Archæological Excavations in Western Samoa

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NUMBER 32

PACIFIC ANTHROPOLOGICAL RECORDS

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BERNICE PAUAHI BISHOP MUSEUM
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INTRODUCTION

The data reported in this volume are the result of continued archeological study in the Mulifanua District of Upolu, Western Samoa (Fig. 1), begun in 1973 and 1974 (Jennings 1974, Jennings et al. 1976). Both the 1976 research and the 1977 final season of study embody a research strategy developed from the findings of the 1974 work. The report on the earlier work, also published in Pacific Anthropological Records, and this volume should be read as a single report.

Descriptions of Samoan climate, micro-environments, and conditions of work have been presented in Jennings et al. (1976). A minor change in site numbering procedures, adopted for 1976 and following years, however, should be described. At the request of Roger Green, Department of Anthropology, University of Auckland, the numbering system previously in use all over Polynesia was modified for the Samoan group. Until 1976 the sites in Western Samoa were numbered with four units designating the island chain, the island, the neighborhood or village where the work was done, and the sequence of site discovery in that locality. The system now in use is tied to the detailed topographic maps (scale 1/20,000) produced by the Department of Lands and Surveys, Government of Western Samoa, and the Surveyor General of New Zealand. The present site designation still consists of a four-unit code: S = Samoa, U = Upolu, followed by the number of the appropriate map and the site numbers in a continuous series for that sheet, not for a locality or district.

OBJECTIVES

Following the initial sampling of Upolu sites (Jennings et al. 1976), the research strategy was conceived as (1) continued excavation at Janes Camp (SU18-1), (2) further excavations at Mt. Olo, and (3) possibly, additional search for early coastal villages. The first objective was abandoned because the owner of Janes Camp demanded a prohibitive permit fee. The incident was fortunate for the Program, however, because the search for additional coastal sites was initiated immediately. On the island of Manono, this search led to the discovery and excavation of two informative ceramic sites, Potusa and Falemoa.

SITE SELECTION

The Manono Island sites were readily selected. Guided by the observations made in 1974, primarily at the Paradise and Janes Camp sites, and a few published descriptions of Lapita village locations elsewhere, I established (Jennings 1976) a series of criteria that seemed to define present day geographic and physiographic situations where early ceramic sites would

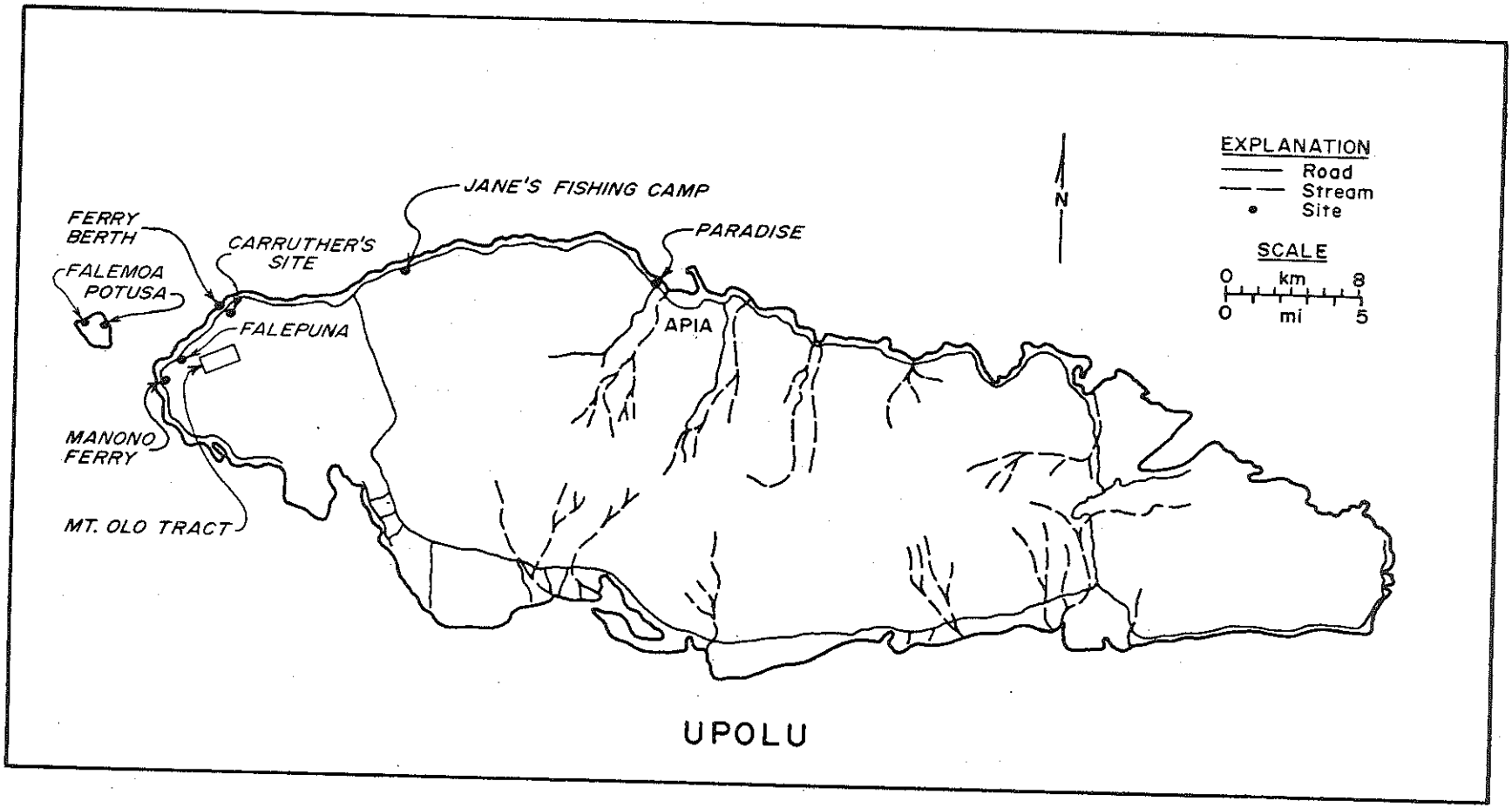


Fig. 1. ARCHAEOLOGICAL LOCATIONS EXCAVATED BY THE UNIVERSITY OF UTAH SAMOAN ARCHAEOLOGICAL PROGRAM IN 1974 (Paradise, Janes Camp, and Mt. Olo), 1976 (Potusa, Falemoa, and Mt. Olo), AND 1977 (Falemoa and Mt. Olo).

most likely be found. These were: (1) location on an islet, (2) not more than 10 meters inland from mean high tide line, (3) where there existed a shelving sand or coquina rock beach lacking coral heads, (4) that extended some distance out on the reef. The site should (5) lie on a low basalt knoll or promontory with a thick mantle of soil, (6) be elevated from 1.5 to 5.0 meters above present mean sea level, (7) where the reef was 1.0 ± km in width, (8) where there was a deep passage in the outer barrier reef. Preferably, (9) there should also be shell or other midden debris visible on the modern surface of the site. Five situations that combined most of the cited variables were noted on Manono. Two of the five were tested--the Potusa (SM17-1) and Falemoa (SM17-2) sites, in Salua and Falemoa districts, respectively.

The procedure at Mt. Olo was a straightforward effort to generate information about the apparently boundless area of stone structures. Mention has been made (Jennings et al. 1976) of the rough volcanic terrain, the density of surface stones, and the utilization of stone as a building material. The abundance of stone made it difficult to distinguish at first between purposeful and nonstructural accumulations of stone. The problems of recognition were reduced, of course, as the surveyors became more familiar with the ruined structures.

Since Mt. Olo is a large area, the preparation of a detailed map was the obvious first step in a serious effort toward an analysis of village architecture and layout and of the settlement pattern at the time of agricultural exploitation of the inland districts. Accordingly, a plane table map of some 2 km^2 of the Mt. Olo district (portions of the Mt. Olo and Tausagi plantations) was generated over two seasons. As the area mapped increased in size, a number of facts were observed. The first to become evident was the unsuspected, quite elaborate, communication system created by a network of carefully constructed trails. These trails actually provide the organizational framework for the settlement, in addition to their communication function. Then it was noted that other consistent attributes, such as the presence of one or more very large platforms, associated with a star or pigeon-trapping mound, and at least one large earth oven (*umu ti*) established clusters of structures into districts or Wards (called Areas in Jennings et al. 1976) within the extensive settlement. Perhaps more interesting was our discovery that the recurrent basic unit of settlement was the Household Unit (HHU), which is defined as an area more than 75% enclosed by walls and paths, containing one large (larger than 10 by 10 meters) or two small (less than 10 by 10 meters) stone platforms or mounds, with one associated stone-free area within the enclosure. Within the surveyed area, there were 381 platforms, 8 earth ovens, 4 star mounds, over 12 km of pathways, 13.2 km of fences or walls, and 83 HHU's distributed along the paths. Therefore, we assume a rather dense occupancy. Unfortunately, the mapping was perforce restricted to those parts of the coconut plantation where cattle grazed, because in unpastured areas the dense fern growth thoroughly obscured the remains. The paths plunge into the dense bush adjoining the plantation on three sides, and we presume that HHU's are also there. Thus, the mapped area is only a sample of convenience. We cannot speculate as to the full areal extent of the settlement.

One or more excavations were conducted in each of the six wards. Entire HHU's were usually taken as the unit of study. Thus, the Cog Mound complex required the investigation of eight

structural entities--the Cog Mound (SU17-162) and three associated structures (SU17-164, -165, and -161), a house platform (SU17-192), an enigmatic wall or pathway (SU17-346), an earth oven (SU17-193), and a symmetrical domed stone mound of undetermined function (SU17-527). Half of these structures (SU17-161, -162, -164 and -165) are reported in Jennings et al. (1976). Therefore, in the sections that follow, HHU refers to a complex of associated monumental remains, most of which bear individual site numbers.

CHRONOLOGY

In the course of three seasons' work (1974, 1976, and 1977) a total of 34 radiocarbon dates was generated. The assays were made by three laboratories, Radiocarbon Limited (RL), University of Georgia (UGa), and the Institute of Nuclear Science, Department of Scientific and Industrial Research of the New Zealand Geological Survey (NZ). All dates, including unacceptable ones, are listed in Table 2, in chronological order. Dates that are aberrant, and/or that contradict the observed stratigraphy, are Nos. 3, 8, 12, 17, 24, 25, 33, and 34. Given the ± figures, although Nos. 3 and 8 reverse the stratigraphy, they are essentially contemporary and raise no problem; Nos. 12, 17, 24, 25, 33, and 34 are disregarded. Nos. 26 and 31 are from pieces of the same piece of shell, and No. 26 has been discarded in favor of No. 31. Similarly, dates Nos. 28, 29, and 30 are derived from the same shell.

Table 1 reveals several clusters of dates that provide a cultural chronology of sorts. Cluster I, the earliest, is actually a single date from the submerged Lapita village at Ferry Berth (SU17-1). Cluster II dates are all referable to the pottery-bearing coastal villages. The oldest of these dates, No. 31, is from Falemoa (SM17-2). However, the early levels at both Falemoa and Janes Camp (SU18-1) are clearly contemporary, some 300 years later than the Ferry Berth occupancy. Latest of all is Potusa (SM17-1). Paradise (see Jennings et al. 1976) is undated but, yielding pottery, falls in the coastal village group. All of the other coastal villages tested yielded pottery, but only the Ferry Berth site in Cluster I contained decorated Lapita pottery. The time span for Cluster II is about 1,000 years.

Cluster III covers a shorter period (800 - 900 B.P. to 1600 B.P.), and consists mainly of charcoal dates recovered from small fire basins (domestic earth ovens) and other fires beneath the stone platforms and star mounds in the Mt. Olo settlement. Finally, Cluster IV dates begin about 600 B.P. and are directly associated with stone structures such as house platforms, raised pathways, star mounds, large earth ovens or *umu ti*, and possible cook house structures.

There is no necessity for further comment here about the radiocarbon suite. The sequence in Table 2 is straightforward, revealing an order of events fully compatible with the archaeology in the light of earlier research in Western Samoa (Green and Davidson 1974). It documents early coastal settlement (Cluster II), an expansion into, or at least utilization of, the interior (Cluster III), followed by extensive inland occupancy and exploitation (Cluster IV). Discussion of various implications inherent in these data appears in appropriate context in this report and in a brief recapitulation in the summary. Dates cited in the text are in their corrected or calibrated form except where indicated otherwise.

A secondary chronological control may be available in the stratigraphic distribution of the ceramic remains. By means of statistical analysis of the ceramic data it has been possible to perceive seven separate descriptive pottery types. (Fig. 42 shows the change in pottery type production through time--or more properly through the sequent strata--at the five pottery-bearing sites.) The seven types distinguished were Mulifanua Lapita, Faleasi'u Coarse, Faleasi'u Fine, Faleasi'u Slipped, Falemoa Coarse, Falemoa Fine and Falemoa Tan. All seven types appear in each site, but in widely varying percentages. The unequal distribution of types throughout all the sites leaves chronological significance of any given collection somewhat uncertain, except that Falemoa Tan dominates the upper levels of all sites. That helps assign Paradise and Potusa to a late time slot, coeval with Falemoa IV and Janes Camp IV. It is to be noted, however, that Figure 42 is not a seriation chart, but if seriated by levels would suggest the observed stratigraphy and the radiocarbon dates of Tables 1 and 2.

Table 1. CULTURAL CHRONOLOGY

UNIVERSITY OF UTAH SAMOAN ARCHAEOLOGICAL PROGRAM

Sequence	Report Reference Number	Location	Date B.P.
	1	Recent	200
200 B.P.			
IV Late Mt. Olo and Sapapali'i Settlement Sequence	2	Cog Mound Interior	270
	3	*Ma'a Ti	380
	4	Janets Oven	290 (uncorrected)
	5	Apulu HHU	445
	6	Green Ti	370 (uncorrected)
	7	Cog Mound Interior	440 (uncorrected)
	8	*Ma'a Ti	470
	9	SS13-9, earth oven	500
	10	SS13-127, earth oven	545
	11	Cog Mound Complex, earth oven	595
800-900 B.P.			
III Early Mt. Olo Sequence	13	Apulu HHU	945 (uncorrected)
	14	Tulaga Fale HHU	1100
	15	Cog Mound earth oven	1150 (uncorrected)
	16	Apulu HHU	1175
	18	Ten Points	1595
1650 B.P.			
II Coastal Sequence	20	Potusa	1850
	22,21	Falemoa and Janes Camp	2080
	23		2190
	24,25		2290
	28		2510
	29		2550
	30		2590
	31		2610
3000 B.P.			
I Lapita		Ferry Berth	2980

*Reverses observed stratigraphy.

Table 2.

RADIOCARBON DATES

UNIVERSITY OF UTAH SAMOAN ARCHAEOLOGICAL PROGRAM, 1973 - 1977

Rept. Ref. No.	Field Season	Lab No.	Site No.	Field Sample Number	Material	Date B.P.	Date A.D./B.C.	Age, old $T_{\frac{1}{2}}$* (5570±30 yrs)	Age, new $T_{\frac{1}{2}}$* (5730±40 yr	Secular* Corrected Age	Comment
1	1976	UGa1486	SU17-175	16	Charcoal	35±70	A.D. 1915	200	200	200	Probably from recent forest campfire
2	1974	RL-460	SuMu-165 (SU17-165)	8	Charcoal	270±110	A.D.1680±110**				Within stone rubble fill of Cog Mound
3	1977	UGa1988	SU17-128	19	Charcoal	285±55	A.D. 1665	290±55	295±55	380±55	Ma'a Ti, earliest of 4 ovens at site
4	1974	RL-458	SuMu-48 (SU17-48)	13	Charcoal	290	A.D.1660**				From bottom of earth oven, Janet's Oven
5	1977	UGa1992	SU17-484	16,32	Charcoal	365±70	A.D. 1585	365±70	375±70	445±70	Apulu HHU. From posthole in platform 4
6	1974	RL-462	SuMu-188 (SU17-188)	12	Charcoal	370±110	A.D.1580±110**				Earth oven fill, 60 cm from surface, Green Ti
7	1974	RL-461	SuMu-165 (SU17-165)	9	Charcoal (palm)	440±100	A.D.1510±100**				Within stone rubble fill of Cog Mound
8	1977	UGa1987	SuMu-128 (SU17-128)	32	Charcoal	440±60	A.D. 1510	440±100	450±100	470±100	Ma'a Ti, latest of 4 earth ovens at site
9	1976	UGa1672	SS13-91		Charcoal	485±125	A.D. 1465	485±125	500±125	500±125	Earth oven from Sapapali'i
10	1976	UGa1673	SS13-127		Charcoal	510±60	A.D. 1440	510±60	525±60	545±60	Earth oven from Sapapali'i
11	1976	UGa1487	SU17-193	16	Charcoal	565±60	A.D. 1385	565±60	580±60	595±60	Earth oven, Cog Mound complex
†12	1977	UGa2209	SM17-2	250	Shell	805±65	A.D. 1145	945±60	970±60	975±60	Stratum IV, below platform, Falemoa; probably too young--see date No. 22

All notes are on p. 10.

Rept. Ref. No.	Field Season	Lab No.	Site No.	Field Sample Number	Material	Date B.P.	Date A.D./B.C.	Age, old $T_{\frac{1}{2}}$* (5570±30 yrs)	Age, new $T_{\frac{1}{2}}$* (5730±40 yrs)	Secular* Corrected Age	Comment
13	1977	UGa1986	near SU17-483 (not a numbered feature)	15,31	Charcoal	945±60	A.D. 1005				Apulu, from fill of shallow basin beneath stone piles
14	1977	UGa1985	SU17-130	86	Charcoal	1115±75	A.D.835**	1115±110	1145±110	1100±110	Tulaga Fale; from fire basin under platform?
15	1974	RL-459	SuMu-165 (SU17-165)	1	Charcoal	1150±110	A.D.800±110				Bottom of fire basin beside Cog Mound
16	1977	UGa1990	SU17-483	8	Charcoal	1205±70	A.D. 745	1205±70	1240±70	1175±70	From bottom of storage pit, Apulu (platform, p. 81)
†17	1977	UGa2210	SM17-2	265	Shell	1565±60	A.D. 385				Stratum II, Falemoa; probably too young
18	1977	UGa1991	SU17-552	5	Charcoal	1620±65	A.D. 330	1620±65	1665±65	1595±65	Ten Points, from base of star mound (suspected ritual stone structure)
19	1976	UGa1485	SM17-1	12	*Tridacna*	1660±60	A.D. 290				Stratum II, Potusa; same sample as NZ4342; discarded in favor of date 20
20	1976	NZ4342B	SM17-1	12	*Tridacna*	1800±40	A.D. 150	1800±40	1850±40		Same sample as UGa1485; corrected to ocean surface water standard--1850 ±40 B.P.;Potusa
21	1977	UGa2208	SM17-2	343	Shell	2020±55	70 B.C.		2080±55††		Stratum III, Falemoa
22	1977	UGa2211	SM17-2	359	Shell	2030±60	80 B.C.		2080±60††		Stratum IV, surface of platform, Falemoa

All notes on p. 10.

Rept. Ref. No.	Field Season	Lab No.	Site No.	Field Sample Number	Material	Date B.P.	Date A.D./B.C.	Age, old $T_{\frac{1}{2}}$* (5570±30 yrs)	Age, new $T_{\frac{1}{2}}$* (5730±40 yrs)	Secular* Corrected Age	Comment
23	1974	RL-478	SU18-1 (SuF1-1)	69	Shell	2130±130	180±130 B.C.		2190±130††		Stratum III, Test 1, Janes Camp; contemporary with RL481
†24	1974	RL-481	SU18-1 (SuF1-1)	119	Shell	2220±120	270±120 B.C.		2290±120††		Stratum IV, Test II, Janes Camp; date & stratigraphy conform
†25	1974	RL-464	SU18-1 (SuF1-1)	45	*Tridacna*	220±110	270±110 B.C.		2290±110††		Stratum II, Janes Camp; probably too young; compare with NZ2726B
26	1976	UGa1484	SM17-2	85	*Tridacna*	2260±65	310 B.C.				Same as NZ4343, Stratum II, Falemoa; discarded in favor of date 31
†27	1974	RL-477	SU18-1 (SuF1-1)	117	Shell	2510±120	560±120 B.C.				Stratum IV, Test II, Janes Camp; unacceptable, too old
28	1974	NZ2726B	SU18-1	46	*Tridacna*	2510±60	560±60 B.C.	2440±60	2510±60		Stratum II; outer 1/3 of same *Tridacna* as RL-464, Janes Camp
29	1974	NZ2727B	SU18-1 (SuF1-1)	46	*Tridacna*	2550±50	600±50 B.C.	2470±50	2550±50		Stratum II; intermediate 1/3 of same *Tridacna* as NZ2726; same as RL-464; Janes Camp
30	1974	NZ2728B	SU18-1 (SuF1-1)	46	*Tridacna*	2590±40	640±40 B.C.	2550±30	2590±40		Stratum II, inner 1/3 of same *Tridacna* shell as RL-464 and NZ2726; Janes Camp

All notes on p. 10.

Rept. Ref. No.	Field Season	Lab No.	Site No.	Field Sample Number	Material	Date B.P.	Date A.D./B.C.	Age, old $T_{\frac{1}{2}}$* (5570±30 yrs)	Age, new $T_{\frac{1}{2}}$* (5730±40 yrs)	Secular* Corrected Age	Comment
31	1976	NZ4343B	SM17-2	85	*Tridacna*	2540±40	590±40 B.C.	2540±60	2610±50		Stratum II, Falemoa; same sample as UGa 1484; corrected to ocean surface water standard--2610±50 B.P.; Falemoa
32	1973	NZ1958B	SU17-1 (SuMu-1)		Shell	2980±80	1030±80 B.C.	2890±80	2980±80		Base of coquina layer sealing submerged Lapitan deposit, Ferry Berth
†33	1974	RL-479	SU18-1 (SuFl-1)	80-1	Shell	3220±130	1270±130 B.C.				Stratum II, Test II, Janes Camp; too old
†34	1976	UGa1671	SS13-85		Charcoal	14,920±175		14,920±175	15,353±180		Earth oven from Sapapali'i; unacceptable, too old

† These dates significantly contradict the observed stratigraphy or are otherwise unacceptable and are disregarded.

* These columns display the recalculations of the American lab results made by the Institute of Nuclear Sciences of the New Zealand Department of Scientific & Industrial Research (except as noted), in terms of both half lives and making a tree ring controlled secular correction for terrestrial material. The NZ dates are calculated w.r.t. a measured $\delta^{13}C$, while for the UGa dates a value of -25‰ for wood and 0‰ for shell has been assumed. It is unlikely that a serious error has been introduced because of this assumption. Dates of less than 1500 yrs have been rounded to the nearest 5 yrs and greater than 1500 yrs to the nearest 10 yrs. Where there are no entries in Columns 9, 10, or 11, the dates in Column 7 are used.

**Standard 1.03 formula used.

††New $T_{\frac{1}{2}}$ calculated by University of Utah; standard 1.03 formula used.

MT. OLO ARCHAEOLOGICAL SITE SURVEY

RICHARD N. HOLMER

INTRODUCTION

The survey activities in the Mt. Olo Tract during the 1976 and 1977 field seasons extended to the west of the zone surveyed in 1974, forming a continuous area covering the eastern, southern, and western flanks of Mt. Olo (Figs. 1 and 2). A few areas, left isolated from the main survey tract in 1974, were connected, allowing a more complete interpretation of their relationship to the surveyed communities. The area surveyed in 1974 was also re-examined in light of increased perceptiveness in identifying structural remains, and several new features were recognized in that section.

The original organization and planning of the Mt. Olo survey and settlement pattern study (Jennings et al. 1976) followed the guidelines outlined by Green (1967:125). The data collected during the 1974 survey and excavations allowed preliminary interpretations of the Mt. Olo settlements. Ethnohistorical references contributed greatly to our interpretations by suggesting combinations of platform and community attributes that might be indicative of functionally significant relationships. For example, clusters of massive platforms appear to be associated with centers of local authority, and each political unit of the settlement may have physical characteristics that are different from other units. The 1976 and 1977 activities more than doubled the data on which those interpretations were based and generally strengthened supporting arguments. A more detailed interpretation of the community organization is now possible.

SETTING

The Mt. Olo tract is located approximately 3 to 5 km inland from the westernmost tip of Upolu, Western Samoa (Fig. 1). It lies within the Olo and Tausagi sections of the Mulifanua Coconut Plantation of the Western Samoa Trust Estates Corporation (WSTEC). Access to the area is via the Olo Plantation road, which turns inland off the main coastal highway at Samea.

Mt. Olo rises to an altitude of 130 meters above sea level and is the northwesternmost mountain in the central ridge that divides Upolu along its E-W axis. It is a low volcanic cone on what is otherwise a gentle slope, and is inconspicuous at a distance. Its upper slopes are steep but soon become gentle for the remaining distance to the sea. Mt. Olo, as well as other volcanic cones in the area, dates to the Mulifanua volcanic series of 10,000 to 40,000 years ago.

The present appearance of the plantation is characterized by a ground cover of scattered basalt stones. Ferns and grasses support cattle grazing, and regularly spaced throughout the plantation are coconut palms, which grow despite the stony conditions. Coconut palms are often planted on prehistoric architectural features, a practice that imposes some restrictions on survey and excavation strategies.

The soils in the Mt. Olo area are suited for subsistence crops and retain their fertility if a bush fallow of three to five years is maintained (Wright 1962:97). The lack of surface water, which results from the porosity of the volcanic rock, does not restrict the use of the land for agricultural purposes. Soil-moisture retention and annual rainfall are the primary factors controlling the agricultural potential of the Mt. Olo area (Curry 1962:55). Monthly rainfall amounts vary greatly from year to year but are generally adequate to prevent a soil moisture deficit during the dry season (Curry 1962:58). Therefore, both soil and climate are favorable for subsistence agriculture at Mt. Olo.

For potable water, rainfall collection was probably a necessity, although small seeps of unknown productivity were found in two lava tubes within the limits of the survey. In addition, a permanent spring in a lava tube, 1 km W of the survey limits, is used by numerous families today as a source of fresh water.

METHODS

Survey activities were conducted during both seasons, over a period of five and a half weeks. A plane table and telescopic alidade were used to map most of the structures, although a telescopic rangefinder and compass proved to be effective for rapidly completing small areas.

Several sites have been excavated during the three seasons. Each named excavated site incorporates several individual site numbers (Table 3). Subjective sampling was used for several reasons. First, there was not sufficient time to excavate a large enough probabilistic sample to provide a meaningful projection for the entire survey tract. Second, it is not known what the relationship of the sample represented by the Mt. Olo Tract is to the total population.

Table 3. SITES EXCAVATED IN MT. OLO TRACT

Site Name and Excavation Date	Site Numbers			
	Mounds	Walkways	Fences	Ovens
Cog Mound Site* (1974)	162, 164, 165	161		
Cog Mound Complex* (1976)	192, 527		346	193
Green Ti (1974)	49			48
Janet's Oven (1974)				188
Tausagi (1976)	175, 180, 526	179	176	
Fiapito (1977)	3, 4, 24, 25	7		
Ten Points (1977)	552	548	549	
Tulaga Fale (1977)	88-92, 127, 130, 150	131, 149		
Ma'a Ti (1977)				128
Crooked Palm (1977)	365-371	328		
Apulu (1977)	477, 483-487	446	478, 482	
Tutia and Misi (1977)	177	189		

*The Site (Jennings et al. 1976) and the Complex (see p. 55, this paper) together make up the Cog Mound HHU.

or community on the slopes of Mt. Olo. Third, since many household units have been badly disturbed by the construction of modern plantation fences and roads, excavation was directed at those that are better preserved. The known presence of datable charcoal (in earth ovens) was also a criterion for selection. The selection of the excavated sites, therefore, was based on a judgment of the potential for producing relevant data and the efficiency of data recovery. As a result, the excavated sample appears to be biased toward "high status" units. A good state of preservation may be a direct result of more meticulous and durable construction utilized at the higher status units than on the average dwelling units.

STRUCTURAL REMAINS

The following descriptions and discussions of the surveyed Mt. Olo structural remains summarize the findings of the three UUSAP field seasons. Results from individual seasons are not referred to except where necessary for clarity. The total of 565 structures has been recorded in an area slightly less than 2 km^2 (Fig. 2). Areas adjacent to the arbitrary boundaries of the survey tract were briefly reconnoitered and all appear to contain site densities similar to the area surveyed.

Four classes of structures have been recorded: mounds, walkways, fences, and ovens. Figures 3a, b, and c show the survey maps with individual numbers of all architectural structures. Certain criteria were established for each class of structure so that consistency of designation could be maintained (Jennings et al. 1976). A few stone piles that are possibly platforms were not recorded because they could not meet the basic criteria. The distinction between fences and the raised parts of some walkways is difficult to make; a few highly deteriorated walkways are undoubtedly recorded as fences. However, the number of completely erroneous designations is probably quite small.

MOUNDS

Three types of mounds are found in the Mt. Olo tract: platforms, star mounds, and stone piles. Platforms and star mounds have been discussed in detail (Jennings et al. 1976) and these definitions were not altered by the addition of the recently discovered mounds. The following discussions, therefore, are abbreviated.

Platforms

A total of 249 platforms was recorded during the 1976 and 1977 seasons, resulting in a grand total of 381 platforms for the three years' activities. Descriptive statistics for the platforms indicate mean basal areas of 177 ± 187 square meters (12 by 15 meters) with heights of 0.56 ± 0.36 meter. The large standard deviations indicate a wide variability in size range. In general, very large platforms are of less than average height; and very high platforms are of less than average basal dimensions.

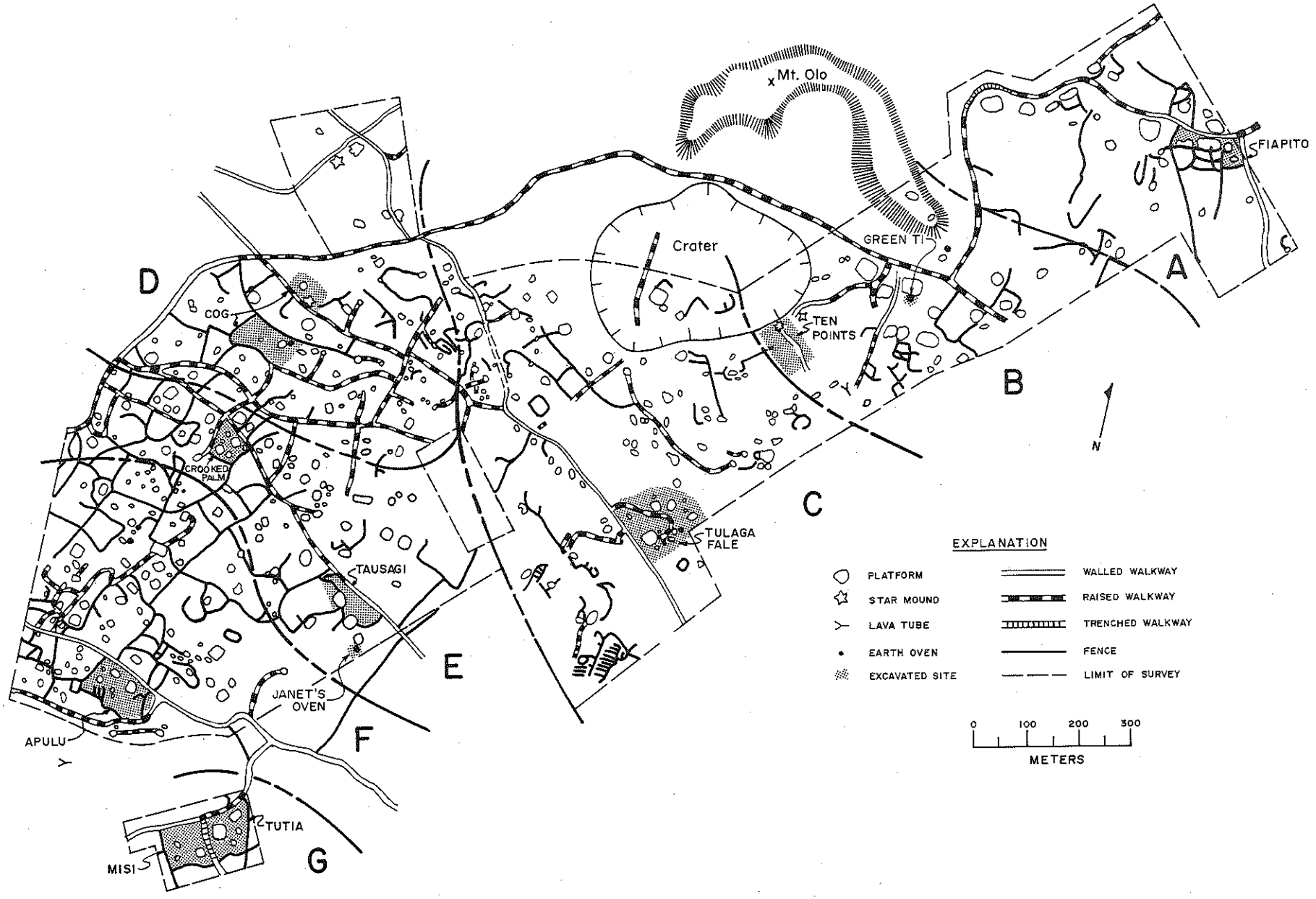


Fig. 2. THE MAPPED PORTION OF THE MT. OLO TRACT, SHOWING WARDS, MAJOR PATHWAYS, AND EXCAVATED AREA.

A wide range of platform shapes also occurs. The tendency for a continuum of small and rounded to large and square has been noted (Jennings et al. 1976:16) and seems to hold true. Some platforms of irregular shapes also occur, although elliptical or rectangular shapes with at least two or three clearly delineated sides seem to predominate.

The sides of the platforms are usually sloping at approximately 45°. Short portions of several platforms have vertical sides, suggesting that at the time of construction the entire platform perimeter may have been vertical. Often the vertical portions blend into sloping sides that are clearly the result of collapse. It is difficult to determine which sloping sides have resulted from collapse and which represent the original construction. In general, intentionally sloping sides appear to be distinguishable by fitted stones of approximately 35 cm in diameter, and collapsed sides seem to consist of unfitted stones of all sizes. For most platforms, a determination could not be made without partial clearing of vegetation, which was done only in excavated areas.

Construction material for the platforms consists largely of local stone; there is a very limited use of earth (see Fig. 33). Often there is a difference in size between the stones used on the sides and those used on the tops of platforms. Many of the better preserved platforms have a smooth, level pavement of stones (2 to 5 cm in diameter) that cover either the entire surface or an oval area that is presumed to be the floor of a superstructure. Most of the platforms have some small areas of small-stone pavement remaining, the rest being disturbed, presumably by vegetation growth after the community was abandoned.

Curb stones were observed on several platforms and probably were not seen on others because of heavy vegetation. Curb stones occur around the basal perimeters of platforms and/or around the perimeter of the platform surface. Often, although not always, they occur only on the sides nearest the walkways. Curb stones are usually block-shaped, ranging considerably in size, set into the soil for perimeter curbing and into the stone fill of the platform for surface curbing.

Curbing rarely seems to suggest the outline of a superstructure. One exception (SU17-177) is the superimposition of a modern house on a prehistoric platform (see p. 86). Curb stones are also used to outline soil areas adjacent to platforms, as seen in the Tausagi Site.

Star Mounds

Four star mounds occur in the survey tract. Another was observed outside the survey area on the northeastern flank of Mt. Olo, approximately 100 meters NW of SU17-35. Star mounds characteristically have numerous projections extending from the main body of the structure. The two star mounds that occur in Ward D are considerably larger than the others, measuring approximately 2.5 meters high and 20 meters in diameter. The two smaller ones are approximately the same diameter but are only 80 cm high. The star mounds excavated are constructed entirely of dry stone masonry with vertical side walls. The two larger examples have earthen caps forming a smooth surface, whereas the smaller ones are stone-topped with surface pavements of irregular stones. Two star mounds in the Mt. Olo Tract have been excavated: the Cog Mound (Jennings et al. 1976) and the Ten Points Mound (see p. 38).

Stone Piles

Stone piles occur throughout the survey area. Most were not recorded but an idea of their density and shape and size range--from small and oval to large and sprawling--can be obtained from the maps of the excavated sites (e.g., the Apulu site; see Fig. 34). Some piles are neatly shaped with curb stones around the perimeters and/or fitted stones forming the mounded surface. Others are formless areas of stone with no definable shape or surfaces. The larger areas sometimes seem to be places where the natural ground cover of stones has not been altered, while the smaller neater mounds could be the result of surface clearance. Most of the small piles occur next to walkways, and the more haphazard ones occur away from walkways. Two of the mounds have been excavated (see pp. 57 & 82).

WALKWAYS

Two types of walkways, raised and walled, are prevalent in the Mt. Olo Tract. A third type, a trenched walkway, is rare, with only two examples present. The types often connect or blend into each other. A total of 12.6 km of walkways of all types was recorded in the survey tract.

Raised Walkways

Raised walkways are low, linear, flat-topped, earth-and-stone structures that are trapezoidal in cross section. The sides slope at approximately 45°, and the average dimensions are 0.55 ± 0.24 meter in height, and 3.93 ± 1.76 meters in width. This is the most prevalent structure type in the survey area; 8.8 km were mapped. Walkways vary considerably in construction. Several walkways are constructed entirely of stone with a surface of roughly fitted stones (e.g., SU17-189). More elaborate walkways consist of sloping sides of soil with curb stones along the outside, a stone core, and a clay-surfaced path with curb stones along each side (e.g., SU17-446).

Walled Walkways

Walled walkways are ground-level paths bordered by two parallel fences. The fences are in varying degrees of collapse, making it difficult to reconstruct the original path width. Measured between the outside edges of the collapsed walls, the widths average 5.38 ± 1.31 meters, and height is 0.71 ± 0.40 meters. As with the raised walkways, the walled walkways vary considerably in elaborateness of construction, width, and height of fences. Less elaborate sections have very low fences that are relatively close together. The total length of walled walkways in the survey area is 3.7 km.

Trenched Walkways

Two examples of trenched walkways occur. They are trough-like with sides sloping down to a path, 1 to 2 meters wide and about 50 cm below ground level. Both examples are directly adjacent to large platforms and connect with other types of walkways a few meters from the platforms.

FENCES

A total of 13.2 km of fences has been mapped in the survey area. Fence dimensions average 0.54 ± 0.37 meter in height, and 2.55 ± 1.17 meters in width. The construction visible in many of the better preserved fences consists of outer courses of large basalt blocks (unshaped), approximately 1 meter apart at the base and tapering to approximately 75 cm apart at the 1-meter-high top. The interior of the wall is filled with smaller, unfitted, stone rubble.

Most fences form enclosures around one or more platforms. These enclosures, referred to herein as HHU's, are significant because of their possible association with a family plot of ground. Numerous small enclosures do not fit the HHU definition because of a lack of contained platforms; these are probably associated with walled gardens or pig pens. A total of 83 enclosures meet the criteria for HHU (see p. 5). An average enclosed area is 5364 ± 3315 square meters, and contains 3.00 ± 2.02 platforms averaging 161 square meters in surface area. More will be said concerning the HHU's in the interpretative section of this report.

OVENS

The inventory of earth ovens (*umu ti*) totals eight in the Mt. Olo Tract. They are raised-rimmed craters or rings of earth that average 0.59 ± 0.18 meter high, and 7.12 ± 2.69 meters in diameter. The central depression often has stones visible at the surface around the edges of the crater. A total of four ovens in the Mt. Olo Tract has been excavated, providing radiocarbon dates. Two (Green Ti and Janet's Oven) are reported in Jennings et al. (1976) and two (Ma'a Ti and Cog Mound Complex) are reported in this volume.

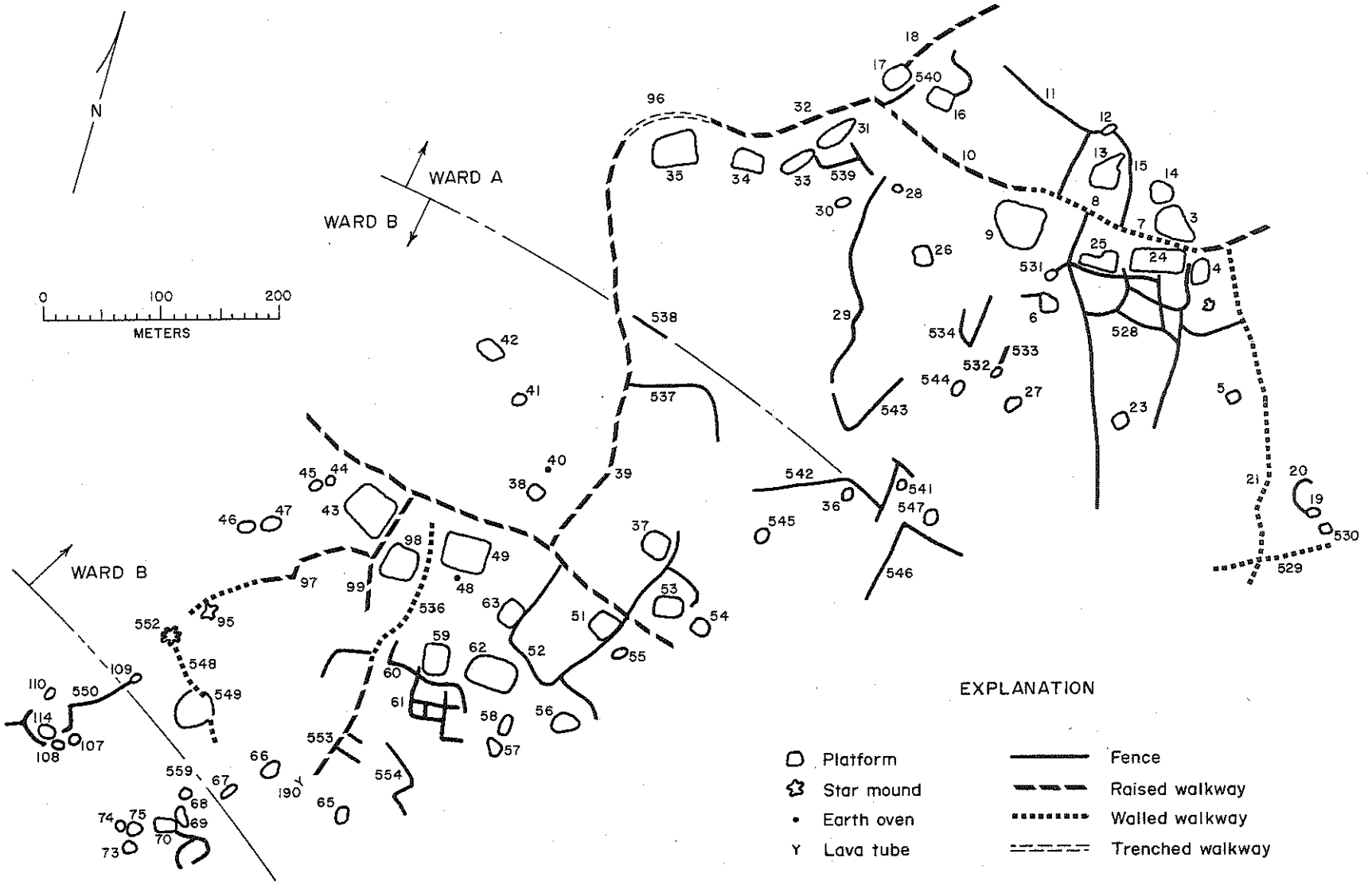


Fig. 3a. DETAIL OF MAPPED PORTION OF MT. OLO TRACT, SHOWING WARDS A AND B. Platform size and shape, and individual feature numbers are shown.

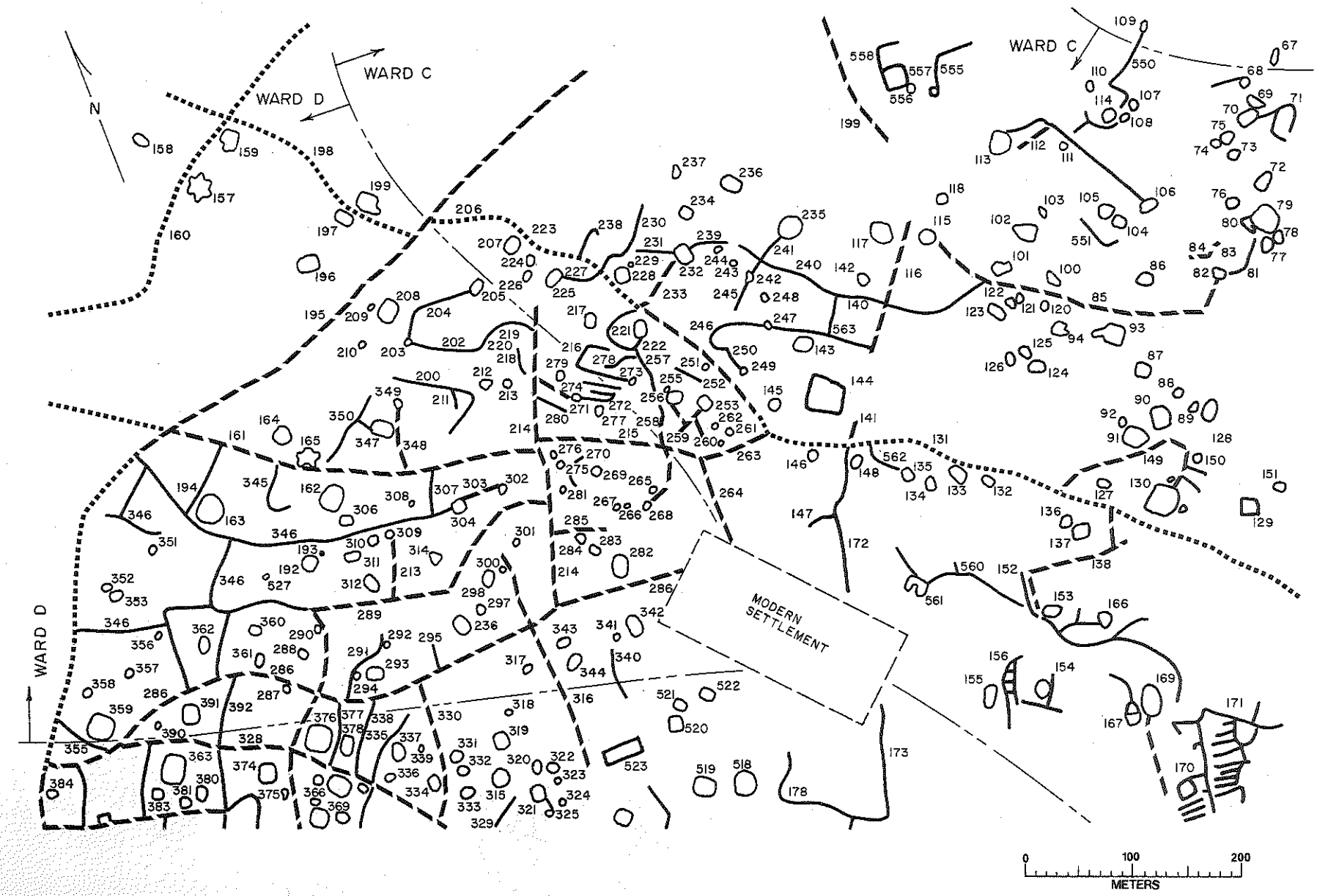


Fig. 3b. DETAIL OF MAPPED PORTION OF MT. OLO TRACT, SHOWING WARDS C AND D. Platform size and shape, and individual feature numbers are shown.

