GENDER, STATUS AND SHELLFISH IN PRECONTACT HAWAII

A Thesis

Presented to

The Faculty of the Department of Anthropology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

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May 2009

SAN JOSÉ STATE UNIVERSITY

The Undersigned Thesis Committee Approves the Thesis Titled

GENDER, STATUS AND SHELLFISH IN PRECONTACT HAWAII

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ABSTRACT

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by Robin H. Connors

This thesis addresses the topics of status and gender and the role of women in the political economy of Hawaii in pre-contact Hawaiian women using marine shell remains found in household middens occupied between the 15th through 19th centuries AD. Ethnohistoric literature describing gender roles within the *kapu* system, a system of traditional rules and beliefs that delineated behavioral roles, is compared with artifact assemblages found in coastal habitation sites occupied from 1400 to 1900 AD in the district of North Kohala, Hawai'i Island, Hawaii. The contributions of women to domestic, political and ritual components of Hawaiian society can be found in the archaeological record. As women were the principal gatherers of shellfish and echinoderms, marine invertebrates, shell midden analysis provides us with a clearer picture of the practices of women as they interacted with the natural environment and the complex cultural sphere of Hawaiian society. Three factors were determined to discern patterns in the female-linked activity of collecting shellfish and distributing the food source to various households: density of distribution, variability of taxa in the midden deposit, and relative size of individual specimens from five molluscan genera.

Patterns of taxon selection and distribution were compared to architectural and male-linked artifact assemblages in household sites, associating shellfish to the status and gender of the pre-contact occupants of the study area.

ACKNOWLEDGEMENTS

I would like to acknowledge the people whose support and assistance made this work possible. First, to my Graduate Chair, Dr. Mark McCoy whose revisions and remarks spurred me on to completion, thank you. Second, to my friends and colleagues Dr. Julie Field and Dr. Kathy Kawelu with whom I surveyed, cleared, mapped, excavated, screened and sorted in the blazing Leeward sun, and who generously provided me with the encouragement, opportunities and resources I needed to continue my research, *Aloha no, mahalo nui loa.*

Third, I was assisted by the efforts of my husband, Dennis Connors, who helped me to make sense of the endless strings of raw data that this project began with and to my children, who repaired hard drives and accompanied me on-line in convoluted investigations of text manipulation in Windows Vista. Without the sincere support from these people, and many others, this thesis would have been incomplete. *Me kealoha pumehana.*

And lastly, to the common women of ancient Hawaii, whose strength, generosity and skill remain a legacy for all Hawaiians today.

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Gender, Status and Shellfish

Resources describing the status and power of women in pre-contact Hawai'i are currently limited to 19th century ethnographic depictions primarily written by voyaging Europeans, Christian missionaries (Ellis 2004), and early Christian converts who became the first generation of native Hawaiian missionaries (I'i 1959; Kamakau S. 1991; Malo 1951). Outside the written literature, traditional descriptions of women taken from the oral literature of chants, describe only the occupations of Hawaiian mythological goddesses and royal women, leaving the common women primarily unrecorded (Emerson 1998).

The majority of women were not chiefly, but commoners, the *maka'ainana,* literally the people that attend the land (Pukui 1986). Our understanding of the activities of common women seems limited, viewing them as passive reactors to the dynamic domains of men and chiefs. We know that their labor provided the necessities for state and ritual function (Sahlins 1958), and despite the traditions of a belief system that separated gender and status, each functional member participated in a manner that supported the system as a whole. How can we hope to understand how women shaped their domain within the complex social structure of Hawai'i given the double distortions of an imposed Western value system and the rigid traditional class structure?

One feminist perspective of the Polynesian social system can be found in an evaluation of the effects of colonialism on Hawaiian women of rank, describing how women inheriting land attempted to gain proper title in the 19th century after the collapse of the monarchy (Linnekin 1990). Another study of gender in Polynesia examines the tapu, or kapu, system as it is practiced in Aotearoa (New Zealand) by the Maori, which questions the stereotype of female pollution (Hanson 1983). Hawaiian folktales (Pukui 1995; Westervelt 1923) give us a tantalizing glimpse of women's activities, but a sturdier contextual frame is required to fully appreciate their meaning.

Archaeology can provide us with insights into gender and status by studying the differences in the types of artifacts the people used as tools, decorations and ritual objects. Emory, Bonk and Sinoto (1959) provided a morphological study of Hawaiian fishhooks; Kirch (1982) performed "stylistic" comparisons of fishhooks from three different pre-contact sites to evaluate differing marine exploitation strategies, Te Rangi Hiroa (1957)(Sir Peter Buck) compiled a catalogue of Hawaiian arts and crafts that included the use, manufacture and ethnographic descriptions of nearly all Hawaiian artifacts identified today.

In another study (Jones and Kirch 2007) of marine vertebrate and invertebrate remains from a site that compared temporally and environmentally to our study area, patterns of selection bias in vertebrate and invertebrate foods were examined. At Kahikinui, Maui, Jones and Kirch compared patterns of rank and gender food preferences between elite and non-elite status sites and concluded that marine foods were particularly important to commoners based on findings of lower concentration indices of vertebrate and invertebrate remains in elite residences (Site 117). In Kohala, heavier concentrations of invertebrates in the higher status site (KAL-10) were found than in the lower status site (KAL-23) as well as a selection bias for particular taxa, in our case *Cypraea* spp. while the Maui sites preferred *Cellana* spp. Jones and Kirch calculated concentration indices for invertebrate remains from excavated soil using the number of individual specimens (NISP) per area excavated (NISP/m^2), while this study used weight in grams per volume of soil excavated (g/m^3). Although the two studies yielded different results for evaluating status, selection biases and the relationship between women and inshore marine resources yielded similar findings.

When we compare the relative size, complexity and location of habitation and ritual structures within one particular area, we gain insights into the social structures by which the occupants arranged their individual and group spaces on the landscape (Kirch 1985; Kolb 1994). By studying the different food remains left by the occupants of these structures, we can also gain insight into how food resources were distributed and what role food distribution played in status hierarchy, gender division, and the ritual and political activities associated with large scale food consumption (feasting) (Claassen 1998; Kirch and O'Day 2003).

As primary gatherers of invertebrate marine food resources, women's activities can be associated with the presence of marine shells as food refuse, domestic utensils and ornaments. These durable shell artifacts and food remains give us an opportunity to examine engendered material deposition in household and ritual sites (Claassen 1998). Pre-contact Hawaiian women labored primarily on materials that preserved poorly in the archaeological record; fiber for nets and cordage, mats and cloth come from vegetable sources and decay quickly, but the shells remain situated physically and contextually in the archaeological record, in contrast with those artifacts that have since disappeared from the locations of their production.

Archaeology and ethnology can be used effectively to provide us with "cultural contexts of gender identities" (Gilchrist 1999:43) within the larger frame of Hawaiian social structure. The intent of this research is to propose another way of looking at gender through cultural materials. However, while it is focused on one gender, female, it is aimed at inspiring archaeologists to use new methods of evaluating cultural materials, widen our view of past peoples and allow greater understanding of the culture as a whole. Sarah Milledge Nelson writes,

> Our understanding of gender roles, even those of the recent past, are viewed through a lens that has been shaped by the incomplete memories and historical records of Western cultures, and [that] these understandings can be disputed by material evidence (Nelson 2007:106-107)

In this thesis I examine the collection and consumption of marine shellfish as one avenue to reconstruct the lives of women in precontact Hawai'i. I begin by looking at individual sizes of various taxa, presence or absence of certain species of shellfish in deposits, and the density of deposition of shell and compare these results with expected differences associated with the eating restrictions placed upon men and women. I specifically want to see how these constraints are evidenced in casual domestic consumption within and outside smaller, more simply constructed residential structures compared to consumption at elite house sites and ritual sites. These differences help give us more information on women's food production and food sharing and distribution and help us to refine our current model of the Hawaiian political economy. Increased shell density and selection of larger, choice taxa are examined alongside measures of household status in the architecture of the household, and accumulations of shell in a ritual site provide us with a gauge to calculate the effects of women's domestic contribution to the economies of subsistence, tribute and ritual.

Research Design

In this study, I present a model for identifying and locating the common woman by the female linked labor of collecting shellfish. This model draws on evidence from sources in Polynesian prehistory, zooarchaeology, malacology, and ethnohistoric observations. Archaeological studies of other Hawaiian sites (Jones 2007; Kirch 1979; McCoy 2008) and other shell gathering societies are examined to evaluate the utility of this model outside of Hawaii (Binford 1968; Classen 1998; Erlandson 1988; Jones, T. L. 2007; Meehan 1982; Thomas 1999).

The data I use come from the analysis of marine shell excavated from archaeological sites on the leeward coast of the northern tip of Hawai'i Island, the largest of the chain of eastern Pacific islands known collectively as the Hawaiian Islands.

