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MEASURING VARIABILITY IN PREHISTORIC STONE CONSTRUCTION ON
RAPA NUI, CHILE

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ABSTRACT

By nature of its remote location and small size, Rapa Nui is ideal for examining the evolution of a single population. By examining variability within and between settlements, we obtain a view of methods and techniques employed for survival across the island, and how these changed through the ca. 1000 years of prehistoric occupation. The variability and distribution of artifacts related to the human occupation of the landscape may be explained by local paleoenvironmental fluctuations and change, however, to test this against the archaeological record we need to have sufficient data on technical, temporal, functional and spatial variability in artifacts across the island. For the last 30 years Rapa Nui has been the focus of numerous, extensive archaeological surveys that have produced a large corpus of data on feature types, quantities, and distributions. Although these surveys have provided information about the overall potential of the archaeological record of Rapa Nui for studying settlement patterns, it is not yet clear how the data were generated and whether they provide sufficient resolution of functional, temporal and technological variability. In addition, the terms and type descriptions used may or may not be comparable across surveys, meaning similar or different labels and descriptions may not have been consistently given for artifacts between surveys. Thus, it is possible that the information generated in one survey cannot be combined with information from other surveys in order to form a comprehensive study of artifact variability on the island. Ultimately, if our goal is to generate reliable information about variability in

prehistoric settlement patterns, we must carefully examine these earlier surveys to determine the degree to which their information can be used.

This thesis performs such a study by examining two previous surveys and the data they have generated. This is done by 1) examining the structure of the descriptive system used in each survey, and 2) conducting a field survey of previously recorded artifacts in order to evaluate the reliability of previous surveys and to determine the consistency in artifact class identification in the field. Based on the results of this study, I propose an explicit and reliable classification scheme that is designed to describe archaeological structures on Rapa Nui. This classification provides comparability between descriptions and enables us to make meaningful measurements across the island and through time. This classification scheme is ultimately necessary to measure variability in the distribution of artifacts related to settlement patterns, and to give us the resolution required to test hypotheses of change.

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CHAPTER 1. INTRODUCTION

Rapa Nui, or Easter Island, is possibly the most isolated inhabited island in the world (Figure 1). It is over 2000 km (1300 miles) from its nearest Polynesian neighbor, Pitcairn Island, and 3600 km (2250 miles) from the Chilean coast of South America. In addition, it is small. At just 171 square km (66 sq miles), Rapa Nui is one of the smallest continuously inhabited islands in Polynesia. Despite this remote location and small size, however, the island is known for some of the most spectacular archaeological features in the world. The most striking of these are its large stone statues, or *moai*. There are over 800 of these statues on Rapa Nui, ranging in height from 2 to 20 meters and weighing up to 270 tons (Flenley & Bahn 2002: 105). With nearly half of these statues located in and around Rano Raraku quarry, some still waiting for the final cuts to release them from the bedrock, and over 200 of them lining the entire coastline, the island has captured the imagination of archaeologists and non-archaeologists alike.

Since the early 1900's much of the archaeological literature has focused on discovering both how and why past inhabitants carved and moved these giant stone monuments. Due to their sheer magnitude and overwhelming nature, this is entirely understandable. Yet other aspects of the archaeological record are equally impressive and are often overlooked. Along with a variety of stone tools, lithic debitage, stone water basins (*taheta*), and other kinds of portable artifacts, the archaeological record on Rapa Nui also contains a large assortment of easily discernable surface features such as platforms, houses, hearths, agricultural enclosures, and stone cairns. Though smaller than most islands in the region, as of 1998 a series of surveys which covered

80% of the island recorded at least 20,000 archaeological features across its surface. With the possibility of buried features, the density of the prehistoric archaeological record on Rapa Nui may be greater than anywhere else Polynesia.

What makes the archaeological record on Rapa Nui even more remarkable is the relatively short period of time that the island has been occupied. Although there are debates over the exact timing, a conservative estimate places the first human occupation at just 1000 years ago, with a small group of settlers migrating from east Polynesia (Green 1998). Once this small group became established, it is hypothesized that the population rapidly increased, with peak estimates thought to be at least 2,000 and potentially as much as 20,000 at its climax (Flenely & Bahn 2002:170). Most researchers have argued that an exponential population increase, in combination with increased resource exploitation for statue construction, soon exceeded the carrying capacity of the environment. A population decline followed, associated with a 'cultural collapse' and increased social strife caused by the depletion of resources and the subsequent fight for survival (e.g., Van Tilburg 1994; Diamond 1995, 2004; Kirch 2000; Bahn & Flenley 1992; Flenley & Bahn 2002).

Despite their popularity and pervasiveness in the literature, these accounts are somewhat misleading. They are, for the most part, based primarily on oral traditions and ethnohistoric reports. While there is evidence of environmental change occurring over the duration of occupation of the island, we do not yet have empirical evidence from the archaeological record to provide unambiguous support for these sensational reconstructions. For instance, we currently do not know what population sizes were through time or the magnitude of the environmental change that occurred, to allow us

to determine its effect on the prehistoric Rapanui. This lack of basic evidence ultimately hinders efforts to explain the distribution and structure of the archaeological record of Rapa Nui, and the lack of empirical evidence forces our accounts to remain 'just-so' stories which cannot be proven nor falsified.

To build explanations of change in prehistoric Rapa Nui, we need to generate basic empirical evidence for the distribution and variability of artifacts across space and through time. Although the *moai* have much to contribute to our understanding of Rapa Nui's prehistory, it is necessary to turn attention to the other artifacts in the archaeological record and more intensively examine the distribution and variability in archaeological features associated with settlement and occupation of the island. This will provide data on differing methods and techniques employed for survival across the island, and on changes in these methods and techniques with time. The density of the archaeological record alone suggests large populations once resided there, however until more research is focused on the fundamental features related to settlement a clearer understanding of population size and the impacts of environmental change will be impossible. Guided by a theoretical framework examining the distribution and patterning of settlements, in terms of the distribution of the artifacts related to the human occupation of the landscape, we can create testable hypotheses about the island's prehistory that are empirically grounded. By explaining this distribution and patterning with relation to the surrounding environment, we will be able to construct measurements of human/environment interactions that varied throughout the island's settlement history. These new measurements may or may not support the current

accounts on Rapa Nui's past and thus have the potential to open up a new chapter in the study of this enigmatic island (e.g., Hunt and Lipo 2001).

Rapa Nui: Environment

As stated above, Rapa Nui is probably one of the most isolated as well as one of the smallest continuously inhabited island in the world (Figure 1). It lies on the outskirts of the southern tropics, resulting in a cooler, more temperate climate than exists in most other islands in Polynesia. The island is roughly triangular in shape with its points marked by three extinct volcanoes with undulating saddles in between. Geologically, Rapa Nui is primarily composed of volcanic basalt, with large outcrops near the volcanoes, and basalt boulders and cobbles studding the entire island. Cinder cones dot the landscape, most originating from the youngest and largest volcano, Terevaka, which generated the north apex and reaches a height of 510 meters.

The southern coastal region of the island is comprised of large, flat plains that gradually increase in elevation from the coastline to the slopes of Terevaka, about 3 kilometers inland. The northern coast stands in stark contrast as the majority of it lies directly on the slopes of Terevaka, with most areas located on sea cliffs as high as 100 meters and within repeating valleys and swales. Increase in elevation is much less gradual, with some valleys having very steep ridgelines only several hundred meters inland from the cliffs edges. Due to a high evaporation rate and soil porosity, there are no perennial streams on the island today. In prehistoric times water was available in the freshwater lakes in the three volcanoes, in pools in lava tubes, and possibly in about nine brackish-water springs along the coast (McCoy 1976: 6).

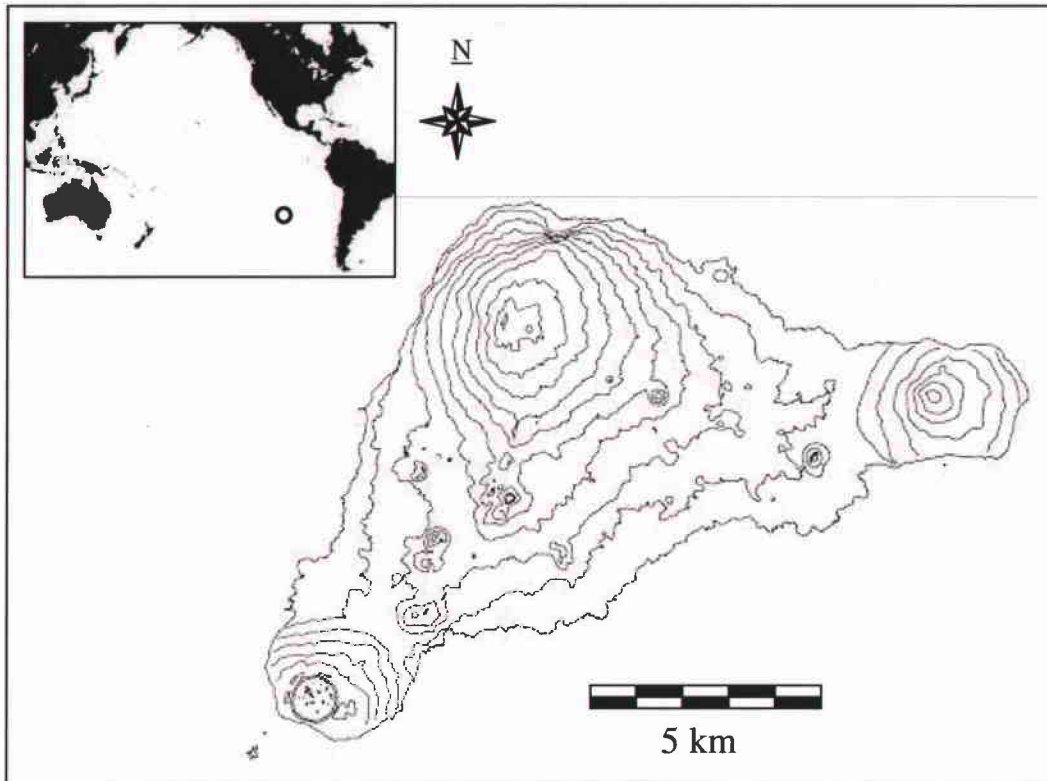


Figure 1. Map of Rapa Nui (Easter Island), with 50 meter contour intervals displayed.

The modern flora of the island includes grasses and sedges, guava shrubs, eucalyptus, pine, and other recently introduced species. The ecological and vegetation history of Rapa Nui is generally considered to have had a subset of the Polynesian flora (e.g., banana, sugar cane, taro, paper mulberry), as well as some species of South American origin (e.g., sweet potato). It is believed that the island was once covered with forests of *Jubea spp.* palms and other tree species, but complete deforestation occurred by A.D. 1650. The island is extremely depauperate in terrestrial fauna with no indigenous mammals or land birds; the Polynesian rat and chicken were introduced with colonization. The fish population is also poor, with 126 species identified

compared to more than 400 elsewhere in Polynesia. Due to the cool water temperatures and a steep shelf along the coastline, there is very little coral reef development, resulting in a limited number and variety of shellfish that could be exploited (Flenley & Bahn 2002:19).

The Rapa Nui Archaeological Record

The extreme isolation of the island and the apparent lack of abundant resources pose a question as to the nature of human occupation on the island – why did the first settlers choose to live here and what enabled their survival within such limited means? The isolation of Rapa Nui effectively presented a significant cost to interaction with other islands and provided few alternatives for inhabitants in times of stress (Finney 1993). As a result of its geographic position, the archaeological record of Rapa Nui reflects variability associated with populations evolving primarily under the effect of the local environment and its perturbations. Thus, the measurement of variability in settlement patterning and the examination of artifact functional variability across the island throughout a varying historical environment are key to explaining the persistence of populations for the duration of their ca. 1000 years of existence on Rapa Nui.

For the most part, however, previous research using spatial analyses on Rapa Nui has focused on the large ceremonial structures and statues of the island (Beardsley 1990). Most analyses regarding habitation or subsistence features are usually conducted in light of their contributions to reconstructions of ceremonial activity or to the examination of general socio-political organization, through cursory study of

differences in labor investment and subsequent conclusions of social stratification (Heyerdahl & Ferdon 1961; Bahn & Flenley 1992; Van Tilburg 1994). Despite its high density, remarkably few investigations have focused solely on the artifact variability that is related to subsistence and settlement patterns. As a consequence, there is a general lack of information on a fundamental portion of the Rapa Nui archeological record.

These measurements are necessary to evaluate hypotheses designed to explain changes in settlement patterning on Rapa Nui through time. For instance, it has been suggested that environmental factors structure the timing, location and abundance of human settlement elsewhere in Polynesia, and these kinds of explanations have been invoked to account for subsistence change, inter-group competition, and socio-political integration among others (Green 1980, 1996; Cordy 1985; Clark 1986; Kirch 1984, 1985, 1988, 1994, 2000; Ladefoged 1993; Ladefoged & Graves 2000). The same may hold true for Rapa Nui. In order to assess how well these explanations articulate with the island's archaeological record, it is necessary to generate basic distributional data of functional subsistence and settlement classes. Explaining relationships between these artifact distributions and environmental variability within a spatially-sensitive analytical framework is vital to the explanation of the overall patterns of settlement and change in the island's archaeological record.

Data Requirements for studies of settlement patterns

The archaeological data requirements to examine settlement patterns are substantial. If we define "community" to be any set of contemporaneous,

homologously related artifacts, identified by their stylistic cohesiveness, and 'settlement patterns' as the spatial distribution of these sets of artifacts at a given point in time, then a study of variability in settlements must be capable of measuring these spatial distributions within the archaeological record. To do this we must develop a means of describing artifacts within such 'communities' in a way that enables us to identify artifact variability across space and change through time. As homologous relationships may exist in various degrees and across very large expanses in space, the first step in analysis is to identify the boundaries within which artifacts will be examined. These are determined by identifying sets of artifacts which share a certain degree of homologous similarity, in terms of stylistic similarity, and which are relatively contemporaneous. The final determination of the boundary is necessarily arbitrary, as there is a continuous spectrum of variability that we partition into archaeologically meaningful units for specific research questions. Also, most often finer-scaled degrees of stylistic similarity are unknown until artifact variability is examined more closely, such as within settlement studies, however, informed decisions must be made to mitigate spatial and temporal discontinuities, as well as to make a project feasible. For example, for this thesis, I have chosen to view Rapa Nui in its entirety as one 'community' of artifacts that share the same degree of stylistic similarity, based on its natural boundary and on observed stylistic similarities in its artifact assemblages. This may or may not be true, meaning there may be differences in the degree of relatedness in artifacts in various areas on the island. As I state above however, for the purposes of settlement pattern studies on the island *a priori* boundaries are necessary to permit such analyses. As research progresses and more is

known about artifact variability, such distinctions may be clearer and research designs will change accordingly, yet setting the initial extent allows research to begin focus on a finite set of related artifacts.

Once such boundaries have been identified as to degree of stylistic cohesiveness and relative contemporaneity, the artifacts must be described in terms of functional and technological variation. These are two aspects of the archaeological record that involve interaction with the environment and thus have the potential to reflect differences in performance and/or innovation (adaptation) and ultimately, persistence through time. Simultaneously, we must also estimate historical environmental parameters so that we can test hypotheses about performance differences and/or adaptive utility of artifact classes.

Studies of settlement patterns and communities also require us to consider more than one scale of artifacts, or phenomena with attributes as result of human activity. While the record associated with settlement patterns includes artifacts at the scale of discrete objects (e.g., projectile points, “tool”, ground stone) it also includes aggregate-scale artifacts. Aggregate-scale artifacts derive their meaning primarily from their association within sets of discrete objects, and must be studied in terms of formal attributes as well as spatial relations. At this scale, we include the examination of what are commonsensically labeled houses, hearths, platforms and other kinds of “features.”

Thus, the primary data for analyses of settlement patterns are measures of stylistic, temporal, technical, functional and spatial variability of discrete and aggregate-scale artifacts within a specified bounded area. Practically speaking, this

means that the study must examine attributes of artifacts that relate to manufacture and interaction with the physical environment and how these attributes and sets of attributes are distributed across the land surface. In addition, chronological data are necessary to determine the contemporaneity of artifacts in the analysis, and to track both functional and stylistic variability through time. Lastly, to explain the distribution of functional and technical variability, a more complete paleoenvironmental record is required, one that is calibrated for the interval of human occupation and human-animal induced alteration hypothesized by most authors. In sum, the interaction of these parameters necessitates a 'non-site' approach to the Rapa Nui archaeological record, because we are looking at a relatively "continuous distribution of artifacts over the land surface with highly variable density characteristics" (Dunnell & Dancey 1983: 272). Delimiting sets of artifacts as 'sites' implies primary functional relationships between those artifacts and a set environment, and not with others. This is unjustified at this stage because we know little about the function of artifacts on Rapa Nui, and cannot assume uniform artifact-environment relationships. Such *ad hoc* presumptions bias analyses of artifact variability and spatial distributions and confound attempts to explain variability in the archaeological record.

Settlement patterns are the primary scale of analysis necessary to determine how past populations were distributed and interacted across the landscape and how these populations changed through time. In this sense, settlement patterns are vital for exploring the popular hypotheses of dramatic changes associated with the conjectured "cultural collapse" proposed by many researchers (e.g., Van Tilburg 1994; Diamond 1995, 2004; Kirch 2000; Bahn & Flenley 1992; Flenley & Bahn 2002). This collapse

model suggests that that as the original population grew to reach the island's carrying capacity, environmental degradation and overexploitation caused severe shortages in resources that resulted in dramatic decreases in population size through starvation and warfare. If these hypotheses are correct, we would expect to see a corresponding shift in settlement patterns across the island. We should, for example, see increases in artifact frequencies and distributions over time and space with abrupt contraction at the point of "collapse." In order to evaluate this account, it vital that we generate reliable data on artifact variability and distribution on the island.

We have a good starting point for generating information on technical, functional, and spatial variability of the Rapa Nui archaeological record. Over the last 30 years, the island has been the focus of numerous, extensive archaeological surveys (e.g., Ayres 1975, 1988; McCoy 1976; Mulloy & Figueroa 1978; Cristino & Vargas 1977-1997; Stevenson 1997). These surveys have produced descriptions of the archaeological record that potentially provide the foundation for spatially-grounded explanations of artifact distributions. Although these surveys have provided information about the overall potential of the archaeological record of Rapa Nui for studying settlement patterns, however, it is not yet clear how the data were generated and whether they provide sufficient resolution of functional, temporal and technological variability. In addition, the terms and type descriptions used may or may not be comparable across surveys, meaning similar or different labels and descriptions may not have been consistently given for artifacts between surveys. Thus, it is possible that the information generated in one survey cannot be combined with information from other surveys in order to form a comprehensive study of artifact

variability on the island. Ultimately, if our goal is to generate reliable information about variability in prehistoric settlement patterns, we must carefully examine these earlier surveys to determine the degree to which their information can be used.

Thesis Goals

Consequently, this thesis seeks to address the study of settlement pattern variability in two ways. First, I examine previous surveys and the data they have generated. This analysis determines the utility of these surveys and whether they can be utilized in combination and/or comparisons in future work investigating settlement patterning on Rapa Nui. I conduct this task by examining the structure of the descriptive system used in each survey. In addition, I undertake a field survey of previously recorded artifacts in order to evaluate the reliability of previous surveys and to determine the consistency in artifact class identification in the field. This analysis permits me to determine if previous data are consistent between researchers and whether we can be confident that each previous investigator was measuring the record in the same manner. This analysis also permits me to assess the degree to which potential variability exists within groups of artifacts identified as members of the same class. If artifacts identified have no consistent conditions for membership in identified classes, then we must consider implementing new classification and descriptive systems to more consistently describe the archaeological record on the island. Only through such description will we be able to conduct meaningful analyses of settlement variability on Rapa Nui.

In the section portion of this thesis, I propose an explicit and reliable classification scheme that is designed to describe aggregate-scale artifact classes in the archaeological record of Rapa Nui based on technological attributes. This classification provides comparability between descriptions and enables us to make meaningful measurements across the island and through time. This classification scheme is ultimately necessary to measure variability in the distribution of artifacts related to settlement patterns, and to give us the resolution required to test hypotheses for Rapa Nui's prehistory.

Thesis Structure

The organization of this thesis follows from these goals. Chapter 2 reviews previous research into settlement patterns on Rapa Nui, and discusses the settlement model and descriptive system utilized by researchers on the island for the last 30 years. This chapter provides background on the ways in which settlements were examined by previous researchers and describes what has been done over the history of archaeological investigations on the island. Chapter 3 describes my efforts to evaluate the efficacy of these previous classification systems through a sample survey conducted on Rapa Nui in 2003. This chapter compares this new controlled survey with previous efforts and assesses the utility of previous work for future analyses. In Chapter 4, I introduce an alternative classification scheme that is designed to generate reliable and comparable information about technological variability of aggregate artifact classes in the archaeological record.

Significance

Rapa Nui provides researchers with a great opportunity to more adequately examine the evolution of a single population. Due to its isolation and small size it effectively serves as an 'island laboratory', within which change is explained primarily by activities of the local population and shifts in the local environment. Although by no means is it perfect, it offers a more controlled setting to examine how past populations utilized their resources and environment, and how they adapt to local perturbations, as evidenced by artifact variability and distribution. From an anthropological perspective this is extremely valuable as it offers a view into human nature that is grounded in empirical phenomena. From another angle, current researchers argue that the historical trajectory of this population parallels that of the modern world, foreshadowing a collapse in civilization as we know it. This view dominates the literature and the public perception of Rapa Nui. More detailed and rigorous investigations into settlement patterning on the island may provide a sound basis for this negative imagery, or will open doors for new investigations and insights into Rapa Nui's past (e.g., Hunt and Lipo 2001).

CHAPTER 2. PREVIOUS RESEARCH

General Review of Settlement Analyses

The importance of examining regional settlement patterns in understanding the adaptive nature of cultural systems was first realized in Gordon Willey's pioneering study of the Viru Valley, Peru, during the late 1940's (Willey 1953), in which he explicitly stated the purpose and utility of such analyses in archaeology:

The term 'settlement patterns' is defined here as the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement, and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control which the culture maintained. Because settlement patterns are, to a large extent, directly shaped by widely held cultural needs, they offer a strategic starting point for the functional interpretation of archaeological cultures (Willey 1953: 1).

Flowing from Julian Steward's 'culture ecology', this study is significant in that it extended its scope from simply looking at questions of regional chronology, as tended to be the case with culture history research, to questions of cultural functioning and processes, specifically through the analysis of the patterning of archaeological sites across space (Parsons 1972).

Although this work, and others that followed (e.g., Sanders 1965; Sanders et al 1979), provided the impetus for more settlement studies, they focused largely on aspects of social-political organization as evidenced solely in variations of architecture and settlement size, organization and location. Also, as they concentrated on primarily creating distributional maps of the regions, they took a synchronic view of the past, looking at patterns representing the endpoint in time rather than attempting to track changing patterns. Not until the New Archaeology developed did the dynamic

relationship between populations and their environments, and a diachronic view of settlement patterns begin to be addressed.

In response to this static view of settlements the distinction between 'settlement patterns' and 'settlement systems' was introduced in the late 1960's (Winters 1967, 1969). According to Winters (1969), "settlement patterns" meant "the geographic and physiographic relationships of a contemporary group of sites within a single culture", and "settlement systems" referred "to the functional relationships among the sites contained within the settlement pattern"; a "single culture" was defined by distributions of stylistic traits (cited in Parsons 1972: 132). This division emphasized the desire to move from simple distributional analyses based primarily on surface area and architecture, to the exploration of settlement patterns in terms of functioning systems, where different sites served different functions, each of which contributed to the larger structure, organization, and development of a "single culture".

In this push to examine settlements as systems, the limitations of the previous data collection methods became clear. Substantial changes in data collection and analyses were made and studies were no longer limited to architecture, location and size information. Instead, questions of seasonality and site function were explored, "requiring the systematic collection and analyses of a wider variety of data" such as faunal and floral remains, environmental and climatological information, subsistence techniques, architectural features, and the differential abundance and distribution of artifacts (Parsons 1972: 132). Today the terms of settlement patterning and settlement systems are interchangeable, as studies of settlement patterning tend to consider and

incorporate hypotheses of functional relationships and human/environment interactions based on a large variety of archaeological, environmental and other data.

This legacy is embedded in all settlement analyses undertaken today, though with some modification in theory and concepts – such as Trigger’s (1967, 1968) three level analysis, Dunnell & Dancey’s (1983) reevaluation of the ‘site’ concept, Dewar & McBride’s (1992) notion of ‘remnant settlement patterns’, and Rossignol & Wandsnider’s (1992) concept of archaeological ‘landscapes’. There were also many improvements in methodology, especially in spatial analyses using remote sensing data, GPS and GIS. Of great significance however, is the incorporation of behavioral and evolutionary ecological theory into investigations of prehistoric settlements. These have provided much needed theoretical models regarding the dynamics of human-environment interaction, offering explanations for the patterning and distribution of archaeological remains, and a more comprehensive analysis of how past populations adapted to their environments (Jochim 1976; Dewar 1984; Ladefoged 1993; Ladefoged & Graves 2000).

Research in Polynesia

Research on settlement patterns became a focus in Polynesia in the late 1960’s. Since Green’s (1967) summary article *Settlement Patterns in Polynesia*, the region has seen a great increase in research examining the spatial distribution of archaeological features, including small-scale intrasite analyses focusing on aspects such as structure typology (Campbell 2000), site function (Streck Jr. 1992; Allen & Addison 2002) and subsistence techniques (Wozniak 1998), but predominantly concentrating on large-

scale intersite studies across the landscape (Rosendahl 1972; Kirch & Kelly 1975; Green 1980; Cordy 1981). Methodologically, this focus on large-scale intersite studies may stem from a number of factors. First, islands are finite in surface area and thus consist of relatively manageable landscapes in which to study. Second, in Polynesia architectural structures are made primarily of stone and, as such, archaeological remains are better preserved and more visible. This aspect of the record makes it relatively efficient to map aggregate scale artifacts across large expanses of space. Third, much of the islands' archaeology lies on the surface. Consequently, researchers are able to inexpensively examine the archaeological record. Fourth, island environments, by nature of their isolation, offer a limited set of resources and space on which human populations can act. As such, islands provide a good laboratory to study the effects of resource constraint on cultural change. Anthropologically, large-scale analyses reflect the desire of many archaeologists to examine issues of social organization and cultural adaptation. This interest has most often been expressed in the study of the development of complex or stratified societies (e.g., Kirch 1984; Cordy 1985; Hommon 1986; Kirch 1990; Ladefoged 1993; Cordy et al 1993).

Within the goals of understanding socio-cultural evolution and adaptation lies a common research focus in the study of archaeological settlements in Polynesia, that of patterns in land use. These types of analyses have examined the extent to which past populations interacted with and adapted to their surroundings, in both predictable and unpredictable environments, evidenced by the spatial distribution and function of archaeological structures across varying landscapes and through time. The most widely studied relationships have been between land use in windward (wet) versus

leeward (dry) environments (Clark 1986; Ladefoged 1993; Kirch 1994; Weisler & Kirch 1985), and land use across elevation zones (Clark & Kirch 1983; Streck Jr. 1992; Cordy et al 1993; Allen & Mcanany 1994; Dixon et al. 1997, 1999, 2002). These studies have shown that the patterns in location and function of certain archaeological features tend to correlate with the availability of resources within those locations. For instance, Allen & Mcanany (1994) and Dixon et al. (1999), have examined traditional land use patterns in Hawaiian *ahupua'a* based on elevation levels and the corresponding changes in environment. These studies have found that human activities were initially concentrated in areas of high productivity with dispersed or little activity occurring throughout the rest of the region, but with time more marginal lands began to be utilized as well. This has been attributed to changing population densities, and to the effects of risk minimization in an unpredictable environment, whereby the subsistence requirements are spread out over larger areas and across more environments to minimize losses during stressful times. Kirch (1985, 1994) also shows that settlement in most leeward areas occurred later than in windward areas, reflecting the productivity and hospitality of the corresponding environments. Although there are many examples of such studies across Polynesia, there has been little published works on the topic for Rapa Nui.

Previous Archaeological Research on Rapa Nui

Although several important investigations were performed in the early to mid-twentieth century (Routledge 1919; Englert 1948; Métraux 1940; Heyerdahl & Ferdon 1961), it was only in the 1960's that more intensive research began on the prehistory

of Rapa Nui. Of the earliest works, those of Routledge (1919), Métraux (1940) and Heyerdahl & Ferdon (1961) have had the most impact on later research; Routledge (1919) and Métraux (1940) for their collection of invaluable ethnographic information on the historic inhabitants, Routledge (1919) also for her investigations on statue quarrying and construction, and Heyerdahl & Ferdon (1961) for their archaeological excavations and inquiries on various features and locations on the island. Although all of these works have proved important for later research, the *Ethnology of Easter Island* by Métraux (1940) has served as the foundation for the majority of later archaeological investigations.

