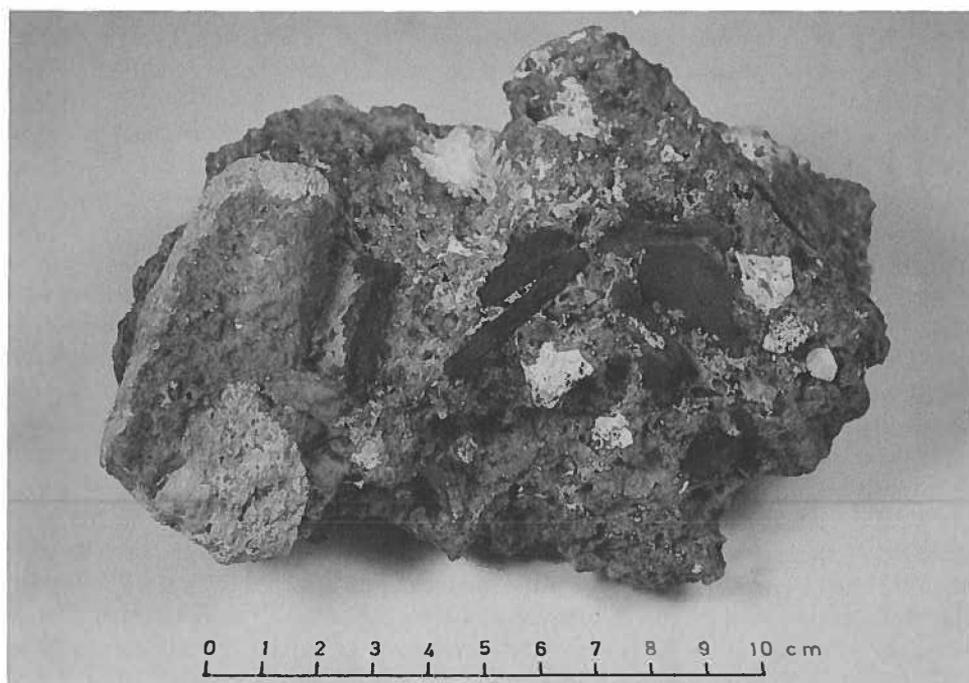


Figure 5. Marine conglomerate with imbedded non-CST pottery from Nan Madol, Dapahu islet, TP-2, Level 3.

That the Nan Madol pottery appears to follow the general trend for CST pottery to precede Non-CST types in the Pacific has been noted elsewhere (Athens 1984a). It may be suggested that this temporal pattern may have something to do with early settlement location and subsequent geomorphological change on the various islands; perhaps suitable non-CST temper sands were not widely available to the earliest coastal dwellers.

A petrographic analysis of pottery temper was undertaken by Dickinson (unpub.) at the request of the author, and Intoh & Leach (unpub.) have also studied the temper along with other physical properties of the Nan Madol pottery. Both studies indicate the presence of crushed sherds or grog tempering in the pottery, including CST and Non-CST types. There is considerable variability in the use of tempering agents in the Nan Madol pottery; some sherds have virtually no temper and others have natural volcanic sand inclusions. However, most Non-CST sherds do appear to contain crushed sherd tempering. According to Intoh & Leach (unpub.), pottery was sometimes recycled several times for use as temper. CST tempering is as high as 41% in some sherds. There is no petrographic evidence to suggest importation of pottery from other islands. While the use of crushed sherd tempering is uncommon in the Pacific, it is known from Yap and Palau, besides Pohnpei (Osborne 1966, Dickinson 1982).

Only two vessel shapes are known for the Nan Madol pottery. Globular vessels are the most common, and small bowls are also present. Carinated forms are not known, and none of the Nan Madol sherds indicates sharply angled side walls, flat bottoms, or sharply constricted openings. It has not been possible to reconstruct any of the vessels from Nan Madol although one particularly large rim sherd (Fig. 3a) indicates a constricted vessel orifice 21 cm in diameter, suggesting that relatively large vessels were being manufactured. There does not appear to be any difference in vessel form between CST and Non-CST pottery.