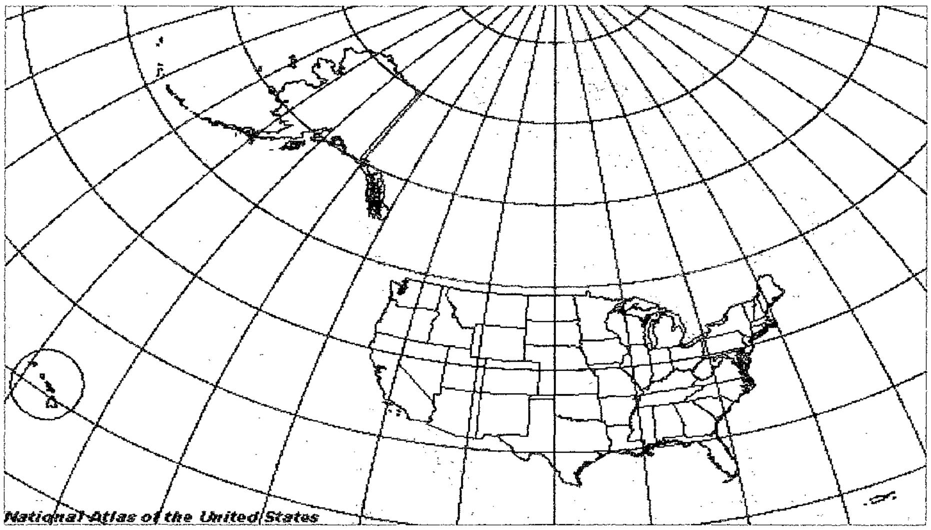

Figure 1: Hawaiian Islands. Source: National Atlas of the United States

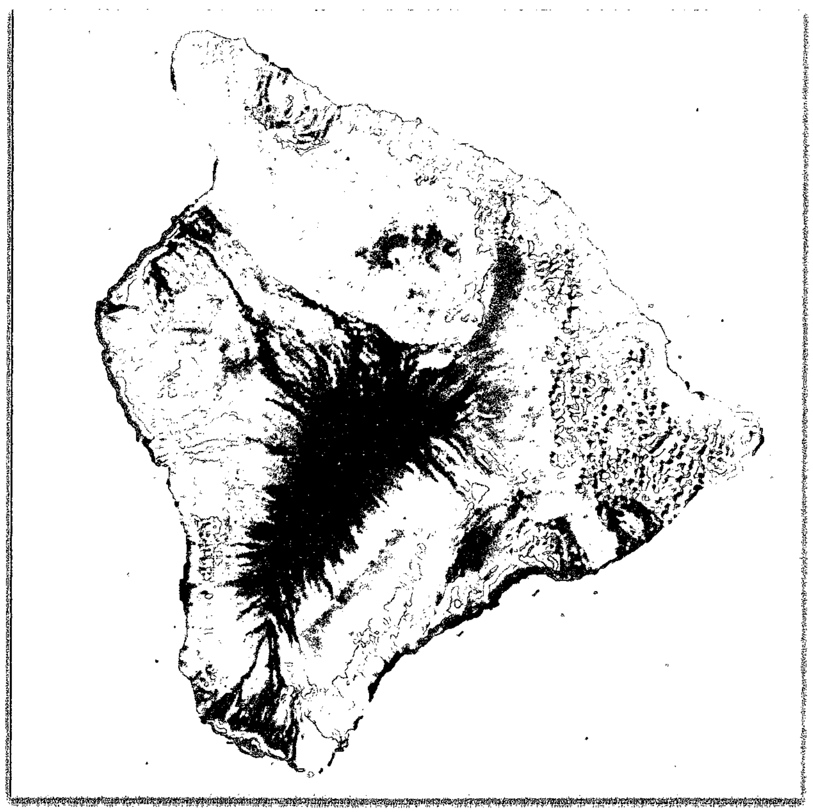

Figure 2: Hawai'i Island. Source: Lansat Mosaic NOAA

Invertebrate marine shell data from eleven test units from three of thirty-one archaeological sites tested during two field seasons in 2007 and 2008, contributed the main shell sample for this model. Based on radiocarbon dates from charcoal retrieved and artifact type these coastal sites were probably occupied from the earliest calibrated age range of 1462-1642 BP to within the last fifty years (Field 2008). Shell samples from twelve test units contained varied species of mollusks and other invertebrate fauna from the nearby coast, including *Cypraea sp.*(cowry), *Conus sp.*(cones), *Thais sp.*(drupes), and *Nerita sp.*(rock snails). In addition, sites in the *ahupua'a* (land division) of Kalala are examined for traditional male and female activities based on artifact assemblages recovered in excavations from the sites, as well as the architectural morphology of the structures.

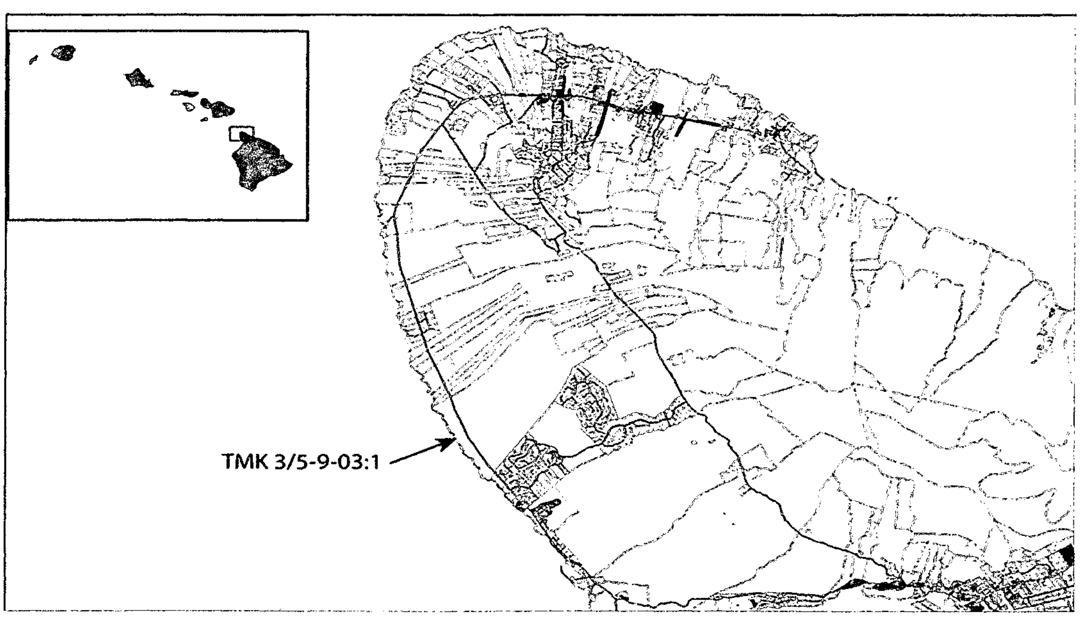

Figure 3: Tax Map Key (TMK) Showing Kalala *ahupua'a* in the North Kohala District (Field 2007)

Thesis Presentation

Chapter 2 contains background information from Hawaiian ethnohistoric sources of gender and status divisions between men and women, noble and commoner, the concepts of *kapu* and *noa*, divisions of labor and production, and subsistence in terms of food, reciprocity and taxation. From archaeological sources, I will examine the household, the community and social structure as seen from the *kauhale* or household, the *ahupua'a* as community, and the dynamics of a stratified society through tribute, war and monumental architecture.

Chapter 3 contains background information on the natural terrestrial and marine environments of the study area and the methodologies employed in the field survey and excavations and the shell analysis and quantification.

Chapter 4 contains the results of the shellfish identification and quantification of the density and frequency of distribution of five key molluscan genera; *Cypraea, Cellana, Conus, Thaidid* and the combined *Nerita/Littoraria*, with an analysis of size variation. A spatial analysis of commoner houses, elite houses and other features compares size and attributes of construction. Shellfish and artifact assemblages excavated from within these structures are evaluated as traditionally associated with male, or in their absence, female activities.

Chapter 5 is a discussion of the material record of women's labor and associations of status and gender specific limitations.

Chapter 6 contains the conclusions of this research project; locating the common woman in specific spaces relative to the presence or absence of male linked artifacts, the variety of shellfish food remains, and the relative size of the shellfish as it is distributed among the households of our study.

Chapter 2: Background of History and Archaeology

Interpretation and clarification of the function of building materials, artifacts, and food remains give us a material record of human activities. This is the function of archaeology. Literary sources, such as ethnographic descriptions of those who used those same materials provide us with a deeper understanding of the significance of the artifacts, food remains and structures we study. The writings and illustrations of those who witnessed the early inhabitants of the sites we study are invaluable as aids in interpretation, but the perspectives of these witnesses must be considered carefully. In some cases, the interpretation of archaeology can conflict with the ethnographic literature.

This chapter explores the advantages and difficulties in interpreting the domestic, political and religious roles of women based upon ethnohistoric depictions of Hawaiians. The perspectives of witnesses whose biases may have clouded or in some cases obscured the roles, domains and activities of the people they observed may conflict with the archaeological interpretation of material remains. Here, I explore some of the perspectives of three historic ethnographic sources; European voyagers, missionaries and male native Hawaiian scholars.

Part 1: Historic Sources

European Voyagers, Missionaries and Native Seminarians. Part of the difficulty in exploring the role of common women in the Hawaiian past is the limited perspective of the primarily male authors of the ethnohistoric literature. Women were sexually objectified by voyaging European men (Sturma 2002); missionaries placed the shame of Eve squarely upon the shoulders of Hawaiian women and misinterpreted their traditional roles in Hawaiian society (Beyer 2003); and the male Hawaiian scholars who collected and recorded the *mo'olelo,* (stories of antiquity) and published in Hawaiian language newspapers in the 19th century were educated in all-male missionary schools. Their writings reflected the dominant paradigm of Western male patriarchy, often limiting their histories primarily to that of the male elites (Malo 1951). It is my intention here to provide a brief summary of the main sources of depictions of Hawaiian women from before, or at the first known point of European contact.

European Voyagers. Europeans engaged in voyages of discovery took note of their journeys in the form of journals and logs. Captain James Cook's observations of Pacific Islanders from voyages in the late 18th century were recorded in this way, and included interpretations of behavior that were necessarily filtered through the lens of his own cultural mores (Beaglehole 1992; Sturma 2002). David Samwell who sailed as a surgeon's mate with Captain George Vancouver wrote of Hawaiian women: "They seem to have no more Sense of Modesty than the Otaheite women, who cannot be said to have any" (Samwell 1967). Yet other male European voyagers viewed women from the perspective of their own status identity; as relatives, wives, domestics or sex partners. Sailors viewed the common women as uniquely exotic and eager sexual partners or as simple prostitutes exchanging sex for trinkets (Cook and King 1784; Samwell, 1967). Officers were treated as visiting chiefs and engaged with noble women who presented them with gifts (Ellis 2004). How did these sailor's interpretations of the behavior of Hawaiian women conflict with the way in which the women understood their own roles?