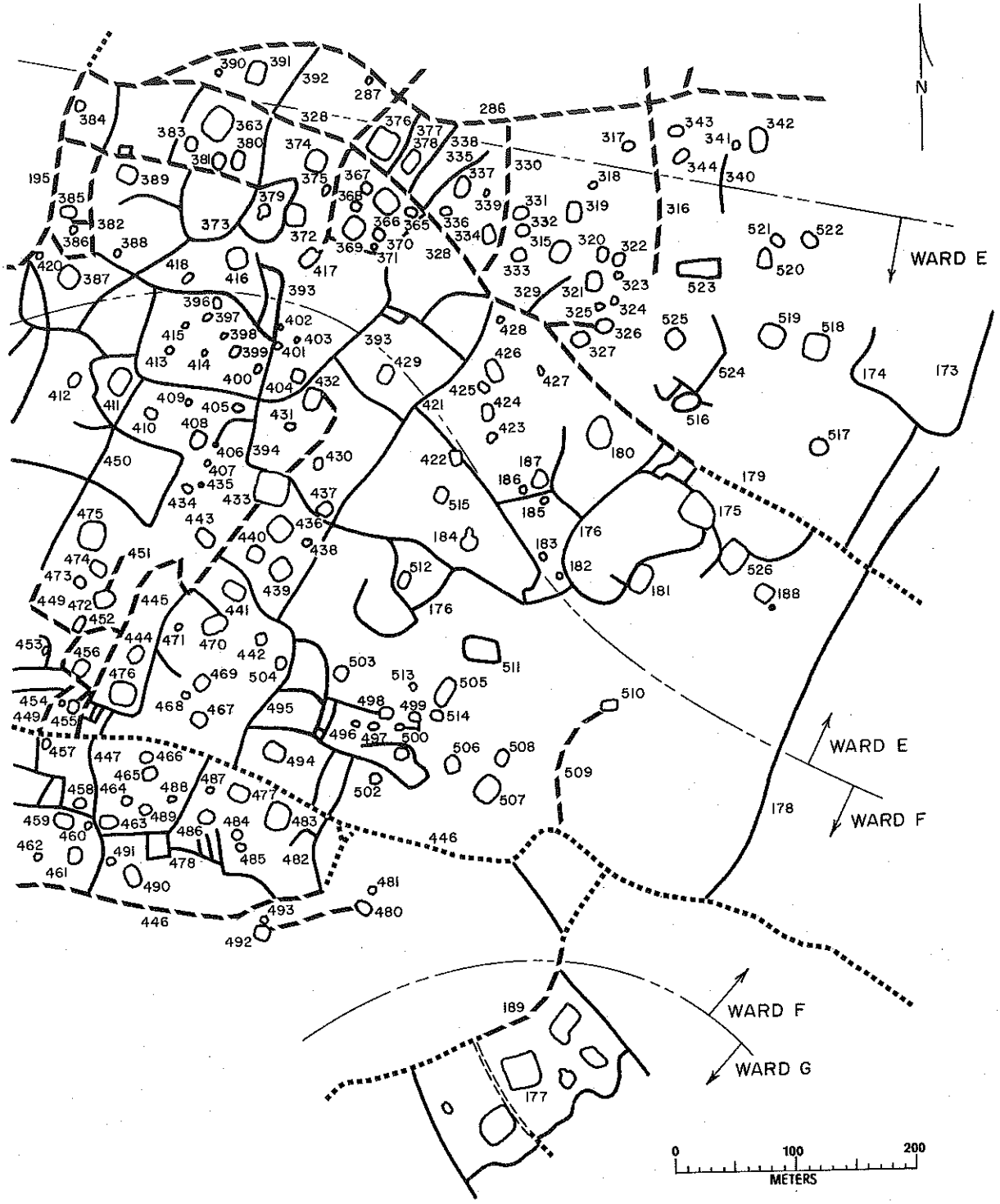


Fig. 3c. DETAIL OF MAPPED PORTION OF MT. OLO TRACT, SHOWING WARDS E AND F. Platform size and shape, and individual feature numbers are shown.

EXCAVATIONS ON MANONO ISLET

Two of the excavated sites were on Manono, one of the islets lying just offshore Upolu, to the W (Figs. 1 & 4). This island is enclosed by a wide fertile reef, an extension of the Upolu reef structure. The exposed lava flows, stone ground, and shallow soils duplicate those of western Upolu. Because Manono is so small--only 2.88 square km in area--many families are now compelled to live and farm on Upolu in the new village of Manonota, south of Manono Ferry Berth.

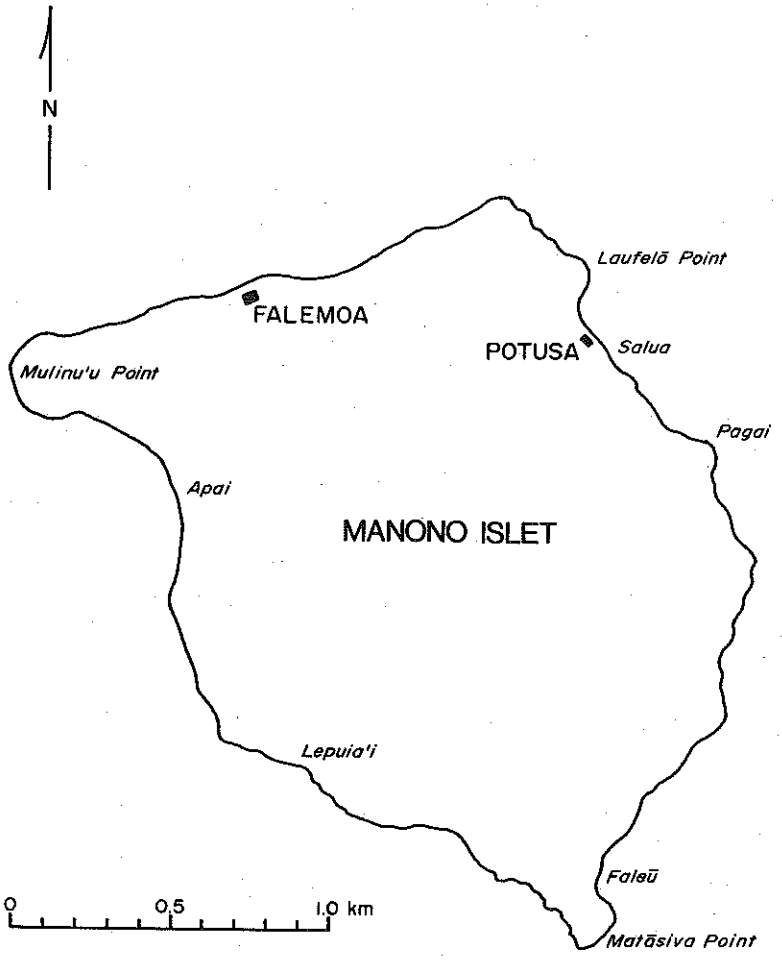


Fig. 4. MAP OF MANONO ISLET, SHOWING LOCATIONS OF EXCAVATED SITES.

POTUSA (SM17-1)

The Potusa site lies within the village of Salua (Fig. 4). It was selected for excavation because sherds, brought to the surface by land crabs, were recovered during reconnaissance. It lies low, only about 1.5 meters above high tide level, alongside the circumisland path. Excavation was confined to a series of test trenches parallel to and a few meters inland from the path, below a low stone terrace in front of several dwellings on a slight knoll.

Excavation revealed that the site was riddled with vertical crab holes, up to 7 cm in diameter. It was soon evident that many of the small potsherds had suffered considerable edge erosion. After a few days' work, no structural features--or even midden lenses--had been encountered in the fill. It was concluded that the pottery deposits were secondary, transported to the foot of the knoll by colluvial action. Permission to work on the knoll was denied, so no search for the original campsite was possible.

While the provenience of any given artifact in the site may be correct, the land crab disturbance leads to doubt. Nonetheless, stratigraphy was readily discernible, and artifacts are provenienced to their stratum of discovery.

Stratum I was the brown clay subsoil and rotten basalt encountered at all excavated sites. Stratum II, above it, was a brown, sandy fill containing sherds and scrap shell. Stratum III, a lighter brown than Stratum II, also contained sherds and shell, and a few adze chips. Stratum IV is the dark, ashy grey, humic forest soil (Fig. 5). It contained a few sherds of prehistoric pottery and recent European artifacts.

Several important types of artifacts were found at Potusa. They were primarily shell--three lures, a circular fishhook, a small ring, a fragment of a heavy shell bracelet and three cowrie (*Cypraea*) shell peelers. These are described in a later section (see also Figs. 43, 44, & 45).

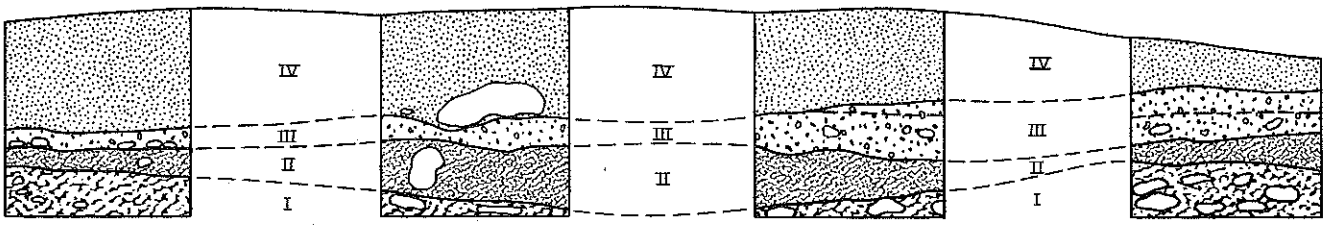


Fig. 5. CROSS SECTION OF THE EXCAVATED PORTION OF THE POTUSA SITE.

FALEMOA (SM17-2)

ERNEST S. LOHSE

SETTING

The Falemoa Site is located on the NW coast of Manono, c. .5 km N of the modern Apai village, atop a basalt hillock c. 10 meters inland from the present beach (Figs. 4 & 6). The site area proper, c. 30 by 20 meters, is bordered on the N and W by the sea, and on the S and E by a modern stone wall. The circumisland path skirts the site. It was originally chosen for excavation because it closely conformed to the series of geographic and physiographic criteria outlined by Jennings for early ceramic sites (see p. 3).

Fig. 6. BEACH AT FALEMOA. Excavation area lies in the opening between the palms at right center.

PREVIOUS INVESTIGATION

The site was first tested in 1976, with William A. Lucius as supervisor. Excavation was not completed due to the onset of the rainy season. Therefore, a crew returned to the site in 1977 to continue the investigation. The work of both seasons (Fig. 7) is included here.

All excavation at the site was controlled vertically by natural levels, and horizontally with reference to 1-meter-grid squares. All material was screened through ¼" wire mesh. A hand-held Brunton compass was used for mapping.

Initially, in 1977, the western end of the 1976 trench was re-excavated. This procedure allowed the second year's excavators to become familiar with site stratigraphy and the location of certain major cultural features. The 1977 field crew was composed of six Samoans, several of whom had been used as excavators in previous years. Gregory Jackmond, a Peace Corps volunteer, acted as interpreter and supervisory assistant during the excavation.

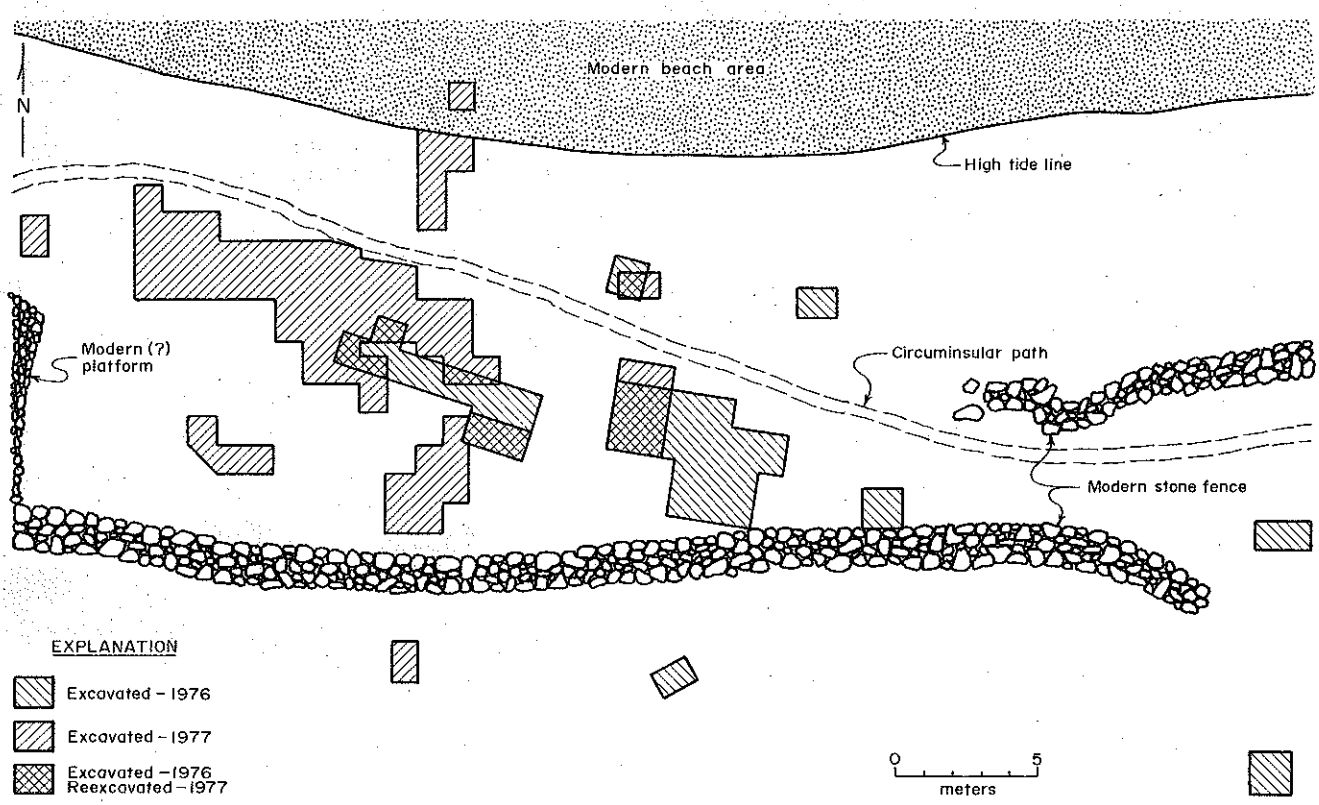


Fig. 7. AREAS EXCAVATED AT FALEMOA DURING 1976 AND 1977.

STRATIGRAPHY

Stratigraphy at the Falemoa site proved to be rather complex and, most certainly, puzzling. Though the controls are reliable, the full explanation of deposition at the site remains somewhat unclear.

Several strata were distinguished at the site: Stratum I, which may be broken down into Ia, the sterile basaltic subsoil, and Ib, the sterile basalar portion of fossil beach sand; Stratum II, the upper 15 to 20 cm of fossil beach sand, which exhibited heavy organic stain and yielded the earliest artifacts at the site; Stratum III, comprising what appears to be charcoal-stained sand with heavy concentrations of shell debris, representing the heaviest occupation layer; Stratum IV, a general cultural midden that proved to be relatively uniform throughout the site area; Stratum V, consisting of recent modern beach sand, which overlay portions of Strata I through IV; Stratum VI, a zone of downslope wash, comprising mixed basaltic subsoil and forest soil, exhibiting a high organic content as well as cultural material; and Stratum VII, representing the modern ashy gray forest soil, which also contained cultural material. The major Falemoa strata, based on content and soils, appear to correspond to those at Potusa as follows:

Falemoa	Potusa
VII (Historic)	IV (Historic)
VI, V	III
IV, III, II	II
I	I

Unlike the Potusa site (SM17-1), the Falemoa site strata were relatively undisturbed. Strata II and III, representing the earliest occupations, proved to be maddeningly variable in thickness, though easily recognizable. A good deal of downslope activity is evidenced in Strata VI and VII, with potsherds lying in the modern forest soil. However, the deposits below gave no evidence of disturbance or of possible vertical displacement of artifacts. The recorded provenience of cultural material is therefore considered reliable. See Figures 8 and 9 for a schematic cross section and composite three-dimensional rendering. Figures 10 and 11 show stratigraphy and excavations in progress.

STRATUM I

Stratum I included both the sterile basaltic subsoil (Ia) and the fossil beach sand (Ib). The subsoil was brownish, extremely granular, and derived from the decomposing basalt bedrock. The fossil beach sand was stained dark-yellow, containing a large quantity of unmodified shell debris. Wave action had eroded the subsoil, depositing fossil beach sand directly upon the basalt bedrock up to the shoreward limit of high tide. This produced a readily discernible interface between the two components of Stratum I. Basalt bedrock was reached at a depth of c. 1.5 meters below the present site surface. The upper limit of Stratum I was reached at a depth of c. 110 meters below the modern site surface.

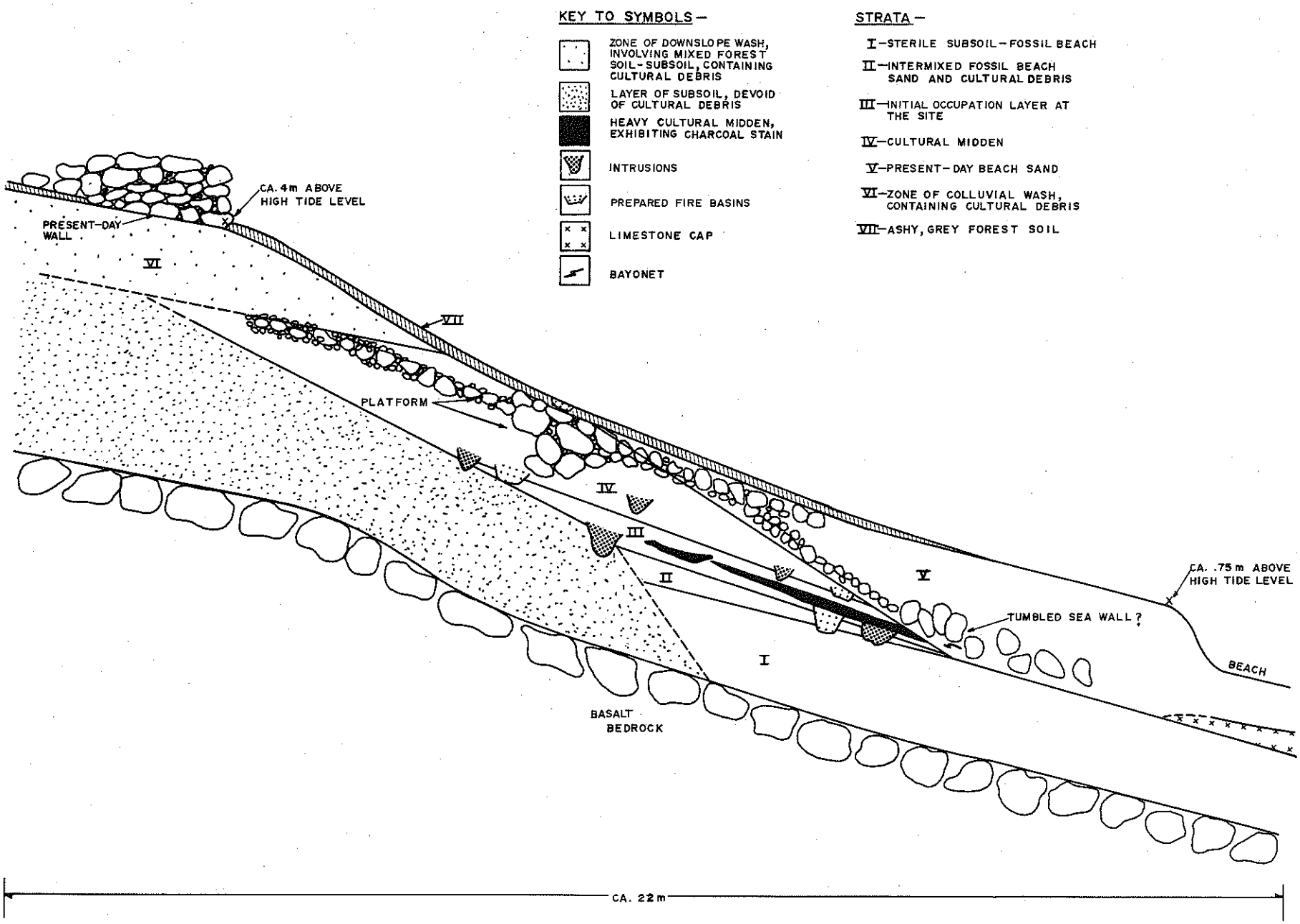


Fig. 8. SCHEMATIC CROSS SECTION OF STRATA OBSERVED DURING THE FALEMOA EXCAVATION. No scale; degree of seaward slope exaggerated.

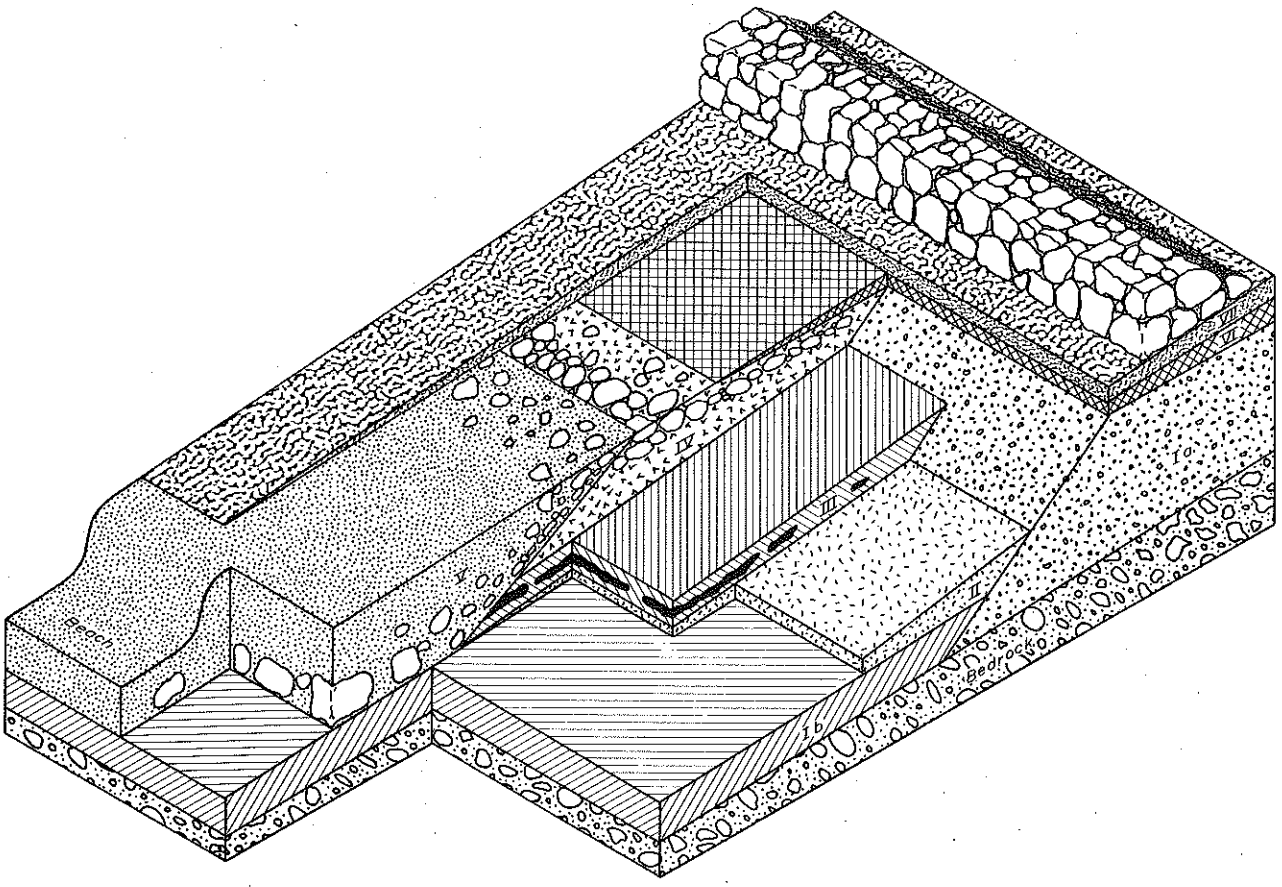


Fig. 9. ISOMETRIC SKETCH OF THE FALEMOA DEPOSITS. No scale.

Stratum I was devoid of recognizable cultural material. The remains of a large sea turtle were found lying directly atop the bedrock, within the lower portion of the fossil beach. Unfortunately, this skeleton lacked sufficient collagen for a radiocarbon date.

STRATUM II

Stratum II comprised the upper 15 to 20 cm of fossil beach sand of Stratum I on the seaward side of the site. The staining of Stratum II is probably a product of the downward leaching of humus in Stratum III deposits, which immediately overlaid it. Stratum II was identified as the earliest occupation at the Falemoa site. Radiocarbon samples obtained from shell out of this layer yielded a date of 2610 ± 50 B.P. (NZ-4343). Stratum II produced potsherds, three shell beads, two probable fishhook fragments, a worked sea-urchin spine, an adze fragment, and both charred and uncharred shell and bone debris.

STRATUM III

Stratum III was composed of what appeared to be charcoal-stained sand, mixed with clumps of shell-bone debris. This layer varied in thickness, but was identified over large areas of the

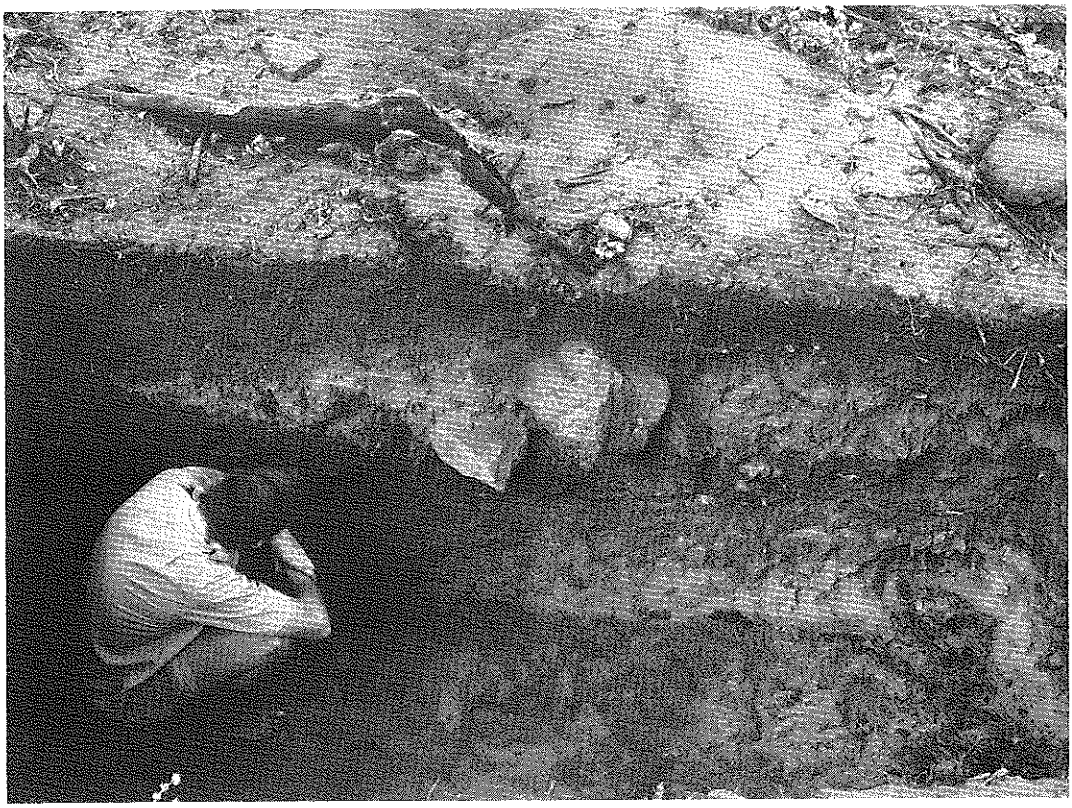


Fig. 10. STRATIGRAPHY AT FALEMOA. Although somewhat obscure, the layers include Ib, at the lower right; II, III, and IV above it. In center is the recent white sand of V, with the south end of the "platform" as first encountered. Above Stratum V is Stratum VII.

Fig. 11. GENERAL VIEW OF FALEMOA EXCAVATIONS TOWARD THE END OF THE SEASON.

exposed horizontal extent of the site. The clumps averaged c. 15 to 20 cm in thickness, and were extremely variable in extent. It seems likely that these masses of charcoal-stained sand-shell-bone were lightly cemented by the effect of the fires on the sand of the old beach surface, and possibly the subsequent wettings of these areas. Bailey (1977), describing the deposition of mounds along the Gulf Coast of the Cape York Peninsula in Australia, notes an Australian aboriginal method of cooking shells that may shed some light on the cause of these agglutinated clumps. He says that the live shells are placed in a heap on the ground and a small fire of twigs and leaves is built over the top of them, which generates enough heat to open the shells without fracturing them. If such were the case on the Falemoa beach, and these areas were constantly inundated by wave action and sand, a welding of materials similar to that observed could be expected. Floating of material revealed not even recognizable grains of charcoal, though a considerable portion of the shell debris showed evidence of having been burned.

Three definable fire basins were identified within Stratum III. All of these had their points of origin within the lower portion of the layer, and extended down into Stratum II. One fire basin was c. 75 cm in diameter, and c. 20 cm thick. A second fire basin was c. 80 cm in diameter, and c. 15 cm thick. The third fire basin was larger, c. 1.5 meters in diameter, and c. 25 cm thick. This fire basin contained darkly stained sand, occasional minute flecks of charcoal, fire-darkened rocks, and general shell debris. No artifacts were uncovered in direct association with these features. Four irregularly shaped intrusions were seen within Stratum III. These exhibited a slightly darker stain than the general deposit, but yielded no artifacts. Their strata of origin could not be determined, but they are thought to have been dug from the top of the stratum.

Stratum III produced potsherds, one possible cowrie (*Cypraea*) shell peeler, an adze fragment, one human tooth, worked examples of shell and bone, burned fish bone, and unmodified shell and bone debris.

STRATUM IV

Stratum IV was a generally sandy midden that occurred uniformly throughout the site area. It was observed at a depth of c. 25 cm below the present site surface, and extended down to the upper limits of Stratum II, or if this feature was lacking, down to the upper limits of Stratum I. The layer thinned markedly as it sloped down toward the modern beach area, and ended abruptly with the introduction of Stratum V. Stratum IV did not exhibit the agglutination and dark stain evidenced in Strata II and III, and, taking into account the differences in the thickness of deposit between the three layers, was much poorer in cultural material.

What may have been a platform was observed within the upper limits of Stratum IV, at a depth of c. 20 cm below the present site surface. Though not fully defined, the structure extended over an area of at least 10 meters N-S, and 10 meters E-W. The lower portion or foundation of the structure originated within the lower limits of Stratum IV, at a depth of 70 to 80 cm. This foundation consisted of large, unshaped basalt boulders, loosely fitted together to form an abutment vertical to the slope of the site. Above this were laid smallish cobbles, and

atop these, a pavement of smaller stones. This surface or pavement sloped slightly down toward the modern beach area. Interestingly, no large boulders could be observed beneath these small stones as excavation approached Stratum V. This may denote a marked downslope movement at the site.

Two relatively well-defined fire basins were uncovered within Stratum IV. The first was c. 60 cm in diameter and c. 15 cm in thickness. It was located immediately below the platform, and contained heavy organic stain, as well as burned and unburned shell and bone debris. The second fire basin was c. 75 cm in diameter and c. 15 cm in thickness, extending from the lower portion of Stratum IV into Stratum I. The sand around this basin showed considerable fire-reddening. The fill consisted of meager amounts of small charcoal flecks and ash.

Five irregular intrusions or disturbed areas were also situated within this stratum. None of these had any associated cultural debris.

Stratum IV produced potsherds, including one decorated rim sherd, worked sherds, one probable fishhook fragment, one example of worked shell, one unidentified mammal mandible fragment, and general shell and bone scraps.

STRATUM V

Stratum V comprised the whitish, recent beach sand. This layer immediately overlay the seaward portions of Strata I, II, III, and IV. Artifacts were recovered from this layer but only within the lower portions directly overlying Strata II and III.

What may be postulated as a seawall was uncovered within the middle to lower reaches of Stratum V. It consisted of an irregular alignment of tumbled, waterworn basalt boulders, extending along the seaward perimeter of the site at a depth of c. 40 cm below the present site surface, roughly paralleling the modern beach. A portion of this feature extends out along the open beach area to the W. A badly corroded bayonet, presumably dating to the late 18th or early 19th century, was uncovered directly below a basalt boulder, in the lower portion of the modern white beach sand. It would therefore seem that no great age should be assigned to either the supposed seawall or the Stratum V beach sand as a whole.

The lower, inland reaches of Stratum V produced potsherds, half of a polished shell bracelet, a fishhook fragment, an adze fragment, a modified sea urchin spine, and unmodified shell, bone, and coral debris.

STRATUM VI

Stratum VI comprised a zone of downslope wash, consisting of mixed subsoil and forest soil. Brownish, lighter in color than Stratum IV, this layer directly overlay the inland one-third of the platform. The boundary between Strata VI and I was indistinct, as the upper layer gradually blended into the lighter color and coarser texture of the lower. Stratum VI was further defined by the presence of cultural material. The upper 30 cm of the stratum produced a few potsherds, and meager amounts of unburned shell debris.

STRATUM VII

Stratum VII was the modern surface zone of forest soil. Dark-brown, granular, and containing a large percentage of sand, this layer varied from 10 to 25 cm in thickness. It tapered gradually downslope to merge with the modern beach sand of Stratum V.

A shallow fire basin, c. 50 cm in diameter, and c. 10 cm thick, was located within this stratum. Minimal concentrations of ash and charcoal were observed, and no artifacts were recovered in association. A human burial was also found within Stratum VII at a depth of c. 10 to 15 cm. The remains were in extremely fragmentary condition. The body appears to have been placed on its right side, in a loosely flexed position. The burial pit extended down into Stratum IV, to a maximum depth of c. 40 cm. No artifacts were uncovered in association with this fairly recent burial.

Stratum VII produced numerous potsherds, one polished shell bracelet fragment, various historic artifacts, and general shell debris.

DISCUSSION

As stated previously, the stratigraphy at the Falemoa site proved to be surprisingly complex, as compared to Potusa. Strata I, V, VI, and VII were found to be fairly uniform throughout the site area. These strata were remarkably consistent in thickness and artifact content. Only Strata VI and VII showed any signs of disturbance, presumably due to downslope erosion. For example, Stratum VII, or the surface zone, contained eroded potsherds. Below these upper two strata, excavation controls were firm with no evidence of artifact displacement. Strata II, III, and IV, were found to be variable in thickness over the horizontal extent of the site. Stratum II was uncovered in direct association with and below Stratum III, which comprised darkly stained, agglutinated clumps of shell and bone debris. Stratum IV was exposed only along the eastern portion of the site, with its western extent roughly corresponding to the western margin of the platform, gradually tapering out into the Stratum VII forest soil. Stratum V, the modern whitish beach sand, is extremely puzzling. The sand was deposited over Strata I, II, III, and portions of IV including the platform, and extends inland 5 meters beyond the modern high-tide mark. The reason for this inland extension is unclear. It may be the result of a catastrophic event--perhaps a tsunami, which may have also resulted in the tumbled seawall and disturbed platform. However, the explanation of the deposition of Stratum V must remain something of a mystery.

Unlike the Potusa site (SM17-1), disturbance within the lower five strata of the site is, at most, minimal. No crab channels were observed, artifacts show little edge erosion, and interfaces between layers are clear and distinct. Recorded artifact proveniences are firm, and are considered to be valid.

CONCLUSIONS

The Falemoa site appears to have been an early living site, consisting of multiple brief occupations, initially taking place on the beach sand about 600 B.C. No habitation structures were uncovered in the earliest levels, with occupation apparently consisting of temporary camp-sites. Habitation, though appearing to be heaviest in the initial strata, seems to extend into the historic period. The occupation at the immediate site area could never have been of prolonged duration, nor have involved more than a handful of people.

FIAPITO

RICHARD N. HOLMER

INTRODUCTION

The Fiapito household unit is located on the northeastern edge of the Mt. Olo survey tract. The terrain slopes gently toward the N and the ground surface is relatively more clear of stones and ferns than in the other wards. The HHU consists of four platforms (SU17-3, -4, -24, and -25) in an area of 6,750 square meters, bounded to the N and E by intersecting walkways (SU17-7 and -8) and to the S and W by stone fences (SU17-528) (Fig. 12). Portions of the HHU have been badly disturbed by the construction of modern plantation roads and fences, although the original shapes of all the structures can be determined. Fiapito was selected for excavation because it is the only clearly defined HHU in Residential Ward A.

EXCAVATION AND STRATIGRAPHY

Excavation began on August 16, 1977, and concluded on September 5. A total of 1,000 square meters of surface area was cleared of vegetation and 15 cubic meters of soil and stone were excavated. All excavations were backfilled upon completion and the structures were restored to approximately their original shape and appearance.

The stratigraphy of the site is consistent with that of earlier excavations in the Mt. Olo tract. The two soil strata (subsoil and topsoil) are the results of in situ pedogenesis, the decaying of the underlying basalt flows into soils by natural processes. The topsoil is less compact and contains much more organic material than the subsoil, which grades directly into the volcanic bedrock. No culturally related soil deposition was observed at the site; the surface of origin for all excavated structures is essentially the modern surface.

STRUCTURES

PLATFORM 1 (SU17-25)

Platform 1 is a low stone structure outlined by curb stones. It measures 31 by 25 meters at most and varies in height from 50 cm on the northwestern corner to ground level along the southern edge, where it blends into the gentle slope.

Approximately 75% of the platform was cleared of vegetation, revealing a rough surface with a few areas of small stones arranged in a pavement. The paved areas are located exclusively on the northeastern quarter of the platform on the rectangular protrusion (Fig. 12). The western two-thirds of the platform consists of a rough surface of large boulders, suggesting that no superstructure ever existed on that portion of the platform. The paved areas were examined for evidence of a superstructure outline but none was apparent. Numerous large disturbances, possibly from the growth and collapse of large trees, interrupted the paved areas. Platform 1 was not excavated because of the disturbed nature of the possible living surface area.

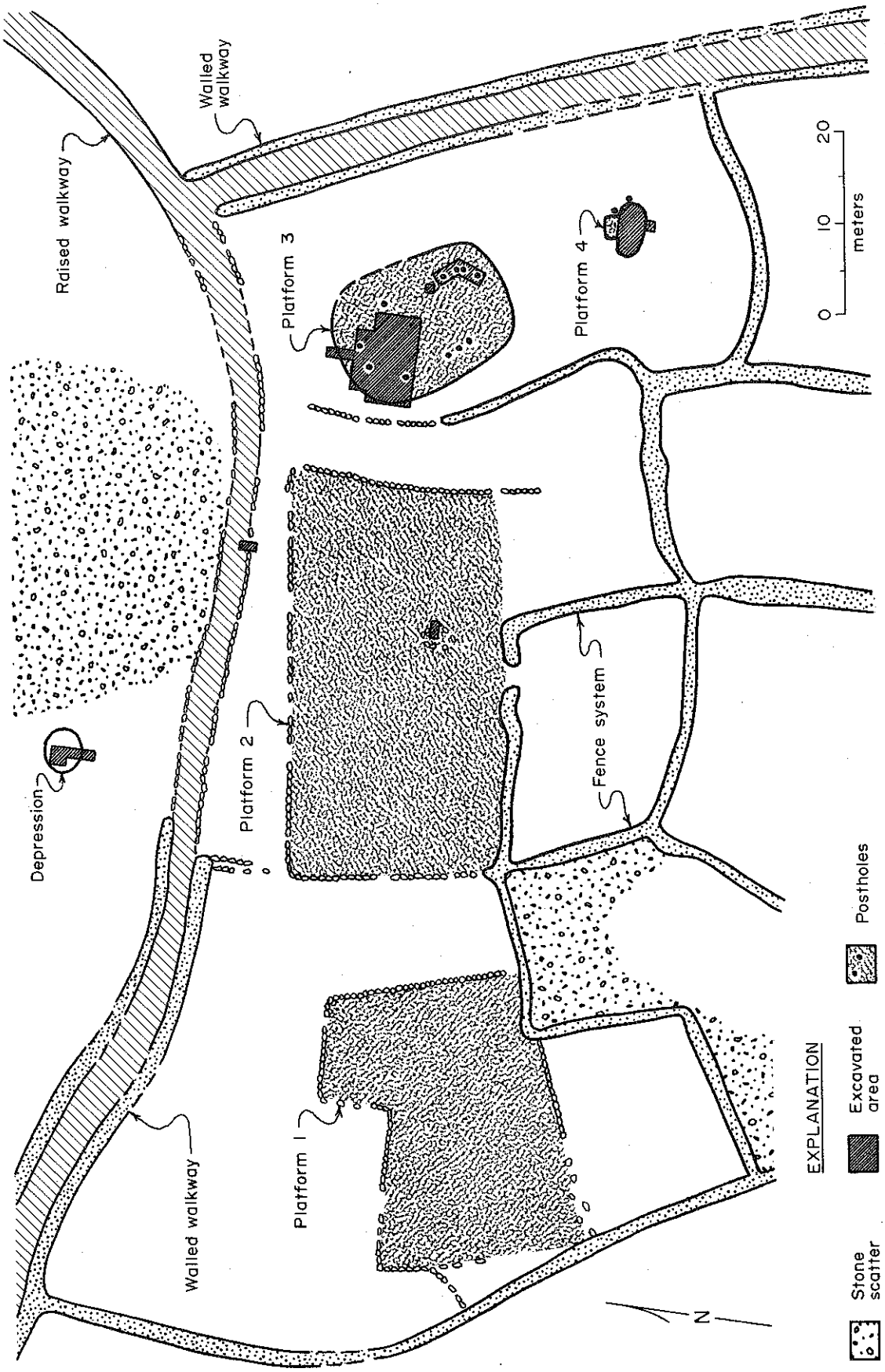


Fig. 12. MAP OF FIAPITO HOUSEHOLD UNIT.

PLATFORM 2 (SU17-24)

Platform 2 is a low, rectangular-shaped stone platform outlined by curb stones. It measures 45 by 23 meters and varies from 15 cm high on the NW corner to ground level along the southern edge.

Several small areas of pavement occur on the surface of the platform, although all appear to be disturbed by vegetation growth. A small paved area on the northeastern corner was cleared of vegetation; it appeared highly disturbed and was therefore not excavated. Excavations were conducted, however, near the center of the platform in an area that appeared to be curbed. Excavations revealed that the displacement of stones into an oval pattern was probably the result of the growth of a large tree, rather than of cultural origin.

PLATFORM 3 (SU17-4)

Platform 3 is a low stone platform representing a type of construction different than that of Platforms 1 and 2. It is not outlined by curb stones but consists mostly of small stones (2 to 10 cm diameter) piled approximately 51 cm thick, with gently sloping sides. The platform is roughly rectangular in shape, measuring 16 by 20 meters. Unlike the other platforms in the HHU, it appears to be relatively undisturbed with few large areas of heavy tree-growth. Because of its apparent preservation, it was the target of most of the excavation efforts at the site.

The entire platform was cleared of vegetation and a test trench was excavated on the northern edge. Fifteen surface depressions were visible, several of which were uniformly spaced in an oval. Eight depressions were examined. Several appear to be the result of the collapsing of stones that once surrounded posts. The pattern indicates posts of 18 to 20 cm diameter, spaced at approximately 1.8-meter intervals, and set at depths of 48 to 78 cm below the platform surface. The superstructure outlined by the post pattern appears to have covered an area of approximately 100 square meters, which is large compared to modern-day house superstructures.

PLATFORM 4 (SU17-3)

Platform 4 is a stone-rubble mound measuring 5.7 by 4.6 meters and 40 cm high. Curb stones occur along the northern and eastern sides and a curbed ramp (2.5 meters wide and 1.5 meters long) extends to the N toward Platform 3, which lies approximately 14 meters away. The eastern half of the platform appears undisturbed, consisting of an area paved with small stones. Excavation in that area provided no evidence as to the function of the platform, although the lack of charcoal, ash, or fire-reddened stones indicates that it did not support a cook house as had been hypothesized. Two well-formed post holes were located on the outside of the curb stones, around the eastern end of the platform, suggesting a superstructure covering approximately 20 square meters, supported by posts 15 cm in diameter and spaced at 1-meter intervals.

WALKWAYS (SU17-7 and -8)

The walkway that forms the northern edge of the HHU is one of the major walkways in the Mt. Olo Settlement. As it enters the HHU from the W, it is a walled walkway with a total width of approximately 7 meters. The slightly crowned earthen path forming the center of the walkway

is approximately 2 meters wide. Paralleling the path on each side are gutter-like stone pavements, measuring approximately 1.25 meters wide. On the outside of those are the remnants of fences measuring approximately 1.25 meters wide at the base. The original height of the fences is impossible to determine because of the collapsed condition of the entire length of the walkway.

Adjacent to the northwestern corner of Platform 2, the walkway changes from a walled walkway to a ground-level path delineated by parallel alignments of curb stones. At that point the pathway becomes wider, measuring 2.5 to 3.0 meters. To the NE of Platform 3, the curbed walkway is intersected by the remnants of a badly disturbed walled walkway, running N-S to form the eastern edge of the HHU. The E-W walkway continues as a low raised walkway with curb stones along each side of the path. To the N, it passes through areas of settlement similar to (or an extension of) Ward A for some 400 meters.

The N-S walled walkway is less elaborate. It consists of two stone fences paralleling a 2-meter-wide clay path. The fences are highly disturbed, apparently from the construction of the modern plantation fence and road. Farther to the S, the walkway is in better condition with a total width of approximately 4 meters and a path width of approximately 1.5 meters.

FENCE SYSTEM (SU17-528)

The fence system that delimits the southern and western edges of the HHU also forms several enclosures to the S of the platforms. The enclosures may be agricultural plots and are probably a part of the Fiapito HHU since there are no other nearby platforms with which they can be associated. The soil within the fence enclosures is relatively stone-free, except for some scatter (Fig. 12). The fences vary greatly in size from a few stones wide and high to rounded heaps approximately 3 meters wide and 1 meter high. Although there are no standing sections of fence remaining, in some areas one or two courses of wall stubs vary in width from 0.9 to 1.3 meters.

PORTABLE ARTIFACTS

The artifacts recovered from the Fiapito site are very limited. They consist of two identifiable adzes, one from a post hole in Platform 3, and one from the outside edge of Platform 4. A nonidentified adze fragment also occurred in Platform 4.

INTERPRETATION

The excavation of the Fiapito site has provided a sample of a household unit from Residential Ward A of the Mt. Olo Tract. The HHU consists of four platforms, two of which fall into the large platform category.

Architectural information concerning superstructures was obtained only from Platform 3. A post-hole pattern outlines a 100-square-meter floor area, which is large enough to allow

postulation that it was a community house (see arguments and references in the Tausagi section of this report). A Type X adze fragment was recovered from one of the post holes, but because this type is not temporally diagnostic (Green 1974:260) it is of little interpretive value.

If Platform 3 is a community house, Platform 2 might be expected to be a chief's residence. It is larger and higher than Platform 3 although the largest platform in the cluster is outside of the fenced HHU enclosure, approximately 30 meters to the W. Whichever might be a chief's house is not the point that needs to be considered. The important fact is that clusters of large platforms are associated with larger than average floor areas, supporting Davidson's (1974c:231) view that they represent high-status structures. The correlation also occurs at the Tausagi Site at Mt. Olo.

In summary, the Fiapito site appears to have been a high-status cluster of structures including a community house. Other platforms in the direct vicinity may have been a chief's house and dwellings and workhouses for retainers.

TEN POINTS

NANCY J. HEWITT

INTRODUCTION

The Ten Points site is located in the Tausagi section of the WSTEC coconut plantation. Situated on the southern edge of the Mt. Olo crater, this site is located in Ward B of the Mt. Olo Survey area (Fig. 3a). Ten Points consists of three main features, including a ten-pointed star mound (SU17-552), a walled walkway (SU17-548), and a large oval clearing (SU17-549), possibly a commons or a *malae* (Fig. 13). About 40 meters north of Ten Points is another star mound (SU17-95). Although the research plan called for the inspection of compact household units, the combination of unusual characteristics (star mound, walkway, and possible *malae*), the good condition of the star mound, and the need for more information about the function of star mounds led to the decision to excavate SU17-552.

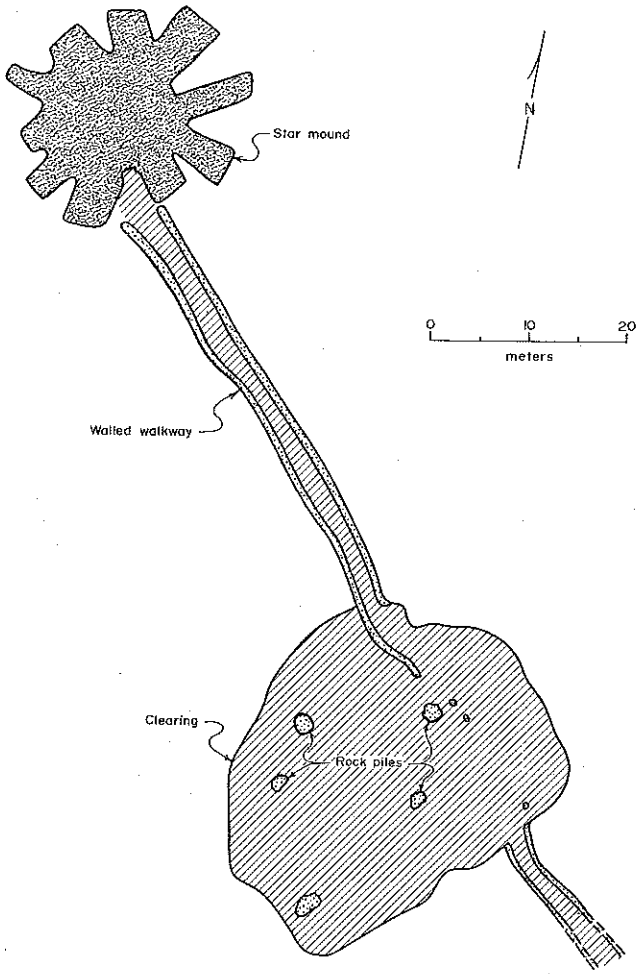


Fig. 13. MAP OF TEN POINTS, WITH THE ASSOCIATED WALKWAY AND POSSIBLE COMMON OR *MALAE*.

EXCAVATION AND STRATIGRAPHY

Excavation objectives were to learn constructional details, identify any related features that might give a clue as to the function of the star mound and large clearing, and obtain datable organic material. Excavation began on August 16 and continued to August 31, 1977. The crew consisted of six Samoan workmen and an interpreter/foreman. Two of the workers and the foreman had previous excavation experience.

