



NEW ZEALAND JOURNAL OF ARCHAEOLOGY



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Settlement Patterns of Complex Societies in the Pacific¹

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ABSTRACT

Different forms of hierarchical organisation in Polynesian and Micronesian societies at European Contact are distinguished, based on a review of historical and anthropological information. Those societies with three or more hierarchical levels were few in number and are argued to be complex societies. Settlement patterns of these complex societies are then analysed—their territorial size; hierarchies of housing, burials, settlements and public structures; and defensive features. Two hypothetical sets of patterns result, one for 3-level and one for 4-level societies. The implications of these patterns for Pacific anthropology and archaeology conclude the paper.

Keywords: EUROPEAN CONTACT ERA, POLYNESIA, MICRONESIA, HIERARCHICAL ORGANISATION, COMPLEX SOCIETIES, SETTLEMENT PATTERNS.

INTRODUCTION

This paper analyses the settlement patterns of complex-ranked societies in Oceania at European Contact² and discusses the implications of these patterns for Pacific anthropology, Pacific archaeology, and anthropology in general.

The development of complex-ranked societies in Oceania is an anthropological problem; one which can be addressed using various forms of data, such as archaeological, oral historical, and ethnographic. The key, however, is that the problem focuses on social organisation—specifically hierarchical organisation. This means that it is critical to understand first the nature of this organisation and changes that have occurred—understand not in general terms, but in specifics that can be measured. Next it is important to identify positively correlated variables and understand how these changed in relation to organisation. We still do not understand the nature of the change. Over the past 12 years I have approached this problem from various points of view (Cordy 1974a, 1974b, 1974c, 1978a, 1981, 1982a, 1982b, 1982c, 1983a, 1983b, in press a, in press b, in press c). My present interest is in using the early historical data to establish a solid comparative picture of hierarchical forms and related variables, so the change can be better postulated. Also, I believe the historical data include cases of change which can be studied in more detail and more rapidly than in archaeological cases.³

DEFINITIONS

WHAT IS A COMPLEX SOCIETY?

There is considerable confusion among researchers today on the definition of chiefdoms and states. In the classical 1960s view, the latter were supposedly complex, and the former simple in political organisation. Also, no states were said to have been present in Oceania before European Contact. Pacific research in the early 1970s revealed that some complex chiefdoms had elaborate hierarchical organisation (Cordy 1974a, Earle 1973), and some researchers even argued that precontact Oceanian societies—particularly Hawaiian ones—were states (Hommon

1972). Similar problems were identified elsewhere in the world, and in the late 1970s general theoretical work radically redefined complex societies. The Michigan school's view (which is widely accepted) is that societies with 2 major decision-making levels (chief-producer) are chiefdoms, while those with 3+ levels (several levels of administrators-producer) are states (Peebles and Kus 1977).⁴ For the Polynesia region, I suggested another classification, following Sahlins' (1958) work, in which simple-ranked societies are those with two social strata (chief/commoner) and complex-ranked societies are those with three or more social strata (Cordy 1978, 1981). (It was also shown that territorial, population, and social distance variables appeared to alter and covary with different forms of stratification). This Polynesian classification, and one recently compiled for Micronesia (Cordy 1982a, 1983a), appear to correspond well with the Michigan classification.⁵

In Oceania, the number of social strata in a society covaried with the number of major decision-making levels. This means that the population, territorial size and social distance values which covaried with strata also covaried with decision-making levels.⁶ In Micronesia, many societies had two major decision-making levels (chief/producer), two social strata (chief/commoner), small territories (0.5-7.0 sq.km), small populations (500-1,000 maximum), and minimal social distance between social strata. Cases include societies in Truk, the Marianas, many of the Carolinean atolls, much of Yap, and the southern Gilberts. Most ranked societies in Micronesia (*ca.* 550 of the *ca.* 600 societies at Contact) were of this type (Cordy 1982a). A few societies had three major decision-making levels (ruler/local chief/producer), three social strata (ruler/local chiefs/commoners), larger territories (10-46 sq.km), larger populations (1,000-3,000), and moderate social isolation of the upper stratum. Approximately 49 such societies were found in Palau, part of Yap, and the northern Gilberts. Last, a very few societies had four major decision-making levels (ruler/high chief/low chief/producer), four social strata (ruler/high chief/low chief/commoner), even larger territories (*ca.* 57-109 sq.km) and populations (3,000-6,000), and considerable social isolation of the upper two strata. These societies were found on Kosrae, Ponape and the Marshall Islands, and they numbered nine in all.

Preliminary work suggests that Polynesia followed a very similar pattern. Again, most societies were of the two-level/strata form. Examples include the many societies in the Tuamotus, Marquesas, Northern Cooks, and New Zealand.⁷ The three-level/strata form was also present, in Samoa,⁸ the Southern Cooks,⁹ and the Society Islands.¹⁰ Initial assessment of the data indicates that societal territorial sizes ranged 15.5-31, 303-373, and 135-596 sq.km (respectively) in each of these areas and that societal population size ranged 1,500-3,400, 2,000-5,000, 2,000-9,000 (respectively) (see Appendix A). About 20 societies of this form seem to have been present at Contact in these areas. The four-level/strata form also was present, in Tonga and the Hawaiian Islands, with 1 and 4 societies in each area. Territories were larger than three-level/strata cases—699 sq.km in Tonga and 1624-10,676 sq.km in the Hawaiian societies. Societal population size was also much larger—about 20,000 in Tonga and 20,000-100,000 in Hawaiian societies.

Peebles and Kus (1977) labelled ranked societies in Oceania as chiefdoms using the Michigan criteria. Clearly, the above data (and even Sahlins' 1958 data) indicate this classification is incorrect. Chiefdoms in Oceania would be only the two-level/strata cases.¹¹ The three-strata and four-strata cases clearly are states given the revised criteria. Because of the confusion still surrounding these terms, the two-

strata cases are here called simple-ranked societies and the three or more strata cases are called complex-ranked, or complex societies.

This paper is concerned only with the complex societies.

SOCIETY

A society here refers to an independent polity.¹² These are the human populations in Micronesia and Polynesia which adapted to the natural environment and to other similar human populations (societies). They are considered an evolutionary unit of analysis.

PATTERNS OF SETTLEMENT IN COMPLEX SOCIETIES AT EUROPEAN CONTACT

The aim of this paper is to identify settlement patterns associated with complex societies, but first it is necessary to consider some patterns that are *not* solely associated with complex societies—ones that have often been mentioned in reference to complex societies. Such analysis is enlightening.