Hawaiian women openly used sexual favors and gifts as a means of securing their own goals, a concept that clashed with Western definitions of virtuous feminine behavior, and actively engaged in exchanges that contributed directly to their own personal status, security and to that of their family. The common women viewed the possibility of pregnancy and a child by one of these visitors as means of raising status and aggressively pursued the sailors for sex (Linnekin 1990). Marital status did not extend unbroken until one or the other party died, but was a series of relationships that could be dissolved, departed from or continued at the behest of either party for any reason (Ellis 2004). The word for marry is *mare* (pronounced mah-ray) or *male* from the Hawaiianization of the English word, but the Hawaiian word for that relationship is *moe*, to sleep with or cohabit. Another Hawaiian word for marriage is *ho'au* which Pukui qualifies as an "old term, probably *lit*., to stay until daylight" (Andrews 2003:544; Pukui 1986:26,479). The institution of marriage was less a binding social contract and more a personal arrangement between commoners. Marriage between the chiefs was a dynastic arrangement involving status, property and political alliance (Kamakau S. 1964; Linnekin 1990). The marital arrangements of Hawaiian commoners encouraged Europeans to view

Hawaiian women as either morally bankrupt or as prostitutes, just as they would view a woman from their own culture who had sex with many men, and sometimes used sex for personal gain.

The observation that women occupied separate living spaces, as proscribed by the structure of the *kapu* system in which women and men had their own strictly segregated domains, was interpreted by the Europeans as a lack of status and respectful treatment. Captain King wrote "In their domestic life, they appear to live almost entirely by themselves; and though we did not observe any instance of personal ill-treatment, yet it is evident that they had little regard or attention paid them" (Ellis 2004:399). However, there was a great deal about segregation that King could not have known.

The following example provides us with an illustration of the dangers found in both visual and literal observations when interpreted through the Western lens. Within the residential complex of traditional Hawaiian households, the *kauhale*, a small house is set aside for women to retreat to during menses, called the *hale pe'a*. Lorrin Andrew's Dictionary of the Hawaiian Language, originally published in 1865 defines "*Hale pea*" as "filthy and unclean", "a house where the menstruous women formerly were obliged to remain" (Andrews 2003:399). This obligation, when viewed from a feminist perspective interprets residence within this small, neatly made structure (Handy, Handy and Pukui 1972) as a welcome monthly respite from household chores and children, and a space where a woman could pray, chant, compose poetry or simply relax.

With regard to the definition of *hale pe'a* by Rev. Andrews, Kamakau describes an obsolete, labor intensive method of thatching a structure with bundles of *ti* leaves called *pe'a* (Kamakau 1976:100). The chapter notes include John Papa Ii's description of the high status *heiau* (temple) house of the *Hale o Keawe* at Honaunau, Kona, in which he specifies that this sacred building was thatched in this manner (Kamakau 1976:124). A

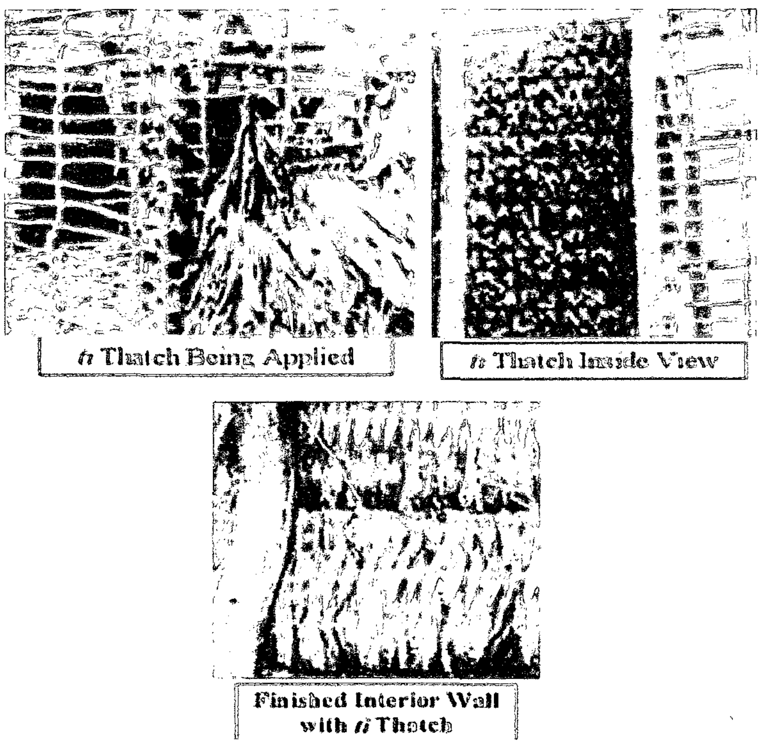

Figure 4: Pe'a thatching with *ti*. Photo by K. Emory

hale pe'a could simply mean a house laboriously thatched with *ti* leaves, as befit a sacred domain, rather than a house that was designated as "filthy or unclean". The automatic assumption and relegation of Hawaiian women to the realm of pollution seems to be a simplification of a very complex Polynesian system of engendered behaviors and interactions.

Missionary Accounts. The domestic economy of the Hawaiian household differed from that of the native households of the English and American missionaries and when American Congregationalist missionaries arrived in 1820, and a delegation from the London Missionary Society arrived in 1822, the missionary wives set to work teaching Hawaiian women to sew with cloth, clean a Western style house, launder Western clothing and care for their children according to Christian principles (Grimshaw 1989). The domestic activities of Hawaiian women were devalued as compared to the Western model of the missionary wife, "The Cult of True Womanhood" (Grimshaw 1989; Beyer 2003; Menton 1992). Efforts to teach them submissiveness were met with resistance (Grimshaw, 1994); they were perceived as lazy, lustful and wild, distracting men from the Christian path of righteousness (Beyer 2003) and well deserving the distinction of being unclean, carefully segregated polluters of sacred society.

As an example of women's activities, the provision of clothing was a domestic duty shared by both Hawaiian and missionary women. The women from the cold English and New England climates made cloth spun from the fibers of cotton, flax, or wool, raising the sheep, harvesting raw wool, carding, spinning, knitting and weaving the cloth for their garments. It was then cut and sewn into dresses, skirts, shirts, pants, petticoats, chemises, coats and capes, providing the necessary coverage for warmth and modesty. This clothing also required time and resource consuming laundering with gallons of clean water and home-made soap when soiled.

Warmer climates required fewer clothes, and the dictates of modesty required less extensive coverage for the people of Hawaii, they did not cover their chests unless they were cold or engaged in sacred or status related activities. *Kapa* (tapa or bark cloth) *kihei* (capes), *pa'u* (skirts) and *malo* (loincloths) were laboriously manufactured by women and worn by all. *Kapa* was dyed, decorated and worn in the same rectangular form in which it was beaten out. It was layered, folded into elaborate pleats and tucks, and sometimes stitched together in layers for added warmth (Kamakau S. 1976), but never cut into pieces until it was soiled enough (Malo 1951) to be discarded as clothing or bedding. William Ellis describes a scene in which Keoua, wife of the Governor of Hawai'i engaged in stripping *wauke*, (*Broussonetia papyrifera*) bark, the raw material for *kapa*, with a party of forty other women. "With lively chat and cheerful song, they appeared to beguile the hours of labor until noon, when having finished their work, they repaired to their dwellings" (Ellis 2004). It must have appeared to the missionaries that the women's work was simple, uncomplicated, and that they lived indolent lives, removed from the major domestic burdens of cooking, the large part of which was done by men, and childcare, performed by older children or elderly female relatives.

Women lived and worked in their own domains, and labored at traditional tasks suited to their own domestic requirements, weaving mats, beating kapa for clothing, twisting cordage for nets, fishing and collecting food. In this way they supported a traditional subsistence and political economy that may have been largely invisible to the missionaries. The women's domestic labor produced finished mats, and yards of *kapa* cloth, necessary contributions towards maintaining their place on the land in a reciprocal arrangement between their family household and the chiefly land managers (Sahlins, 1958). This was their power base and replacing these skills with sewing, cooking, cleaning, Christian child rearing and church attendance was not a simple acquisition of new skills, it was a proscription of women's fundamental social power. Their domestic contributions became proscribed by the narrow and relatively constricted domain of the Western family model: wife, children and elderly parents under the protection of an industrious husband, all living together under a single divided roof.

Gender Depictions by Hawaiian Scholars. Much of the "traditional" literature explaining Hawaiian life in the times before contact with Europeans comes to us from the writings of male Hawaiian native scholars under the tutelage of Christian missionaries. Of particular note is the Lahainaluna Group, all of whom collected and published accounts of Hawaiian antiquity, called *mo'olelo* in the Hawaiian language newspapers of the day. One of the most widely read is David Malo, born on February 18, 1795 near North Kona on Hawai'i Island. In his youth he was associated with the court of the high chief Kuakini, and it is believed that much of the traditional knowledge he collected came from elderly retainers from Kamehameha's time, in particular an orator and genealogist named Auwae who later converted to Christianity (Malo 1951). Malo himself was baptized in 1828 and after attending Lahainaluna School for three years, became a school master there, and went on to become an ordained minister. Malo's *Mo'olelo Hawaii*, written in 1835-1836 and published under the translated title of "Hawaiian Antiquities" offers conflicting testament to the role of women in traditional Hawaiian culture.

At the end of his life Malo was greatly embittered towards women in general, and complained about the habits of his much younger third wife Lepeka. In Nathaniel

Emerson's "Biographical Sketch of David Malo" written as an introduction to Malo's book he writes:

> his union with this young woman proved most disastrous; her dissolute ways were a constant thorn in the side of her husband, driving him well nigh to distraction, and ultimately proved the cause of his death…The shame and disgrace of his wife's conduct told upon him, and at length came to weigh so heavily on his mind that he could not throw it off. He refused all food and became reduced to such a state of weakness that his life was despaired of (Malo 1951).

Malo clearly interpreted his wife's behavior alongside the model of "The Cult of True Womanhood" as imposed by his conversion to Christianity, and he may well have misinterpreted the activities and motivations of Hawaiian women of antiquity according to this same model.