Rapa Nui differs from the majority of Polynesia with its general lack of continuity between prehistoric and contemporary populations, and thus its lack of useful ethnographic data with which to help explain its archaeological record. During the 150 years following first European contact (1722) there were many visits to the island by various expeditions, many of which remained only for several days at most and often did not step foot on the island. Detailed reports of these visits are also few in number (though see Cook 1777; La Perouse 1797, 1799; Thomson 1889; and Sharp 1970 for brief descriptions). In the 1860's the Peruvian Slave trade led to the near complete decimation of the indigenous population. A combination of kidnapping and introduction of disease resulted in only 111 remaining inhabitants on the island by 1877, out of possibly several thousands or more in the years before. Geiseler (Ayers & Ayers 1995) offers a view into the conditions on the island in 1882 with his ethnographic account. Unfortunately, it is brief and limited as he stayed for only three and a half days. In 1914-1915 Routledge (1919) conducted research on the island for

16 months, during which time she did detailed investigations of the statue quarry and ceremonial structures. She also succeeded in collecting cultural information on the surviving population. Unfortunately, the only publication from this expedition is her popular work *The Mystery of Easter Island* (1919), which lacks the thorough nature of her original research. Though written primarily for a lay audience, this publication does provide some important information on prehistoric society, most significant being the documentation of tribal lineages and land divisions (Routledge 1919:221-224).

Not until Métraux's (1940) work in the 1930's do we have a detailed, thorough investigation and documentation of the indigenous population on the island. His ethnographic survey details almost every aspect of Rapa Nui culture at the time, providing valuable information for archaeologists on things such as feature function, subsistence practices, and social organization. Although extremely valuable, his work comes more than 200 years after initial contact on the island and almost 80 years after the population collapse, not to mention the influences of missionary arrival in 1864. As such, the relevance of this work to prehistoric society may be debated. In fact, Métraux himself questions how much of prehistoric culture was known to the islanders themselves (Ayers & Ayers 1995:4). However, the lack of other sources from which to draw inferences for archaeological phenomena and the general paucity of artifactual evidence to aid in reconstructions, has led to the heavy reliance on his work for archaeological interpretation. Although there may be difficulties associated with extending his observations to early prehistoric periods they provide data from

which we can begin to assess and test functional and distributional aspects of archaeological structures.

Since the 1960's the island has seen numerous archaeological studies on several aspects of its prehistory, all of which may be incorporated into regional settlement studies. Various paleoenvironmental investigations suggest dramatic changes in the island's vegetation as a result of environmental degradation after initial Polynesian settlement, leading to the disappearance of trees by A.D. 1650 (Bahn & Flenley 1992; Hunter-Anderson 1998; Orliac 2000; Flenley et al 1991; Flenley 1996, 1998; Mann et al 2003). This has many implications for land use patterns, as such deterioration would have resulted in corresponding changes in settlement organization and location. As the extreme isolation of Rapa Nui and the attendant loss of woods required for canoes precluded migrations to new areas, tracking the timing and effects of environmental changes in relation to prehistoric settlements would provide valuable information on human adaptation to such conditions.

Other research has sought to describe general settlement and subsistence patterns (e.g., Yen 1988; Ayers 1985; Vargas Casanova 1998; Stevenson 2002; Stevenson et al 1999; Stevenson et al 2002) or investigated specific aspects of settlements at several sites on the island (Stevenson & Cristino 1986; Stevenson 1997; Stevenson & Haoa 1998; Martinsson-Wallin & Crockford 2002; Wozniak 1998, 1999). These contribute to our understanding of land use with more intensive analyses in specific areas and topics that allow for the development of hypotheses for the island as a whole. In this respect, research from Vargas Casanova and others of the University of Chile holds much potential as they have collected an enormous amount

of information on the archaeological structures across the island. Since the 1970's, they have conducted the Easter Island Archaeological Project with the intent of building on previous surveys to complete a full coverage survey of the entire island. As of 1998 surveys of 80% of the island has located over 20,000 archaeological features. Results from these surveys have been summarized in several reports, some of which focus on descriptions of archaeological features themselves, and others which describe general distributions of features within various regions on the island (Budd & Vargas Casanova 1990, 1993; Vargas Casanova et al 1992; Vargas Casanova 1994, 1995, 1996, 1998, 1999).

Two large-scale, intensive archaeological analyses of the island's settlement patterns are dissertations by McCoy (1976) and Stevenson (1984). Because they are the largest, most in-depth studies published thus far, and as their conclusions form the basis for the majority of later research on the island, they deserve discussion.

McCoy's (1976) *Easter Island Settlement Patterns in the Late Prehistoric and Protohistoric Periods*

As part of a larger regional survey program initiated by William Mulloy and Gonzalo Figueroa in 1967, the island was divided into arbitrary 2.5 by 3 km quadrangles to provide a means of tracking surveys and surveyed areas. Based on his survey of the five southwestern-most quads—1,2,4,5, and 6 (Figure 2) —McCoy identified and classified sites into 15 broad, functional categories based on observed attributes and previous ethnographic accounts of use, function and/or context (Table 1). In mapping, sites were identified and located on maps as groups or complexes of features, although features located in isolation were also defined as a site and given

their own site number and pinpointed location. A maximum 300-year occupation period (ca. A.D. 1550-1865) is suggested for the surface habitation sites in the survey area, obtained through a combination of “ethnohistoric information, ‘absolute dates’, relative chronology, and archaeological inference” (McCoy 1976: 14). The late date is attributed primarily to the superposition of habitation features, the most recent being visible on the surface, with habitations older than A.D. 1550 buried underneath.

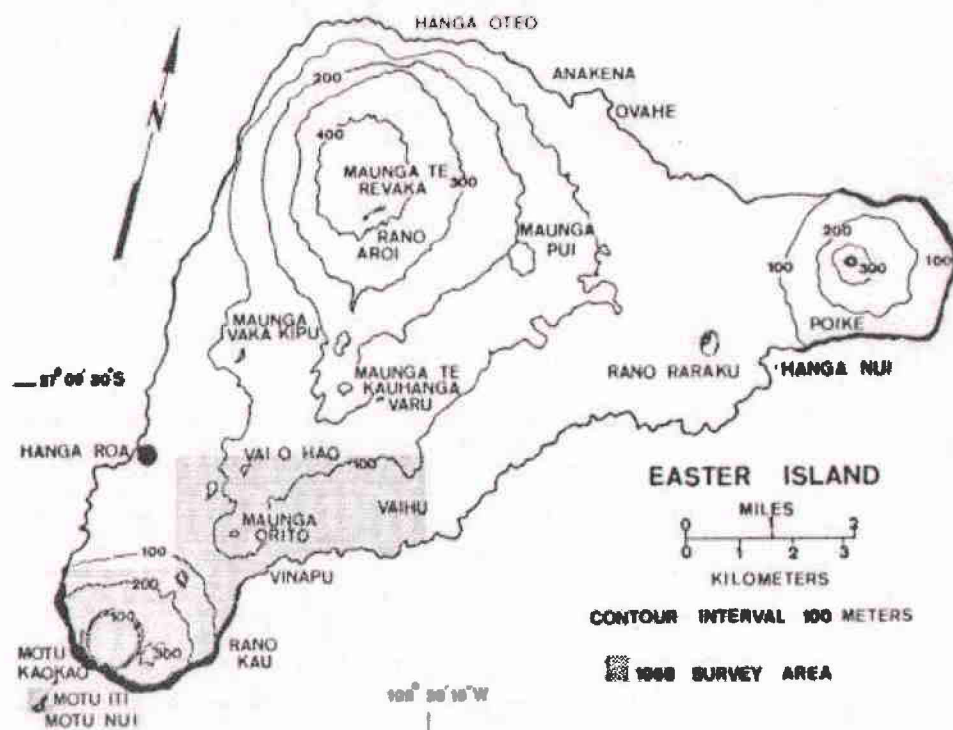


Figure 2. Quadrangles surveyed by McCoy in 1968-1969 (From McCoy 1976: 4)

Table 1: Synthesis of McCoy's (1976) Classification

Category	Type	Subtype	Description
1	Houses		
	I	Elliptical Thatch Hut Indeterminate Form	Lacking curbstones, identified by a pavement of beach stones (<i>poro</i>) or terrace
		Subtype 1A (<i>hare paenga</i>)	Dressed curbstones, with <i>poro</i> pavement
		Subtype 1B	Undressed curbstones, with <i>poro</i> pavement
	II	Round Thatch Hut (<i>hare oka</i>)	
	III	Rectangular Thatch Hut (<i>hare kau kau</i>)	
	IV	<i>Orongo</i> Type House	Corbelled, stone houses, located only on Rano Kau
2	Rockshelters		
	I	<i>Karava</i>	Small niche or overhang, ~1.5m deep/wide
	II	<i>Ana</i>	Any overhang, cave or lava tube larger than Type I, ~6x8x2m
	III	<i>Ana Kionga</i>	Refuge cave, usually containing fortification features or artificial construction
3	Ovens		
	I	<i>Umu Pae</i>	Stone-lined oven of various shapes – pentagonal, rectangular, circular, other
	II	<i>HareUmu</i>	Oven house – <i>umu pae</i> surrounded by thatched structure, evidenced by circular stone foundation
	III	Earth Oven	Ovens with no stone lining
4	Chicken House (<i>hare moa</i>)		Rectangular stone structures with side entryway(s) to house chickens
5	Agricultural Sites		
	I	Garden Enclosures (<i>manavai</i>)	
		Subtype 1A	Surface – free-standing, walled enclosures
		Subtype 1B	Subsurface – excavated into the earth
	II	<i>Pu</i>	
6	Water Holes or Catchment Basins		
7	Canoe Ramps		
8	Quarries		
9	Roads		
10	Boundary Marker (<i>pipi horeko</i>)		Stone cairns
11	Historical Landmarks		
12	Religious Monuments		
	I	Image <i>ahu</i>	
	II	Semi-pyramidal <i>ahu</i>	
	III	<i>Ahu poe poe</i>	
	IV	Rectangular <i>ahu</i>	
	V	Upright slabs	
	VI	Enclosed courts	
	VII	Unclassified	
13	Burials		
	I	<i>Avanga</i>	
	II	Tombs	
	III	Crematoria	
14	Earth Mounds		
15	Rock Art		
16	Unclassified		Destroyed or unknown features

In the first section of his thesis, McCoy provides descriptions of most feature types, along with some synthesis of archaeological data recovered and ethnohistoric and ethnological accounts related to them. In this analysis of feature types, he proposes a few hypotheses about the chronology and/or use of several feature classes:

- 1 Garden enclosures and chicken houses to be of later date, after A.D. 1770, as they are not mentioned in historic accounts until after that time;
- 2 The presence of *hare paenga* and elliptical house foundations with no curbstones represents a form of social stratification due to differing labor investment, locations (*hare paenga* are only located in front of *ahu*), and associated features (*hare paenga* are usually not associated with subsistence features other than earth ovens);
- 3 Round house forms signify temporary habitations due to their lack of both associated subsistence features and evidence of occupation; and
- 4 Rectangular house forms are earlier temporary structures based on an early, single radiocarbon date, and the lack of associated chicken houses or garden enclosures (stated above to be from a later period).

Based on statistical summaries he also finds that house sites are almost always built facing the coast, on “rocky eminences” or hill slopes, and subsistence-related features are almost always located on the front, seaward side of the house within a range of 10-50 meters [mean = 20 meters] (McCoy 1976:30).

When all data were collected, McCoy performed an analysis of settlement patterns based on a three-scales settlement criteria developed from Trigger (1967, 1968): 1) the individual household, 2) the settlement, and 3) between settlements. Individual households are defined as the smallest social and residential unit on the island, and are recognized archaeologically as single habitation sites composed of a dwelling (rock shelter, house foundation, pavement, or terrace) usually associated with other subsistence-related features such as an earth oven, chicken house, or garden enclosure (McCoy 1976: 16). An open-site dwelling or rock shelter with clear evidence of habitation is considered the minimum definition of a household. Based on the work of Métraux, McCoy defines the household sociologically as belonging to a patrilocal extended family, headed by the senior male, and usually composed of 30 people. Occupants are normally relatives, most likely brothers and cousins, which held and worked common land (McCoy 1976: 16).

The analysis at the second scale, the settlement, proved to be difficult as there is no chronological control to allow for the sorting of contemporaneous features. There are also no real natural physiographic boundaries or features which logically delineate settlement extent. Rather, archaeological features are continuously distributed across the landscape. McCoy attempts to overcome this by focusing first on ethnohistoric and ethnographic records to determine the probable settlement patterns, and then testing them against the archaeological evidence.

Based on the ethnohistoric and ethnographic data, protohistoric settlements are thought to be small “villages” composed of dispersed habitations located inland of *ahu*, joined with agricultural fields. At times house sites were loosely clustered into

units of two to three structures. Habitation features consisted of elliptical thatch huts of two classes (*hare paenga* and elliptical huts lacking curbstones), and “occasionally caves, a communal feast house, and a seclusion hut for young people” (McCoy 1976: 73).

According to Métraux, these settlements are thought to consist of lineages, each of which is allocated a piece of land stretching from the coast to inland (*kainga*), which in turn is divided among households. The *ahu* are also said to be representative of the various lineages, marking the focal point of these land divisions (McCoy 1976: 74). The subsistence base consisted primarily of agriculture in household gardens as well as extensive open-field systems, supplemented by marine resources, fowl, and sometimes rat. Unfortunately there is little archaeological evidence for these open-field systems, leaving garden enclosures as the best source of data on agricultural activities.

Distributional analysis of house types found in McCoy’s survey show that the *hare paenga* are usually located 100-300 meters inland from the *ahu* in groups of five or more, whereas the ‘commoner’ structures - elliptical huts without curbstones – are located further inland, in no perceptible pattern. The ‘commoner’ houses were rarely clustered in groups of more than three structures, coinciding with the ethnohistoric account of settlements discussed above. By defining “clusters” as habitations lying within 15 meters from one another however, he also finds that households in his study area are most often comprised of clusters of two to three structures (1976:115).

McCoy also hypothesizes that the large number of habitation sites is principally a result of the effects of warfare, where people were forced to relocate and build new

structures following the destruction of old ones (1976: 114). He regards this as another reason for relying more on ethnohistoric and ethnographic accounts than the archaeological evidence in reconstructing settlement patterns.

McCoy also hypothesizes that the two types of garden enclosures (surface and subsurface) represent different time periods, the subsurface type being an earlier form. His distributional analysis of these features shows them to rarely co-occur and the subsurface type to be more evenly and widely distributed, inferred as signifying early population expansion. McCoy also finds no positive correlation between these enclosures and soil type, though they are primarily found below the 50 meter contour level, which coincide with the transition from shallower, stonier soils on the coast to deeper, less stony soils further inland (McCoy 1976: 84). Analyses of chicken houses show similar distributions, however, it is noted that rarely do both chicken house and garden enclosures occur at the same site. Suggested reasons for this are that sites with only garden enclosures predate the appearance of chicken houses, or that there was a division of labor between households in the raising of fowl (McCoy 1976: 87).

In all, there is no account of possible settlement size or definition, except in terms of *ahu* and *hare paenga* location. It is not determined how to define which 'commoner' sites belong to which *ahu* or lineage group, as there is no discernable pattern to their location. McCoy does find though, that settlements generally tended to be concentrated along coastal areas where marine resources and brackish, fresh water ponds are more accessible, and where the soil type was more favorable to the staple crop of sweet potato. Using his distributional maps, he also looks at site densities within 500-meter² boundaries to determine the localization of habitations, and

provides general patterns of site and population distribution (Figure 3). He finds that site density decreases with distance from the coast, the drastic change being marked at 1000-1500 meters inland. There is no significant change in topography, soils or vegetation until 2500 meters from the coast, implying that settlement density varies with relation to accessibility of fresh water, marine resources, and the community center (the area near the *ahu*). Uninhabited areas are attributed to topographic anomalies such as the crater lakes, or modern road building and agriculture.

Using all of these analyses, but again relying primarily on ethnohistoric and ethnographic accounts of the late 1800's and early to mid 1900's (e.g., Métraux 1940; Thomson 1891), McCoy constructs a model of settlement pattern changes from A.D. 1500—A.D. 1865, where population pressure on land and resources is the primary cause of settlement change and expansion. This expansion is thought to have led to over-exploitation of resources and environmental deterioration beginning as early as the 16th century. These changes are linked to the innovation of new structures for agriculture and animal husbandry. Garden enclosures were invented to protect against wind and erosion, prompted by the removal of ground cover, especially trees. Chicken houses developed with the increased reliance on domesticated foods in the diet, resulting from the domino effect of forest depletion and subsequent lack of wood for building fishing boats, leading to lower fish yields. The proximity of these later features near residential structures, along with ethnographic accounts of increased social strife in the form of thievery and the need to protect valued, limited resources, contributes to this rather depressing picture. Ultimately, this pressure on limited land and resources with the combined effects of landscape deterioration led to increased

social competition in the form of warfare and punctuated cultural collapse, finalized by the Peruvian slave raids and the arrival of the missionaries in the late 1800's.

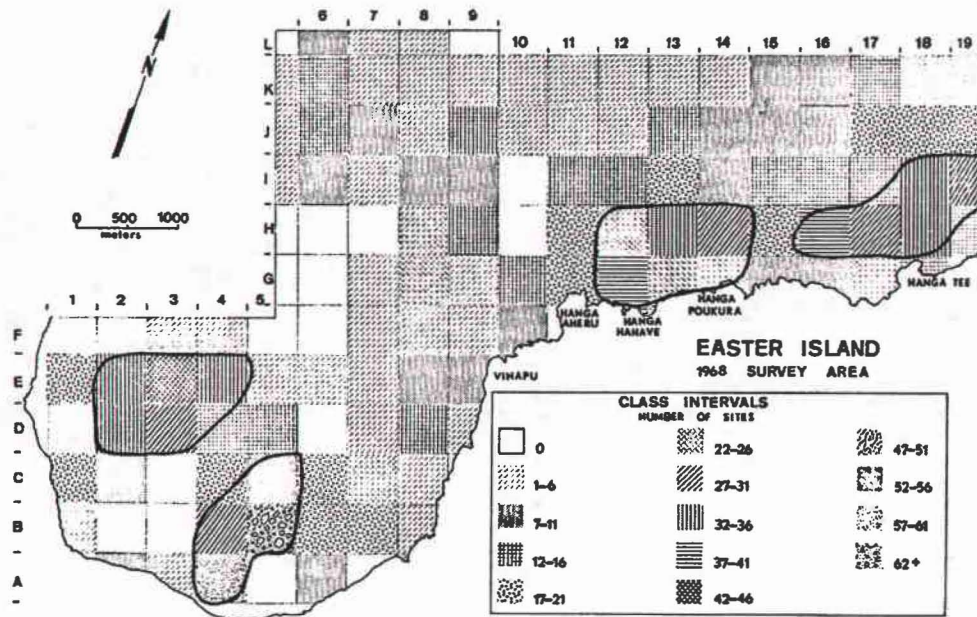


Figure 3. McCoy's Site Density Map (From McCoy 1976: 134)

Although most of the concluding discussion of settlement patterning on the island is largely reconstructed from ethnographic and ethnohistoric accounts, McCoy's research has been invaluable to settlement studies on the island by providing an overview of the types and distributions of features across a large, contiguous portion on the south coast. As it was the first and is still the largest settlement study for the island, it has served as the foundation for the majority of future analyses of settlement structure for prehistoric Rapa Nui (e.g., Stevenson 1984, Wozniak 1998, and Vargas Casanova 1998).

Stevenson's (1984) Corporate Descent Group Structure in Easter Island Prehistory

Stevenson's study of the Akahanga quadrangle on the south coast, adjacent to McCoy's study area, confirms these conclusions although he provides a social perspective in his analysis. His study offers a chronological view of occupation in the area as he attempts to measure settlement patterns through time in relation to the construction of the large ceremonial platforms (*ahu*). The goal of his study was to identify the formation of distinct lineages in the region, assumed to be discernable through distributional analysis of residential and religious structures. As is normally the case when socio-political structures of past societies are the goal of research, heavy emphasis and reliance is placed on ethnographic works primarily because of the difficulty in identifying empirical referents in the archaeological record (e.g., McCall 1979).

As with McCoy the generally accepted belief is that the island, like those in other areas of Polynesia, was divided among various lineages, each of which held a portion of land in common (*kainga*). According to McCall (1979), the island was divided into 11 *mata*, or descent groups, who occupied a defined territory with access to both marine and terrestrial resources. Each *mata* consisted of multiple lineages composed of extended families, which were in turn composed of single nuclear family units. These "corporate" groups are, by definition, localized, cohesive, stable entities, most often held together or reinforced through religious ritual (esp. ancestor worship). As it is thought that the *ahu* are associated with lineages (McCoy 1976: 74), meaning they were collectively constructed by the various descent groups and held religious/political meaning for them, Stevenson believed that by studying the coastal

religious structures and the patterning of residential sites inland of them, it is possible to determine the number of corporate groups and possible lineages present on the southern portion of the island (Stevenson 1984: 17-18).

To analyze changes in settlement through time, Stevenson obtained over 1,300 obsidian hydration dates for residential sites and *ahu*. Based solely on a hierarchical ordering of *ahu* (classified by labor investment) and on their chronological appearance in the study area, Stevenson reconstructs corporate group structure through time. A phase-by-phase analysis shows a general trend, beginning in the 14th century, of initially dispersed residences (i.e., autonomous local lineages) integrating into more nucleated settlements (i.e., multiple lineage centers) by the 16th century. At the same time however, sub-lineage *ahu* construction increases, suggesting “more group activities below the lineage level” (Stevenson 1984: 163). By the 16th century five platform *ahu* (the highest ranked structure), representing four politically autonomous descent groups (2 are integrated) are present and persist until the 18th century. This is thought to coincide with the period of environmental deterioration, where subsistence-related stress resulted in the need for greater cooperation among units, as well as more control over resources. The distribution of garden enclosures within 1 km from the coast and the introduction of stone chicken coops during the same periods are considered representative of ‘buffers’ necessary to deal with these deteriorating conditions (Stevenson 1984: 174-177). In the 18th century multiple lineage centers are then abandoned, suggesting a breakdown in corporate descent group structure and the reversion to a non-ranked, or autonomous lineage-based group configuration.

In his concluding discussion, Stevenson hypothesizes that the south coast was settled after the more favorable areas of the island were occupied, due to the late dates of occupation obtained for Akahanga (~A.D. 1300) relative to the date of initial settlement of the island, ~A.D. 400-700 (depending on what date one chooses to accept, see Martinsson-Wallin & Crockford 2002). He does however, note the possibility that settlement had occurred earlier in the region but had not been detected due to biases in the survey procedure (such as the definition of sites as stone structures, when early sites may not have had stone foundations).

Limitations in Previous Settlement Studies on Rapa Nui

Both McCoy (1976) and Stevenson (1984) provide valuable information on general settlement patterns for the south coast. The limitations of their studies however, lie in the scales used in analysis. Models from evolutionary ecology suggest that populations tend to organize and distribute themselves on the landscape according to resource potential, availability and distribution, and especially in unpredictable environments, do so in such a way as to minimize risk (Jochim 1976; Smith 1987; Smith & Winterhalder 1992; Boone 1992; Cashdan 1992; Kaplan & Hill 1992). These models attempt to explain change in settlement and subsistence strategies through time, and ultimately the nature and means of human adaptation to their environments. Archaeological investigations in other areas of Polynesia utilizing these models, both implicitly and explicitly, have found that settlements in fact tend to be distributed and organized according to various environmental, climatic, and/or topographic features (Rosendahl 1972; Kirch & Kelly 1975; Green 1967, 1980; Weisler & Kirch 1985;

Clark 1986; Cordy 1981; Cordy et al 1993; Ladefoged 1993; Kirch 1994; Allen & Mcanany 1994; Dixon et al 1997, 1999, 2002). These studies have looked at many specific attributes of the landscape –such as elevation zones, soil types, rainfall, topography, hydrology, wind regimes, marine resources, and so on –and found variable environments from coastal areas to upland regions that may have supported different settlement and subsistence strategies. The same patterns may exist for Rapa Nui.

McCoy (1976) and Stevenson (1984) both examine the distribution of residence structures across the landscape in relation to environment, but only at a broad and general scale (i.e., distance from the coast and its resources). The techniques of the time did not allow for easy detection and analysis of small-scale environmental changes within the study area (microenvironments) nor for more defined boundaries for larger scale environments (macroenvironments). Today Geographical Information Systems and databases facilitate more detailed and fine-scaled analyses of relationships between feature distributions and both macro- and microenvironmental variations (Allen et al 1990; Lock 2000). For example, using GIS techniques Williams et al. (1990) have shown that contrary to their hypotheses, the historic site locations in Fort Hood, Arkansas were not dependent on such general aspects as close proximity to water sources, transportation networks or community centers, but to landscape quality for agriculture production. Using data on such attributes as soil types, slope, and aspect for the areas surrounding sites, they were able to determine three land use strategies that could have been employed in various regions of the study areas, and as such offer a more fine-scaled explanation for the observed patterning of the

settlements. Another study by Madry and Crumley (1990) has shown the utility of GIS by performing line-of-sight and corridor analyses, in combination with information on land use/land cover change through time, to explain the location and distribution of archaeological sites in the Arroux Valley, Burgandy. Similar research questions and techniques may enable a more detailed understanding of settlement variability on Rapa Nui.

New direction for settlement studies on Rapa Nui

A new area of research that holds much potential is one that utilizes the models and investigations previously used in other areas in Polynesia to determine their applicability for explaining the variability and distribution of artifacts on Rapa Nui. For instance, Rapa Nui has similar contrasts between different sides of the island, as observed in other studies across Polynesia. There appear to be significant differences in settlement density, intensity, and land use between the northwestern and southeastern parts of the island. The southeastern coastal plain, stretching from Akahanga to Tongariki appears to have been settled generally earlier, marked by coastal adaptation, and sustained larger and more highly-integrated populations than have been reported from the valleys on the northern coast (McCoy 1976; Stevenson 1984, 1997; Stevenson & Haoa 1998; Wozniak 1998). The north shows evidence of later, more dispersed settlement, with more reliance on opportunistic features for both shelter/housing and agriculture and with less use of oceanic resources. These observed differences in the form and temporal order of settlement may be directly related to resource abundance and recurrent environmental stress.

This can be investigated more closely by examining the extent to which seasonal and long-term variation in the climate, particularly rainfall, and variation in geography and hydrography of these regions, influenced settlement patterns on the island. Research in other Polynesian islands has shown that settlement generally begins on the coastlines, in areas where fresh water and subsistence resources are more abundant and easiest exploited (Bellwood 1972; Rosendahl 1972; Kirch & Kelley 1975; Kirch 1984, 1985, 2000; Weisler & Kirch 1985; Allen & Mcanany 1994). With time and needs of a growing population, settlement expands to encompass other coastal areas and inland regions, some of which are not as productive without additional effort, require the identification of new resources, or which impose transport costs. The structures associated with these settlements tend to vary along with environmental variability. The settlements in the northwestern and southeastern portions of Rapa Nui seem to exemplify this traditional culture historical pattern on the surface, but require analysis of pertinent environmental variables to test whether this explanation accounts for the historical evidence.

Previous studies on Rapa Nui note the presence of an orographic rainfall pattern for the island, and propose that higher elevations (beginning at 200 meters) receive twice the amount of rainfall as coastal regions (Stevenson et al 2002). However, this higher abundance of rainfall may be offset by cooler temperatures (0.6-1.0°C for every 100 m increase in elevation) and greater wind velocities (suggesting increased levels of evapotranspiration). Due to their vastly different topographic characteristics, this orographic effect has many implications for both environmental regimes and settlement structure between the north and south coasts. The south may

be overall more arid with slighter winds, while the north may be consistently wetter and cooler, but with harsher wind patterns. It is also notable that the south coast, being comprised largely of flat plains, has easier access to marine resources and an overall higher amount of arable land, in contrast to the steep cliffs and gradual slopes of Maunga Terevaka on the north. All of these traits result in differences in resource abundance and diversity and sustainability between the north versus the south coasts of the island.

Acquiring data on climatic variables (wind and seasonal storm regimes, actual rainfall) and geographical variables (hydrography and topography) affecting the island will provide baseline information for the analysis of key variables in settlement patterning, such as water availability and its association with agricultural features, and the spatial distribution of landforms or resources exploited for shelter, agriculture, or other purposes. Information on ocean currents and modern fish distributions and movement patterns around the island may also contribute by determining the most probable location of and available types of marine food resources. The incorporation of all of these data into a GIS for the island will facilitate the analysis of their effects on settlement location and organization.

By integrating multiple layers of data on environmental and climatic variables with information on the location and distribution of specific classes of archaeological features, it is possible to determine any patterns or relationships that exist between them. This analysis has the potential to determine which environmental or climatic variables explain settlement patterns within these regions; in other words, to determine

how past populations have adapted to certain varying environmental or climatic regimes.

Previous studies of settlements on Rapa Nui have focused largely on the southern and eastern regions of the island. These studies have shown the presence of dense settlements along the coastlines, with density decreasing towards the inland or upland areas (McCoy 1976; Stevenson 1984, 1997; Stevenson et al 1998). These areas also exhibit a wide range of archaeological feature types, some of which are evidenced only in specific elevation zones (e.g., feature types associated with different agricultural techniques, or the presence of rectangular and circular habitations only in the upland regions). Within these investigations are also general discussions of spatial distributions of features at the level of the household and the larger level of the settlement (McCoy 1976; Stevenson 1984, 1997; Vargas Casanova 1998). These may provide a useful foundation for examining settlement patterns on the south coast of the island and its comparison to that of the north.