The initial procedure was to remove all the vegetation from the star mound and the walled walkway, and to establish a meter grid system for control. Then two test trenches were put into the star mound. Both were 2 meters wide; one was 8 meters in length, and the other 7 meters. The 8-meter trench was dug to the basaltic bedrock; the other was extended only to sterile subsoil.

A 1-by-2-meter trench was excavated to bedrock in the walled walkway, two 2-by-2-meter trenches were dug to subsoil in the clearing, and a 1-by-2-meter trench was extended to bedrock beneath an amorphous rock pile within the clearing. A total of more than 28 cubic meters of earth and stone were excavated, then replaced.

The stratigraphy of all three sites was simple and uniform. Stratum I is the slick, dark yellowish-brown, clayey, sterile soil, which contains various sizes of rotting basaltic rocks. This layer is homogeneous and found beneath all features of the site. It varies in depth from .20 to 1.25 meters. Stratum II is the dark-brown, crumbly forest soil containing much organic material. Average thickness is 10 cm. This stratum is found throughout the area and is the surface of origin for the major structural features. It should be mentioned here that the basaltic bedrock underlying Stratum I beneath the star mound rises toward the center of the mound and occasionally forms the actual ground surface.

STRUCTURES

STAR MOUND (SU17-552)

The star mound, labelled Ten Points, is prominently located on the very edge of the Mt. Olo crater. It is a well-preserved structure and has ten rectangular arms or protrusions varying in length from 4 to 10 meters, and in width from 2.5 to 4.5 meters (see Fig. 13). The mound itself has a maximum diameter of 25 meters (from the tip of one arm to the tip of the arm opposite it), an average height of .80 meter, and a maximum height of 1.2 meters.

The entire structure is built with a loose rubble of basaltic stones that display no evidence of mortar or artificial shaping. The vertical sides are faced with several courses of fairly large (80 by 60 cm) stones. The loose fill of the structure consists of stones ranging from 20 to 60 cm in diameter. Limited portions of the surface, particularly the arms, are paved with small stones (5 by 8 cm). Very small pieces of charcoal were scattered throughout the stone rubble; one sample found on the forest soil (Stratum II) beneath the star mound was ample for dating.

Eleven surface depressions of varying depths were mapped but revealed no apparent pattern and may be the result of modern disturbances. Since there is no evidence to indicate multi-constructional stages, it is assumed that this star mound was built in a single phase. As Holmer (Jennings et al. 1976:28) has suggested, the technique for construction probably involved building the perimeter first, then adding the stone rubble.

Between two of the arms on the south side of the star mound is a gently sloping ramp, which begins at the walled walkway and goes to the top of the mound, presumably providing access to it. The ramp is constructed of tightly fitted, fairly flat basaltic rocks and is defined on both sides by flat upright stones. It measures 1.72 meters in length and is .79 meter wide.

WALLED WALKWAY (SU17-548)

The walkway consists of two parallel stone walls with a 1.5 to 2-meter-wide pathway between them. Only a few sections of the walls are intact, but this was adequate to discern constructional details. Each wall consists of a type of double-walled construction with a rubble core, and is at least three courses high (average 50 cm). Average thickness of the intact walls is .65 meter. This walkway runs from the ramp for 48 meters down the south slope of Mt. Olo to the clearing.

CLEARING (SU17-549)

Although this feature is not a structure per se, it deserves brief discussion. Situated in a natural basin, this large oval clearing (33 by 37 meters) is surrounded on all sides by heavily rock-strewn areas. It appears that stones were deliberately piled up along the edges; it is assumed that these stones were removed from the clearing. Within the area are eight small, low piles of stone, all amorphous and less than 20 cm in height. Excavation into one of these revealed only that it was built on forest soil (Stratum II); its purpose is unknown. Several excavations within the clearing revealed that the subsoil had not been disturbed, which fully rules out its use for agriculture.

The walled walkway enters the clearing on the NW side, penetrating it for 8 meters. Directly across the clearing on the SE side, the walkway resumes and continues for about 15 meters, where it is interrupted by a modern road. The relationship of the walkway to the clearing suggests that the clearing may have been a secular village green or *malae*, or that it had some other functional connection with the star mound, although no material evidence was recovered to support either hypothesis.

PORTABLE ARTIFACTS

Three artifacts were recovered from the star mound. A stone adze (Type I) was found on the surface of the forest soil (Stratum II) beneath it, an adze flake was recovered from the rocks, and a modern bullet was found in the initial test trench.

INTERPRETATION

Excavation of the star mound did not reveal any positive evidence about its function. However, the scarcity of artifacts and lack of post holes and other habitational features did indicate that this structure was non-residential. No evidence of burials was found in the excavated portions.

Contemporaneity of the star mound, walkway, and clearing is assumed because of their relationships to each other. The radiocarbon date (1665±65 B.P.) obtained from beneath the star mound predates the complex. Therefore, dates of construction of the star mound and associated features can only be inferred from dates of other star mounds. In the Mt. Olo area, the Cog Mound dated from 440 B.P., or c. A.D. 1500 (Jennings et al. 1976:31). Another star mound near Luatuanu'u, excavated by Peters (1969), was also constructed late in Samoan history.

It has been hypothesized by many that star mounds had some ritual function, despite the traditional explanation that they were pigeon-snaring mounds. The combination of this star mound with the ramp that leads directly down to the walled walkway, which in turn runs into the clearing, leads one to believe that the whole complex had some special function. If the clearing is comparable to a *malae*, meetings would have been held there.

It may also be significant that this complex is located a considerable distance from any residential features, although other star mounds are found in association with residential platforms.

TULAGA FALE

NANCY J. HEWITT

INTRODUCTION

The Tulaga Fale site, located in Ward C of the Mt. Olo tract survey, is in the Tausagi section of the WSTEC coconut plantation. The surrounding terrain is rocky, undulating, and slopes gently to the south. Defining the eastern edge of the site is a large natural depression, which may be a crater or collapsed lava tube. This complex, recorded in 1974, consists of thirteen raised stone platforms ranging in area from 23.3 to 728 square meters, one raised walkway, one walled walkway, one earth oven (*umu ti*), and numerous amorphous rock piles (Fig. 14). The structures incorporated bear the individual site numbers SU17-88 through 92, -127, -128, -130, -131, -149, and -150. This site was selected for excavation because it typifies a householdunit and was in a relatively undisturbed condition.

EXCAVATION AND STRATIGRAPHY

Eight platforms and major portions of both walkways were cleared of vegetation. Five platforms and one rock pile were excavated in varying degrees in a search for constructional details, post holes, organic material for dating, and any other cultural phenomena. The earth oven Ma'a Ti was excavated by Gregory Jackmond and is reported here (see p. 51).

Excavation commenced on September 1 and continued to October 6, 1977. The crew consisted of eight Samoan workers and a foreman/interpreter. A meter grid system was set up over the entire complex to establish horizontal provenience. A total of 75 cubic meters of soil and stones was excavated and more than 2,300 square meters of surface area was cleared of vegetation. All excavated areas were back-filled upon completion; all structures were restored to their original appearance.

The stratigraphy of this site duplicates the sequence found throughout the Mt. Olo area. Both strata, topsoil (or "forest soil") and subsoil, are the result of in situ pedogenesis. Beneath the subsoil is the basaltic bedrock that occurs above the surface as outcroppings. Excavation of the five platforms revealed that four were constructed on these outcroppings, incorporating the exposed flow.

STRUCTURES

PLATFORM I (SU17-90)

Platform I is a large raised stone structure measuring 22 by 23 meters and ranging in height from 1.45 meters on the S, where the terrain slopes southward, to .50 meter on the roughly level N end. The entire surface of this structure was cleared of vegetation, revealing a relatively flat surface, paved in some areas with small stones. Six surface depressions were mapped but revealed no pattern and, because of the great variation in size, do not appear to be

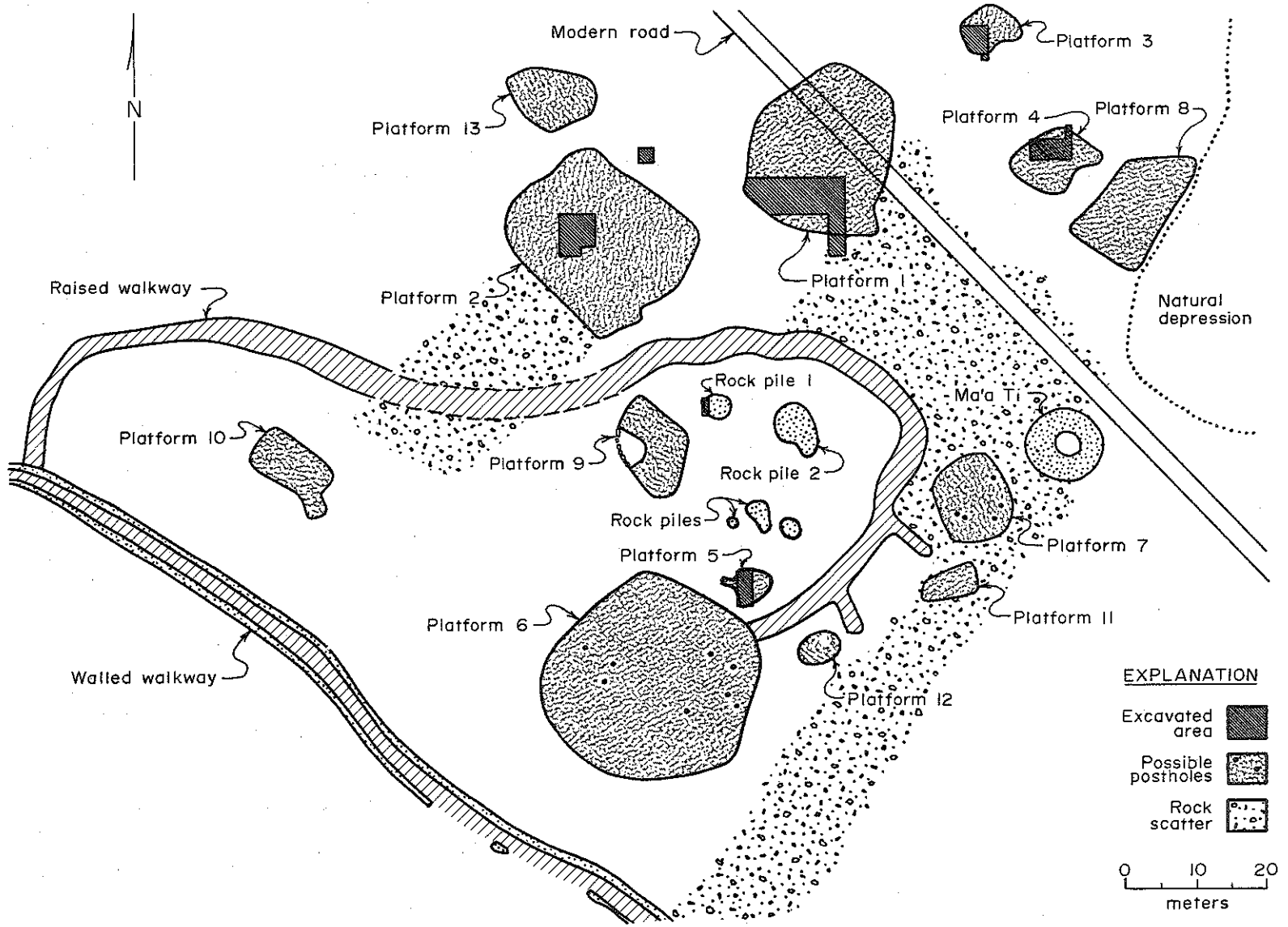


Fig. 14.. MAP OF TULAGA FALE, INCLUDING THE MA'A TI EARTH OVEN.

post locations. This squarish structure was constructed entirely of basalt. What can be called curb stones outline the platform, standing two to three courses high. The remainder of the structure is made up of a rubble of 40-by-40-cm rocks.

Original excavation strategy was to remove the stones of the platform to the subsoil in an attempt to find post holes. However, the structure proved to be constructed on a natural rock outcrop and had no soil beneath it. Therefore, any posts erected to support a superstructure would have been anchored in the rocks of the platform. A search for post holes or collapsed post bracings among the rocks failed; the looseness of the rocks precluded preservation of such features. No curbed outline of a superstructure or pavement of small stones was discernible on the surface.

Between this platform and Platform 2 is a rock-free area (Fig. 14). A 2-by-2-meter trench was excavated here, since it was postulated to be a garden plot. Excavation revealed no disturbance of the subsoil.

PLATFORM 2 (SU17-91)

This platform is roughly square, measuring 21 by 22 meters. Compensating for the slope, the S side of the structure measures 1.10 meters in height. To the N and E, the platform is nearly level with the ground. The surface is relatively flat in the middle, then slopes gently in all directions toward the edges. Clearing of the entire platform surface revealed that there was more forest soil on the surface and mixed with the rock fill than is typical. Subsurface excavation showed that the rubble fill consisted of small (10 by 10 cm) rocks with larger stones defining the edges.

Although the bedrock came close to the ground level below this structure, it never emerged as an outcropping. There was subsoil beneath the platform, and two possible post holes were found intruding into it. They measure 23 by 23 by 48 cm and 20 by 20 by 25 cm. Also intruding into the subsoil and sealed by the construction of the platform were three fire basins or possibly shallow earth ovens (*umu*). The largest of these was a pit (Pit A) measuring 90 by 95 cm in diamter and 40 cm in depth. The sides and bottom were lined with small charcoal chunks, granular fire-reddened earth, and rocks. A date of 1100±110 B.P. (A.D. 850) was derived from the charcoal. The two other basins were shallow (Pit B measured 100 by 70 by 20 cm, and Pit C measured 57 by 47 by 10 cm) and contained some charcoal and fire-reddened rocks and soil. Carbon samples were taken but were insufficient to submit for dating. A small stone flake was recovered from Pit B.

A well-used *kava*-pounding mortar was imbedded in the surface of this platform. Several adze flakes, an adze fragment, pieces of coral and a Strombidae shell were also found in association with this structure. Considering the flat, fairly smooth surface and the two possible post holes, it is assumed that this platform was the foundation for some kind of structure.

PLATFORM 3(SU17-88)

Platform 3 is a small (7 by 9 meters) stone structure, raised above ground level to a maximum height of 60 cm. Much of the flattish surface was paved with small stones and, therefore,

probably supported a superstructure of some sort. The sides of the platform slope sharply, tending toward vertical.

Two shallow depressions on the surface were investigated as possible post holes, with negative results, due to the rock outcropping on which the platform was constructed. A long depression, measuring 2.8 by 1.6 meters in diameter and 60 cm deep, was observed in the NW side of the platform. Excavation gave no clues as to the purpose of this feature.

The only artifact recovered from this platform was a modern bullet.

PLATFORM 4 (SU17-89)

Similar in shape to Platform 3, this platform is slightly larger, measuring 9.4 by 8.1 meters. Constructed entirely of basaltic rocks--larger ones forming a curbing along the edges, and smaller ones in the rubble core--Platform 4 reaches a maximum height of 90 cm. The surface is relatively flat, sloping slightly to the S, and paved with small (5 by 8 cm average) stones. The sides of this platform are nearly vertical and only one stone high.

Two surface depressions were traced down to ground surface to see if they intruded into subsoil, but like Platforms 1 and 3, this structure was erected on a natural outcropping of basaltic rock.

Two artifacts were recovered from this platform: a smooth, fine-grained stone, apparently not indigenous to the Mt. Olo area, and a piece of Strombidae shell.

PLATFORM 5 (no site number)

Due to the small size of this platform and its proximity to the largest platform (Platform 6), it was investigated as a possible cooking house (*fale umu* or *umu kuka*). This oval structure measures 4.9 by 4.9 meters and has a maximum height of 60 cm above ground level. The surface is fairly flat, slopes to all sides, and is paved with small stones (5 by 5 cm average).

Excavation revealed that Platform 5 was also constructed on a rock outcropping and that the small-stone rubble of the structure is actually only 25 cm deep. The larger rocks that form the edges are part of the natural outcropping. On the W side a small ramp-like feature, measuring 1.25 meter wide and 1.57 meter long, slopes gently from the top of the platform.

After nearly 10 square meters of this platform had been excavated and no charcoal, fire-reddened rocks, or other signs of culinary activities were found, the idea of a cook house was abandoned. Even the ground surface directly adjacent to the platform was checked for post holes, with negative results. Function of this structure, therefore, is not known and its use as a small house foundation is only inferential on the basis of the paved surface.

PLATFORM 6 (SU17-130)

Platform 6 is the largest and most disturbed platform in the complex. It measures 28 by 26 meters and has a maximum height of .90 meter above ground level. Roughly square, it is

constructed entirely of basaltic rocks (average size 30 by 40 cm) with vertical edges of larger rocks (50 by 60 cm). Although the surface is fairly level, it is very disturbed and the typical small-stone paving is virtually non-existent. Due to its dilapidated condition, no excavation was conducted after clearing of vegetation.

Forty-five surface depressions of varying diameters were mapped and carefully examined. It was reasoned that if these were post holes, each would have been surrounded originally by a circle or ring of tightly fitted stones that anchored the post. With the removal or decay of posts, the stones within each depression would have collapsed slightly inward and downward, and therefore would be readily distinguishable from the rubble core of the structure. Since other agents, such as tree roots, could have altered the platform surfaces, only those disturbances that appeared to fit the circular collapsed situation were regarded as post holes (Fig. 14). They form no pattern.

The disturbed condition of this platform leads one to suspect that it may be older than the other platforms in the complex and that stones were perhaps robbed for construction of others. Unfortunately, we have no dates to confirm or disprove this thesis. The large size suggests that the platform may have supported the chief's house or a community house, but we found no concrete evidence such as curb stones outlining the area of a superstructure nor small, stone-paved areas.

PLATFORM 7 (SU17-150)

Platform 7 is a small platform measuring 10 by 13 meters. It is raised above ground level to a maximum height of 90 cm. The entire structure is constructed of stone, displaying the typical outline curbing of large stones and a heterogeneous rubble core. The sides are vertical, one to two courses high.

This platform was not excavated, but clearing the vegetation revealed a flat surface area of 8 by 8 meters, with the remainder of the surface sloping gently toward the S. The surface was somewhat disturbed and had very limited small-stone pavement. Thirteen surface depressions were carefully examined and mapped. Five were marked as possible post holes that formed a roughly circular pattern. These five depressions were cylindrical, defined by a ring of tightly fitted rocks, and the loose rock and dirt fill was easily removed to the ground level beneath the platform.

PLATFORM 8 (no site number)

This platform, located in the crater-like depression E of the site, measures 8 by 15 meters. Roughly rectangular and constructed of stone, it is raised above ground level to a maximum height of 40 cm. The bulk of the structure consists mostly of coconut-sized stones, with a curbing of larger stones defining the edges. The disturbed surface slopes toward the natural depression and lacks the small-stone pavement. The SE side is deteriorated and grades into the depression. Only a small portion of the surface was cleared of vegetation and no excavation was conducted.

PLATFORM 9 (no site number)

This platform is a raised stone structure measuring 15 by 12 meters, with a maximum height of 50 cm. It has a peculiar shape; it would be square except that the W side is ragged and irregular as if a large number of the rocks had been removed. This may indicate that the rocks were "robbed" for construction elsewhere. The surface is fairly flat but slopes to the W. It has a pavement of small rocks (10 by 20 cm), but these are larger than most paving stones. Because of its disturbed condition, this platform was neither cleared nor excavated.

PLATFORM 10 (SU17-127)

A rectangular, raised stone structure, Platform 10 measures 13.5 by 6 meters and is 50 cm high. The surface is flat, characterized by small-stone paving. The sides slope to ground level. No clearing or excavation was conducted.

PLATFORM 11 (no site number)

This small rectangular platform measures 8.4 by 3 meters and is 60 cm high. It is built entirely of stone and has vertical sides of large stones. The surface is rough, apparently disturbed, with only a limited amount of small-stone paving. Its unusual shape and narrowness indicates that it could not have been a residential house foundation. This mound was neither cleared nor excavated.

PLATFORM 12 (no site number)

Platform 12, constructed of stone rubble, is roughly oval in shape and measures 5.3 by 4.4 meters and up to 40 cm high. The top is irregular, paved in a few areas with small stones, and appears to have a central depression. No clearing or excavation was conducted due to the disturbed condition.

PLATFORM 13 (SU17-92)

A small, squarish, raised stone structure, this platform measures 8 by 8 meters and is 40 cm high. Clearing the vegetation revealed that the surface is fairly flat and level, but disturbed. The sides of this platform are sloping and the entire structure is constructed of small stones (20 by 20 cm average). Due to its poor condition, this platform was not excavated.

RAISED WALKWAY (SU17-149)

This raised walkway adjoins the largest platform in the complex, Platform 6. Curving to the E, it has two short forks, which dwindle away to the SE. Curving again to the N, the walkway passes Platforms 1 and 2, continues W, and connects to the walled walkway.

The portion of the raised walkway between Platforms 6 and 1 was cleared of vegetation to reveal constructional details. The entire structure is built of stone, larger stones forming a vertical facing on both sides of the pathway. The surface is flat and is characterized by a small-stone pavement. The core of the walkway apparently consists of a stone rubble fill, although no excavation was conducted to verify this assumption, since similar walkways had been cross-sectioned during other excavations.

WALLED WALKWAY (SU17-131)

This walkway, one of the primary ones in the Mt. Olo settlement, runs the entire length of Ward C, and connects with two other primary walkways (see Fig. 2). It consists of two parallel walls with a 1.5-to-2.0-meter-wide pathway between them. The walls vary considerably in constructional details. Some sections consist of double-walled masonry, three to four courses high, with vertical sides, a rubble core, and an average width of 50 cm. In other areas, the construction is similar, but the walls are thicker, 2.5 meters, and the surface is paved with small stones. Some portions of the walkway walls are simply one-stone thick and several courses high. Other portions are rubble of rocks, rounded in profile with sloping sides. Maximum height of the walls is .75 meter, averaging .45 meter.

In the vicinity of Platform 6, the westernmost wall of the walkway disappears for 15 meters. This could be either a consequence of some aboriginal situation or a modern disturbance; it is unusual. In the Mt. Olo settlement, walkways tend to be more elaborately constructed in the vicinity of high-status structures, and Platform 6, due to its size, is believed to be this type of structure. However, this walkway is congruent with the general observation that primary walkways are structurally lower than high-status structures. In this instance, the walkway is built at a considerably lower elevation, partly because of the natural slope.

AMORPHOUS ROCK PILE

Near the center of the site, virtually enclosed (or at least defined) by the raised walkway, is an area relatively rock-free except for numerous amorphous rock piles. Although it is postulated that these stone heaps may simply be the results of clearing for gardening purposes, the neat, purposeful appearance of one (Rock Pile 1) induced excavation.

Rock Pile 1 is a small, circular, raised stone structure, measuring 2.65 by 2.35 meters and up to .30 meter high. A curbing of coconut-sized and larger stones defines the outside edge. The bulk of this rock pile consists of small stones (10 by 10 cm average) and the entire surface is paved with very small stones (3 by 5 cm). Although it seems to have been constructed with some care, indicated particularly by the small-stone pavement, excavation gave no clues as to its possible function. One possible interpretation, however, is that it served as a god house, since family god houses are known to be of small size (Davidson 1969:67).

PORTABLE ARTIFACTS

STONE

Thirteen complete and broken adzes were recovered during the excavations of Tulaga Fale. Only six were identifiable to type. Five fall into the Type I cagegory, and the sixth specimen is a Type VI. Four of the Type I adzes were recovered from Platform 1, and one was found on the surface of Platform 5. The Type VI adze was also recovered from Platform 1. Three of the broken unidentifiable adzes came from beneath Platform 1, and one came from the platform itself. One fragment was found in Platform 2, another was recovered from the initial test trench cut into

Platform 2, and the last fragment was found in the topsoil (Stratum II) in the clearing between Platforms 1 and 2.

Basalt flakes were the most numerous artifacts recovered from Tulaga Fale. Of the 101 specimens, 31 are clearly broken from finished adzes, since at least one side is well ground. The remaining 70 may be scrap flakes resultant from the reworking or rise of completed adzes (see Green 1974:145-146; 226-267). None of the flakes show any evidence of retouching. By far the majority of these flakes were recovered from Platform 1, possibly indicating its use as a work house. Provenience is as follows. Adze flakes: Platform 1, 8; surface beneath Platform 1, 14; surface of Platform 2, 4; Platform 2, 4; initial test trench in Platform 2, 1. Basalt Flakes: Platform 1, 20; surface below Platform 1, 32; initial test trench in Platform 1, 1; Platform 2, 6; surface of Platform 2, 4; initial test trench of Platform 2, 6; surface of ramp leading to Platform 5, 1. A much-used basalt *kava* pounder was recovered from the surface of Platform 2.

The only other stone artifacts were 11 smooth, fine-grained scraps of basalt, all unworked, but apparently not indigenous to the Mt. Olo area. Six were recovered from Platform 1, one from beneath Platform 4, two from beneath Platform 2, and two from the rock construction of Platform 2.

BONE

Part of a much deteriorated sacrum and two human molars found beneath Platform 1 attest to an earlier burial at this location. Portions of other bones, too decomposed to identify, were also recovered.

SHELL AND CORAL

Five pieces of coral, and 169 pieces of seashells were collected during excavation. Three pieces of coral came from Platform 1, one from the surface beneath Platform 1, and one from Platform 2. Twenty families of seashells are represented in this collection, most of them recovered from below Platform 1.

MISCELLANEOUS

Several pieces of charred coconut shell were found in the loose forest soil beneath Platform 1, but the sample was too small for radiocarbon dating. Given the looseness of the rock construction of the platform at this spot, it is possible that these charred bits are recent and filtered down through the rocks.

Two modern bullets were recovered, one from Platform 3 and one from Platform 1.

INTERPRETATION

The excavation of the Tulaga Fale site provided a sample of a household unit from Ward C of the Mt. Olo Settlement. Adjacent is a large earth oven, Ma'a Ti, which should probably be

considered part of the Tulaga Fale HHU. Radiocarbon dates from this *umu ti* indicate that it was in use during the late sixteenth and early seventeenth century. Although there is no occupation date for any other structures of Tulaga Fale, the locational analysis indicates that this site was probably contemporaneous with the large oven. The date obtained from the fire basin below Platform 2 indicates that the area was in use in some limited way in the ninth century.

Solid architectural evidence concerning superstructures was obtained only from Platform 2. However, since there were only two discernible post holes beneath this platform, no pattern or size could be inferred. Other possible post holes were recorded for Platforms 6 and 7. Those on Platform 6 reveal no obvious pattern. The suspected post holes in Platform 7 outline a 49-square-meter floor area, which is large enough for a residential structure.

Platforms 3, 4, 8, 9, 10, and 13 have surface areas large enough to have supported ordinary sized dwellings, yet no features were uncovered that would definitely indicate such use.

Platform 6, with a surface area of 728 square meters, may have been a community house or a chief's house. However, the chief's house is typically higher than the other structures in a complex and this is not the case for Platform 6. But it could well have been a community house, since such structures are said to be the largest in the community (Davidson 1974c:234). Ethnographic evidence also indicates that the chief's house and the community house often border the community's meeting ground (*malae*) or are located along a pathway or road. The clearing to the north of Platform 6 could have functioned as a meeting ground, although it is not as large as *malae* reported ethnohistorically. This platform is, however, located near the walled walkway and is connected to the raised walkway.

If Platform 6 is a community house, either Platform 1 or Platform 2 could have been the chief's house, since both are topographically higher than the other structures in the HHU, and both have a surface area of more than 400 square meters. In addition, both are adjacent to the raised walkway and the central clearing. The important point, however, is not which structure is the chief's house, but that there is a cluster of these large platforms which, according to Davidson (1974c:231), is probably indicative of a high status area.

MA'A TI

GREGORY JACKMOND

INTRODUCTION

Ma'a Ti (SU17-128) is located on gently sloping land along the southern flank of Mt. Olo, within the Tulaga Fale HHU. On the surface, it appeared to be a single shallow crater similar to those previously designated in the literature as *umu ti* (Davidson 1974c:236-237; Jennings et al. 1976:33-40; see p. 44, this volume). Upon excavation, it proved to be a superimposed series of four similar ovens of various sizes (Figs. 15 and 16), constructed consecutively.

EXCAVATION AND STRATIGRAPHY

The excavation of the oven was intended to reveal interstructural features and to obtain charcoal samples for dating. To accomplish these goals, the eastern half of the structure was stripped of all vegetation and a 1-by-11-meter trench was excavated along the eastern edge of the site, extending from its NW rim to a natural depression on the SE. After excavating the initial test trench to c. 1.5 meters below the crest of the earthen rim of the central crater, the excavation was extended westward in wide cuts until approximately half of the crater had been removed (Fig. 15). The stratigraphy of SU17-128, as would be expected within an area of intensive use, was churned and jumbled but appears to have consisted essentially of six strata (Fig. 16).

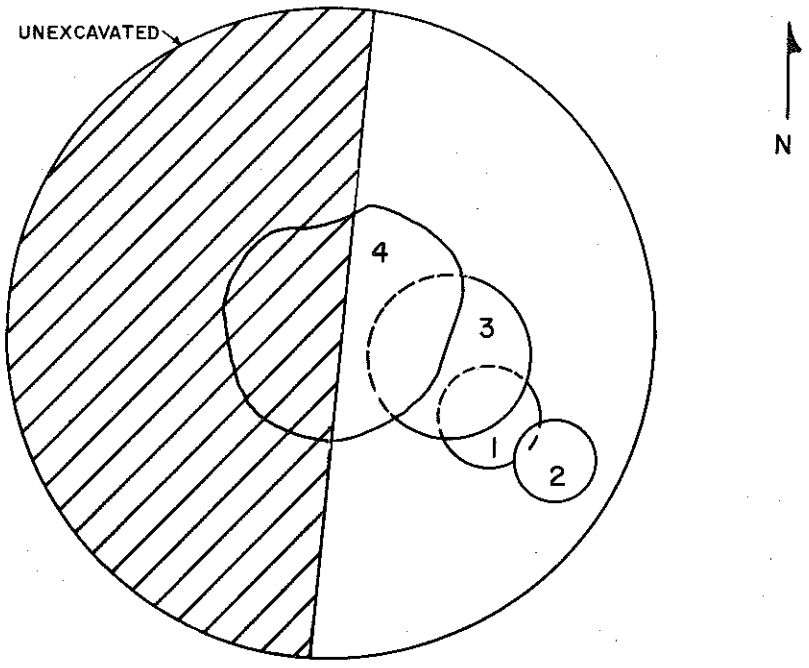


Fig. 15. PLAN VIEW OF THE RELATIONSHIP OF THE FOUR OVENS IN MA'A TI. No scale.

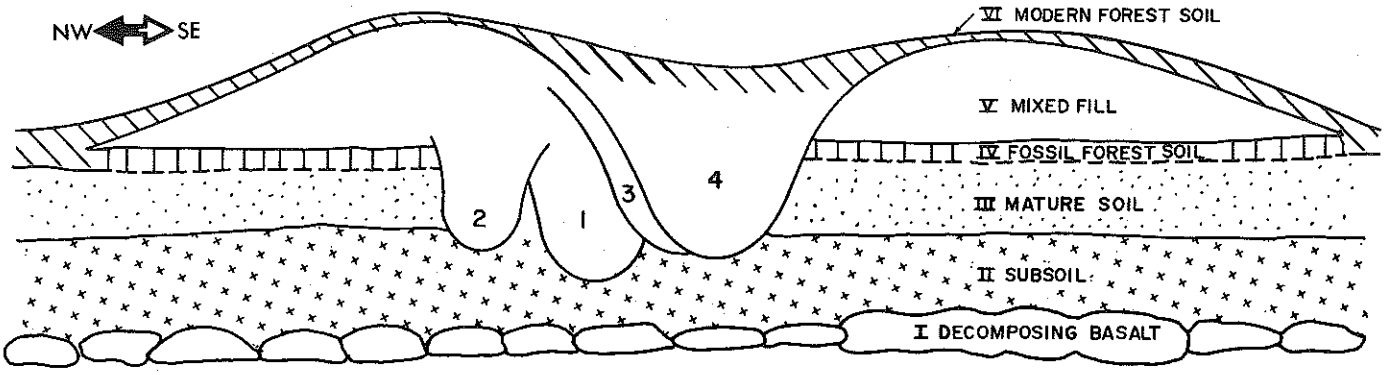


Fig. 16. IDEALIZED CROSS SECTION OF THE SEQUENCE OF EARTH OVENS IN MA'A TI. No scale.

Stratum I, the decomposed basalt that underlies the entire area, was observed only in the NE corner of the area excavated due to the unusual depth of the subsoil (Stratum II).

Stratum II consisted of the same fine-grain, yellowish-brown, compact, sterile subsoil previously encountered in the area.

Stratum III appeared to be an irregular intermediate layer of mature soil. In texture and color, it was evidently a mixture of the compact, fine-grain, yellow-brown subsoil (Stratum II) and the looser, coarser, dark-brown-to-black forest soil (Stratum VI). Eventually it was recognized as probably being oft-disturbed spoil dirt, as four successive earth ovens were constructed here.

The fossil forest soil, Stratum IV, a logical entity within the stratigraphic sequence, was not actually identified within the area excavated because of the disturbance of the upper strata resulting from the intensive construction activity at the site. Nonetheless, Stratum IV has been included in the discussion and the idealized cross section (Fig. 16) because of its undoubted one-time existence at the location; probably it contributed the forest soil component of Stratum III as described above.

Stratum V consisted of several layers of redeposited and intermixed lower soils (Strata II, III, and IV) containing scattered evidence of oven-making activities (i.e., spoil soil, charcoal lenses, charcoal scatters, bits of charcoal, and chunks of fire-reddened earth and stone).

Stratum VI, the present surface of modern forest soil that covers the area, consisted of a loose, coarse, dark-brown-to-black soil with a high organic component.

Intrusions caused by root and rodent activity were observed within all strata excavated and added another variable to the complex mixing of fill.

DESCRIPTION

Excavation revealed that SU17-128 consisted of a sequence of four similar ovens of various sizes, but the site had no clear stratigraphic relationship with any other structures within

the Tulaga Fale HHU. Oven 1, the earliest of the sequence (Table 1, C^{14} age, 380±55), appeared to have originated from the fossil forest soil, and extended deepest into the subsoil. It differed from Ovens 2, 3, and 4 in that it contained a large concentration of charcoal (c. 1/3 cubic meter) in its southern corner, but was similar to Oven 4 in that it had a heavy charcoal lens (10 to 20 cm thick) under and within the basal layer of larger (30 to 50 cm diameter) basalt stones. Oven 1 was of moderate size, slightly less than 2 meters in diameter, with almost vertical sides.

Oven 2, the smallest of the ovens, was built through the southeastern edge of Oven 1 sometime after its abandonment and before the construction of Oven 3. Oven 2 was also constructed with almost vertical sides. Although it lacked the heavy concentration of charcoal observed in Ovens 1 and 4, it did contain several smaller (less than 10 cm diameter) pockets of charcoal, as well as other, even thinner, scattered patches.

Oven 3, with sloping interior walls, was built into the northwestern third of Oven 2 from a level above Oven 1, probably from a surface corresponding to the earthen sides formed by the mixed fill or spoil dirt generated during the construction of Oven 2. Oven 3 contained almost no charcoal, but in its lower third most of the soil was heavily fire-reddened, leading to the conclusion that it was probably the most efficient--certainly the hottest--of the ovens excavated.

Oven 4, the only oven observable from the modern surface, was by far the largest. As in Oven 1, Oven 4 contained large amounts of charcoal in its lower zone. The sides of its internal depression appeared to be more sloped than in Oven 1 (Fig. 16). Oven 4 was the last in the sequence with the spoil dirt from its construction completely covering all surface evidence of any previous construction (Figs. 17 & 18).

Although several charcoal scatters and lenses were observed at different levels within the mixed fill of Stratum V, suggesting the reuse of Ovens 2, 3, and 4, only Oven 4 exhibited internal evidence of reuse, in the form of a thin (5 to 10 cm) lens of fire-reddened soil beneath the lowest layer of charcoal and stone, and a thin (± 5 cm) layer of unreddened soil.

Although each oven was a distinct entity, all had six common attributes: (1) Large amounts of closely-packed, angular, vesicular basalt were contained within an excavated pit. (2) The stones were usually largest toward the bottom of each oven with the small (10 to 20 cm diameter) and medium-sized (20 to 30 cm) stones intermixed above. (3) All were filled (or partly filled) with a coarse, loose, crumbly or granular soil similar to modern forest soil. (4) In varying degrees, all ovens contained evidence of fire, with charcoal appearing either in large concentrated pockets (Ovens 1 and 4) or scattered toward the base and outside edges (Ovens 2 and 3), fire-reddened and thermo-fractured stones were mixed throughout, and fire-reddened soil was usually located around the lower edges (except in Oven 3 where it appeared throughout). (5) All extended into the subsoil (Stratum II). (6) All ovens appear to have had earthen sides formed from spoil dirt removed during excavation of the central pit.

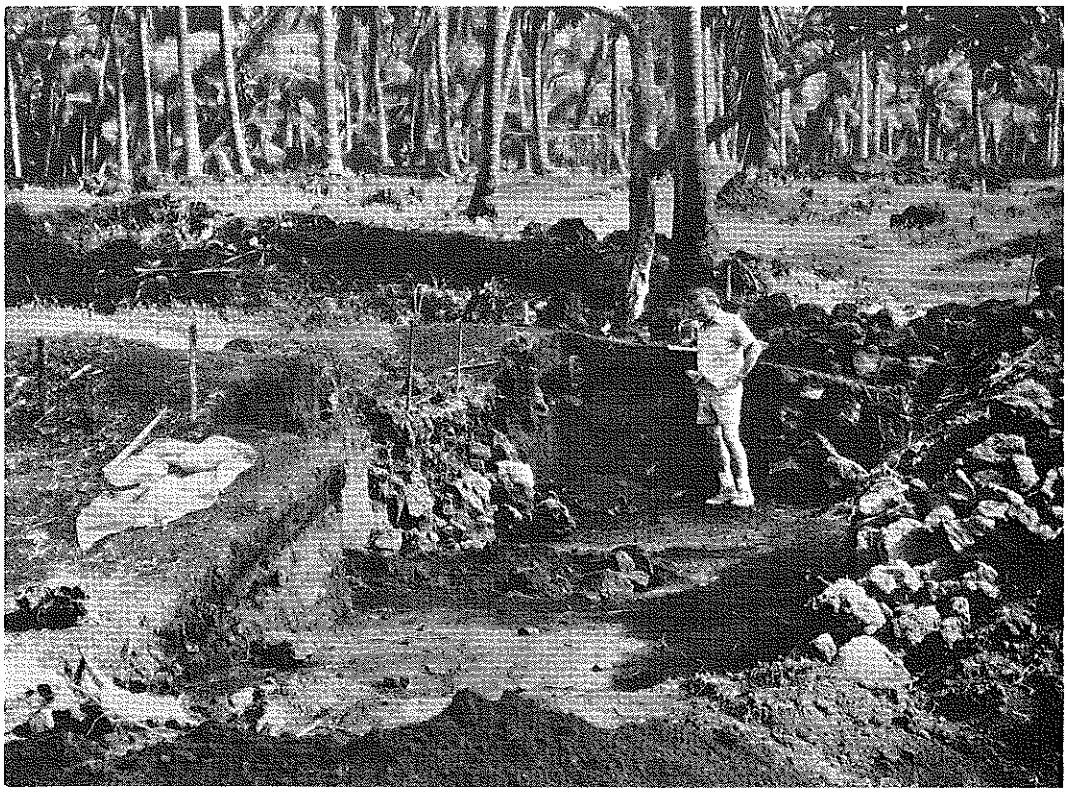


Fig. 17. LAST PHASE OF EXCAVATION AT MA'A TI, SHOWING OVEN 4 PARTIALLY CUT AWAY. The stony rubble marks the bottom of Oven 1, the deepest of the four.

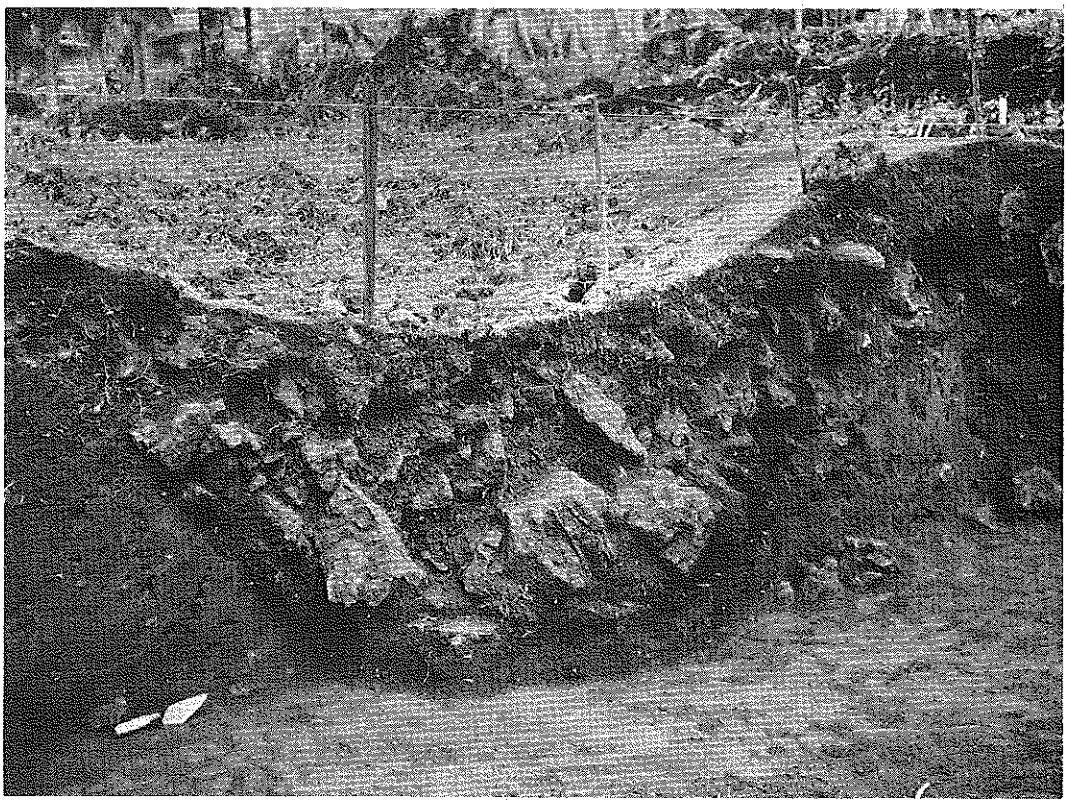


Fig. 18. CLOSE-UP OF SECTION THROUGH OVEN 4 AT MA'A TI. After removal and smoothing of the Oven 1 remnant.

COG MOUND COMPLEX

NANCY J. HEWITT

INTRODUCTION

The Cog Mound Complex is located in the Tausagi Coconut Plantation of the WSTEC. Situated approximately 100 meters SW of the Cog Site (SU17-165), it lies on the gentle slopes of Mt. Olo. It consists of four sites, SU17-192, -193, -346, and -527 (Fig. 19). Together with the Cog Mound structures reported in Jennings et al. (1976), it makes up the Cog Mound HHU in Ward D. SU17-193, a raised, circular, crater-shaped structure some 15 meters in outside diameter, proved to be a large earth oven or *umu ti*. SU17-192 is a raised stone platform located 8 meters to the SW. Roughly square, it measures 15 by 15.7 meters. Partially enclosing the earth oven and the

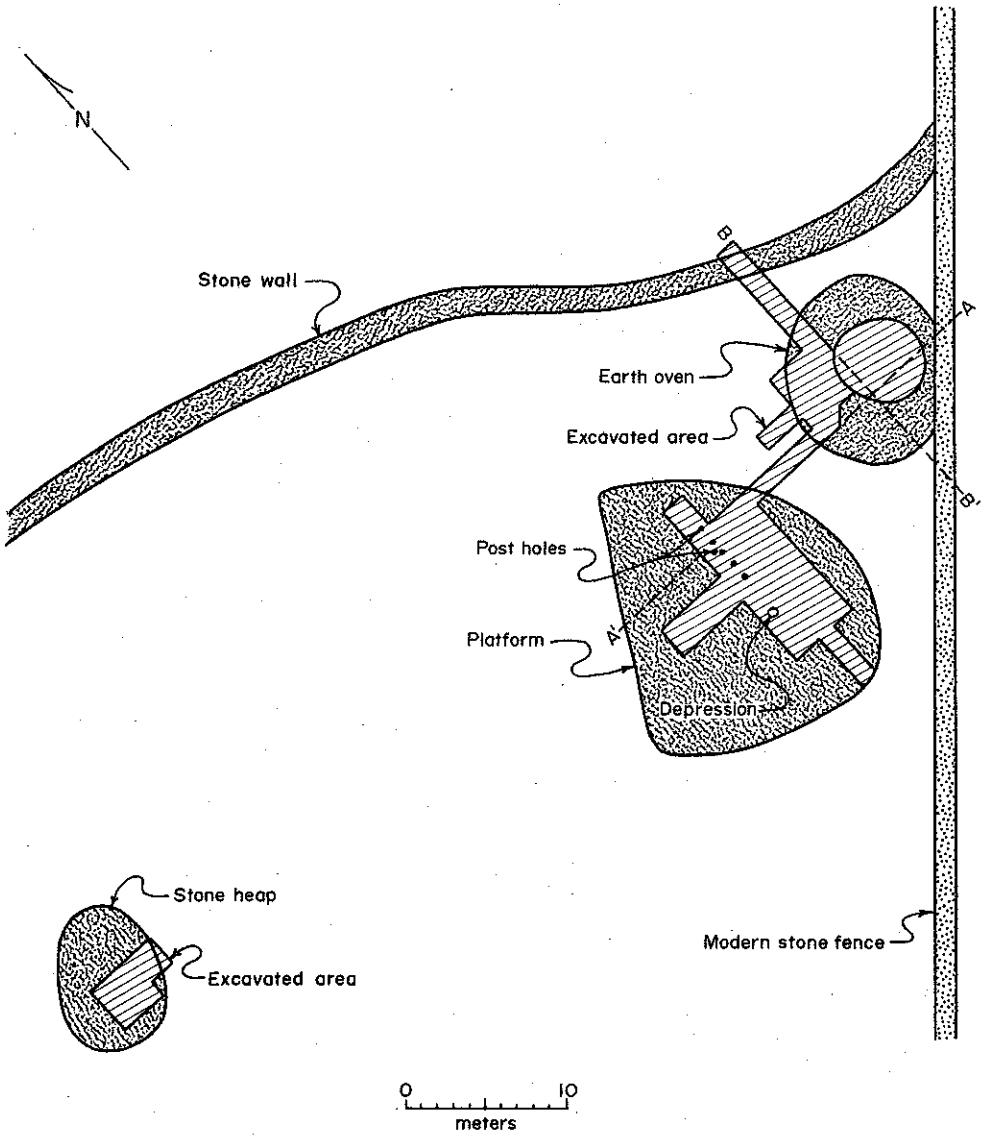


Fig. 19. MAP OF THE PORTION OF THE COG MOUND COMPLEX EXCAVATED IN 1977. It lies to the southwest of the Cog Mound dug in 1974.

platform is a stone wall or possibly a damaged walkway (SU17-346). The structure was so disturbed that its original shape was indeterminable. The fourth site in this complex, located about 40 meters W of SU17-193, is an oval mound or stone heap (SU17-527).

EXCAVATION

Excavation, intended to reveal structural details and determine the stratigraphic relationships among the four features, began on September 13 and was completed on October 22, 1976. The crew consisted of five Samoan workers and one foreman. Two of the workers and the foreman were familiar with excavation procedures and helped in the training of the others.

The initial test trench was cut into culturally sterile soil to the W of SU17-193, the earth oven, to familiarize both the excavator and the workers with the natural soil. Once bedrock was reached and a definition of soil layers was achieved, the trench was extended E toward SU17-193. The trench was terminated at the edge of the central depression. At this point the trench was expanded to 5 meters and N-S cuts were made until the full extent of the crater could be seen in cross section. Once the stratigraphy of the oven was defined no further cutting was done. However, the interior depression was then cleared of debris and rocks until the limits of the central oven area were completely exposed.

In order to maintain clarity of context and controls and to examine relationships between the various structures of the complex, trenches were extended from the oven to the N, to include the stone wall, and to the W to include the raised stone platform. The trench to the rock wall was 1.5 meters wide, and represented the only subsurface excavation of that structure. The trench cutting into the platform revealed two post holes in cross section. In a search for more post holes, the platform stones were removed to the underlying soil. That surface was then brushed carefully and examined. This procedure extended S for 10 meters along a 4.5-meter-wide cut, and N at a 2.5-meter width. Six and possibly a seventh post hole were found in a N-S alignment, but the alignment did not continue. Using data available on prehistoric house size and shape (Green & Davidson 1969, 1974), a house outline was extrapolated on the platform using the existing post holes. With this projection in mind, clearing the rock pavement continued W for 5 meters to the point where the platform began to slope and taper down to the natural ground level. This search for more post holes proved fruitless. In the interim, a trench, 1 by 4 meters, was excavated into the southeastern edge of the platform to check the stratigraphy and construction of its steep side.

Excavation of the stone heap began with a 2-by-3-meter exploratory trench cutting into the center of the structure and extending down to bedrock. A total of 13 square meters was excavated here.

STRATIGRAPHY

Although the stratigraphy is simple, it varied at each site and thus each will be discussed separately. Principal cross sections are illustrated in Figure 21.