PATTERNS SHARED WITH LESS COMPLEX SOCIETIES

Some patterns appear to be found in all ranked societies and many egalitarian societies in Oceania, for example, territorial borders and public structures (monuments). It has often been noted that states had political borders and chiefdoms had kin borders. This delineation is confusing at best.¹³ Territorial borders are present in big man societies, simple-ranked societies and complex-ranked societies. These borders are delineated spatially by natural features (such as ridges) and cultural markers (such as unoccupied or lightly occupied zones). Also, these same societies all have impressive public structures of some sort (be they important meeting places such as *malae*, *tohua*, *bai*, *nahs*, *maneaba*, or important religious places such as *me'ae*, *marae*, *heiau*, and sacred *pot*).

Some settlement patterns are found in all ranked societies in Oceania, for example, housing and burial hierarchies and most public structures located near the residence of the ruler of the society. These patterns have long been pointed out (in archaeological settlement references see, for example, Green 1967a, 1970; Bellwood 1979).

Last, the presence of intensive agriculture is often cited as a pattern of settlement solely associated with complex societies.¹⁴ It is not. Intensified agriculture is present in simple-ranked societies (Carolinean atolls, Yap, the Southern Gilberts and the Northern Cooks) and in complex-ranked societies (Yap, Palau, the Marshalls, Hawaii, and the Southern Cooks). Equally, it is not present in some simple-ranked cases (the Marianas, Truk, the Marquesas) and in some complex-ranked cases (Kosrae, Ponape, Tonga). An analysis of Micronesian cases yielded a correlation of near 0 between intensified agriculture and complex hierarchical organisation (Cordy 1982b). In contrast, the presence of intensive agriculture had a high positive correlation with islands having a high population density. In sum, this pattern seems to be a density-dependent factor (which is not surprising given previous research findings, for example, Boserup 1965).

Because these patterns are found in less complex societies, citing the presence of any of them is not particularly helpful in understanding complex societies in the Pacific.

SETTLEMENT PATTERNS OF COMPLEX SOCIETIES IN OCEANIA

The following patterns are hypotheses. In some areas, data have been found which strongly support the patterns. In other areas, data have been found which indicate the patterns exist, but further archival work is needed to recover the specific hierarchical patterns. Data supporting the patterns are attached in appendices.

1. *Greater Territorial Sizes* (see Appendix A)

As indicated initially, within Micronesia and Polynesia complex societies have distinctly larger territories than simple-ranked societies. Simple-ranked societies in Micronesia had areas *ca.* 0.5-7.0 sq.km. In Micronesia, three-strata cases seem to have been 10-46 sq.km (excluding Yap, noted below); four-strata societies were 57-109 sq.km. In Polynesia, three-strata cases seem to have been 15.5-370 sq.km; four-strata cases being 699-10,676 sq.km. (Again, there is a regular progression of exclusive ranges within each area, but Micronesian areas were smaller. This difference may well be a function of small island size.)

Yap is an exception here. Three-strata societies in Yap had small territories like those of simple-ranked cases. This seems to have been due partly to the practice of giving enclaves of existing territory to landless people. These people became a third stratum—a socially isolated “serf” class.

2. *A Housing Hierarchy* (see Appendix B)

In all the cases so far considered, a hierarchy of housing is definitely or tentatively associated with the number of major decision-making levels and strata. This housing hierarchy is distinguished by labour expended in the construction of housing (see Cordy 1981). Each stratum tends to have similar amounts of labour expended on their housing. Housing labour may involve the use of rare or valuable materials, the size of the house, the height of the house, the extent of pre-structure work, and the inclusion of valuable artwork.

Most important, the hierarchy is different in simple-ranked societies, three-strata and four-strata societies. In simple-ranked cases there are two levels: the chief's and the commoners' houses. In three-strata cases, there are three levels: the ruler's, the local chiefs', the commoners'. In four-strata cases, there are four levels in the hierarchy: ruler's, high chiefs', low chiefs', commoners'. The difference in the nature of the hierarchy is crucial.

3. *Burial Hierarchy* (see Appendix C)

A similar burial hierarchy appears to exist in Micronesia and Polynesia. More properly, this should be stated as a hierarchy in the mortuary ritual—identifiable by labour expenditure. Two-, three-, and four-levels are apparent in societies with two-, three-, and four-major decision making levels and strata, respectively.

4. *Settlement Hierarchy* (see Appendix D)

This variable has been called settlement hierarchy in the literature. It has, however, several underlying variables. The community group is the settlement level of concern, and settlement size and the highest level of major decision-maker in residence are classifying variables. In fact, the associated decision-maker is the key here; this variable could be labelled political hierarchy of communities. In the Pacific, with community settlements often dispersed, the unit considered for such a hierarchy must be the community as a whole (e.g. Hawaii's *ahupua'a*, Kosrae's *facl*, not the internal, small dispersed settlement units.

In simple-ranked societies in Micronesia and Polynesia there is usually only one community.¹⁵ Spatially, this community may occupy a nucleated village, a nucleated village with small clusters of outlying houses, dispersed houses or house clusters.

In the three-strata cases of both areas, a two-level community hierarchy seems to have existed, the ruler's community and the communities headed by local chiefs. The four-strata cases are a bit more complicated. A three-level community hierarchy was the mode, consisting of ruler's community, high chiefs' communities, and the rest of the communities headed by low chiefs. Within this mode, there was a variation. Rulers in Hawaii and the Marshalls often moved their court.¹⁶ In these cases, there was a mobile hierarchy of ruling centres.

The Kosrae case is an exception here. All the high chiefs and the king lived in Leluh—a semi-urban centre with *ca.* 1,500 people. Researchers have suggested that this pattern probably was established in the past by a king to keep an eye on the high chiefs (Lütke 1835 (I):349). There are suggestions that high chiefs once had power bases in different areas of the island (Cordy in press c). Thus, a three-level community hierarchy seems to have developed into a two-level one. The small size of the island may well have facilitated this consolidation, because communication with outlying areas would have been easy and rapid, making an intermediate communication (decision-making) node expendable.¹⁷

PATTERNS NEEDING FURTHER ANALYSIS THAT MIGHT PROVE TO BE ASSOCIATED SOLELY WITH COMPLEX SOCIETIES

Some patterns may well prove to covary with complex societies. Indeed, in some cases, data suggest this fact. Yet, further analysis is needed to corroborate initial ideas.