As mentioned in the introduction however, the utility of these previous investigations needs to be examined before their combination in more detailed studies of settlement patterning and variability. This next chapter provides such a study by examining previous survey data for resolution, consistency and reliability. An issue not discussed within this thesis, but of great import in settlement studies is that of the contemporaneity of artifacts on Rapa Nui. The only study into the chronology of archaeological features on the island has been Stevenson's (1984) *Corporate Descent Group Structure in Easter Island Prehistory*. This study is limited in its analysis as it only looks at a small sample of artifacts within the Akahanga quad. It does not take

into account the amount of variability in features across the landscape and through time. This lack of chronological data is one of the most significant reasons why detailed studies of settlement patterns and change have not been attempted as of yet, and why the little published literature we do have only offers general overviews of trends in settlement patterning, based on a synchronic view of feature distributions. Although the requirements for chronological determinations are daunting, to progress in our understanding of settlement patterns and change on the island, such investigations must be undertaken. It is my hope that this thesis will somewhat facilitate this process by providing a reliable means to identify and track the true variability in archaeological structures on the island, on which later chronological investigations into both absolute and relative dating may be based.

CHAPTER 3. EXAMINATION OF PREVIOUS ARCHAEOLOGICAL SURVEYS AND DATA

In general, a single classification system has been used and accepted over the last 30 years of archaeological investigations on Rapa Nui. This classification is based largely on Patrick McCoy's (1976) surface reconnaissance in 1968-69. This in turn was based primarily on the ethnographic work of Alfred Métraux (1940), in combination with fragmentary ethnohistoric accounts from the late 1700's to the late 1950's (e.g., Cook 1777; La Perouse 1797, 1799; Palmer 1870; Pinart 1877; Thomson 1889; Lavachery 1935; Englert 1948; Heyerdahl & Ferdon 1961). These accounts provide descriptions of the form and function of features in use at that time. Although some are more descriptive, the majority of the discussions tends to be brief and at times do not contain much detail about structural attributes of the features themselves. What is available has been summarized often in later archaeological investigations (e.g., McCoy 1986; Vargas Casanova 1998), though the most detailed discussion is still in McCoy's (1976) *Easter Island Settlement Patterns in the Late Prehistoric and Protohistoric Periods*. Since then there has been little modification or review of this system, though some of the more recent reports have introduced several new feature types pertaining to agricultural production (Stevenson & Haoa 1997, Wozniak 1996, Stevenson et al 1999).

The problem with this system is evident when comparing the available 'archetypal' descriptions of the various types to the actual site records from previous archaeological surveys. In a brief review of the original site records for the island I observed a large amount of variability in the kinds of features grouped together under

one name in the field. At some level they may correspond to one of the feature types, but differences in such attributes as size and shape, and/or the overall structure question how appropriate grouping is and the utility of the data being collected. This same problem applies to those features that could not be identified to functional type. These were labeled according to morphological characteristics, such as 'stone alignments', 'stone structures', or 'enclosures', yet a large amount of variability resides within any one of these generic feature types.

In any normative archaeological research one aspires to incorporate and build upon previous data collection. To do so confidently requires a determination of the compatibility of the data being combined and/or compared, as well as the ultimate utility of the available work for different research questions or goals. This thesis was ultimately designed to assess the data from previous surveys on the island to determine: 1) if they provide enough resolution to examine variability in the archaeological record and consequently, 2) their compatibility with future investigations into settlement patterning and variability on the island. In resurveying previously recorded features in the field, I hoped to determine if the same identification would result, and if not, what kind of variability is presently lumped within each feature type. The first goal is intended to test the strength of the current classification system, and the second is to allow for some understanding of what different kinds of features are actually present if the current system is failing to identify them. In light of the extent of the problems observed during this study, this thesis concludes with the foundation for an explicit classification scheme that allows

for standardization and increased reliability in identification of archaeological features on the island.

Datasets

According to Vargas Casanova (1998), as of 1998 over 80% of the island has been surveyed, resulting in the identification and description of over 20,000 archaeological features. Multiple researchers have conducted these surveys at various times over the last 30 years (e.g., Ayres 1975, McCoy 1976, Mulloy & Figueroa 1978, Cristino & Vargas 1977-1997, and Stevenson 1997). The Easter Island Archaeological Atlas (Cristino et al 1981) identifies the location and distribution of archaeological phenomena for the 16 quadrangles (each 2.5 by 3 km) surveyed as of 1981, consisting of 11,491 individual features (Figure 4). This Atlas encompasses nearly the entire southern half of the island, with two quadrangles located in the interior (Figure 5). Even with such an extensive reconnaissance effort, the data from the original surveys are only available for the southwestern sector of the island. This includes quads 1,2,4,5 and 6 (Rano Kao, Vinapu, Maunga Orito, Hanga Poukura, and Vaihu quads, respectively) surveyed by McCoy in 1968-69, and a section of quad 7, Akahanga, surveyed by the University of Chile in 1977. These data are all on file in the Museo Antropologico Padre Sebastián Englert on Rapa Nui, and as such this study will examine these two sources.

All of McCoy's survey and site records are available for this analysis. This contains over 1700 site descriptions including over 2300 features, and covers

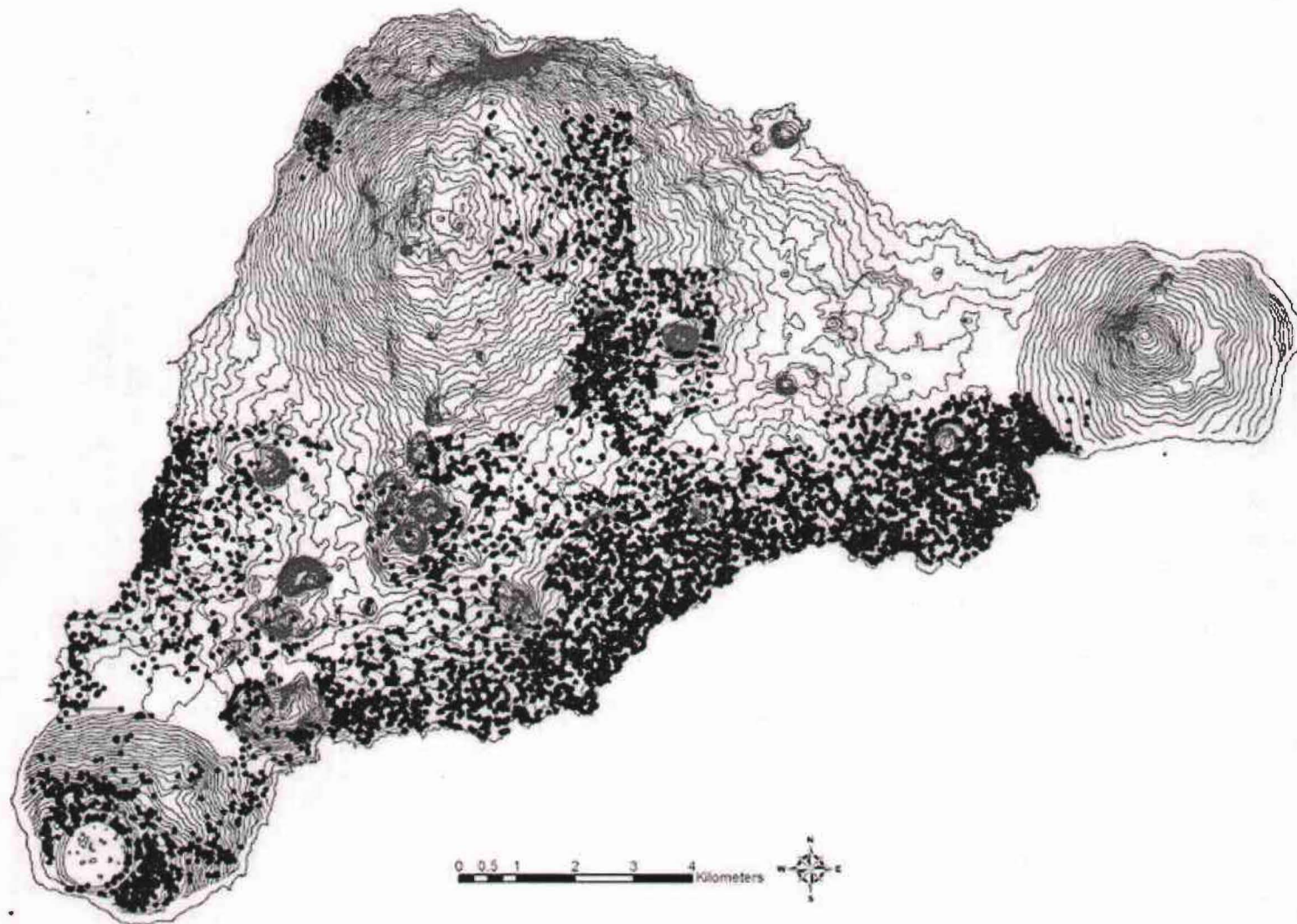
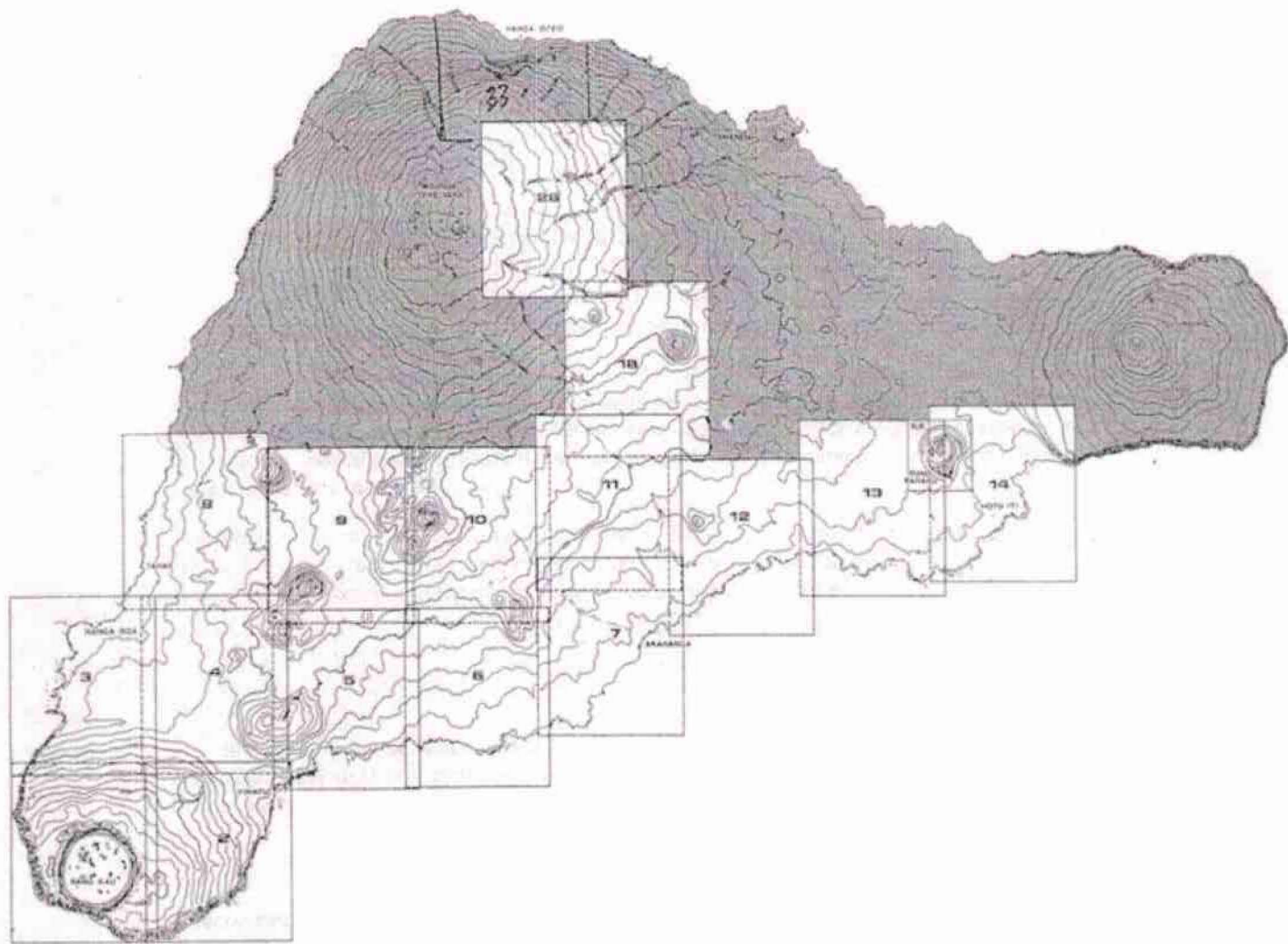


Figure 4. Distribution of Archaeological Features on Rapa Nui (digitized from Easter Island Archaeological Atlas, (Cristino et al 1981).



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Figure 5. Areas surveyed as of 1981 by the Easter Island Archaeological Survey, University of Chile (Cristino et al 1981).

approximately 7.5 by 2.5 kilometers, or 4,873 acres in area. At the time the research was collected for my present study only a limited selection of data was available from the extensive survey program conducted by the University of Chile. This consists of 611 feature descriptions from the western edge of the Akahanga quad. The features for both datasets were originally located by field-walking or ground survey, and were mapped using plane table and alidade.

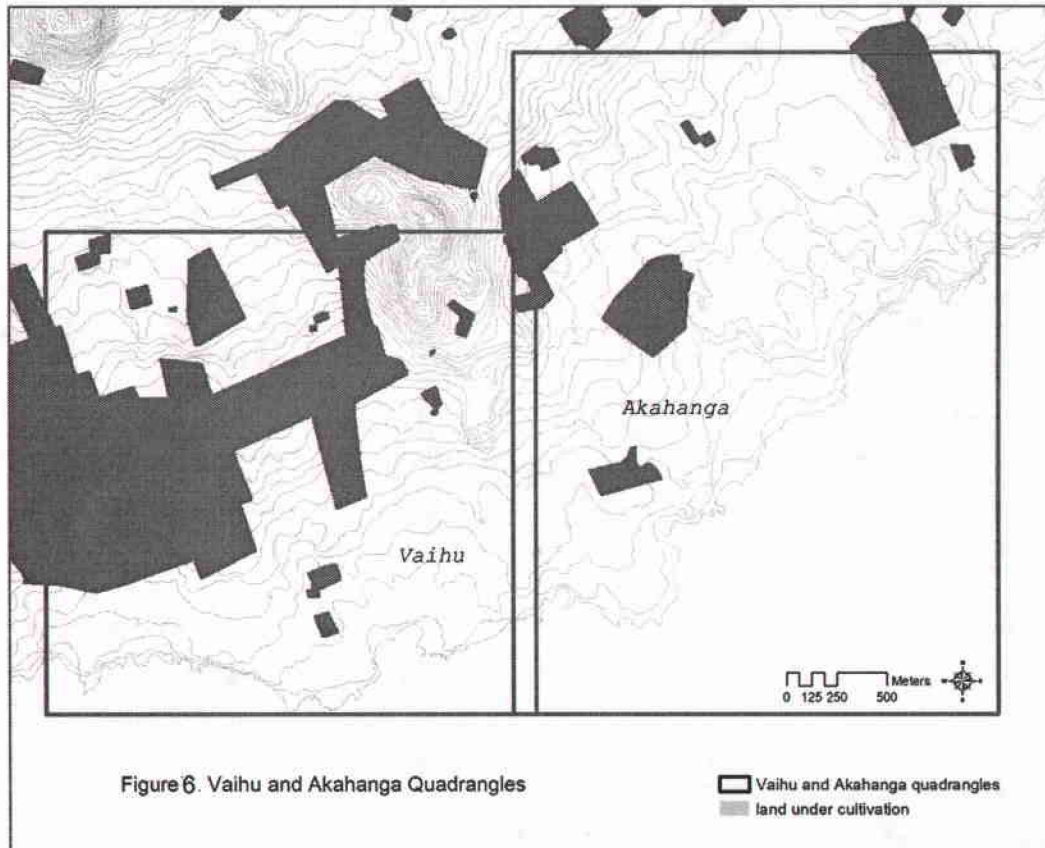
As the Chilean data covered only the western portion of Akahanga, I chose to focus on the 866 features identified by McCoy for the Vaihu quad, to the west of and adjacent to the Akahanga quad, to enable the analysis of a continuous section of the archaeological record (Figure 6). This study area, approximately 4 x 2 sq. km, has an advantage in that it contains similar topography and environment throughout, allowing for the comparison of feature classification and descriptions not confounded by issues of variable environments and landscape regimes.

This study was done through several weeks in July of 2003 as part of the University of Hawai'i Rapa Nui Archaeological Field School, under the direction of Dr. Terry Hunt. Between 8-13 students served as field recorders at any one time, always under the direction of teaching assistants with at least one season of field experience in Rapa Nui as well as graduate research interests on the island

Research Design

To examine these two sources, I initially chose a 10% random sample of each feature type previously identified and located by the investigators, to relocate and describe using the same criteria listed in their published works. A 10% sample was

chosen simply to gather as much data as possible about previous work within the limited time frame allowed. Thus, a 10% random sample of each feature type was



selected from McCoy's dataset and another 10% random sample of each feature type was selected from the University of Chile's dataset, and both were examined using the same descriptions/criteria they discuss as characteristic of each feature type. The two data sources were examined independently, since they are derived from different researchers, and thus different research contexts or conditions.

The 'feature types' were tabulated based on the identified feature definitions in the site records. Most of these correspond to McCoy's categories in Table 1, however not all features were identified as one of these types; some were identified under generic terms based on morphological characteristics such as 'stone structure' or 'stone outline'. As such, samples were based on the distribution of feature identities in the site records rather than McCoy's general categories. For instance, in addition to McCoy's general categories, a 10% sample was also obtained for features described as stone alignments or stone circles in the site records (Tables 2 & 3) to determine if we would have identified them in the same manner. These features were located using GPS units and coordinates derived from the Easter Island Archaeological Atlas (Cristino et al 1981).

In the attempt to relocate these samples in the field I encountered problems with reconnaissance accessibility in the Vaihu quad. A large portion of the quad was either under cultivation or contained private parcels that we had not obtained permission to enter (Figure 6). We examined and described the locations for those that were accessible, and supplemented other randomly chosen locations for those that were not. In the interest of covering as much ground as possible during the time allowed, several groups of surveyors worked in different sections of the survey area, each given a group of locations to examine along with substitute locations if needed; field descriptions, sketches and photographs were obtained for each feature relocated. At times this resulted in a more than 10% random sample as total numbers of features located were not known until the end of the workday. The project was stopped once we had at least a 10% sample of each of the feature types possible.

The accessibility restriction also resulted in problems with exploring all feature classes assigned by McCoy, as the rarer types tended to fall within the inaccessible portion of the quad. Tables 2 and 3 lists 1) the feature types described by McCoy and the University of Chile, 2) their frequency in the survey area and their proportion in the total population for each dataset, 3) the total number of features randomly chosen (number surveyed), and 4) the number of each type actually located and recorded. The 'number surveyed' versus the number actually 'located and recorded' reflects both the inaccessibility of features in the survey area, and the inability to locate features in areas that were accessible. In some instances, although the area was accessible we could not relocate previously identified features. I believe the primary cause of this is the level of landscape modification that has occurred since the initial surveys were done. However, in some instances another reason could be technical errors in the datasets, such as errors in mapping locations, digitizing, and the like. This was alleviated somewhat by surveying the area around the proposed feature locations to see if they could be located nearby, assuming that such errors have not resulted in substantially different coordinates. As the ultimate goal was to re-examine the descriptions/classification of previous researchers to see if we are identifying features in the same way, I supplemented additional randomly chosen locations to ensure that at least 10% of each feature type was located and described.

Study Results and Analysis

In the following discussion I present the results of the study. This consists of a listing of the previous definitions of the feature types employed by the investigators of the two data sources, the correspondence of our collected data with their

identifications and definitions, and an analysis of the consistency between the various datasets. Based on this analysis, a preliminary classification scheme is developed that identifies the relevant criteria that may be utilized to reliably assign the variety of archaeological phenomena on Rapa Nui to specific feature classes.

The definitions of feature types are primarily derived from McCoy (Table 1; McCoy 1976) as he offers more detailed descriptions than other published accounts, though when available additional description is included from Vargas Casanova (1998) and others. McCoy has identified 15 basic functional categories of features based on observed attributes and previous ethnographic accounts of use, function and/or context (Table 1). Some of the categories, such as houses, are further broken down into types or styles based on levels of variations in form, material, or construction. A final category is also included for those features that are deemed 'destroyed' or 'unclassifiable'. All other published analyses agree with these descriptions or have utilized them in their work, so I view them as representative of the types employed on Rapa Nui. A problem however, lies in the incompleteness of the listing. Only those types that occur most frequently have been described in detail, such as *manavai*, *hare moa*, ovens, pavements and *hare paenga*. Other functional types have been employed, but I have not been able to find adequate descriptions of what they are or the criteria used to assign them, such as *avanga*, *pu*, crematoriums, tombs, and boundary markers, to generate objective definitions. The descriptions for these are often brief accounts of their function (obtained from both published works like Métraux 1940, Routledge 1919, and from informants during the actual survey period), with vague reference to physical attributes. What is available will be

discussed below. There are also various features which previous investigations could not assign to a functional type. These are identified under generic terms based on morphological characteristics such as enclosures, stone alignments, stone circles, and stone structures.

Table 2. Feature Frequency and Sample Totals from McCoy's dataset

Category	Feature Type	Frequency	% of Total Features	Number Surveyed	Number Located/Recorded
Living Surfaces	House Type I- 'Indeterminate form' - pavements	81	9.4	15	11
	House Type I- 'Indeterminate form' - terraces	36	4.2	10	6
	House Subtype 1A- <i>hare paenga</i>	5	0.6	3	1
	House Subtype 1B	0	0	0	0
	House Type II – <i>hare oka</i>	0	0	0	0
	House Type III – <i>hare kau kau</i>	2	0.2	1	1
	Rock Scatters	15	1.7	4	3
	Rockshelters	123	14.2	17	12
Subsistence Features	<i>Umu pae</i>	202	23.3	33	20
	<i>Hare Umu</i>	3	0.3	2	1
	Earth Oven	17	2.0	4	2
	<i>Hare moa</i>	120	13.9	24	12
	<i>Manavai</i>	109	12.6	25	17
	<i>Pu</i>	1	0.1	1	0
Other-morphological	Foundations/Stone Structure	20	2.3	5	4
	Stone Alignments	10	1.2	4	4
	Enclosures	9	1.0	2	1
	Rock Walls	4	0.5	3	1
	Stone Outlines	7	0.8	4	0
Other- functional	Destroyed/Unclassified	0	0	0	0
	<i>Avanga</i>	27	3.1	4	4
	<i>Tupa</i>	0	0	0	0
	Crematorium/Tomb	11	1.3	2	1
	Boundary Markers	1	0.1	1	0
	<i>Ahu</i>	18	2.1	2	1
	Pathways	3	0.3	2	0
Miscellaneous artifacts – not surveyed	<i>taheta</i> , petroglyphs, isolated stones, etcetera	42	4.8	0	0
Total		866	100	168	102

Table 3. Feature Frequency and Sample Totals from University of Chile's dataset

Category	Feature Type	Frequency	% of Total Features	Number Surveyed	Number Located/ Recorded
Living Surfaces	House Type I- 'Indeterminate form' - pavements	57	9.3	7	7
	House Type I- 'Indeterminate form' - terraces	6	1.0	4	4
	House Subtype 1A - <i>hare paenga</i>	9	1.5	3	3
	House Subtype 1B	0	0	0	0
	House Type II - <i>hare oka</i>	2	0.3	2	1
	House Type III - <i>hare kau kau</i>	0	0	0	0
	Rock Scatters	0	0	0	0
	Rockshelters	48	7.9	6	6
Subsistence Features	<i>Umu pae</i>	112	18.3	17	12
	<i>Hare Umu</i>	18	2.9	4	3
	Earth Ovens	0	0	0	0
	<i>Hare moa</i>	58	9.5	16	14
	<i>Manavai</i>	91	14.9	13	11
	<i>Pu</i>	4	0.7	2	2
Other - morphological	Foundations/Stone Structure	6	1.0	3	3
	Stone Alignments	23	3.8	7	7
	Stone Circles	10	1.6	2	2
	Mounds	4	0.7	2	0
Other - functional	Destroyed/Unclassified	75	12.3	11	7
	<i>Avanga</i>	7	1.1	3	3
	<i>Tupa</i>	3	0.5	2	2
	Crematorium/Tomb	2	0.3	3	1
	Boundary Markers	12	2.0	2	2
	Basalt Quarry	1	0.2	1	1
	Water Well	9	1.5	2	1
Miscellaneous artifacts – not surveyed	<i>taheta</i> , petroglyphs, isolated stones, etcetera	54	8.8	0	0
Total		611	100	112	92

Living Surfaces

These are identified as areas and/or structures exhibiting characteristics of past occupation. The feature types included are houses, rock scatters and rockshelters.

Houses

There are three types of house structures defined:

Type I: This is the basic house form described in ethnographic accounts of the early 1900's (Figure 7; Routledge 1919, Métraux 1940). The archetypal description of this structure is an elliptical thatch hut that

has been repeatedly compared to an overturned boat with upward pointing keel. It consisted of a roof resting directly on the ground and supported by a framework composed of the following elements: a ridgepole, ridgeposts, rafters, purlins, and the central post. The curved rafters were either stuck into the ground or fixed in holes along rows of curbstones (Métraux 1940: 194, cited in McCoy 1976: 40).

The doorway was a narrow, tunnel-like opening located in the middle of one side, and there were often small openings on the ends of the structure. This category is broken down further into 3 subtypes: Indeterminate Form, Subtype IA, and Subtype IB.

Features defined as '**indeterminate form**' are considered the commoners' dwelling by McCoy. This house type leaves little archaeological evidence as to its structure, making it difficult to determine its size and shape. Most often it is identified by a stone pavement of usually "less than 25 contiguous, partly buried stones covering an area rarely more than 2 meters square" adjacent to the front side of the house (McCoy 1976:40). These pavements are different from those of other house types in that they are generally smaller and use angular lava rock (McCoy 1986: 145). When no pavement is present, McCoy states that this type can be identified by the presence of

an oven, chicken house, garden enclosure, or terrace. Terraces are generally small, crescent shaped, flat surfaces averaging between 2 – 4 m in length by 2 m in width; stone walls, if present, are usually less than 50 centimeters in height. When none of the above features are present, habitations of ‘indeterminate form’ can still be identified by the presence of “fire-cracked rock, obsidian flakes, water-worn pebbles, coral chunks, or thin slabs of basalt ...on a dark stained surface” (McCoy 1976:42).

Subtype IA are house structures called *hare paenga*, believed to belong to persons of high rank and wealth. These are large houses with dressed stone foundations or ‘curbs’:

The size of the stone curbs varies considerably; some are only 0.5 meters long, others are 2.5 meters or more; the average breadth is between 20 and 30 cm. As most of these curbs are firmly embedded in the ground, it is difficult to estimate their total height; generally they rise 1 foot above the ground. Their depth underground must be between 30 cm. and 1 meter. The unseen part is generally roughly carved and thicker than the upper part, which has sharp angles and smooth surfaces. The upper surface of each slab has 2 or 3 (rarely 4 or 5) cup-shaped depressions. These cavities, in which rafters were inserted, are 5 to 8 cm. deep with a diameter of 2.5 to 5 cm. The distance between them is variable (Métraux 1940: 194-195, cited in McCoy 1976:48).

The number of curbstones varies with the length of the structure and individual curbstone length. Contiguous with these foundations are large pavements made of water-worn beach stones. The foundations are generally 10 to 15 m long, and 1.5 to 2 m wide. Vargas Casanova generally agrees with this description, though she finds that these structures average 12 - 18 m in length. She also adds that the entrance, always located in the middle of one side, is narrow with a low access of 0.80 - 1.20 m in length and 0.45 - 0.60 m in width, defined by two parallel alignments of dressed stone. The pavements, located on the entrance side, are “crescent moon shaped ...covering a

similar surface to that of the interior of the house”, and are normally 2 - 3 m its widest extent (Vargas Casanova 1998: 117).