OVEN (SU17-193)

The principal layers observed in the oven were difficult to differentiate at first due to the similarity of the fill. But once the dirt had dried out, the following strata were readily defined (Fig. 20). Stratum I is a slick, yellowish-brown, claylike sterile subsoil. Scattered throughout this layer, especially in the lower portions, are decomposing basaltic rocks. This layer is uniform throughout the area, occurring at most of the sites excavated. The only variation seems to be in depth. In the area of the wall, oven, and platform this layer averages 35 cm. However, at the stone heap, the same layer is approximately 1 meter deep.

Stratum II is a thin (10 cm) layer of "fossil" forest soil or top soil. Texture was loose and crumbly and there was much humus material. This layer is referred to as a "fossil" soil layer since it was the surface at the time the oven was constructed and occurs under the spoil dirt (Stratum III). In composition the layer is identical to Stratum IV. Outside the structures, Stratum II blends with Stratum IV.

Stratum III is the spoil dirt from the construction of the oven and contributes to its crater-like form. Essentially, this soil is the same as Stratum I, having originally come from that layer.

Stratum IV is the modern forest soil, varying from 8 to 13 cm in thickness. It is friable in texture, ashy brown in color, and contains much humus material. This stratum is continuous throughout the complex.

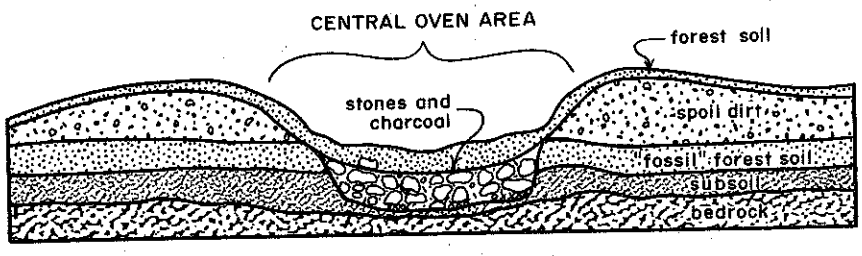


Fig. 20. CROSS SECTION OF THE COG MOUND COMPLEX EARTH OVEN.

PLATFORM (SU17-192) AND STONE WALL (SU17-346)

Strata I and II, discussed above, are present in the same relationship beneath these two structures (Fig. 21). Stratum II is the surface of origin for both. The southern edge of the stone wall, however, is intrusive into the subsoil and in profile appears to have been set into a shallow footing trench.

STONE HEAP (SU17-527)

At this site, Stratum I is the same clayish, slick yellow subsoil observed in the other sites except that it is approximately 1 meter deep. Stratum IV (modern forest soil) is present around the outside of the structure but Stratum II (fossil forest soil) could not be observed as the surface of origin. This indicates that either the stones settled down below this stratum (a condition not evidenced at other sites in the area) or that the forest soil was purposely removed before the structure was built.

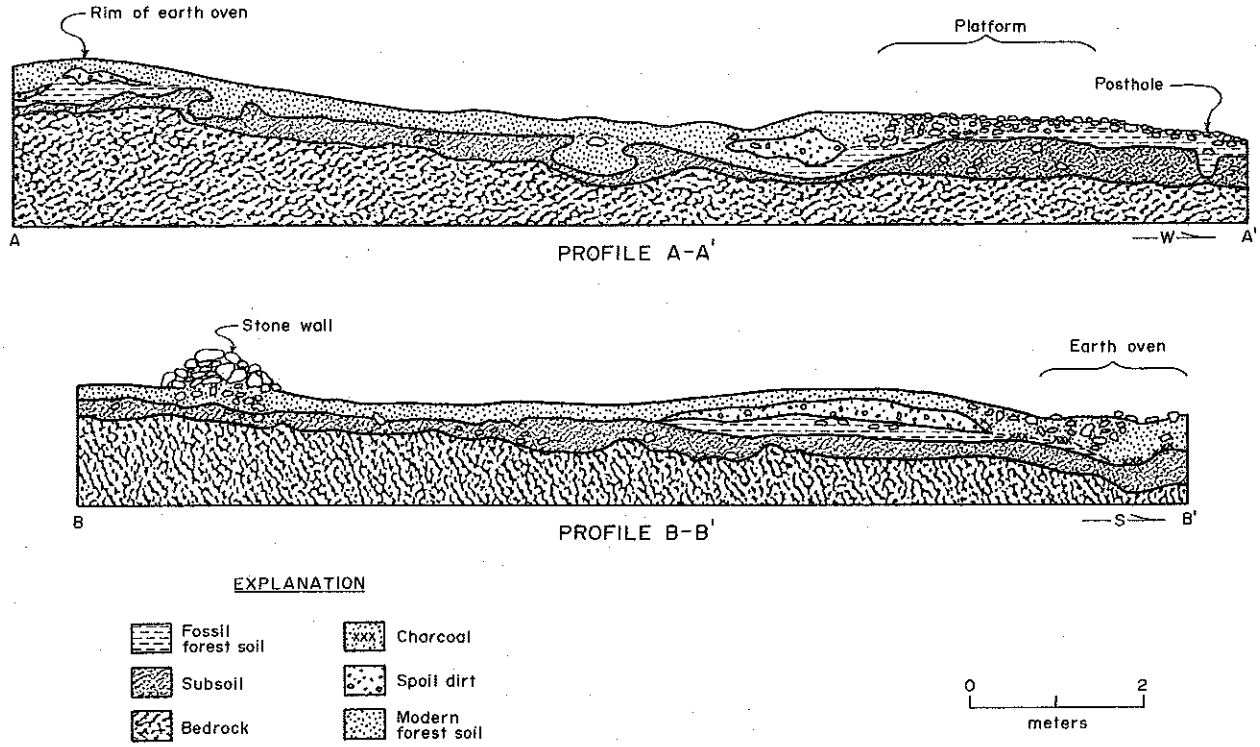


Fig. 21. CROSS SECTIONS SHOWING STRATIGRAPHY OF THE WALL, EARTH OVEN, AND PLATFORM OF THE COG MOUND COMPLEX.

STRUCTURES

EARTH OVEN (SU17-193)

This structure proved to be a specialized earth oven or *umu ti*. Seen from the surface, SU17-193 is a circular, raised-rim structure with a central crater-like depression. Within this depression are various-sized fire-reddened rocks at a depth of 70 cm below the crater rim. Outside dimensions of the structure are 11.3 meters along the N-S axis and 14.5 meters E-W. The N side is slightly lower than the S side. Diameter of the central depression is 4 meters N-S by 4.6 meters E-W.

Construction began when a large circular pit with fairly vertical sides was dug into subsoil to basaltic bedrock. The resulting spoil dirt was thrown around the outside of the pit, creating the sloping sides of the oven and giving it the crater-like appearance. Maximum depth from the rim to the bottom of the circular pit is 1.2 meters. For a schematic cross section, see Fig. 20.

The oven was apparently prepared for use by building a fire on the basaltic floor of the pit; then various-sized rocks were placed in it to absorb the heat. The oven was filled with these rocks; most were coconut-sized and fire-reddened. Larger rocks, c. 40 by 50 cm, were found resting on the floor of the pit. At first, it appeared that these rocks were used as the floor, some being quite flat. However, when they were removed, a layer of charcoal and "pebbly" or granular reddened earth was found beneath them. It was also discovered that these large, flat

stones only covered a small portion of the floor and many were too irregular in shape to be considered a flag-stoned or paved floor.

The layer of charcoal and pebbly reddened earth found on the bottom of the pit continued intermittently up the sides of the oven. Charcoal and several charred logs were found among the rocks. These were collected for radiocarbon testing. A number of melted stones resembling slag were recovered from the oven, giving a clue to the intensity of the heat.

PLATFORM 1 (SU17-192)

Following the typology in Jennings et al. (1976:45), this structure is a Type I platform. Since it falls into the "small" category, it is presumed to have functioned as a foundation for an average residence house. The surface of the platform is roughly square, measuring 15 by 15.7 meters, with one corner rounded or cut off. It is constructed of various-sized rocks and paved in some areas with golf-ball-sized stones. No curbing or house outline was discernible and the middle portion was disturbed. Other peripheral surface disturbances include several coconut trees and an oval pit (5.7 by 3.3 meters), possibly caused by a fallen tree.

On the N and E sides of the platform the construction shows that a basal layer of relatively flat rocks was placed directly on fossil forest soil (see Fig. 21), Stratum II. Several more layers of stone raised the platform to an approximate height of 25 cm. Also on these sides, a small amount of basalt subsoil was piled up against the edge of the rock structure, apparently to increase its size. The downhill (S and W) side of the platform was constructed slightly differently. Here, to compensate for the natural slope of the terrain, the rocks were piled to an average height of 50 cm in order to make a level surface. These edges are sloping and paved with smaller stones. The S side reaches a maximum height of 80 cm above ground level. No basal layer of flat rocks was observed.

Major surface features on this platform were six post holes, all c. 25 cm in diameter and of depths varying from 25 to 50 cm. All but one are in a N-S alignment and spaced 1 meter (± 2 cm) apart (see Fig. 19).

Two zones of fire-reddened soil and small pieces of charcoal were found beneath the platform. Both extended into the subsoil somewhat, but were too irregular in shape to be considered small earth ovens. Neither contained enough charcoal for radiocarbon dating. Many adze fragments and pieces of smooth, fine-grained stones were found within the stone fill of the platform or below it. Similar fine-grained basalt is found at the quarry on Mt. Vaea behind the city of Apia (Golson 1969:18; Green 1974:141).

STONE FENCE OR WALL (SU17-346)

This structure is fairly dilapidated with the stones widely scattered, making it difficult to determine original configuration. It is best described as an alignment of lava rocks with a sort of paving of smaller rocks on the surface. Maximum height in the area of excavation is .50 meter. Maximum width is 1.5 meters. It runs E-W for some 50 meters in the vicinity of the oven, then forks, with one section continuing W, the other running S behind the stone heap (SU17-527) near the Cog Mound (see Fig. 3). This alignment was followed for a considerable

distance in both directions, and in some areas coursed vertical walls were found still intact. However, in the immediate area of excavation, such vertical construction could not be observed. Excavation revealed a possible footing trench on the downhill side of this structure. At least three, possibly four, courses of rocks were placed in a narrow (c. 25 cm) trench dug into Stratum I. Excavation also revealed that the bottom two layers of this rock structure are lying in the fossil forest soil (Stratum II).

Whether this feature was built as a fence or as a raised walkway was not determined. In the area of excavation, it appears as a raised walkway with sloping rather than vertical sides and with what seems to be a paving of small rocks on the surface. However, the eastern continuation shows portions of a two-course or higher vertical wall still intact but lacking the smaller rocks. In a discussion of stone walls and pathways, Davidson (1974c:238) states that "stone walls seem to have performed many functions.... Some are boundaries of agricultural plots, house site land, the land of a *nu'u* (parish) or the land of a district. Some have served as paths, sometimes as single walls, and sometimes as parallel walls on either side of a level or sunken tract." While it seems possible that this structure may have served a dual purpose, where sectioned it most resembled a raised walkway.

STONE HEAP (SU17-527)

The fourth structure in the complex is located approximately 40 meters W of the house platform. This structure is an oval heap of stones 7 meters wide, 8.4 meters long, and 1 meter high. It is constructed of various-sized basaltic stones interspersed with soil. Small charcoal flecks were found throughout the fill. The surface is paved with golf-ball-sized (4 by 4 cm) rocks similar to the paving on most house platforms. However, this small, domed structure could not have functioned as a house platform. The heap appears to have been constructed after clearing down to subsoil (Stratum I) instead of on top of the fossil forest soil (Stratum II) like the other structures in the area.

Evidently construction of the stone hillock was interrupted when it stood 30 to 35 cm high. On the center of the platform formed by the lower one-third was a zone of fire-reddened rocks and crumbly red soil, 1.25 by 1.38 meters and 5 to 15 cm thick. Two objects were recovered from this zone; a small black seed (Euphorbiaceae family) and an adze fragment. After the fire, the stone mound was finished to its final height of 1 meter.

The purpose and function of this structure are totally unknown. Buist (1969:44) mentions small stone heaps that were stockpiled for use in ovens or for pavements. However, "the small stones had obviously been sorted during agricultural clearance and set aside from the larger blocks." Golson (1969:19) excavated one-half of a stone heap that "proved to be a simple heap of stone, presumably from agricultural clearance. There was no disturbance of the ground below it." The stone heap described here does not quite compare to the ones described by Buist and Golson. Another heap that appears to be nearly identical to SU17-527 in size, shape, and construction is located 100 meters to the NW.

PORTABLE ARTIFACTS

The portable artifacts recovered from the four sites include 1 adze fragment, 14 adze flakes, 9 stone pieces (called hammerstones, although they show little battering), and 4 pieces of shell scrap.

RADIOCARBON DATES

The only datable material was the charcoal recovered from the earth oven. For this structure, a date of 595±60 B.P. was obtained. This can be compared to the other excavated earth ovens in the Mt. Olo tract--uncorrected dates of 390 B.P. for Green Ti (SU17-188), 370 B.P. for Janet's Oven (SU17-48) and 380 and 470 B.P. for Ma'a Ti (SU17-128).

SUMMARY

The Cog Mound Complex consists of four structural features within a 30-meter radius, representing a portion of the HHU. The entire HHU includes the Cog Mound reported in Jennings et al. (1976). A date of 595 B.P. has been derived for the earth oven but its contemporaneity with the other features in the complex is uncertain. Other structures in the immediate area have been dated to 270 B.P. and 1150 B.P. The Cog Mound Complex structures are regarded as essentially contemporaneous with the previously excavated later parts of the HHU.

The earth oven of this complex is essentially the same as others in the area and its specialized use as an *umu ti* may be assumed. The house platform fits well within the size and shape classifications defined in previous studies, although it lacks the curb stones. Six post holes were found, but their relative positions do not allow for an interpolation of floor shape or size. The stone wall or walkway may have served as access to the complex or as a boundary marker, or simply as an agricultural fence. The function of the ovoid stone heap and its associated fire-burned zone is beyond speculation.

The limited artifact inventory adds little information. Any chronology based on adze types is tenuous, since context is not always a reliable guide. For example, the adze fragments in the stone heap were probably not originally discarded there but had been incorporated as part of the rubble fill or were generated during construction

CROOKED PALM

ERNEST S. LOHSE

INTRODUCTION

The Crooked Palm site, initially reported and surveyed during the Mt. Olo Tract survey in 1976, includes seven stone platforms within an area enclosed by two stone walls and two raised walkways within Ward E (Fig. 22). The numbers are SU17-365 through -371. Because the site was compact, well defined, and seemed to typify the household unit, it was selected for excavation.

EXCAVATION AND STRATIGRAPHY

Excavation in 1977 was carried out with a labor force of eight Samoans, under the direction of a supervisor and a trained Samoan foreman. Prior to excavation, all vegetation was removed and a photograph was taken of the cleared structure. Excavation was then initiated by means of test trenches, 1-meter wide and of variable length, extending down to the culturally sterile soil below the structure. In the platforms, the test trenches were placed where the surface exhibited the most well-preserved pavement. The initial cuts were expanded laterally in 1-meter-wide strips, exposing a large area of subsoil. It was hoped that such a strategy would allow detection of post-hole patterns in the subsoil below the stone structure. Four stone platforms, an open plot, and a raised walkway were tested.

The stratigraphy at the site is simple and uniform. Stratum I is a light brown, homogeneous, sterile subsoil, containing vesicular basalt rocks varying in size from small cobbles to large boulders. The lower portion of the stratum grades into the decaying basalt bedrock. Stratum II is a dark brown, crumbly topsoil. Outside of the site area proper, Stratum I is reached at a depth of c. 10 cm. Within the site area, Stratum I is reached at a depth varying between c. 15 and 25 cm. Presumably, habitation and horticultural practices and the accompanying biochemical action increased the depth of the topsoil (forest soil), thereby lowering the boundary between the two zones.

STRUCTURES

Construction of all platforms seemed to involve the following steps: first, a natural eminence was selected as the core of the structure; then large basalt boulders were placed on the ground surface, forming a roughly level, raised surface of the desired shape; next, smaller cobbles were laid atop this foundation until the desired height had been obtained; finally, small stones were laid atop the platform, forming a level, even surface or pavement (Fig. 23). All of the platforms tested exhibited sections of intact exterior curbing composed of large basalt boulders (Fig. 24). Only one of the platforms exhibited an interior curbing.

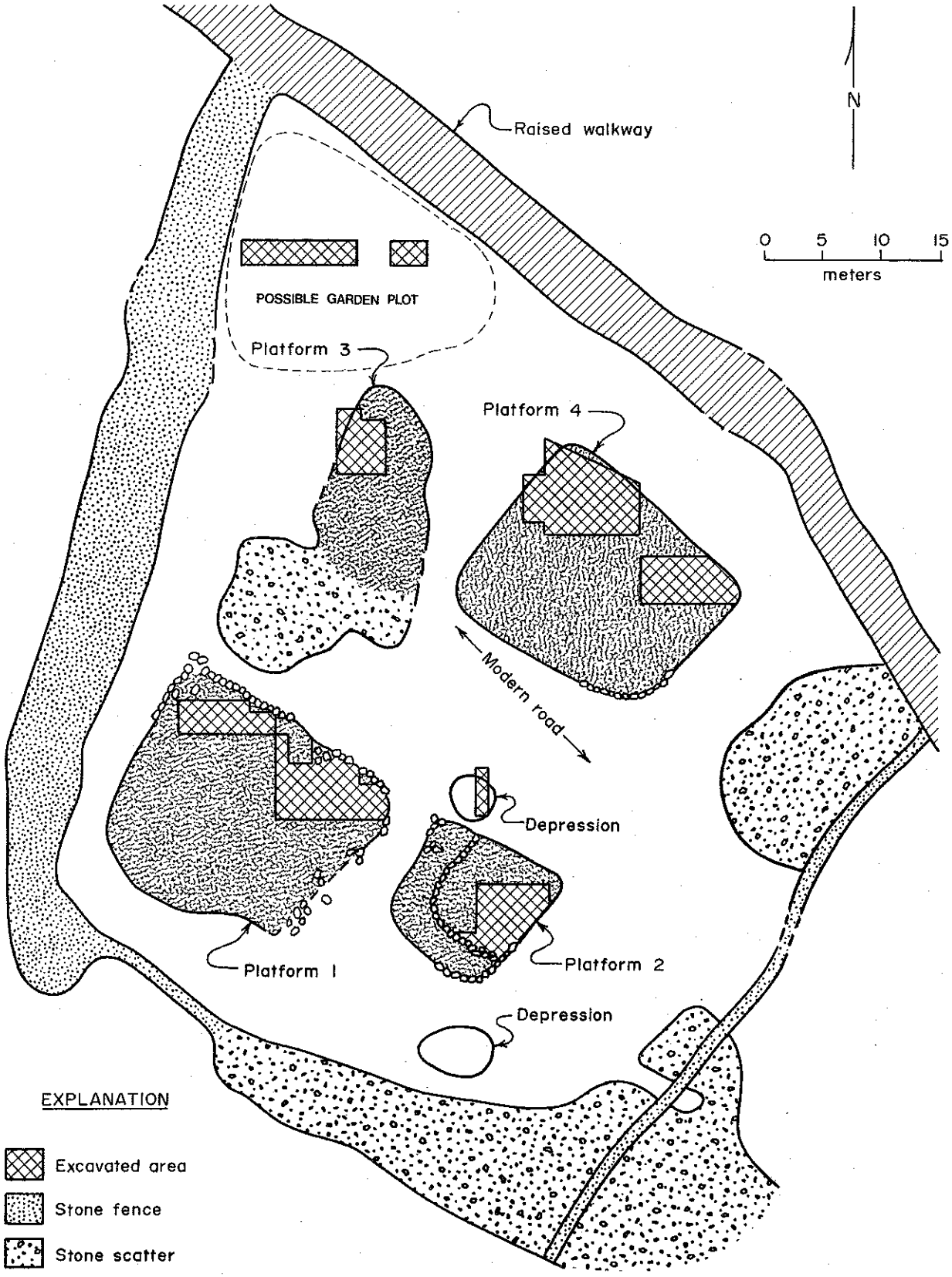


Fig. 22. MAP OF CROOKED PALM HOUSEHOLD UNIT.

PLATFORM 1 (SU17-369)

Platform 1 is roughly rectangular in outline, c. 18.5 meters N-S and c. 20.5 meters E-W. The platform averages c. 20 to 30 cm in height. The surface of the structure was in generally poor condition with only the northern one-half to one-third of the pavement relatively intact. Numerous depressions were visible on the surface. However, none of these could be observed to extend down into the subsoil beneath the platform.

Human remains, in very poor condition, were found within the platform stones along the northern margin of the structure. The remains were spread amongst the stones, over an area of c. 1.5 by 2 meters, and no definable intrusion could be observed within the stone fill.

No subsoil features were observed. The artifact yield was negligible, consisting of two adze flakes recovered from within the stone fill of the platform.

PLATFORM 2 (SU17-370)

Platform 2 is a low, tiered structure, located c. 4 meters SW of Platform 1. It is roughly square in outline, c. 11.5 by 12 meters, and c. 30 cm in height. The upper tier is delineated by a border of basalt boulders along the S and E, rising to a height of c. 10 cm above the lower platform surface. This lower surface probably functioned as a use area. The tiered effect is typical of modern Samoan houses, with the border of the upper level roughly corresponding to the outline of the dwelling. Though depressions were visible on the upper surface of the platform, these did not appear to extend down into the subsoil.

No subsoil features were observed, and no artifacts were recovered in association with Platform 2.

PLATFORM 3 (SU17-367)

Platform 3, located c. 20 meters N of Platform 1, is a tear-drop-shaped structure, c. 14.5 by 8 meters and c. 50 cm in height. The platform surface is extremely irregular and shows signs of extensive disturbance. It seems probable that this structure, as well as others in the site area, was utilized as a source of material for later builders.

No subsoil features were observed. One adze fragment was uncovered within the stone fill of the structure.

PLATFORM 4 (SU17-366)

Platform 4 is a low, roughly square structure, located c. 15 meters N of Platform 2, and c. 5 meters E of Platform 3. It measures c. 17 meters N-S, c. 19.5 meters E-W, and c. 30 cm in height. The surface pavement is badly disturbed. Numerous surface depressions were observed. Two probable post holes, roughly coinciding with two of these depressions, were defined in the subsoil beneath the NW corner of the platform. These features were c. 15 cm in diameter, and from 25 to 35 cm in depth. No other features could be discerned, either in profile within the stone fill of the platform or in the subsoil below. Two adze fragments were recovered from the stone fill.

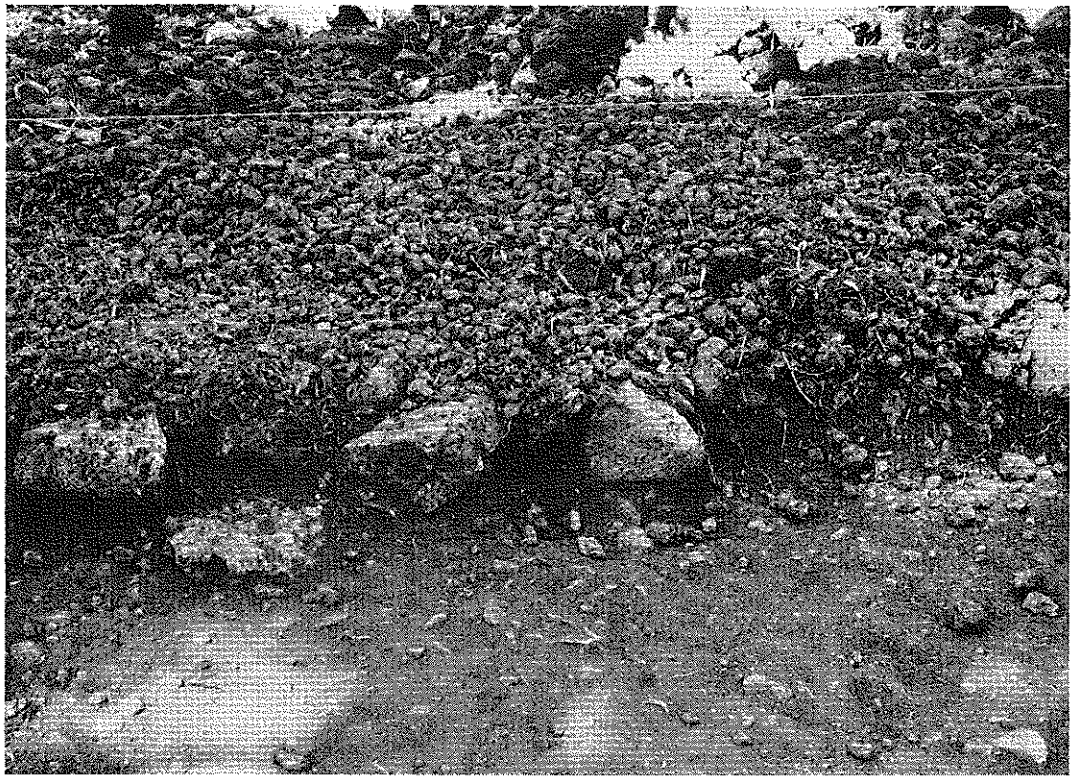


Fig. 23. CUT INTO PLATFORM 1 AT CROOKED PALM. Showing the large blocky stones of the mound fill and the small surface stones of the pavement.

Fig. 24. CURBSTONES AND PAVING OF PLATFORM 1 AT CROOKED PALM.

POSSIBLE GARDEN PLOT

The NW corner of the site area was remarkably free of stones and boulders. It was decided to test this area to ascertain whether it could possibly be a garden plot. It was postulated that a garden would have lowered the interface between Strata I and II, and that this would be readily observable in profile within a test unit. An E-W test trench, 1 by 16 meters, was sunk to a depth of c. 30 cm. As expected, Stratum II was thicker in this area than anywhere else in the site. Stratum I was not apparent until a depth of c. 25 cm was reached.

RAISED WALKWAY (SU17-328)

The raised walkway delineating the northern border of the site was tested by means of a 1-by-7-meter test trench, running N-S. Construction of the walkway involved parallel borders of basalt boulders, spaced c. 5 meters apart, between which earthen fill was placed to form a soft, level pathway with lateral support. The walkway averaged c. 50 cm in height.

No artifacts were found in association with the walkway.

CONCLUSIONS

The Crooked Palm site appears to represent a definable household unit. Excavation failed to reveal good evidence of house construction, as no subsurface features, aside from two possible post holes, were recorded. The artifact yield was exceptionally meager, and no material suitable for radiocarbon dating was obtained.

TAUSAGI

RICHARD N. HOLMER

INTRODUCTION

The Tausagi complex is located in Ward E of the Mt. Olo Tract (Fig. 2), about 1 km E of the Crooked Palm HHU. The terrain surrounding the site slopes gently toward the W, although steeper slopes occur to the E. The complex consists of three house platforms (SU17-175, -180, and -526), a fence (SU17-176), and a major walkway (SU-179) that also passes Crooked Palm HHU (Fig. 25). Several other features were surveyed and excavated, including fences and areas that had been cleared of the natural stone ground cover. Janet's Oven (Jennings et al. 1976:33) lies 60 meters to the SE and is probably part of the Tausagi complex, although direct association can

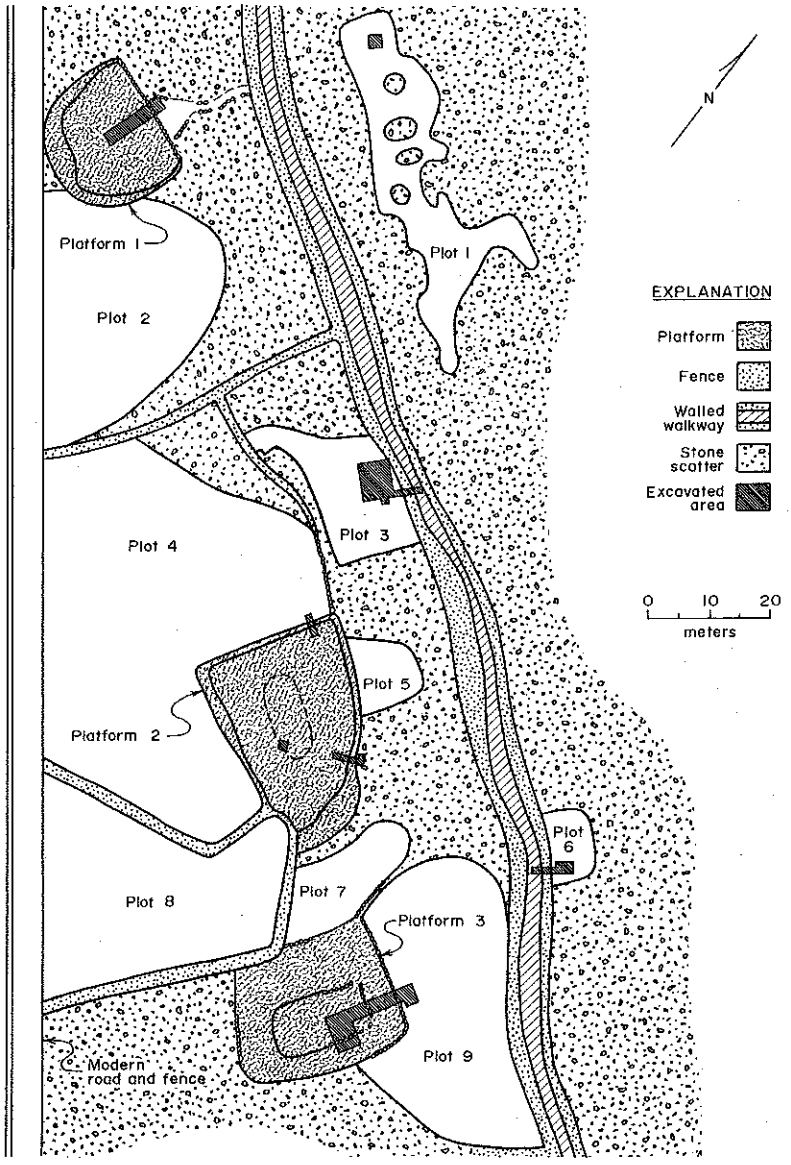


Fig. 25. MAP OF TAUSAGI HOUSEHOLD UNIT.

only be assumed. The Tausagi location was selected for excavation because of its relatively undisturbed appearance and the presence of different types and sizes of structures within a small area.

EXCAVATION AND STRATIGRAPHY

Excavation began at the site on September 14, 1976, and continued for five weeks employing a crew of nine Samoan workers and one foreman/interpreter. Excavation activities resulted in over 1,000 square meters of area cleared, and over 65 cubic meters of earth and rocks were removed. All trenches were backfilled following the excavations and all structures were restored to their original shape and appearance.

Eight separate trenches were excavated to sample the structures and other cultural features represented at the site. Trenches were extended according to their apparent potential in elucidating problems concerning the construction or function of the structures. All trenches were excavated into the subsoil to insure stratigraphic control. Artifact and cultural feature proveniences were maintained by 1-meter-grid squares and strata.

The stratigraphy of the site is that encountered elsewhere in the Mt. Olo Tract. Stratum I is a homogeneous, dark-reddish-brown, sterile subsoil (Munsell color ranging from 5YR 2/1 to 5YR 4/3). It contains fist-sized and larger vesicular basalt fragments that are in the process of weathering into soil. The lower portions grade directly into decaying bedrock, the parent material for the soil. Stratum II, termed forest soil, is dark-reddish-brown (Munsell color ranging from 5YR 3/3 to 5YR 4/4) with a well-defined, coarse, crumbly structure. Compared with Stratum I, it is less compact, and contains much more organic carbon (over 5% as compared to less than 2% for Stratum I).

As was discussed for the soils in the Cog Site area (Jennings et al. 1976:22), the natural soil strata are clearly the result of in situ pedogenesis. Some modifications have occurred, however, apparently due to the activities of man. For example, top soils are approximately 20 cm thicker in areas cleared of the natural stone rubble; the stone-free zones were suspected to have been garden plots, but upon investigation, none have proved to be disturbed as would be likely in a garden plot.

The surface of origin for all structures seems to have been the then current surface. A few cultural features appear to originate in the topsoil stratum, so it is assumed that the development of the forest soil continued around and upon structures after they were built. Locating the precise surface of origin is therefore difficult because of the high amount of biochemical activity that has taken place within the topsoil.

STRUCTURES

PLATFORM 1 (SU17-180)

Platform 1 is a semicircular terrace-like platform (Fig. 26) measuring 19 by 22 meters and built on a gentle slope. The uphill (northern) edge of the platform is at ground level, and is

marked by curb stones set into the topsoil. The downhill (southern) side is approximately 90 cm above ground level with sides that slope at an angle of approximately 25°.

Adjacent to the platform to the N is a semicircular cleared area partially surrounded by curb stones. Extending northward from the clearing is a ground-level pathway, connecting the clearing to a major walled walkway. Where the pathway intersects the walkway, there is a clearly marked opening in the walkway's stone wall.

Excavation of the platform and the associated features revealed little except for general construction details. The bulk of the platform consists of a "core" of stones of all sizes although stones of approximately 30 cm in diameter are the most common. The surface is paved with small stones fitted so as to make a relatively flat surface. The paving stones are mostly 2 to 5 cm in diameter, although several larger stones of the core are partially exposed.

The sloping sides of the platform are not as smooth as the top. The sides consist mostly of unfitted larger stones, similar to the core with some smaller stones intermixed. The northern edge does not slope but consists of block-shaped stones measuring approximately 15 by 15 by 30 cm, laid end-to-end to form a curbing, and set into the topsoil to a depth of c. 10 cm. No evidence of a footing trench was visible in the excavated walls; it seems unlikely that the stones would have settled that much since construction.

The cleared semicircular area to the N is probably not a garden area because of the shallowness of the soil (12 cm and less) covering the bedrock. The fact that a pathway enters the cleared area leads to a possible interpretation of the area as a "porch" or entranceway to a house built on the platform.

PLATFORM 2 (SU17-175)

Platform 2 is a roughly trapezoidal flat-topped rock structure, measuring 22 by 34 meters and varying in height from 15 cm on the northeastern side to 1 meter on the southwestern side. Much of the perimeter consists of sloping sides; however, a few sections are vertical, suggesting that all sides were vertical at one time. The one-course-thick perimeter wall consists of fitted stones, averaging approximately 20 by 30 by 30 cm (Fig. 27). No mortar is apparent in the vertical sections and no attempt to shape the stones for a better fit is evident. The stone fill or core of the platform is similar to that of Platform 1, consisting of large stones interspersed with smaller ones. A significant difference in construction, however, is evident. In Platform 2 the stone rubble fill provides a surface level with the tops of several large outcrops incorporated as part of the platform core.

The surface of the platform is paved with fitted stones; however, the central portion contains a considerably higher percentage of very small stones that define a roughly oval area that may have been the floor of a dwelling. Although several depressions dot the surface of the platform, excavation yielded no evidence as to their function. Some might be post holes, particularly those that lie around the perimeter of the suspected dwelling outline; however, many (or all) might have resulted from tree growth after the abandonment of the site. In fact, one

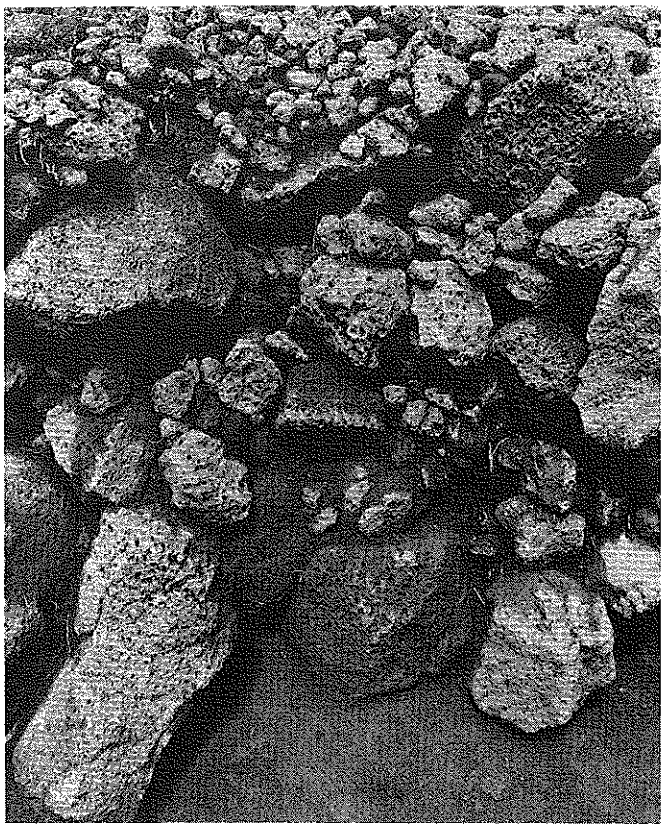


Fig. 26. CLOSE-UP OF CONSTRUCTION OF PLATFORM 1 AT TAUSAGI. Note large stones of rubble fill and pavement of small stones.

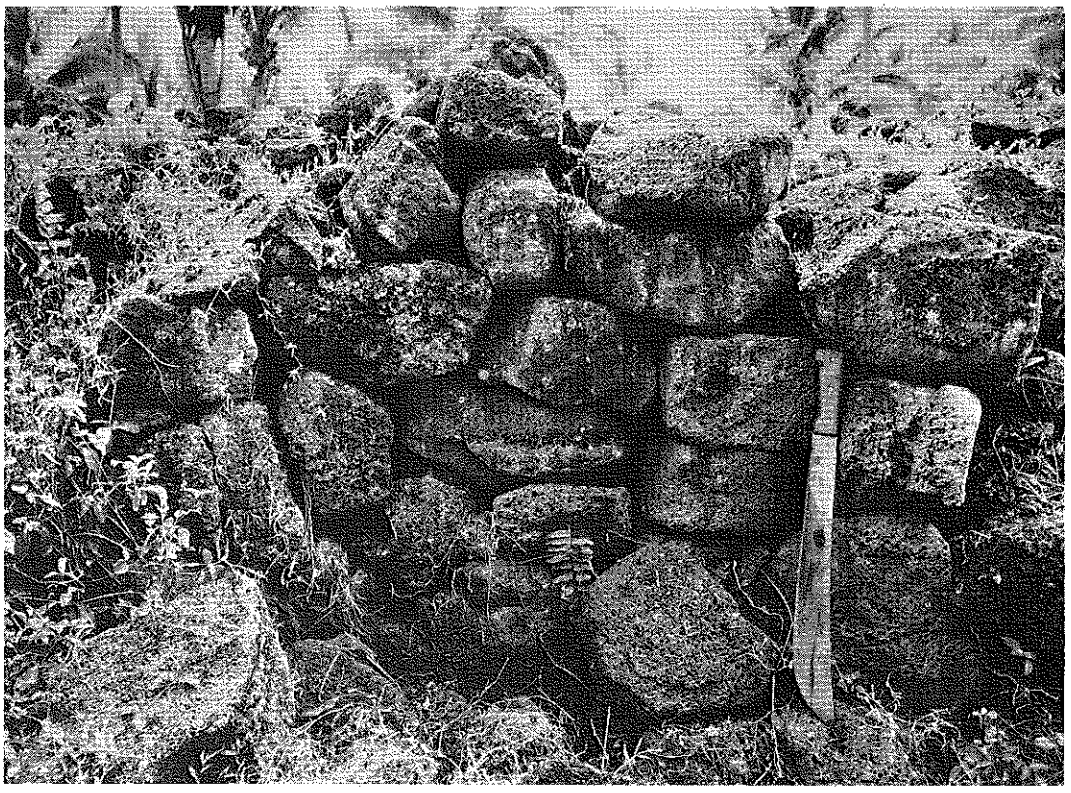


Fig. 27. WALL CONSTRUCTION USED IN PLATFORM 2 AT TAUSAGI.

large tree stump (1.2 meters in diameter) still stands on the western corner of the platform. The tree obviously had grown after the construction of the platform because the root system had established itself in the stones.

PLATFORM 3 (SU17-526)

Platform 3 is a trapezoidal stone structure that measures 25.5 by 21.5 meters and is approximately 40 cm high. The sides slope gently from a centrally located, rectangular, flat area that measures 17 by 8.5 meters. Both the central flat area and the platform outline are curbed in many places, suggesting that during prehistoric use, curbing completely surrounded both.

Considerable effort and time were invested in a search for evidence of post holes because of the good preservation and the relative shallowness of the stone fill, compared to the other two platforms excavated (Figs. 28 & 29). It was thought that since it was difficult, if not impossible, to detect intrusions in stone fill, there might be some evidence in the protected topsoil beneath, if posts had been set deeper than the 40 cm thickness of the platform. No such evidence could be located, either inside or outside of the central flat area curbing. Despite the lack of post hole evidence, it is thought that the platform supported a dwelling that generally conforms in shape to the curbing outline.

The platform construction is essentially the same as that of the other two, with the core of the structure consisting of large stones and the surface finished with fitted small stones. The top stones of the central flat area are smaller and better fitted in general than those covering the sloping sides. The smooth, levelled nature of the flat area is additional evidence that it was the floor area of a structure.

The curbing stones of both the perimeter of the platform and the suspected floor area are block shaped (measuring 20 by 20 by 30 cm) and are inset into the topsoil or the stone platform fill to approximately one-half of their thickness.

Few artifacts were recovered from the excavations in Platforms 1 and 2. In Platform 3, however, numerous artifacts were concentrated in one area on the eastern edge of the suspected surface. The artifacts consist primarily of small stone flakes of a non-local, dense basalt. Numerous pieces have finely ground sides and edges, suggesting that they were once part of finished adzes. Other pieces do not have the finely ground surfaces but show evidence of conical percussion fractures. The attributes of the flakes and their location, clustered at the edge of a stone pavement, parallel those reported by Green (1974:145, 266) in Layer 5 at SU-Sa-3. He interprets their presence as indicating a work area adjacent to a house, the flakes resulting from the use or reworking of complete adzes.

Other artifacts recovered from the excavation consist of two pot sherds of the thin-fine variety. One was under the platform; the other was just outside its edge. Both sherds originated in the lower topsoil, clearly antedating the construction of the platform. Their existence, and the dates resulting from excavations of Janet's Oven (Jennings et al. 1976), could indicate

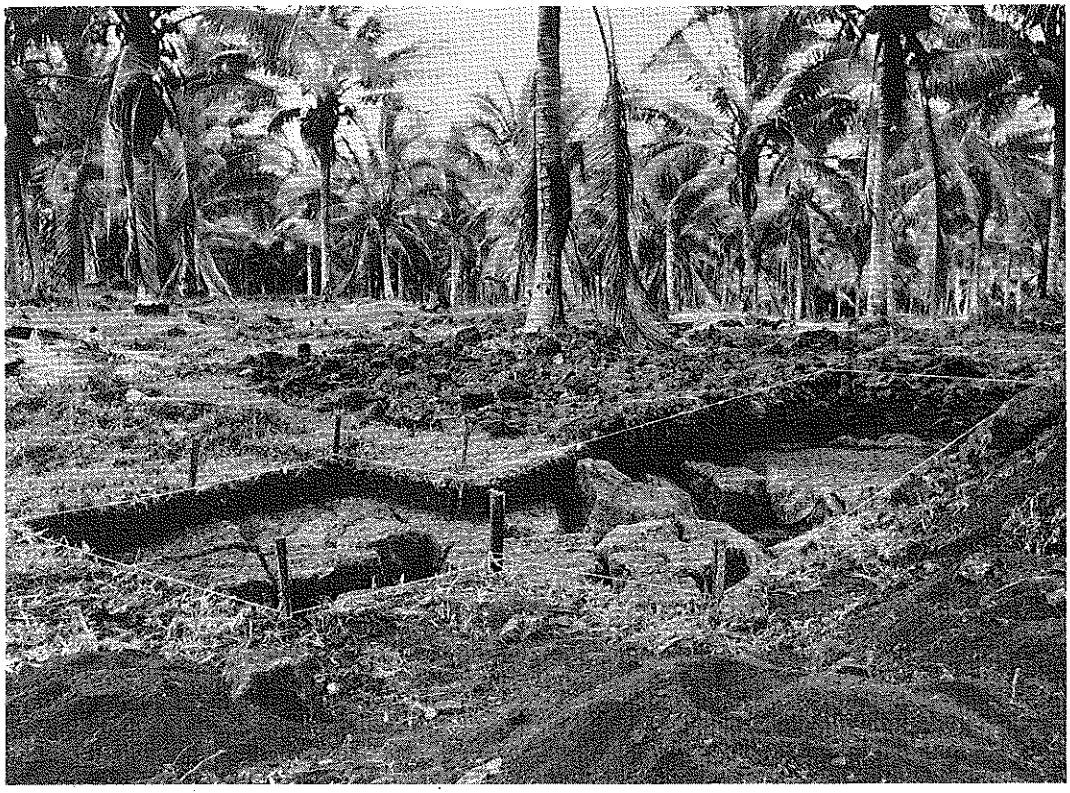


Fig. 28. EXCAVATION OF PLATFORM 3 AT TAUSAGI.

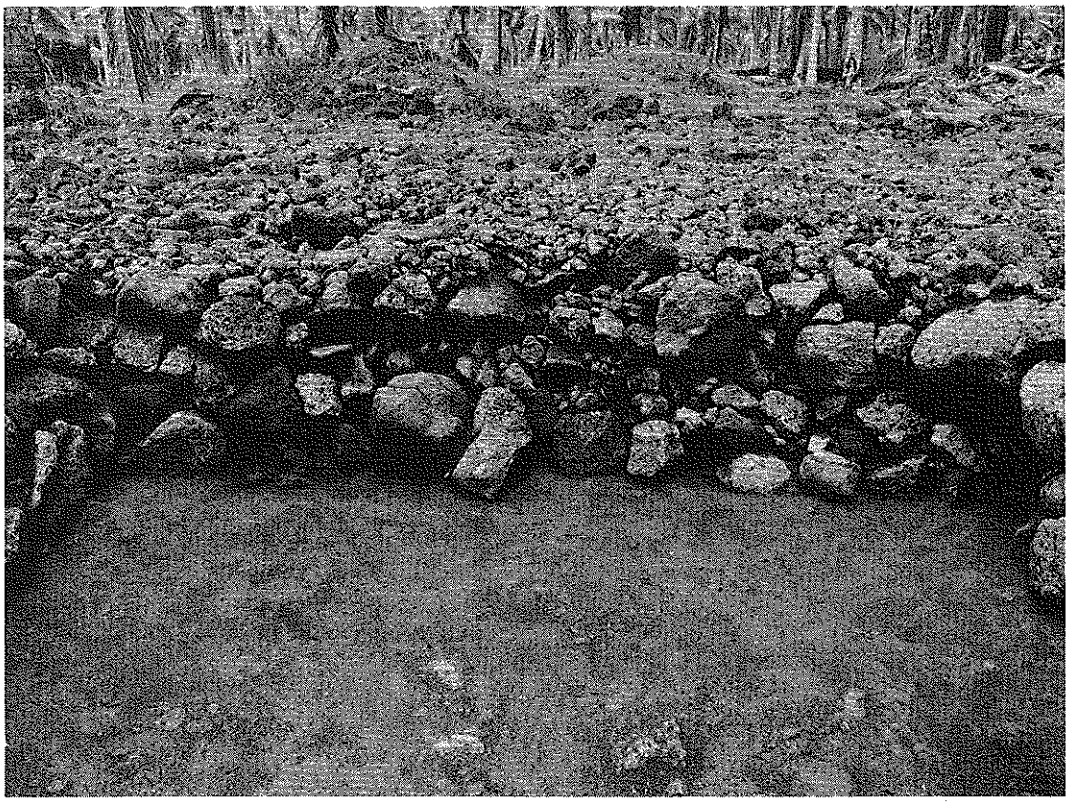


Fig. 29. CROSS SECTION OF PLATFORM 3 AT TAUSAGI.

that the site area was used prehistorically for a period of at least 1,000 years, but such a claim can hardly be made on the basis of two sherds.

A burial was found close to the center of the suspected floor surface. The heavily rotted skeletal material was located at a depth of approximately 20 cm below the platform surface. Only portions of the skull were removed. The remaining bones were left in place because of the uneasiness shown by the crew when human bones were discovered. While no evidence of an intrusion could be detected in the stones covering the burial, it is apparent that it postdates the platform because it is above the fossil topsoil stratum.

WALKWAY (SU17-179)

The walkway traverses the Tausagi site, passing the three excavated platforms at a uniform distance of approximately 50 meters (Fig. 30). The walkway is one of the best preserved structures of its type recorded in the Mt. Olo Tract. Within the Tausagi site, the walkway changes from a raised way to the NW to a walled way toward the SE. The transition is very gradual; a section of over 100 meters has characteristics of both raised and walled walkways.

Two trenches were extended into the walkway in search of construction and descriptive information. The walkway consists of a soil path, varying in width from 1.3 to 1.6 meters, with parallel stone-rubble fences (walled way) or sloping sides (raised way), measuring 2 to 3 meters wide overall. In the walled portions of the walkway, the path is usually at ground level where the natural stone cover has been removed. In most of the raised portions, the soil path has been constructed on top of a stone rubble core. The soil pathway is approximately 20 cm thick and consists of subsoil (possibly used for its dense clay properties). The height ranges from ground level to approximately 1 meter. In the transition zone (where the raised way changes to a walled way, approximately at the southeastern end of Plot 3, see Fig. 25), there are a few remnants of low walls on each side. In all places, the soil pathway is bordered by 1-meter-wide stone pavements constructed slightly above the level of the path. In the walled sections, stone fences border the flat pavements and in the non-walled sections (usually raised) the sides slope down to the ground at an approximate 45° angle. Construction of the walls or fences that border the walled walkways consists of large, block-shaped, fitted stones forming a one-course-thick facing on both sides of the wall. The central core consists of small stones (10 cm in diameter) with very few larger stones evident (Fig. 31).