1. Hierarchy of Public Structures

One variable that anthropologists used in the 1960s to try and distinguish states from chiefdoms was monumental architecture—probably more aptly called public architecture. The problem in the 1960s was determining how large architecture had to be to be a state trait rather than a chiefdom's. This problem was never satisfactorily resolved. In Oceania we could try once again to detect labour differences in public architecture between simple-ranked and the two forms of complex-ranked societies. Under public architecture, wood-and-thatch structures (such as the huge *pebaey* of Yap, *wuut* of Truk, and *fale tele* of Samoa) would also have to be considered. It is possible, of course, that there may be labour differences in the public architecture between archipelagos regardless of the form of hierarchical organisation (archipelago-specific differences). For instance, some of the largest *me'ae* and *tohua* in the Marquesas may well equal or exceed the size of the large *marae* in the Societies or *heiau* in Hawaii. If so, an alternative research approach might be to study archipelagos where three- or four-strata societies developed from earlier forms and identify labour differences in public architecture *within* archipelagos.

Another aspect of public structures seems more promising for consideration. There may be a hierarchy of such structures associated with different strata. For example, in the Society Islands there were said to be three major levels of *marae* (temples)—those associated with the ruler (national *marae*), those associated with local chiefs (district *marae*), and those associated with commoners (family *marae*) (Ellis 1829 (I): 206).¹⁸ There is a possibility that there was a hierarchy of *heiau* (temples) in Hawaii (see Malo 1951; Cordy 1974a; Green 1980) and of *fale aitu*

(god-houses) in Samoa (see Davidson 1969a; Holmer 1976). On Kosrae the largest feast-house (*lom lulap*) was associated with the king, while high chiefs had large feast-houses, low chiefs slightly smaller feast-houses and commoners none (Cordy in press c). Appendices E and F present further data on hierarchies of secular and sacred public structures.

In sum, the nature of public structures in simple-ranked societies compared with those of complex societies needs further analysis.

2. Defensive Features

It may well be that complex societies had different defensive features than simple-ranked societies. This topic has yet to be studied. Any analysis that occurs must consider the nature of warfare in each case. Studies of fortifications include those by Green (1967b), Groube (1967, 1970) and Frost (1974).¹⁹ Many of their cases are archaeological from precontact times and are often undated, so correlations with hierarchical organisation forms are difficult at best.²⁰ The few cases where Contact era warfare patterns and forts are correlated seem to apply to simple-ranked cases.²¹

Several extremely tentative patterns of defence are identifiable (see Appendix G). No marked covariations separating simple- and complex-ranked societies are noticeable. Some islands with frequent raiding and land wars, resulting in high numbers of deaths, seem to have had more defensive features—notably the Marquesas, Rapa, and New Zealand in Polynesia and Truk in Micronesia. Areas with less frequent casualties (e.g., where raids resulted in few casualties, where wars were often fought at sea, or where warfare was large-scale but infrequent and occurring in unpredictable locations within large territories) may have had fewer permanent defensive features—notably Hawaii, the Southern Cooks, the Society Islands, Palau, and perhaps Tonga prior to the advent of guns. Atolls seem to have had few or no defensive features, whether simple- or complex-ranked.

DISCUSSION

Among complex societies, two sets of patterns can be seen—one correlates with three-strata societies, the other with four-strata (Table 1). The correlations appear strongly positive. Only two negative correlations were noted, and then only in the variables of territorial size and settlement hierarchy. Yap's three-strata cases had small territories (a result of the unique Yapese development of hierarchical societies, with serf enclaves within existing two-strata society territories). Kosrae's four-strata society had two strata of political centres (a result of consolidation of power on a small island). Again, the positive correlations are extremely high.

TABLE 1
SETTLEMENT PATTERNS OF COMPLEX SOCIETIES

Three-Strata Societies	Four-Strata Societies
1. Territorial sizes greater than simple-ranked societies (Micronesia: 10-46 sq. km) (Polynesia: 15.5-370 sq. km)	1. Territorial sizes even larger. (Micronesia: 57-109 sq. km) (Polynesia: 699-10,676 sq. km)
2. Three strata of housing	2. Four strata of housing
3. Three strata of burial	3. Four strata of burial
4. Two strata of settlements	4. Three strata of settlements

IMPLICATIONS FOR PACIFIC ANTHROPOLOGY

Note that these are only synchronic correlations. They indicate variables highly related with different forms of hierarchical organisation. But they do not indicate diachronic relations. For example, the highly related variables may not change at the same time as change in hierarchical organisation. These diachronic relations are critical to understanding the development of hierarchical societies; the synchronic relations only give clues as to which variables are important for study.

Initial work on diachronic relations using historical and oral historical data (Cordy 1981, 1982a) indicated that societal territorial size increased to a threshold. Once this threshold was crossed, if territorial size was maintained, a new major decision-making level was formed to ease administration. I suggested that a new social stratum then formed around this level, as did a new hierarchical level of settlement, housing, and burial. Importantly, these initial findings suggest territorial size and hierarchical organisation correlate at a lower positive level, or are independent yet related variables, while decision-making levels, strata, and hierarchies of burial, housing and settlement are all very closely linked.²²

IMPLICATIONS FOR PACIFIC ARCHAEOLOGISTS.

For archaeologists interested in the development of complex hierarchical societies, this information should have very obvious meanings. Material correlates of hierarchical organisation are vital prerequisites for the archaeologist to identify organisational patterns in the archaeological record. The housing, burial, and settlement hierarchies clearly are such correlates.

Just knowing these correlates, however, is not enough. Methods must be developed to reconstruct and measure them. Such methods have only recently been developed in the Pacific. Tainter (1973, 1975; Tainter and Cordy, 1977) reconstructed hierarchical organisation based on burial hierarchies in Hawaii. The method he used focussed on the labour expenditure differences between burials—measuring a series of labour related variables and classifying burials using an information statistic. Kirch has recently presented data that show mortuary hierarchies can also be reconstructed in Tonga (Kirch 1980; Cordy in press d).²³ I have reconstructed hierarchical organisation based on housing hierarchies in Hawaii (Cordy *et al.* 1975; Tainter and Cordy 1977; Cordy 1978a, 1981), and on Kosrae (Cordy in press c), and also discussed such hierarchies on Yap (Cordy in press b). As with Tainter's approach I focussed on labour expenditure differences—measuring a series of labour related variables and classifying household housing according to clear hierarchical levels. Settlement hierarchies have also been identified in a crude fashion in Hawaii by looking at *heiau* frequency within *ahupua'a*. The assumption here is that *heiau* are public architecture forms associated with chiefs and numbers of larger *heiau* should reflect community importance in a political hierarchy.²⁴ To my knowledge, Kus (pers. comm.) was the first to undertake such a study, looking at patterns on Kauai in about 1973. I did somewhat similar work on Maui in 1978 (Cordy 1978b, 1978c), and Green has looked at the Waianae area of Oahu (Green 1980). There are problems with such studies—primarily a lack of knowledge about the exact association of *heiau* and chiefs. More recently, settlement hierarchies have begun to be constructed by identification of chiefly communities of different hierarchical levels on the basis of residential criteria. This is being done by Bath in Ponape; by myself, Ueki, Streck and Athens on Kosrae; and apparently by Gumerman, Snyder and Masse in Palau.