Malo's references to the activities of women provide us with descriptions of some of her industries, and made status distinctions between the activities of women at court and those who lived in the "country" (Malo 1951: 66-67). Of the religious observations of women, he perplexingly states "The majority of women…had no deity and just worshipped nothing" and "The women were a further source of disagreement; they addressed their worship to female deities, and the god of one was different from the god of another. Then, too, the gods of the female chiefs of a high rank were different from the gods of those of a lower rank." As a recent Christian convert, he said in his description of an "excellent fan" "Such were the comforts of the people of Hawaii nei. How pitiable!" (Malo 1951:123). In his biographical sketch of Malo, Emerson remarks further

> …his judgment seems often to be warped, causing him to confound together the evil and the good, the innocent and the guilty, the harmless and the depraved in one sweeping condemnation, thus constraining him to put under the ban of his

> reprobation things which a more enlightened judgment would have tolerated or even taken innocent pleasure in, or to cover with a veil of contemptuous silence matters which, if preserved, would now be of inestimable value and interest to the ethnologist, the historian and the scholar. (Malo 1951)

Although we owe a great debt to Malo for his contribution to our knowledge of the ancient Hawaiians, his perception and portrayal of women is, perhaps, not as accurate and complete as we would wish.

Part 2: Gender and Status

Gender Relationships as Kapu and Noa. Pre-contact Hawaiians lived their lives according to a strictly enforced system of responsibility and duty, regulation, restriction, and resource management called *kapu,* or *tapu* from which we get the word taboo. However, the English sense of the word "taboo" limits the Hawaiian context of *kapu* to mean merely a restriction from something. As the example of the interpretation of the woman's *kapu hale pe'a* indicates, this segregation of women may mean more than a restriction due to an inherent state of pollution.

At times, certain resources were restricted by *kapu* such as fishing during a spawning period, or gathering certain plants when they were scarce. Thus, by restricting access to resources through the *kapu* system they were carefully managed. Strict enforcement and punishments were meted out by the chiefs and the priesthood to those who broke the *kapu* either intentionally or carelessly. *Kapu* breakers could be killed on the spot or offered as sacrifice for serious offences.

In addition to the more practical aspects of restrictive resource management *kapu* also means to set apart, to make sacred, under divine influence, to prohibit or restrict a contact, or a period of time or activity as consecrated or holy (Andrews 2003; Pukui 1986). This definition helps to clarify the important distinctions Hawaiians made in their system of social hierarchy, and the appropriate responsibilities of the sexes. The persons of the chiefs, both men and women, were *kapu*. Their bodies, clothing, possessions, even bathwater were *kapu,* but the maintenance of this kapu was a part of the responsibility of chiefs to maintain their *mana* or sacred power in order to intercede successfully with the supernatural forces that controlled the well being of all of the people. Men and their form of religious observation, and the *mua* or men's house was *kapu,* containing a shrine to the family gods. The activities and tools specifically associated with men were *kapu,* such as the fishing gear for open ocean fishing, and the manufacture and use of stone adzes. The power or *mana* of these objects to cut trees, carve canoes or to catch fish was enhanced and protected by their *kapu.* The process of cutting a tree for a canoe was a religious ritual, carefully prepared for and enacted. The fisherman went out to fish in silence, after a period of prayer, and celibacy (Kamakau S.1976). The success of these operations depended on the observation of the rituals of *kapu.*

Yet another complexity of *kapu* is the perception of things prohibited or set aside as sacred as strictly pure. In the ethnographies of the Christianized Hawaiian scholars, *kapu* in these instances meant defiled. Corpses and those who handled them were *kapu*; blood and human excrement were *kapu.* In another interpretation by the Maori scholar, Te Rangi Hiroa (Sir Peter H. Buck), those who came into contact with these substances were not explicitly defiled (*haumia*) but rather exposed to the *kapu* of the substance. Until such persons were ritually made free of its influence, the power of these substances placed a person inside the dangerous realms of the supernatural (Hiroa 1957:565). This interpretation changes the concept of pollution by certain substances or genders into exposure to supernaturally powerful substances.

The complementary concept, *noa,* means freedom from *kapu,* a lifting of restriction, and is associated with women. To be free of divine influence and supernatural influence could be detrimental or beneficial. The concept of *noa* is not as extensively documented as *kapu*, as the *kapu* system was lifted in 1819 after the death of Kamehameha I, and the first vocabularies of the Hawaiian language were compiled by those seeking to translate the Bible into Hawaiian. Thus, the native Hawaiian concepts of religion were poorly understood at best, if not actively suppressed. *Noa* was simply defined as the antithesis of *kapu*. If *kapu* was sacred, *noa* was profane. If *kapu* occupied the positive realm of light and activity, *noa* was negative, dark and passive. Three compilers of Hawaiian dictionaries Andrews, Pukui and Elbert, add definitions meaning low, common, and to prostitute, "as one's daughter" (Pukui 1986). The associations between *noa* and pollution were thus transferred to the female gender, but perhaps unfairly.

Elsewhere in Polynesia, Aotearoa, Hanson and Hanson wrote,

> Many circumstances existed in Maori culture when it was desirable to be separated from the influence of the gods, to be made *noa*. Anyone participating in particularly sacred, potent, or dangerous activities, among them conducting ritual, learning or teaching sacred lore, tattooing, planting sweet potatoes, membership in a war party, handling a corpse, to name a few – came under a particularly stringent *tapu*, stemming from the intensified involvement of *atuas* [gods] in such undertakings. This form or degree of *tapu* was not the normal state of being for most persons, and it entailed a number or restrictions on social contacts and mundane activities (such as not being allowed to use ones hands while eating) which made it confining. (Hanson 1983:73)

In Hawaii, women were *noa*, and like their Maori sisters had the capacity to free men from the restrictions of *kapu*. The rituals of the *Hale o Papa* (house of the goddess Papa) outside the *luakini* temple used in royal rituals (Valeri 1985) allowed the men who participated in religious rituals that exposed them to dangerous association with *kapu,* to return to the normal activities of daily life (Linnekin 1990). This freedom from *kapu* did not entail an automatic state of pollution, and *noa* women were not necessarily defiled. When a woman walked over fishing gear she didn't pollute the fishhooks, she took away their power to catch fish. Maori women were believed to contain in their vaginas a direct passageway between the *noa* world and the *kapu* of the supernatural world (Hanson and Hanson 1983). Perhaps a more careful reading of the traditional literature of Hawaiian mythology and chants would show a relationship with *noa* and *kapu* similar to that of the women of Aotearoa. Maori women have maintained a close connection to their past and traditions and as their Polynesian sisters, Hawaiian women's activities and the responsibilities of their gender would be better interpreted by this powerful model. The explanation for the separate and divided living spaces, the consumption of different foods, and the divisions of responsibility might be seen more clearly than the simplistic interpretations of female pollution.

Status. There were three general classes of people in Hawaiian society; *ali'i, maka'ainana* and *kau'wa*, chiefs, commoners and slaves (Kamakau S. 1964). The highest were the chiefly class, paramount chiefs who controlled islands, high chiefs who controlled large districts of the islands and lower chiefs who acted as administrators and overseers of the common people. Their status was determined by their genealogy. Priestly or *kahuna* status was determined by calling as well as birth and genealogy. The commoners or *maka'ainana*, were attached to the land primarily as agriculturists and fishermen and also practiced other crafts and skills. The lowest class and without any status were *kau'wa*, the slaves or outcasts (Malo 1951).

Of the chiefly class, the *ali'i* occupied levels of hierarchy dependent upon their genealogy. The highest could trace their ancestry back to the gods and had the strictest *kapu,* reflecting their association with divinity. Kamakau lists eleven degrees of rank (Kamakau S. 1964:4-6). At the highest levels, chiefs were so sacred that they could only travel about or converse with others at night lest their sacred shadow fall on someone, who must then be killed for compromising the chief's sanctity . At the lowest levels were chiefs without rank, having a commoner mother or father. Chiefs of lower status could assume power through conquest, and raise the status of their children through marriage with a chiefess of higher rank. Chiefly residences were distinguished by the labor expended to build the structures and by convenience of location with access to resources such as water and fishponds (Kirch 1985). Kamakau writes,

> The ruling chiefs, chiefly land holders, land agents, native sons, and prominent people had large establishments, with sheds, men's houses, sleeping sheds, heiau houses, women's eating houses, houses for the storage of provisions, houses for cooking, and many other houses. (Kamakau 1976:96).

Captain Cook observed some houses as large as 50 feet by 30 feet (15 by 9 m) (King 1784: 3:140), and William Ellis observed large houses with posts as tall as 12 to 14 feet (4 to 4.25 m) (Ellis 2004:314). An elite residential structure might only be occupied temporarily as the chief made his way through his landholdings overseeing projects, performing ritual duties and accepting offerings and tribute from one district to another, as during an annual round of collection and redistribution of food and goods by the high chief. Once a chief occupied a structure, it became imbued with his or her *kapu*, and could not be occupied by anyone else.

Commoners, (*maka'ainana*) were the "keepers of the land", and many posessed artisan or craft skills such as adze production, fine mat weaving, canoe building or makers of *kapa* (bark cloth). Commoners built fishponds and engaged in aquaculture fished the shoreline, the reef and the deep ocean. They raised dogs, chickens and pigs, planted the sweet potatoes, taro, sugar cane, breadfruit, bananas, and coconuts that were the staples of the economy. *Awa (Piper methysticum)* is a plant used throughout Polynesia. Its roots are pounded and mixed with water as relaxing narcotic drink, and a frequent and respectful offering to the gods.

The best portion of the harvests of the land and the sea were set aside for the chiefs. The finest mats, *kapa* cloth and other goods manufactured by women were also offered up to the chiefs and were necessary for the observation of important religious rituals. It was the responsibility of the *konohiki* (land stewards) to supervise the commoners and collect surplus food, and goods and services in the form of craft production and labor. Most obligations were easily met, but occasionally, secreted food or goods, "wealth and failure of the woman of the household to produce mats were sufficient reasons for a commoner's dispossession" (Malo 1951; Sahlins 1958: 15;). The commoners occupied the land that fed them at the pleasure of their chief, and these goods and services were their gifts to the chief. In return for these gifts, which could be collected from them at any time by anyone of higher rank, (Sahlins 1958) the chiefs returned military protection and the power of divine intercession through ritual and the power of chiefly *mana*. After periods of kapu, when resources were placed under restriction as a method of conservation or religious observation, the chiefs redistributed food to the lesser chiefs and commoners with feasts.