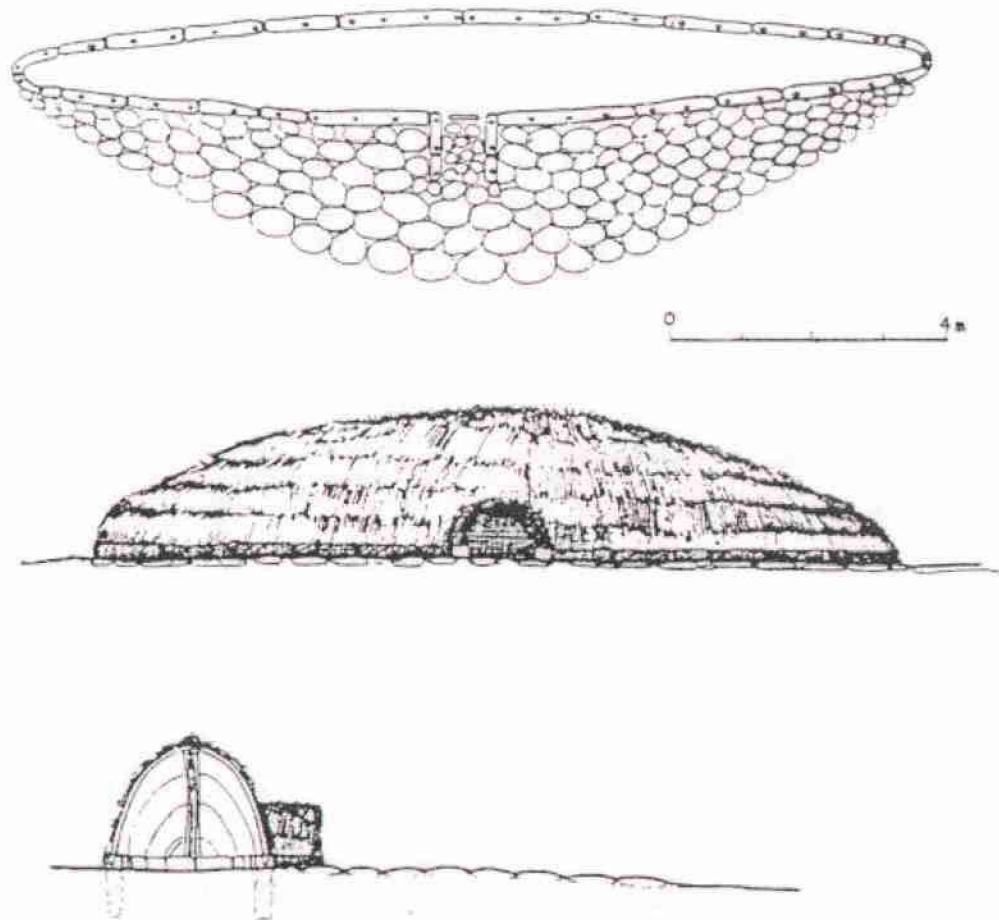


Figure 7. Basic form of elliptical thatch hut. They may or may not have the dressed curbstones depending on subtype (from Vargas Casanova 1998:120)

Subtype IB is the least represented of McCoy’s three subtypes of the Type I house. They are characterized by elliptical foundations made of undressed curbstones lacking the cup-shape depressions found on stones of *hare paenga*. A beach stone pavement is also contiguous to the foundation. Vargas Casanova agrees with McCoy’s description

of the structures included in his Indeterminate Form and Subtype IB, though she combines them into one group (Subtype 2) (Vargas Casanova 1998: 119).

Comparison:

There were houses of both 'indeterminate form' and subtype IA (*hare paenga*) in the survey area. The houses of 'indeterminate form' included stone pavements and terraces.

Type I - Indeterminate form – Pavements

Of the 81 pavements identified by McCoy in the Vaihu quad, 11 were relocated and described. Most often McCoy's site records only state the presence of a pavement made of beach stones, though at times an approximate length is given, yet all of the descriptions for the 11 features relocated generally agreed with the definition above. The differences from the above description are in the said use of 'angular lava rock' in these pavements. I find that in general, these pavements are made of smooth, water-worn, dense beach stone (at times intermixed with vesicular water worn stones), which are placed contiguous to each other on the surface or embedded in the ground. The average size is about 20 – 30 cm, though larger stones of 40 – 50 cm are not uncommon.

Some of the pavements identified also have 1) a border along one edge made of beach stones embedded vertically in the ground, or 2) a possible entryway marked by two vertical beach stones placed ~50 cm apart in the center of one border (Figure 8). It also appears that pavements located near the coast (in the Vaihu quad) tend to be made of, on average, larger beach stones ~50 – 70 cm, and at times of a more porous

or vesicular beach stone that is darker in color. These pavements may have belonged to McCoy's Subtype IA structures (*hare paenga*) but the dressed curbstones that served as the foundation have been removed or recycled. Evidence for this is the presence of these stones in nearby rock walls (*pirca*) used for land divisions or for the containment of cattle in the historic period.

Of the 57 pavements identified by the University of Chile, 7 were relocated and described. The site records for this dataset are much more detailed allowing one to note dimensions and other attributes of the features described. Again their descriptions correspond with the characteristics noted above. This group had the added benefit of containing three more complete pavements, from which we may infer the original shape, dimensions and orientation of the structures; they tend to be crescent-shaped with the curved border oriented toward the coast, and between 11 – 13 m in length by 2.5 – 3 m in width (Figure 9). The pavements are identical to those house structures with foundation stones, with the exception of possible differences in the size of the stones used, as explained above.

If the basic attribute of the 'presence of beach stones' is taken to be the primary criterion for identifying a feature as a pavement, then there appears to be consistency within this feature type. This system is insufficient however, for examining variability among these features as differences, such as the presence of the water worn stone borders and entryways and differences in size or type of stone used, are masked under the single common-sense title of 'pavements'.

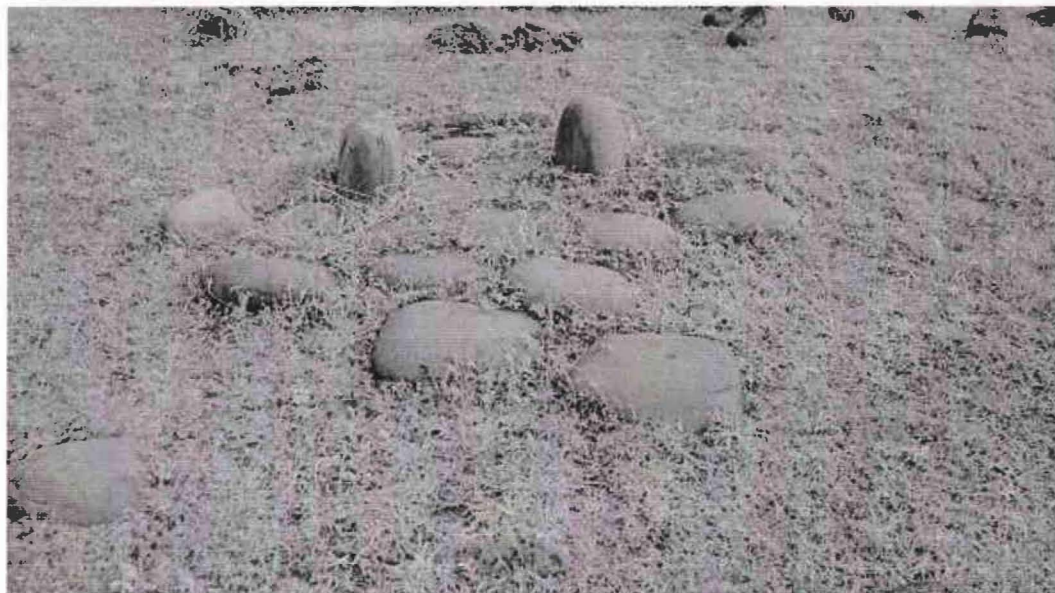


Figure 8. Pavement with vertical stones at entryway (Rapa Nui Archaeological Field School)

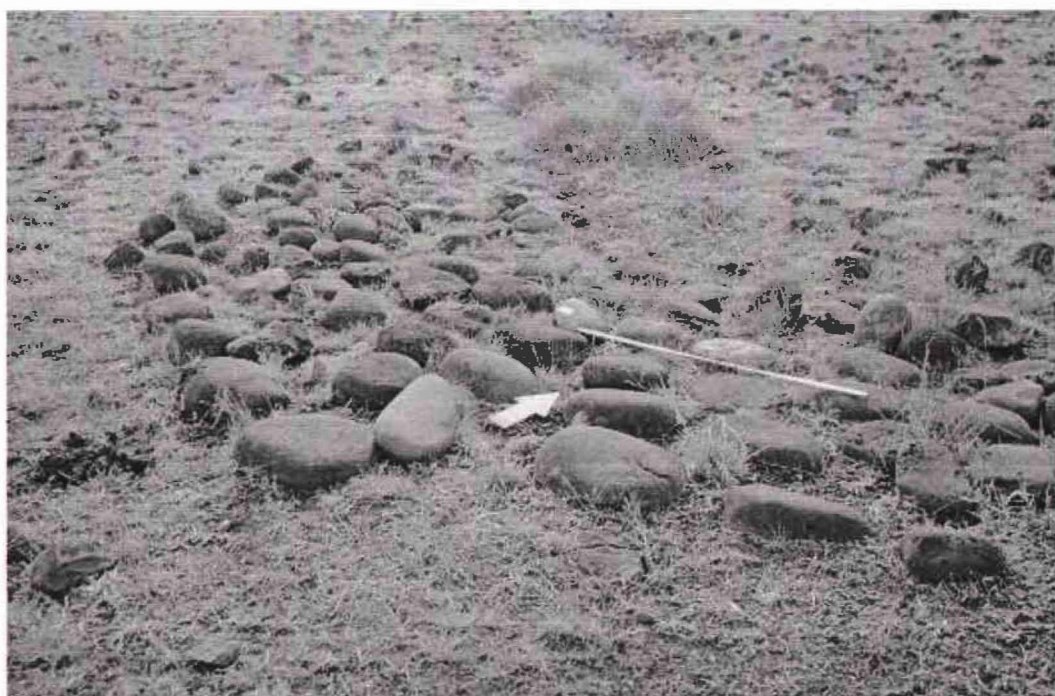


Figure 9. Nearly complete pavement (Rapa Nui Archaeological Field School)

Type I – Indeterminate form - Terraces

Of the 36 terraces identified by McCoy in the Vaihu quad, six were relocated and described. All except one feature coincides with the given definition of a terrace. They consist of low retaining walls, generally less than 50 cm in height and made of one course of contiguous boulders averaging 50 cm in size (though with some on either side of the size range). One of the features has a wall height of 0.81 m made of stacked stones, with a small cave to the rear of the terraced area. Four of the walls are curved, almost semi-circular, and two of them are straight. These walls serve as the front margin of a flat or level surface that averages between 4 – 6 m in length by 2 – 3 m in width.

The feature that does not correspond to the above descriptions has no wall to indicate cultural origin. It consists only of a rock outcrop with a level surface both above and below. Approximately 10 m distant are a *manavai* and *hare moa* suggesting, but not requiring, a habitation site nearby. McCoy identifies the lower surface as the terrace and provides dimensions of 5 – 6 m by 2 – 3 m. We could not identify any boundaries, but the land area does appear to be elevated above the adjacent features. This alone does not provide enough evidence of cultural use and so was not identified as a terrace in the sample survey.

Of the six terraces identified by the University of Chile, four were relocated and described. They all consisted of curved retaining walls with upper surfaces that are relatively flat or level. The level surfaces average between 6 – 7 m in length and 3 – 5 m in width. Two of the retaining walls are made of several courses of stone, with heights of 0.7 and 1.1 m (Figure 10).

In both of the datasets, terraces were found to be on gradual slopes, on the lower surface adjacent to bedrock outcrops, or in front of cave openings. Although lumped under one functional category, there may be significance in the different wall heights employed in these 'terraces'.



Figure 10. Terrace with retaining wall (Rapa Nui Archaeological Field School)

Subtype IA - Hare paenga

Of the five *hare paenga* identified by McCoy in the Vaihu quad, one was relocated and described. This feature consisted of three dressed curbstones embedded in an alignment of approximately 8 m in total length, with a space of 4.8 m between two of the stones. The lengths of the stones range between 0.65 - 1.5 m. The stones are worked or dressed, meaning they have been modified to form their characteristic rectangular shape, though only one has a cup-shaped depression. That this structure is a foundation is inferred based on the definition above, and due to the fact that the

stones appear to be *in situ*. There has been disturbance in the surrounding area as it is located near the main road on the coast, which may explain the incomplete foundation and the lack of a beach stone pavement.

Of the nine *hare paenga* identified by the University of Chile, three were relocated and identified, which generally fell in line with the descriptions above. One of these was well defined, with a nearly complete foundation of 23 dressed, embedded curbstones forming an elliptical shaped perimeter. Four of the dressed stones were placed perpendicular towards the center on the seaward border of the foundation, marking the entryway to the structure. All except two of the curbstones had cup-shaped depressions on the top surface, though the depressions on the stones marking the entryway also connected to holes drilled out on the lateral sides of the stones. There was also a disturbed beach stone pavement adjacent to the seaward border of the structure, with beach stones also embedded within the entryway. The pavement is crescent-shaped, with stones placed in parallel rows moving out from the structure. The second feature relocated consists of a foundation of 14 embedded, dressed curbstones forming an elliptical shaped perimeter. Three of the stones have cup-shaped depressions, and two of the stones in the foundation are made of red scoria. The entire structure is approximately 11.2 m in length and 2 m in width. The third resurveyed feature is disturbed and incomplete. It consists only of one embedded dressed curbstone with cupped depressions on the surface that connect to holes on the lateral sides of the stone, and four beach stones embedded in the ground adjacent to it. As it is disturbed it is difficult to state with certainty that it was a *hare paenga*, though

the features present and as they appear *in situ*, may support its placement it in that group.

Due to the past and present modifications to the landscape the original structure of many archaeological features has been greatly altered or disturbed, making it difficult to determine the original form. This has led to the tendency to infer and reconstruct remains based on circumstantial evidence. This in itself is not bad research, yet because little is known about the functional or stylistic variety on the island it would be wiser to take the conservative viewpoint and somehow separate obvious from not so obvious structures. The primary criterion for identification as a *hare paenga* in previous investigations is the presence/absence of dressed curbstones outlining the perimeter, yet through time these stones have been incorporated into many different types of features. In this sense, identifying curbstones as evidence for a habitation structure may be misleading until more evidence is found to support that conclusion. Variations within more complete structures may also imply stylistic or technological differences (e.g., use of red scoria as curbstones), and should be identified in such a way as to facilitate more detailed investigations into these features. The sample from the University of Chile notes the presence of this variability, but due to the inconsistencies thus far it is impossible to be certain that this is being done repeatedly throughout both datasets examined.

Type II: Round thatch huts (*hare oka*)

This is the second major house type, described as round thatch huts. These are described as a single course of undressed stones arranged in a circle. The diameter

ranges between 1.5 to 9 meters, with the majority being between 2 to 4 meters in size (McCoy 1976:53). According to Vargas Casanova, these structures also occur in oval plan shape, averaging 4 by 3 meters in size (1998: 124). In some instances, these structures are defined by a single alignment of flat stones, probably belonging to an outside pavement, rather than by the foundation of embedded stones (Figure 11).

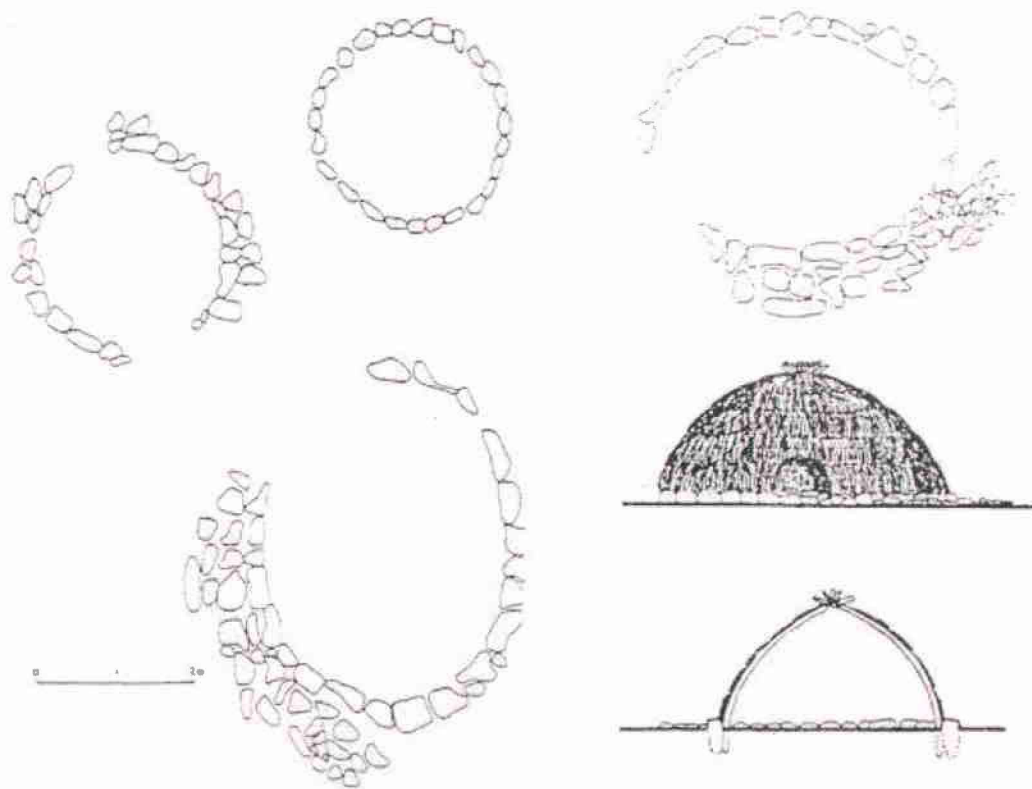


Figure 11. Round thatch huts (from Vargas Casanova 1998:125)

Comparison:

There were no features of this type identified by McCoy for the Vaihu quad, though of the two *hare oka* identified by the University of Chile, one was relocated and recorded. It consisted of one course of 18 embedded stones forming a relatively oval shaped perimeter; the stones were of rough basalt, averaging 60 x 20 cm in size.

The structure was approximately 7.5 by 5 m in size. This generally corresponds with the definition above, however with the lack of other evidence it is difficult to state with certainty that this represents a habitation structure. McCoy describes these as temporary structures as they are not associated with other subsistence features or refuse mounds, however more research is necessary to support/negate that hypothesis (McCoy 1976: 55). The large range in diameter given for such features—1.5 to 9m—also questions the utility of identifying these features as habitations, as they may encompass a variety of functional types.

Type III: Rectangular thatch huts (*hare kau kau*)

These have also been identified by McCoy as temporary structures, due to the absence of a garden enclosure or chicken house and a “minimal midden deposit” (1976: 57). They are described as rectangular thatch houses, defined by parallel stone alignments set in the ground. Some structures show a sub-rectangular shaped perimeter, with the longest sides parallel and the shorter sides slightly curved. The length of these structures ranges from 2 to 5 meters and the width averages 2 meters. Vargas Casanova adds that these are sometimes defined by double alignments with 10 – 15 cm between them (Figure 12). There may also be a row of flat stones placed as a pavement around the structure about 10 - 15 cm from the foundation. The entrance is located along the one of the longer sides and is sometimes identified by a small rectangular area paved with flat stones with an outline of thin slabs vertically embedded in the ground (1998: 124).

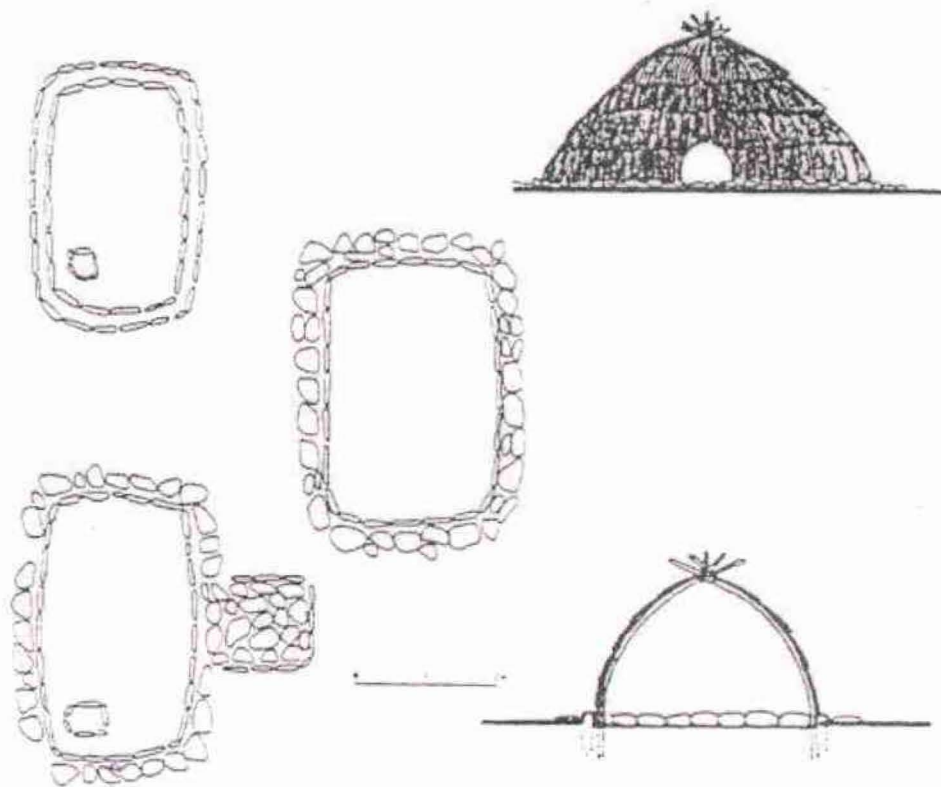


Figure 12. Rectangular thatch huts (from Vargas Casanova 1998:125)

Comparison:

McCoy identified two of these features in the Vaihu quad, one of which was relocated and recorded. This feature consisted of a sub-rectangular foundation outlining the perimeter, with the eastern end being either removed or deliberately left open. This foundation is made of embedded boulders, averaging 40 cm in size, and has a total length of approximately 2.6 m and width of 0.9 m. Although its general form may place this structure in the class of rectangular houses this, and the other feature McCoy described for the Vaihu area, are different than those more commonly represented in other areas. On Rano Kau, the identified rectangular houses (n=11)

average 2 – 5 m in length, but at least 2 m in width. The features in the Vaihu quad would seem to be too narrow for inclusion into that group. There are no other attributes cited by McCoy that would justify their designation as ‘house’ sites, other than the presence of an oven nearby. More research needs to be conducted on such features before their function can be determined.

Rock Scatters

This group consists of amorphous scatters of beach and/or curbstones identified by McCoy as habitation sites in the Vaihu quad. Of the 15 scatters identified, three were relocated and recorded. The first contains three dressed curbstones with cup-shaped depressions and several beach stones lying on the surface in an area of approximately 20 m. The second contains three dressed curbstones with cup-shaped depressions embedded in an alignment, though two stones are separated by 6.5 m. There are beach stones scattered on the seaward side of these curbstones. The third feature contains a scatter of 23 large beach stones averaging 70 – 90 cm in size, some of which are embedded in the ground. This feature is bounded on both sides by roads, and there is a modern cattle wall (*pirca*) with dressed curbstones mixed within located nearby.

In all it appears that these concentrations of worked and beach stone may represent highly disturbed house structures, possibly of the *hare paenga* type. Two are located less than 20 m from a road and one is nearly adjacent to a *pirca* wall, both of which may have influenced the removal from or disturbance of stones in the structures.

A review of the site records for the University of Chile found five features that are similar in attributes with McCoy's "rock scatters". Unfortunately, these were not included under the classification of rock scatters during my study and so were not sampled in the survey. They are identified as the 'remains of a house' in the site records, and the descriptions provided indicate scatters of both dressed curbstones and beach stones in four of these sites. One only describes an alignment of four embedded stones, with no indication of stone type.

The fact that seven of the rock scatters discussed above may originally have been of the *hare paenga* group, as they contain both dressed curbstones and beach stone, suggests that the *hare paenga* structures were, and are, a target for recycling or destruction. Two reasons for this may be the presence of more highly valued stone which may be incorporated into other features (see discussion of ovens below), or simply the fact that these structures tend to be located on the coast, in areas that have historically seen more landscape use and modification. This is not to suggest that other features have not experienced the same amount of modification or disturbance; it is only to point out possible biases incorporated into analyses about the distribution of these structures. It is not known whether these types of rock scatters have been included or omitted under the label of *hare paenga* in past analyses of settlement distribution; the criteria for inclusion for one researcher may be different than that for another, and this difference *may* result in varying conclusions about past settlement patterns for the island. On the other hand, as mentioned previously caution must also be used when identifying these features as *hare paenga* or habitations because the level of disturbance may mask other functions.

Rockshelters

There are three primary types of rockshelters:

Type I, called *karava*, are simple shelters made of a rock overhang, with both shelter depths and widths of less than 1.5 meters. There are rarely modifications to the shelter nor features associated with them, and as such are considered to have been used infrequently in the past.

Type II shelters, called *ana*, are overhangs, caves, or lava tubes larger than Type I shelters. The largest shelters range from 6 to 8 meters in both depth and width, with 2 meters in height. Partially sealed entrances are common cultural modifications, and some contain shallow firepits. These shelters usually have associated features such as ovens, midden deposits, chicken houses and/or garden enclosures. It is the presence or absence of these associated features that determine whether these shelters were temporary, semi-permanent or permanent habitations.

Type III shelters, called *ana kionga*, are refuge caves. They are characterized by the highest level of modification, usually in the form of “elaborate corkscrew entrances”, and are said to have been located on cliffs or in areas where they could be concealed from enemies. Métraux notes that these caves were utilized only later in the islands prehistory, around AD 1680, during the proposed time of intensive warfare on the island (1940: 194). He describes one such cave:

Its existence is revealed by a low mound paved with boulders. A shaft 2 meters deep and lined with stones joins a horizontal passage, also flagged with carefully dressed stone, which is so low that one must crawl through it. The chamber to which it leads is oval and about 2.5 meters high. One side is natural rock and the other is faced with carefully laid stones...the top of the cave has been roofed over with slabs where it otherwise would be open to the sky (1940: 193, cited in McCoy 1976: 37).

Comparison:

The 10% resurvey for rockshelters did not differentiate between the three types listed above. McCoy rarely assigned the rockshelters he identifies to specific types, and although the University of Chile's records for the most part identify their rockshelters as one of the three, it is not done consistently, with some rockshelters identified only as caves. As the distribution of the various types is therefore uncertain, I chose to sample the group as a whole. The terms 'caves' and 'rockshelters' are used interchangeably.

Of the 123 caves sites identified by McCoy for the Vaihu quad, 12 were relocated and recorded. Of these, 11 were rockshelters of variable dimensions. Eight of the shelters had dimensions ranging between 2 – 5 m breadth and 3 – 5 m depth. One of the shelters was approximately 4 m in breadth and 10 m in depth, with human remains present within. All of these shelters contained some type of modified wall around the entry, which narrowed the opening to anywhere between 0.4 – 2 m. One of these also contained a rock wall in the interior of the cave.

Two of the caves were identified as possible *ana kionga*, as the entryways were extremely modified with boulders making tight, narrow entries, which opened up to larger rooms (Figure 13). We did not enter these structures, but McCoy describes their dimensions. The interior of one cave is approximately 2 m deep, 3 m broad, and 1 m in height; the other is approximately 25 m deep, 4 m broad in the center, though it also contains a separate passage that extends for 10 m. This second, larger cave also contained several dressed curbstones, beach stones and other artifacts.

The last feature relocated is described by McCoy as a midden cave, made of a “large, artificial earth mound of small rock 5 – 6 m across noting the location of a buried habitation shelter...no idea of where the entrance is could be gathered”. Our description corresponds to his, though it is impossible to identify it as a cave as it has no characteristics that would identify it as such.

With the exception of this last feature, all the caves relocated contain modifications that imply cultural use. Based on McCoy’s criteria above, the two features identified as *ana kionga* appear to fit the criteria well, with their highly modified entryway, and the others, though variable in size, would seem to fit the *ana* type with their slightly lower levels of modification.

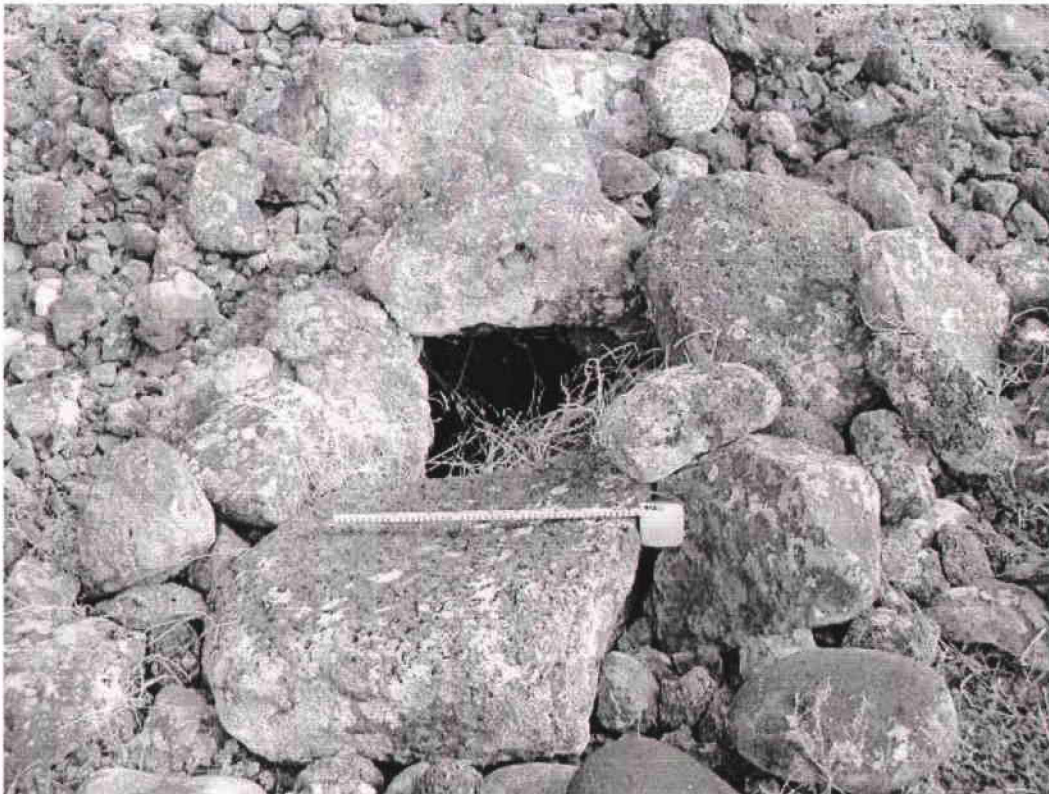


Figure 13. Highly modified entry to an *ana kionga* (Rapa Nui Archaeological Field School)

Of the 48 caves identified by the University of Chile, six were relocated and recorded. All except one of our descriptions were relatively the same. One was identified as a *karava* in the site record. It had a floor space of 3 x 3 m, with possible modification in the entry noted by several stones vertically embedded in the ground.