Others might note that Pacific specialists have long identified hierarchies. This is not quite the case. Pacific archaeological interpretations exist which show a dichotomous (two-level) organisation (such as chief/commoners, high-ranking/ordinary) in housing, burial or settlements. However, this is not an adequate approach to distinguish among the forms of hierarchical organisation; it is too simplistic. A few cases exist in which methods indicate a relative ranking continuum. For example, in Samoa Davidson (1969a, 1974a) suggested that ranking differences between settlements and housing could be shown, and Holmer (1976) proceeded to illustrate this point by identifying household housing and noting labour expenditure differences (volumes of platforms with inferred man-hours). Relative differences between three Mt. Olo settlements on Upolo were noted. However, a relative ranking approach is also inadequate. It can only show relative ordering. For example, 10 settlements might be relatively ranked. But this is not useful for distinguishing the forms of hierarchical organisation. To do so, hierarchies must be identified. The Samoan work (and any rank orderings) actually are only a step away from achieving this aim. Major hierarchical levels need only be distinguished.²⁵

Just as important here, the archaeologist must remember that even if he or she has the methods in hand, the behavioural variable to be reconstructed is *societal* organisation at different points in time. This means that analysis must consider representative sampling within individual societies. In turn, this means society borders need to be reconstructed at different points in time and sampling within the borders considered. Regions do not equal societies. Two regional samples may be from different societies and may not be comparable, because labour expenditure and other hierarchical equivalents may differ between societies. This point has important implications because in most studies our regions have consisted of 1-2 communities (e.g. Moorea, Samoa). (See Cordy 1981 for a discussion of this problem and application to Hawaiian data).

Last, fine chronological control is obviously critical, as has been emphasised elsewhere (Cordy 1981).

My point here is that the historical data and their correlations clearly point out variables Pacific archaeologists need to analyse in order to study the development of complex societies. Methods need to be geared to reconstruct these variables.

CROSS-CULTURAL CONSIDERATIONS

This paper has considered complex societies in the Pacific—settlement correlations and archaeological implications. A wider perspective is appropriate to conclude this paper. First, it seems quite likely that major decision-making levels, social strata, and hierarchies of burials, housing and settlement are highly and positively correlated cross-culturally. Wright and Johnson's work in the Near East (Wright and Johnson 1975; Johnson 1972) and Peebles' work in the Southeastern United States (Peebles and Kus 1976) are based on a strong tie between decision-making levels and settlement hierarchies. Tainter (1975) has evaluated the relation between burial hierarchies and social strata cross-culturally and found an extremely high correlation, and I have done the same for housing hierarchies and social strata with similar results (1978a, 1981). I have also postulated that major decision-making levels and strata are highly related (1981, 1982a). These studies suggest a group of highly related variables relevant for the study of complex societies anywhere. The Pacific serves as a useful region to study these patterns.

CONCLUSION

The intention here was to look at synchronic historic data from the era of European Contact to see what settlement pattern variables covaried among complex societies in Oceania. The ultimate aim was to direct attention to archaeological correlates of hierarchical organisation and variables related to the development of complex societies.

Seventeen years ago at the 11th Pacific Science Congress (1966), Green stated

... the possible relationships between settlement patterns and social or political organisation in Polynesia are by no means completely known. (1967a:124)

Green reported his and his colleagues work on Moorea and in Samoa as the first settlement studies on these topics.²⁶

... the present studies imply that we are now entering a new phase in the understanding of Polynesian social organization to which the archaeologist, who previously contributed little, may now contribute much. (1967a:126)

Certainly, the social organisation interpretations in Moorea (Green *et al.* 1967) were a first. Davidson (1974a) and later Holmer (1976) successfully followed with similar interpretations in Samoa, and similar detailed social organisation interpretations were achieved in Hawaii in the early 1970s (e.g., Cordy *et al.* 1975), using different approaches. However, these 1960s-1970s results were only initial probings on a whole variety of social organisation considerations. The detailed reconstruction of social organisation received very limited attention in the 1960s-1970s in Polynesia and Micronesia. Problems such as duration of settlement, origins, Lapita, and subsistence dominated those years.

In the 1970s, however, interest in the development of complex societies in the Pacific reared among archaeologists in Hawaii (myself, Earle, Hommon and Tuggle). It has since become a focus of interest in Micronesia—on Palau (Gumerman *et al.* 1981), on Yap (Cordy in press b; Hunter-Anderson 1983), on Ponape (e.g., Ayres and Haun 1981; Athens 1980; and unpublished work by Bath, Saxe, and Streck), and on Kosrae (e.g., Cordy 1982c, in press c; and unpublished work done cooperatively by Cordy, Athens, Bath, Streck, Shun and Ueki). This problem really is one centering on an aspect of social organisation, and it has eventually brought the archaeological reconstruction of social organisation to the forefront again. Addressing this anthropological problem archaeologically requires complicated and specific approaches (Cordy 1981). We are just now developing such archaeological methods and starting towards unravelling the questions on change in hierarchical organisation. Although I did not develop my approaches from Green's, I agree with him that archaeologists can contribute to research on social organisation problems in the Pacific and that this can be done only through analysis of settlement or regional patterns. Indeed, Pacific archaeologists and anthropologists can contribute a great deal to the general understanding of the development of complex societies, because of the short span of human occupation in the Pacific and the often mentioned, laboratory-like isolation of the islands.

NOTES

1. Paper originally prepared for the symposium on "Settlement Pattern Archaeology in the Pacific" at the 15th Pacific Science Congress in Dunedin, February 1983.

2. Complex-ranked societies in Oceania are commonly considered to have developed prehistorically only in Polynesia and Micronesia. It is possible that some Melanesian societies (e.g., in Fiji, New Caledonia) were complex-ranked, but I do not explore this possibility here. Douglas' (1979) paper indicates that a good many Melanesian societies were simple-ranked, as were most Polynesian and Micronesian societies. It is not clear from Douglas' paper if there were what are here called complex-ranked societies in Melanesia.