Food. Many types of foods were forbidden to women of all status, and even chiefly women were not allowed to partake of feast foods until a period of time after the men (Kamakau 1976; Malo 1987). During such times as the offerings of tribute or taxation placed a strain on the households of the commoners, the larder had to be filled with more humble fare. "Free" foods that were unrestricted were collected by women and children, much of which was gathered from the shoreline (Kirch 1979:121). The inshore marine resources, the streams with fresh-water shrimp and fish offered an opportunity to women for autonomy and security.

Ethnohistoric accounts indicate that men and women participated in activities appropriate to their gender within the *kapu* system (Handy 1972). Certain resources were the domains of men or women. Common women fished the reef and in-shore zones, fresh water ponds and streams and men fished the outer reef and open ocean (Jensen 2005). As described in the early ethnographies, men and women ate in separate spaces and consumed foods according to restrictions called the *ai kapu* (Malo 1951). The *maka'ai nana* were observed to consume mainly fish, *ia,* defined as any animal caught or gathered from the water (Pukui 1986) and vegetable food, *ai,* (taro or sweet potato), with pig and dog mean a rarity (Kirch 2003). All women were prohibited from eating pig, except in strictly controlled ritual functions.

Part 3: Archaeology and Women's Labor

Women as Fishers. As the primary fishers of invertebrate marine food resources, women and their activities can be associated with the presence of marine shell in archaeological sites as food refuse, domestic utensil, and decoration (Claassen 1998). Women and children gathered the bulk of the food provided by mollusks, sea urchins and other invertebrates of the coastline (Handy 1972; Pukui 1986; Titcomb 1972). The hard shells of these animals present an opportunity to examine gendered cultural material deposition in household and ritual sites (Jones 2007).

The large fish and deeper ocean resources were the domain of the men (Jensen 2005), and the bones of large pelagic fish found in the household sites likely indicate male fishing activities. Further indications of the separation of these fishing activities are reflected in the offerings of first catch fish, traditionally given from the right hand to the male god Ku'ula-kai and with the left hand to the female goddess Hina-puku-'ia (Kamakau 1976), at small shrines for both of these fishing deities placed along the coast. Those shrines and offertories contained the remains of both men and women's resource zones, the bones of large fish, and the shells of inshore invertebrates.

The perception of women as the primary gatherers of shellfish is supported by current studies of shell fishing. Betty Meehan's study of Anbarra women and children in 1982 suggested the social nature of the activity "involving a dozen or more women and sometimes including as many as four generations" (Meehan 1982). Cheryl Claassen observed a similar socializing among the women and children of San Salvador Island, Bahamas, in which the activity represented "recreation and family time" (Claassen 1998:181). In "Native Uses of Fish in Hawaii" Margaret Titcomb writes,

> Children played about the shores and took what they pleased and could get from the shore pools, and shallow reef areas, and ate it when and as they pleased, raw or cooked. When old enough to follow their elders they learned by imitation how to get small fish and shellfish and *limu* (seaweed) from the sheltered waters, and later how to fish in deeper waters...Everyday saw many people, women in the majority out on the reefs for hours searching; collecting all that was edible and desirable...Doubtless the women made a merry social time of it too. To women belonged also the larger part of the task of gathering fish and shellfish from the mountain pools and streams (Titcomb 1972: 3-4).

Frank Thomas' Kiribati research provides a close look at the mollusk collecting and optimum foraging strategies of Gilbert Island women (Thomas 1999).

The fish that spawn during the spring return to the lagoons and bays in the summer. This initiated the beginning of deep sea fishing by the men and the women began gathering shellfish, catching shrimps (*o'pae*) at the mouths of streams and *o'opu* (*Gobiidae*) in the tide pools. Fish, shellfish, sea cucumbers and sea urchins were collected and carried up to the habitation sites to be shared out and eaten. The surplus meat was removed from the shell, processed and stored (Silva 2008). Marine mollusks were eaten raw, boiled, broiled, steamed, salted, pickled, or pounded into a relish with other foods. The liquid in which the shellfish were steamed or boiled was consumed as a broth.

Methods and materials for shellfish gathering were simple and required little in the way of special tools or technology. Basket containers were quickly woven from coconut or pandanus leaves, and sharp stones called *opihi ku'i* were used to pry the more stubborn animals from the rocks (Handy 1972). Bone picks were used to pick snails from their shells and breakage patterns of the shells reveal specific sequences for breaking open and removing meat from the shells. A close study of midden remains of the *Drupa spp.,* a common rock snail along the shore in Kohala indicates the insertion of a sturdy pick into the aperture, an upward twist that breaks away the spire and a piece of the body whorl, leaving three commonly identifiable pieces of the animal's shell. In a short amount of time a quick snack could be gathered and eaten on the spot, indeed, enough protein could be gathered in just a few minutes to meet nutritional protein needs of an adult (Erlandson 1988), and in an hour or two, enough shellfish and sea urchin could be obtained to supplement a meal for a large family group or visiting relatives.

Women as the Producers of Finished Goods. Common women provided important material contributions to both the domestic economy and the political economy. Women's labor provided the spun cordage for weaving and plaiting nets and fishing line (Kamakau, S. 1976), they wove fine mats of sedge and pandanus leaves for household furnishings, canoe sails and for placing over the earth ovens (Hiroa, 1957). They beat out the bark of *wauke* (*Broussonetia papyrifera*) with heavy wooden mallets on thick anvils of wood and stone to make the soft, finely decorated and dyed *kapa* cloth for clothing and bedding (Kamakau S. 1976). They gathered and fished with nets and traps along the shoreline (Jensen 2005), collecting shellfish, echinoderm and crustaceans used for food, domestic tools, fish bait and kapa dye (*wana*) (Malo 1951). The raw materials required for these products had to be collected and gathered, cultivated and harvested or reciprocated in family exchange networks and then processed into useful forms. The final products were necessary for the household in the form of clothing and adornment, bedding and sleeping mats, domestic utensils, fishing nets, lines and hooks.

The Social Structure of Distribution. In addition to the surplus food and fish cultivated and caught by the men, a portion of women's manufactured goods were obligatory offerings given by the head of the household to the chief administering the land the families occupied. This was could be a lesser chief, or *konohiki* (land steward) whose responsibility was to see that each household produced and contributed appropriately. The *konohiki* managed the conservation and exploitation of resources by placing them under *kapu* according to his authority or that of the higher chief he served (Sahlins 1958). These domestic offerings were either redistributed to the people during religious feasts or stored for the higher chiefs when they made their periodic visits to their various landholdings.

This ramified system of "overlapping stewardship" (Sahlins 1958:48) was structured with the *mo'i* (paramount chief) and his chief adviser in control of the island, the high chiefs managing the large districts such as North Kohala, the intermediate or lesser chiefs managing the *ahupua'a,* (smaller land divisions of districts) and the commoner head-of-household managing the *kuleana,* or groups of *kauhale* (households) occupied by extended families (Sahlins 1958).

Lands were redistributed upon the accession of a new paramount chief, either by inheritance or warfare. As most of the high chiefs did not engage in subsistence production, although there are some notable exclusions they spent much of their time training for war, from adolescence onward with spears, javelins, slings, clubs and daggers (Handy 1965). When a new paramount chief redistributed the lands, the chiefs who were dispossessed or driven out frequently resorted to warfare to regain control of their holdings. Each *ahupua'a* provided a number of warriors who followed their chief into battle. The Hawai'i Island paramount Alapa'i was said to have gathered 8,500 men for his invasion of Maui, which Cordy considers plausible with 10-15 men coming from the 600 *ahupua'a* (Cordy 2000: 63)

In addition to food, goods and warriors, the chiefs could muster labor from the commoners. As Sahlins notes,

> The demand for labor is passed down the hierarchy of group heads until it reaches the household level...The food used to support suprahousehold labor is provided by the ramage head who initiated the undertaking. The role of the ramage heads in the distribution system allows them to accumulate the necessary food (Sahlins 1958 :148-149).

Specialists such as canoe makers would be supported while building sailing canoes, laborers constructing walls and platforms, repairing ditches or building elaborate temples would expect to be fed and clothed while they labored on public works. Some of the largest public works remain standing in the form of *heiau*, places of worship.

> A *heiau* on level ground...did not need as much stone covering, but many thousands of stones were needed just the same...the chiefs and those who lived in their households did the work, but if the task were extremely laborious, then it became "public work" (*hana aupuni),* and the people (*maka'ainana*) helped (Kamakau, S. 1976:135).

The labor and resources required to build these large public structures were a direct measure of the power and status of the chief who initiated the project. This power and status continued down through the ranks to the *maka'ainana* that were protected and fed by the chief.

The chiefs and their priests conducted the religious observations that brought security, bounteous harvests, and plentiful fish for the people. Religious rituals and seasonal observation of *kapu* periods required offerings of mats, *kapa*, fish, pigs and dogs in numbers and amounts authorized by the priests *(kahuna)* conducting the rituals to propitiate the gods. These gods filled the ocean with fish, made the rain that irrigated the plantations and brought life or death to the people through the intercession of the divine chiefs and the priesthood (Kamakau, S. 1976).

Although the women were *noa,* the goods they produced were necessary for the observation of the strictest *kapu* rituals and ceremonies observed by men, conducted in temples barring women from entering, excepting extraordinary circumstances (Pukui 1986). Female chiefs and *kahuna* priestesses conducted the important rituals for women and children within their own *heiau,* and the small *Hale o Papa* housing the female goddess Papa required men to pass through this female domain to safely re-enter the earthly realm, often situated directly outside the larger structure of the war *luakini* or agricultural temple (Jensen 2005).