Three of the caves were identified in the site records as *ana*. One of the caves fit the criteria of an *ana* with a rock wall lining an entry of 4 by 1 m, and with a depth of approximately 3 m. The site records noted the presence of human remains within. A second cave identified in the site record as an *ana*, seems to better fit the criteria of an *ana kionga*, with a highly modified, narrow entry that extends down vertically for about 2 m. The cave was not entered during our survey, but the site record described the interior as approximately 3.5 by 3 m. A rock wall is also present within the cave.

The third cave that was identified in the site record as an *ana* was not identified as such in our study. The site record notes an entry of 60 – 70 cm in a rock outcrop, with an interior length of 3 m. In the resurvey the outcrop was located, with an oval opening on the top surface extending down vertically. This opening was about 2.5 m in length and 1.5 – 2 m in width. On the western side was an overhang about 3 m in length, but with a height of only ca. 20 cm. It is possible that the ceiling had collapsed sometime after the original survey in 1977, but it cannot be proven without excavation. There is also no note of cultural modification in the site record, throwing into doubt that the type names assigned to these features are consistent as the primary difference noted in the descriptions of these types is the level of modification.

The last two caves relocated were identified as *ana kionga* in the site records and our descriptions of the exterior of the caves correspond well. The caves were not

entered during the re-survey, and so we rely on the site records for the description of the interiors. Both are highly modified with narrow entryways and rock walls in the interior. One is located on a relatively flat plain and lies somewhat below a *hare moa* structure. This probably represents a collapsed lava tube that was later built up on its sides and roof with boulders, beach stones and dressed curbstone. The other is marked by a vertical entry into a rock outcrop with no visible modification in the surface. The interior of the entryway was 0.85 x 0.35 m, it appeared to be walled, and extended down vertically for approximately 1m. The site record indicates an interior dimension of approximately 3 x 2 m with another possible chamber of 2 x 2 m that has been blocked off by a rock wall.

In sum, all except two of our site descriptions correspond well with McCoy's and the University of Chile's records. However, the review of the two datasets shows inconsistency in assigning type names. A new system for identifying the variability in rockshelters across the island is thus necessary to enable a more coherent discussion about their use potential and distribution.

Subsistence Features

There are three types of subsistence features that are frequently represented archaeologically by discrete structures across the landscape. These are ovens (*umu*), chicken houses (*hare moa*), and garden enclosures (*manavai*). Another less common feature are *pu*, which will be defined below. Researchers have recently identified other forms of agricultural features, such as rock mulch gardens and small planting circles.

Neither of these were identified in the two datasets and so are not examined in this study, however, brief descriptions of these additional features are given for reference.

Ovens

The most common type of oven is the *umu pae*, which are stone-lined and of pentagonal, rectangular or circular shape. They average 50 cm in diameter and 30 - 60 cm in depth.

A second type of oven is the *hare umu*, or “oven house”. These are cooking sites covered by thatch roofed structures, and are identified by a circular stone outline averaging 2 - 3 m in diameter with a stone-lined oven, *umu pae*, in the center.

Comparison:

Umu pae

Of the 202 *umu pae* identified by McCoy for the Vaihu quad, 20 were relocated and recorded, and of the 112 identified by the University of Chile, 12 were relocated and recorded. All corresponded with McCoy’s descriptions, although McCoy’s records most often only provide names for the features, with no description of their attributes. Eighteen of the ovens were complete, consisting of 4 - 7 stones, with interior diameters of 50 – 70 cm (Figure 14). The other fourteen were incomplete, though with a minimum of three stones. This type of oven is identified by small enclosures of contiguous stones embedded vertically in the ground. When the structures are incomplete, they are still usually easily identified by the size and placement of the remnant vertically embedded stones, and by the potential size of the enclosure they may form. However, with two or less stones it becomes more difficult

to positively identify them as ovens, requiring the examination of their contexts within a larger area to support the determination.

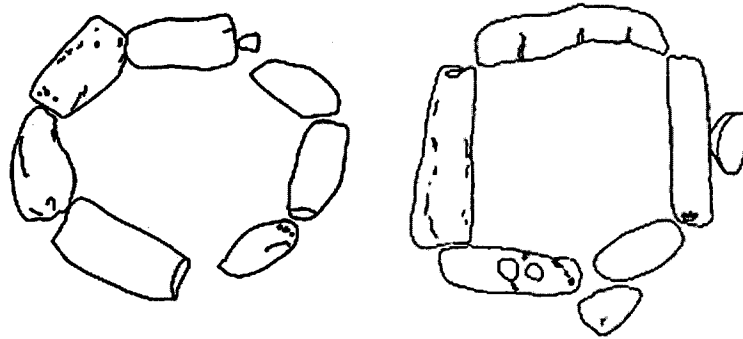


Figure 14. Drawing of *umu pae* identified in the field (Rapa Nui Archaeological Field School)

In some instances, these features consist of one or more dressed curbstones or water worn stones of the type used in the house structures (n=6 in the total sample surveyed). This may provide evidence of recycling of materials during the prehistoric or protohistoric period, requiring caution in performing settlement studies based on feature distributions. The use of these stones in other features brings into question the extent of such recycling, For instance, how many features were dismantled for the use of these materials? As these types of stones required more labor investment to make and/or move, rather than investing labor on the construction and/or movement of new stones it is likely that they were taken from original, abandoned structures for use in others. The timing of such events is unknown, as there are few dates for habitation features, adding to the question of the contemporaneity of the structures across the landscape. Various hypotheses are possible regarding the occurrence of these stones in features other than house structures, and must be taken into account when evaluating

past settlement patterns (e.g., the stones were cast-offs during the construction process or they are not confined to use in house structures and were consciously made for the various features).

For all of these reasons, it is important to adequately describe the attributes of these features to enable more detailed analyses of their construction and distribution. Simply labeling them 'ovens' or '*umu pae*' in site records, as in McCoy's records, again makes it difficult for other researchers to examine this existing variability.

Hare Umu

Of the three *hare umu* identified by McCoy for the Vaihu quad, one was identified and relocated, and of the 18 identified by the University of Chile, three were identified and relocated. All correspond to the above description. Minimally, these are



Figure 15. *Hare umu* structure (Rapa Nui Archaeological Field School)

identified by the presence of a curved or semi-circular alignment of embedded stones surrounding an *umu pae* (n=3 in the samples surveyed). This alignment is on average 1.5 – 2 m distant from the *umu pae* structure, and generally located on the side facing the wind (Figure 15). At times the alignment is completely circular, forming an enclosure around the *umu pae* (n=1 in the samples surveyed).

It is unknown whether the original structure was designed to have complete circular enclosures around the oven, or whether the semi-circular alignment was also an intended design. The description above implies an original circular form, however the frequency of the semi-circular alignments and their tendency to exist on the windward side of the structure suggest an intended design. Ethnohistoric accounts support this hypothesis as La Perouse “observed that cooking areas possessed small windscreens” (La Perouse 1798: 349, taken from Stevenson & Cristino 1986: 32); more research on these structures may provide other support for this hypothesis (e.g., excavation may reveal postholes or other structural evidence for the presence of a windbreak or “thatched roof structure”, as described above). An alternative idea is given in a site record from the University of Chile, which proposes that the circular enclosure served to protect the oven from water runoff or drainage. Again, more research needs to be conducted to negate/support these ideas.

Earth Ovens

A last group of ovens that were identified by McCoy in the Vaihu quad were *earth ovens*, or ovens without a stone lining. The presence of these was noted

primarily by an artificial earth mound, with carbon and burnt rock on the surface. Of the 17 described by McCoy and the four that were resurveyed, none could be positively located and identified. Two possible features consisted of a mound with 3 shallow depressions on the surface of each. This however, conflicts with McCoy's description of three separate mounds for each feature. There was no other evidence identifying an oven in the nearby area. As his survey was conducted in 1968 it is possible that such features have eroded or been destroyed, however until this can be determined (i.e., excavation may locate charcoal or fire-cracked rocks) we must use caution when including the location of these in any analysis.

Chicken Houses

Called *hare moa*, these structures are said to have been used to house chickens during the night to prevent their theft by others (Routledge 1919: 218; Métraux 1940: 203); the entryways into the structure were blocked off by large stones, whose movement would have caused enough noise to alarm the owners. These structures were not documented in historic accounts until the late 1800's (Palmer 1870), leading McCoy to suggest that they were relatively recent introductions on the landscape, possibly appearing between AD 1770-1868 (1976: 23). They are described as

rectangular, thick walled, level topped structures of dry masonry, with a normal height of 1.5 - 2 meters, width of 2.5 - 3.5 meters, and a more variable length of c. 5 - 6 to more than 20 meters. Occasionally the ends are slightly rounded. A small number recorded in the survey are round. The usual form has a low, narrow chamber in the center, extending part or nearly the whole length of the walls, with one or two lateral entrances at or slightly above the ground level (Figure 16; McCoy 1976: 23).

Vargas Casanova adds that

the walls are built with stacked stone interior and exterior facings, with a core of smaller cobble fill in the center. A long and narrow chamber (0.45 - 0.60 m wide)

extends along the longitudinal axis of the structure, 0.90 - 1.40 m from the ends. These chambers are connected outside by one or two long and narrow entrance tunnels, measuring 1 - 1.5 m long, 0.30 m height and 0.20 m wide. Their position in the side of the structure define the location of the interior chamber's floor, which normally varies from 0.30 - 1 m above ground level. Average *hare moa* range in size from 3 - 12 m long, 1.8 - 2.8 m wide and 1.5 - 1.8 m high (Vargas Casanova 1998:124).

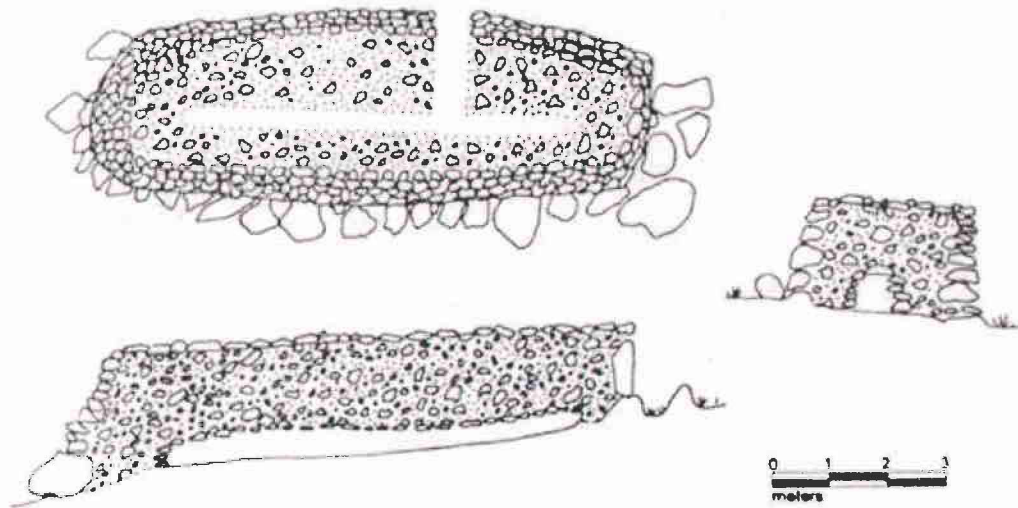


Figure 16. Diagrammatic sketch of chicken houses (*hare moa*) (from McCoy 1976: 29)

Comparison:

This has proved to be the most difficult feature to identify on the ground. The above descriptions refer to the ideal or complete forms of *hare moa*, completely preserved in their original design. Unfortunately, they are rarely represented as such in their archaeological counterpart. They tend to be the most disturbed of the feature types, often destroyed beyond recognition in the field. Previous researchers have acknowledged that 'substantial numbers' of chicken houses or garden enclosures have been destroyed, making them difficult to identify; in some instances these have been defined only as 'destroyed sites' in their feature descriptions (Stevenson & Cristino

1986). For this reason, the dimensions of the features described are estimates as it was difficult to determine the extents of many of the structures.

For this class of features, McCoy's site descriptions were largely vague. In some cases he simply identifies the presence of a *hare moa* as a "concentration of stone"; in others he notes the presence of portions of a "foundation" and extrapolates the dimensions for the structure. Of the 120 features of this type described by McCoy for the *Vaihu* quad, 12 were relocated and recorded. Our general descriptions corresponded, however many of the features do not contain specific attributes or any of the criteria listed in the above descriptions to warrant the designation of a *hare moa* structure. Of the 12 examined, nine were identified as 'possible' *hare moa*. Out of these, only 4 contained enough attributes to confidently place them in this class. One of these was a well-preserved rectangular structure 8 m in length, 3 – 4 m in width, and 1.2 m in height, attached to a *manavai* (garden enclosure). The interior structure could not be examined, but its overall appearance fit well with the above description. The other three consisted primarily of 3 - 4 parallel, embedded alignments of boulders (Figure 17: A, C). The outer alignments averaged between 7 – 9 m in length, with two shorter alignments embedded between them. In two of these structures, the outer alignments curved inward and joined at the ends to form a sub-rectangular shape. The maximum width was between 3 – 4 m, with usually less than 1 m separating each alignment from its nearest neighbor. The areas between and around these alignments were also covered with cobble fill. The outer alignments appear to correspond to the outer foundation of the structure, while the interior alignments may represent the remains of its inner chamber. The cobble fill is all that remains of the larger structure.

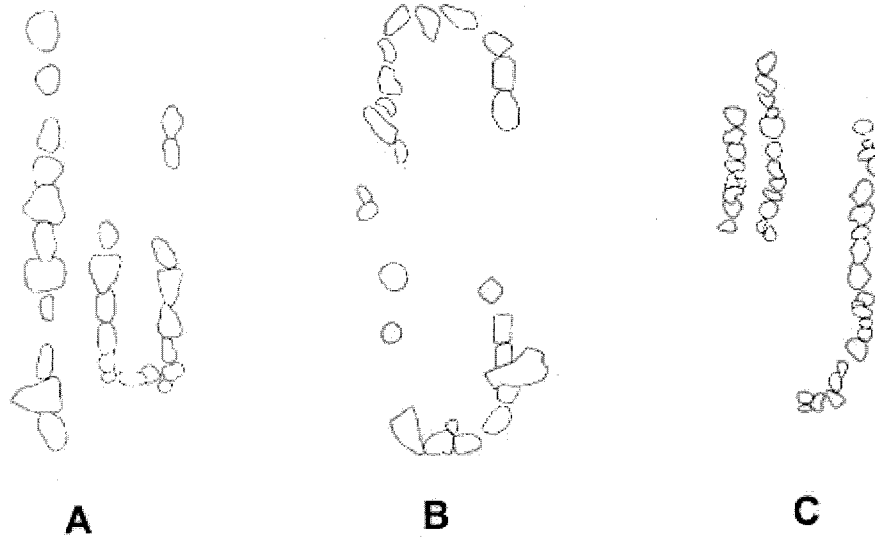


Figure 17. Drawing of several *hare moa* identified in sample survey (Rapa Nui Archaeological Field School)

Of the remaining five ‘possible’ *hare moa*, two consisted of only two parallel alignments of embedded boulders, surrounded by scattered boulders and cobble fill. These alignments were straight, approximately 2 – 3 m apart, and formed borders up to 9 m in length. This may correspond to the outer borders of the *hare moa* structure, as the dimensions fall within the range given. Of the last three, two structures each contained two parallel, circular to ovate alignments lying less than 1m apart, while the other consisted of a single sub-ovate alignment of stones. All three were surrounded by scattered boulders and cobble fill. These may represent the foundations of *hare moa*, however, they also fit the criteria for double-or single-walled garden enclosures, making it difficult to determine which class they belong to.

The last three features relocated had no characteristics to define them as a *hare moa* other than a concentration of boulders (avg. 30 – 50 cm) and smaller cobbles

scattered on the surface of the ground. The boulders were identified as scattered “foundation stones” in McCoy’s records, but as there is no structure left it is difficult to support that conclusion.

The same problem with identifying these structures is evident in the University of Chile’s site descriptions as well. Of the 58 features of this type identified in this dataset, 14 were relocated and recorded. Interestingly, although the general descriptions were for the most part similar, the descriptions by the University of Chile provided details about certain structural attributes that we were unable to duplicate. For example, dimensions were given for inner chambers and alignments that we were unable to identify within the structure during our survey. The description of the surrounding features and location assured me that the correct features were being described, so the differences are unaccounted for. Two possibilities are that the structures have been modified since the initial survey in 1977, or there were discrepancies or variation in the perceptions of the fieldworkers who described the features, both in the initial survey and the present one.

Although some of the features relocated appeared to correspond with the above descriptions, several did not contain enough identifiable attributes to classify them as *hare moa*. Twelve were identified as ‘possible’ *hare moa*. One consisted of a well-preserved sub-rectangular stone structure, approximately 11 x 2.5 x 1.8 m in size. This appears to fit the general description of a *hare moa*, however there are two small openings located on the top of the structure rather than on the sides. The function of these is not known, and the University of Chile does not mention these in their

descriptions. It is possible that the structure has been modified since the initial survey, as nearby structures appear to have been reconstructed relatively recently.

Seven of the structures were identified by a sub-rectangular to oval foundation made of a single alignment of embedded boulders surrounded by scattered boulders and cobble fill (Figure 17: B & 18). These foundations ranged between 5.5 – 12 m in length and 2 – 4 m in width, falling within the size range given in the descriptions above. Again, it is difficult to positively identify these features as *hare moa*, however, the presence of the foundations in conjunction with the associated scattered boulders and cobbles seem to support their determination as such. Considering the method of constructing these features may also support this determination. There has been no published detailed description of this, however, it is possible that the foundation of the inner chamber was not required to be laid directly on or embedded in the ground, but rather at times may have been placed on a surface of cobble fill. If so, when dealing with such disturbed/modified remains it is not unlikely that the inner alignments would be difficult to identify or even be removed. In reviewing the description of such structures given above, the inner chamber was located between 0.3 - 1.0 m above the ground, this variation could account for the presence in some and absence in others of inner alignments in the archaeological remnants. The scattered boulders associated with these features may represent the remnants of these alignments. As such, the presence of sub-rectangular to rectangular outer foundations may be enough to qualify such structures as *hare moa*. I note that this is purely speculative, and more research on *hare moa* construction needs to be undertaken to support/negate this idea.



Figure 18. Rectangular foundation of a *hare moa* (Rapa Nui Archaeological Field School)

Another ‘possible’ *hare moa* consisted of two parallel semi-circular alignments surrounded by scattered boulders and cobble fill. Due to the incompleteness of the alignments it is difficult to determine the original form of this feature. Although it may represent the foundation of a *hare moa*, it also appears similar to a double-walled garden enclosure.

The last three ‘possible’ *hare moa* consisted of single alignments, either straight or curved at one end, surrounded by dense concentrations of boulders and cobbles. Again, the presence of the alignments with the associated boulders and cobbles appear to identify them as destroyed *hare moa* structures, however without other evidence it is impossible to positively define them as of this type. It is also possible that they may represent destroyed garden enclosures or some other feature type.

The last two features relocated consisted of only several embedded stones spread out amongst boulder and cobble rubble. There was no identifiable structure to these features to warrant their classification as *hare moa*.

In sum, of all features types represented archaeologically the *hare moa* is the most difficult to identify in the field. The criteria used to identify these features are not well defined, leading to the inclusion of a wide variety of structures or remains under this label. Of the 26 features relocated, only five fit the descriptions given at the beginning of this section well enough to more confidently identify them as such. These features are represented either by well-preserved rectangular stone structures, or by two sets of parallel alignments corresponding to the structures' outer foundation and base of the inner chamber. Nine other features may also be included under this type as they contained either parallel alignments or sub-rectangular to rectangular outer foundations that correspond to certain attributes listed in the above definitions (shape, size, and materials). The association of boulder and cobble concentrations with these features also supports their identification as *hare moa* as they represent the remains of larger, generally rectangular, stone structures. Seven features contained too few attributes to positively identify them as *hare moa* yet the structures present, primarily alignments and boulder/cobble rubble, seem to warrant their consideration as belonging to this type. However, more evidence is needed to support that determination. The last five features contained no structural evidence for their identification as *hare moa*.

Needless to say, caution should be exercised when performing analyses on the distribution of this feature type based on previous work, as various investigators have

employed different criteria for identifying them as such. The large amount of variability and overlapping among the features and between feature types questions the utility of this group as a whole as it is highly likely that several functional groups are represented.

Garden Enclosures

Called *manavai*, these are described by McCoy as of two types: “oval to circular excavated pits, and free standing masonry-walled structures” (Figure 19; McCoy 1976:26). The excavated pits average 4 m in diameter and 1 m depth, some of which have a well-fitted stone lining around the interior walls. Many pits also have a low, raised rim of earth resulting from the excavation, and this type occurs rarely in pairs and never in groups of more than three. The free-standing type includes a variety of forms, the most common being either circular or oval and occurs singly. They average 2 - 3 m in diameter and 1 m in height. The most common wall construction for this type is double-faced with small rubble fill between facings. Though not frequent, these occur in clusters of usually 3 to 10, sometimes more. Vargas Casanova’s description differs in that she finds clusters of 2 - 50 structures, covering areas of 20 - 600 square meters, and that the average size is 3 – 5 m diameter by 1.5 - 2 m height (1998: 124).

These structures have been identified ethnohistorically as garden enclosures, built to offer protection of plants from strong winds and the hot sun, as well as to retain soil moisture (McCoy 1976: 26). McCoy and other researchers have found these

to be located generally within 1.5 km from the coastline, supporting the hypothesis that they functioned to protect plants from the harsher environments that exist there.

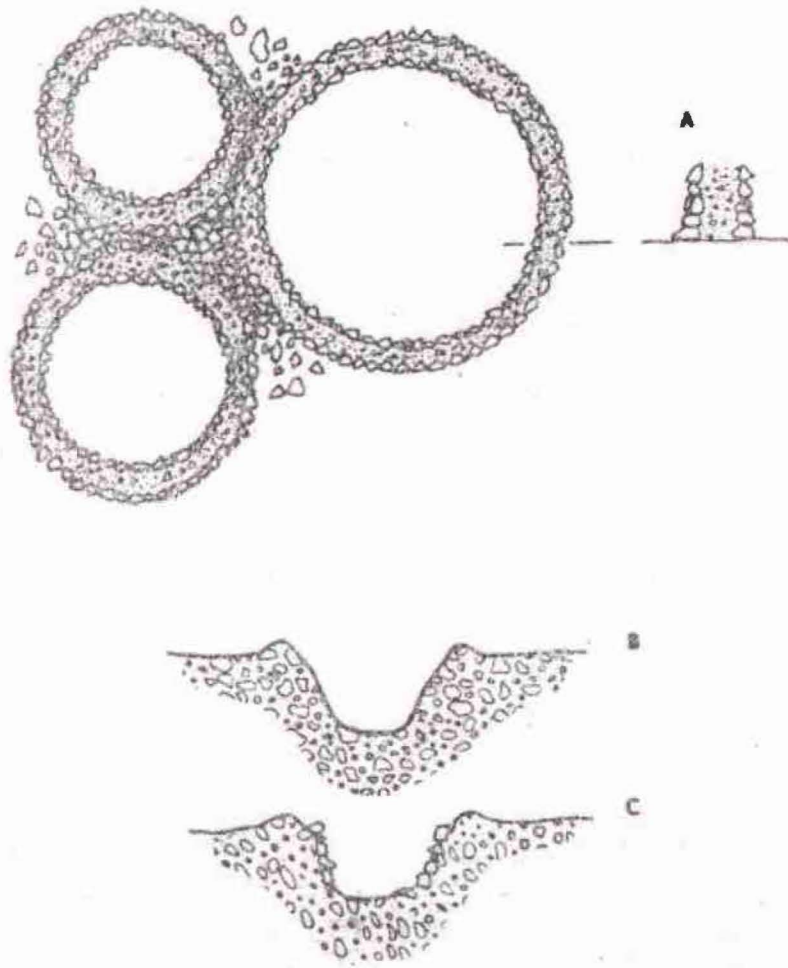


Figure 19. Diagrammatic sketch of *manavai* structures. A. Clustered free-standing *manavai*. B. Excavated depressions. C. Excavated depressions with rock wall lining (from McCoy n.d.:8).

Comparison:

Of the 109 *manavai* described by McCoy for the Vaihu quad, 17 were relocated and recorded. Only one structure differs slightly from the above descriptions. Nine of these were identified by excavated depressions with clusters of boulders and

cobbles filling the base (Figure 20). These depressions were generally circular, excavated on one side of a slight slope, and ranged between 4 – 9 m in diameter and 0.15 to 1 m in depth; the dimensions are only approximate as at times the rims of the depression were eroding into the surrounding slope and the base was filled with sediment, making it difficult to determine the exact extents. In seven of these depressions a rock outcrop or bedrock formed one wall, and two contained slightly raised earthen rims around its perimeter. Two depressions also contained partial rock walls lining the interior.



Figure 20. Excavated depression identified as a *manavai* in the sample survey (Rapa Nui Archaeological Field School)

Six of the structures relocated were isolated surface, or ‘free-standing’ *manavai*, identified by roughly circular, embedded alignments of boulders forming a base, surrounded by boulder and cobble clusters. All were destroyed, with only this base remaining intact. These structures ranged between 2 – 5 m in diameter; again these dimensions are only approximate as at times the base was incomplete or

disturbed, making it difficult to determine the exact extents. Two of these features contained remnants of a double-wall (Figure 21: A). This consisted of two parallel alignments of boulders placed on average 50 cm apart, with small cobble fill between them.

One of the features relocated was a cluster of 'free-standing' *manavai*, containing four complete and two to three partial structures, underneath and adjacent to a *pirca*. These were roughly circular in shape, with double-walls made of one to three courses of boulders. The total structure covered an area of approximately 19 x 8 m; the average diameter for the complete structures was 2 – 3 m, with depths varying with the level of disturbance from 0.4 - 1.2 m. There was also a rectangular foundation attached at one end, approximately 4 x 2 m, also showing double-walled construction. It is unsure if this represents a *manavai*, or some other type of feature. In other surveys both isolated *manavai* and *manavai* clusters exhibited attached *hare moa* structures or arched cavities (of unknown function), also rectangular in shape and of similar dimensions.

The last feature consists of two double-walls lying perpendicular to one another, which if complete may be rectangular in shape. The walls formed a structure approximately 30 x 1 x 0.96 m. Both the large size and shape of this feature makes it difficult to conclude that it is a *manavai*. Other surveys have found no other *manavai* similar in structure and so its designation as of that group seems unfounded. It is possible that it represents the remnants of a corral or enclosure for animals, or for some other function.

Of the 91 features described by the University of Chile, 11 were relocated and recorded. All of the descriptions corresponded well. In contrast with McCoy's sample, this group consisted of only two depressions, with two isolated 'free-standing' *manavai* and seven clusters.

The depressions, like McCoy's, were excavated on a slight slope with a rock outcrop forming one wall. One had a diameter of approximately 8 m and depth of 1.6 m, with a cluster of boulders and cobbles at the base. The other was approximately 6 m in diameter by 1 m in depth. This structure contained a rock wall lining the interior of the structure.

One of the isolated 'free-standing' *manavai* was well preserved, showing a double-wall construction and dimensions of 4.8 x 2.5 x 1.6 m. It is roughly oval in shape, with stacked boulders and cobble fill forming the walls. Along one border is what appears to be an attached *hare moa* structure, also well preserved. However, the opening into the structure is located on the top surface, or roof, rather than on the side, possibly signifying a different functional class of feature. The other free-standing *manavai* consisted of a destroyed feature showing only remnants of a curved, embedded alignment adjacent to a rock outcrop. It is surrounded by scattered boulders and cobbles making it difficult to determine the extents, and a *pirca* is located nearby, suggesting many of the rocks were removed from the feature for the construction of that wall.

The seven clusters consisted of groups of between 2 - 12 identifiable free-standing *manavai*, all using double-wall construction (Figure 21: B). Six of these groups are well preserved, with circular to oval or sub-rectangular enclosures ranging

between 3 – 6 m in its longest axis, between 1.2 - 1.7 m in depth, with walls averaging 1 m in width. The last cluster is destroyed with only one, possibly two, semi-circular double-walled alignments underneath and adjacent to a *pirca*. The University of Chile identifies three *manavai* in this location, however we only observed two alignments that may or may not represent two separate structures.