3. This paper was planned as a spin-off of my initial archival work. However, because of other commitments, the archival work has been slow in starting; thus this paper is not based on as much work as I had wished. It is definitely a working paper. It was done to make me think about complex societies from another tangent and hopefully to stimulate more work on this topic and on archaeological methods used to address the topic.

4. In fact, what I have called here two- and three or more- decision-making cases, the Michigan school labels 1- and 2-level cases. The producer is not counted as a decision-making level. I have counted the producers as a level for conceptual ease; the relation with social strata becomes more apparent.

5. Wright (1977) has more variables in his classification. He argues that chiefdoms try to eliminate hierarchical build-ups, while states encourage them ("regulatory strategy") and that chiefdoms frequently collapse with constant wars while states do not ("oscillation"). And, perhaps his most important criterion is that states show specialisation of tasks within decision-making levels (see Cordy 1983b).

6. The population and territory size values differ between Micronesia and Polynesia. Three- and four-strata Polynesian societies had larger populations and territories than similar Micronesian cases. Yet increases in these two variables covary with the other variables in both regions.

7. In the New Zealand case here, I include only the horticultural societies of the North Island and the northern South Island. The Polynesian data are highly confusing because of the number of twentieth century ethnographies written long after massive cultural change. Few ethnographies based solely on early historical data exist (e.g., Oliver 1974), so some cases have been omitted pending further research into primary sources. Easter Island illustrates the difficulties. Easter Island is said to have had 10 tribes (*mata*) in two districts with chiefs of the tribes secular rulers but with a paramount priest-chief (*ariki-mau*) (McCoy 1979). Population at contact was around 3,000-4,000. Does this mean 10 two-strata societies with 300-400 people each? Or does it mean one three-strata society with 3,000-4,000 people? Or does it refer to two three-strata societies with 1,500-2,000 people? The situation is not clear.

8. The Samoa data are also confusing, even to social anthropologists, as illustrated by the Ember-Freeman exchanges. Ember (1962), Goldman (1970: 273-4), and Green (1970:24) treat the Samoan village (*nu'u*) as the independent polity—a two-strata context. Freeman (1964) has argued for the "district" as the polity, following earlier researchers (e.g., Turner 1861; Stair 1897; Ella 1895; Krämer 1902). At this point I agree with Freeman's arguments for three-strata societies occupying a district and extending back before A.D.1840. But my review has yet to cover American Samoa, where the data appear somewhat different.

9. The Southern Cooks' situation also is confusing. Rarotonga, Aitutaki, and Atiu clearly fit the three-strata pattern (e.g., Crocombe 1964; Bellwood 1971). Mangaia is ambiguous. It is said to have had 10 "tribes" on an island 70 sq.km and with 3,500 people (Bellwood 1971). This is consistent with a two-strata picture—10 societies with territories and populations of 7 sq.km and 350 people each. Yet a temporary paramount chief (the *Mangaia*) who gave the "tribal" districts to underlying chiefs suggests a three-strata case (one society with 3,500 people) if the *Mangaia* really was not temporary. The three-strata case seems better, but I defer any conclusions here. Mauke and Mitiaro have yet to be considered.

10. Society Island societies have been placed equal to those of Hawaii and Tonga in hierarchical organisation (e.g., Sahlins 1958), but were they? Early historical sources such as Cook and Banks suggest three-decision-making levels: ruler (Tutaha, Vahiatua and Amo of Tahiti's societies, Puni of Borabora, and Ori of Huahine), *fenua* chiefs, and commoners. Social strata data conflict and are confusing (Oliver 1974: chapter 18). One could argue for four-strata centred on ruler, *fenua* chiefs (of varying rank and power), *ra'atira* and *manahune*; or one could say three centred on ruler, *fenua* chiefs, and commoners (with *ra'atira* and *manahune* two rank grades within the commoner stratum. Bligh (in McCormick 1977:272) was told *ra'atira* and *manahune* were "citizens". (In the Southern Cooks, closely related to Tahitian culture, *rangatira* were minor lineage heads—Crocombe 1964). Here I opt for a three-level/strata placement for Society Island societies, but again I emphasise my analyses are only in progress. (Most authors opt for four or more strata—see Oliver 1974). My population data were computed as follows: three societies were present on Tahiti. Two were Teva i tai and Teva i uta (Oliver 1974: 1173), and I lump the rest of western Tahiti as a society under Tutaha (based on Cook in Beaglehole 1955: 90-2, 107; Banks in Beaglehole 1962: 270, 273-4, 295-6, 311). Populations are estimated as 4,008 for Teva i tai, 2,784 Teva i uta, and 9,258 for Tutaha's (Wilson 1799, collected in 1797); the other societies' estimates were 2,000 (Moorea), 2,100 for Huahine-Mai'ao, and 4,580 for Borabora (-Maupiti-Tahaa-Raiatea) (Oliver 1974:34-38).

11. From here on, I term the organisational forms two-strata, three-strata, and four-strata for brevity and convenience.

12. I would strongly urge the use of such a general term in Polynesian and Micronesian anthropology. Many terms are used for the society — e.g., tribe, tribal division, district, etc. Tribe still seems to be used in some schools of the British tradition, but it is a long out-dated and extremely ambiguous term in American anthropology. Districts and the like have island-specific meanings which are confusing for scholars not specialising in an island. A general term (like society) enhances comparability.

13. The confusion rests on the fact that past discussions have not truly questioned the presence of society (polity) territorial borders; rather they have been concerned with whether a single localised kin group or several unrelated kin groups constituted the society (Burrows 1939) or whether the society was organised as a theoretical kin group (ramage) and land ownership was regulated via corporate kin groups *versus* organisation and regulation on other principles (e.g., feudal) (cf. Hommon 1972; Cordy 1981:222-226). The emphasis on the word "borders" has perhaps been unfortunate.

14. Intensive agriculture is used here in the classic water-control sense. Kirch's (1976) findings indicate that shifting agriculture can sometimes be intensive. Thus, a reanalysis of this variable's relation in this wider reference is needed.

15. Some atolls confuse this picture. Atolls of small population under one chief often have their land divided into sections (often the residential focus of localised kin groups). At this stage in the analysis, it is uncertain whether these sections are communities (the maximal enduring face-to-face interaction groups) or whether they are lower level local groups.

16. In the Hawaiian Islands, it appears as if the Hawaii Island society might have had more mobile centres.

17. There are elements of this two-strata organisation in all four-strata societies. High chiefs often resided in the ruler's community for periods of time, basically commuting between the royal court and their home bases. In Kosrae, the commuting was simply eliminated.