Part 4: The Archaeology of the Household; Material Culture, Community and Social Structure

*Material Culture***.** Material culture gives us an opportunity to more fully explore the lives of women. Through the study of these artifacts we can begin to see patterns of social organization and discern the activities that occupied women, as well as forms of worship, labor and crafts. Recent research in household archaeology uses marine invertebrate remains to make distinctions in status based on concentration indices of gastropod species, with a higher frequency of invertebrate remains concentrated in non-elite residential sites (Jones 2007). In other research, segregated cooking practices are evident in the presence of two adjacent slab lined hearths, interpreted as evidence of the practice of the *'ai kapu* (gender segregated cooking) in habitation structures (Kirch and Van Gilder 1997). More recent studies identify structures within *kauhale* complexes as *mua* or men's houses associated with male activities such as stone tool making and the consumption of pig and pelagic fish, foods traditionally restricted to men (Dixon 2008).

Hawaiian archaeology is beginning to look to the domain of the household for a more definitive depiction of the Hawaiian past, but the texts in common use as the exemplary models of Hawaiian archaeology feature the material culture as it reflects the activities of males; fishhooks, war gods, stone tools, or the monumental architecture that figures in the reconstruction of the power struggles of the male elites (Cordy 2000; Kirch 1985; Kolb 1994). Studies of the contribution of labor for the construction of male centered ritual sites (Kolb 1994), the use of corvee labor for large agricultural projects, and the dedication of certain days of the week to the cultivation of fields (*koelo*) belonging to the chiefs, (Malo 1951; Kanahele 1993), provide us with descriptions of the labor of men.

The activities of women are less visible, in the texts and on what remains of the cultural landscape. Women's contributions of mats and *kapas* were essential to the performance of state rituals, and the labor required for their production represented payment of taxes and tribute necessary for the household to remain on the land they occupied (Malo 1951). In addition to the occupation of manufacturing goods, woman's labor as a fisher and gatherer can be measured in the remains of the marine resources contributed to the woman's own and the households of others. The remains of shellfish and sea urchins are found in ritual sites and the houses of both commoners and chiefs (Field 2008).

Considerations of Diet. The use of skeletal collections to determine diet and nutritional patterns using isotopic analysis is not a part of current Hawaiian archaeology. After the passage of the Native American Graves and Repatriation Act in1990, modern Hawaiians regained authority over the treatment of the cemeteries and burial places holding the bodies of their ancestors, and traveled to museums around the world to recollect and rebury the bones and skeletons of those who had been removed from Hawaii. They choose not to subject these skeletons and isolated bones and any others that might be inadvertently discovered to the studies of archaeologists and physical anthropologists.

Other methods for determining the dietary patterns of a given population through the identification of faunal remains including marine shell have been conducted in Hawaii (Jones O'Day 2001; Kirch 1979; Kirch 1982; Jones and Kirch 2007; McCoy 2008) and the analysis of shell at archaeological sites has been useful for what it can reveal about seasonality, environmental reconstruction, and subsistence strategies (Binford 1968; Claassen 1998; Erlandson 1988; Thomas 1999). Because men provided most of the cooked food in the traditional Hawaiian diet (Malo 1951) women are frequently seen as passive recipients rather than providers of food to the household. When shellfish is considered, it is frequently classified as an energy expensive and poor nutritional supplement to the meat and large fish provided by the men.

In Jon Erlandson's study of nutritional resources in California shellfish, common Native California foods of 100 g portions were evaluated for protein sources. *Mytilus* (California mussel) yielded 14.4 g and *haliotis* (abalone) yielded 18.7 grams of protein, compared to seal meat (26.0g) and venison (22.0g), both of which are higher risk in energy expenditure as protein sources (Erlandson 1988). Two Millingstone (7000-4000 BP) sites (CA-SBA-1807 and CA-SBA-206) were found to contain the components for processing plant foods; manos, metates and battered core hammer stones, but few or absent hunting or fishing tools. The shell middens on each site inferred 70-90% of the protein consumption came from the marine resources in the prehistoric estuarine environment and rocky shores of the coastline, shellfish. This supports the findings in Hawaii from Kirch's study of Kalahuipua'a, in which he noted that "mollusks generally compose more than 90% of the total weight of midden at Kalahuipua'a cave-shelter sites" (Kirch 1979).

A previous study (Parmalee 1974) proposed that a diet of shellfish protein was nutritionally poor and energy expensive, but Parmalee and Klippel used outdated nutritional data from 1938 to support this. Erlandson contradicts these findings and contends that shellfish are not a marginal resource, rather an efficient and abundant protein resource in some prehistoric diets. Protein consumption in cultures similar to the Millingstone (Jones T. L. 2007) whose diets were rich in milled carbohydrates would have been nutritionally supported in their "mixed dietary strategies" by shellfish

(Erlandson 1988). This applies to the Hawaiian diet of carbohydrates in the form of sweet potatoes, cooked and mashed taro root (*poi)*, sea vegetables, and marine protein sources in fish and shellfish. If the overall percentage of shellfish remains in Hawaiian middens is significantly greater than other protein sources such as fish and mammal bone as this research suggests, then the women who gathered the invertebrate marine resources made a significant contribution to the daily nutritional requirements of the household.

Shell and Social Organization. Using shell as a means of studying status, labor and gender in the pre-historic population is not a typical application, but shell has the advantage of durability, is less likely to have been carried off the archaeological site by a collector and so remains *in situ*, retaining the value of context and provenience in the archaeological record. Shell is likely found exactly where it was tossed by the person who ate the animal it contained, and this locus, now associated with the mollusk-eater can provide us with many other contexts and potential explanations for the shellfish consumer's behavior and activities. Atifacts present in this location along with shell tell us what activities the shellfish consumer engaged in. The quantity of shell here might indicate consumtion by several people or a greater portion for one person. The kind of mollusk preferred at this particular locus tells us something about the consumer. The location with the biggest, meatiest mollusks might tell us something of the preferences and status of the inhabitants. If the shell was placed whole and unbroken with several other whole and unbroken shells, a religious observance or ritual may have occurred here. Shell carries with it a host of associations to ritual, trade and social organization. That the gatherers and distributors of these resources were women gives us a means of establishing the role of women in domestic, reciprocal and ritual relationships not ordinarily seen in the material culture of Hawaian archaeology.

Our view of pre-contact women from ethnohistoric literature and archaeology falls short of providing us with a representation of women on their own terms and from their own domains. The imposition of Western devaluations of women's activities distorts the contextual parameters for agency within which Hawaiian women acted. These two sexes acted in context- dependent roles from traditions that had waxed and waned for centuries, some still in place at Western contact, but not all of which were visible to the non-Polynesian eye. At the chiefly level, a woman's genealogy was of immense value, offering a powerful chief an opportunity to raise the status of his family by marrying a chiefess of higher status than his own, as Kamehameha I did when he married the sacred chiefess Keopuolani. Keopuolani's status guaranteed the succession of their children as Kamehameha's heirs. At the commoner level, a woman's skills as a weaver of mats and a maker of *kapa* not only furnished the home and clothed the family, but allowed the accrual of wealth through trade, the payment of taxes and tribute, and the provision of products necessary for the observation of state level rituals. The mats and *kapa*s have left few traces, but the shells from the wild foods gathered at the shore remain to inform us that the shellfish, crab and shrimp, sea urchin and seaweed provided a stable foundation for the nutritional needs of the household, and the households of others. Shell provides us with a trail to follow between reciprocal relationships of the seashore, and the plantations of sweet potato and taro in the uplands.

As archaeologists, we run the same risk of distortion encountered with the ethnohistoric sources when we anthrocentrically interpret archaeological material culture and activity areas.

The Architecture of Household Archaeology. What was the architecture of the household in pre-contact Hawaiian habitation sites? What was the finite structure around and within which the *maka'ai nana* women carried on their activities? Most descriptions in the ethnohistoric literature separate classes of habitations according to status; those households without wealth made do with "a little shanty" (Malo 1951:122), and those with more wealth, "respectability…or who belonged to the *alii* class" occupied from three to six or more different structures, specifically designated for different activities. The houses of the commoners were less imposing than the chiefs, and probably had fewer associated structures (Hiroa 1957:76; Malo 1951:122; Kamakau, S. 1976:96). The simplest structures were constructed without any foundation, with two posts to support a ridgepole, and rafters extending straight onto the cleared ground like an "A"- frame. These were thatched with a variety of materials, mainly leaves and grasses woven or tied to the purlins that crossed the rafters. Stone foundations were also common, with poles placed inside the walls supporting ridgepoles and rafters with thatching purlins for the walls (Hiroa 1957). The archaeological traces for the first type would be limited to post holes, one or more stone lined hearth or oven features and a refuse scatter of shell and bone, and for the latter, stacked stone walls, cooking features, the refuse scatter and perhaps a few small associated storage areas or separate structures.

Figure 5: Separate Structures. Image Source: www.sacredtexts.com

The structures above show early historic period houses with a much larger doorway than would normally be required in a traditional house. The two structures illustrate both the simple "A" frame and the standard hip roofed house, thatched with bundles of dried *pili* grass. Both structures are elevated on stone platforms. The single house below (Figure 6) sits on paved stone platform.