Remnants of the stone walls suggest a trapezoidal cross section with a consistent basal width of approximately 1 meter; these dimensions support the findings of the 1974 Mt. Olo Survey (Jennings et al. 1976:51) and the 1976 session. Several sections of the walls remain standing, although all show evidence of partial collapse. It appears that the original height of the walls was approximately 1 meter, as calculated from the height of the remaining portions and the amount of rubble lying at the wall bases.

FENCES

Four fences are within the area, but were not sectioned by excavation. They vary considerably in preservation, ranging from sections that remain vertical to sections reduced to rounded

Fig. 30. WALLED WALKWAY AT TAUSAGI AFTER VEGETATION HAS BEEN CLEARED. This section is opposite Platform 2. A few courses of stone remain in place in the upper left.

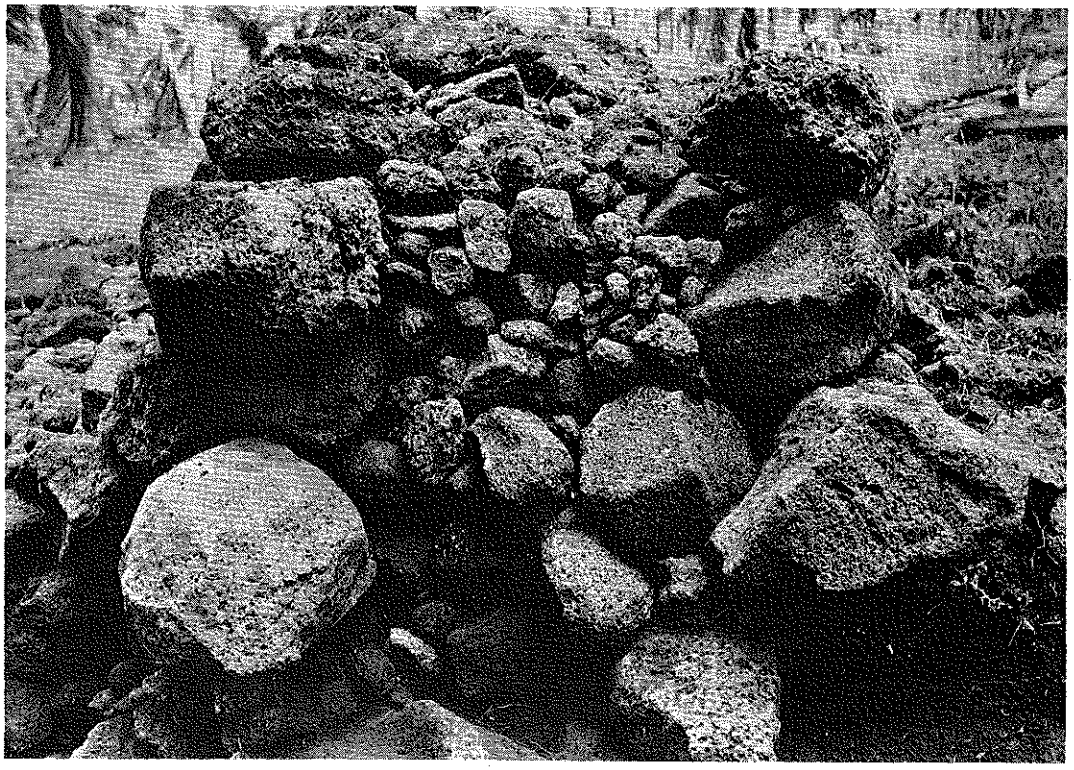


Fig. 31. CROSS SECTION OF STONE WALL OF WALLED WALKWAY. Showing outer courses of large fitted stones and smaller stone rubble fill.

linear piles of stones. The vertical sections demonstrate that the original height and width were similar to the fences of the walled walkways with the exception of the section of fence that joins the northern corner of Platform 2. Here there is little deterioration or collapse, and the fence appears to have originally measured 95 cm wide and 60 cm high, making it narrower and lower than most other walls in the survey area.

CLEARED PLOTS

A minimum of nine stone-free plots were noted in the Tausagi site area. They appear to be the result of the clearing and removal of all large stones (greater than 5 cm in diameter) from the topsoil. The stones removed from the plots apparently were simply discarded on the surrounding natural stone cover, resulting in mounded stone-rubble heaps. In several places the perimeter of the plots evidences a definite effort to make an even edge, to the extent of placing curb stones in some sections. In a few areas, the curbing takes the form of a short wall, two or three stones high and one course thick.

Four of the nine plots were test-excavated in a search for some evidence of function. Only the excavation in Plot 3 provided any information. Twenty-one approximately circular intrusions were exposed in a 33-square-meter area (Fig. 32). The sizes of the intrusions are relatively uniform with a average maximum diameter of 37.9±6.1 cm. Many of the intrusions are not perfectly circular. They yielded an average minimum diameter of 35.3±5.9 cm. The depth is 61.9 ±9.1 cm. As the small standard deviations on the measurements indicate, there was considerable consistency in size and shape, suggesting that all the intrusions might be related in origin or function.

The distribution of the intrusions does not appear to follow any pattern. A test to determine if their distribution is random, clustered, or dispersed (Whallon 1974:18; Kowta 1975:105) demonstrated a strong tendency toward the random. ($R = 0.807$ with a chi-square = 12.6 with 22 degrees of freedom, indicating that the distribution is not significantly different from an expected random distribution.)

Extrapolation from the excavated area suggests that approximately 200 intrusions could exist in Plot 3. Interpretation of the intrusions as evidence of gardening is not warranted; they do not resemble the holes made for planting any of the crops commonly grown in Samoan gardens today. The intrusions originate high in the topsoil stratum (it is impossible to determine exactly where) and penetrate the 20 to 25 cm of topsoil, extending another 40 cm into the subsoil. The intrusions are now filled with soil that is similar to the topsoil, although it contains slightly less organic carbon (3.71%).

Plot 1 was test-excavated specifically to examine it for similar intrusions. A 2-by-2-meter-square sounding was excavated, which would be sufficient to locate intrusions at a density similar to that observed in Plot 3. However, none were detected. The topsoil in Plot 1 averages approximately 20 cm thick and is identical in consistency and color to that found in Plot 3. Plot 1 is different from the other plots surveyed in the Tausagi site in that it is highly irregular in shape and has four symmetrical piles of stone located within it. The piles are

Fig. 32. HOLES ENCOUNTERED IN PLOT 3, TAUSAGI.

approximately 1 meter high and appear to have been carefully constructed with small stones fitted on the surface, very similar to SU17-527 at the Cog Complex. The perimeters are often edged with stones, which in places appear to form a curbing. Along the eastern edge of Plot 1, a large, fine-grained, basalt *kava*-pounding stone was found.

Plots 2, 4, and 8 are not as neatly groomed as the other plots, having some large (60 cm in diameter and larger) stones scattered about. Although those plots were not excavated, it appears from the surface that the topsoil contains more stone than in those plots bordering the walkway. This might suggest that less care was taken in preparing the plots farther from the walkway, conceivably because different species were grown (if they were for gardens in spite of our conclusions) or for aesthetic reasons.

Plots 6 and 9 were partially excavated to establish stratigraphic control for the excavation of the walkway and Platform 3, respectively. No evidence of intrusions was noted. Both plots did, however, yield pottery at a depth of approximately 10 cm below the modern surface. The piece recovered from Plot 6 was located in the soil fill of a shallow fire basin, which provided enough charcoal for radiocarbon dating. The resultant date of 35 B.P. clearly indicates that the pottery and the basin are not contemporaneous. Although the piece of pottery found in Plot 9 is not associated with any cultural feature, it was about as deep below the modern surface as the piece recovered from under Platform 3, suggesting that the pottery predates the construction of the platform.

PORTABLE ARTIFACTS

Most of the artifacts recovered are flakes of fine-grained basalt of a type not indigenous to the Mt. Olo area. Many are worked, or more properly, are fragments of worked stone, probably adzes. A total of 45 pieces of stone was recovered (15 showing some evidence of shaping, and 30 showing no smoothed surfaces or conical fractures). Forty-three pieces came from Platform 3, and 2 from the walkway surface. One abrading stone came from Structure 3, and one unidentifiable adze. The only other types of artifacts found are the three pieces of pottery which have been discussed above.

Ten shells (not artifacts) were also recovered: 4 non-identifiable fragments, 2 Lucinidae from Platform 3, and 4 Spondylidae from the surface of Platform 1.

INTERPRETATION

The excavation of the Tausagi Site has provided a sample of an HHU in Residential Ward E of the Mt. Olo settlement (Fig. 33). The site is adjacent to Janet's Oven (Jennings et al. 1976). The site yielded a radiocarbon date of A.D. 290 B.P. While contemporaneity of the oven with the Tausagi structures cannot be positively established, the statistical locational analysis, presented later in this report, strongly supports a direct association. Occupation of the Tausagi Site, therefore, is believed to have occurred during the 16th century.

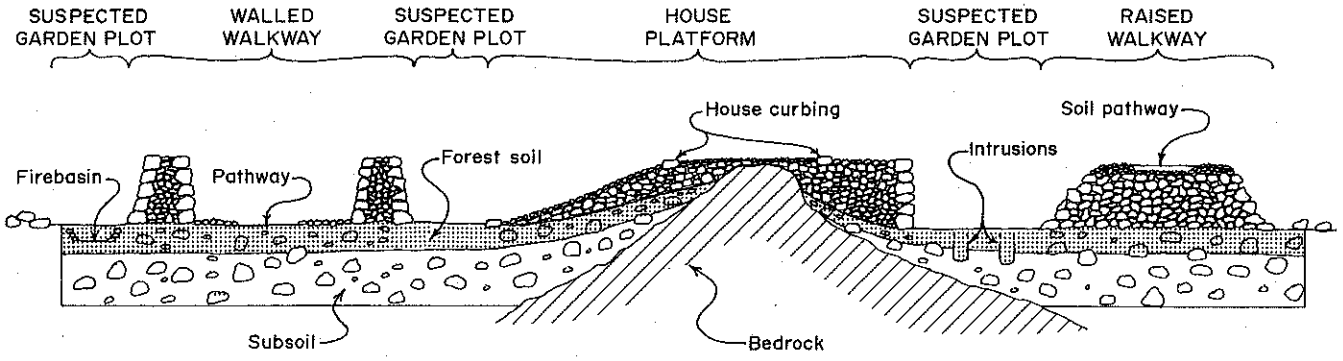


Fig. 33. BLENDED SCHEMATIC SECTION SHOWING STRATIGRAPHY AND CONSTRUCTIONAL DETAILS OF PHENOMENA EXCAVATED AT TAUSAGI. No scale.

Of the platforms excavated, Platforms 2 and 3 exhibit apparent house outlines of gravel pavement or curb stones. The pavement outline on Platform 2 is oval with an area of approximately 55 square meters. Platform 3 has a clear house outline with a small-stone pavement partially outlined by curb stones. The shape of the paved area is more rectangular than Platform 2 with an area of 235 square meters. Both house outlines are considrably larger than the average size reported for eastern Upolu (Davidson 1974c:234). McKinlay (1974:29) reports an early historic structure, interpreted as a community house, that is oval and has a floor area of approximately 95 square meters. Davidson (1974c:234) suggests that an area of 90 square meters or more is required before a community house can be identified with confidence. Platform 3 clearly exceeds that requirement, leaving the possibility open for its interpretation as a community house.

The floor area of Platform 2 does not approach the community house size although it still is considerably larger than the average house. The largest house outlined at Vaigafa (Davidson 1974b:184) encompasses an area of 68 square meters, and Davidson (1974c:234) interprets the house as possibly being associated with high status. Other large house outlines occur at Vaigafa, and all are directly adjacent to a raised pathway, forming a pattern similar to that at Tausagi. The interpretation of Platform 2 as a house structure of a person of high rank supports the conclusions of the 1974 settlement pattern study for the Mt. Olo area (Jennings et al. 1976). At that time, it was hypothesized from the size of the platform alone that it might be a chief's house or a community house.

The ethnohistorical evidence indicates that the community houses are essentially owned by the local chiefs and that there is one community house for each chief (Davidson 1969:63). Also, both structures often border the community's meeting ground (*malae*) or are set out along a road or pathway (Davidson 1969:59). Any one of several clearings around the two platforms could have functioned as a meeting ground, although none are of the size (300 meters in diameter) reported ethnohistorically (Davidson 1969:62).

The function of the numerous plots in the Tausagi site remains unknown. A difference in the appearance of the plots is evident according to the distance from the walkway. Those directly adjacent are completely clear of all surface stones, while those farther away than c. 30 meters are cluttered with boulders. The differences may merely indicate that it was socially important to maintain an uncluttered appearance near the walkway.

The walkway is elaborately constructed in comparison to other walkways in the area. It has unique features, such as the narrow pavements bordering each side of the soil path. That the walkway was changed from a walled to a raised way in order to be consistently level also appears to be unique. Others simply follow the contours of the terrain.

In summary, the Tausagi site appears to have been an area of high status, perhaps with a community house and a chief's house occupying two of the three platforms. The excavation of the platforms and the related garden plots, fences, and walkways yielded information concerning the construction of the structures but provided little information concerning superstructures except for possible size and shape.

APULU

RICHARD N. HOLMER

INTRODUCTION

Located near the southwestern corner of the Mt. Olo Survey Tract, the Apulu HHU comprises sites SU17-83 through -87, -446, -477, -478, and -482. The terrain in the vicinity of the site slopes gently to the NE toward a swale approximately 50 meters away. About 100 meters S of the site is a series of large depressions, apparently the result of the collapse of underground lava tubes. There is an entrance into one of the tubes in the easternmost depression (Fig. 2). Even during the height of the dry season, some moisture collected on the ceiling and walls of the tube. However, its dependability as a source of potable water is unknown.

The Apulu HHU consists of four stone platforms in an area of approximately 9,185 square meters, bounded to the N and E by intersecting walkways and to the S and W by stone fences (Fig. 34). Bisecting the HHU is a modern plantation road, which has disturbed portions of one platform and short sections of the walkways and fences. Apulu was selected for excavation because it contains several well-preserved platforms of differing sizes and is an example of a household unit in Residential Ward F.

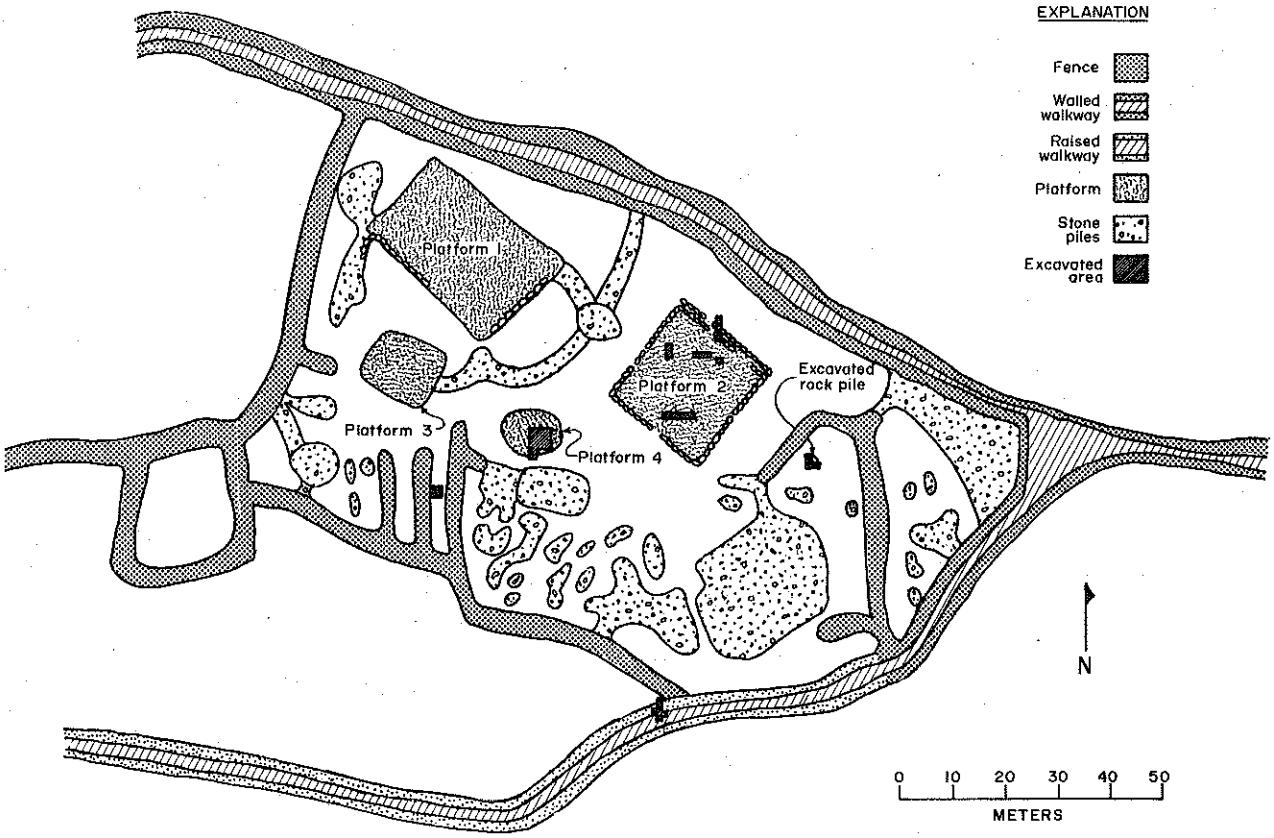


Fig. 34. MAP OF APULU HOUSEHOLD UNIT.

EXCAVATION AND STRATIGRAPHY

Clearing activities and excavation took place from September 6 through 28, 1977, with a crew of six to nine Samoan workers. A total of 1,680 square meters of surface area was cleared of vegetation and 27 cubic meters of soil and stones were excavated. All excavations were backfilled upon completion and the structures were restored to approximately their original appearance.

All cultural features originate on or near the modern surface. The subsurface stratigraphy of the site is the familiar one characterizing the other locations in the Mt. Olo Tract.

STRUCTURES

PLATFORM 1 (SU17-477)

Platform 1, the largest stone structure in the HHU, is rectangular, measuring 19.8 by 31.8 meters and varying in height from ground level to 30 cm in the northern corner. Curb stones outline portions of the southeastern and southwestern sides, suggesting that the entire platform circumference may have been curbed at one time. The top is bisected by a modern plantation road, resulting in an uneven surface with few areas of pavement remaining intact. The northeastern half of the platform was cleared of vegetation but the disturbed condition precluded excavation.

PLATFORM 2 (SU17-483)

Platform 2 is a square stone structure measuring 21.6 by 22.4 meters and varying in height from 15 cm in the southern corner to 60 cm near the center of the northeastern side. Curb stones delineate the entire circumference and a second parallel row forms a 1-meter-wide step or tier on the NE side, closest to the walkway. The top of the platform is paved with small stones, up to 10 cm in diameter. Because the pavement is one of the best preserved of those recorded during the survey, the platform was the object of considerable subsurface excavation.

The paved surface has 18 circular depressions. Mapping the depressions revealed no regular pattern that could be interpreted as superstructure post holes. Six depressions, thought more likely to be post holes because of their locations, were excavated; however, none could be positively associated with culturally related activities. Excavation revealed no intrusions in the soil beneath the depressions; therefore, if the depressions resulted from collapsing post holes, the posts were not set into the soil beneath as is the custom today. Either posts were supported entirely by the stone fill of the platform (c. 50 cm thick) or the depressions result from other events such as tree growth and the subsequent decay of the trunk and root systems.

A relatively large disturbed area, with soil mounds paralleling two linear depressions, occurs near the southwestern edge of the platform. Excavation in the depressions revealed two lozenge-shaped pits that measured 1 by 4 meters and 90 cm deep. The pits appeared to be the result of human activity because of their regular shape and consistently vertical sides. That

they were dug prior to the construction of the platform is suggested by the continuation of the stone rubble platform fill and pavement over the pits. The platform abuts the earth mounds, formed by the spoil dirt from the pits, deposited on the topsoil surface. It is possible that the platform stones could have been removed and replaced several times if the pits were then being used for food storage. A small area of burned earth and charcoal occurred in the bottom of one pit. A charcoal sample yielded a radiocarbon date of 1175±70 B.P.

PLATFORM 3 (SU17-486)

Platform 3 is rectangular, measuring 12 by 15 meters and 40 cm high. The perimeter consists of sloping sides (c. 45°) of stones similar to the top. The general appearance of the sides suggests that they are as originally constructed, rather than the result of the collapse of previously vertical sides. The top of the platform is badly disturbed with two large depressions (c. 3 meters in diameter and 20 cm deep), apparently the result of tree growth. A few small areas of intact stone paving occur, indicating that the top was at one time paved and, therefore, probably supported a superstructure. The entire platform was cleared of vegetation but no excavations were conducted because of the disturbed appearance of the presumed living surfaces.

PLATFORM 4 (SU17-484)

Platform 4 is roughly oval, measuring 10.5 by 8.8 meters. It is 25 cm high on the northern side, blending into the gentle slope on the S and E. Much of the top is rough stone with no evidence of fitting to create a smooth surface. An oval area of soil, 4.4 by 5.5 meters, occurs in the southwestern quarter of the platform. The area appears to be a natural eminence that was incorporated into the stone structure. Excavations in the soil area revealed a series of ten closely spaced post holes and a large zone of charcoal, ash, and fire-reddened soil permeating the entire topsoil stratum (20 cm thick). The post holes vary in diameter from 15 to 20 cm and average approximately 50 cm deep. The oval pattern outlines an area measuring 3.3 by 2.8 meters, resulting in a floor surface area of 9.25 square meters. The northwestern third of the perimeter is destroyed, presumably disturbed by a large fallen tree. Curb stones occur along the southeastern edge of the platform, outside the superstructure floor area.

Several charcoal samples were collected from the fire-reddened and charcoal zone. One sample, recovered from the bottom of a post hole, provided a date of 445±70 B.P.

One post hole contained a complete adze and several fragmentary adzes. Other adze fragments were collected from the soil area of the platform.

ROCK MOUNDS (SU17-485, and several unnumbered)

Numerous amorphous piles of stone occur in the HHU, concentrated toward the rear of the unit, away from the main walkway that runs along the N side. The piles appear to be the result of agricultural clearing, although a few of the larger areas have a built-up rim of stone. Some of the larger piles may represent the natural distribution of stones before the area was modified for habitation. The zones may also have been areas where the natural vegetation was left undisturbed and where stones from the surrounding cleared land were thrown. The smaller piles

may result from stones thrown around the base of large single trees, as is often seen in modern villages, or simply be open piles in an area otherwise cleared for cultivation.

One small mound, unique in appearance, was excavated. It measures 2.35 by 2.75 meters, and 25 cm high, and consists of small stones fitted into a pavement with a curbed perimeter of stones c. 15 cm in diameter. Bisecting the mound revealed a 25-cm-deep basin, approximately the same diameter as the mound, that was filled with small stones and soil to form the mound. Among the fill were several scattered fire-reddened stones, one piece of pottery, three adzes, and two small areas of charcoal. Charcoal from these two areas was combined to produce a sample large enough for radiocarbon assay, yielding a date of 945±60 B.P. No inference concerning the function of the basin or mound can be made.

FENCES (SU17-478, -482)

Two classes of fences occur in the HHU. The fence that forms the southern and western perimeter of the HHU is relatively massive, compared to other low, linear stone arrangements within the HHU. The perimeter fence, in its present collapsed form, varies in height from 40 to 80 cm, and in width from 1.15 to 3.20 meters. In a few places, portions of the original wall remain intact, with a basal width of slightly over 1 meter. The stones in those sections do not appear to be as carefully fitted as in the walled walkway on the N side of the unit.

Several smaller fences occur in the HHU. They are approximately the same width as the higher fences, although their height rarely exceeds 30 cm. They also differ in the size of stones incorporated. Stones in the higher fences are up to 60 cm in diameter; in the lower fences stones are smaller than 20 cm in diameter. The lower fences may be related to the stone mounds discussed above, in that they may have resulted from agricultural clearing and were never intended to restrict the movement of people or animals.

The fences form several unusual enclosures and configurations. At the southwestern corner is a rectangular enclosure, 18 by 21 meters, possibly a garden plot or pen. To the E three parallel fences extend from the southern wall, forming pen-like enclosures. A 2-meter-square excavation in the eastern enclosure revealed no subsurface indication as to the use of the area. A low fence seems to establish a boundary between Platforms 1 and 2.

WALKWAYS (SU1-446)

Two types of walkways occur along the northern and eastern perimeter of the HHU (Figs. 35 & 36). Both are excellent examples of their respective types, with great care in construction evident. The walled walkway on the N and E of the HHU consists of two parallel stone fences delineating a 2-to-3.8-meter-wide soil pathway. Of interest is that the pathway is widest directly adjacent to the two platforms, narrowing slightly between the platforms and considerably to the E and W of the HHU.

Several portions of the stone fences remain intact. The original walls appear to have measured approximately 1 meter high and 1 meter wide at the base, tapering to approximately 75 cm at the top. The construction technique is identical to the excavated walled walkway at the

Fig. 35. WALLED WALKWAY AT APULU.

Fig. 36. RAISED WALKWAY AT APULU.

Tausagi HHU. Large stones (25 to 40 cm diameter) were carefully fitted to form the outside faces of the walls and smaller-stone rubble makes up the core. This construction technique has been observed only in fences forming the walls of walkways.

A triangular intersection occurs on the northeastern corner of the HHU where the E-W walkway connects with the walkway entering from the SW. Through the intersection, the E-W path is slightly raised (approximately 10 cm) while the other enters at ground level, possibly indicating the relative importance of the two.

The raised walkway begins near the southeastern corner of the site with an abrupt transition from the walled walkway to the N. The transition point is separated from the two large platforms of the HHU by the low stone mound. The view of the platforms in the HHU would have been restricted for the entire length of the raised walkway, if the present dense stone scatter between the walkway and the southern fence of the HHU points to a natural forest growth or other vegetation at the time of use. Being able to view the platform only from lower walkways is consistent with Davidson's (1974c:240) suggestions that relative height is a significant social factor. The raised walkway is trapezoidal in cross section with a total width of approximately 6.5 meters. The outer edges are marked by curb stones and the sloping sides consist of small stones and soil. The slightly mounded top or path measures approximately 3 meters wide and is also curbed along each edge.

Excavation revealed a construction sequence for the walkway. First, two parallel rows of earth and stone, each measuring 30 cm high and 1.5 meters wide, were constructed c. 3.5 meters apart. The space between was filled with a rubble of large stones to a depth of 45 cm. Finally, the path itself, of clay c. 15 cm thick, was placed upon the rubble core. The pathway curb stones appear to have been placed prior to the completion of the top because of the depth (10 cm) that they are inset into the soil. The cross section cut showed a linear fire-reddened area of soil measuring 1.7 meters long and 45 cm wide on the old forest soil surface under the walkway. Charcoal was insufficient for dating. The burned zone could have resulted from the burning of a log on the old surface prior to the construction of the walkway, possibly during the clearing for the walkway.

PORTABLE ARTIFACTS

The excavations in the Apulu HHU produced numerous and varied artifacts. The single piece of pottery recovered from the low stone pile hints at, but does not demonstrate, an early use of the area. As with the pottery found at Tausagi, it is not associated with any of the dwelling structures. However, the radiocarbon date of charcoal from the same rock pile (945±60 B.P.) confirms an early occupancy that preceded the construction of the stone architectural features. An adze recovered from the same pile is a Type III that is not temporally distinctive.

Seven other identifiable adzes were recovered during the excavations. The excavation of Platform 2 produced four: a Type IVb and a probable Type IV in the stone fill; a Type II in the topsoil approximately 1 meter N of the platform; and another Type II in the fill of the lozenge-shaped pits near the south side of the platform (dated at 1175±70 B.P.). Type II

commonly occurs after pottery-bearing levels, although small specimens occur in early pottery-bearing horizons. Types IV and IVb, however, are usually associated with early pottery-bearing sites.

Three adzes, two of Type I and one of Type VI, were recovered during the excavation of Platform 4 (dated at 445±70 B.P.). The Type VI adze occurred in a post hole of the structure. Types I and VI adzes are very common and neither are temporally significant.

Other artifacts recovered include five non-diagnostic adze fragments, four from Platform 4 and one from Platform 2. Numerous stone flakes were also recovered, mostly from Platform 4.

Occasional scraps of shell were recovered from both Platform 2 and the small excavated stone pile, but all were so badly decayed that no identification was possible.

INTERPRETATION

The Apulu site is the only excavated household unit in Residence Ward F of the Mt. Olo settlements. The major contributions of the excavations to the understanding of the prehistoric settlements are the presence of possible storage pits, the clearly defined kitchen house outline (Platform 4), and radiocarbon dates for the use of the site.

The possible storage pits are the only features of that type recorded at Mt. Olo. The stratigraphic sequence of the pits below the platforms is parallel to Green's findings at Vailele (1969:121) where the construction of pits is the earliest activity represented. The radiocarbon dates of 1175±70 B.P. from the Apulu pits agree with other early dates on charcoal recovered from beneath stone structures in the area.

Platform 4, the kitchen house, is also the only identified structure of its type located in the survey area and provides the only superstructure architectural information in the HHU. The small oval post-hole pattern covered an area of similar size to those kitchens observed in modern HHU's. The presence of many basalt flakes suggests that the area was also used as a work area.

The three radiocarbon dates and the presence of pottery support the temporal sequence inferentially established at other sites at Mt. Olo. The area may have seen earlier casual use, but the large permanent settlements possibly were not constructed until the 15th century A.D.

TUTIA AND MISI

RICHARD N. HOLMER

INTRODUCTION

The Tutia and Misi HHU, located in Ward G of the survey tract, include SU17-177 and -189, as well as several unnumbered features that were discovered during the excavations (Fig. 37). The terrain in the area slopes gently to the NW, into a swale bisected by Walkway 1. The ground outside of the HHU's is densely covered with scattered stone, while within the units much of the ground is uncleared. During the original survey the area was thought to be a single HHU. The bisecting walkway was discovered after the vegetation clearing began.

The Misi HHU, on the W side of the walkway, consists of one large platform and two smaller curb stone outlines of suspected house structures. The HHU is bounded to the NW by a walled walkway, to the SW by a stone fence, to the SE by a short section of fence and an area of thick stone cover, and to the NE by the sunken or trenched walkway that separates the two HHU's. The total area enclosed in the Misi HHU is 7,220 square meters. This unit was not excavated, although two of the structures were cleared of vegetation.

To the E of the sunken walkway is the Tutia HHU, bounded on the NE by a stone fence, on the SE by a large area of natural stone cover, and on the NW and SW by walkways. Tutia contains two large and two small platforms in a total enclosed area of 7,735 square meters. This unit was selected for excavation because of the excellent preservation of the platforms and the presence of clear house outlines of curb stones and post holes.

EXCAVATION AND STRATIGRAPHY

Excavation and clearing began on September 29, 1977, and continued for five days with a crew of ten laborers. A total of 990 square meters of vegetation was cleared and 13.2 cubic meters of soil and stone were excavated. All excavations were backfilled and the structures were restored to pre-excavation condition.

The natural stratigraphy of the site is similar to other sites at Mt. Olo, consisting of two strata formed from the parent volcanic flow material. Two trenches were excavated that penetrated Platform 1 and exposed a third soil stratum of culturally deposited topsoil.

STRUCTURES

PLATFORM 1 (SU17-177)

Platform 1, in Tutia HHU, is a square stone structure, measuring 28.6 by 28.8 meters and varying in height from 50 cm on the N side to ground level on the S (Fig. 38). The top pavement is of fitted stones, up to 5 cm in diameter, outlined by curb stones. The sloping sides of the platform are of soil, extending for approximately 2 meters on the N and W sides and blending into the gentle slope toward the SE corner.

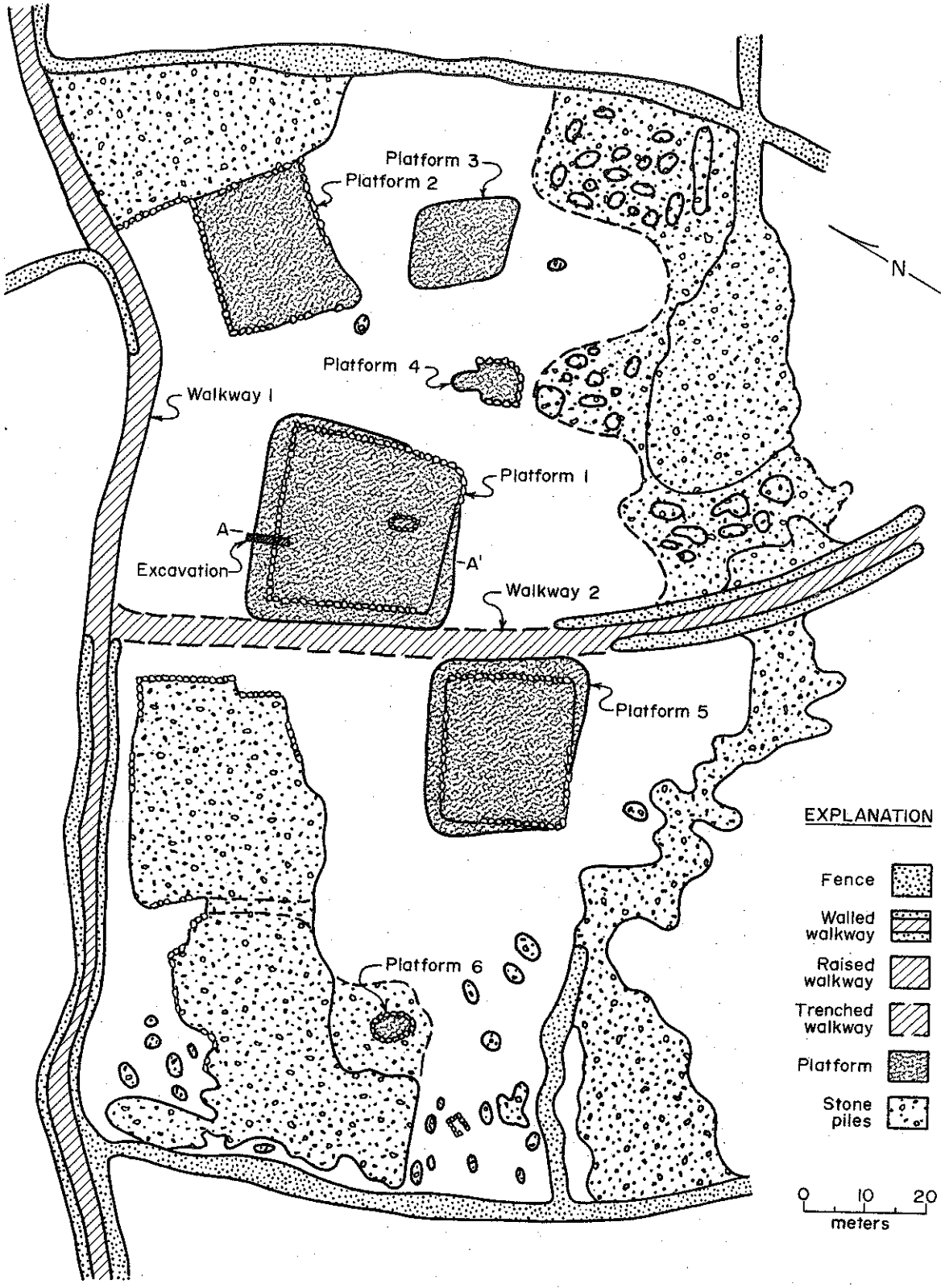


Fig. 37. MAP OF TUTIA (above) AND MISI (below) HOUSEHOLD UNITS.

The top is spotted with numerous depressions ranging from 40 cm to 1.5 meter in diameter, and 5 to 20 cm deep. Detailed mapping revealed no pattern that could be interpreted as a post hole arrangement. Four depressions were excavated but no evidence of collapsed post holes was observed in either the stone core of the platform or the soil below. Some depressions undoubtedly resulted from the growth of forest trees; the badly decayed remains of one stump was still present in one depression.

A well-preserved house outline curbing occurs toward the southern edge of the platform (Fig. 39). It measures 5.5 by 2.5 meters and encircles a paved stone floor that is approximately 10 cm above the platform surface. Round post holes are clearly evident around three-quarters of the perimeter. Numerous pieces of glass and metal cans were also present on and directly adjacent to the curbing. Because of its superimposition on the platform and the differential preservation of the pavement, curbing, and post holes, it is thought that the house structure was constructed much later than the platform. The presence of badly rusted cans and the glass suggests its use in the last fifty years, although there is no certain association between the refuse and the structure. It may have been constructed during the clearing of the forest vegetation for the expansion of the Tausagi Plantation. A similar structure (Platform 6; see Fig. 37) occurs in the Misi HHU, although it is not superimposed on a platform.

Subsurface excavations in the platform exposed a construction technique different from other platforms in Mt. Olo. The profile of the excavations (Fig. 40) shows that the sloping sides of the platform are linear piles of topsoil deposited prior to the placement of the stone core. The soil sides were apparently constructed from topsoil taken from directly adjacent to the platform. The sunken walkway to the W of the platform seems to have also been a borrow area that supplied much of the soil for the platform sides. The topsoil/subsoil interface, marked by a scatter of small stones, is approximately 10 cm lower than the outside edge of the soil sides, apparently from the increase of the topsoil depth following the many years of pedogenic transformation processes converting the upper portion of subsoil into topsoil.

PLATFORM 2 (no number)

Platform 2 is a rectangular stone structure measuring 20 by 25.5 meters and 20 cm high. It is curbed around much of its perimeter and adjoins an area of uneven stone cover to the E. The platform does not have sloping soil sides like Platform 1, but rather has curb stones placed directly on the ground surface. No excavations nor clearing activities took place on the platform, although it is apparent that the top is nicely paved with small fitted stones.

PLATFORM 3 (no number)

Platform 3 is not as clearly defined as Platforms 1 or 2, nor does it have perimeter curb stones. It is roughly rectangular, measuring 16 by 13.5 meters and 30 cm high. The top paving is not as fine as on Platforms 1 or 2 and many of the stones are larger than the 5-cm maximum diameter found on the other two. No clearing or excavation activities were undertaken on the structure.

Fig. 38. PLATFORM 1 IN TUTIA AFTER CLEARING. Trenched walkway (2) is faintly visible in foreground.

Fig. 39. OUTLINE OF SMALL, PROBABLY RECENT, HOUSE ON PLATFORM 1 IN TUTIA.

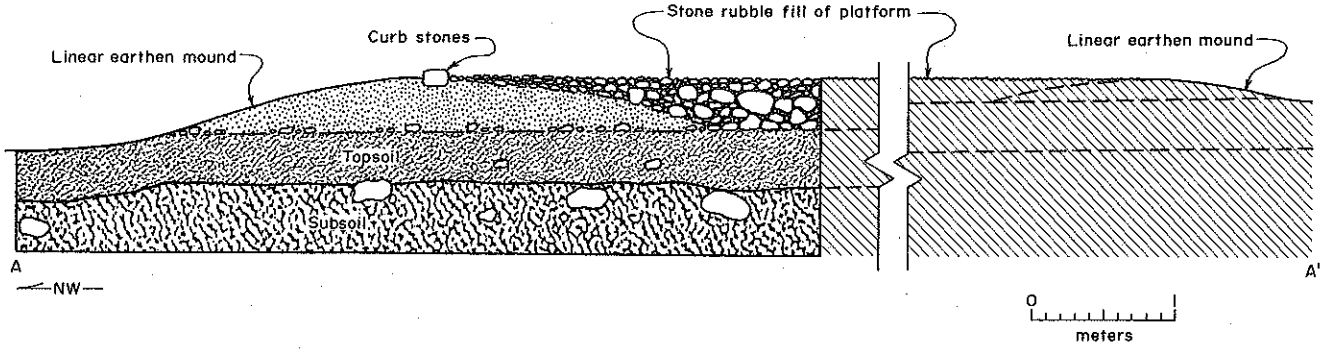


Fig. 40. CROSS SECTION OF NW SIDE OF PLATFORM 1 IN TUTIA. Note unusual construction feature, i.e., the earthen retaining mound or ridge.

PLATFORM 4 (no number)

Platform 4 is the smallest raised-rock structure in the HHU measuring 7 by 7 meters and 40 cm high. It is curbed around three sides and a rough ramp extends approximately 4 meters to the N. The top is rough, with large stones (approximately 10 to 20 cm diameter) forming the surface. No excavations or clearing took place here.

PLATFORM 5 (no number)

Platform 5 is on the W side of the sunken walkway in the Misi HHU. It is rectangular, measuring 21.5 by 24.8 meters, and is 50 cm high at the northern corner and 10 cm high on the southern corner. It was not cleared or excavated but its construction is similar to Platform 1, with a nicely paved top surrounded by curb stones and sloping soil sides. Much of the surface was badly disturbed, however, by the construction of a modern plantation road bisecting it.

PLATFORM 6 (no number)

Platform 6, in Misi HHU, is unlike all other platforms in the area but is very similar to the curbed outline on Platform 1. It is oval, measuring 3.5 by 6 meters with clearly formed and preserved post holes around its perimeter. The platform is 40 cm high and has curb stones outlining its surface of fitted stone pavement. As with the other oval curbed pavement, numerous pieces of tin cans and glass are scattered on and around the paved surface. The platform was cleared of vegetation and photographed, although no excavations took place.

PLATFORM 7 (no number)

Platform 7, also in Misi HHU, is a square outline of curb stones set into the topsoil. It measures 2.5 by 2.6 meters, and is less than 10 cm high. No surface paving of small stones is present, although several larger, fire-reddened stones occur in a fire-blackened zone in the western half of the outline. Concentrated in the burned area in and around the structure are numerous pieces of tin and glass.

WALKWAY 1 (SU17-189)

Walkway 1 forms the northwestern border of the Tutia and Misi HHU's. It enters from the W as a walled walkway and abruptly changes to a raised walkway at the junction with the trenched walkway (Walkway 2). To the E of Platform 2, it becomes a ground-level path through an area of a thick ground cover of stones. At the junction with the stone fence that forms the eastern edge of the HHU, it again is a raised walkway paralleled by a stone fence on the S side. Within 10 meters, a stone fence begins on the N side and the raised walkway lowers to ground level to become a walled walkway.

The walled walkway portion consists of a ground-level path varying in width from 1 to 3 meters. The two parallel stone fences are badly collapsed and average approximately 40 cm high and 2 meters wide.

The raised walkway portion varies in total width from 4.8 to 5.6 meters and from 10 to 30 cm in height. The sides slope at approximately 45°, making a top path width of approximately 4.5 meters. The top is paved with small stones much like that found on Platform 1.

The portion directly in front of Platform 1 was cleared of vegetation but was not tested. It is the most elaborately constructed section of the walkway observed in the immediate vicinity.

WALKWAY 2 (no number)

Walkway 2 separates the two HHU's. As a trenched walkway it connects with Walkway 1 where the latter changes from a walled to a raised way. It passes Platforms 1 and 5, and then returns to a walled form, leaving the HHU's through an area of thick ground cover of stones at the back of the units.

The trenched walkway portion measures approximately 6 meters in total width and 60 cm deep. The bottom is roughly flat, forming a 1-meter-wide clay path, flanked by paved areas also about 1 meter wide (Fig. 38). A trench bisecting the walkway revealed that it was excavated and the spoil dirt probably was used in the soil sides of Platforms 1 and 5. A slightly mounded western edge of the walkway resulted from the placement of excess soil, suggesting that the primary purpose was not as a borrow area for the soil sides of the platforms.

The walled walkway portion measures 7.5 meters in total width. The ground level path measured 2 to 3 meters wide with badly collapsed parallel stone fences, each measuring 2 to 3 meters wide and approximately 40 cm high.

STONE MOUNDS (no number)

Numerous stone piles occur throughout both HHU's. In the Tutia HHU, they are concentrated toward the back with one large one in the NE corner. The Misi HHU is different from most other HHU's because of the large stone area in the front near the walkway. Portions of the eastern end are curbed and a modern road may have obscured a possible platform. The western half is very rough and apparently never supported a superstructure.

FENCES (no number)

Fences form the eastern and western sides of the two HHU's. They are rounded masses of stone measuring 2 to 3 meters wide and approximately 40 cm high. The portions closer to Walkway 1 are less collapsed, suggesting an original width of approximately 1.2 meters and a height of approximately 1 meter.

MT. OLO SETTLEMENT PATTERN INTERPRETATION

RICHARD N. HOLMER

INTRODUCTION

The archaeological remains recorded in the Mt. Olo tract can be interpreted on four levels: (1) individual structures; (2) household units; (3) residential wards; and (4) communities. These levels have been discussed in varying degrees in earlier publications (Jennings et al. 1976; Jennings 1976, 1977) and are summarized here in light of recent analyses. Because of the interrelationship of the levels, it is often necessary to refer to one before it has been defined or justified.

ARCHITECTURAL STRUCTURES

MOUNDS

Conclusions of the 1974 Mt. Olo settlement pattern study (Jennings et al. 1976) suggested that the survey tract could be divided into areas (referred to in this report as residential wards), each having unique characteristics as to types and sizes of platforms, walkways, and fences. For platforms and walkways, it was argued that the larger groups within each area were associated with higher status residences. This concept is supported by Davidson (1969), who suggested the foundation platforms for chiefs' houses and community houses are significantly larger than those for average dwellings. The superstructures that occurred on the platforms vary in size according to status, resulting in combinations of superstructure and platform size that reflect the function of the platform. Table 4 summarizes the physical evidence (that can be recorded archaeologically) indicative of each platform type as derived from the ethnohistorical literature (Jennings et al. 1976:48-49).

Table 4.
SUMMARY OF STRUCTURE TYPES AND ATTRIBUTES

Type	Platform Area (m^3)	Height (cm)	Superstructure Floor Area (m^2)	Comments
Community house (*fale tele*)	200	30	90-180	Largest superstructure in community
Chief's House	250-400	100-150	30-60	Most massive platform in community
Dwelling (*fale o'o*)	100-200	20-60	14-60	
Cook house (*fale umu*)	5-40	30	5-15	Often constructed without platform
God house (*fale aitu*)	1-200	?	0.5-60	Size ranges from very small to large

Thus, chiefs' houses should be archaeologically identifiable as being the largest and highest platform in the community with a floor area falling within the range of the average dwelling. The community house platform should be large, possibly as large as the chief's house, but lower, with the largest superstructure floor area in the community (two to four times the size of the average dwelling). Also, chiefs' houses and community houses are located close to each other, providing an additional criterion to assist in their identification. Often so-called god houses are also associated with chiefs' and community houses. This pattern provides a basis for interpretation of the clusters of large platforms in the Mt. Olo Tract.

To analyze the distribution of large platforms, a nearest-neighbor analysis was used. In the analysis, platform basal area was used instead of volume because community house platforms may be extensive in surface area but very low, resulting in low volume. A division of 400 square meters for basal area was selected to separate large from small because it excludes most platforms but includes the largest of platforms from all parts of the survey area. Eight significant clusters (at the .001 confidence level) resulted, as summarized in Table 5. Excavations have been conducted in, or directly adjacent to, six of those clusters. Only two clusters, however, have provided data that are directly applicable to the identification of chiefs' houses and community houses. At the Tausagi site, two large platforms were excavated. The higher platform apparently supported a superstructure that covered a 55-square-meter floor area. The lower platform has a curbed superstructure outline covering 135 square meters. These data agree nicely with the ethnohistorical data. It is suggested, therefore, that the Tausagi site consists of high status structures, including a chief's residence and a community house.

Table 5.

CLUSTERS OF LARGE PLATFORMS (over 400 square meters)

Platform Nos.	Name of Cluster	Ward	High Status?
24, 25	Fiapito	A	Yes
43, 49, 99	(Unnamed)	B	Yes
90, 91, 130	Tulaga Fale	C	Yes
162, 163	Cog Site	D	Yes
175, 180, 526	Tausagi	E	Yes
433, 436	(Unnamed)	F	Yes
177	Tutia	G	Yes
359, 363	(Unnamed)	D&E	No

The other cluster of large platforms that has provided architectural information is the Fiapito site. There, a superstructure outline in post holes (resulting in a floor area of 98 square meters) was exposed on a low platform. No superstructure outline, however, could be detected on the disturbed adjacent higher platform. It is suggested that the high, more massive platform was a chief's residence and the lower platform was a community house. Of significance is that the total basal area of the suspected community house platform is considerably less (300 square meters) than the arbitrary 400-square-meter cut-off. This suggests that large platforms cannot always be interpreted according to size, but they appear to be useful as indicators of high status areas.

Another attribute that correlates significantly with clusters of large platforms at Mt. Olo is the earth oven. Of the eight clusters, four are accompanied by one or two ovens. To test the correlation of the distribution of ovens and large platforms, a chi-square test of significance was used in a contingency table (Table 6). Volume is used because it is a better general indicator of size than surface area (Jennings et al. 1976:42). Only those platforms more than 100 meters inside the outer limit of the survey area are included. The results indicate a correlation significant at the .001 level (x^2+28.857). More important, however, is that the exact probability of the correlation is less than a one in ten million chance that the observed relationship of large platforms and ovens could occur by chance. This correlation has many important ramifications that will appear in the conclusions of this paper.