18. Green and his associates' archaeological work (1967) on Moorea clearly showed that a ranking continuum of *marae* existed from the commoner levels up.

19. I have seen a reference to James Daugherty, 1979, *Polynesian Warfare and Fortification*. M.A. Thesis, University of Auckland. I have been unable to consult this work, and clearly it could be vital to this discussion.

20. For example, the Hawaiian ridge forts (Green 1967b) are not recorded as being built or occupied during Contact era items. If many of these forts exist, they may date back to earlier times when two- or three-strata organisation was the norm in Hawaii.

21. Green (1967b) referred to different patterns of warfare associated with forts, but (as Frost, 1974: 124, noted) he did not specify the warfare patterns.

22. Societal population size also seems to have been an independent but related variable (see Cordy 1981, 1982a).

23. Initial hierarchical ideas have been formulated by McKern (1929) and Davidson (1969b, 1971).

24. The implications for a *marae* hierarchy has long existed in Society Island work (e.g., Green *et al.* 1967; Green and Green 1968).

25. Green's early 1960s work at Opunohu on Moorea (Society Islands) also led to a relative ordering of housing — rectangular, small oval (*fare pote'e*), intermediate oval (small to large, respectively) and another type, even larger, hypothesised for the coast (Green and Green 1967: 176). These were inferred to reflect relative social ranking order (Green 1967c: 225, 226; Davidson 1967: 137-8; Green and Green 1967: 170, 175-6). As in the Samoa case, these housing ranks need to be placed into major hierarchical levels in order to analyse the form of hierarchical organisation.

26. Groube and other students were also doing extensive settlement pattern work in Northland (North Island, New Zealand) (e.g., Groube 1964; Kennedy 1969).

APPENDIX A
GREATER TERRITORIAL SIZE

Island Group	Range of Territories (sq km)	Mean (sq km)	Mean Number of Societies
<i>2-Strata Cases</i>			
Mokil Atoll		0.6	2
Losap Atoll	1.0		1
Truk Lagoon	0.3-1.8	0.8	c.100
Puluwat Atoll		1.7	2
Yap		1.7	c. 30
Mariana Islands		4.7	c.300
Tobi	0.6		1
Southern Gilberts	3.1-7.0	4.7	c. 34
 (No data collected for Polynesian cases yet, but Hanatekua Valley had a valley floor area of 0.8 sq km — perhaps representative of Marquesan societies.) ¹			
<i>3-Strata Cases</i>			
Palau		37.5	13
Yap		1.7	c. 30
Northern Gilberts	10.1-45.6	25.1	6
Samoa ²		373 (Upolu)	3
		303 (Savai'i)	6
Southern Cooks ³	c. 15.5-31.1 (Rarotonga)	22.3	3
	15.5 (Aitutaki)		1
	28.5 (Atiu)		1
Society Islands ⁴	— (Tahiti)	347	3
	133 (Moorea)		1
	370 (Borabora-Maupiti-Tahaa-Raiatea)		1
	83 (Huahine-Mai'ao)		1
<i>4-Strata Cases</i>			
Kosrae	109		1
Ponape	c. 21-93	67	5
Marshall Islands	c. 39-80	57	3
Tonga	699		1
Hawaiian Islands	10,676 (Hawaii)		4
	1,624-2,238 (Maui, Oahu, Kauai)		

All Micronesian data presented in Cordy (1982a; in press a)

NOTES

1. Bellwood (1972)
2. Samoa society areas computed by dividing island area by number of societies listed in Krämer (1902). Note actual society areas will vary. For example, on Upolu the 3 societies had 16, 8, 20 villages (respectively), and territorial areas will vary accordingly. American Samoa is not included.
3. Crocombe (1964), Bellwood (1971, 1979) were data sources.
4. Areas from Oliver (1974: 8). I treat Moorea as unified at Contact under the Marama line although Oliver (1974: 1203-5) says unification might have occurred later. It is consistent with the pattern on the other islands.

APPENDIX B
HOUSING HIERARCHY

Island Group	Predicted	Data
<i>3-Strata</i>		
Palau	3	Krämer (1926: 210-12, 225-6): "the <i>blai</i> [sleeping houses] are the basic elements of the social order; ... as a rule their quality decreases with the rank." Number of doors and length covary in 3-strata (rulers 5-6 doors, 4 local chiefs, 2-3 ordinary). Payments in valuables greater per door. Type of wall finish varies with rank. Highest ranks have ornamental decoration inside.
Yap	3	Cordy (in press b: 30-2, 80): Informants indicate that there were larger and higher platforms in villages controlling serf village. Lingenfelter (1975: 117, 158): In one case when a younger brother was challenging his brother (the ruler) they competed in house building—making their houses longer and higher to outdo each other. Chiefs' houses were built by serfs.
Northern Gilberts	3	"nobles" distinguished by "living facilities" (Mason 1951: 286).
Samoa	3	Davidson (1969a, 1974a:229, 1974d: 156; Holmer 1976: 48, 54). "Today, the height of house foundations in Samoa is closely related to the social status of occupants, and there is little reason to think that it was otherwise in the past." (Davidson 1974d: 156). "Stair (1897: 111-112) states that the platforms for chief's houses ... were constructed by the united labor of the inhabitants; the number of workers being relative to the influence of the chief ..." (Holmer 1976: 55). See Davidson (1969a: 65) citing early sources.
Southern Cooks	3	Ranking people had pavings around the house (Savage in Bellwood 1978: 218).
Society Islands	3	See Green and Green (1967: 171) for numerous references indicating great chiefs' houses were larger and higher. Bonacorsi (Corney in Green and Green 1967: 171)— <i>arii</i> homes were better built. Bougainville (1772) indicates a size continuum as does Morrison (1935). Morrison adds a chief's compound had a fence with its internal yard paved with pebbles or grass.
<i>4-Strata</i>		
Kosrae	4	Cordy (in press c). King's dwelling compound largest, with largest feast-house, numerous internal compounds and huge walls; high chiefs' dwelling compounds had large walls, numerous houses, and 1 feast-house; low chiefs' dwelling areas had low walls or no walls with 1-3 houses and 1 feast-house; commoners' dwelling areas had low or no walls, 1-3 houses and no feast-house. Numerous early references in Cordy (in press c).
Ponape	4	Riesenberg (1968: 68). Ruler had a special sleeping room added and a servant's house. Chiefs' houses in general had special wood (hibiscus and breadfruit) and elaborate lashings. Ayres and Haun (1981) cite references indicating a size difference among strata.
Marshalls	4	No data collected
Tonga	4	Anderson (in Beaglehole 1967: 935) noted houses of a "middling" sort with an area 30 feet x 20 feet, houses of principal people twice as large, and those of people still of higher rank even larger.
Hawaii	4	See Cordy (1981: 73-6, 83-4) references cited.