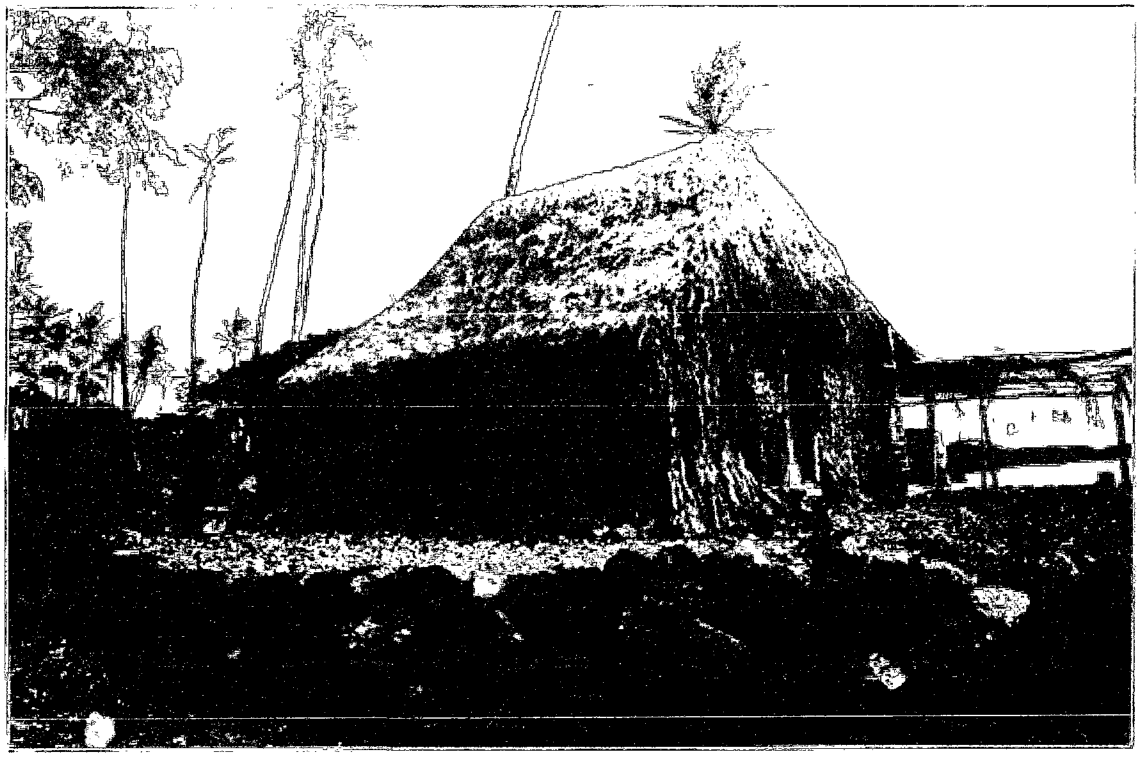

Figure 6: Hawaiian House and Platform.
Source:www.gutenberg.org/files/18450/18450-h/images/p210.jpg

Table 1, below, lists some of the component structures of the Hawaiian household. Not all households would have all of these structures, and some households, such as those of the chiefs would have these and perhaps more.

Table 1: Component Structures of the *Kauhale*. From Van Gilder and Kirch, 1997:48 after Handy and Pukui, 1958

Hale Mua	"It was a place where the men and older boys ate their meals and where the head of the family offered the daily offerings of *'awa* to the family *'aumakua"*.
Hale Aina	"The women had their own eating house, the *hale 'aina.* Here the women, girls and small boys ate together…"
Hale Noa	"Everybody slept in the *hale noa* (house freed of *kapu* .where no restrictions were placed on the men and women sharing it together. This house was for sleeping and no eating was permitted there".
Hale Pe'a	"This was the *hale pe'a*, a small comfortable thatched house where the women of the family retired when menstruating and remained until the period was completely over".
Halau	"A fisherman had a *halau*, a long thatched house where he kept his canoe, fishnets and other paraphernalia. Kapu were enforced there also, for no women were permitted to handle the large nets, or were anyone allowed to step over the lines, hooks or nets".
Hale Papa'a	"An inland dweller would have a house to keep his implements and store his crops until needed".
Hale Kuku or Ku'a	"Tapa makers had a thatched shed, called a *hale kuku*, where they pounded the inner bark of *mamake* (*Pipturus* spp.) or *wauke (Broussonetia papyrifera)* into tapa cloth".
Hale Kahumu	"There was also the *hale kahumu (kahu umu)*, a thatched shed where cooking was done in bad weather and cooking materials were stored. The men had one, and the women had theirs, until the kapu on eating was abolished. In good weather cooking was done in outdoor imu, one for the men and one for the women; but in rainy weather , or if there was not a quantity of cooking to do, the *hale kahumu* was the place to go".
Kamala	"A temporary house…was called a *kamala.* It was tent shaped…the rafters came right down to the ground".

Residential structures of similar description were excavated on the leeward coast of Kahikinui, Maui by Van Gilder and Kirch, and those of the Kipapa Waena Cluster seem similar in landscape orientation and construction. What we described in Kohala as a "long high-backed house" corresponds to what they describe as a "linear shelter" (Van Gilder 2001). Van Gilder excavated two side by side slab lined hearth features on a "stone faced terrace" (Site 752) which she interpreted as possible "individual women's and men's cooking facilities, as would be consistent with adherence to the *'ai kapu"* (Van Gilder and Kirch 1997:52).

As most of the materials used by women in their craft production preserve poorly, they are now rarely found in archaeological sites, and few, if any associations can be made between these objects and structural remains. Food remains (bones and shells) preserve well, and contiguous, contemporaneous architectural features for eating, food processing and preparation tell us that food was being prepared and eaten by people who observed traditional segregated eating; one hearth and specific foods for the men and another hearth and specific foods for women; the men eating in the *hale mua* and women in the *hale aina.* Where the *ai kapu* (eating restriction) was observed, medium mammal bones in the midden demonstrate status and gender. The quality of food and the density of the remains within the structures applies to shellfish as well, and as shell is ubiquitous on the coastal landscape of our study area, shell provides us with information about chiefs and commoners, men and women, equally well.

Settlement Patterns. Studies of the archaeology of settlement patterns in Hawaii abound in the well-defined boundaries, field borders and irrigation systems of the upland agricultural systems (Ladefoged and Graves 2006; Rosendahl 1994) and in the remains of fishing exploitation sites (Emory, Bonk and Sinoto 1959; Kirch 1979). Agricultural surplus from the uplands represented the wealth and power of the chiefs. The resources, and the entitlement to them, were redistributed by inheritance and conquest (Kirch and Sahlins 1994; Cordy 2000; Earle 1993). The changes in divisions, subdivisions and boundaries of these land units give us a dynamic political map of alliances and conquests.

Each island or a large district of an island was called a *moku.* A radial slice of the *moku* was called an *ahupua'a* (Kirch 1985). This was a political, as well as geographic land division (Earle 1993). The *mo'i* (paramount chief) of the *moku* distributed *ahupua'a* divisions to his followers who would then pass the resource on to their descendants.

Ideally, the diversity of resources within one of these land units made each unit self sufficient. The rain-wet mountain resources provided forest for timber, vines for cordage and the coveted bird feathers to adorn the chiefs and ritual objects, but were sparsely occupied. Plantations and fields of agricultural staples like breadfruit, bananas, taro and sweet potatoes were more heavily populated according to the seasons of planting and harvesting. The shoreline and ocean provided fish, shellfish and sea vegetables and were populated more heavily during the summer months when the fish that spawned in the spring were mature enough to catch or gather (Kirch 1982). Territories were fought over, won and lost, re-apportioned and inherited, and although the resources of the *ahupua'a* went to whichever chief currently held title, the *maka'ainana* remained as the principal residents unless they were removed for failure to provide the chief with tribute or driven out by conquest (Sahlins 1958).

The *ahupua'a* were further divided into smaller plots and strips, *ili* and *moo,* on which the *kauhale* (households) were dispersed and occupied by kin groups of extended family called *ohana. Ohana* occupied and traveled between these resource areas stretching from sea-shore to the mountains, gathering, cultivating, fishing and exchanging or offering as gifts the surplus of their labors. Of this system of exchange Sahlins writes

> a constant sharing and exchange of diverse foods and other goods and services took place between these productively specialized households. The exchanges took two forms: (1) reciprocal gift giving and (2) redistributions in the form of feasts supervised by the senior member of the entire *ohana* (Sahlins 1958:208).

The significance of the name of the *ahupua'a*, "pig altar", comes from the collection of these diverse resources by the paramount chief as he or she made the seasonal circuit of the island, stopping at the boundary between one *ahupua'a* and another collecting the pigs, dogs, fish and other food and manufactured goods, products of each land division "heaped" (to mound or pile up) before the ruling chief as the gift or tribute of the people.

This model of settlement and resource exploitation can still be seen in the long rock walls thought to define the boundaries of these land divisions and in some cases, the placement of ritual structures in the form of stone platforms, the actual "pig altars", and *heiau* located near these boundaries (Ladefoged 1998).