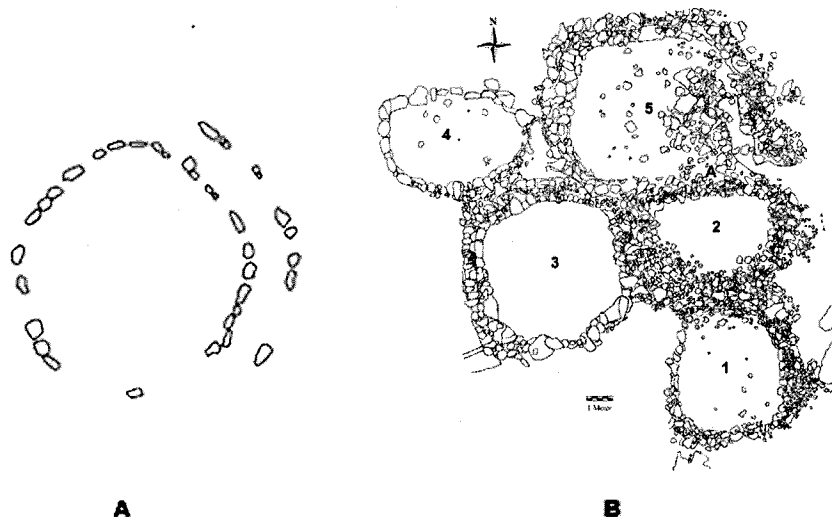


Figure 21. Drawing of *manavai* structures identified in the field. A. Double-walled *manavai*. B. Clustered, free-standing *manavai*. (Rapa Nui Archaeological Field School)

In all, the identification of *manavai* is consistent between datasets.

Interestingly, at least 23 of the structures in the sample either directly utilized or were constructed within 2 – 3 m of a rock outcrop. Nearly all of the excavated depressions had bedrock forming one wall; this could be a function of excavating into a slope or ridgeline and subsequent erosion to reveal the underlying bedrock, or it may signify purposeful use of the bedrock as one wall, which would have required less labor

investment in its construction. Utilizing a ridgeline or a slope would also require less labor investment in terms of excavation, as there is less volume of sediment that would need to be moved to create the enclosure. The slope or ridgeline would also offer more protection from wind regimes and possibly require less depth than those structures built on flat plains. The majority of surface or 'free-standing' *manavai* identified also either utilized or were located at the base of rock outcrops. Again this may offer more protection from wind and provide for less labor investment for those utilizing the bedrock outcrops, but it may also be a good location for capturing water in the form of run-off or slopewash during wet weather.

Although the data corresponded well between investigators, again we have a large amount of variability in forms lumped under one label. Although these different forms may in fact be simply different type-varieties of *manavai*, we cannot be sure of this until examinations of function have been conducted on a number of features. Until then we are basing all studies into Rapa Nui prehistory on the assumption of function, which is detrimental to any scientific research.

Pu

McCoy described these structures as "small, circular shallow depressions" used for agriculture, possibly for the planting of taro. They are "usually less than 1 m in diameter and 20 cm deep... they normally occur in clusters of 10 or more, in an area of 10 – 35 m in diameter located in front of houses" (McCoy 1976: 84). Vargas Casanova also describes an agricultural feature called *pu'u* as "small plots of ground ...opened within rock fields" where tubers were grown (1998: 122). Stevenson

identifies them as depressions within rock concentrations that are approximately 50 – 60 cm in diameter and extend to the soil layer below (Stevenson & Haoa 1997).

We were unable to locate the one feature identified by McCoy for the Vaihu quad. However, out of the four identified by the University of Chile, two were relocated and recorded. Both consisted of large concentrations of boulders and cobbles covering an area of on average 10 m in length and width. The concentration of stone appears to be enclosed in a foundation or border of embedded boulders. Within these rock concentrations are several identifiable depressions, some of which contain retaining walls of larger rocks, and bases filled with smaller cobbles. These depressions are less than 1 m in both diameter and depth, but do not extend to the soil layer as described above. These depressions may have been modified or filled in with time. The site records by the University of Chile identify six *pu* in one and 16 *pu* in the other feature, whereas we were only able to positively identify two and three, respectively. This discrepancy could be due in large part to the vegetation growth that covered these features, making it difficult to see the entire structure, but may also be due to the possible lack of definite structure in the depressions. It is unknown how they were constructed; for instance, if some stones were simply removed to form a shallow depression there may be no way to determine natural from cultural origins. It must be noted however that with a landscape so mottled with boulder and cobble concentrations of both natural origin and from the destruction of archaeological features, at times it may be difficult to distinguish these features from others. Definition should include depressions lined with some kind of distinguishable

retaining wall, or some other evidence of cultural origin, and/or possible borders of embedded stone around the concentration that may hint at an intended structure.

Rock Mulch

Stevenson and others have recently identified rock mulch as another form of agricultural practice on Rapa Nui (Stevenson & Haoa 1997, Wozniak 1996, Stevenson et al 1999). These are defined as surface rock concentrations utilized as ‘mulch’ to maintain soil moisture; the stones used in such ‘mulch’ range from 5 – 20 cm in size forming a thin layer over the soil. Surveys conducted for the La Perouse area on the island have found differences in the density and spatial extent of these concentrations based on location from the coast and from habitation features, and so, in addition to *pu* and *manavai*, 4 other agricultural features have been proposed: household gardens, lowland fields, slope fields and hilltop fields (Stevenson & Haoa 1997). Again, these are defined by the density of rock and the spatial extent of the concentrations, with hilltop fields being the most dense and extensive and household fields the least.

These features were proposed only recently, and so neither of the datasets have included this type in their survey. These features are however, difficult to locate on the landscape as there are no borders or modifications that would help in their identification. As the entire south coast consists primarily of ‘surface rock concentrations’, it is nearly impossible to identify those that occur naturally from those of cultural origin without excavation.

Planting Circles

These have been described by Stevenson and colleagues as “formed by rings of small stone 1.0 - 1.5 m in diameter and define the perimeter of a planting pit. The soils within the circle are deep (30 – 50 cm) and have been thoroughly mixed” (Stevenson et al 1999: 5) Excavations have provided evidence of their use as pits for single plants. None of these were identified in either of the datasets examined.

Other Features

Morphological Feature Types

Other features were identified by both McCoy and/or the University of Chile under the labels ‘enclosures’, ‘foundations’, ‘rock walls’, ‘stone alignments’, ‘stone outlines’, ‘stone circles’ and ‘stone structures’. These were features that could not be classified as one of the functional types and so were identified based on morphological characteristics. Samples were resurveyed from all of these classes when possible (see Tables 2 & 3). As these features occur relatively infrequently in the total sampled population I will not describe each one in detail.

Upon resurvey these features were not identified as belonging to one of the more known functional classes, nor did they combine to form other homogeneous groups of features (i.e., their structure and location were highly variable). At question here, however, is the tolerance level for identifying these types of structures as one of the known functional types. For instance, when is a stone circle identified as a *manavai* or a stone alignment as a *hare moa*? It seems rather arbitrary as these features

contain similar attributes, and in other situations features with the same limited structural remains have been identified as one of the various functional types.

Functional Feature Types

Under this category are the feature types ‘destroyed/unclassified’, ‘*avanga*’, ‘crematoria/tombs’, ‘*tupa*’, ‘basalt quarries’, ‘water wells’, ‘boundary markers’, ‘pathways’ and ‘*ahu*’. Most of these were either not represented or represented by only one or two features in the sample survey. Due to the lack of definitive descriptions for most of these types in previous reports, I will not discuss all of them here. Several however, deserve discussion due to their quantity or as their description and/or function has proved somewhat controversial. These are identified as ‘destroyed’ or ‘unclassified’, *avanga*, and *tupa*.

‘Destroyed’ or ‘Unclassified’

These features have been categorized as unclassifiable due to the level of destruction and/or modification that has occurred. This type may be considered part of either the morphological or functional category of ‘other features’; I have included them here due to the presence of some functional interpretations within the individual site records. McCoy does not identify any features as such for the Vaihu quad; I believe he chose to identify them as generic morphological types such as stone alignments or outlines, or as one of the existing feature types. On the other hand, the University of Chile’s records contain 75 features described as ‘destroyed’ or ‘unclassified’ structures. Seven of these were relocated and recorded. Four features could not be reassigned to a known group of structures.

In two of these, although they are initially identified as ‘destroyed’, they are described as *manavai* in the record itself. Our findings correspond with these structures as *manavai*, showing inconsistency when categorizing such features. There does not appear to be any justification as to why these are identified as ‘destroyed’ in some instances, while in others cases where there is even more disturbance to the feature they are identified directly as ‘*manavai*’. This may be due to varying criteria used by different fieldworkers for categorizing features or to different methods for completing the site records. This may only be a problem if one bases their study only on the label of the features, rather than through the examination of the entire site record, as such examination would make it clear what type of feature they are dealing with. *However*, in another instance a ‘destroyed’ feature was identified as a possible *hare moa* within the site record (with little description of its attributes), but our findings do not support that statement. It consisted of scattered boulders and cobbles with a few embedded boulders mixed in; there was no identifiable structure to the feature. In this case the above solution may lead to more confusion. There needs to be more consistency that would allow other researchers to accurately interpret what type of feature is being described. As only a small selection of the University of Chile’s site records was available for examination, I am not sure if this ‘problem’ has been resolved in subsequent drafts of their research or how analysis of features identified as ‘destroyed’ has ensued.

Avanga

These have been identified as a form of burial. McCoy cites previous descriptions of these structures but does not consolidate them into one exclusive category. They are either rectangular structures, irregular mounds of stone with rectangular cists for burials, or cremation structures. For this reason, it is difficult to determine the difference between *avanga*, tombs, and crematoria.

Of the 27 *avanga* identified by McCoy for the Vaihu quad, four were relocated and recorded. Three of these consisted of small circular to ovate mounds of stones ranging between 3 – 5 m in diameter. The base is generally made of larger boulders with smaller boulders and cobbles stones piled on top (Figure 22). The fourth feature consisted of three parallel alignments of embedded stone approximately 5 m in length by 2 m in width located on a flat plain.

Of the five *avanga* identified by the University of Chile, three were relocated and recorded. Two corresponded with the stone mounds described by McCoy, though human remains were observed within the structure during their survey. The third consists of a roughly rectangular stone structure of approximately 6 m in length by 2 m in width. The foundation is made of large boulders (avg. 60 – 80 cm) on which is piled smaller boulders and cobbles.

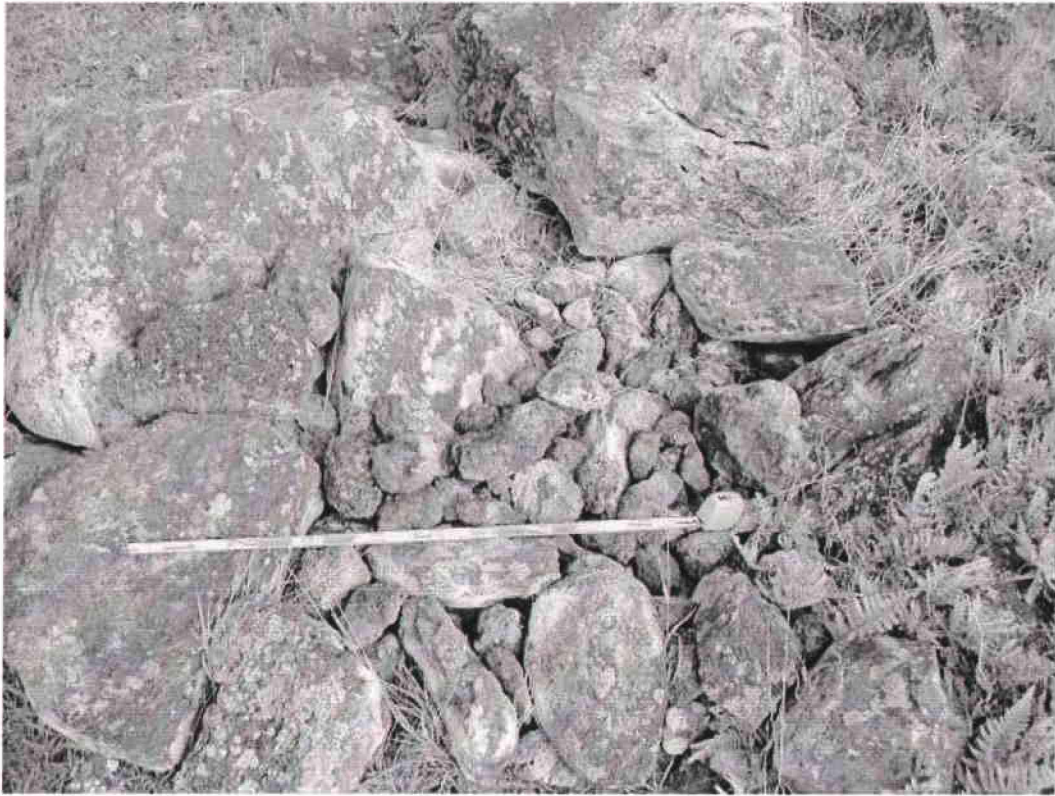


Figure 22. *Avanga* relocated in the sample survey (Rapa Nui Archaeological Field School)

The difference in structural attributes between these two types of features points to the ambiguous definition of what their function is and what they should look like. It is possible that the only necessary attribute is that the structures contain human remains, though none were observed during our survey. Based on the above descriptions, it is only possible to state that such features either consist of small circular to ovate stone mounds, with foundations of boulders and cobble fill *or* roughly rectangular structures, also made with foundations of large boulders and cobble fill. In the second instance, it appears as though the distinction between *avanga* and *hare moa*, both rectangular stone structures, may be the level of structure evident; *avanga* should contain less organized placement of stone, forming more mound-like

structures, while *hare moa* have more formal structure with their inner chamber, well built walls and foundation, and at times, their entryway. However, other accounts have identified rectangular *avanga* that are similar in their formal characteristics and organization to the *hare moa* (e.g., neatly stacked stone walls with an interior chamber), the only evident difference being the presence of an entryway in *hare moa* structures and their absence in the rectangular *avanga* (Métraux 1940: 288).

Tupa

The only descriptions found for these structures define them as “thick-walled, tower-like structures” with entryways located at the ground level near the tower-like section (McCoy 1986: 145, 147), as “specialized habitational stone towers used by ancient priests (Vargas Casanova 1998: 117), or as “turtle watch-towers” (Ayers & Ayers 1995: 170). Two photographs of such structures are found in McCoy (Figure 23; 1986: 147) and Ayers & Ayers (Figure 24; 1995: 171). They are different in construction, one being a tall, cylindrical tower-like structure with an entry at the base, the other being a long, rectangular structure with a tower-like section on one end and an entry at the base.

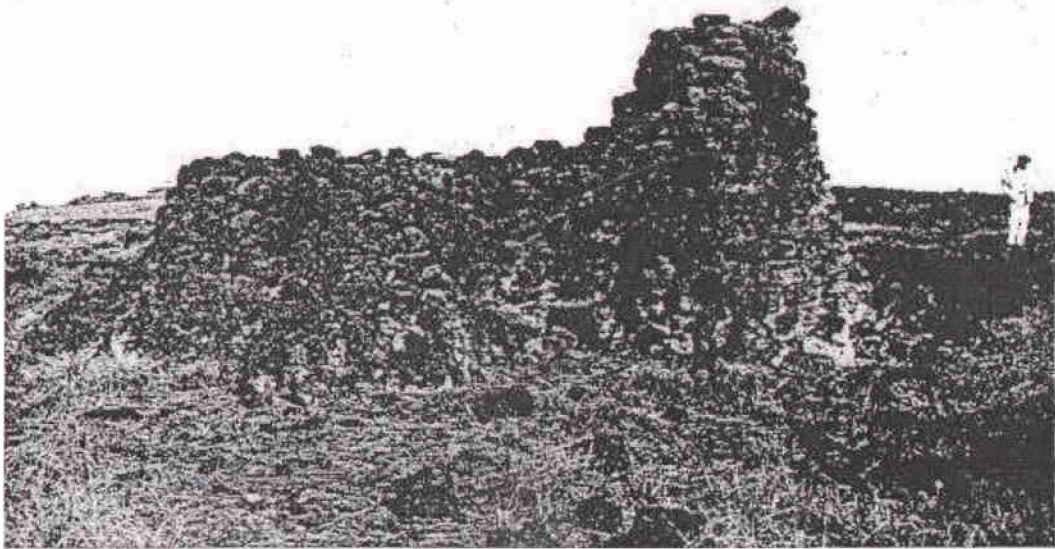


Figure 23. *Tupa* (from McCoy 1986: 147; Bishop Museum)

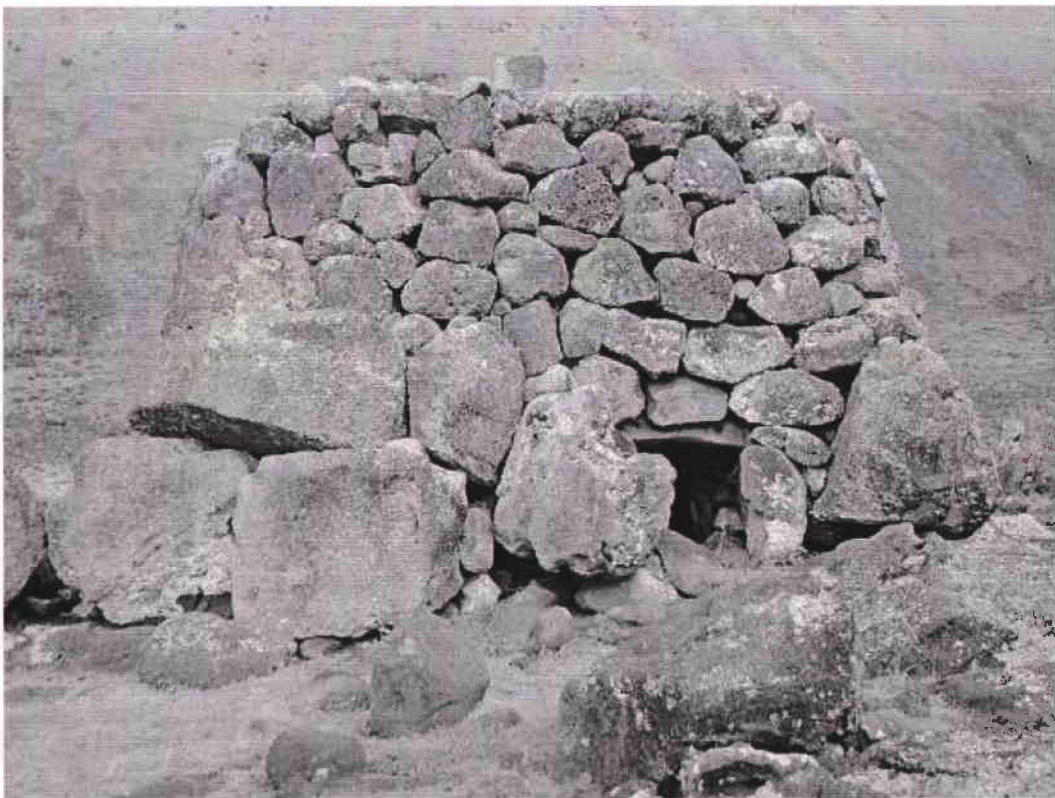


Figure 24 *Tupa* (identified in Ayers & Ayers 1995; photo by author)

McCoy found no structures of this type in the Vaihu quad, but out of the three identified by the University of Chile, two were relocated and recorded. One of these may correspond to the “turtle watch-tower” shown in Ayers & Ayers (1995: 171). It is roughly elliptical in shape, with exterior measurements of approximately 6.4m in length and 5.1m in width, and interior measurements of approximately 3.5 m in length

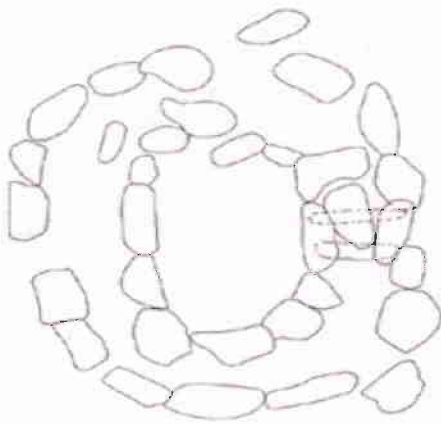


Figure 25. Sketch of tupa identified in sample

and 1.5 m in width. Only the foundation remains intact, showing a double wall construction of parallel lines of large, vertically embedded boulders with cobble fill (Figure 25). On the seaward side is an entry at ground level about 57 cm wide and 55 cm tall, which extends into the structure

for approximately 1.5 m. The entry is lined on both sides by vertically embedded boulders lying perpendicular to the walls of the structure, with capstones placed across the top (Figure 26). The interior floor of the structure is completely covered by cobble fill.

The other structure is not so distinct. It is located about 35 m from the feature described above, and consists of a smaller, roughly oval structure with exterior dimensions of approximately 4 m in length and 3.5 m in width, and interior dimensions of approximately 1.5 by 1.5 m. Only part of the foundation remains, showing possible double-wall construction with cobble fill. There was no entry

present, and due to its incompleteness it is impossible to determine if there may have been one in the past.

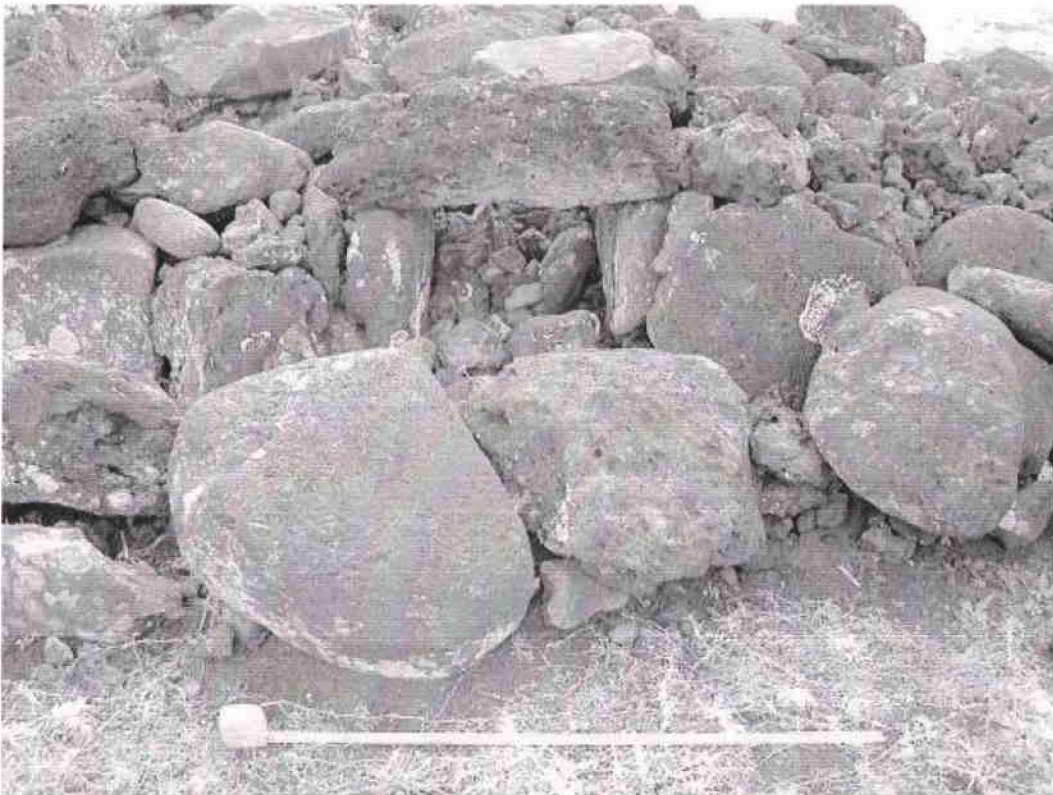


Figure 26. Entryway to *tupa* relocated in sample survey (Rapa Nui Archaeological Field School)

As there are no detailed descriptions of the function or attributes of these features, it is difficult to positively place the above features within this category. However, based on the image provided in Ayers & Ayers (1995: 171), it is possible that the first feature described above may correspond to a *tupa*. This is due largely to the presence of the entryway, explicitly defined as an attribute of such features in McCoy's description above, and implicitly defined by Vargas Casanova in her description of its use as a 'habitation', suggesting the use of an entryway for that

purpose. The second feature relocated is simply too incomplete to assume a specific function; it may fit the category of *manavai*, *tupa*, or an unclassified stone structure.

An Evaluation of the Traditional Rapa Nui Feature Classification System

On one level, the classification of the frequently occurring features (i.e., living surfaces and subsistence features) is consistent between the datasets. Most were given English names to imply purpose or function, such as “garden enclosures,” “ovens,” “pavements,” and so on. With the exception of chicken houses, only one to two features for each of those types did not fit the general description given for inclusion in the assigned group. This general correspondence would suggest the compatibility between and the utility of previous datasets for specific feature types. When looked at closely however, a number of problems characterize the existing descriptive system. First, the classification system lacks defined criteria that would allow researchers to identify items as members of classes. Criteria (significata *sensu* Dunnell 1971) minimize variability between researchers in identification and thus reduce variability in group membership. Thus, for example, the type *hare moa* contained a wide range of features with different attributes, resulting in a broad class of features.

Secondly, and related to the first problem, is that the lack of mutually exclusive criteria has also led to the overlapping of features between various feature types. For example, at times there was difficulty in distinguishing *hare moa* as distinct from garden enclosures (n=7 of 26).

Finally, the classification system lacks methods to deal with ‘other’ features that do not share characteristics of traditional types. Currently, features not identified

as a traditional type are labeled 'destroyed', 'unclassified', or some other generic term, and are excluded from analyses, although they potentially have much information to offer.

Ultimately, the foundation of these problems lies in the limitations imposed by basing the classification system on functional interpretations rather than physical, empirical attributes. By assuming a direct relationship between form and a single function and that all functional types are known, in this system each archaeological feature encountered can logically, or commonsensically, be interpreted and placed into one of a limited number of types. This relies primarily on the summary of general characteristics of a feature and the determination of a 'best fit' among the available types. This leads to highly variable groups; as explicit, empirical definitions to aid in identification is lacking, different researchers will inevitably 'interpret' archaeological features in different ways. A good example of functional interpretation versus empirical evidence, is in the types *avanga* and *tupa*. The function for these features is discussed and they are identified in the field as such, yet there is no agreement on what they actually look like to be able to consistently identify them in the field.

This type of research is reminiscent of the reconstructionist paradigm of the mid- to late 1900's. As a reaction to the cultural historical paradigm and led by the motto "archaeology is anthropology or it is nothing" (Willey & Phillips 1958:2), researchers sought to 'flesh out' the archaeological record by reconstructing "behavioral correlates" for artifacts, allowing for more anthropological statements of the past (Dunnell 1978b: 195). In Polynesia, particular emphasis was placed on the use of the direct historical approach, whereby accounts from the historic period provided a

baseline from which to work back into prehistory. This approach was thought to be appropriate due to the relatively short time span of human occupation in the region, especially in eastern Polynesia, in combination with the difficulty in obtaining sound chronologies and functional interpretations for its archaeological features (Parsons 1972: 134). This method is still in widespread use in Polynesian archaeology today. For some research goals this may be acceptable, however, the tactic of using ethnographic accounts and/or analogies to provide commonsensical names for features implicitly assumes a one-to-one correlation between artifacts and function– and between form and a single function. This is simply unwarranted. It is not reasonable, plausible or possible that form is equivalent to function and that this has not changed with time.

The basic premise for this analogical reasoning is that if archaeological phenomena were similar to ethnographic descriptions in some ways, then they probably are in others. Thus in the case of Rapa Nui, an alignment with a boulders and cobble concentration is the same as the rectangular three-dimensional structure described as a chicken house in the ethnographic literature because they both have alignments and boulder-cobble concentrations. This is an erroneous assumption in that 1) there is no evidence that these rectangular three-dimensional structures described in the ethnographic accounts were in fact chicken houses, 2) we do not currently know enough about the variety of features on the island to determine if alignments with boulder-cobble concentrations are common to other features and functions as well, and 3) we do not currently know enough about the recycling or re-use of features to know if relationships between form and function have changed with time. This type of

reasoning leads to a heavy reliance on inference as both the ethnographic and the archaeological counterpart are based on untested “just-so” stories with as of yet no empirical grounding.

As this analytical design does not depend on robust classification schemes for the identification of features in the field, the discrepancies noted in my study of previous datasets may be understood when viewed within the larger issue of classification versus grouping (Dunnell 1971). In Dunnell’s *Systematics in Prehistory*, the problem with traditional methods of archaeological classification is identified as the conflation of theoretically defined ‘classes’ and empirical ‘groups’. To understand how this pertains to Rapa Nui a brief discussion of his concepts on classification and terminology is required.

According to Dunnell, classification involves the creation of units of meaning through the stipulation of redundancy (i.e., the specification of what attributes make included phenomena the same) (1971: 44). It is the creation of tools by which we can measure or partition variability and talk about empirical phenomena observed or examined. Although this is how most traditional research perceives classification, there is a vital difference in how they are created. In Dunnell’s perception, the units of analysis created within a classification system, otherwise known as ‘classes’, derive their meaning from the particular purpose of the classification. The defined classes are not inherent in the features themselves but are theoretically defined based on what attributes are deemed relevant for specific research questions and thus only have meaning with relation to such questions. Classes are intensionally defined, in which the necessary and sufficient conditions for membership within a class are explicitly

stated, resulting in the formation of mutually exclusive groups of phenomena (Dunnell 1971). Because classes are intensionally defined, there is no ambiguity when identifying phenomena in the field. Ideally, as there are stated criteria for membership all features will be identified in the same way by all researchers (i.e., the results of survey or research will be replicable). This is necessary to ensure the comparability of data included in any analysis, and the reliability of statements generated from them.