**APPENDIX C
BURIAL HIERARCHY**

Island Group	Predicted	Data
<i>3-Strata</i>		
Palau	3	Keate (1788: 160-3): son of heir (a powerful chief in the capital) had elaborate burial. Osborne (1966: 42): "Burial ceremonies, especially for high-born men, were lengthy and expensive".
Yap	3	Lingenfelter (1975: 158): members of the chiefly village were buried by their serfs. Also recorded from informants in Cordy (in press b; 19, 26, 30). Ruler buried in multiple tiered grave (ca. 5-9 tiers in early 1900s. See Pacific Studies Institute (1980) for recently collected ethno-archaeological information on burial practices.
Northern Gilberts	3	No data collected.
Samoa	3	Davidson (1974c: 205-6) indicates differences in burial practices between chiefs and ordinary people. Davidson (1974a: 230) notes "ordinary people were buried in shallow graves in or near houses", while "graves of important people are in or under raised structures". One paramount or ruler was buried in special vault at Faleolo.
Southern Cooks	3	No data collected.
Society Islands	3	Buried in marae of respective rank (Oliver 1974: 507-8, 887). Commoners were simply wrapped while chiefs were embalmed (Henry 1928; Morrison 1935: 232).
<i>4-Strata</i>		
Kosrae	4	See Cordy (in press c). King buried in large truncated pyramid tombs in a special compound; high chiefs in prismatic basalt lined areas within dwelling compounds; low chiefs in unknown contexts; commoners in small plots near houses. Labour expenditure in rite covaries with strata.
Ponape	4	Riesenberg (1968: 72): "the stone structures were used primarily for chiefs, whereas commoners were buried in earth graves". Elaborate rites for ruler.
Marshalls	4	Kotzebue (1830, III: 173): commoners buried in sea, chiefs within stone enclosures on land. Paulding (1970: 152) notes the place for the burial of the "royal" dead was near the atoll chief's house (stratum below ruler). Tobin (notes in Trust Territory Historic Preservation Office files): rulers' burial in enclosure renowned still. Mason (1947:35): upper class had greater burial treatment.
Tonga	4	Commoners in mounds, chiefs in mounds with slab facings (<i>faitoka</i>), members of the ruling line in larger mounds with facings (<i>langi</i>) (see McKern 1929; Kirch 1980).
Hawaii	4	See Cordy (1981: 52) for early historic references.

**APPENDIX D
SETTLEMENT HIERARCHY**

Island Group	Predictions	Data
<i>3-Strata</i>		
Palau	2	Capital village (<i>pelu</i>) of ruler, small <i>pelu</i> headed by local chiefs (Hockin 1803: 33; Kubary 1885: cf. 116; Krämer 1919: cf.2).
Yap	2	Ranking village (<i>binaw</i>), serf villages (Lingenfelter 1975).
Northern Gilberts	2	Ruler's section, section headed by low chiefs (Talu 1979: 37; Lambert 1966: 647-8).
Samoa	2	Capital village* (<i>laumua</i>) of ruler, other villages headed by local chiefs (Krämer 1902; Freeman 1964: 561-2; Stair 1897: 81; Turner 1861: 287).
Southern Cooks	2	Ruler's <i>tapere</i> *, rest of <i>tapere</i> headed by local chiefs (<i>mataiapo</i> (Crocombe 1964).
Society Islands	2	Ruler's <i>fenua</i> *, rest of <i>fenua</i> headed by local chiefs (Cook in Beaglehole 1955: 107-113, 133).
<i>4-Strata</i>		
Kosrae	2	Leluh city (residence of ruler and high chiefs), small <i>faci</i> * headed by low chiefs (<i>mwetsuksuk</i>) (Lütke 1835; Cordy in press c).
Ponape	3	Ruler's <i>kousapw(nanwei)</i> *, titled high chiefs' <i>kousapw</i> , rest of <i>kousapw</i> headed by low chiefs (see Riesenberg 1968: 33).
Marshalls	3	Ruler's section, sections of high chiefs on capital atoll and outlying atolls, rest of sections controlled by low chiefs. ¹ (Kotzebue 1830; Paulding 1970: 172; Mason 1947).
Tonga	3	<i>Mua</i> =capital centre (where ruler and other high chiefs lived), communities* where high chiefs resided, rest of communities headed by low chiefs (Kaeppler 1973; Davidson 1979: 105, 1971: 32, 35; Anderson in Beaglehole 1967: 904).
Hawaii	3	<i>Ahupua'a</i> * where ruler resided, <i>ahupua'a</i> where high chiefs resided, rest of <i>ahupua'a</i> headed by low chiefs (<i>konoiki</i>) (cf. Cordy 1981; Earle 1973).

*Land units associated with communities having dispersed settlement.

1. Sections here are not meant to correlate directly with *wato* (land sections) occupied by a localised kin group. Several of these *wehi* were controlled in larger units (what I call here sections) by the various strata of chiefs.

APPENDIX E

HIERARCHY OF PUBLIC STRUCTURES (SACRED)

Island Group	Data
Palau	God-house (<i>blil a galid</i>)—4 types. Largest made with more care and was near meeting house of community, where it served as altar for village god (Krämer 1926: 228).
Yap	Sacred places (<i>tiliw</i>)—1+ per village. No data collected.
Northern Gilberts	No data collected.
Samoa	God-houses (<i>fale aitu</i>): platforms for god-houses “were constructed by the united labor of the inhabitants; the number of workers being relative to the influence of the chief or god” (Stair summarised in Holmer 1976: 55). “Samoan religion embraced not only personal observances and deities associated with particular settlements for whom small god houses were built, but on occasion included the construction of very large god houses, on massive foundations, in honour of gods whose influence extended over entire districts.” (Davidson 1974a: 244). See also Davidson (1969a, 1974a: 229-31).
Society Islands	Domestic (family), district (<i>fenua</i>) and national <i>marae</i> (temples) (Ellis 1829 (II): 206). Great <i>marae</i> of rulers (Cook in Beaglehole 1955: 111-113, 1967: 199-202; Green and Green 1968).
Southern Cooks	Rarotonga: Hints of <i>marae</i> associated with family cluster, local chiefs, and ruler (Bellwood 1971: 103; 1969: 522-3). Savage and Crocombe (in Bellwood 1978: 12): built by ruler (<i>ariki</i>) and low chiefs (<i>mataiapo</i>). Aitutaki: Hints <i>marae</i> complexity grading related to social stratification (Bellwood 1978: 100, 104).
Kosrae	No data collected
Ponape	No data collected
Marshalls	No data collected
Tonga	No data collected
Hawaii	Large national <i>heiau</i> (temples) associated with ruler, possibility of <i>heiau</i> associated with high chiefs (see Cordy 1974c), possible community <i>heiau</i> built with permission of ruler or by ruler, family worship spots in <i>mua</i> (men's house) (see Malo 1951; Cordy 1974a; Green 1980).