The method of vessel manufacture is of interest. Interior thumb indentations were found on most sherds large enough for these to be recognized. This is suggestive of a pinch-molding technique in which the wet clay is pressed between the fingers to achieve proper thickness and shape (see Rye 1981 for a description of this technique). Smoothing on the exterior surface after molding evidently eliminated evidence of finger indentations on the outside vessel surface. In contrast to the use of the pinch technique for the vessel body, the rims may have been produced by means of either coils or slabs. This is suggested by the presence of a slight horizontal outer clay lip or upraised area on many rim sherds, which is apparently indicative of the place where either a coil or perhaps a separately manufactured rim segment or clay slab was joined to the vessel body and incompletely smoothed (perhaps due to the curvature of the rim). Examples of this horizontal clay lip may be clearly seen in Fig. 2 (f and g) and Fig. 3b.

CST pottery tends to be substantially thicker than Non-CST pottery. The 203 measurable CST sherds from Test Pits 1 and 2 on Dapahu have a mean thickness of 6.93 mm, while the 1,643 Non-CST sherds from the same test pits have a thickness of 4.57 mm. This difference appears to be representative of the entire Nan Madol collection. Vessel thickness in both types may be as low as 2 mm, although 11 mm is the maximum for Non-CST. Maximum thickness for CST vessels is about 20 mm (see Figs. 6 and 7).

The relative thinness of both types of pottery is suggestive of the ability of the Pohnpeian potters to achieve a reasonable degree of vessel hardness in their manufacturing

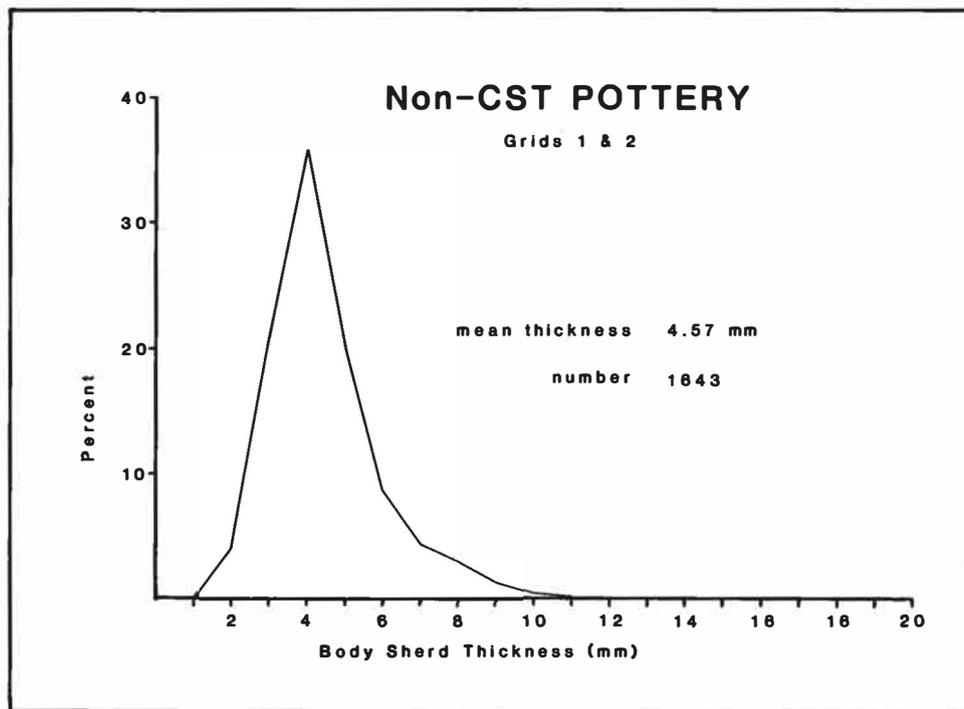


Figure 6. Graph of body sherd thickness for non-CST pottery, Nan Madol, Daphau islet, TP-1 and TP-2.

process. Furthermore, the reduction of vessel wall thickness over time as the tempering emphasis shifted away from CST suggests an improvement in the quality of the pottery. This was perhaps the result of the increased emphasis on the use of crushed sherds as a tempering agent. By comparison, CST pottery from Fefan Island on Truk has a mean body sherd thickness of 11.8 mm ($n = 514$; personal communication, J. Takayama), and the CST pottery from Yap has a mean thickness of 10.4 mm ($n = 831$; personal communication, R. Hunter-Anderson). Laminated Yapese pottery (non-CST pottery) has a mean body sherd thickness of 8.26 mm. Clearly, the Non-CST Nan Madol pottery is quite thin compared to these other Micronesian wares.