Table 6.

DISTRIBUTION OF OVENS AND LARGE PLATFORMS

		Volume of platforms (m^3)	
		0-239	240-700
Distance from platforms to ovens (m)	0-99	45	12
	100+	184	4

It appears, therefore, that high-status areas can be identified by the close proximity of at least two large platforms and one or two earth ovens. Of the eight clusters of large platforms, five have earth ovens. Two that lack earth ovens (Fiapito and Misi) were not completely surveyed, so ovens unknown to us may occur in the immediate vicinity. The other cluster (SU17-359 and 363) that has no oven may not even by a chief's house-community house cluster because two primary walkways (SU17-286 and 328 in Wards D and E, respectively) run between the two large platforms, a circumstance that occurs at no other high-status cluster. It seems likely, therefore, that this cluster is a chance occurrence and for this discussion is not considered to be a center of local authority.

Other structures that appear to be related to high-status areas are the star mounds. Four occur in the survey area and one that was discovered but not mapped occurs on the northeastern ridge of Mt. Olo. Always associated with them are platforms that are larger than 400 square meters. Two of the star mounds have been excavated (Cog Mound and Ten Points) but have provided little information as to function. There is no evidence that they were foundations for superstructures.

Platforms that are not directly associated with the high-status areas are regarded as ordinary folk dwellings, or structures related to household activities, such as cook houses and work houses. Comparing the volumes of platforms in high-status clusters (253.5±191.3 cubic meters) with those not in high-status clusters (73.5±90.8 cubic meters) by the use of a t-test indicates (at a significance at the .001 level) that they are samples from separate populations. There is, however, some overlap in the size distribution curves. Small platforms in the vicinity of high-status structures are expected; however, occasional large platforms scattered throughout

the rest of the community need some explanation. They probably are foundations for dwellings of ranked individuals lacking chiefly status.

It has been suggested that platforms of less than approximately 40 square meters basal area are too small to support average residence houses (Jennings et al. 1976:47). It is also clear from the excavation of the Apulu site that some kitchen houses are on rough platforms larger than the 40 square meters. Further, it was observed that many of today's kitchen houses are constructed without a stone platform. Also, a small platform (20 square meters) excavated in the Fiapito site was clearly not a kitchen house because of a complete lack of charcoal and ash. It seems, then, that kitchen areas cannot be identified from platform sizes. They should probably be assumed to exist, however, for each household unit.

WALKWAYS

Walkways receive limited mention in the ethnohistorical literature; however, there is no information concerning functional differences of walled and raised walkways. Davidson (1974c: 240) suggests that the path type is related to status, although that is not inferred from Mt. Olo data. There is, however, a strong tendency for the walkways to be either structurally or topographically lower than adjacent high-status structures. Also, there is a tendency for walkways to be more elaborately constructed immediately adjacent to high-status structures (e.g., Tausagi and Apulu sites).

Walkways can be divided into primary and secondary categories. Primary walkways are defined as those that continue for long distances and provide the principal access to one or several residential wards. Secondary walkways are often short and provide access for single or small groups of structures. Some walkways are difficult to assign to a category but for analysis (t-test), a somewhat subjective division revealed that primary raised walkways are significantly wider (at the .001 level) than the secondary ones. The heights, however, are not significantly different. It is also apparent that walled walkways are usually primary walkways. The few that are not, however, seem to provide access to high-status structures (e.g., Ten Points and Tulaga Fale).

HOUSEHOLD UNITS

Household units in the Mt. Olo Tract were first defined by Jennings (1977) as "an area more than 75% enclosed by walls and paths, containing one large or two small stone platforms or mounds with one apparently stone free area (suspected garden) within the enclosure." Considerably more now can be said about the HHU and its constituents and a more detailed definition can be developed.

The HHU can be equated with a plot of ground used for family domestic activities. Ethnohistorically, it is referred to in the Samoan langauage as a *fua i ala*, which translates as a "measurement along a path" (Davidson 1969:56). The organization of most HHU's along pathways is fully evident in the Mt. Olo Tract. Stone fences connect at right angles to the pathways to form the HHU enclosures. Several of the HHU's, however, do not border walkways. Access to

them must have been by less elaborate ground-level pathways that were not detected during survey activities.

If walkway access is an integral part of each HHU (and it should probably be assumed to be) then the description "measurement along a path" may provide an important aspect of their definition. The term "measurement" can be interpreted either as a specific length that is physically measured and allotted to each family, or it may simply be a non-specific distance along a pathway. Data supporting one or the other is difficult to collect because some residential wards have poorly defined HHU's. Those wards, however, probably utilized the same concept without the use of stone fences as markers. All over Upolu the modern villages show many examples of domestic units segregated by rows of vegetation rather than stone fences. As demonstrated earlier, the more densely populated wards have considerably higher densities of stone fences and walkways. In the less densely populated wards the need to delimit a family's land may have been less necessary because of less pressure of encroachment. Measuring the distance between fences along walkways where the HHU's are clearly defined yields an average distance of 89±17 meters. The low standard deviation suggests that the concept of a specific size may have been used in the allotment of family land. As a point of interest, 90 meters is roughly equivalent to 100 paces.

Whereas the width of an HHU along a pathway is regular, the depth varies greatly. The areas enclosed by fences average 5,367±3,313 square meters. Many of the larger enclosures, however, consist of a considerable area of unaltered stone ground cover, which may represent areas where the natural forest vegetation was left standing. If these enclosures are excluded from the analysis, the results are probably more indicative of the actual area used by a family unit. The average HHU, therefore, is probably in the range of 4,000 to 6,000 square meters.

There are approximately 120 enclosures with more than 75% of their circumference defined by fences or walkways. Of those, 37 do not contain recognizable platforms. Some of the smaller ones (e.g., the small one SW of the Apulu HHU) were possibly walled gardens or pig pens. Larger ones that are the size of HHU's but without the platforms may also have been garden plots, or possibly, they are HHU's that contain highly disturbed platforms that were not recognized by the surveyors. The remaining enclosures average 3.00±2.02 platforms in an HHU measuring approximately 90 by 60 meters. The average size for the three enclosed platforms is 161±144 square meters.

Household unit data derived from excavations and the examination of other clearly defined units reveal a pattern of organization of structures in the enclosure. (The Apulu HHU exemplifies the ideal pattern; see Fig. 34). Two or three residence platforms commonly occur. Those platforms are near the bordering walkway, which marks the front of the unit. Between the residence platforms and the walkway are areas completely cleared of surface stones. Whether the cleared areas were open "yards" or highly manicured gardens is impossible to determine. One such area at the Tausagi site contained regularly spaced intrusions that may have resulted from agricultural activities, although that plot is not directly between the platform and walkway. Occasional piles of stones, somewhat domed, occur in these plots. Many of the piles appear to

be paved with fitted stones and curbed around the perimeter. One excavated at the Apulu HHU covered a depression that had been filled with small stones. Among the stones were an adze, a potsherd, and some charcoal. Dates from the charcoal indicate that the potsherd was a secondary deposition during the construction. The function of the domed stone mounds is not known.

In contrast to the manicured appearance of the front of the HHU's, the area behind the residence platforms is often cluttered with irregular rock piles in partially cleared plots, poorly constructed fences, and one or two platforms that are smaller and more carelessly constructed than the residence platforms. Farther away from the walkway, fences tend to be collapsed, presumably because less care was taken in fitting the stones, allowing them to fall more readily.

Many HHU's have irregularly shaped areas of stone surface scatter that are occasionally curbed or have raised rims. An ethnohistorical reference (Davidson 1969) to a large village describes small stands of natural vegetation scattered throughout. The stone areas may be the remains of those stands preserved because the stone ground cover would not need to be altered for agricultural purposes. They always occur behind or off to the side of the residence platforms in the HHU's.

Located behind the residence platforms are often one or more small platforms. Modern analogs suggest that these are probably small work houses and kitchen areas. Food preparation and other domestic duties take place in the work house and the actual cooking is done in the kitchen house.

Subsurface features that are associated with the HHU's are burials and pits. The pits may be related to food storage. Three burials have been encountered at Mt. Olo (Tausagi, Tulaga Fale, and Crooked Palm). All are approximately 30 to 50 cm deep in the stone fill of a residence platform. There is no evidence of the construction of a vault or chamber nor any preparation of the surface on which the body was placed. There is also no evidence for the inclusion of grave goods.

Two lozenge-shaped pits were excavated at the Apulu site. Their use as food storage pits is a possibility, although there are no supporting data.

Up until now the HHU discussion has focused on family residence units. The high-status clusters discussed in the previous section are also residence units but consist of different patterns. Ethnohistorically, they consist of a chief's house, a community house, a young men's house, a god house, a *malae*, and the various residences of the retainers. All but the *malae* are identifiable archaeologically at Mt. Olo. The strong association of the earth oven with the high-status structures adds another dimension.

In summary, therefore, there are two kinds of residential units: a high-status unit that correlates to a center of local authority, and a household unit that is interpreted as an unranked family's domestic unit. The HHU's are organized along walkways and contain at least one dwelling structure and a kitchen area. Many have two or more dwelling structures located in the

front (near the walkway) and one or two smaller work houses and kitchen houses behind. The HHU's are delineated by stone fences in the more densely populated areas and possibly by vegetation in the less dense areas. The average HHU is approximately 90 by 60 meters.

Considerable care in preparation of cleared spaces, stone piles, fences, and platforms is exhibited at the front of the HHU. Toward the back, less care appears to have been taken.

RESIDENTIAL WARDS

Ethnohistorically, individual lineages resided in a *pitonu'u* or residential ward. The wards, as well as the community as a whole, were organized around walkways and high-status clusters. Early work at Mt. Olo (Jennings et al. 1976) suggested the segregation of "areas" that objectively showed similar platform size distributions, although no direct association with the residential wards was made. The awareness of the organizing function of the walkways prompted a reanalysis of those areas using the walkway as the basic element. The reanalysis supported the idea of "area" (now ward) reached earlier but with some modification.

The analysis began with a nearest-neighbor analysis (Whallon 1974), which indicates significant clustering (at the .001 level) of platforms. Those clusters always border walkways or at least overlap with a walkway at some point. This seemed to justify the idea of analyzing the entire community in relation to walkways. Distributions of platform sizes were statistically summarized for each walkway. Using a t-test to compare adjacent walkways led to the grouping of walkways into systems. Six systems were generated that correspond nicely with the objectively defined areas (Jennings 1977). Since each system contained a high-status cluster, it was evident that the systems probably correspond to residential wards. A seventh ward, G, was then established; otherwise Ward F would have contained two high-status clusters. Ward G is so incompletely surveyed that statistically it could not be differentiated from Ward F.

Each residential ward, therefore, consists of a high-status cluster and numerous HHU's organized along a primary walkway system. As can be seen from Figures 2 and 3 a, b, c, the farther W in the survey area, the greater the platform density. The trend is not as regular for the fence and walkway density although it is still perceptible.

As previously mentioned, the more densely populated wards have more clearly defined HHU's, possibly resulting from a greater need to differentiate land. Whereas there is a difference in platform density between wards, the nearest-neighbor distances are quite similar, suggesting that platform density adjacent to walkways is similar in all wards. The significant difference between wards, therefore, is the occupation of the land set back from primary walkways. The dense wards have more evenly distributed platforms than the more open ones. There also appears to be a status difference that correlates with this. The HHU's close to walkways contain larger platforms as represented in the following contingency table. The small platforms, which are probably foundations for small residences, work houses, and kitchen houses, are fairly evenly distributed. Larger platforms, which are probably the remains of residence structures, are more often located near walkways; and the large high-status structures are consistently near walkways (all are closer than 50 meters).

Table 7.

DISTRIBUTION OF PLATFORMS AND WALKWAYS

		Volume of Platforms (m^3)		
		0-25	26-239	240-up
Distance from Walkway (m)	0-32	51	148	29
	33-up	55	72	3

In summary, residential wards consist of a center of local authority and numerous HHU's organized along a walkway system. The HHU's are more clearly defined by stone fences in those wards that were densely populated; HHU's set back from walkways appear to be of lower status. There is no apparent physical marker that indicates the boundary of wards, but there seems to be internal consistency of platform sizes and HHU patterns that distinguish one ward from another.

VILLAGES

Residential wards are sections of a larger village or *nu'u*. The wards correspond to land used by a lineage and controlled by a local sub-chief. The village corresponds to tribal land controlled by a titular chief (Bellwood 1979). The use of the term "village" is somewhat misleading because the *nu'u* is actually a large tract of land that extends from the coast inland and may contain several isolated settlements that are all considered parts of the same village. This pattern is characteristic of much of Polynesia. The residential wards located on the flanks of Mt. Olo, therefore, are probably part of a much larger village that extends from the coast to the central ridge of the island. Presumably the walkways that extend to the N and W from the survey area go to the coastal wards of the same village. One attempt to follow a clearly defined walkway (SU17-446) to the coast was made. The thick bush vegetation outside of the plantation made this impossible, although some other limited observations were made. The area of high platform and fence density continued for several hundred meters to the W, followed by a longer stretch of roughly 1 km that contained very few surface structures. Close to the coast, the density of abandoned (prehistoric?) structures rapidly increased until the coastal village of Satuimalufilufi was reached. During much of the search, pathways were followed. Some appeared to be very old but still in use. Others appeared to be modern and were constructed for vehicular traffic. All of the land traversed is being used by the residents of Satuimalufilufi for plantation land, which may suggest that the Mt. Olo settlements were once part of Satuimalufilufi holdings.

CONCLUSIONS

The three field seasons of survey and excavations at Mt. Olo have resulted in a detailed archaeological record of a portion of a large inland settlement. The location is on gently sloping terrain inland from the largest lagoon area of the island of Upolu. The natural resources of the coastal and inland area make it one of the most desirable habitation areas on the island (Davidson 1974c:242). The only lacking resource is a permanent supply of potable water, although

Davidson (1974c:242) argues that water availability is a secondary consideration for settlement location. The primary consideration is the presence of a large lagoon area and gently sloping inland zones. The Mulifanua to Mt. Olo area has both these features; it also possesses fertile soils that are able to support intensive agriculture.

The inference of a symbiotic relationship between the Mt. Olo settlements and coastal settlements seems justified. It is a traditional feature of Polynesian island economy and has been archaeologically supported for other areas of Western Samoa (Davidson 1974a). Occasional shells recovered during excavations are the only physical evidence from Mt. Olo to support the movement of coastal resources inland. There were no midden areas discovered in the HHU's. This is not unusual, since Davidson (1974a:158) records a similar lack in the Falefa Valley. This lack is attributed to middens being located away from residential areas.

The organization of sites at Mt. Olo coincides with ethnohistorical description and modern analogs. Domestic sites are organized into household units, often segregated by stone fences. The HHU's consist of one or more dwellings, work houses, and kitchen houses. Pits, possibly used for food fermentation or storage, are also occasionally present. Burials occur in dwelling floors without non-perishable grave goods.

The domestic units are organized along walkways into residential wards. Each ward contains a high-status residence area, probably inhabited by the local chief. The chief's area consisted of a chief's residence, a community house, a god house, large raised-rim ovens, and domiciles and work houses for the retainers. One attribute of the traditional Samoan political center, however, is noticeably absent. The *malae*, or open meeting ground, is characteristic of ward or village political centers, but no clearings of the sizes ethnohistorically or ethnographically described occur at Mt. Olo. Smaller clearings do occur, however; they may be a manifestation of small prehistoric *malae* not mentioned in historic accounts.

Structures other than domestic and political platforms are the star or pigeon-snaring mounds. Although two were excavated within the Mt. Olo settlement, little can be added to what is already hypothesized about their function and distribution (Davidson 1969, 1974c; Jennings et al. 1976). What can be stated is that they occurred both within and outside of community areas. Their direct association with walkways and high-status structures at Mt. Olo suggests a function related to chiefly status or local political authority. Their occurrence in remote locations in other parts of Western Samoa may support a hunting retreat for pigeon-snaring. Since pigeon-snaring may have had a religious significance (Jennings et al. 1976:49), it seems likely that it was only one of several ritual activities associated with star mound structures.

Dating of the Mt. Olo settlements can be documented for the past 1500 years. The earliest evidence is the radiocarbon date of 1595 B.P. from the Ten Points site and the scant pottery recovered from the Tausagi and Apulu sites. Other early radiocarbon dates range from 1175 to 945 B.P. from the Apulu, Cog Mound, and Tulaga Fale HHU's. There are no structures, however, that

can be associated with that early period. Platforms of the size common at Mt. Olo would not be expected during that period because their occurrence in other parts of Samoa is noted only after A.D. 1000 (Davidson 1974c:226, 232). All other dates from the settlement fall in the range of approximately 600 to 350 B.P. Most dates are from the large earth ovens. Davidson (1974c:225) warns that dates from ovens should not be used to date adjacent structures because the ovens are ethnohistorically recorded as being constructed in the bush near the *ti* (*Cordyline* sp.) resources. Any relationship with prehistoric structures therefore is probably fortuitous, although Davidson does entertain the possibility that the *ti* grows mostly in abandoned cleared areas or that the plant was cultivated in the settlement. The one-in-ten-million probability in favor of the chance occurrence of the proximity of ovens and high-status structures evident at Mt. Olo strongly suggests that Davidson's warnings are unnecessary. The odds indicate that the contemporaneity of the high-status structures and ovens is almost certain. Additionally, the highly regular pattern within each ward supports the application of oven dates to the entire ward.

The presence of the large earth ovens in the political centers of each ward suggests their use for ritual or luxury purposes. The baked *ti* root (used as a sweetener) may have been a luxury item. The *ti* could either have been cultivated in the vicinity of the chief's house or transported there for processing. Also a possibility, however, is that the ovens had several uses, such as the preparation of large amounts of food for a feast of reciprocity with other wards or villages and were not *ti* ovens at all. Mead (1968:251) describes the repeated preparation of an oversupply of food by a ranked household for use as gifts for relatives and visitors.

It is not known when the Mt. Olo settlements were abandoned, although it apparently occurred prior to the German occupation of Samoa. The areas around Wards A and B were cleared from bush for the German plantations in the late 1800s. The area of Wards C through G was cleared around 1950. An informant described the area as dense forest vegetation prior to clearing. A few large tree stumps remain from the clearing activity. Some occur on platforms (e.g., Tausagi and Misi) and another occurs in the middle of a primary walkway (Apulu). The obstruction of the walkway undoubtedly occurred since abandonment. A date of abandonment during the late 17th century seems likely if a forest containing trees 1 to 2 meters in diameter could establish itself.

To summarize the culture history of Mt. Olo, there seems to be a gradually increasing intensity of use from approximately A.D. 300 to 1400 with little or no construction of dwelling platforms. At A.D. 1400 an increase in use appears to have occurred with the construction of complete residential wards and religious structures. At approximately A.D. 1600 to 1700, the area was abandoned and reverted to bush. The pattern is similar to that of the Falefa Valley, located near the eastern end of the island (Davidson 1974a). There the habitation began slightly earlier and the intensive occupation occurred at the same time. That area, however, was not completely abandoned after A.D. 1700 but the intensity of use seems to have dropped considerably.

The dramatic drop of population density that is evident at both Mt. Olo and Falefa Valley may reflect an overall population decrease or a general shift of people from inland to the coast. Soil depletion could account for a movement of population. Or, the introduction of

European diseases could account for the reduction of population. Warfare is another possibility, although it seems unlikely that it could cause such a dramatic decrease and there is no evidence of fortifications at Mt. Olo. The introduction of disease before the arrival of the missionaries seems the most likely (Davidson 1969:75). An overall reduction of population pressure would allow a consolidation of residential wards in the coastal areas, resulting in the settlement distribution recorded by the early European missionaries.

SAMOAN CERAMIC ANALYSIS

RICHARD N. HOLMER

A typology of the ceramics recovered from excavations in Western Samoa has not been developed beyond Green's (1974) outline of the major temporal trends in the Samoan ceramic tradition, although Smith (Jennings et al. 1976) used quantitative methods to evaluate and refine Green's conclusions. Neither, however, have provided a working typology that can be used to classify ceramic collections, nor have they provided provenience data of excavated sites to allow temporal or areal comparisons. This chapter proposes a ceramic classification, provides type definitions by which Samoan collections can be classified, and outlines developments in both time and space that have occurred in the Samoan ceramic tradition.

Typologies can be based on an almost infinite range of attributes. Criteria for the selection of attributes often depend on the ranges of variation evident in the collection and the specific questions the typology is expected to answer. The process of selection of attributes, therefore, is subjective, with the researcher doing his best to integrate the relevant data into the analysis. It is believed that the selection of variables offered here effectively records the major differences and similarities of the large collection of sherds recovered from five sites on the islands of Upolu and Manono in Western Samoa.

The objectives of the typology were not entirely realized at the outset of the project. At the least, the classification of sherds was expected to produce a descriptive tool enabling similarities and differences of sites and individual strata to be more directly stated. It was hoped that some change over time in terms of the types could be demonstrated, although this change was not anticipated because observations made during excavation suggested a wide range of varieties in all levels with no obvious change in relative frequency.

Initially, the study reported here was designed to be compatible with that done by Smith (Jennings et al. 1976), so that his data, coded and recorded on computer cards, could be re-utilized. The researchers quickly abandoned that design, realizing that more information, more precisely recorded, was necessary if the study was to yield the hoped-for results.

The ceramic collections recovered from five sites were examined, and selected attributes were coded. Two of the sites, Potusa (SM17-1) and Falemoa (SM17-2), were excavated by the UUSAP during 1976 and 1977 and had not been included in Smith's original study. The other three sites, Janes Camp (SU16-1), Ferry Berth (SU17-1), and the Paradise Site (SUVs-1), were the focus of Smith's study. The latter were recoded using newly defined attributes. Only those sherds with known provenience and where all variables could be confidently measured were included. A total of 1,928 sherds was used; the totals for each site are included in the provenience chart (Table 8).

Once all acceptable sherds were coded, recorded, and punched onto computer cards, a factor analysis (SPSS) was performed to see if the general distribution that Smith reported could be duplicated and possibly refined. Distributions similar to his were obtained. However, statistics

Table 8.

DISTRIBUTION OF SHERDS BY CERAMIC TYPE

Site & Stratum	Ceramic Type MfL No.	%*	FaC No.	%	FaF No.	%	FaS No.	%	FmC No.	%	FmF No.	%	FmT No.	%	Totals
Ferry Berth	108	61.4	25	14.2	17	9.7	4	2.3	12	6.8	4	2.3	6	3.4	176
Paradise Site	2	2.7	13	17.6	5	6.8	4	5.4	16	21.6	27	36.5	7	9.5	74
Janes Camp 5	1		4		0		2		2		2		0		11
4	6	2.9	34	16.7	31	15.2	11	5.4	49	24.0	72	35.3	1	0.5	204
3	36	11.7	25	8.1	59	19.1	60	19.4	69	22.3	57	18.4	3	1.0	309
2	8	9.6	10	12.0	20	24.1	15	18.1	16	19.3	12	14.5	2	2.4	83
1	15	9.3	25	15.4	41	25.3	27	16.7	14	8.6	39	24.1	1	0.6	162
Total	66	8.6	98	12.7	151	19.6	115	15.0	150	19.5	182	23.7	7	0.9	769
Potusa 4	0		6		3		2		14		10		0		35
3	0		1		0		0		0		0		0		1
2	3	2.5	20	16.8	17	14.3	0	0	36	30.3	38	31.9	5	4.2	119
Total	3	1.9	27	17.4	20	12.9	2	1.3	50	32.3	48	31.0	5	3.2	155
Falemoa 7	4	1.8	14	6.3	19	8.5	4	1.8	96	42.9	69	30.8	18	8.0	224
6	2		0		1		0		2		1		0		6
4	10	2.7	38	10.3	35	9.5	15	4.1	128	34.7	103	27.9	40	10.8	369
3	0		2		5		1		9		9		0		26
2	2	1.6	5	3.9	11	8.6	13	10.2	50	39.1	36	27.3	12	9.4	129
Total	18	2.4	59	7.8	71	9.4	33	4.4	285	37.8	218	28.9	70	9.3	754

*Percent of stratum total.

indicated a very low covariance between attributes. In fact, with the more accurately coded variables, the covariances that Smith reported were not present. Virtually no covariance was found to exist between any of the variables, causing essentially one factor for each variable to be produced. A key function of factor analysis in a study of this kind is to replace several covarying variables with one factor, thus reducing a multidimensional scattergram (with one axis for each variable) to a few dimensions, which can be more easily perceived by the researcher. Since the variables all appear to vary independently, factor analysis did not aid in examining the distribution of sherds for natural clusters. Once this was realized, the use of factor analysis was abandoned and other quantitative techniques were examined for their applicability to the problem.

It had been obvious from handling the ceramics during coding that differences and similarities between sherds did exist. Sherds were segregated into "types" on the basis of similarities and differences resulting in seven groups of from 10 to 30 sherds each. The groups appeared to include the variability represented in the entire collection, except for an occasional aberrant sherd, clearly different from all others. The isolation of the groups was an entirely subjective proceeding, done just as a traditional typologist would handle such a problem. From the seven groups of sherds that were segregated on subjective bases, 141 sherds were selected as exempli-

fying the seven tentative types. The sherds were subsequently analyzed for their similarities and differences by the Discriminant Analysis (SPSS) program. Shifting a few clearly misplaced sherds after the first computer run resulted in seven statistically defensible groups (the F value for their being considered independent groups is significant at the .001 level). The seven groups, therefore, are considered as a "type collection" against which the rest of the collection was automatically classified by the Discriminant Analysis program. Before proceeding to the results, the variables used in the analysis need to be defined.

VARIABLES*

For each sherd, the site number, field specification number, stratum of origin, presence of decoration (for Mulifanua Lapita sherds), vessel portion (rim, shoulder, or body), and the variables listed below were coded and punched on computer cards. One of the important functions of Discriminant Analysis is that a ranking of variables is provided according to importance in the segregation of groups. The following variable definitions are arranged in order of importance.

PRIMARY VARIABLES

Slip

Slip is coded as being present (1) or absent (0). Slip occurs on both interior and exterior. The color is consistently 2.5YR 5/8 on the Munsell Soil Color Chart.

Temper Type

Temper type is indicated by presence (1) or absence (0) of ferromagnesium basalt tempers. Two non-ferromagnesium basalt tempers (as defined by Dickinson 1976) occur; however, no attempt to distinguish between them was made. The overwhelming predominance of ferromagnesium basalt temper suggests that a fine distinction between the non-ferromagnesium basalt tempers was probably not important; and, in order to incorporate temper type in the program (which requires interval level measurements), it was necessary to make the variable dichotomous.

Temper Density

Temper density is indicated by the percent of temper material as determined from the temper density chart in Bennett (1974:105).

Temper Size

The average temper size is a visual assessment of the size range for most of the temper particles (ignoring extremes). A calibrated binocular microscope (Power 10) was used to measure representative sizes. The size categories are:

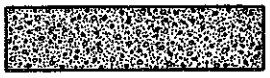
(1) 0.12 - 0.24 mm
(2) 0.25 - 0.49 mm
(3) 0.50 - 0.99 mm
(4) 1.00 - 1.99 mm
(5) 2.00 - 4.00 mm.

*The establishment and description of variables was done by William Lucius, who participated in the preliminary stages of the ceramic study.

Clay Structure

Clay structure is perhaps the most subjective variable in the analysis, as no clear measuring technique was developed. Each sherd viewed in cross section was assigned to a category according to the average size of the irregularities or "chunks" caused by the minute fracturing of the clay matrix. The categories are:

(1) granular chunks 0.00 to 0.49 mm with linear fractures or fracturing in layers



(2) chunks 0.50 to 0.99 mm with irregular or crumbly fractures

(3) chunks 1.00 mm or larger with an irregular fracture without the crumbly appearance of category 2. Also included are sherds with a very hard dense matrix with very little evidence of a clear fracture plane.

Paste Color

Paste color was derived from a streak color on a porcelain streak plate and then recorded according to the Munsell Soil Color Chart. The tripartite Munsell color designation (Hue, Value, and Chroma) was reduced to a single interval level scale by changing the alphanumeric Hue value to a numeric value according to the following scale:

10R = 10.0	7.5YR = 17.5
2.5YR = 12.5	10YR = 20
5YR = 15	2.5Y = 22.5.

A factor analysis was performed on the three numeric designators, resulting in the following equation, which provides a single color value that best reflects the three original numbers:

$$\text{Paste color} = (-0.43125(\text{Hue}-1.6194)/0.1595) + (9.35815(\text{Value}-4.2774)/1.5164) + (0.54723(\text{Chroma}-5.8194)/0.9966).$$

OTHER VARIABLES

The remaining five variables are much less significant than the preceding six for the typing of sherds. Although they were used in this analysis, they probably need not be recorded for similar future analyses.

Carbon Streak

The presence (1) or absence (0) of a carbon streak is indicated by this variable. Since the presence of a carbon streak may be the result of both firing technique and the subsequent heating of the vessel, as well as the clay composition, it is understandable that this variable is not highly significant in the typing of the sherds.

Wall Thickness

Measurements are taken with a vernier caliper and rounded to the nearest millimeter.

Color Irregularities--Interior/Exterior

Interior and exterior color irregularities are coded separately as present (1) or absent (0); the significance of these variables is difficult to evaluate. Most color irregularities are probably due to cultural activity, and most likely are carbon deposits from cooking. The occurrence of irregularities on both interior and exterior walls of a vessel might indicate intentional interior smudging, although firing techniques (unintentional or otherwise) may have caused the irregularities.

Crazing

Presence (1) or absence (0) of either interior or exterior crazing is indicated. Crazing appears to be a result of clay composition; therefore interior and exterior crazing were not segregated. It should be noted that crazing can be influenced by mechanical manipulations of the surface (polishing or floating); slips can also craze.

RESULTS

The results of the Discriminant Analysis was the automatic classification of the total collection of sherds using the variables as ranked above. After all of the sherds had been typed, the seven ceramic groups still proved to be significantly different (as indicated by an F value significant at the .001 level) and therefore, are considered valid types. A reanalysis of the total collection suggests that up to 2% of any type are potentially misclassified; therefore, the presence of 2% or less of any type in any site or stratum may indicate that none of that type actually exist there.

The seven ceramic types can be given traditional type definitions as well as statistical definitions. Both are included here--the traditional definitions based on the "type collection" of 141 sherds are in paragraph form, and the statistical definitions based on the analysis of 1,928 sherds given in Table 9.

The seven types, because they are statistically autonomous groups, are given names rather than numerical designations. The names were assigned in North American tradition (Wheat et al. 1958), being broken down into Wares, Series, and Types. The basis for the taxonomy is not statistical but temporal and regional (see Fig. 41). The Lapitan Brown Ware is the earliest pottery in Samoa and would theoretically include what is called plain Lapita pottery from other island groups. The Mulifanua Brown Series is the local Samoan manifestation. The Mulifanua Lapita type contains two varieties, plain and decorated, both occurring in the Ferry Berth Site.

The Samoan Brown Ware apparently developed out of the Lapita Brown Ware. The Ware incorporates all post-Lapita pottery made on Samoa. It is broken down into the Upolu Brown and the Manono Brown Series. The Upolu Brown Series is predominant at Janes Camp at Faleasi'u, Upolu. The Manono Brown Series is predominant at Falemoa on Manono. Each series has three types, named after their place of predominance. A descriptive term is added to the place name indicating the major visually recognizable differences of that type as compared to the other two types classified in the series. Figure 41 summarizes the taxonomy.

Table 9.

CERAMIC TYPE STATISTICAL DEFINITIONS

Variable	Means						
	Falemoa Coarse FmC	Falemoa Tan FmT	Faleasi'u Coarse FaC	Faleasi'u Fine FaF	Falemoa Fine FmF	Mulifanua Lapitan MfL	Faleasi'u Slipped FaS
Thickness (mm)	7.5 6967	8.2 9474	8.6 1000	6.7 4249	6.9 9782	8.0 2674	8.3 9355
Color Irregularities Ext.	.2398	.3579	.4800	.4249	.3646	.2567	.1161
Color Irregularities Int.	.4262	.2105	.4200	.2918	.1921	.3636	.2581
Carbon Streak	.2254	.0947	.1500	.0644	.0437	.4439	.0645
Crazing	.7480	.3158	.5450	.5451	.7336	.4706	.6000
Slip	.0123	.0000	.0150	.0215	.0262	.5348	.9677
Temper Type	.9734	.9053	.8050	.0129	.9934	.2299	.7871
Clay Structure	1.9201	1.8000	2.8800	1.8584	1.5524	2.2888	1.7161
Temper Size (mm)	2.0164	1.8105	3.3550	1.9142	2.8057	1.6791	2.4129
Temper Density	12.9652	47.7895	15.2300	22.3305	21.4454	19.7433	30.1935
Paste Color	-.0303	-.4406	-.5949	.2479	.1777	-1.7070	.3573

Variable	Standard Deviations						
	Falemoa Coarse FmC	Falemoa Tan FmT	Faleasi'u Coarse FaC	Faleasi'u Fine FaF	Falemoa Fine FmF	Mulifanua Lapitan MfL	Faleasi'u Slipped FaS
Thickness (mm)	1.9 3192	1.9 8330	2.7 3777	1.5 0938	1.6 8855	1.9 9578	2.3 5625
Color Irregularities Ext.	.4274	.4819	.5009	.4954	.4819	.4380	.3214
Color Irregularities Int.	.4950	.4098	.4948	.4556	.3944	.4823	.4390
Carbon Streak	.4183	.2944	.3580	.2460	.2046	.4982	.2465
Crazing	.4346	.4673	.4992	.4990	.4425	.5005	.4915
Slip	.1103	.0000	.1219	.1452	.1599	.5001	.1773
Temper Type	.1612	.2944	.3972	.1130	.0808	.4219	.4107
Clay Structure	.6439	.4519	.3258	.7020	.5193	.7347	.6216
Temper Size (mm)	.7305	.6407	1.0219	.6442	.6477	.6908	.5674
Temper Density	9.4250	11.3155	10.2515	9.6014	9.1008	11.6881	11.9099
Paste Color	1.0889	1.1040	1.1578	.9489	.9133	1.2926	.9337

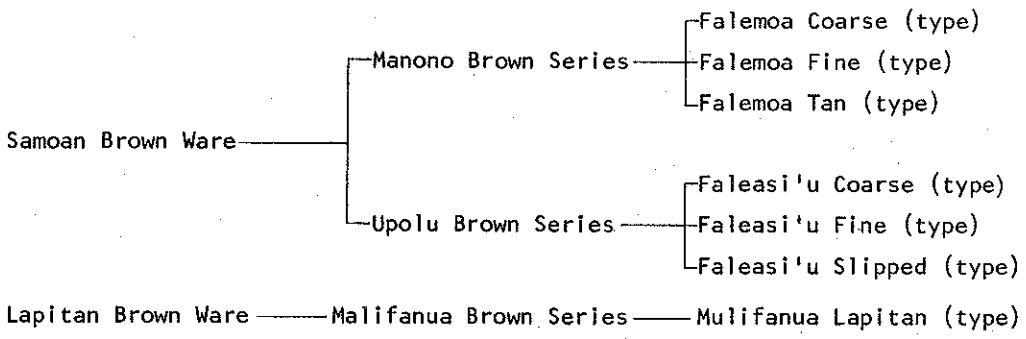


Fig. 41. PROPOSED SAMOAN CERAMIC TAXONOMY.

Collections of sherds can be subjectively typed according to the above definitions or they can be typed more accurately by coding the variables as described in the variable definitions and actually calculating a classification score for each type. The highest score indicates the type membership. Scores can be calculated according to the following equation:

$$C_i = c_{i1}V_1 + c_{i2}V_2 + c_{i3}V_3 + \cdots\cdots\cdots c_{i11}V_{11} + c_{i0}$$

where C_i is the classification score for group i; the c_{i1}, c_{i2}, etc., are the classification coefficients for group i found in Table 10; c_{i0} is the constant for group i from Table 10; and V_1, V_2, V_3, etc., are the raw coded variables as defined earlier. With the seven equations giving seven scores, a programmable calculator can easily be used to compute them quickly for large amounts of data. A computer, therefore, is not needed for direct comparison of other Samoan ceramic collections with the ones reported here.

Table 10.

CLASSIFICATION FUNCTION COEFFICIENTS

Variable	Falemoa Coarse FmC	Falemoa Tan FmT	Faleasi'u Coarse FaC	Faleasi'u Fine FaF	Falemoa Fine FmF	Mulifanua Lapitan MfL	Faleasi'u Slipped FaS
Thickness (C_{i1})	.16618	.14291	.16262	.11085	.13103	.16612	.15097
Color Irreg.Ext.(C_{i2})	1.72739	2.82913	3.71009	3.28567	2.51800	1.99373	1.22822
Color Irreg.Int.(C_{i3})	2.36677	.85637	2.59548	1.40955	.88278	2.06662	.57923
Carbon Streak (C_{i4})	2.34997	-.42230	1.21322	.09045	.00484	4.21977	1.00209
Crazing (C_{i5})	2.93679	1.23410	1.34637	2.05504	2.51244	1.51411	1.35529
Slip (C_{i6})	-3.80630	-2.90648	-2.65821	-.00376	-3.95077	13.94167	21.12438
Temper Type (C_{i7})	16.36551	17.42642	12.47575	-.08006	16.30884	2.96832	10.28146
Clay Structure (C_{i8})	5.23557	5.25941	8.51417	5.68351	4.50389	6.95961	5.29432
Temper Size (C_{i9})	3.80550	5.23278	7.35673	5.06896	6.13903	3.69313	5.49167
Temper Density (C_{i10})	.22780	.62794	.31646	.30920	.38763	.24264	.45325
Paste Color (C_{i11})	-.84405	-1.05364	-1.23366	-.02222	-.42079	-2.43477	-.79324
Constant (C_{io})	-26.65835	-39.29307	-41.27388	-18.78508	-30.32647	-28.19887	-39.05762

MULIFANUA LAPITA

DESCRIPTION

Construction: Unknown, possibly fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, possibly available locally.
Color: 5YR 4/6 (yellowish-red) to 10YR 6/3 (pale brown); predominantly 10YR 4/3 (brown).
Temper type and size: Ferromagnesium basalt with occasional coral sand, 1.7±0.7mm.
Clay structure: Chunks 0.50 - 0.99mm with irregular or crumbly fractures.
Thickness: Average 8.9±1.9mm.
Carbon Streak: Common, evident in approximately 41% of sherds.

Surface:

Color: Variable gray to reddish-brown.
Surface color irregularities: 50% of sherds have interior irregularities and 40% have exterior irregularities.
Sooting: Not observable due to leaching of sea water.
Finish: Smoothed and wiped, occasionally slipped. Temper particles generally covered by clay float or slip.
Slip: Variable color evident on 64% of sherds.

Shapes and Sizes: Apparently wide-mouthed bowls and possibly jars.

Rims: Flat to rounded inverted rims common.
Decoration: Some sherds are dentate stamped. The two varieties, decorated and plain, probably result from sherds from different parts of a decorated vessel.
Function: Probably cooking, service, and storage.

TYPE OF SITE

Ferry Berth (SUMu-1), Mulifanua, Upolu, Western Samoa.

FALEASI'U COARSE

DESCRIPTION

Construction: Unknown, probably fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, probably available locally.
Color: 5YR 5/6 (yellowish-red) to 10YR 6/4 (light yellowish-brown); predominantly 7.5YR 5/6 (strong brown).
Temper type and size: Ferromagnesium basalt, Trachyte, or Feldspathic basalt, 3.4±0.8mm.
Clay structure: Chunks 1.00mm or larger with irregular non-crumbly fractures.
Thickness: Average 12.4±2.8mm.
Carbon streak: Occasional, evident in approximately 19% of sherds.

Surface:

Color: Light brown to brown.
Surface color irregularities: 42% of sherds have interior irregularities and 39% have exterior irregularities.
Sooting: Common.
Finish: Smoothed and wiped, no polishing. Surface ranges from rough to smooth, with temper particles visible on the surface of many sherds.
Slip: None.

Faleasi'u Coarse, cont'd.

Shapes and Sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Generally flat.

Decoration: None.

Function: Probably cooking, service and storage.

TYPE OF SITE

Janes Camp (SUF1-1), Faleasi'u, Upolu, Western Samoa.

FALEASI'U FINE

DESCRIPTION

Construction: Unknown, probably fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, probably available locally.
Color: 2.5YR 4/6 (red) to 7.5YR 5/6 (strong brown); predominantly 5YR 5/6 (yellowish-red).
Temper type and size: Coral sand, 2.0±0.5mm.
Clay structure: Chunks 0.50 to 0.99mm with irregular or crumbly fractures.
Thickness: Average 6.7±2.0mm.
Carbon streak: Rare, evident in approximately 6% of sherds.

Surface:

Color: Reddish-brown.
Surface color irregularities: 31% of sherds have interior irregularities and 56% have exterior irregularities.
Sooting: Common.
Finish: Smoothed and wiped, no polishing. Surface is smooth with coral sand temper showing.
Slip: None.

Shapes and Sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Generally flat.

Decoration: None.

Function: Probably cooking, service, and storage.

TYPE OF SITE

Janes Camp (SUF1-1), Faleasi'u, Upolu, Western Samoa.

FALEASI'U SLIPPED

DESCRIPTION

Construction: Unknown, probably fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, probably available locally.
Color: 5YR 5/6 (yellowish-red) to 7.5YR 4/6 (strong brown); predominantly 5YR 5/6 (yellowish-red).
Temper type and size: Ferromagnesium basalt, 2.5±0.6mm.
Clay structure: Chunks 0.5-0.99mm with irregular crumbly fractures.
Thickness: Average 11.1±2.7mm.
Carbon streak: Occasional; evident in approximately 13% of sherds.

Faleasi'u Slipped, cont'd.

Surface:

Color: Slipped reddish-orange.
Surface color irregularities: 33% of sherds have interior irregularities and 6% have exterior irregularities.
Sooting: Occasional, may be intentional smudging of interior.
Finish: Smoothed, wiped, and slipped; no polishing. Surface is smooth with temper particles covered by slip.
Slip: Reddish-orange (2.5YR 5/8) on interior and exterior.

Shapes and sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Flat and rounded.

Decoration: None.

Function: Probably cooking, service, and storage.

TYPE OF SITE

Janes Camp (SUF1-1), Faleasi'u, Upolu, Western Samoa.

FALEMOA COARSE

DESCRIPTION

Construction: Unknown, probably fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, probably available on islands.
Color: 2.5YR 4/6 (red) to 10YR 4/4 (dark yellowish-brown); predominantly 5YR 5/6 (yellowish-red).
Temper type and size: Ferromagnesium basalt, 2.2±0.7mm.
Clay structure: Chunks 0.50-0.99mm with irregular or crumbly fracture.
Thickness: Average 10.0±3.9mm.
Carbon streak: Occasional, evident in approximately 18% of sherds.

Surface:

Color: Brown to reddish-brown.
Surface color irregularities: 63% of sherds have interior irregularities and 11% have exterior irregularities.
Sooting: Common.
Finish: Smoothed and wiped, no polishing. Surface ranges from rough to smooth, with tempering particles usually covered by clay float.
Slip: None.

Shapes and sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Generally flat.

Decoration: None.

Function: Probably cooking, service, and storage.

TYPE OF SITE

Falemoa (SM17-2), Manono, Western Samoa.

FALEMOA FINE

DESCRIPTION

Construction: Unknown, probably fillet.

Falemoa Fine, cont'd.

Firing method and temperature: Free access to oxygen. No inforamtion available concerning temperature.

Core:

Clay: Sources not known, probably available locally.
Color: 2.5YR 4/6 (red) to 7.5YR 5/6 (strong brown); predominantly 5YR 4/6 (yellowish-red).
Temper type and size: Ferromagnesium basalt, 2.9±0.7mm.
Clay structure: Chunks 0.50-1.00mm and larger with irregular fractures.
Thickness: Average 8.5±2.1mm.
Carbon streak: Rare, evident in approximately 5% of sherds.

Surface:

Color: Variable reddish-brown to light-brown.
Surface color irregularities: 25% of sherds have interior irregularities and 15% have exterior irregularities.
Sooting: Common.
Finish: Smoothed and wiped, no polishing. Surface ranges from rough to smooth, with temper particles not always covered by clay float.
Slip: None.

Shapes and sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Generally flat.

Decoration: None.

Function: Probably cooking, service, and storage.

TYPE OF SITE

Falemoa (SM17-2), Manono, Western Samoa.

FALEMOA TAN

DESCRIPTION

Construction: Unknown, probably fillet.

Firing method and temperature: Free access to oxygen. No information available concerning temperature.

Core:

Clay: Sources not known, probably available locally.
Color: 5YR 4/4 (reddish-brown) to 10YR 5/6 (yellowish-brown); predominantly 5YR 5/6 (yellowish-red).
Temper type and size: Ferromagnesium basalt, 1.7±0.5mm.
Clay structure: Chunks 0.5-0.99mm with irregular or crumbly fractures.
Thickness: Average 9.1±1.9mm.
Carbon streak: None.

Surface:

Color: Tan to reddish-brown.
Surface color irregularities: 40% of sherds have interior irregularities and 40% have exterior irregularities.
Sooting: Present.
Finish: Smoothed and wiped, no polishing. Surface smooth, with temper particles covered by clay float.
Slip: None.

Shapes and sizes: Apparently wide-mouthed bowls. No jar sherds.

Rims: Generally flat.

Decoration: None.

Falemoa Tan, cont'd.

Function: Probably cooking, service, and storage.

TYPE OF SITE

Falemoa (SM17-2), Manono, Western Samoa.

DISCUSSION

From the provenience charts in Table 8, certain trends in relative percentages of the seven ceramic types are apparent. Trends visible at Janes Camp are similar to those at Falemoa (Fig. 42), although there are significant differences in relative percentages. The differences could be a result of regional variation. Assuming that the two sites are fully contemporary as suggested by the 2610 B.P. radiocarbon date from Stratum II at Falemoa and the three closely similar dates from Stratum II at Janes Camp, then the difference could reflect regional variation, with the Manono Brown Series predominant at Falemoa and the Upolu Brown Series predominant at Janes Camp.

Comparison of the ceramic collection from all the pottery-bearing sites excavated by the UUSAP exposes some potentially significant associations. An index of affinity between the individual strata of each site can be easily caluclated by the following equation:

$$(1- \ (\ (f_1 - f'_1 \ )^2 + (f_2 - f'_2 \ )^2 + \ldots \ (f_7 - f'_7 \ )^2) \ )^2 = A$$

where A is the index of affinity; f_1 (i = 1 through 7) is the frequency of each ceramic type within a stratum (from Fig. 42); and f'_i is the frequency of the same ceramic type from the other stratum in the comparison. The resultant indices are listed in matrix form in Table 11. That table indicates that the Paradise Site is most closely associated with Stratum IV of Janes Camp. The Paradise Site is not radiocarbon dated, but the association suggests an age of approximately 2200 B.P. for that site.

The strongest association for the ceramic collection from Potusa is with Stratum IV at Janes Camp, although Stratum IV at Falemoa is a close second. The date of 1850 B.P. for Potusa seems a little late, if the date of 2290 B.P. is accepted for Stratum IV at Janes Camp and 2080 B.P. for IV at Falemoa. However, the sites show a marked resemblance to each other. If they all extend late into the pottery-producing horizon of Samoan prehistory there is support for temporal as well as a regional significance of the typology. If the typology reflects only regional variation, then Potusa would be expected to be different from Falemoa. The upper strata at Janes Camp overlap statistically in time with Potusa, and the Paradise Site falls within that overlap. Thus the radiocarbon dates, the affinity indices, and the seriation all generally support each other.

In order to solve the spatial and temporal distribution problems outlined above, more dated ceramic collections from sites in other regions of Samoa need to be classified by this technique.