Grouping on the other hand is the inductive method of describing units through statistical summaries of what the included phenomena have in common. They are extensional definitions, meaning they are empirical units derived from summary observations about a group or groups of things (Dunnell 1986). As there is no intended purpose with which to guide decisions, the determination of which phenomena to include in such groups is also wholly intuitive and dependent on the particular researcher's perspective (Dunnell 1978a, 1978b). As such, derived groups are not mutually exclusive. This means that 1) individual phenomena are not required to have all of the attributes listed in the group description to be a member, and 2) included phenomena may contain a variety of attributes of the same dimension. For example, if a dimension in a classification is shape, and the attributes are curved or linear, a mutually exclusive system requires an either-or separation (i.e., phenomena must have either one or the other attribute). The resulting groups (denotata *sensu* Dunnell 1971) cannot contain both curved and linear phenomena, or phenomena that are neither curved nor linear. A system that is not mutually exclusive however, allows for both curved and linear artifacts within any one group, or for the inclusion of phenomena that are not curved or linear based on the quantity of other attributes it has in common

with a group. This type of system is problematic as groups become highly variable, masking true variability and limiting the types of analyses that may be undertaken. At a certain level distinctions between groups also become hazy as specific attributes cross-cut boundaries between them; the designation of phenomena with only those specific attributes to groups becomes necessarily arbitrary. For instance, if two groups have as attributes 'curved alignment' in their definition, to which group does an artifact represented by only a 'curved alignment' belong? Groups are also contingency-bound, changing constantly with the addition of new data. They are bound by their location and the individual artifacts they describe, and so may only be useful to examine isolated assemblages of artifacts where all variability is known. As such they are meaningless in examining similarities or differences in artifacts across space and/or time (see Ford vs. Spaulding debate - Spaulding 1953, 1954; Ford 1954; Dunnell 1978b).

As most research on Rapa Nui was conducted during the reconstructionist era, it is no surprise that grouping has been the method employed to categorize the island's archaeological resources. As discussed above, the groups traditionally used have been identified largely by ethnographic and ethnohistoric accounts of function, combined with cumulative observations of archaeological features in the field. Observed features are continuously 'made to fit' into one of the ascribed types based on some intuitive commonsense notion of similarity and function, and the variability that may exist between features is ignored. Labels are given primacy over definitions as criteria for inclusion within these units have not been explicitly defined, resulting in the grouping of highly variable features dependent on the particular researcher's (subjective)

perception (Dunnell 1971). As a result, some of the more complex features cannot be reliably identified in the field by different investigators wishing to test or build on previously offered hypotheses, and variability is masked from future analyses. This is detrimental for scientific research as it is difficult to replicate results, and the validity of previous hypotheses cannot be adequately assessed. This is particularly evident when looking at the problems in identifying feature classes such as *hare moa*, *avanga* and *tupa*. In light of the inconsistency that exists in these groups, it may be impossible to determine the validity of previous analyses of their distribution.

Compounding the problem of how broad and inclusive each feature type is, is that not enough information was recorded in many of the early site records to enable one to sort out this variability. It appears that the reliance on ethnographic accounts of functions and types was so pervasive that the recording of the most basic attributes of features identified were deemed unnecessary (e.g., size, shape, or anything else that defines it as cultural in origin). This precludes more detailed investigations of specific types and distributions as not enough information is noted for meaningful analyses of a type and, for instance, its variability across space and/or time.

In response to these problems, the final sections of this thesis proposes a new classification system that attempts to define mutually exclusive criteria for the designation of features to a class, and to provide data with which to examine variability within and between features on the island.

CHAPTER 4. A NEW CLASSIFICATION SYSTEM FOR DESCRIBING ARCHAEOLOGICAL STRUCTURES ON RAPA NUI

So far this study has examined the consistency in feature identification between datasets collected at different times and by different researchers to determine the compatibility of the data for combination and/or comparison in future analyses. The problems revealed with the existing classification system can be explained in terms of classification versus grouping, involving the heavy reliance on ethnographic labeling with the lack of explicit, mutually exclusive criteria for membership within a group. Rather, groups have been made with implicitly defined classes, leading to difficulties in replication and evaluation of previous research. Although the general description for some of the feature types corresponded well between datasets, the existing problems reflect the need to devise appropriate schemes by which features may be reliably classified, the validity of previous hypotheses tested, and with which the generation of new hypotheses may be possible

As a step towards this goal, a preliminary paradigmatic classification scheme is presented below (Table 4). Although preliminary, it is discussed here to show the potential such a classification has for producing repeatable and testable results. It is important to note however, that classifications are devised with particular research questions in mind. What is an appropriate classification scheme for one research design may not be so for another. In this case, the classification was created to examine technological attributes of aggregate-scale artifacts on the island. The measurement of these attributes will inform on construction methods and techniques, which in combination with corresponding environmental data will allow for some

insight into the adaptive techniques employed by prehistoric peoples on Rapa Nui. It does not offer or provide in itself any interpretation of other aspects of the record, such as function or chronology. At this point it is difficult to determine function or chronology for many of the structures on the island, as both a large quantity have been disturbed and as there is a paucity of associated artifacts to assist in interpretation. More in depth studies of the variability in these technological attributes (or the lack thereof), or of stylistic variability, in combination with excavations for archaeological material within and around such structures in the future will shed more light on these aspects of the archaeological record. The type of classification system proposed may serve as a base for such analyses and at the same time serves to provide a means of achieving consistency in the identification of features in the field.

In the discussion above, we saw that the term “feature” has many connotations in relation to function. As such, in the following section I chose to use the term “structure” when explaining the proposed classification system to deter functional inferences. These are identified as those artifacts on the landscape composed of more than one discrete object in close proximity, forming a larger “structure” (i.e., aggregate-scale artifact). When used, the term “feature” refers to the functional categories traditionally used on the island. This is done to facilitate the discussion between old and new.

Paradigmatic Classification of Archaeological Structures on Rapa Nui

Ideally, a paradigmatic classification offers the least ambiguity and subjectivity in the designation of artifacts to particular classes. An intensionally defined class, one

that has explicit, mutually exclusive criteria for membership, is the proper means of sorting the variability in these artifacts to avoid classification error and inter-observer bias. I have chosen each attribute based on their ability to describe the basic form and construction characteristics of archaeological remains on the island, and in a way that attempts to identify the technological variability that exists across the landscape.

Attributes begin at the smallest level, with the element, or individual, discrete artifacts that make up a larger form. They then move to the form combinations of these elements take, meaning, how they are combined to make a larger structure. Finally, they move to the larger relationships between more than one of these combinations, such as how two different forms are related within one structure. This provides flexibility in later analyses, as questions regarding archaeological structures may be focused on varying levels of their construction.

There are a nearly infinite number of choices one may make in deciding which attributes are relevant in the classification. These decisions should be guided by the research question, however, devising the most appropriate classification is difficult and time-consuming. Although it has been through many revisions, some of the attributes I have chosen may later be determined irrelevant, and others may be added. At this point it is presented as a heuristic devise as well as a preliminary scheme.

Another point of concern is how structures are delimited on the landscape. This can be related to the current arguments of how 'sites' are identified, from whether they should include areas of isolated artifact occurrences to identifying them at the larger scale of landscapes (Dunnell & Dancy 1983, Ebert 1992). The same applies for isolating artifacts in the field. At what scale do we define structures? From the single

stone, a single form such as an alignment, or from the structure in its entirety, defined by a density of material separated from other areas of dense concentrations. The choice depends on the research question, whether it is interested in certain stone types and their distributions, to those interested in the larger combinations of those types and their distributions. Here the latter method is employed, and structures were identified by areas where material was concentrated by cultural activity, and in which single artifacts and forms were contiguous and contributed to the formation of a larger, aggregate-scale artifact.

In Table 4, an *element* is defined as the minimal unit of identification for aggregate-scale artifacts on Rapa Nui. This would be the individual stones or other materials that are combined to form a larger structure. Under the category of element, 11 attributes were chosen to reflect the variability in the kinds of material used to construct these kinds of artifacts on the island. They include general attributes of material type, form, surface attribute, size, shape, position, and whether or not they are embedded in the ground, and artificial attributes of presence and quantity of indentations/cupules, cut/shaped surfaces, and form of shaped surface. Most are self-explanatory; however a few need further discussion. Whether or not the element is embedded in the ground was included as relevant for two related reasons. First of all, many times archaeological structures are difficult to identify on the ground, especially if they consist of concentrations of boulders/cobbles with little definition. A key to identifying such remains as man-made from natural concentrations of stones is to identify any alignments of embedded stones, which is unlikely to occur in nature. Secondly, and again due to the difficulty in identifying structures on the ground,

alignments of elements may form naturally with time. However, if they are embedded we can say with more confidence that they are cultural versus natural in origin.

For materials 6-7, often there are either no artificial attributes or none of the other general or artificial attributes on the list apply. For these the attributes in 10 and 11 identify their form, but the primary description of their importance is to be included in a written description of their context.

There can also be more than one element classes within a structure. These should be listed even if there is no patterning as to their distribution, to allow for future analyses of element types. If there are more than one element classes within a structure, their patterning should be described as well as drawn to provide data about their placement relative to one another.

An *element set* is the combination of more than one of a particular element and/or the combination of more than one kind of element to form a larger structure. This is limited to single or repeated forms (i.e., having the same shape and orientation). For example, an element set could be either one continuous line forming a rectangle or two parallel lines of stones separated by a gap. These may be made up of several different classes of elements (e.g., dense basalt, scoria, and tuff), patterned or unpatterned. However a line located perpendicular to another and separated by a gap, is considered two different element sets and need to be classified as such using a relationship set. This allows us to look at each individual form within a structure and how they are combined to make a larger, aggregate-scale artifact. It also enables us to look at commonalities between different classes of structures at various levels in their construction.

Table 4. Preliminary classification scheme

Element # **# of elements**
Element:

General Attributes

- | | | |
|--|--|---|
| <p>I. Material</p> <ol style="list-style-type: none"> 1. dense basalt (non-porous) 2. vesicular basalt (porous) 3. red scoria 4. coral 5. tuff 6. earth 7. non-portable bedrock | <p>II. Element Surface</p> <ol style="list-style-type: none"> 0. N/A 1. Smooth surface 2. irregular/rough surface | <p>III. Element Size</p> <ol style="list-style-type: none"> 0. N/A 1. 0-20cm 2. 20-50cm 3. 50-80cm 4. 80-100cm 5. 100cm or more 6. Indeterminate |
| <p>IV. Element Shape</p> <ol style="list-style-type: none"> 0. N/A 1. round 2. angular 3. irregular 4. L-Shape 5. indeterminate | <p>V. Element Position</p> <ol style="list-style-type: none"> 0. N/A 1. upright 2. flat 3. indeterminate | <p>VI. Element embedded in ground</p> <ol style="list-style-type: none"> 0. N/A 1. Yes 2. No 3. indeterminate |

Artificial Attributes

For materials 1- 5

- | | | |
|--|--|--|
| <p>VII. Indentations/cupules</p> <ol style="list-style-type: none"> 0. N/A 1. 1 surface 2. 2 surfaces 3. 3 surfaces 4. 4 surfaces 5. 5 or more surfaces 6. none 7. indeterminate | <p>VIII. Cut/shaped surfaces</p> <ol style="list-style-type: none"> 0. N/A 1. 1 surface 2. 2 surfaces 3. 3 surfaces 4. 4 surfaces 5. 5 or more surfaces 6. none 7. indeterminate | <p>IX. Shaped surface attribute</p> <ol style="list-style-type: none"> 0. N/A 1. convex 2. concave 3. planar 4. indeterminate |
|--|--|--|

For materials 6-7

- | | | |
|--|---|---|
| <p>X. Form</p> <ol style="list-style-type: none"> 0. N/A 1. excavated pit 2. mound 3. natural cave/rockshelter 4. modified cave/rockshelter 5. other | <p>XI. Shape</p> <ol style="list-style-type: none"> 0. N/A 1. circular/ovate 2. angular 3. irregular 4. linear | <p>For materials 6-7
 go directly to description
 unless combined with other
 element sets</p> |
|--|---|---|

Element Classification 1: _____ Qty ____
Element Classification 2: _____ Qty ____
Element Classification 3: _____ Qty ____
Element Classification 4: _____ Qty ____
Element Classification 5: _____ Qty ____

Table 4. (Continued) Preliminary classification scheme

Set XZ: (Horizontal in one dimension -with width less than 1m- and height)

1. Linear—Curved
2. No. of Courses: 2—3—4—5 or more—indeterminate
3. No. of Rows/Alignments (need to be contiguous to be considered an XZ set): None—1 —2—3 or more— Indeterminate
4. Rubble fill within form? Yes—No—indeterminate—N/A
5. Construction Method: Stacked regular—Stacked irregular—Mounded—indeterminate—N/A
6. Height: <1m—1-2m—2-3m—3m or more
7. Earth level with highest part of set on one side? Yes – No
8. Concentration of boulders/cobbles present?: Yes—No

Set XYZ: (Horizontal in two dimensions and height)

1. Excavated—Surface
2. Filled (cobbles/boulders filling structure entirely)—Not filled (relatively clear of rocks)
3. Stony Depressions?: Yes—No—N/A
4. Roofed (hollow cavity beneath): Yes—No—indeterminate—N/A
5. Enclosed (bounded)—Not enclosed (not bounded)
6. Curved—Angular—Circular/Ovate
7. No. of Courses: 2—3—4—5 or more—indeterminate—N/A
8. No. of Rows/Alignments (individual alignments, either enclosed or not enclosed): None—1—2—3—4—5 or more— Indeterminate—N/A
9. Row/Alignment Spacing pattern X: Regular—irregular—indeterminate—N/A
10. Row/Alignment Spacing pattern Y: Regular—irregular—indeterminate—N/A
11. Row/Alignment Spacing X: Contiguous--<0.5m—0.5-1m—1-2m—2+m—N/A
12. Row/Alignment Spacing Y: Contiguous--<0.5m—0.5-1m—1-2m—2+m—N/A
13. Rubble fill (small cobbles) between row/alignments?: Yes—No—indeterminate—N/A
14. Internal Diameter: N/A —<0.5m—0.5-0.7m—0.7-1m—1-2m—2-3m—3-4m—4+m
15. Construction Method: Stacked regular—Stacked irregular—Mounded—Indeterminate—N/A
16. Set repeated: Yes—No
17. No. of repeated sets: None—1—2—3—4—5—6—7—8 or more
18. Location of sets: adjacent—gap—overlapping—N/A
19. Max. Height/Depth: <1m—1-2m—2-3m—3m or more

Relationship Sets: XY—XZ—XYZ

1. Location relative to Element Set 1: inside—Outside—Overlapping—Overlaying—Underneath—Boundary—Intersecting
2. Placement relative to Element Set 1: Gap—Adjacent—Overlapping—Overlaying
3. Location relative to Element Set 1: Over—Under—N—NE—E—SE—S—SW—W—NW—Inside—Intersecting—Bounding
4. Oriented/Angle to Element Set 1: Parallel—Perpendicular—Center—Fill—Boundary —Angle: N/S—E/W—NE/SW—NW/SE—indeterminate—N/A
5. Overall Shape: Round—Angular—Elliptical—Linear—Curved—indeterminate—N/A
6. Overall Dimensions: Min x__Max x
Min y__Max y
Min z__Max z
Int/Ext Diameter

An *XY element set* is a structure that has 2 horizontal dimensions, with no depth (e.g., a pavement or a foundation). An *XZ element set* has one horizontal dimension that has a width of less than one meter, with depth/height (e.g., a rock wall). The maximum width defines the boundary between an XY set and an XZ set. An *XYZ element set* has both X and Y horizontal dimensions and depth (e.g., a rectangular structure with height). A *relationship set* defines how two or more element sets are combined to form a larger structure. Any of the above element sets may be combined with one another to form a relationship set, for instance, an XY set may define a foundation, and an XYZ set may define a homogeneous set of stones that lay on top of it.

Within these different kinds of element sets are various attributes thought to be relevant in identifying the variability in the technological attributes of structures on the island. All attributes are related to how structures were constructed, such as the spacing of elements, the number of rows and their placement, the number of courses of stone, and the construction method. Some however, may later also inform on function such as shape, whether or not they are filled or enclosed, if there is a concentration of boulders/cobbles present, and if element sets are repeated within a single structure (e.g., several circular enclosures adjacent to one another). Appendix A provides explanations and discussion of each attribute on Table 4.

An advantage of this type of classification is that attributes may be added or deleted with little modification of the overall design. If a new relevant attribute is encountered, it may be added with little difficulty; previously classified artifacts need to be reexamined for only the specific attribute with the remainder of the classification

left intact. The same applies for an attribute later deemed irrelevant. The attribute may be deleted with no modification of the remaining classification.

Once defined, classes may also be combined or separated based on varying levels of inclusiveness with regard to a particular purpose or question. For instance, if one were to know the function of a particular form with relative certainty, it may be possible to combine several classes based on certain criteria in an analysis. In Table 5, if we were certain of the function of the ethnographic types, the listed attributes limit the structures that may be included first in each class (i.e., definitions are given primacy over labels), and then in each group. The necessary attributes can be viewed as providing various levels of inclusiveness, with 1 being the most inclusive class definition (adapted from Lipo 2001). The more attributes required for membership in the class, the less inclusive it becomes. The following are some examples of various classes and levels created using this new classification system:

An ideal *hare moa* structure would be classified at the highest level (lowest inclusion) as an XYZ element set with the following characteristics: surface structure, filled, roofed, enclosed, and angular in shape with 5 or more courses of stone stacked irregularly.

At a lower level, with a higher level of inclusion, a *hare moa* may be classified as the following XY element set: filled, bounded, linear in shape, elements contiguous and vertically embedded, 4 parallel rows less than 1m apart with rubble fill in between and cobble/boulder concentration in and around the structure.

An ideal *manavai* structure would be classified at the highest level (lowest inclusion) as an XYZ element set with the following characteristics: surface structure,

not filled, enclosed, circular in shape with 4-5 courses of stone stacked irregularly, 2 parallel rows less than 1m apart with rubble fill in between

At a lower level, with a higher level of inclusion, a *manavai* may be classified as the following XY element set: not filled, enclosed, circular/ovate, contiguous elements, 9 or more stones, 1 row,

An ideal oven would be classified as an XY element set that is not filled, is enclosed and bounded, elements contiguous and embedded in earth, less than 9 stones, 1 row, internal diameter 50-70cm.

An ideal pavement would be an XY element set that is not filled, not enclosed or bounded, elements are rounded, smoothed stones laid flat and embedded in earth contiguously, forming a “pavement”.

An ideal *hare paenga* would consist of a relationship set between two XY element sets. The first (XY1) contains smoothed, angular vesicular basalt boulders with cupped depressions carved into upper surface, stones are embedded vertically and contiguously in ground in an elliptical shape, making the structure enclosed and bounded but not filled, and containing only 1 row of stones. The second element set (XY2) is the same as the ideal pavement described above. The relationship is that XY2 is located outside, parallel and adjacent to XY1.

Depending on which level is employed the occurrence of structures within a class increases or decreases, as does the certainty of one’s conclusions. The same applies to the combination of such classes to form larger groups. For instance, if we accept all of the classes listed in Table 5 for *hare moa*, as previous investigations have done, the number of structures included will be much larger, but the certainty of the

Table 5. Preliminary classification with varying levels of inclusiveness for archaeological structures on Rapa Nui

Necessary and Sufficient Criteria for inclusion in a class	Group	
<ol style="list-style-type: none"> 1. Cluster of water worn (rounded) stones. 2. Water worn (rounded) stones of basalt, placed contiguously on the ground. Stones average 20-50 cm in size, though range is relatively homogeneous with any specific structure. 3. Water worn (rounded) stones of basalt, placed contiguously embedded in the ground. Stones average 20-50 cm, though range is relatively homogeneous with any specific structure. These are somewhat aligned in 5 or more parallel rows. 	Pavements	Living Surfaces
<ol style="list-style-type: none"> 1. A level surface on an otherwise sloped area. 2. A level surface bounded on the front margin by a retaining wall of a single course of basalt boulders. 3. A level surface bounded on the front margin by a retaining wall of several courses of stacked basalt boulders. 	Terraces	
<ol style="list-style-type: none"> 1. Presence of vesicular basalt showing evidence of modification in the relatively smoothed, angular shape of the stones and the presence of cup-shaped depressions on the top surface. 2. Presence of vesicular basalt showing evidence of modification in the relatively smoothed, rectangular shape of the stones and the presence of cup-shaped depressions on the top surface. Stones vertically embedded in the ground. 3. Presence of vesicular basalt showing evidence of modification in the relatively smoothed, rectangular shape of the stones and the presence of cup-shaped depressions on the top surface. The stones are aligned and embedded vertically in the ground, forming an elliptical foundation. 4. Presence of vesicular basalt showing evidence of modification in the relatively smoothed, rectangular shape of the stones and the presence of cup-shaped depressions on the top surface. The stones are aligned and embedded vertically in the ground, forming an elliptical foundation, with a pavement adjacent to the front margin. 	<i>Hare paenga</i>	
<ol style="list-style-type: none"> 1. Single course of undressed stones arranged in a circle or oval, with a diameter greater than 2 meters. 2. Single course of undressed stones arranged in a circle or oval, with a diameter greater than 2 meters, and a stone pavement lining the exterior. 	Round Thatch Huts (<i>hare oka</i>)	
<ol style="list-style-type: none"> 1. Parallel stone alignments set in the ground in a rectangular to sub-rectangular form. The length of these structures is greater than or equal to 2 meters with a width averaging 2 meters. 2. Double alignments with 10-15 cm between them, forming a rectangular to sub-rectangular form. The length of these structures is between 2 - 5 meters with a width averaging 2 meters. 3. Double alignments with 10-15 cm between them, forming a rectangular to sub-rectangular form. The length of these structures is between 2 - 5 meters with a width averaging 2 meters. A row of flat stones forms a pavement around the structure about 10-15 cm from the foundation. The entrance is located along the longer side, identified by a small rectangular area paved with flat stones with an outline of thin slabs vertically embedded in the ground. 	Rectangular Thatch Huts (<i>hare kau kau</i>)	

Table 5. (Continued) Preliminary classification with varying levels of inclusiveness for archaeological structures on Rapa Nui

Simple shelters made of a rock overhang, no modifications evident.	Rockshelters (<i>karava</i>)	
<ol style="list-style-type: none"> 1. Simple shelters made of a rock overhang, no modifications evident 2. Overhangs, caves, or lava tubes showing evidence of some modification. 	Rockshelters (<i>ana</i>)	
<ol style="list-style-type: none"> 1. Overhangs, caves, or lava tubes showing evidence of some modification. 2. Caves or lava tubes exhibiting intensive labor investment in modification, such as narrow tight entryways and other structures within. 	Rockshelters (<i>ana kionga</i>)	
<ol style="list-style-type: none"> 1. Minimally 2 contiguous vertically embedded stones forming a partial small enclosure. 2. Small enclosure of 4 or more contiguous vertically embedded stones, with an interior diameter averaging between 50-70cm. 	Ovens (<i>umu pae</i>)	Subsistence Features
<ol style="list-style-type: none"> 1. Presence of an <i>umu pae</i> with a curved alignment of a single course of stone averaging 1.5-2m distant on the windward side, 2. Presence of an <i>umu pae</i> with a circular alignment of a single course of stone surrounding the <i>umu pae</i>. 	Ovens (<i>hare umu</i>)	
<ol style="list-style-type: none"> 1. Concentration of boulders and cobbles on the surface, resulting from cultural activity. 2. Single alignments of boulders embedded in the ground, surrounded by boulder and cobble concentrations. 3. Two parallel alignments of boulders embedded in the ground, surrounded by boulder and cobble concentrations. 4. A rectangular to sub-rectangular alignment of embedded boulders, ranging between 3-12m in length and 2-4m in width, surrounded by boulder and cobble concentrations. 5. Three parallel alignments of boulders embedded in the ground, on average less than 1 apart with rubble fill in between, surrounded by boulder and cobble concentrations. 6. Four parallel alignments of boulders embedded in the ground, on average less than 1 apart with rubble fill in between, surrounded by boulder and cobble concentrations 7. A rectangular roofed structure of 5 or more courses of irregularly stacked basalt stones and cobble fill, ranging between 3-12m in length and 2-4m in width. 	Chicken Houses (<i>hare moa</i>)	
<ol style="list-style-type: none"> 1. Circular concentration of boulders and cobbles. 2. Circular to oval enclosure of one course of boulders, averaging 2-5m in diameter, surrounded by boulder and cobble concentrations <i>or</i> an excavated depression on a slope averaging 4-9m in diameter, with rock concentrations at the base. 3. Circular to oval enclosure made of stacked basalt boulders, either single or double-walled, averaging 2-5m in diameter and 1-2m in height, <i>or</i> an excavated depression on a slope with a rock wall of stacked basalt lining the interior walls, averaging 2-5m in diameter and 1m in depth, <i>or</i> clusters of circular to oval enclosures made of stacked basalt boulders, either single or double-walled, averaging 2-5m in diameter and 1-2m in height. 	Garden Enclosures (<i>manavai</i>)	

conclusions associated with them much lower, than if we had only accepted the highest level with the lowest inclusiveness. Researchers need to be explicit about the tolerance level they employ for the grouping of structures (which levels have been determined as valid for particular analyses), allowing others to determine the confidence level they can achieve in utilizing previous work.

Table 5 discusses only the more straightforward structure types on the island. However, many structures on the landscape have been recycled or modified to the degree that it is difficult (possibly impossible) to determine their original form or composition. In some instances these structures may represent functional palimpsests, or structures that served a variety of purposes in the past. Previous classifications either attempt to force these structures into one of the ethnographic descriptions, or chose to leave them out rather than confound analyses. This classification system allows for their inclusion as it is based only on individual attributes of a structure, without interpretation as to function. These can also be grouped based on decisions made by the researcher with reference to a particular question or design.

Turning to the data collected by the University of Hawaii Archaeological Field School for the sample survey conducted in this report; if the data included in the group of *hare moa* were reclassified following this scheme we would have the following 14 classes, exemplifying the variability currently encountered within this group of feature (Table 6):

Table 6. Reclassification of “*hare moa*” structures examined in sample survey

XYZ element sets:		
1	6-294B	Surface structure, filled, not roofed, enclosed, angular in shape, 4 courses of stone, 2 rows placed less than or equal to 1m apart with cobble fill between them, stacked irregularly, 1-2m in height
2	7-97D, 7-98A	Surface structure, filled, roofed, enclosed, angular in shape, 5 or more courses of stone stacked irregularly, 1-2m in height
XY element sets:		
3	6-285C, 7-96C, 7-222B, 7-266F, 7-315D, 7-223	Filled, bounded, enclosed, angular/subangular in shape, 4 sides, more than 9 stones, 1 row
4	7-292C, 7-293B, 6-259B, 6-293B, 6-288C, 7-236D	Filled, bounded, enclosed, sub-angular in shape, 4 sides, more than 9 stones, 2 rows placed less than or equal to 1m apart with cobble fill in between them
5	7-211	Filled, bounded, not enclosed, curved, more than 9 stones, 1 row
6	6-272	Filled, bounded, not enclosed, linear, more than 9 stones, 2 rows placed 1-2m apart with cobble fill in between them
7	7-189C	Filled, bounded, not enclosed, linear, more than 9 stones, 2 rows placed 5m apart with cobble fill in between them
8	7-88D	Not filled, bounded, not enclosed, angular in shape, 3 sides, more than 9 stones, 1 row
9	7-152B	Not filled, bounded, not enclosed, linear, more than 9 stones, 1 row.
10	6-244D	Not filled, bounded, not enclosed, linear, more than 9 stones, 2 rows placed 1-2m apart with cobble fill in between them
11	6-207D, 6-287A, 7-272B, 7-265D	Not filled, not bounded, not enclosed, random distribution, no structure, 9 or more stones consisting of a concentration of boulders and cobbles
Relationship Sets:		
12	6-275D	XY1 = Not filled, bounded, not enclosed, curved, more than 9 stones, 1 row; XY2 = filled, bounded, not enclosed, linear, more than 9 stones, 2 rows placed less than or equal to 1m apart with cobble fill in between them. Relationship set: XY2 is located outside, perpendicular and to the west of XY1 with a gap in between them.
13	7-211	XY1 = filled, bounded, not enclosed, curved, more than 9 stones, 1 row; XY2 = filled, bounded, not enclosed, linear, 4 stones, 1 row. Relationship set: XY2 is located outside, perpendicular and to the south of XY1 with a gap in between them.
14	6-234B	XY1 = Not filled, bounded, not enclosed, linear, more than 9 stones, 1 row; XY2 = filled, bounded, not enclosed, angular in shape, 3 sides, more than 9 stones, 1 row with cobble fill. Relationship set: XY2 is located outside, parallel and to the south of XY1 with a gap in between them.

*All classes contain element classes of vesicular basalt stones with irregular rough surfaces averaging 20-50cm or 50-80cm in size, angular to irregular in shape, upright and both embedded or not embedded in the earth with no artificial attributes on the stone itself.

These may be further consolidated into a smaller number of larger groups, based on how inclusive one wants the classes to be (in previous investigations they were all combined into one large group). For instance, classes that contain only one row may be consolidated into one group, and those with two rows may be combined to

form another. Or those that are filled, bounded and enclosed may be combined into one group and those that are not filled, not bounded, and not enclosed, into another. In the above list of classes I have also already combined several structures that contain either different average sizes or shapes of stone, to simplify it for the discussion. In some analyses this may be appropriate, in others it may not. How they are grouped depends on the criteria chosen as definitive or relevant for a particular analysis. It is also highly likely that different grouping methods will result in different distributions and relative frequencies of classes across the Rapa Nui landscape. It is vital that one be explicit about the criteria used in grouping structures from more than one class.