Rim sherds, of which there are 103 in the Nan Madol collection, have a generally uniform shape, being mostly everted and with flat lip tops (see Figs. 2 and 3). Some rim sherds, however, do show a certain amount of thickening within this basic shape. Also, a few rims, apparently from bowls, do not have the everted form, and they may have either a flat lip or a rounded lip. There is no difference in the rim shape between CST and Non-CST pottery. Thus, these two pottery types appear to be quite closely related despite temper and thickness differences.

In comparison, pottery rims from Fefan Island in Truk, which are approximately the same age as the Nan Madol sherds, have a considerable variety of rim forms, most of

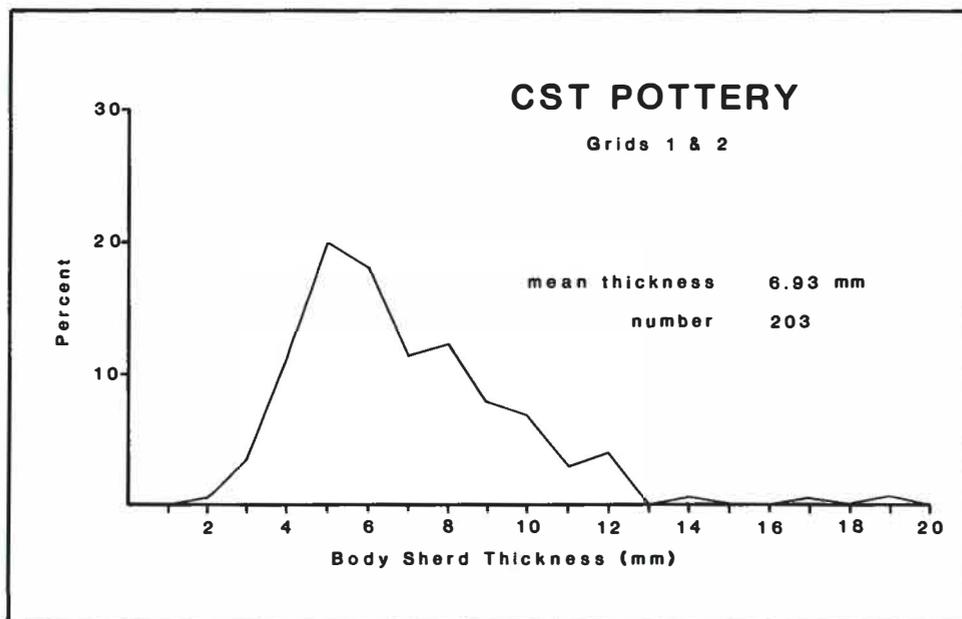


Figure 7. Graph of body sherd thickness for CST pottery, Nan Madol, Dapahu islet, TP-1 and TP-2.

which bear little or no resemblance to the Pohnpei specimens (Shutler *et al.*, 1984). The same may also be said of the Yapese CST pottery (Intoh & Leach 1985), which appears to have a slightly earlier beginning date of 360 B.C. (Takayama 1982).

The Pohnpei sherds have relatively little decoration. None of the sherds shows evidence for clay slips. However, approximately 35 percent of the rim sherds have parallel notches along the inner and outer lip edges. In addition, one such sherd has a row of small punctation marks between the lip notches, as well as 3 rows of punctation along the inner rim surface (Fig. 2a). Two body sherd specimens also exhibit punctation. Decoration with lip notches or punctation is not known from either Truk or Yap.

The final descriptive element concerning the Nan Madol pottery concerns color of the exterior vessel surface. Of the 193 sherds for which Munsell color determinations were made from Test Pit 1 at Dapahu (all sherds from levels 3, 8, and 9), Non-CST sherds tended to be a dark reddish brown, while CST sherds, being more variable, ranged from a weak red to grayish brown and brown. In comparison, most of the Fefan Island pottery is black, although a few sherds exhibit either a grayish brown or greyish red color (Intoh & Leach unpub.).