Table 11

MATRIX OF SIMILARITY COEFFICIENTS

CERAMIC TYPES	FM7	FM4	FM2	POTU	PARA	JC4	JC3	JC2	JC1	FB
FM7	1.00	.98	.98	.93	.88	.88	.86	.80	.72	.21
FM4	.98	1.00	.98	.97	.94	.93	.86	.82	.76	.25
FM2	.98	.98	1.00	.93	.88	.88	.86	.80	.72	.21
POTU	.93	.97	.93	1.00	.96	.98	.84	.82	.80	.25
PARA	.88	.94	.88	.96	1.00	.97	.85	.80	.82	.26
JC4	.88	.93	.88	.98	.97	1.00	.87	.85	.88	.26
JC3	.86	.86	.86	.84	.85	.87	1.00	.99	.94	.44
JC2	.80	.82	.80	.82	.80	.85	.99	1.00	.96	.43
JC1	.72	.76	.72	.80	.82	.88	.94	.96	1.00	.40
FB	.21	.25	.21	.25	.26	.26	.44	.43	.40	1.00

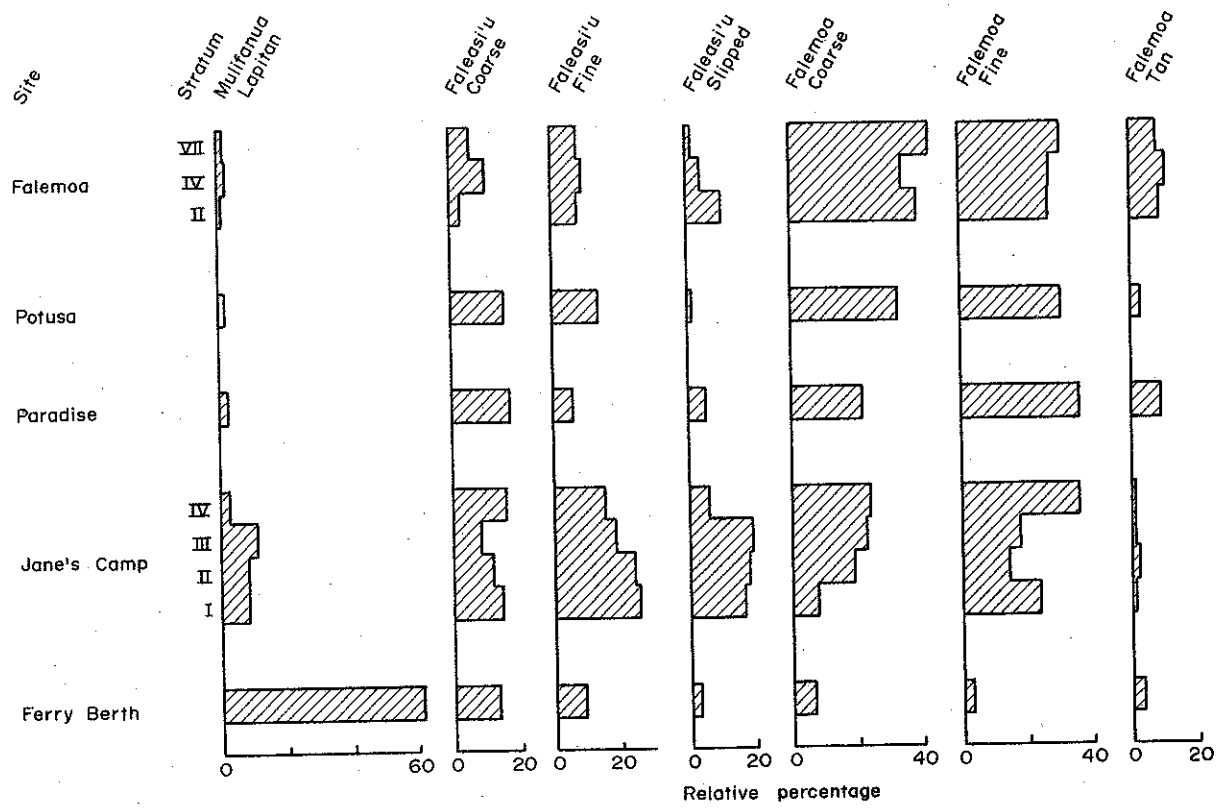


Fig. 42. DISTRIBUTION OF CERAMIC TYPES BY SITE AND STRATUM.

ANALYSIS OF DIETARY REMAINS FROM POTUSA AND FALEMOA

JOEL C. JANETSKI

INTRODUCTION

The University of Utah Samoan Archaeological Program excavations in 1976 and 1977 on the island of Manono, Western Samoa, yielded substantial quantities of food scrap in the form of marine shells, bone, and sea urchin spines. Through an analysis of these remains, it was hoped that some statements could be made regarding the kinds of foods being utilized by early Samoans as well as the technology implied. Also of importance were the comparisons that could be made with a similar analysis from Janes Camp at Faleasi'u on Upolu (Jennings et al. 1976) and with the Lotofaga Midden (Davidson 1969), also on Upolu.

The islet of Manono lies just off the western tip of Upolu, and about 10 km W of Faleasi'u. It is completely surrounded by a shallow reef lagoon, which extends an average of over 1 km to the W, N, and S, and just over 3 km eastward to Upolu. The reef bottom around Manono varies from a soft sandy to a hard coral environment, which provides a diversity of shellfish habitat within easy reach of Manono foragers.

MIDDEN ANALYSIS

The analysis of the shell, bone, and sea urchin remains consisted of identification of species and quantification by the field collection lots. Due to the generally good preservation of the shell, identification was often possible to the species level, although the analysis compares families more often than species. Comparisons were made on the bases of total grams of shell per species and observed minimum counts. Minimum counts were based on the occurrence of distinctive, singular elements from each shell species. With *Cypraea*, for example, minimum numbers were derived by counting the columella or outer lips, whichever were more numerous. When only portions of these were present, which was often the case, counts further relied on the occurrence of accompanying portions of either the anterior or posterior canal. Another method of determining an individual count was tentatively considered. This involved weighing a number of complete specimens to determine an average whole weight. This average weight was then divided into the weight of the species fragments present to calculate the average number of animals in that lot. As might be expected, however, this procedure gave a much lower estimate of numbers present than did the actually observed minimum count procedure, so the minimum count was continued.

An attempt was made to correlate weight of shell with the observed minimum count from that shell with the hope that a predictive formula could be obtained for future analysis. The seven shell-bearing strata from Potusa and Falemoa were used as the samples, since both total weight and minimum count had been caluculated for these levels. With this limited data, a linear regression formula of $Y = 0.021X - 80.51$ was calculated with $r^2 = 0.89$. Total minimum

counts (Y), as well as species minimum counts could therefore be predicted with reasonable accuracy based on the weight (X) of the shell. Accuracy would increase, of course, with the quantity of shell.

POTUSA

The shell scrap used from Potusa was essentially restricted to Stratum IV (62% of total), which was historic, and Stratum II (26%). Only limited samples were obtained from Stratum III. As mentioned by Jennings (1976:11), some problems with possible mixing were encountered at Potusa, as evidenced by the glass and iron which occurred in lots from both Strata II and IV.

The remains from Potusa reflect quite a wide range of shellfish utilization with thirty families represented. Certain species, however, were preferred, or were more available in the reef, and these are more commonly found in the deposits. The preferred groups were: Pelecypoda (26%), Cypraeidae (16.76%), Strombidae (10.47%), Conidae (9.13%), and Trochidae (7.84%). These figures are based on observed minimum counts, and record the percentages of total number of animals in the site. The most preferred species within the families are *Cypraea arabica-eglantina** (4.38%) and *Gefrarium pectinatum* (6.03%).

Stratum II and III at Potusa yielded almost no bone. Found in Stratum IV were 10 fish mouthparts, a few fragments of crab shell, 37 fragments of pig bone and mandibles, and nearly 100 fragments of unidentified bone, some of which is probably pig bone. One bird bone and nine *Heterocentrotus* (sea urchin) spines were also found.

Due to the inferred mixing and skewed sample at this site, no effort is made to deal with change through time for Potusa as is done for Falemoa. It is, however, apparent that there was extensive foraging on the reef into historic times, although the sample from Potusa testifies primarily to shellfish gathering rather than to fishing.

FALEMOA

The midden at Falemoa was more clearly stratified and yielded fairly substantial samples of food scrap from the individual strata. Although the exact volume of dirt excavated per stratum was not calculated for the 1976 season, it was the impression of the project supervisor that the midden debris density within each stratum increased through time (Jennings 1976:11), an impression borne out at least tentatively by measurements derived from the profile map and the site notes for Strata IV and V. Calculations based on these measurements yielded an approximate shell density of 8,325 gm of shell per cubic meter for Stratum V and 7,170 gm per cubic meter for Stratum IV. Volume calculations were made, however, for the 1977 excavations. On the basis of these figures, the shell density was calculated as 6,742.4 gm per cubic meter. Density figures for both shell and bone (Tables 12 and 13) reflect a general decrease in dependency on reef collecting through time.

*Although *C. arabica* and *C. eglantina* are distinguishable when they occur whole and with their natural color, they sometimes are quite difficult to segregate when bleached and fragmented; consequently, all *Cypraea* were treated as one species for analysis. Burgess (1970:213) has also noted the close similarities among examples of these two species.

Table 12.

FALEMOA SHELL DENSITY BY STRATUM

(1977 season only)

Stratum	Weight gm/m^3	Minimum Count no./m^3
VII	7,224	451.68
VI	2,998.8	197.08
V	357	22.1
IV	11,279.26	559
III	21,707.71	1,162.99

Table 13.

FALEMOA BONE DENSITY BY STRATUM

(1977 season only)

Stratum	Weight gm/m^3	Count no./m^3
VII	55	38.8
VI	19.38	15.58
V	2.1	1.9
IV	76.04	67.76
III	209.69	295.27

Once again analysis of the shell points to a rather broad utilization of reef molluscs, although definite preferences are apparent. Groups preferred at Falemoa are: Cypraeidae (36%), Trochidae (17.1%), Neritidae (13.8%), and Strombidae (12.5%). These figures are the percentages of the total minimum count for the site. The *Cypraea* group is by far the most preferred with *C. arabica-eglantina* (34.5% of all *Cypraea* based on minimum count) and *C. caputserpentis* (18.8%), as the preferred species.

Species preference through time is quite stable, as shown in Table 14. There is a decrease in the occurrence of Vasidae and an increase in the occurrence of Conidae and Strombidae. The latter reflects an increase in the number of small (2.55 gm average) *Canarium microurceum* specimens, which often occur unbroken and which should, by logic, be eliminated in terms of food importance. They were included in the totals, however, because they had been brought to the site presumably to be eaten.

Other economic remains at Falemoa include *Heterocentrotus* spines, fish bones and mouthparts (mostly parrotfish, probably taken from within the reef), crab body parts, turtle carapace fragments, flying fox bones, a few bird bones, and two pig mandible fragments from the historic level (see Table 13). Just above the rotten basaltic bedrock in Stratum I were found the remains of a sea turtle, tentatively identified as being of the genus *Chelonia*, likely to be used for food. The turtle was estimated to measure 1 meter in length and weigh approximately 450 lbs. Fragmentary skeletal remains of another sea turtle, possibly of the same genus and comparable in

Table 14.

DOMINANT SPECIES BY STRATUM

		Min. Ct.	% of Stratum Total
Stratum VII	Cypraeidae	906	24.8
	Strombidae	594	16.3
	Trochidae	404	11.1
	Neritidae	356	9.8
	Conidae	203	5.6
	Ceriths	190	5.2
	Turbinidae	164	4.5
	Other	832	22.7
	Total	3,649	
Stratum IV	Cypraeidae	828	29
	Trochidae	437	15.3
	Neritidae	266	9.3
	Veneridae	161	5.6
	Muricidae	160	5.6
	Vasidae	153	5.4
	Strombidae	151	5.3
	Other	697	24.5
	Total	2,853	
Stratum III	Cypraeidae	523	27.3
	Trochidae	354	18.5
	Neritidae	256	13.4
	Ceriths	149	7.8
	Vasidae	85	4.4
	Strombidae	71	3.7
	Muricidae	70	3.7
	Other	418	21.2
	Total	1,917	

size, were recovered from Stratum II. The fish bones were mostly mouthparts and vertebrae from reef-dwelling teleosts such as parrotfish. A few vertebrae represented fish that could have weighed up to one hundred pounds. Species identification of most fishes is not possible with only vertebrae available. The bone remains from Falemoa support the concept of a focus on the reef as a protein resource and its broad utilization by prehistoric Samoans, although Table 13 reflects a general decrease in the occurrence of these animals through time.

In summary, shellfish constitute by far the majority of the Falemoa debris. There were 203 kg of shell recovered from the site during the 1976 and 1977 seasons, compared to 2.8 kg of bone. Bone represents fish, turtle, and perhaps one or two sea birds. There is no provenienced mammal bone positively identified other than one possible long bone in the historic level (Stratum IV) and two fragments, perhaps of a rodent, from Stratum III. Essential vitamins, such as C, as well as roughage would have to have been obtained from either wild plants or garden produce. The analysis of the midden does not document other than a gradual decrease in the collecting pattern, which might be equated with the increased reliance on horticulture. One problem with the data at Falemoa is the question of how representative they are of developments in Samoa. Also there is no archaeometric data for the Manono midden except the date from the basal layer of Falemoa at 2600 B.P. and one of 2080 B.P. from Stratum IV. As a result, there is little control over the time span represented in the deposits above Stratum III.

COMPARISONS

A comparison of the shellfish remains from Potusa and Falemoa reveals, as could be expected from sites only a few meters apart, that the same species of shells were gathered in both areas. There is, however, a generally lesser dependency on Gastropoda and a greater use of Pelecypoda at Potusa. Considering the lack of temporal control at Potusa, intersite comparisons by stratum would not be particularly productive.

The dietary remains from the midden site at Janes Camp at Faleasi'u show interesting similarities and differences with the Manono middens. As at Faleasi'u, the Manono sites had access to a broad reef from which shellfish, fish, crabs, sea urchins, and turtles could be gathered. In both areas, the preferred shellfish was *Cypraea arabica-eglantina*, although at both Potusa and Faleasi'u the *Venus* and *Tellin* bivalves were also important. Faleasi'u contained considerably more *Heterocentrotus* spines and bird bones, while Falemoa yielded cowrie (*Cypraea mauritiana*) and crab parts (which were not identified at Faleasi'u), more fish bone, and a slightly denser midden, i.e., about 6,750 gm of shell per cubic meter at Falemoa, compared to about 5,200 gm per cubic meter at Faleasi'u. Neither, however, begins to approach the extremely concentrated shell middens at Galatea Bay, New Zealand, where the density was about 77,005 gm per cubic meter (Shawcross 1967:122) or the large, dense shell mounds on Cape York Peninsula, Australia (Bailey 1977).

At Lotofaga (Davidson 1969:243), the most common shellfish species by minimum count were *Trochus maculata* (22), *Turbo setosus* (10), and *Turbo crassus* (8), while only a few *C. arabica* (3) were found. Here, as at Falemoa, though, the emphasis was on Gastropoda (53) rather than Pelecypoda (12). Such a bias may be a matter of preference or availability, although the generally varied reef environment, with hard, coral-predominating areas alternating with sandy sections, should support a full range of shellfish species. Although more common at Falemoa and Faleasi'u, bone does not appear in any quantity in any of the Samoan middens. The same appears to be true of the Tongatapu midden in Tonga (Poulsen 1968:89).

It is interesting to note the complete absence of shellfish remains in the Lapita site of Tavai on Futuna (Kirch 1976:40), possibly a result of acidic soils in light of the decomposing burials found in the cultural layer; however, fish vertebrae, a dog tooth, and other organic debris, including coconut and candlenut endocarp, were found. No comment on the relative preservation of these items is made by Kirch. If the soils are too acidic for the preservation of shell it would be unusual to find organic debris and bone preserved in the same contexts. Regardless, the fish remains are evidence that the reef was probably not ignored; in fact, a dual reliance on agriculture as well as marine resources is suggested for Lapitan colonizers by Kirch (1976:59). Historical support for such an economy is found in present-day Samoa, where horticulture is practiced and reef protein continues to be a complementary subsistence resource. Anuta, another Polynesian outlier, has produced archaeological sites with pottery, shell, coral, and *Heterocentrotus* spine artifacts, as well as midden deposits of marine shell and bone (Kirch and Rosendahl 1973).

On Niuatoputapu in Tonga, Kirch (1978) has reported pig bone associated with Lapita ceramics. This, along with *Cypraea* shell scrapers and possible food storage pits, he takes to be indirect evidence of agriculture. The scraper, a *C. tigris* with the dorsum removed, is identical to scrapers recovered at Faleasi'u and Falemoa. Though no pig bone was recovered from prehistoric levels at Falemoa, the various scrapers could be interpreted as indirect evidence of horticulture here as well.

CONCLUSIONS

The preliminary descriptions of the Potusa and Falemoa sites generally supports the conclusions made from the similar study of the Faleasi'u midden (Jennings et al. 1976). From the Christian era and continuing up to the contact period, Samoan settlers were actively engaged in subsistence-foraging in the reef lagoons. Although a wide range of species was gathered, certain species were consistently preferred. This preference, probably based on relative abundance, ease of gathering and extracting, and taste, varied little between Faleasi'u, Falemoa, and Potusa. Both the Faleasi'u and the Falemoa middens suggest a decrease in shellfish use during historic times. Though the faunal evidence to date from Falemoa and Faleasi'u is limited, it also suggests a decrease through time in the use of reef animals such as sea urchins, fish, and crabs, as well as turtles. One explanation for this decrease is an increasing dependence on horticulture rather than the reef for food. However, depletion of supply through the pressure of continuous exploitation is equally likely to account for the decrease noted.

Agricultural activity is evidenced by the *Cypraea* and *Turbo* peelers and scrapers from both Potusa and Falemoa. The fishhooks and lure shanks give Samoan prehistorians a glimpse into precontact fishing technology. As mentioned in the artifact discussion, these hooks and lures are probably not evidence for deep water fishing, but more likely for fishing within the reef, the fish bone generally being from reef fishes. Although the remains of some large fish were found, they and their habitat cannot be specified. It should also be pointed out that the lures from Potusa Stratum IV are probably historic and the *Conus* preform from Stratum II may be. Consequently, we have no lures that can unequivocally be assigned prehistoric status. However, there is good control for at least three fishhooks from prehistoric levels at Falemoa (see Table 15). Additional reef foraging technology is represented by the presence of *Cypraea tigris* octopus lures. It might be noted here that, although they are not gathered today and definitely decrease in archaeological deposits, slate pencil sea urchins are still available in Western Samoa, where several were collected in 1976 on the reef margin near Apia.

SHELL, BONE, CORAL, AND URCHIN SPINE ARTIFACTS

JOEL C. JANETSKI

As mentioned by Jennings (1976:10), artifacts in the two sites on Manono were scarce but did include some new items that help to expand understanding of the Samoan prehistoric technology.

POTUSA

Of considerable interest to Samoan prehistorians is the recovery of fishing gear from the two Manono middens. At Potusa, one round pearl-shell hook was found in Stratum IV, which is the historic level. The hook measures 2.2 cm outside diameter at its widest point. Both the point and the shank head are broken off. Also from Stratum IV were two pearl-shell trolling lure shanks. One of these is an unfinished preform, which has been carefully worked into a flattened, torpedo-like shape, though the exterior cortex has not been removed from the outer side. It measures 3.3 cm long, .62 cm wide at the head, and .3 cm thick. The other lure shank measures 2.35 cm long, .78 cm wide, and .3 cm thick. It is notched for the line lashing at the narrow end and has two holes drilled side-by-side at the head, separated by a distinct median ridge that runs for the length of the lure. This shank has been redrilled after being broken at two holes just in front of the present perforation. From Stratum II is an additional lure shank preform (?) made of *Conus eburneus* shell. It has been worked to the same torpedo shape as the other two, is flat in cross section, and measures 3.3 cm long by .7 cm wide by .2 cm thick.

Tools used in the preparation of vegetable foods include three distinctive *Cypraea* (two *C. eglantina* and one *C. arabica*; Fig. 44, a-e) peelers, one from Stratum II and two from Stratum IV. Each of these has two fairly large holes in the dorsum, one fore and one aft, to facilitate peeling. They average 5 cm long by 3.5 cm wide at the base. A sharp, ground edge, dulled by wear, is apparent in all cases on the upper edge of one of the holes. Additional peelers, both from Stratum IV, of *Turbo* and Fasciolariidae shell were found. On both, the outside edge of the aperture shows edgewear from use. Two scrapers of *C. tigris* (Fig. 44, j, k) shell were also recovered from Stratum IV. These are both made from the outer lip of the shell and are broken at the labial callus, along which there has been considerable use-wear.

Shell rings from Potusa include a large (8 cm in diameter projected) fragment of a *Tridacna* shell band (Fig. 45, h) from Stratum IV and a smaller (1.6 cm in diameter) complete *Conus* shell ring (Fig. 45, i), which was unprovenienced at the site.

One broken *Tridacna* shell adze (Fig. 43, e) was found in Stratum IV. It is roughly shaped to a quadrangular cross section and measures 8.7 cm long by 4.4 cm wide by 2.1 cm thick.

Additional shell artifacts include a serrated fragment of pearl shell, a piece of cut *Tectus pyramis*, and the heavily worn spire of a *Conus eburneus* shell from Stratum IV. Also from Stratum IV is an unidentified shell, which is badly eroded and fragmented but which is shaped and perforated like a pendant. One *C. tigris* dorsum cap was found in Stratum IV as well.

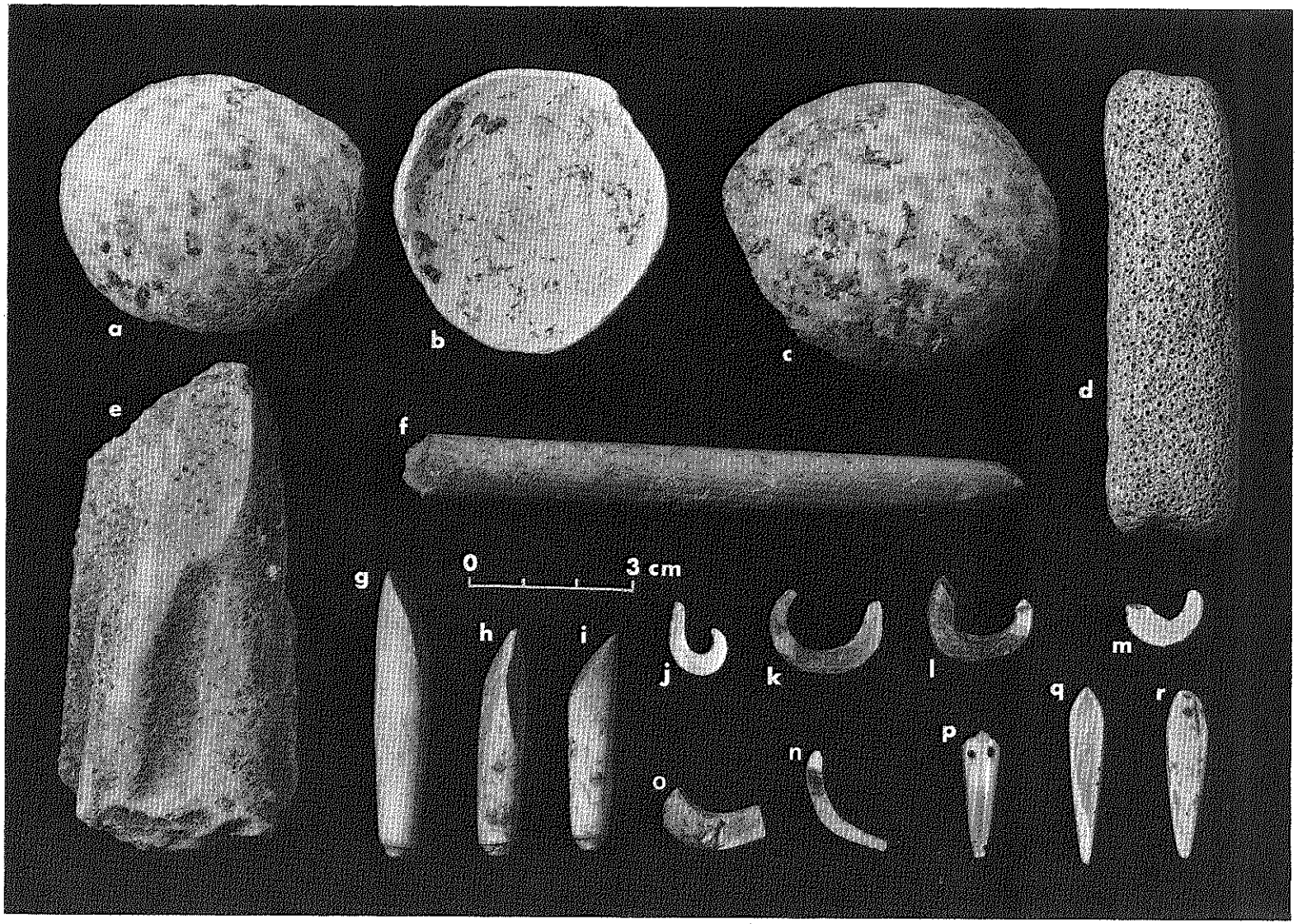


Fig. 43. FISHHOOKS, LURES, COWRIE CAPS, FILES, AND ADZE. a-c, *Cypraea tigris* dorsa from Falemoa, Stratum VI, Faleasiu, Stratum III, and Potusa, Stratum IV, respectively. d, coral file, Faleasiu, Stratum IV. e, *Tridacna* adze fragment, Potusa, Stratum IV. f-i, *Heterocentrotus* spine files from Falemoa (f and g, Stratum III; h, Stratum IV) and Faleasiu (no provenience). j, *Turbo* fishhook, Falemoa, Stratum IV. k, pearl-shell fishhook, Potusa, Stratum IV. l, pearl-shell fishhook, Falemoa, Stratum II. m, pearl-shell fishhook fragment, Falemoa, Stratum V. n, pearl-shell fishhook, Falemoa, Stratum VII. o, shell fishhook, Falemoa, Stratum IV. p, pearl-shell trolling lure, Potusa, Stratum IV. q, pearl-shell trolling lure preform (?), Potusa, Stratum IV. r, *Conus* trolling lure preform (?), Potusa, Stratum II.

Seven fragments of branch coral, which appeared superficially smoothed from use, were found at the site, but none could be labeled as artifacts without reservation; the wear could credibly be attributed to erosion from wave action. Two of these are from Stratum II and five are from Stratum IV. No worked *Heterocentrotus* spines were found at Potusa.

One small fragment of flat bone, which appears smoothed on one edge, was found in Stratum IV. In Stratum II was part of a tooth (dog canine?), which is worn and blunted on one end. A boar's tusk was found on the surface.

FALEMOA

Fishing gear from Falemoa consists of four round fishhooks: one of *Turbo* shell (Fig. 43,j) and three of pearl shell (Fig. 43, l, m, & n). All the pearl-shell hooks are broken at the tip and all but one (Fig. 43, n) have the head broken off. This latter hook has two slight but unmistakable grooves on the outer side of the shank, causing a slight knobbing at the head. Though broken, hook l may have been of the circular type described by Emory, Bonk, and Sinoto (1968:8) with an outside diameter of 2 cm. An additional fragment of worked, unidentified burnt shell (o) may also be a section of a fishhook. Though it is rather thick (.6 cm), the curve suggests identification as a fishhook rather than a bracelet. The *Turbo* hook (Fig. 43, j) may also be broken at the shank but could simply be unfinished, or finished without a head for line attachment.

Other angling gear includes five complete and one fragmented octopus lure caps made from the dorsa of *C. tigris* shells, e.g., Fig. 43a. These were found in Strata II (3), III (1), VI (1), and VII (1), and average about 5 cm in length. All but two have definitely smoothed, though irregular, edges. Two complete *C. tigris* shells (not illustrated) were found on the surface at Falemoa with holes drilled in the dorsum, one fore and one aft. These are identical to the octopus lures from Hawai'i, pictured and described by Emory et al. (1968:11, 29).

Shell peelers and a scraper from Falemoa include two of the *C. eglantina* peelers (Fig. 44, d, e) with holes broken in the dorsum as described for Potusa. They are provenienced in Strata III and IV and average 5 cm long by 2.5 cm wide at the base. The example from Stratum IV is heavily worn on its upper working edges, while that from Stratum III is still quite sharp. It is possible these peelers were resharpened by simply recutting the bevel on fine basalt. A small *C. annulus* (Fig. 44, f) from Stratum IV was found cut in exactly the same style as the larger *C. eglantina* peelers. This item is not sharpened and, because of its small size, its function as a peeler is doubtful. A *C. mauritiana* scraper (Fig. 44, g) found in Stratum III was made from the labial portion of the shell. The broken dorsum is irregular but well worn. Also from Stratum III is a complete *C. tigris* base (Fig. 44, h), with the dorsum removed to the callus, which shows considerable wear along the broken edge. From Strata III and VII are broken *Conus* shells, which are smoothed and shaped for possible use as scrapers. A *Turbo* shell peeler (?) was found in Stratum III.

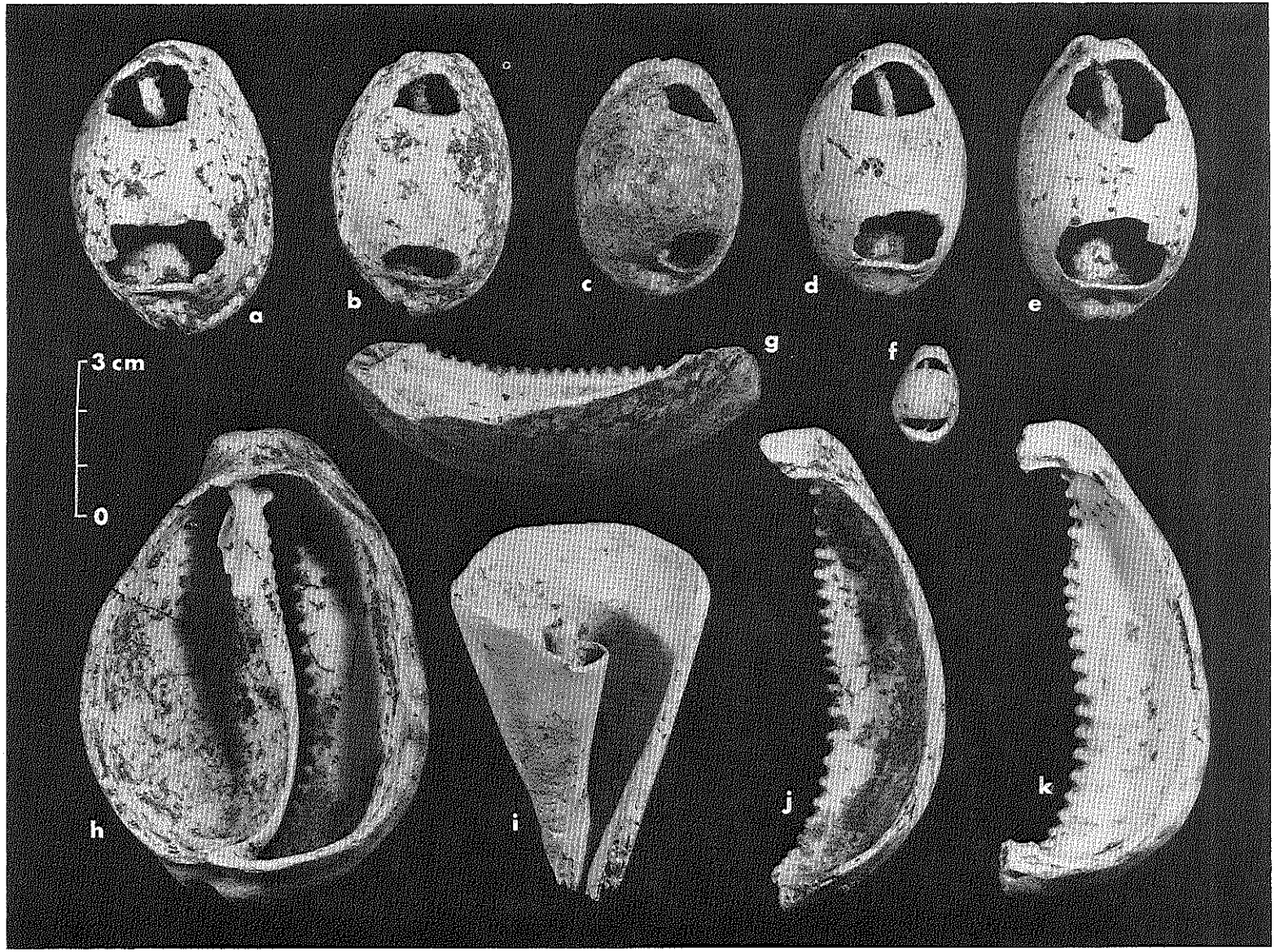


Fig. 44. SCRAPERS AND PEELERS. a-c, *Cypraea* peelers, Potusa, Stratum IV and II (c). d-e, *Cypraea* peelers, Falemoa, Stratum IV and III. f, *Cypraea* peeler (?), Falemoa, Stratum IV. g, *Cypraea* scraper, Falemoa, Stratum III. h, *Cypraea* scraper, Falemoa, Stratum III. i, *Conus* scraper, Faleasiu, Stratum IV. j-k, *Cypraea* scrapers, Potusa, Stratum IV.

Table 15.

SHELL, BONE, CORAL, AND URCHIN-SPINE ARTIFACTS FROM FALEMOA

1976-77

Stratum	Fishhooks	*Cypraea* dorsa	*Cypraea tigris* octopus lures	Peelers, *Cypraea*	Peelers, *Turbo*	Scrapers, *Cypraea*	Scrapers, *Conus*	Beads, bone	Bracelets, *Conus*	Bracelets, *Tectus*	Discs, *Cypraea*	Discs, Coral	Files, *Heterocentrotus*	Adze, *Tridacna*	Misc. worked: shell	bone	coral
NP	--	--	2	--	--	--	--	--	--	--	1	--	--	--	2	--	--
VII	1	1	--	--	--	--	1(?)	--	2	--	--	--	1	--	5	1	--
VI	--	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
V	1	--	--	--	--	--	--	--	1	1	--	1	--	--	4	--	--
IV	1,1(?)	--	--	2	--	--	--	--	--	1	1	--	5	1	7	--	1
III	--	1	--	1	1(?)	2	1(?)	--	--	10	--	--	2	--	4	1	1
II	1	3	--	--	--	--	--	2	--	--	--	--	1	--	2	--	--
I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Some 15 fragments of shell bracelets or armbands were found at Falemoa during the 1976 and 1977 seasons. Seven of these are considered to be portions of finished but broken armbands on the basis of their well-smoothed appearance. The remaining 10 fragments are identified as being in various stages of production of armband manufacture. Examples of four finished fragments are seen in Figure 45, a,b,f, and g, while two fragments (Fig. 45, d,e) represent steps in the finishing process. For instance, (d) has only been chipped to shape, while (e) has been partially ground to remove the rough chipped edges. The bracelets are of *Conus* (*leopardus* or *litteratus*; Fig. 45, a,b) and *Tectus pyramis* (Fig. 45, d,g).

Two carefully shaped concave-convex shell discs (Fig. 45, j,k), measuring 2 cm and 2.3 cm in diameter and made from *C. tigris* (?) dorsum, were found at Falemoa. Possibly these are ornaments.

Two biconically drilled beads were uncovered in Stratum II. At first thought to be of shell, closer scrutiny suggests they are made of ivory (?); probably they are from sea mammal teeth. One (Fig. 45,m), measuring 1 cm long by 1 cm in diameter, has been drilled the length of the bead, while the other (Fig. 45, n) was drilled for a short distance of its length and drilled in from the sides at both ends to complete the perforations (Fig. 45, m,n). It measures 1.7 cm long by .8 cm in diameter. It is a well-known Lapita type. In cross section, both of the beads are roughly triangular.

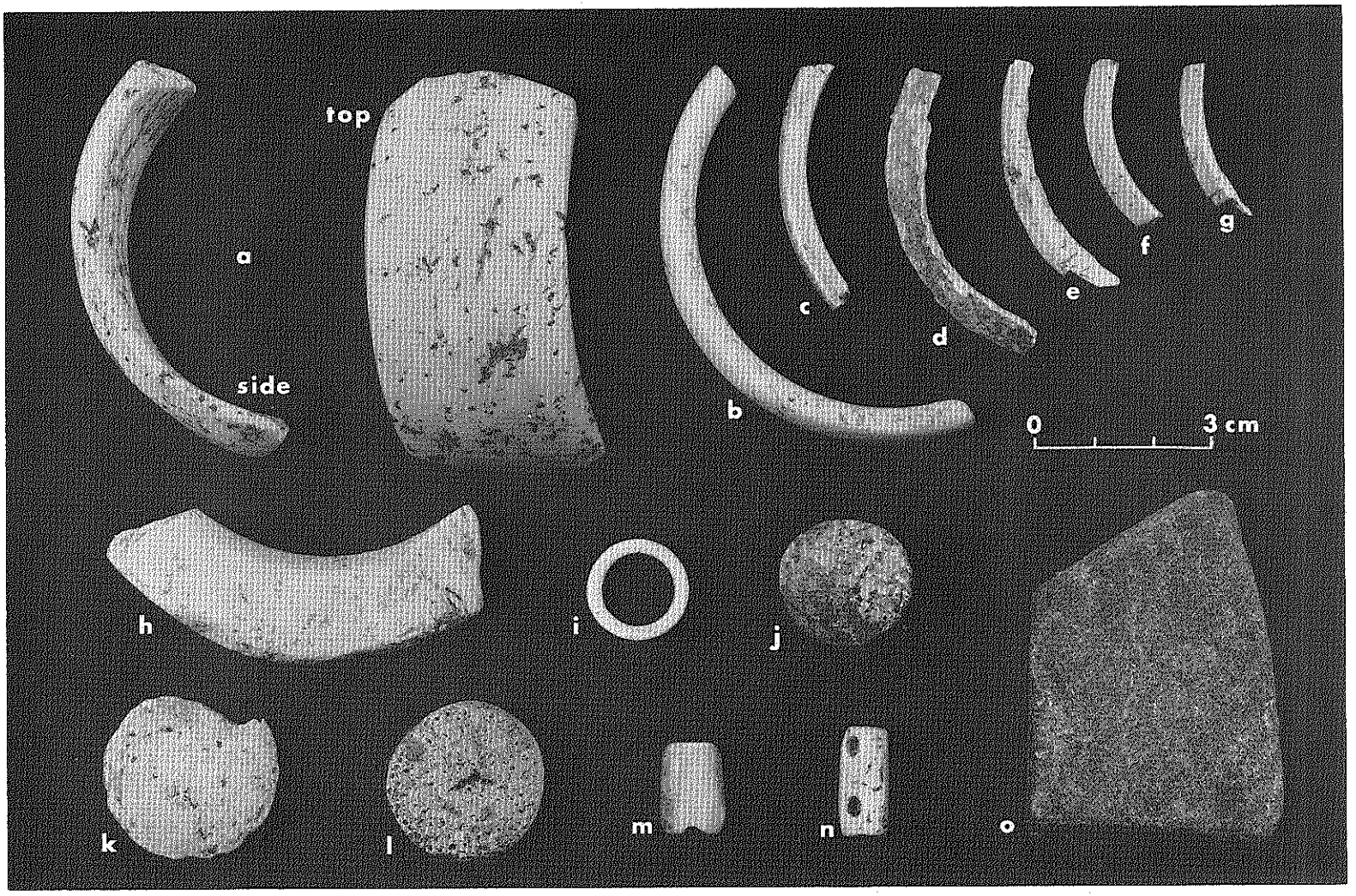


Fig. 45. BRACELETS, BEADS, AND DISCS. a, *Conus* bracelet, Falemoa, Stratum VII. b, *Conus* bracelet, Falemoa, Stratum V. c, unidentified bracelet, Faleasiu, Stratum III. d-g, *Trochus* bracelets, Falemoa, Stratum III. h, *Tridacna* bracelet (?), Potusa, Stratum IV. i, *Conus* ring, Potusa, no provenience. j-k, *Cypraea* discs, Falemoa, Stratum IV. 1, coral disc, Falemoa, Stratum VII. m-n, bone (?) beads, Falemoa, Stratum II. o, coral abrader (?), Falemoa, Stratum IV.

Additional worked shell includes five pieces of *Pinctada* (not illustrated)--two from Stratum VII, two from Stratum III, and one from Stratum II. Each appears to have been smoothed along one or two edges. The largest piece is about 4 cm long by 3 cm wide and the smallest is triangular, 2 cm by 1.8 cm, and could be a fragment of a lure preform, similar to that from Potusa. Four pieces of smoothed *Tridacna* shell were found, one in Stratum III and three in Stratum IV. That from III is the smaller; it measures about 5 cm long by 1.8 cm at its widest and .7 cm thick, and may be a scraper. One of the Stratum IV fragments is triangular and measures 7.8 cm long, 3.8 cm at its widest, and 2 cm thick. It appears to be smoothed along one edge and could be part of an adze. The other two have been ground to a smooth, flat surface on one or several sides. One of these is ground to an even thickness (1.2 cm) and one edge is ground quite straight. It measures 6 cm long by 4.5 cm wide. The other is "chipped" into a rough semicircle like a crude bracelet, and ground smooth on one side only. It measures 6.7 cm across. The only other distinctive piece of worked shell is the spire of a cone, ground flat and with the center chipped out as though a ring were being made. It is broken in half, however; possibly the break occurred while it was being worked. It measures 2.7 cm outside diameter. Four small fragments of *Tectus pyramis* from Strata III (1), IV (2), and VII (1) appear to have been either chipped or ground but their finished form cannot be inferred. The largest of these is 2.3 cm in length by 1 cm wide. A smoothed, though worm-eaten, shell was found in Stratum II. Pendant-shaped but without perforation, it measures 2.5 cm long by .8 cm in diameter.

Artifacts of coral include a thick smoothed disc from Stratum V (Fig. 45, 1). It measures 2.5 cm in diameter and 1.5 cm thick. Although several fragments of coral were at first thought to be files, none can definitely be called such. One squared piece of coral (Fig. 45, o) from Stratum IV was judged to represent an abrader. It is smoothed and flattened on six planes into an irregular block, 5.5 cm long, 3.7 cm wide, and 2 cm thick.

Nine *Heterocentrotus* spine files (e.g., Fig. 43, f-i) were found in the midden. Four of these are flattened on three sides of the distal end, while the others were only used on one side. A worked spine from Stratum II is flattened on the proximal end.

Two worked bone fragments were found at Falemoa. One mammal bone(?) from Stratum VII shows evidence of rasping along one side. It measures 4.5 cm long by .8 cm at its widest. The other fragment from Stratum III has been blackened and shows evidence of polishing, though no rasping marks can be seen. This bone is quite dense, possibly mammal also, and measures 2.8 cm long by 1.2 cm wide.

COMPARISONS AND CONCLUSIONS

The fishing gear from Falemoa and Potusa has no archaeologically derived precedent in Samoa*; however, Buck (1930) has described some of the material aspects of late Samoan fishing technology.

In his description of Samoan trolling lures, Buck (1930:494-517) relies on shank length, among other things, in distinguishing four lure types. These include the *pa tangi*, the largest

* A possible exception is the *Turbo* Fishhook reported by Davidson (1969:247; Fig. 103a).

of the trolling lures, though probably not native to Samoa (Buck 1930:497); the *pa 'atu*, usually measuring between 65 and 105 mm long; the *pa ala*, falling between 47 and 62 mm in length; and the *pa seuseu*, which was the smallest of the four. *Pa 'atu* were used with a rod outside the reef for bonito fishing, while the smaller lures were used primarily inside the reef with handlines or casting rods. The shank lengths and morphology of the lures from Potusa suggest that they were of the *pa seuseu* variety and were not used in the open sea but for the smaller fish within the reef. Also, the lures from Potusa without drilled holes, which are here referred to as preforms, may in fact be similar to small, finished lures without holes known from Pukapuka (Green 1974:273).

Buck also mentions that shells other than *Pinctada* were often used for the manufacture of *pa ala* and *pa seuseu*, though he does not mention *Conus* shell. Green (1974:269-274), in his description of lures collected in Samoa by Vanderford (1823) and the Wilkes Expedition (1839, 1841), notes that small lures such as *pa ala* and *pa seuseu* were apparently more common than *pa 'atu* at the time of contact. He also notes that these smaller lures were more often made from *Conus* and *Cypraea* shells than from *Pinctada* From his study, Green (1974:273) concludes that the *pa 'atu* lure, or West Polynesian type, was not the dominant lure in Samoa, as suggested by Annel (1955); rather, the smaller lures were more common. The Potusa lures, which are probably historic, support Green's conclusions.

One-piece shell fishhooks are not described by Buck, however, and the absence of the shank heads (with the one exception) makes comparisons tentative at best. Shell fishhooks are reported from Tonga (Poulsen 1968:88); these do not resemble the Samoan examples, but the two pictured by Kirch (1978:10) from Niuatoputapu, Tonga, appear very similar to those recovered from Manono. The carefully made *Turbo* hook (Fig. 43, j) is most closely paralleled by the *Turbo* hooks from Anuta (Kirch and Rosendahl 1973:226; fig. 20c). A fishhook of *Turbo* shell is also reported by Davidson (1969:247, fig. 103a) for Lotofaga but its morphology is not distinctive enough for comparisons. For similarities to the round hooks of pearl shell, we go to the Marquesas and the Hane Sand Dune site (Sinoto 1968:298, figs. 4a, 13). Both Suggs (1960) and Sinoto report this type as an early form in the Marquesas. Finished one-piece hooks without shank heads are reported ethnographically by Emory and Sinoto (1965:205) from the Tuamotus, which allows for the possibility that at least the *Turbo* hook from Manono may be a complete specimen, and is probably historic.

The use of whale teeth and dog canines for ornaments at Hane, as well as the whole drilled *Cypraea* octopus lures and the distinctive *Cypraea* peelers, may suggest some additional, though admittedly very tentative, artifactual similarities between Samoa and the Marquesas. However, the distinctive *Cypraea* peeler is reported late for the Marquesas and Societies. Shell and coral discs are new to Samoa, though discs of shell, stone, and pottery are considered an integral part of the Lapita assemblage.

The *C. tigris* octupus-lure caps, *Turbo* shell peelers, *Cypraea* scrapers, *Heterocentrotus* and coral files, and the implications of their use have all been discussed previously (Jennings et al. 1976:73-74). Their continued occurrence in Samoan sites lends credence to the conclusions discussed in that report. The high incidence (86) of worked sea urchin spines from the

Faleasi'u midden as compared to the few (9) from Falemoa requires some attempt at explanation. It is now believed that a number of the "files" from Faleasi'u were labeled as artifacts when, in fact, they were not; at least, the modern specimens of living *Heterocentrotus* (slate pencil sea urchins) were seen to have spines that were naturally rounded. The best evidence of cultural use is the distinctive angular beveling or flattening of the distal or proximal end of the spine rather than any rounded apparent wear patterns.

The Manono middens have added considerably to the Samoan artifact assemblage, with Falemoa with its better provenience control being the more reliable source of information. Early Samoans as known today can now be described as coastal dwellers, foraging and fishing within the reef and probably practicing limited horticulture, although specifics as to crops and the extent of dependency are far from clear. Evidence for prehistoric fishing technology is still thin; while it is evident that fishhooks of various types were being utilized for angling, the impact of this technique on subsistence would appear to have been slight. At present there is no secure evidence for the use of any of the trolling lures for fishing in precontact Samoa.

ADZES AND BASALT ARTIFACTS

NANCY J. HEWITT

The typology used in this analysis is that set up by Green and Davidson (1969) and Green (1974), modifying Buck's (1930) typology. It is also based on the criteria shown in Table 16. The terminology taken from Davidson (1961) is summarized in Figure 46, a re-drafted copy of Davidson's figure.

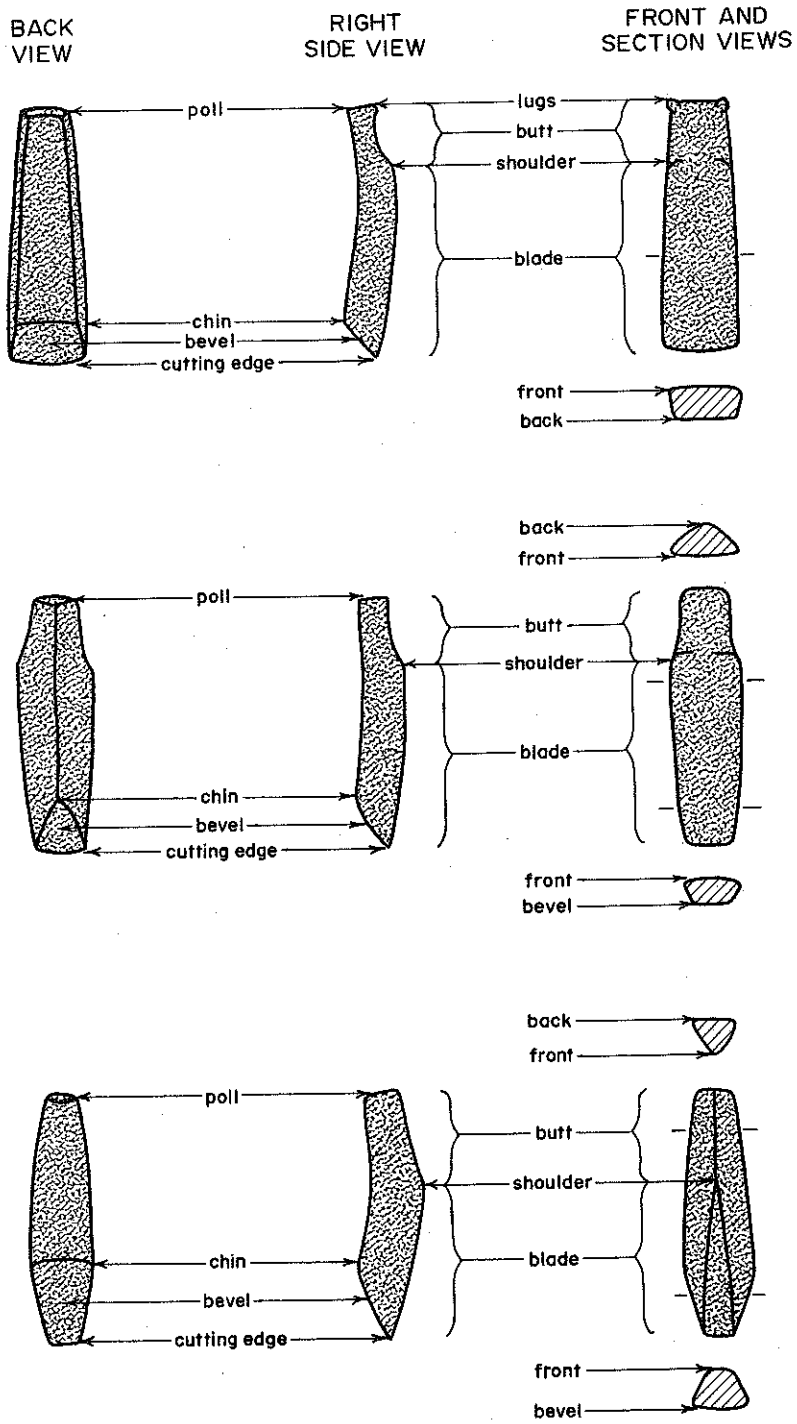


Fig. 46. ADZE TERMINOLOGY AFTER DAVIDSON (1961).