APPENDIX F
HIERARCHY OF PUBLIC STRUCTURES (SECULAR)

Island Group	Data
Palau	Meeting house (<i>bai</i>) of ruler's village where all chiefs meet, <i>bai</i> of each village where village council meets, <i>bai</i> of different clubs in village (cf. Krämer 1919; Keate 1788).
Yap	<i>Pebaey</i> (meeting house) of village chief's section which served as village meeting house, other <i>pebaey</i> in village (if present), serf village <i>pebaey</i> (if present). (Conclusion here based on personal observations of <i>pebaey</i> sizes and importance, cf. Cordy in press b).
Northern Gilberts	<i>Maneaba</i> =meeting house. No data collected.
Samoa	<i>Malae</i> =open area for meetings. Great <i>malae</i> of capital villages (Stair 1897: 81). "As well as the village <i>malae</i> which were frequently described by witnesses there were district <i>malae</i> which were named and famous" where "large meetings and festivities associated with marriages of chiefs and other secular gatherings, great annual religious festivals" were held (Davidson 1969a: 62). Davidson (1969a: 62-3) includes early references. <i>Fale tele</i> =community house. Wilkes (in Davidson 1969a: 64) said every village had one and it was the property of the chief. This hints at a potential hierarchy.
Southern Cooks	No data collected.
Society Islands	Wilson (in Green <i>et al.</i> 1967: 225) counted the principal houses of kin groups associated with <i>fenua</i> . Green <i>et al.</i> interpret these houses as community houses. The fact that there were often several such houses per <i>fenua</i> (see also Cook in Green <i>et al.</i> 1967: 173) suggests the community house had kin group hierarchies (from commoner and local chief levels). Ellis (in Green <i>et al.</i> 1967:173) notes their association with the leading chiefs (ruler presumably) too.
Kosrae	Cordy (in press c) has numerous early references. The feast-house (<i>lom lulap</i>) of the king was the most important, being the centre for society festivities, rites and meetings. It also had the most kava pounding stones at contact. High chiefs' feast-houses were also large; low chiefs' were smaller and in the outlying <i>facl</i> (communities) on the main island. Commoners had no feast-houses.
Ponape	Riesenberg (1968: 68): Community houses (<i>nahs</i>) of section chiefs and of the ruler (<i>nahs en wehi</i>) at the capital. Presumably the titled high chiefs had <i>nahs</i> too (of intermediate size?).
Marshalls	No data collected
Tonga	No data collected
Hawaii	Men's houses (<i>mua</i>) were associated with local groups of commoners and with chiefs' households (Cordy 1981). It is likely that they differed in labour involved in construction (cf. Ii 1959) but I have collected no specific data on this topic.

APPENDIX G
DEFENSIVE FEATURES: HISTORICAL DOCUMENTATION

Island Groups	Border Defences	Forts on Flats	Fortified Ridge/Peak Settlement	Settlement Adjustment	Cave Refuge
<i>2-Strata Cases</i>					
Marianas ¹					
Yap ²	+				
Truk ³	+		+	+	
Marquesas ⁴	+	+	+	+	
Tuamotus ⁵					
New Zealand ⁶		+	+		
Rapa ¹⁰			+		
<i>3-Strata Cases</i>					
Palau ⁷	(+)				
Yap ²	+				
Samoa ⁸			+		+
Southern Cooks ⁹				(+)	
Society Islands ¹¹					
<i>4-Strata Cases</i>					
Kosrae ¹²					
Ponape ¹³	+?		+?		
Marshalls ¹⁴					
Tonga ¹⁵	+?	(+)			
Hawaii ¹⁶					+

(+) Very few cases of defensive features. In essence negligible presence.

NOTES

1. Garcia (translated by Higgins) 1936-39.

2. Men's houses were located directly on- and off-shore (*faluw*) (Lingenfelter 1975).

3. Meeting houses (*wuut*) (where men slept) only on shore; sleeping houses on mountain slopes. Fortified settlement (refuges?) in interior ridges. (Gosda 1958; Takayama and Intoh 1978: 54-55).

4. See Green (1967b: 105). Ridge watch-points and defences. Refuges on ridges and flats with walls and ditches. Settlement located in middle and upper valleys.

5. No defences reported (Green 1967b: 101; Emory 1947).

6. *Paa* forts (Groube 1967, 1970; Kennedy 1969).

7. One case reported of wall across entry path into village (Keate 1788).

8. Green (1967b: 107), Davidson (1974a, 1974b, 1979), Scott and Green (1969: 208-9); refuge caves Green (1969).

9. Settlement in middle and upper valley of Aorangi society and possibly only in the Maungaroa Valley *tapere* (Bellwood 1969: 519; 1971: 155, 1978: 9).

10. Hanson (1970).

11. None reported (Green 1967b: 103).

12. No defences reported (e.g., Lütke 1835; Sarfert 1919, 1920).

13. Ponape data are confusing. Riesenberg (1968: 60-1) notes that there were formal battlegrounds and sea battles before contact, yet he mentions "breastworks of stones and watch towers" in the 1856-59 Uh wars and a "mountain fort" refuge in the late 1800s. Streck (1982 personal communication) says forts were pre-contact, but I have yet to review the historic documents in detail.

14. Kotzebue 1830.

15. Apparently most of the ring-ditch forts date after the introduction of guns; however, Mua had long had a ditch around its perimeter (Green 1967b: 106). Linear earthworks (e.g., Keli a Pelehake on Tongatapu) were sited on major boundaries in Tongatapu and Vava'u (McKern 1929; Davidson 1971: 35).

16. See Fornander (1969) and Malo (1951). Warfare was on open ground usually, and although occasionally quick and simple defensive features were made for a battle, they were not permanent or made beforehand. Refuge caves are popularly known in Hawaii on Hawaii Island.

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