External Relationships

With this description of the Nan Madol ceramics, it is now appropriate to inquire about the significance of this pottery in regard to initial settlement and external relation-

ships. Both of these questions are fundamental in Pacific island archaeology, and pottery is often regarded as being of considerable interpretive value for addressing such issues (e.g., Greene 1978, 1979, Spriggs 1984, Kirch 1981, Kirch *et al.* 1987).

As is probably apparent from the above comparisons with the pottery of Truk and Yap, there is no basis upon which to conclude that the initial settlers of Pohnpei had any direct relationship with these other islands. The pottery styles, while sharing certain characteristics at a very general level (e.g. globular vessels and simple bowls, minimal or no decorative elements), are simply quite different. These differences include rim and lip form, decorative treatment (e.g., the lip notches on the Nan Madol pottery), vessel thickness and vessel color. It is impossible to derive the pottery of Truk from that of Pohnpei or vice-versa, and the same is true for Yap and the other islands of western Micronesia. Thus, the only reasonable inference—at least insofar as pottery studies warrant—would appear to be that the settlement of the Micronesian islands, and particularly the Caroline Islands, did not proceed in an “island hopping” manner. Migrants did not gradually settle the islands in either an east to west direction or a west to east direction. Furthermore, it seems unlikely that the settlers of these islands had precisely the same origin, or that they necessarily originated in the same island group. Judging from the pottery, the initial settlers of the Caroline Islands must have been a fairly diverse group of people although this does not mean that their cultural traditions were very distinct. The linguistic evidence, of course, suggests that they did share the same basic cultural background at some distant point in the past (e.g., Dyen 1965, Alkire 1972).

Regarding the origins of the Pohnpeian settlers and, perhaps, those of Truk and Kosrae, it appears that the best case can be made for a linkage with the late Lapita Plain Ware pottery tradition (see Green 1979). The chronology is consistent: it begins after 500 B.C. The pottery vessel shapes and decorative techniques are consistent: simple globular pots and bowls with perhaps some rim notching or punctuation. Also, its location is consistent: late Lapita Plain Ware pottery is found in the southeast Solomon and New Hebrides Islands where linguistic data suggest the homeland for nuclear Micronesians is located (Shutler & Marck 1975). Finally, there is no archaeological support for deriving the Nan Madol pottery from any other known pottery tradition.

Based on the above inferences, it appears likely that the settlement of at least central Micronesia occurred as a result of separate landings on the various islands by people of the Late Lapita Plain Ware tradition who came directly from various locations in the southeast Solomon and New Hebrides Islands. These settlers apparently did not make intermediate stops or island-hop along the way; rather they may have made purposeful voyages of discovery.

The suggestion that these were purposeful voyages of discovery derives from the fact that dog remains were found with the earliest Nan Madol pottery in the Dapahu excavations, and dog remains were also recovered with the Fefan Island pottery on Truk (Shutler *et al.* 1984; the Truk specimen was re-examined by the author and Sara Collins, a faunal specialist). It seems unlikely for dogs to be either taken in a canoe or to survive an unanticipated open ocean drift voyage or lost canoe voyage, considering the distances involved.

As to the question of possible inter-island contacts and relationships, none of the Nan Madol pottery provides any positive or even probable indication that they occurred. Dick-

inson's (unpubl.) petrographic study of temper is indicative of a local Pohnpeiian origin for the Nan Madol pottery. Also, none of the decorative elements or features on the sherds is suggestive of an origin outside of Pohnpei. Shutler *et al.* (1984) reached the same conclusion in their study of the Fefan Island pottery in Truk Lagoon.

During all of the excavations at Nan Madol, the only item that appears to be a possible candidate for an origin outside of Pohnpei is a small but perfectly formed quartz crystal, which is not expected to occur naturally in volcanic Pohnpei. The crystal is from the islet of Sapwenpwe, Test Pit 11, Level 2. Because CST sherds are low in this level and above, and Non-CST sherds are present, the crystal must have been introduced after A.D. 500 but before A.D. 1100.