Table 16.

CLASSIFICATION OF SAMOAN ADZES*

Quadrangular Cross Section						Rounded		Triangular		
Back > Front					Front > Back	Back	Flat	Apex up		Apex down
Thin			Thick		Thin	Thin	Thick			
I	II	III	X	IX	IV	Va	Vb	VI	VII	VIII
Flaked & Partially Ground		Fully Ground Finish			Flaked and Partially Ground Finish					

*From Green and Davidson (1969) and Green (1974)

TYPOLOGY

The criteria of Green and Davidson (1969:21-32) and Green (1974) are repeated here, almost verbatim. Provenience of the adzes from our collection, which fall into the several types, is given in Table 17.

TYPE I (Fig. 47 a, d)

This type has a low flat trapezoidal cross section with the front narrower than the back. Generally the back narrows from cutting edge to poll and the front narrows more markedly. Adzes of this type have distinct sides that slope inward to the front. The bevel is usually short. Surface treatment includes ground front and bevel, sides ground or flaked, and a flat, flaked back. Shoulder index ranges from 35 to 91 in the specimens collected by the University of Utah Samoan Archaeological Program. However, there is a clustering between 40 and 55. This is the most numerous type represented in our collection.

TYPE II

Adzes of this type have a roughly five-sided section with a median ridge down the back, rather than the flat back typical of Type I. Also compared to Type I, these adzes are more roughly finished and less regular. The obtusely sloping sides create a curved back, which makes these specimens thicker with relation to width than those of Type I. Shoulder index shows more variation. Surface treatment is usually a short ground bevel, a ground front, and flaked back and sides.

TYPE III (Fig. 47, c)

The most distinguishing characteristic of this type is the fully ground finish on all surfaces except the poll. It has a trapezoidal cross section that is usually quite thin, resulting in a low shoulder index (26 to 64). The front is narrower than the back.

It should be stated that there are adzes in Types I and IX that correspond in cross section shape but lack the fine finish, so it is specifically this characteristic that sets Type III

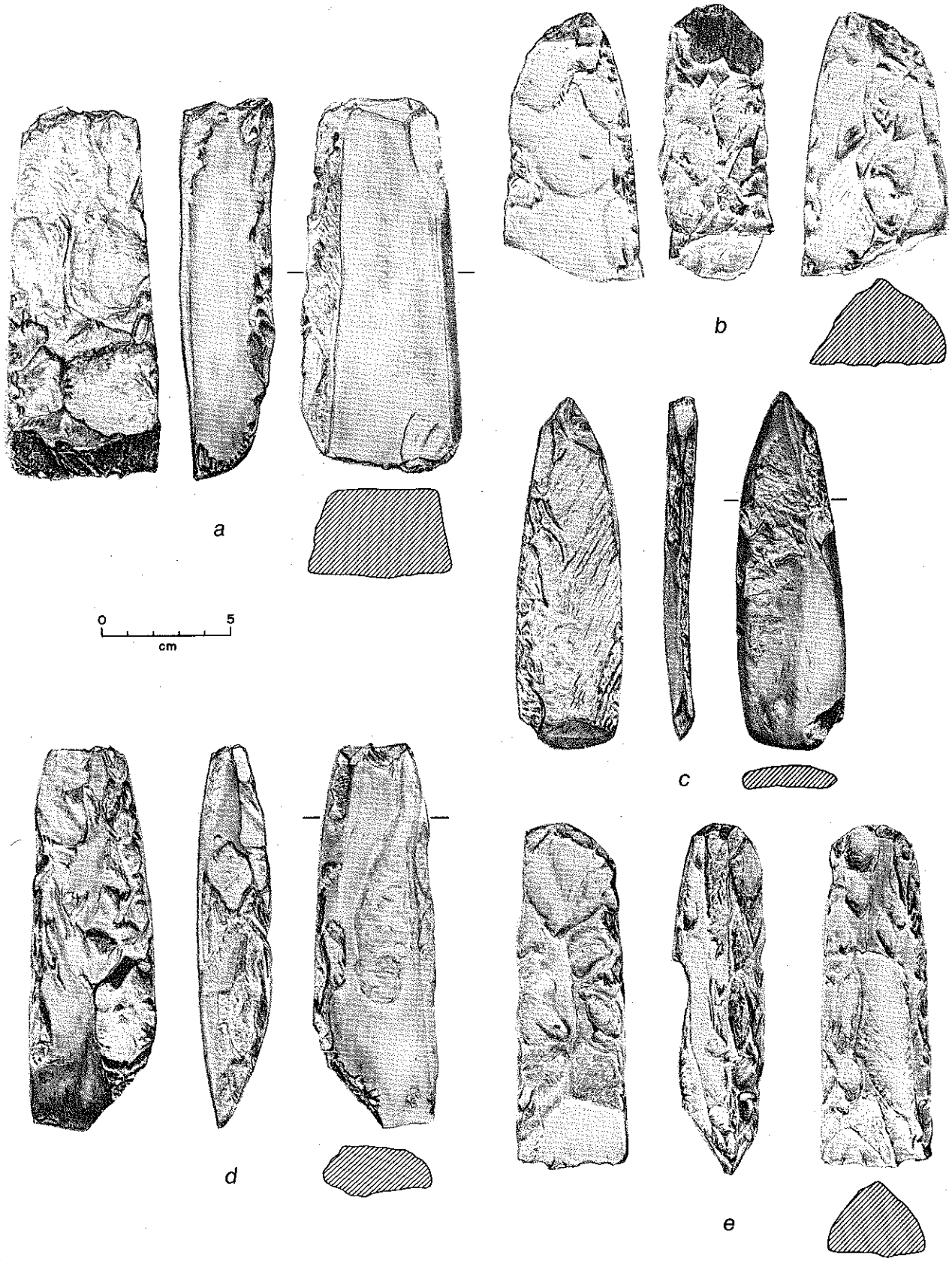


Fig. 47. TYPICAL ADZES. a, Type I, Tulaga Fale. b, Type VI, Tulaga Fale. c, Type III, Potusa. d, Type I, Cog Mound earth oven. e, Type VI, Apulu.

apart. It is also significant to note that the shoulder index, especially the low end, is important in the classification of Type III adzes.

TYPE IV

In contrast to the previous types, this type has a reverse quadrangular cross section with the front wider than the back. The surface is usually fully ground and the specimens tend to be small with little variation in length (50 to 110 mm) and width in relationship to thickness. Shoulder index ranges between 35 and 60. Buck (1930:345-46) subdivided this type into two variants. Type IVa has distinct sides and back, which meet with clearly defined edges to form a trapezoidal cross section; IVb has more rounded sides and back with no distinct edges.

TYPE V

This type has a rounded or plano-convex cross section, the result of a rounded front and sides without edges and a flat back. The back is well ground; the front is flaked or partially ground.

Green and Davidson (1969:25) define two varieties. The Vailele variety is relatively wide and thin, and first defined in early contexts from SUVa-1. The Sasoa'a variety is narrower and thicker. The width of the plano-convex cross section, which distinguishes Type V, does not increase as much in proportion to the thickness as it does in other geometric cross section forms. Therefore, the thick and thin varieties of Type V adzes have fairly uniform widths and the shoulder indices tend to cluster for each variety. The Vailele variety clusters at the lower end of the range from 35 to 70. The Sasoa'a variety clusters at the upper end of the range from 75 to 95. Length is also a significant factor in defining these variants. The Vailele adzes range from 70 to 140 mm, whereas the Sasoa'a adzes fall between 110 and 190 mm. No Type V adzes were recovered during the 1976 and 1977 excavations, although five were recovered during 1974.

TYPE VI (Fig. 47, b, e)

This type is characterized by having a triangular cross section with the apex to the front, a fairly wide back, and a median ridge in front. Some of these specimens are large and heavy. One specimen from the University of Utah collection is quite small; however, it is not complete and total length cannot be measured.

Green and Davidson (1969:26) have defined a single variety of this type. This Lotofaga variety has the additional feature of a specialized development in which the front of the adze is concave due to the fact that the expanded portion of the front, which forms the cutting edge, turns upwards slightly above the plane of median line that forms the remainder of the front. Specimens of this variety are typically large and heavy. They also have a length of over 315 mm and a shoulder index of over 100. The specimens in the University of Utah collection, as well as the majority of Type VI specimens, are generally smaller and have a shoulder index range of 81 to 95. The total shoulder index range for this type is between 65 and 110.

TYPE VIII

The distinguishing characteristic of this type is a triangular cross section with the apex downward, with a median ridge down most of the length of the back. Two varieties can be distinguished on the basis of surface treatment. Type VIIIa is ground on all surfaces and Type VIIIb is largely flaked. There is also a tendency for the "a" variety adzes to be shorter in length and to have a lower shoulder index. Shoulder index for both varieties is below 76. Green and Davidson (1969:26) suggest that these varieties are tentative. Equally tentatively, one specimen from our collection appears to be Type VIII, but cannot readily be fitted into either variety.

TYPE X

The quadrangular cross section of this type is similar to Type I and III except that it has a greater thickness relative to width. It is the surface treatment that clearly distinguishes Type X. Specimens in this category have a highly ground finish on all surfaces. The shoulder index range was not included in Green and Davidson's (1969) article. Our specimens have indices of 52, 68, 51, and 72.

CHRONOLOGY

Since the collection is relatively small, it is not possible to add to the basic chronological sequence established by Green and Davidson (1969:32) and further refined by Green (1974: 258-60).

Types I and V adzes are the most common types that appear in the first and second centuries A.D. Type I, however, continues to be the most common type throughout the rest of the 2,000-year sequence. This persistence explains why Type I is the most numerous type in most collections, as it is in ours. Green (1974:258) states that there is more variation among Type I adzes found in the earlier context, but the type becomes more standardized later in time. Thirteen Type I specimens were recovered from the Mt. Olo area of Upolu and are dated to the fourteenth through the seventeenth centuries (see Table 1). Three specimens are from the Manono sites and probably date between 2610±50 B.P. to 1850±40 B.P.

The absence of any Type V adzes from the Mt. Olo area supports Green and Davidson's (1969: 32) hypothesis that this type was probably an early form not found in later assemblages. It is noteworthy that this type is lacking from the Manono sites, but is the most common type at Janes Camp, which dates between 2550 and 2130 B.P.

Type II adzes are fairly common in the late prehistoric tool kit, although they are found much earlier. Both of our specimens come from the Mt. Olo area. One was found in a storage pit, which was dated to 1175 B.P.; the other was found in the topsoil and, if dated by association with the nearby features, could fall anywhere from 1175 B.P. to 370 B.P.

Adzes classified as Type III are absent from Green's (1974:258) Early Fine Ware pottery horizon, but he feels this could be due to sampling error, since this type is known from even

earlier contexts in Tonga. Its association with the possibly later coarse ware contexts, however, is certain and they continue to the end of the sequence. Two of our specimens are from the Mt. Olo Settlement; one (SU17-483) is dated to 945 B.P. The other was from the undated Fiapito Site (SU17-24). The two remaining Type III adzes in our collection were recovered from the Manono sites. One is from Stratum II at Potusa, which dates to 1850 B.P. The other is from Stratum III at Falemoa.

Green and Davidson (1969:32) postulated that Type IVa is an exclusively early form, but Green in the later article (1974:259) suggests that both Types IVa and IVb appear to have had a long history, although the type was never common in Samoa. The single IVa specimen from our collection was recovered from the surface of a platform in the Mt. Olo complex and is undated. One of the IVb specimens has the same provenience. There is always the possibility that these adzes were picked up from the surrounding area and placed among the many other smallish stones that make up the surface of such a platform. In such cases, it is possible that they could date either to the early occupation period of the Mt. Olo Settlement between about 1600 and 950 B.P., or to the later period of occupation from 600 to 300 B.P. The third Type IV specimen in our collection, identified as a "b" variety, was from Janes Camp (SU18-1), an early site.

Type VI is known from the upper part of the early pottery horizon and continues to be fairly common throughout the sequence. Previous collections show that the smaller forms are from the earlier horizons, whereas the thicker, heavier forms and the Lotofaga variety were apparently later developments. All but one of our specimens are from the Mt. Olo area and date by association to the fourteenth through sixteenth centuries A.D. However, none of them are particularly large and heavy; in fact, one is the smallest adze in the collection. The remaining specimen was recovered from Stratum IV at Potusa and is of historic date.

Type VII adzes are one of the rarest types in surface collections and are apparently an early type that disappeared in the later part of the Samoan sequence. No Type VII adzes were recovered during our excavation.

Type VIII is uncertainly placed in the sequence, as it is rare in surface collections. Our single specimen from the Paradise Site (SUVs-1) offers little for chronological placement since it was found on the surface and is not dated.

Adzes identified as Type IX are not found in Green's (1974:259) early fine ware contexts but are known from the later coarse ware contexts, which date to the second century A.D. Green and Davidson (1969:32) note that Type IX is numerous in surface collections and suggest it was fairly common in later times. We can add nothing to their placement in time since this type is missing from our collections.

Type X was found in early pottery levels by Green and Davidson (1969:32), and Green (1974: 260) feels that its origin was as early as Type IX. This type increased over time and became somewhat numerous toward the end of the sequence. Two of our specimens are from the Manono sites and are of a relatively early date. The other two are from the Mt. Olo settlement but cannot be securely dated.

Table 17.

PROVENIENCE OF MT. OLO ADZES

Site Name	Site Number	Type	Provenience
Janes Camp	SU18-1	Type III	Stratum III
		Type IVb	Unknown
		Type V	Stratum III
		Type V	Stratum IV
		Type V	Stratum V
Unknown	?	Type V	
	?	Type V	
	SUVs-1	Type III	Testpit
		Type VIII	Surface
Potusa	SM17-1	Type III	Stratum II
		Type X	Stratum III
		Type VI	Stratum IV
		Type I	Surface
Falemoa	SM17-2	Type X	Stratum V
		Type I	Stratum III
		Type I	Stratum IV
		Type III	Stratum III
Green Ti	SM17-48	Type I	
Tulaga Fale	SU17-130	Type I	Platform 1
		Type I	Platform 1
		Type I	Platform 5
		Type I	Platform 1
		Type VI	Platform 1
		Type I	Platform 1
Apulu	SU17-483	Type VI	Platform 4
		Type I	Platform 4
		Type I	Platform 4
		Type III	Stone mound
		Type II	Topsoil
		Type IVa	Platform 2 surface
		Type IVb	Platform 2 surface
		Type II	Storage pit
		Type I	Platform 4
Cog Mound	SU17-193	Type I	Beneath platform
		Type I	Forest Soil
		Type VI	Platform 1
Ten Points	SU17-552	Type I	Star mound
Fiapito	SU17-24	Type X	Post hole, Platform 3
		Type I	Platform 4
		Type III	Platform 4
	SU17-527	Type X	Rock pile fill
		Type VI	Rock pile fill
Tausagi	SU17-175	Type VI	Beneath platform

Table 18.

PROVENIENCE OF UNIDENTIFIABLE ADZE FRAGMENTS

Site Name	Site Number	Total	Provenience
Apulu	SU17-483	6	Platform 4
Apulu		1	Platform 2
Cog Mound Complex	SU17-193	1	Beneath Platform 1
Cog Mound Complex	SU17-527	5	Stone Heap
Falemoa	SM17-2	2	Stratum IV
Falemoa	SM17-2	2	Stratum VII
Potusa	SM17-1	2	Stratum II
Potusa	SM17-1	1	No Provenience
Tausagi	SU17-175	2	Platform 3
Tulaga Fale	SU17-130	1	Platform 2
Tulaga Fale	SU17-130	3	Beneath Platform 1
Tulaga Fale	SU17-130	1	Clearing between Platform 6 and Platform 5

OTHER STONE ARTIFACTS

BASALT FLAKES

The most numerous basalt artifacts recovered from our excavations are waste flakes. Most of these are unretouched, usually showing a concoidal fracture. But many of them are clearly flakes broken from adzes during use, since they have at least one edge that is finely ground. Usually these flakes are from the cutting edge.

At the Potusa Site (SM17-1), the flakes are not numerous, totaling 28. Adze flake provenience: Stratum II, 4; Stratum IV, 12; no provenience, 1. Plain flake provenience: Stratum II, 2; Stratum IV, 7; no provenience, 2.

The Falemoa Site (SM17-2) yielded a total of 160 flakes. Adze flake provenience: Stratum III, 4; Stratum IV, 9; Stratum VI, 1; Stratum VII, 16. Plain flake provenience: Stratum II, 3; Stratum III, 10; Stratum IV, 24; Stratum V, 5; Stratum VI, 20; Stratum VII, 65. Stratum III at this site has been identified by Lohse (see p. 27) as the heaviest occupation layer, and yet only 14 of the total 160 flakes were recovered from this layer. The bulk of the flakes, both adze and plain, were recovered from the modern forest soil layer Stratum VII.

A single unretouched waste flake was found beneath Platform 3 at the Fiapito Site (SU17-24). Also, a single waste flake without any signs of retouching was recovered from the star mound at Ten Points Site (SU17-552).

Very few flakes were collected during the excavation of the Crooked Palm site (SU17-369). Adze flake provenience: Platform 1, 2; Platform 4, 2. Plain flake provenience: Platform 1, 2.

A total of 49 flakes was recovered from the Apulu site (SU17-483), all from Platform 4. Adze flakes totaled 8, and plain flakes totaled 41.

The Tulaga Fale site (SU17-130) yielded a total of 101 basalt flakes. Adze flake provenience: Platform 1, 8; surface beneath Platform 1, 14; surface of Platform 2, 4; Platform 2, 4; initial test trench in Platform 2, 1. Plain flake provenience: Platform 1, 20; surface below Platform 1, 32; initial test trench in Platform 1, 1; Platform 2, 6; surface of Platform 2, 4; initial test trench of Platform 2, 6; surface of ramp leading to Platform 5, 1.

Two plain flakes were found in the fill of the Stone Heap at Cog Mound Complex (SU17-193). An adze flake was recovered from the fire zone near the bottom of the stone heap. One flake was found in Stratum IV, one from Stratum II, four from Platform 1, and one adze flake from an intrusion into Platform 1.

A total of 45 flakes was collected at the Tausagi Site (SU17-175). Provenience: Platform 3, 43; Walkway, 2.

At the Tulaga Fale, Apulu, and Tausagi sites, one platform in each complex yielded the majority of the total waste flake collection for each site. It appears as though the houses supported by these platforms were used as work houses, possibly for craft production (cf. Green 1974:145-146; 226-267). Holmer (Jennings et al. 1976:32) suggested a similar platform at the Cog Site might be a work house (SU17-165). It is significant that all of these have been identified as high-status areas. Therefore, it seems entirely possible that these particular platforms may have been for craft specialists under the direction of each local chief.

MISCELLANEOUS

Kava Mortar

Partially embedded in the surface of Platform 2 at Tulaga Fale was a large fine-grained chunk of basalt, smoothed and worn on four sides. It is assumed to have been used as a mortar for pounding *kava* root. Maximum length is 27.5 cm. Maximum width is 14.5 cm and maximum thickness is 14.6 cm. The smoothed sides range in concavity depth from 1.5 cm to .8 cm.

Another smaller basalt stone with two smoothed and worn sides was recovered from Stratum IV at SM17-1. It measures 6.7 by 5.5 cm, and is 1.9 cm thick. Although this stone is smaller than most *kava* mortars, it may have been used for this purpose or possibly for grinding some other material.

Grinders or Abraders

Four rectangular stones with linear striations may have been used as abraders, smoothers, or grinders. Two were recovered from the Stone Heap at the Cog Mound Complex (SU17-193); the third was from Platform 1 at the same site. All three are 9 cm long, 5 cm wide, and 2 cm thick. The fourth specimen was recovered from Platform 3 at the Tausagi site (SU17-175) and measures 4.5 cm in length, 5.5 cm in width, and 4 cm in thickness. Since this artifact is broken, total original length is unknown.

Chisel

Stratum II at Falemoa yielded a small tool, rounded in cross section like a Type V adze, and very smoothly ground on all surfaces. It measures 2.4 cm in length, 1.55 cm in width, and .25 cm in thickness. Although it is possible that this artifact is a very small stone adze, there is no bevel or cutting edge remaining (see Fig. 48, b).

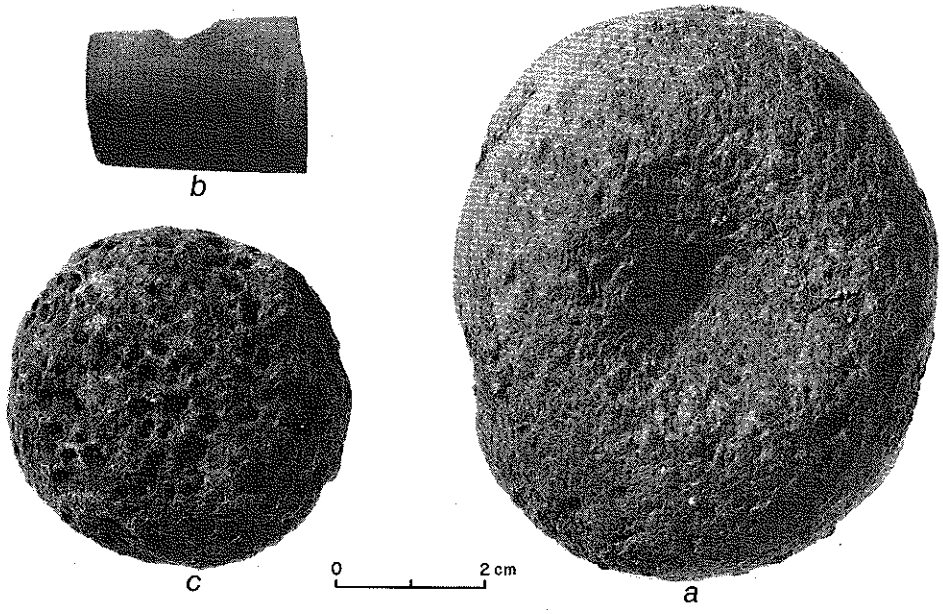


Fig. 48. BASALT ARTIFACTS. a, hammerstone with pecked finger grips, Falemoa. b, possible file or chisel, Falemoa. c, stone ball, Cog Mound Complex.

Hammerstone

A hammerstone with pecked finger grips on opposite sides was found in Stratum IV at the Falemoa site (SM17-2). This artifact measures 5.9 cm wide, 7.4 cm long, and is 4.7 cm thick. It weighs 0.4 kg. Material is a fine-grained dense, light-colored basalt. In shape, this tool is a slightly flattened sphere with the pecked finger grips on the flattened sides. The lateral surfaces show evidence of percussion (Fig. 48, a).

Nine suspected hammerstones were recovered at the Cog Mound Complex, but are not further noted.

Stone Ball

A very round stone ball made of vesicular basalt was recovered from Platform 1 at the Cog Mound Complex (SU17-193). It measures 5 cm in diameter and weighs 4.5 ounces. This artifact is of unknown function (Fig. 48, c). Two similar stone balls were recorded for Janes Camp (SU18-1) (Jennings et al. 1976:70).

Obsidian

Four small pieces of obsidian were collected at Falemoa (SM17-2). Provenience: Stratum II, 1; Stratum III, 1; Stratum VII, 1; uncertain, 1. Green (1974:268) has stated that obsidian utilization was part of the ancestral complex of West Polynesia; a practice that continued until about the third century A.D. He also points out that obsidian glass was traded and widely used by the Lapitan cultures W of Samoa, and occasionally found in Lapitan contexts in Tonga where there is a source on Niuatoputapu. The source for the Falemoa obsidian is presently unknown but is found in strata that date as early as A.D. 150.

SUMMARY

Although most of the data presented in this report flow from two seasons' (1976 and 1977) fieldwork, occasional reference has been made to earlier work (1974) reported in Jennings et al. (1976). In that sense, then, this summary deals with the overall findings of three seasons' study in a single district in Western Samoa, and at the nearby islet of Manono. The earlier report tended to be largely descriptive. This one is also heavily descriptive, but throughout it contains more material of an explanatory or interpretive nature. The aim of this section is to offer a short evaluation of the results of the UUSAP study.

Probably the most useful idea in the corpus of new data may be the household unit concept, and the attendant delineation of seven wards in the Mt. Olo district. The HHU concept was developed in 1976 during an assessment of the detailed map of the Mt. Olo Plantation. As an idea it was easily arrived at intuitively; its definition was empirically determined. The HHU is regarded as a spatial manifestation of the minimum effective social unit. The original notion that each HHU contained a garden plot received no archaeological support and therefore has been abandoned. As a result, one is forced to assume that individual family gardens (today called plantations) were distant then as they tend to be today, where the garden areas are large enough to allow a form of swidden farming. The current practice seems to involve a rotation of crops within a number of plots, with about half the plots returning to bush at any one time, and with the one longest in fallow the next to be cleared and planted. This practice is believed to be ancient.

The discovery of wards was detected statistically. They are to be understood as closely linked to the extensive web of roads or pathways that are part of an extensive district-wide and possibly island-wide communication system. The ward centers are a large, presumably high-status, HHU fronting on what are called the primary pathways. The primary pathways are the larger and more carefully constructed ones. The wards are thought to have been subdivisions, under the control of subchiefs, of some larger social governance unit that might be analogous to the modern village, controlled by a dominant chief.

In view of the close similarity of the prehistoric Mt. Olo settlement to a modern Samoan village, the conclusion is reached that the settlement pattern observed today is quite ancient. The ancient demographic pattern, however, was evidently the reverse of the historical one, where today the population is concentrated in villages along the coasts with only scattered HHU's and plantations to be found inland. Efforts to determine the full extent of the Mt. Olo settlement, and thereby learn the size of the prehistoric village, were thwarted by the density of vegetation in the bushland, and ferns in the ungrazed portions of the coconut plantation. In casual travel over both islands--Savai'i and Upolu--one sees the ruins of villages (pathways, walls, platforms) wherever the land is clear. Appendix I exemplifies an old "lost" village near Sapapali'i on Savai'i. In the Letolo district, on the Nelson plantation on Savai'i, a dense

settlement containing scores of HHU's and the customary network of pathways covering some 5 square kilometers has been mapped but not yet reported. The conclusion is inescapable that the prehistoric population on both islands was widely dispersed over the islands for a long period except in the most precipitous interior terrain. Even so, there is not yet available any reasonable basis for estimating a peak population in prehistoric times, although we believe it was much greater in prehistoric than in historic times. The settlement pattern proposed above was predicted by Davidson (1974b) on the basis of a rapid sampling survey of Upolu.

In terms of chronology, the UUSAP work has extended the occupancy span of Western Samoa to about 3000 B.P., as Green (1974) has suggested as probable on the basis of the archaeology. The suite of radiocarbon dates seems to provide a reliable set of chronometric controls, albeit some dates of crucial importance are lacking. For example, only two dates (nos. 2 and 7) actually come from within a stone structure. All others that appear to date the Mt. Olo village/settlement are from the associated large earth ovens (*umu ti*). The earlier dates supporting the Early Mt. Olo occupancy come from phenomena underlying the stone masonry of the Late Mt. Olo construction. Also, the consistent discrepancy between the NZ and UGa dates from the coastal villages leaves a question as to which is more nearly correct. The radiocarbon dates cause another problem in the interpretation of the ceramic data. My own intuitive view is that the Janes Camp, Potusa, Falemoa, and Paradise sites are essentially contemporary. This reflects my interpretation of the ceramic distributions charted in Figure 42. There appears to be some change in ceramic percentages through time. Our data show the coarse pottery types co-occur with the fine ware, increasing only slightly toward the top of the deposits. The early occurrence of the coarse types differs from Green's (1974) findings at the Falefa and Vailele locations, where there is a rather dramatic increase in coarse ware after the time of Christ. The coarse ware may well have been dominant as the pottery tradition disappeared. However, the coastal village dates are evidently earlier; with little overlap with Green's dates, there is no clear challenge of Green's findings.

The separation of the ceramics into a series of named types should be a useful extension/refinement of Smith's (Jennings et al. 1976) effort with the Janes Camp pottery sample. Hopefully, the types will prove useful in later work with Samoan/Tongan ceramic study; possibly a finer chronology for coastal sites can be produced with seriated ceramic data. Thus, although Samoa is the eastern end of the occurrence of pottery in Polynesia (save the few pieces in the Marquesas), our interpretation is that the Samoan plain types support the idea that early Pacific pottery is all in the Lapita tradition. Green prefers to see a Polynesian Plain ware sufficiently different from Lapita Plain to be regarded as a separate entity. He would agree, however, that the Polynesian Plain pottery has evolved from that Lapita complex (Green 1974).

The discovery and documentation of the intricate trail system (8.8 km of raised pathways and 3.7 km of walled ways at Mt. Olo) add new data, the paths having not been recognized previously as being so extensive. A few have been known to the Samoans but all those are linked to legendary Tongan invasions. It is now evident that inland-coastal communication would have been easy and must have been extensive. It was even possible to trace one from Mt. Olo to the

modern village of Satuimalufilufi. Nearby, a trail still used heavily today by the Satuimalufilufi villagers seems to blend with a prehistoric one. Ethnographic mention of the existence of inter-coastal paths that pass through abandoned inland villages supports our view of both the extensiveness of the trail system and its antiquity.

Of wider interest, beyond the extended time span for Samoa, is the UUSAP expansion of the list of material objects associated with early coastal villages. Aside from the ceramics, the inventory of material traits now includes circular, one-piece shell fishhooks, small shell lures, shell discs, shell discs of shallow basin form cut from cowrie shell, cowrie shell peelers, *Turbo* shell peelers, a shell ring, slender and heavy shell bracelets (fragments), coral and pottery discs, a shell adze (fragment), and, of course, stone adzes. Most of the newly recovered items have been cited as part of the basic Lapita tool kit. In view of the decorated Eastern Lapita pottery and the tool inventory above, the Samoan founder population is regarded as undoubtedly Lapita, the pioneers having arrived there by 3000 B.P.±.

It is evident that our findings led us, time after time, to early historic or even modern day practices for aid toward understanding the archaeological evidence. In such things as the HHU's, wards, and villages of Mt. Olo and Sapapali'i, the modern villages mirror the prehistoric patterns. The modern concept of plantations quite distant from the densely packed village was perforce invoked in explanation of the lack of garden plots at Mt. Olo. The UUSAP findings therefore tend to agree with Davidson's conclusion that Samoan culture is to be characterized as a continuity rather than as showing marked changes over time. Particularly, if the shell peelers are accepted as oblique evidence for agriculture, the subsistence base seems to be unchanged, i.e., reef animal exploitation and root crop agriculture constituted the base at 2500 B.C. as they do today.

Such changes as can be noted would include demographic shifts, probably resultant from fluctuations in population or temporary loss of soil fertility. The loss of pottery can be thought of as a change in technology, implying the use of wood as the raw material for containers. No impoverishment or restriction of lifeway need be assumed to have resulted from that change. Present evidence is that the cooking of *ti* root has a late prehistoric occurrence. It may merely reflect a late introduction of a new food plant. The construction of stone residence platforms and the identification of the larger platforms as indicators of rank and status may imply an intensification of the social stratification that remains the basis of Samoan life. The intensification, probably linked with population increase, can be seen as an additional emphasis rather than a new concept, if the stratified society is as old as the Lapita cultural complex, which some scholars believe.

In closing it is noted that Kirch's (1978) work on Niuatoputapu has provided one other link in the chain of Lapita locations to the W of Samoa. There a series of sites document the early Eastern Lapita pottery, with an ensuing transition to a wholly plain ware. Moreover, shell adzes and one-piece fishhooks duplicate objects in the Samoan collection from Potusa and Falemoa.

APPENDIX

SAPAPALI'I SETTLEMENT

GREGORY U. JACKMOND
AND
RICHARD N. HOLMER

INTRODUCTION

Interest in the Sapapali'i area was stimulated by the previous work of Buist (1969) during a general reconnaissance of Savai'i. That reconnaissance included a superficial survey along the Sapapali'i Plantation Road. There he noted seven archaeological structures and inferred the existence of many more. Since the actual density of archaeological sites could not be determined from Buist's report, a 5-km-long transect along the plantation road was initially examined and locations of several prominent platforms were recorded (Jackmond Ms.). As the wide distribution and density of archaeological remains became apparent, an area archaeologically representative of the transect, with relatively sparse vegetation and within reasonable walking distance of Sapapali'i, was selected for an intensive survey. The objective of the survey was to produce data from Savai'i which could be compared with the detailed work by Jennings (1976; Jennings et al. 1976) on Upolu, and thus expand the knowledge of the settlement patterns of Western Samoa.

The survey area (approximately 20 ha.) is located 1 to 1.4 km northwest of the modern coastal village of Sapapali'i (Fig. 49). A large, unnamed, intermittent stream roughly parallels the plantation road, which forms the southern boundary of the survey area (Fig. 50). In general, the terrain is flat or gently sloping to the S and SE although there are limited steeper areas with slopes of up to 10° or more. Vegetation consists of an overstory of coconut trees (20 to 30 meters in height) and a dense undergrowth of ferns, mile-a-minute (*Mikania micrantha*), and brush (0.5 to 1.5 meters in height).

ARCHAEOLOGICAL REMAINS

Four classes of archaeological remains were encountered during the survey (fences, walkways, platforms, and earth ovens), all having been previously recorded and described for Western Samoa (Buist 1969; Davidson 1974; Jennings 1976; Jennings et al. 1976; and this volume). All recorded archaeological features have been numbered following the system applied to other sites reported in this volume. An additional class of archaeological feature, the household unit, was observed during the survey, but these are not designated as separate sites because they merely represent a cluster of numbered structures, as at Mt. Olo.

FENCES

A total of 4,887 meters of stone fences was recorded within the survey area. They are constructed of a wide range of stone sizes (5 to 40 cm in diameter) and vary from quickly built, unstable, 1-meter-high walls (often only a single stone thick) to massive solid walls that clearly required considerable time and effort to construct.

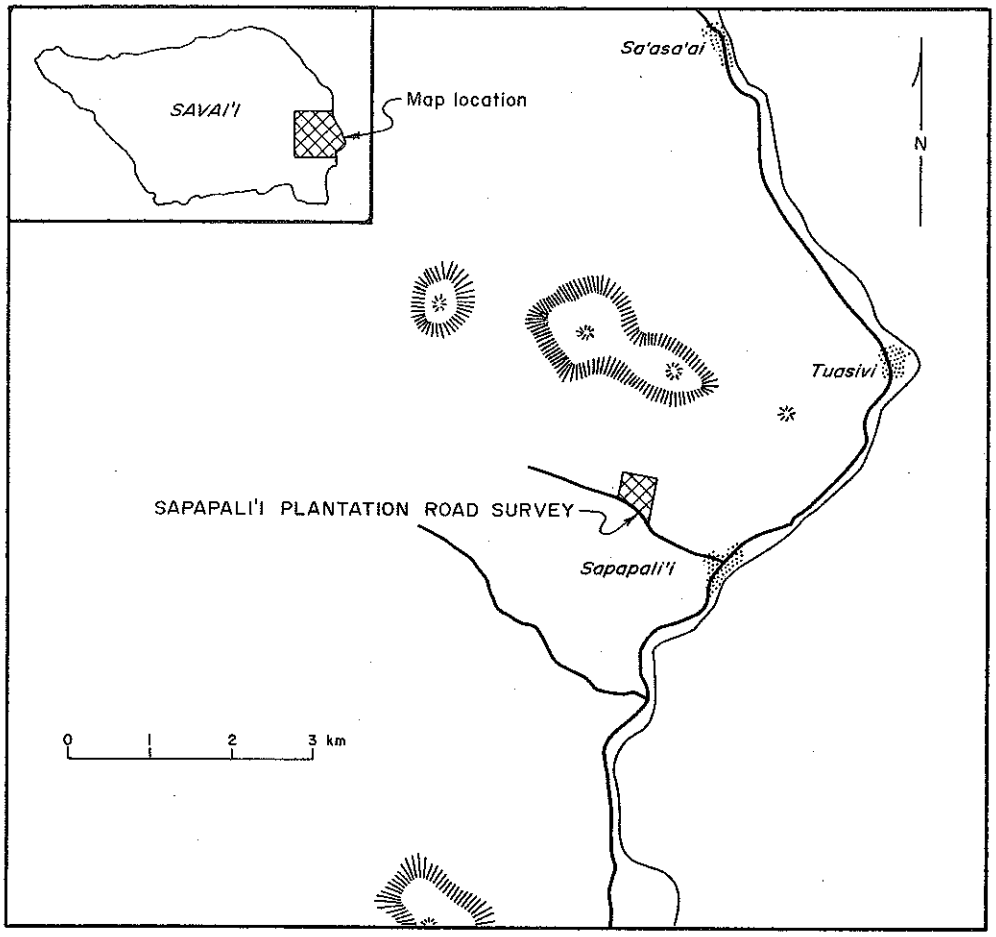


Fig. 49. LOCATION MAP, SAPAPALI'I STUDY AREA.

Historically, stone fences similar to the ones recorded here are used for subdividing land for use as pig pens, agricultural plots, and household enclosures. There is no reason to doubt that they had similar functions prehistorically.

WALKWAYS

A total of 2,105 meters of walkways was recorded during the survey. Both raised and walled walkways are common, although the raised variety is predominant. These structures, presumed to function much as modern roadways and trails, may have also served many of the same land-division functions as fences. They possibly also acted as status indicators (cf. Davidson 1974c: 240; Jennings et al. 1976:50).

PLATFORMS

Platforms recorded during the survey range in size from small, low, flat-topped stone piles to large, 1-meter-high stone mounds. Shape varies from square or circular to rectangular or elliptical.

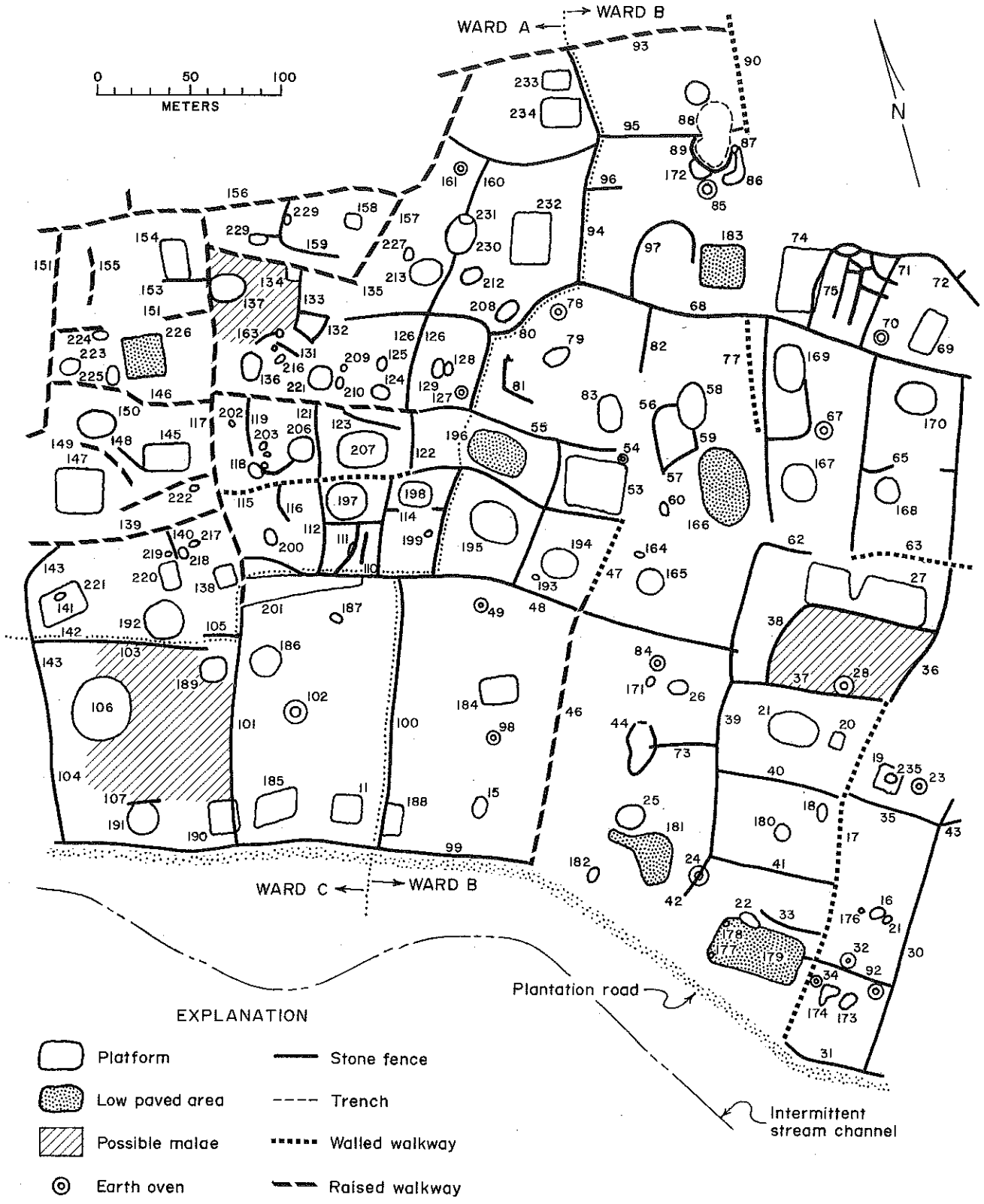


Fig. 50. MAP OF FEATURES WITHIN THE SAPAPALI'I STUDY AREA.

A total of 109 platforms was recorded in the surveyed area. They average 36±30 cm high and 199±252 square meters in basal area. The high standard deviations indicate the great range in sizes, with the basal area data being highly skewed toward the smaller sizes.

The individual platforms can be interpreted by size following the Mt. Olo survey interpretation presented in this volume. In addition to the cook house, residence, and high-status functional categories presented there, several large low paved areas occur at Sapapali'i (Fig. 50, SS13-179, SS13-181). They are similar to the paved areas observed in modern villages in front of some dwellings. The modern examples are usually associated with higher-status dwellings and are often used for the drying of clothing, mats, mat-making material, and copra.

EARTH OVENS

Seventeen earth ovens were recorded in the survey area. These measure 8.45±2.28 meters outside diameter, 0.56±.37 meter high, 3.27±.81 meter central depression diameter, and 0.42±.44 meter central depression depth. Three ovens were partially excavated to obtain datable charcoal. The resultant dates are 500 B.P. (SS13-91) and 545 B.P. (SS13-127). The date from SS13-85 is not acceptable.

HOUSEHOLD UNITS

A total of 43 fenced enclosures was recorded during the survey. They enclose an average area of 3,350±2,725 square meters and contain 2.0±1.2 platforms. Most enclosures are bordered by walkways. The average length of the walkway adjacent to those units is 47±17 meters.

Not all of the fenced enclosures can be assumed to be household units as defined elsewhere in this volume. To segregate land as being lived on by a single family from land fenced for other reasons, certain domestic attributes should be present. The most diagnostic attribute is the cook house. In modern villages there is one cook house per family (household unit) and they are located behind (away from any major roadway, important structure, or *malae* village green) the associated dwelling structures. If these structures could be consistently recognized in the archaeological remains, the household unit could be readily interpreted. However, they are difficult to identify and their presence should probably be assumed in those fenced enclosures that contain platforms of suitable size to support a dwelling structure. The difficulty of identifying cook houses is documented by the fact that only one structure of this type was identified at Sapapali'i (Fig. 50,SS13-193) and only one at Mt. Olo. The 43 fenced enclosures that contain at least one platform large enough to be a house platform should probably be considered residential or household units.

INTERPRETATION

The total survey area, which appears to be a single continuum of fences, walkways, and platforms, can be divided into three distinct sections. The integrity of the sections is based on a comparison of six traits that combine to distinguish each as a separate entity. The traits include: terrain, earth oven density, platform density, platform size, fence and walkway density, and household unit site (see Table 19).

The question as to whether the three sections are separate villages or distinguishable wards within a single village is not easily determined from the limited data available. For the sake of convenience, each section is referred to as a ward. Whether they are wards of the same village or separate villages is a question that cannot be answered.

Although slight variations in terrain aided in separating the survey area into wards, the topography of Ward A does not differ enough from that of Ward B to explain the differences that exist in the density of platforms and walkways, or HHU size. The differences, therefore, are probably attributable to factors such as differential preferences in ward organization or possibly prestige or wealth. Each ward contains all of the types of structures essential to a village or village ward, including possible *malae* (see Fig. 50). Even though a superficial observation of the area surrounding the survey area indicates that these wards may only be portions of much larger villages, both Ward A and Ward B are large enough by modern standards to be considered separate wards. This was determined by roughly estimating the population of each ward by using the constant of 3.75 people per dwelling (Davidson 1974c:236), assuming a 90% occupancy of platforms larger than 27 square meters in basal area. The estimates are listed in Table 20 along with the resultant density of individuals per hectare.

As indicated in the ethnohistorical literature (Davidson 1969), the larger platforms in each ward should be associated with the *malae*. The largest platforms in both Wards B and C (greater than 950 square meters) are directly adjacent to the suspected *malae* areas. In Ward A, the third largest platform (Fig. 50, SS13-137, measuring approximately 270 square meters) is associated with the possible *malae*, while the two largest platforms (Fig. 50, SS13-145 and -147, which are greater than 490 square meters) are located approximately 50 meters to the SW.

The suspected *malae* areas are all approximately 75 by 50 meters. These are smaller than those mentioned by Davidson (1969:57), but they are within the range of the smaller *malae* observed in many modern villages.

A comparison of the data presented here with the Mt. Olo Survey data discussed in this volume reveals several distinct differences. The most notable is the greater density of apparent occupation at Sapapali'i. There are approximately three times more platforms per hectare at Sapapali'i than at Mt. Olo. There are also approximately ten times more fences (in meters per hectare) and three times more walkways (in meters per hectare). Directly related is the much larger size of household units at Mt. Olo, even though they contain similar numbers of platforms. The comparisons suggest that more people lived on less land in the Savai'i settlement than in the Upolu settlement.

Other differences include the greater density of earth ovens at Sapapali'i. It is highly probable that at Mt. Olo the earth ovens are somehow related to the suspected political centers of each ward. However, the most ovens associated with any center is two. This pattern is not readily apparent at Sapapali'i, which has earth ovens scattered throughout Ward B. If that area happens to be a political center for a much larger region and the high numbers of ovens is unique within the region, then the same relationship may exist but on a larger scale. Current

survey work in the southeastern portion of Savai'i is recording settlements of a density similar to that of Sapapali'i but with a distribution of earth ovens similar to that at Mt. Olo.

The reason for the greater population density of the Sapapali'i settlements than at the Mt. Olo settlements can only be speculated. Both settlements date to the 15th or 16th century, eliminating temporal changes in population size as a possible explanation. Environmental factors may provide some insight into the problem. For example, the rainfall and soil fertility data (Wright 1962) indicate that the Sapapali'i survey area receives approximately 75 cm more rain per year than the Mt. Olo survey area. Whereas the soils of both areas are moderately fertile and both are derived from related volcanic flows, the Sapapali'i area has some intermittent streams that flow during rainstorms. Water rarely flows in the Mt. Olo area, where the high porosity of the soils and bedrock allows all but the heaviest rains to be completely absorbed. Possibly the Sapapali'i soil retains moisture more effectively.

The seasonality of rainfall is also of significance, with Sapapali'i having a dry season one month shorter than Mt. Olo on the average. The greater rainfall and the shorter dry season may allow for a greater carrying capacity of the Sapapali'i survey area. Although populations no longer reside inland in either area, the present coastal population density adajacent to the Sapapali'i survey area is over twice that of the coastal settlements adjacent to the Mt. Olo survey area (as derived from the numbers of structures indicated on the topographic maps along an 8-km length of coastline).

An explanation of differences of population densities based entirely on rainfall amounts is undoubtedly oversimplistic. However, given all other factors as equal, the difference of 75 cm per year may be of significance. It may be that the land inland from the modern village of Sapapali'i is better suited for agriculture than that around the Mt. Olo area; if so, its carrying capacity would be greater. The numerous social and economic factors that are also involved are not known. Future intensive surveys and comparative studies involving ethnographic correlates will clarify the dependence of settlement patterns on social and environmental factors within island ecosystems.

Table 19.

SUMMARY OF TRAITS IN SAPAPALI'I SURVEY AREA SECTIONS

Attribute	Ward A	Ward B	Ward C	Total
Size of Structures				
Platform (m^2)	133±173 (49)	250±303 (49)	264±251 (11)	199±252
HHU (m^2)	2025±1230 (19)	3362±1470 (21)	11,627±1190 (3)	3348±2726
Density of Structures				
Platforms/hectare	9.8	4.3	3.3	5.5
Earth Ovens/hectare	0.4	1.3	0.3	0.9
Walkways (m/hectare)	284	58	0	106
Fences (m/hectare)	255	303	208	239
Population Estimates	116	132	34	282
Density (per hectare)	23	11	11	14

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