Utility of previous site records for studies of settlement variability

Unfortunately, devising an explicit classification for structure types on Rapa Nui may necessitate the resurvey of previously recorded structures. Although some site records may contain enough description of the attributes listed in the classification scheme to allow for reclassification, most often they do not as the data were collected with a different research agenda or perspective in mind. We return again to the class of chicken houses. As many of the site records do not include enough information on the attributes of the structures located (some only a name), it is not possible to reclassify them, or even to determine the tolerance level (e.g., Table 5) used to assign them to the class of chicken house. For example, Tables 7 & 8 list some of the descriptions or attributes offered by McCoy and the University of Chile in their site records for the *hare moa* and *manavai* resurveyed for this report.

We can see that McCoy's site records do not contain enough information on existing attributes to identify what he considered as criteria for inclusion in the class of *hare moa* (Table 7). Based on his limited description, we cannot even confidently place many of his records within level 1, the most inclusive definition in Table 5. Although they may mention a 'foundation' or a 'base', there is not enough information given on exactly what that means (e.g., shape, type or size of stone, embedded vs. not embedded). In order to evaluate the certainty of any analyses involving these structures, they need to be resurveyed and rerecorded.

The University of Chile offers more detail in their site records for this class of feature. In all but one of the descriptions there are enough attributes listed that may allow for their placement on a higher, or less inclusive level in Table 5. For instance, 5 of the records may fall into level 4 and 1 record falls into level 3 on Table 5. However, this still requires some interpretation or assumption on my part for some aspects, such as whether the stones are embedded or not or how the shape of the structure is determined (is there an enclosed alignment forming a rectangle, or is it only several parallel stone alignments with the general overall shape of a rectangle, as in Figure 17C?). Other researchers following this scheme may interpret these records differently. Because of the complexity of this feature type and the variability that exists within previous definitions, as with McCoy's data it would be wiser to resurvey and classify those structures with insufficient information using the new classification scheme than make assumptions about previous decisions.

The same situation applies for the descriptions of *manavai* offered by the two sources (Table 8), although because of the less complex nature of the feature type

more of the records may prove to contain sufficient information to allow for reclassification. I have assigned most of the descriptions in Table 8 varying levels of inclusiveness based on Table 5. However, again some interpretation is required, such as the shape in the University of Chile's descriptions (in some instances it appears as though the label *manavai* implicitly implies a certain shape), and dimensions for individual structures in both sources. To ensure an appropriate classification, it may be necessary to reexamine these structures.

One may think that the simplest of features types may not need similar scrutiny. This is not the case however, when looking at what is thought to be the most consistent and identifiable features on the island, the *umu pae* (oven). Although the attributes of these structures may in reality all conform to the definition of an *umu pae*, many of the records do not explicitly state what these individual attributes are to allow us to determine this for a fact, or to look at the variability between them (Table 9). Again, McCoy offers less data, requiring more interpretation on our part as to what criteria he is using to define these features. Shapes and diameters are given, but we are left to infer that these shapes are formed by vertically embedded, contiguous stones of certain shapes and sizes, or that they are enclosed rather than say, half-circles assumed to originally be circular. for the necessary details. The University of Chile offers more detail in their records, but this is not done consistently. Some contain sufficient information, and others contain details about rock sizes, shapes or positions, but lack important information such as material type or diameters. Although common-sense may fill in the blanks on such simple structures as these, this lack of data precludes both reclassification of and more detailed analyses about them.

Table 7. Descriptions of hare moa provided by McCoy and the University of Chile

McCoy	Description
6-207D	...a completely disturbed <i>hare moa</i> or chicken house denoted by a concentration of stone.
6-229C	...a <i>hare moa</i> measuring 4 meters long and 1.60 meters wide. Only a portion of the base is intact.
6-234B	...a destroyed <i>hare moa</i> enough of which remains to indicate a structure at least 5 meters long and 1.25 meters wide. The <i>hare moa</i> is located on the south edge of a knoll.
6-244D	...a <i>hare moa</i> part of the foundation being intact showing a structure 6 meters (p) long and 2 meters (p) wide. It is situated on a slope obliquely with adjacent flat areas being kept for habitations.
6-275D	... a <i>hare moa</i> with a sub-rectangular shape base of large rough stones and a floor of small rock. The probable length of the structure is 6 meters with a width of 2 meters.
6-285C	... a completely destroyed <i>hare moa</i> noted by the presence of the typical small rock floor and loose foundation stones in a concentrated area. This feature is located at the brim of a flat plain
6-287A	... <i>hare moa</i> is essentially situated on top of a rock outcrop and is denoted by a concentration of small stone for the floor, and loose foundation stones.
University of Chile	
7-96C L4	...a totally destroyed <i>hare moa</i> . The remains are oriented approx SE to NW. They approx 10 meters length x 3 meters width. Only some stones define the contours. Its form is basically rectangular with rounded ends...
7-152B L4	A destroyed <i>Hare moa</i> ...The base of the structure is oriented longitudinally N-S and has a rectangular form 6.4 meters long by 4.3 meters wide. The walls were not preserved. The remains of the inner chamber gave a width of 43 cm but length was indeterminable. The rest of the structure extended in an area of 7meters diameter
7-189C L4	Destroyed <i>hare moa</i> ...It measures approximately 7 m from N to S with an average width of 2.2 m. The centers remain relatively clear, the extremes are completely ruined and in a rectangular form. There are remains of vaka ure, but it is not possible to determine an exact width. This lengthwise orientation of N to S is parallel to the house (S7-189A). The interior has kikiri; it is defined by large stones of 40 to 80 cm and arranged horizontally. The height of the remains is 50 cm.
7-265D	Destroyed <i>hare moa</i> ...The remains occupy an area about 4.8 m NE to SW by 3.6 m.
7-266F L4	Destroyed <i>hare moa</i> ...a rock outline, measuring 8.8 m long, and oriented longitudinally from N to S. The average width is 2 m and rectangular shaped with rounded edges. It is defined by contiguously placed round rocks with a size of 48 X 27 cm and a height of 25 cm. The interior is round and filled with kikiri. The exterior remains are found dispersed more than 2 m around.
7-222B L4	The remains establish a length of 8.80 mts and a middle width of 2.30 mts on the exterior. The only clear remains correspond to the exterior foundation which is a base of irregular rocks 50 to 80 cm generally placed in a vertical position with 40 to 50 cm on the highest part. Its shape is presumed subrectangular. The mass of the vaka ure (type of wall) and the characteristics of the room are impossible to determine without excavating because they are covered with a great mass of kikiri rocks (small rocks for fill).
7-88D L3	A destroyed <i>hare moa</i> ... The remains form a compact area of 6 meters in diameter covered with rocks of 30-50 cm and a large quantity of gravel used for fill. The walls of the structure are constructed using irregular stones that form double walls with mortar (vaka ure) that are destroyed. In the S section of the remains, there is a segment that consists of an alignment of foundation blocks that allow us to suppose that the structure is oriented longitudinally from the N to the S. Dimensions: length (est.), 6.50 meters; Width, 3.00 meters The remains have an average height of 30 cm corresponding to the elevation of the base stones that are in situ. The estimated height of the structure is 1.8 meters. The evidence in the terrain is not sufficient to determine the form but one can presume that it may have been rectangular or semirectangular.

Table 8. Descriptions of *manavai* provided by McCoy and the University of Chile

McCoy	Description																																				
6-189 L2	...a small-excavated basin on the southeast side of a rock outcrop. The bottom of the 4 meters wide enclosure is filled with rock.																																				
6-206 L2	...an isolated <i>manavai</i> consisting of an excavated pit 4 meters or more in diameter and with a depth of less than 50-60 centimeters. An artificial rim is noted showing an excavation																																				
6-231 L3	...a <i>manavai</i> consisting of an excavated circular pit on a flat plain. There is a rock wall lining the interior of the pit. The inside diameter of the enclosure is 2 meters.																																				
6-432	4 <i>manavai</i> of oval and sub rectangular shapes. The enclosures are rock wall structures with double wall bases showing rubble fill between. The area covered is ca. 15 Meters (p).																																				
6-296 L2	...an isolated <i>manavai</i> consisting of two paralleling concentric bases. The enclosure has a diameter of little more than 2 meters and the interior is filled with large rock.																																				
6-229D L2	...a <i>manavai</i> with a sub-circular outline on the west side of a rock outcrop. There is one course of buried stone forming the outline with a diameter of 4 meters. The interior of the enclosure is covered with semi-large rock. No excavation was involved in this case and represents another type of <i>manavai</i>																																				
University of Chile																																					
7-96F L3	A group of surface <i>manavai</i> ...covering an area of 17.30 meters (NS) by 8.15 meters (EW). One can distinguish 5 structures, defined by walls of the vaka ure type of a thickness of .9 – 1.1 meters wide. In the sections that are the best conserved these walls have a height of 1.60 meters. 1. oval 6.2 x 2.5 meters 2. oval 3.10 x 2.5 meters 3. oval 3.80x 2.60 meters 4. circular 3.4 meters diameter 5. oval 6.3 x 4 meters																																				
7-97B L3	Two surface <i>manavai</i> that are connected... These <i>manavai</i> are very well preserved and cover an area of 9.50 x 5.60 meters. The wall that separates both structures has a height of 1.40 meters...walls have an average height of 1 meter. The last third of the wall is invariably destroyed. The walls are of the double walled type (vaka ure) and are .90-1.00 meters wide...most stones inserted in the ground and the space between both walls is filled with gravel and small stones (kirikiri) 1 circular 3.7 meters in diameter 2 circular 3.0 meters in diameter																																				
7-215 L3	Cluster <i>manavai</i> on surface in a good state of preservation...it has a length of 22.50 meters NE SW and a middle width of 13.70 meters. You can identify 18 structures in this area...the best conserved <i>manavai</i> have interior walls that vary in measurements between 1.40 meters and 1.60 meters. The average thickness of the vaka ure is 0.80 meters- 1.40 meters in width...The average diameter of the <i>manavai</i> is of 3 meters.																																				
7-295C L3	Located 7.8 m W/SW of 295 A. Cluster <i>manavai</i> on the surface associated with 295 B. It is a group of 8 well-preserved <i>manavai</i> . The one designated by the number 3 is the best preserved.																																				
	<table border="1"> <thead> <tr> <th></th> <th>#1</th> <th>#2</th> <th>#3</th> <th>#4</th> <th>#5</th> <th>#6</th> <th>#7</th> <th>#8</th> </tr> </thead> <tbody> <tr> <td>Height</td> <td>1.5m</td> <td>1.46m</td> <td>1.4m</td> <td>1.7m</td> <td>1.4m</td> <td>1.4m</td> <td>1.38</td> <td>1.35m</td> </tr> <tr> <td>Vaka ure</td> <td>.9m</td> <td>1.1m</td> <td>.9m</td> <td>.6m</td> <td>.8m</td> <td>1m</td> <td>.8m</td> <td>.9m</td> </tr> <tr> <td>Diameter</td> <td>7 m</td> <td>6X2.3</td> <td>6X6</td> <td>4X4</td> <td>3X3</td> <td>6.5X2.6</td> <td>4X2</td> <td>6X2</td> </tr> </tbody> </table>		#1	#2	#3	#4	#5	#6	#7	#8	Height	1.5m	1.46m	1.4m	1.7m	1.4m	1.4m	1.38	1.35m	Vaka ure	.9m	1.1m	.9m	.6m	.8m	1m	.8m	.9m	Diameter	7 m	6X2.3	6X6	4X4	3X3	6.5X2.6	4X2	6X2
	#1	#2	#3	#4	#5	#6	#7	#8																													
Height	1.5m	1.46m	1.4m	1.7m	1.4m	1.4m	1.38	1.35m																													
Vaka ure	.9m	1.1m	.9m	.6m	.8m	1m	.8m	.9m																													
Diameter	7 m	6X2.3	6X6	4X4	3X3	6.5X2.6	4X2	6X2																													

Table 9. Descriptions for *umu pae* provided by McCoy and the University of Chile

McCoy	
6-221C	A rectangular earth oven 60 X 57 centimeters in dimension is noted and carbon stained earth.
6-275B	...is the remains of a circular umu with a diameter of 40-50 centimeters
6-298A	...a pentagonal shape umu with a diameter of 60 centimeters...
6-315B	...a pentagonal umu with a diameter of 52 centimeters...
6-210C	...a pentagonal shape umu, one side of which is missing. The diameter of the earth oven is 70 centimeters maximum.
6-230D	...an irregular shape umu of 6 stones with a maximum diameter of 56 centimeters.
University of Chile	
7-291B	The umu has 4 rocks in situ and a large rock has fallen towards the outside. It has an average size of 18 cm. It can be found above a small mound of approximately 3.5 m in diameter. 70 X 46; 60 X 24; 57 X 20; 35 X 16; 42 X 15
7-127C	...a pentagonal <i>umu pae</i> whose stones stick out 15 cm above the ground on the inside of the umu and 12 cm on the outside.
7-28C	Pentagonal form bordered by homogenous rectangular stones. The stones are buried about half way and protrude from the ground between 30-35 cm
7-3	It is hexagonal, bordered with rough rectangular stones, arranged vertically, approximately one-third buried...they project an average of 12.5 cm from the exterior level of the ground and 11 cm from the interior level of the structure. The maximum interior diameter is 60 cm (north south), and the east-west interior diameter is 49 cm.
7-18C	The hexagonal shape is delineated by 6 basalt rocks of 35 by 20 cm on average that are inserted in the ground, rising an average of 25 cm. It has a maximum diameter of 55 cm (a minimum of 45 cm).
7-291C	Destroyed <i>umu pae</i> . It is on top of a mound of approximately 4 m in diameter and has an approximate height of 30 cm in relation to the surrounding land. There are 2 stones in situ that measure approximately 15 cm tall.

The comparison of these two classification systems also highlights the important aspect about how such systems are contingent on the research question and design at hand. The methods and design used to record and identify features in the previous investigations are vastly different than what I have outlined here in Tables 4 and 5. Previous investigations accepted the ethnographic descriptions of feature function and form, and were not interested in variability within such types or the existence of 'other' types not described in historic accounts. The utility of more detailed data on individual structure attributes for different research questions, or even to examine basic assumptions, was not realized. This is not conducive to more detailed

analyses of say, chronology, function, or technology, as no data is provided to allow for the examination of variability within structures at any level (from elements to relationship sets, either stylistic or formal), or even to evaluate construction methods and technological choices.

The classification scheme proposed here allows for discussion of aggregate-scale artifacts from the smallest levels—attributes or elements—up to larger suites of attributes, based upon formal characteristics and their architectural configuration. The attributes selected as important in this scheme is based on preliminary observations of the technological variability that exists within and between structures on the island, and so offer valuable data with which to start grouping them in a consistent manner. Only when there is a standard classification scheme in place can we begin to understand or grasp something as simple as what is on the island? And how alike or different are artifacts across the landscape? This serves as a good foundation for more detailed analyses of chronology or function as one's research focus can be narrowed down to specific groups of artifacts identified as similar (though at times with some level of variability) based on formal or construction attributes (i.e., empirical attributes). For example, classes may be grouped for functional analysis by sharing attributes such as embedded, enclosed circular alignments. The resulting group would include ethnographic types of ovens, *manavai*, planting circles, and other miscellaneous circular structures; the study is not biased by predefined functions as all artifacts bearing these traits are included, not only those predetermined to be say, garden enclosures. The reverse is also true, in that the level of inclusiveness can decrease to isolate only those artifacts bearing more traits defined as necessary and

sufficient for membership within the class. For instance, we can add two parallel rows with <1m distance and rubble fill in between, 4 courses of stone, 1-2m height, and no fill within the enclosure, to the list of necessary criteria. The number of artifacts will be drastically reduced and the study would be more narrowly focused.

This is not to say that everything previously done needs to be reexamined and reclassified. Many records may offer sufficient information to enable reclassification without going back to the field. Unfortunately however, as Tables 6-8 show, this is not consistent within any one dataset, meaning each feature type discussed above has both useful and limited records. Whether resurveying is necessary or not also depends on the questions being asked and the data requirements for answering them. Different questions will require different kinds of data; it would be necessary to review all available data with this in mind, to determine which ones need to be re-surveyed. Depending on time and available funding, it may be more cost effective to simply resurvey entire areas than go through various datasets and attempt to relocate only specific structures. Reclassifying all structures using this new classification system, or another similar to it, has the advantage of alleviating this problem for future researchers as it results in a consistent, more detailed catalog of the both the similarity and variability of structures on the island from which they can begin analyses. Either way, this study has shown that the reexamination of how we identify structures on the landscape is necessary to provide a sound basis for testable hypotheses about Rapa Nui settlement patterns specifically and Rapa Nui prehistory in general.

CHAPTER 5. SUMMARY AND CONCLUSIONS

An enormous amount of time and effort has been spent in collecting a vast amount of data on feature forms and distributions for the island, and new or modified research questions should make use of such an invaluable resource. However, this should not be done without questioning and evaluating the accuracy, consistency, and even the ultimate utility of such data for different research questions. This report addresses the issue of the compatibility of data collected by different researchers at different times to ensure that the standards used to identify structures are consistent throughout, ultimately allowing us to confidently use such data in more detailed analyses of settlement variability on Rapa Nui. Its results have revealed inconsistencies in past classification systems that may lead to difficulties in both supporting one's conclusions and replicating another's results, both of which are vital aspects of any scientific discipline. I have offered an alternative system with which to both re-examine past surveys and utilize in future ones, with the intent of achieving reliability and validity in the analysis of archaeological remains on the island. To use it effectively will require the resurvey of many, if not all, of the previously recorded features, depending on what tolerance level researchers choose for their analysis as well as what kind of question being asked. Because many of the features are consistently identified as to 'type' between datasets using previous criteria, questions on certain distributions and frequencies may be possible. Any detailed analysis into settlement variability and change however, requires the review of previous data discussed above. The amount of detailed and vital information on the vast majority of

previous collected data is too limited to allow for any meaningful study of those questions.

The potential on Rapa Nui for new and productive analyses of the structure of the archaeological record is substantial. The history of archaeological inquiry into Rapa Nui prehistory is replete with ideas of “cultural collapse” or social and environmental deterioration. For example, Kirch describes it as “an island civilization, which, overshooting its resource base and damaging its fragile ecology, descended into the darkness of social terror” (Kirch 2000:2); Diamond sums it up as a “complex society” spiraling “into chaos and cannibalism” (Diamond 1995:1); and Bahn & Flenley use the “rise and fall” of Rapa Nui culture as a “cautionary tale relevant for the future of all humankind (Bahn & Flenley 1992:9). The prevalence of reconstructions like these overshadows the extraordinary tale of *adaptation* and *success* in extreme isolation.

Prehistoric populations on Rapa Nui were faced with limited resources and land area from the days of initial settlement to European contact. This was primarily a result of a colder climate, to which many of the traditional Polynesian cultigens or staple crops were not adapted (e.g., coconut, breadfruit), and which limited marine resources with the lack of coral reefs. The extreme isolation of the island also precluded the security of long distance interaction in times of stress or unpredictability. The fact that they survived in relatively large numbers until the arrival of the first Europeans attests to the fact that their story is one of continuous, *successful* adaptation to environmental/climatic regimes. If a reliable classification system is employed, more in-depth research may contribute to this perception by

focusing on the ways in which individuals and populations utilized space and resources within differing environments on the island, through the spatial analysis of their material remains, thus shedding light on choices that were made to promote survival (e.g., Hunt and Lipo 2001 introduce the model of bet-hedging and its role in the evolution of cultural elaboration on Rapa Nui, as a means of explaining their endurance on the island for over 1000 years). All of this will allow the discussion of innovations and adaptations undergone by prehistoric Rapa Nui populations until the arrival of the first Europeans, and lessen the bias towards conceptions of the island as a source of “cautionary tales...for all humankind”(Bahn & Flenley 1992:9).

Appendix Explanation of Attributes and form in Table 3

Element set # ___ of # of element sets ___: At times there are more than one element set within a structure. Each element set requires a separate form, and should be numbered to keep them ordered. The section for Relationship Set is to be filled in on the appropriate form to identify how they are tied together.

General Attributes of the element(s) within a set (to be completed under element classification):

I. Material

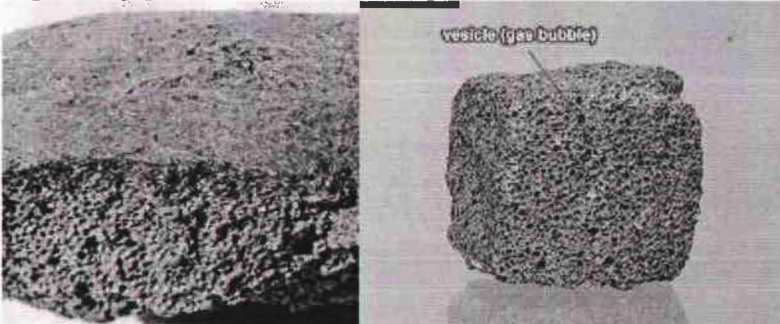
1. dense basalt – basalt that is fine-grained and non-porous, meaning there are no pores or voids evident on the surface.



Koday, E.

n.d. *Basalt*. Retrieved March 19, 2005 from
<http://www.ivyhall.district96.k12.il.us/4th/kkhp/RocksandMinerals/basalt.html>

2. vesicular basalt – basalt that is porous, meaning pores or voids formed by expanding gas bubbles as lava extruded onto the surface are observable.



Department of Earth and Planetary Sciences, Washington University in St. Louis
(July 2, 2004) *Vesicles and amygdules*. Retrieved on March 19, 2005 from
<http://epsc.wustl.edu/admin/resources/meteorites/meteorwrongs/vesicles.htm>
The Open University, UK.

n.d. *Vesicular Basalt*. Retrieved March 19, 2005 from
http://mysite.wanadoo-members.co.uk/geology_revision/basaltv.html

3. red scoria – highly vesicular lava rock, reddish-brown in color due to oxidation, formed as lava exploded out of a volcano. Gas bubbles formed inside the lava, and were trapped as the lava cooled and hardened into rock. Scoria is generally lighter than dense or vesicular basalt.



Gyllenhaal, E.D.

July 27, 2002 *Neighborhood rocks: Scoria*. Retrieved March 19, 2005 from <http://www.saltthesandbox.org/rocks/scoriabasalt.htm>

4. coral – self-explanatory
5. tuff – hard volcanic rock composed of compacted volcanic ash
6. earth – self-explanatory, attributes II-IX not applicable
7. non-portable bedrock – self-explanatory, attributes II-IX not applicable

II. Element surface

1. smooth surface – the surface is naturally relatively smooth in appearance and to the touch, with no ridges or irregularities
2. irregular/rough surface – the surface is naturally rough with irregular topography

III. Element size – average size of element type, not applicable for material types 6 & 7

IV. Element shape – self-explanatory

V. Element position – self-explanatory

VI. Element embedded in the ground – self-explanatory

Artificial attributes of the element(s) within a set (to be completed under element classification):

VII. Indentations/cupules – cupped depressions pecked into a surface of an element

VIII. Cut/shaped surfaces – one or more surfaces of an element has been artificially pecked to make it smooth in appearance and to the touch.

IX. Shaped surface attribute – a cut surface is smoothed and shaped, giving it a convex, concave, or planar profile.

X. Form – applicable only for material types 6 & 7, self-explanatory

XI. Shape – applicable only for material types 6 & 7, self explanatory

Element Classification and quantity: Numerical class of element, based on numbers chosen for element attributes I-XI. More than one may be present within a set. The quantity of each class observed within a set is to be tabulated to allow for future analysis of the distribution of element types.

Element combinations:

1. Is there more than one type of element present within a set?
2. If so, is there a pattern to the way they are arranged within the set?
3. If there appears to be a pattern, how often is it repeated throughout the set?

Layout: Draw a sketch of the set being described using the element classification number, to indicate where they generally lay relative to one another. Indicate if the sketch is of a plan view or profile.

Element sets:

Dimensions – self-explanatory

Set XY: (Horizontal dimensions present only, no height)

1. Filled or not filled – is there a relatively homogeneous concentration of boulders and/or cobbles filling the structure entirely?
2. Enclosed or not enclosed – enclosed applies when two ends of one form connect at some point, forming an enclosure of some sort
3. Bounded or not bounded – Although they may appear similar, I have included the both the attributes of being enclosed and being bounded for one reason. Enclosed means that two ends of one form connect at some point along the way, forming an enclosure of some sort. Common-sense would associate this with a boundary around either an empty space or some other form or attribute. However on the flip side, if viewing only the results of the classification and something is identified solely as *not* enclosed, one may also think that there is no boundary present even if there is say, a half-circle or nearly complete circular alignment of stones bordering or bounding a filled surface. The attribute ‘bounded or not bounded’ is included to clarify such cases. This also serves to separate something like an obvious circular cluster of boulders and cobbles (a filled surface) that does not have a foundation or definitive boundary surrounding it, from the above example. So bounded applies if there is some sort of definitive alignment, foundation, or ‘boundary’ present within a set. Anything that is enclosed will be bounded, as there is a definitive border used to identify it.
4. Shape formed by set of elements – Forms are only angular/subangular if they contain alignments with angular/subangular corners, otherwise they are linear. Forms are only circular/ovate or elliptical if they are enclosed, otherwise they are curved. A form is a pavement if it consists of contiguous stones forming a ‘paving’ over the surface; no function is implied.

5. No. of sides – this only applies if the sets are bounded. If they are not bounded, there is no definitive border with which to identify boundaries, and thus sides, of the set. If the set is bounded, the number of sides is equivalent to the number of bounded sides only. For instance, if a structure is rectangular overall, but contain only 2 alignments forming an ‘L’ at the edge of a filled surface, there are only 2 sides.
6. Element spacing – are the elements contiguous, separated by a gap less than 1m (medium), separated by gaps larger than 1m (sparse), or scattered about randomly with no apparent structure (no structure).
7. No. of stones – self-explanatory
8. No. of rows/alignments – multiple alignments are of the same set only if they are of the same orientation. If they are different, a new form is necessary to separate them.
- 9-10. Row/alignment spacing pattern X & Y – applicable if there are more than 2 alignments. Is the spacing between alignments the same throughout/is there a pattern to their spacing, or are they all different.
- 11-12. Row/alignment spacing X & Y – applies if there are 2 or more alignments.
13. Rubble fill between rows/alignments? – is the area between rows filled with small cobbles?
14. Internal Diameter – self-explanatory.
15. Set repeated? – is the form the set takes repeated in the same area. For example, a set may describe a circular enclosure which is repeated 7 times adjacent to one another.
16. No. of repeated sets – how many times is the same form repeated in the same area. In the above example it would be 7.
17. Location of sets – are the repeated sets adjacent to one another forming one large structure, or are they separated by a small gap of less than 1m.
18. Concentration of boulders/cobbles present? – this is significant as it notes the *possibility* of a larger structure or other forms/attributes associated with the set at some point in the past.

Set XZ (Horizontal in one dimension with less than 1m width, and height-more than one course of an element):

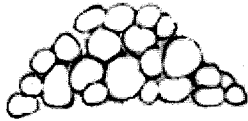
1. Shape of set can only be linear or curved; otherwise it is an XYZ set.
2. No. of courses – self-explanatory
3. No. of Rows/Alignments – rows/alignments need to be contiguous, and cannot result in more than 1m width to be considered an XZ set; otherwise it is considered and XYZ set.
4. Rubble fill within form? – are there small cobbles or gravel filling in between larger rocks in set.
5. Construction Method
 - A. Stacked regular: elements are stacked in a regular pattern and/or courses are easily distinguished in wall-like form.



B. Stacked irregular: elements are stacked randomly, though the complete form is wall-like.

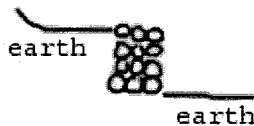


C. Mounded: elements stacked randomly, with complete form resembling a mound – i.e., rounded top and sloping sides.



6. Height – self-explanatory

7. Earth level with highest part of set on one side? – this is to distinguish possible retaining walls from free-standing walls.



8. Concentration of boulders/cobbles present – this is significant as it notes the *possibility* of a larger structure or other forms/attributes associated with the set at some point in the past.

Set XYZ (Horizontal in two dimensions with height—more than one course of an element):

1. Excavated or Surface – has sediment been removed from the area where the set is located, or is the set placed on the surface?
2. Filled or not filled – same as in XY sets.
3. Stony depressions? – is the set a filled surface with evidence of deliberate depressions whose base does not reach the soil layer below.



4. Roofed – applies if there is a hollow cavity below the uppermost layer of an element set.
5. Enclosed or not enclosed – same as in XY sets.
6. Shape – self-explanatory
7. No. of courses – same as in XZ sets.
- 8-13. Same as in XY sets.
14. Internal Diameter – self-explanatory

15. Construction method – same as in XZ sets.
- 16-18. Same as in XY sets.
19. Maximum height/depth – self-explanatory.

Relationship sets XY—XZ—XYZ:

Attributes 1-4 are self-explanatory. Sets are to be recorded in order from one set to the next nearest set. Thus, the form for the second set recorded will note its position relative to the first set, and the third to the second, fourth to the third and so on. For attributes 5-6, overall shape and size pertains to the most dominant shape and the extents of the combination of sets.

Sketch and Description:

Indicate the element set number on the appropriate form drawn on the sketch.

The description should briefly discuss the general layout of the overall structure, as well as any observations the attributes above do not cover.

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