Conclusion

The basic conclusions to be drawn from the study of Nan Madol pottery may be summarized as follows: 1) the initial settlers of Pohnpei probably had a Late Lapita Plain Ware cultural affinity with an origin somewhere in the southeast Solomon or New Hebrides islands, 2) an island-hopping mode of settlement across Micronesia in either an east or west direction is unlikely; rather settlement of the various islands or island groups was probably directly from the southeast Solomon or New Hebrides Islands in each case, 3) the original settlers of central Micronesia probably came from quite different locations within the southeast Solomon or New Hebrides Islands, and 4) once central Micronesia was settled, there were minimal and possibly no regular contacts between the various major islands or island groups during the pottery-producing period (i.e. until at least after A.D. 1100 and perhaps until the historic period); in effect, the central Micronesian high islands had extremely insular societies.

Acknowledgements

Research at Nan Madol was supported by the Office of Historic Preservation, T.T.P.I. and additionally, in 1984, a grant from the National Geographic Society. The author is grateful for this support, and for the assistance provided by the Pohnpei Historic Preservation Committee. The assistance and hospitality offered by the family of Masao Silbanuz on Temwen Island is also warmly acknowledged. The author is also grateful for the assistance of J. Takayama and R. Hunter-Anderson for providing thickness data on pottery from Truk and Yap, respectively. The Truk data are from surface sherds from Aikei and Winas at Sapota Village on Fefan Island. Measurements were taken by Professor Takayama on 514 sherds (personal communication Dec. 6, 1981). The Yap thickness data are from pottery excavated by Takayama & Intoh at the Pemrang site in 1980. The measurements on 831 CST sherds and 114 laminated sherds were recorded in Yap by Dr. Hunter-Anderson (personal communication 1981).

References

- Alkire, W. H. 1972. *An Introduction to the Peoples and Cultures of Micronesia*. Cummings Publishing Co., Menlo Park, California.
- Athens, J. S. 1980a. Pottery from Nan Madol, Ponape, Eastern Caroline Islands. *J. Polynesian Soc.* 89: 95-99.

- Athens, J. S. 1980b. Archaeological investigations at Nan Madol: islet maps and surface artifacts. Pacific Studies Institute, Guam.
- Athens, J. S. 1981. The discovery and archaeological investigation of Nan Madol, Ponape, Eastern Caroline Islands: an annotated bibliography. Micronesian Archaeological Survey Report 3. Office of Historic Preservation, Trust Territory of the Pacific Islands, Saipan.
- Athens, J. S. 1983. The megalithic ruins of Nan Madol. *Nat. Hist.* 92(12): 50–61.
- Athens, J. S. 1984a. Surface artefact distributions at the Nan Madol site: a preliminary assessment of spatial patterning. *N. Z. J. Archaeol.* 6: 129–153.
- Athens, J. S. 1984b. Jobs Bill completion report: Nan Madol project, Ponape, Eastern Caroline Islands. Report submitted to Office of Historic Preservation, Trust Territory of the Pacific Islands, Saipan.
- Athens, J. S. 1986. Archaeological investigations at Tarague Beach, Guam. Report submitted to Andersen Air Force Base, Guam. J. Stephen Athens, Ph.D., Archaeological Consultant, Honolulu.
- Ayers, W. S. 1983. Archaeology at Nan Madol, Ponape. *Bull. Indo-Pacific Prehist. Assoc.* 4: 135–142.
- Ayres, W. S. & A. E. Haun. 1980. Ponape settlement archaeology: Report 79-2. Report submitted to the Office of Historic Preservation, Trust Territory of the Pacific Islands, Saipan.
- Ayres, W. S., A. E. Haun & R. Mauricio. 1983. Nan Madol archaeology: 1981 survey and excavations. Report submitted to the Office of Historic Preservation, Trust Territory of the Pacific Islands, Saipan. Pacific Studies Institute, Guam.
- Bellwood, P. 1979. *Man's Conquest of the Pacific*. Oxford U. Press, New York.
- Bernart, L. 1977. *The Book of Luellen*. Translated and edited by J. L. Fischer, S. H. Riesenbergl, and M. G. Whiting. Pacific History Series No. 8. University Press of Hawaii, Honolulu.
- Dickinson, W. R. 1982. Temper sands from prehistoric sherds excavated at Pemrang site on Yap and from nearby Ngulu Atoll. *Bull. Indo-Pacific Prehist. Assoc.* 3: 115–117.
- Dyen, I. 1985. A lexicostatistical classification of the Austronesian languages. *Internat. J. of Amer. Ling.*, Memoir 19. Indiana University Publications in Anthropology and Ling., Bloomington, Indiana.
- Green, R. C. 1978. New sites with Lapita pottery and their implications for an understanding of the settlement of the Western Pacific. Working Paper 51 in Anthropology, Archaeology, Linguistics, and Maori Studies, Department of Anthropology, University of Auckland, New Zealand.
- Green, R. C. 1979. Lapita. In J. D. Jennings (ed.), *The Prehistory of Polynesia*, pp. 27–60. Harvard University Press, Cambridge, Massachusetts.
- Gulick, L. H. 1857. The ruins on Ponape, or Ascension Island of the Pacific Ocean. *The Friend* n.s. 6(8): 57–60.
- Hambruch, P. 1911. Die Ruinen von Ponape. *Korrespondenzblatt für Anthropologie, Ethnologie und Urgeschichte* 42: 128–131.
- Hambruch, P. 1936. Ponape: die ruinen. In G. Thilenius (ed.), *Ergebnisse der Sudsee-Expedition 1908–1910*, Vol. II, B7-3. Friederichsen, de Gruyter & Co., Hamburg.
- Intoh, M. & F. Leach. 1985. Archaeological investigations in the Yap Islands, Micro-

- nesia: first millennium B.C. to the present day. BAR International Series 277. Oxford, England.
- Kirch, P. V. 1981. Lapitoid settlements of Futuna and Alofi, Western Polynesia. *Archaeol. in Oceania* 16: 127–143.
- Kirch, P. V., M. S. Allen, V. L. Butler & T. L. Hunt. 1987. Is there an early Far Western Lapita province? Sample size effects and new evidence from Eloaua Island. *Archaeol. in Oceania* 22: 123–127.
- Klein, J., J. C. Lerman, P. E. Damon & E. K. Ralph. 1982. Calibration of radiocarbon dates: tables based on the consensus data of the Workshop on Calibrating the Radiocarbon Time Scale. *Radiocarbon* 24: 103–150.
- Morgan, W. N. 1988. *Prehistoric Architecture in Micronesia*. University of Texas Press, Austin.
- Osborne, D. 1966. *The Archaeology of the Palau Islands: an Intensive Survey*. Bulletin No. 230. B. P. Bishop Museum, Honolulu.
- Rye, O. S. 1981. *Pottery Technology: Principles and Reconstruction*. Taraxacum Inc., Washington, D.C.
- Schurig, M. 1930. *Die Sudseeopfererei*. Leipzig.
- Shutler, R., Jr. & J. C. Marck. 1975. On the dispersal of the Austronesian horticulturalists. *Archaeol. and Phys. Anthropol. in Oceania* 10: 81–113.
- Shutler, R., Jr., Y. H. Sinoto & J. Takayama. 1984. Preliminary excavations of Fefan Island sites, Truk Islands. *In* Y. H. Sinoto (ed), *Caroline Islands archaeology: investigations on Fefan, Faraulep, Woleai, and Lamotrek*, pp. 1–64. *Pacific Anthropological Records* 35. Dept. of Anthropology, B. P. Bishop Museum, Honolulu.
- Spriggs, M. 1984. The Lapita cultural complex. *J. Pac. Hist.* 19: 202–223.
- Takayama, J. 1982. A brief report on archaeological investigations of the southern part of Yap Island and nearby Ngulu Atoli. *In* M. Aoyagi (ed), *Islanders and Their Outside World*, pp. 77–104. Committee for Micronesian Research, St. Paul's (Rikkyo) University, Tokyo.
- Yawata, I. 1932. Earthenware of Oceania. *Zinruigaku Zassi* 47(2): 79 (in Japanese; English translation in P. S. Chapman, *Micronesian archaeology: an annotated bibliography*, p. 243. M.A. thesis 1964, Dept. of Anthropology, Stanford University, California).