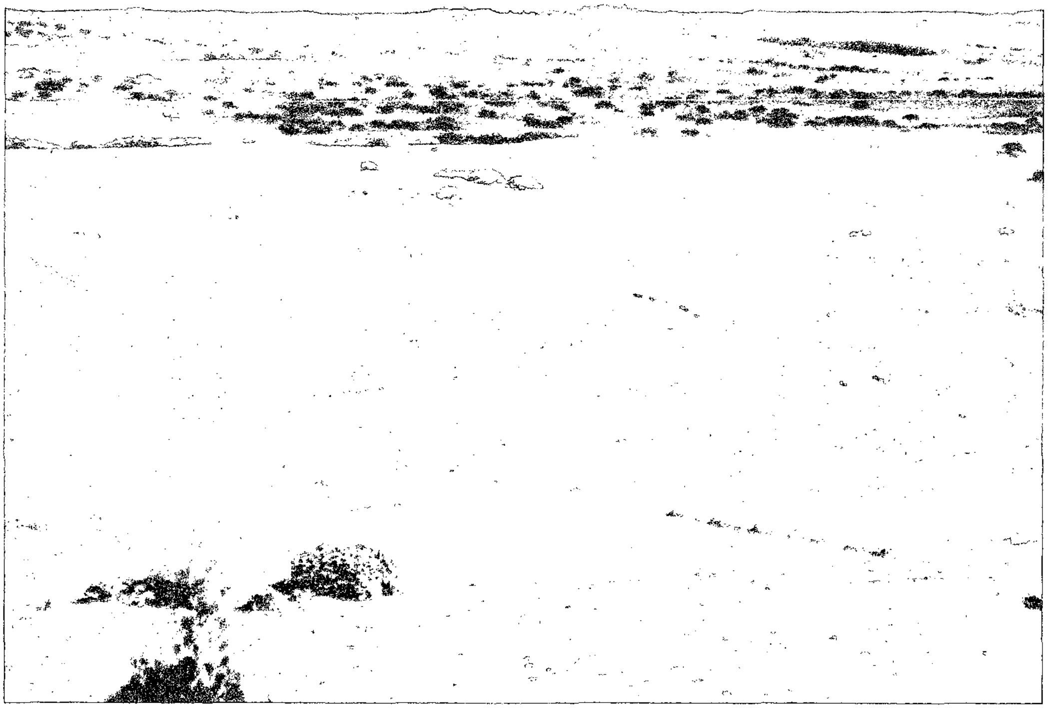

Figure 7: Kohala Field System Walls. Photo by Author

Chapter 3: Study Area and Methods

Part 1: The Natural Environment of Leeward North Kohala

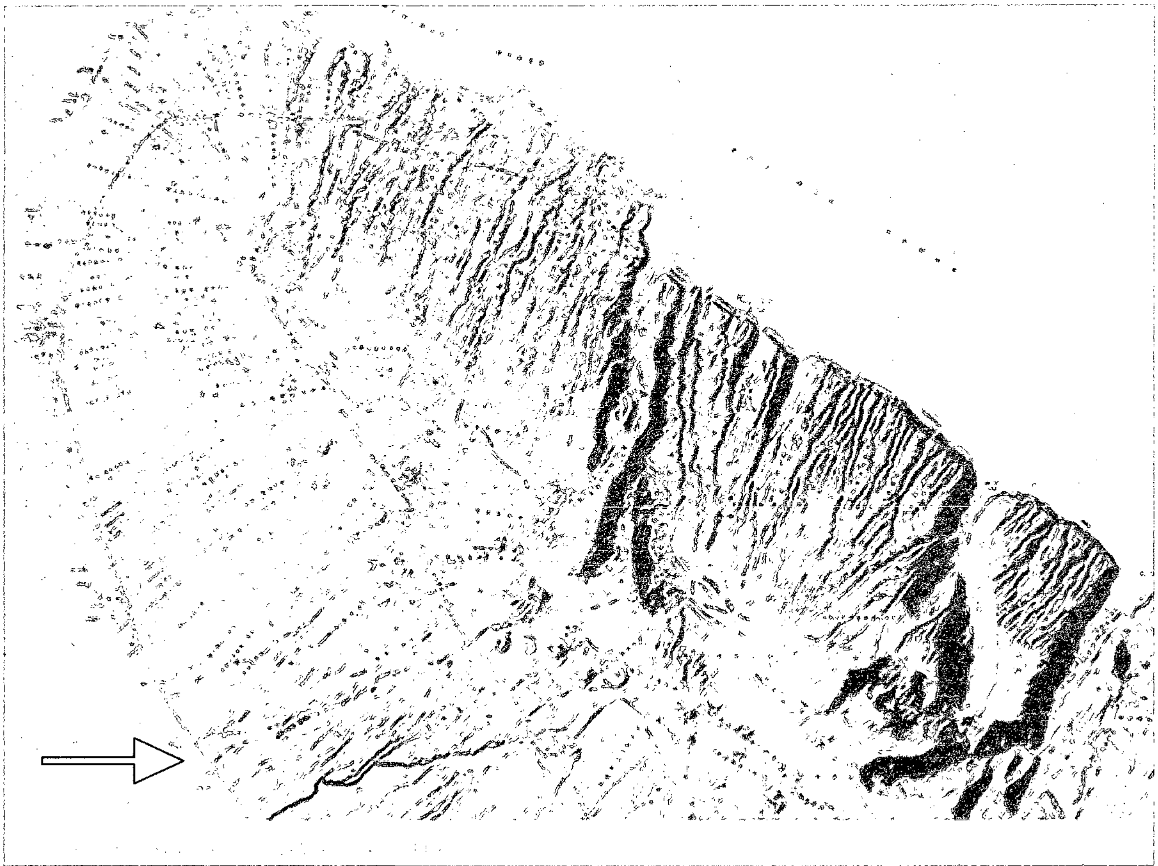

Figure 8: Topographic Map of North Kohala and Area of Study. US. Geological Survey Map

Natural Environment of the Study Area. The area of study lies along the coastal area of the leeward dry side of the northern tip of Hawai'i Island. The leeward side of the island is in the rain-shadow of Kohala Mountain, (altitude 5,480 ft. 1699m), the oldest volcano on the island. This dormant volcano divides the leeward side from wet windward side of North Kohala, exposed to the rainy north easterly winds, with its deeply eroded valleys and gulches. The dry leeward coastline is steep, rugged and boulder-strewn and lies directly across the Alenuihaha channel from the coast of East Maui. There is little to no fresh water, although deep gullies indicate that water occasionally sweeps through, and when an unusual rainstorm arrived, we observed water sweeping down the gullies, puddling in the red dirt and staining the shoreline. It is possible that small gardens of sweet potatoes could have been irrigated through water catchment or other water conservation methods, similar to the women's gardens in Ka'u, another dry district, as described by Pukui. (Handy 1972)

The soil in our study area consists of dark reddish brown extremely stony very fine sandy loam about 2 inches (5 cm) thick, below which is a dark reddish brown and dusky red stony silt loam. This is a shallow soil deposition, and archaeological excavations rarely went beyond 45 cmbs (centimeters below surface) and supported only the hardiest plant life. The hard *pahoehoe* lava bedrock lies below at a depth of about 30 inches (76 cm). Munsel soil color ranges from 2.5YR 2/4 at the surface to 10YR ¾ at 30 inches below surface. The annual precipitation is 5-20 inches (13-51 cm) mainly during the winter months and the mean annual soil temperature is between 74 and 77 degrees F. The natural vegetation is limited to the hardy introduction *Prosopis pallida* or *kiawe*, a kind of thorny mesquite, thick tufts of introduced buffel grass (*Pennisetum cilare)* and the endemic *ilima (Sida fallax)*.

A series of ridges run perpendicular to the coastline and the tops of these ridgelines expose basalt outcrops. On top of these boulder bases Hawaiians added courses of stacked stones and walls to build structures. The backs of the structures block the dry, stiff wind from the mountains and the ridgeline habitations offer a view to the sea, where schools of fish are frequently noted and pods of dolphin swim back and forth. Small bays line the coast, some with canoe landings and caves, most with long fingers of rough black lava reaching out into the surf. Trails lead along the cliffs and down to the shore, and are still in use by local fishermen.

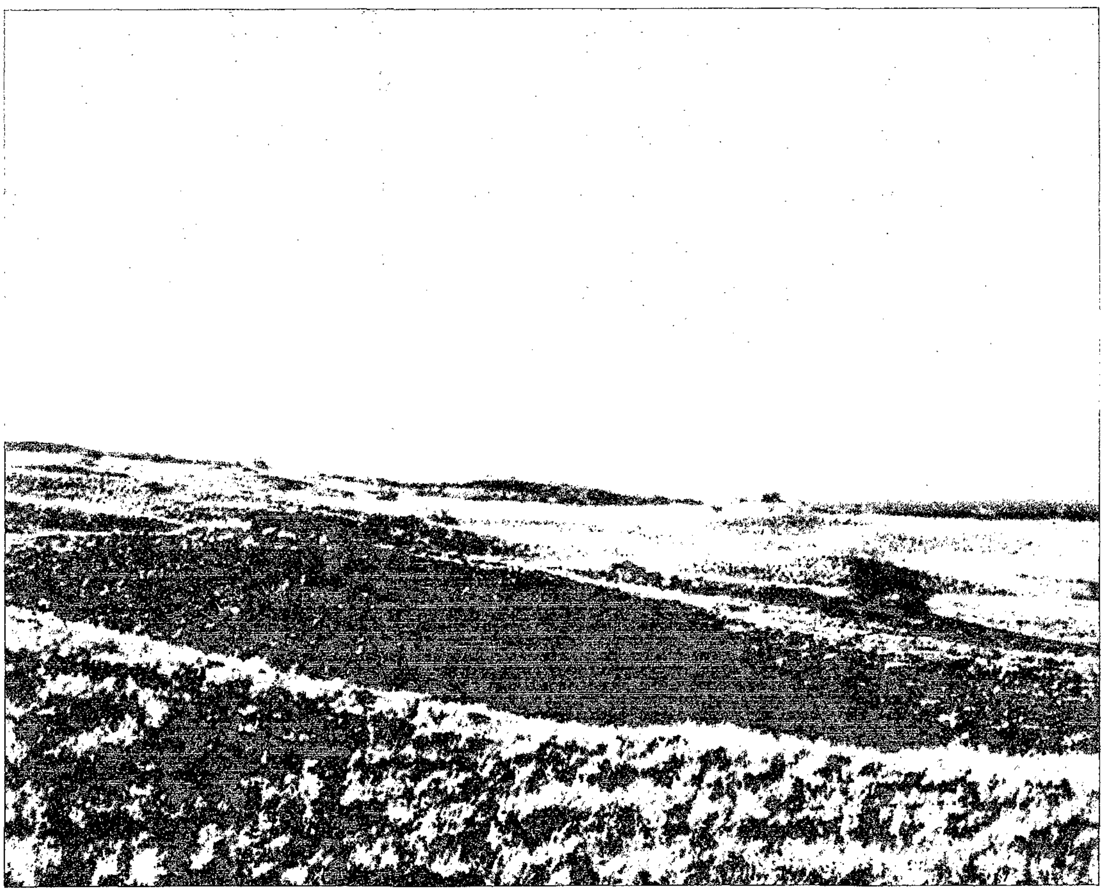

Figure 9: Ridgeline Structures in Kalala *Ahupua'a*. Photo by Author

The Marine Environment of North Kohala. The leeward coast in the area of study is defined by small bays bordered by rough lava outcrops, some with coarse sandy beaches, cobble, and boulder strewn shorelines. Thick fingers of the ancient Pololu and Hawi volcanic flows stick out into the sea forming rocky shelves and caves. These outcrops form the base for coral and algal growth that today are populated with vertebrate and invertebrate marine fauna.

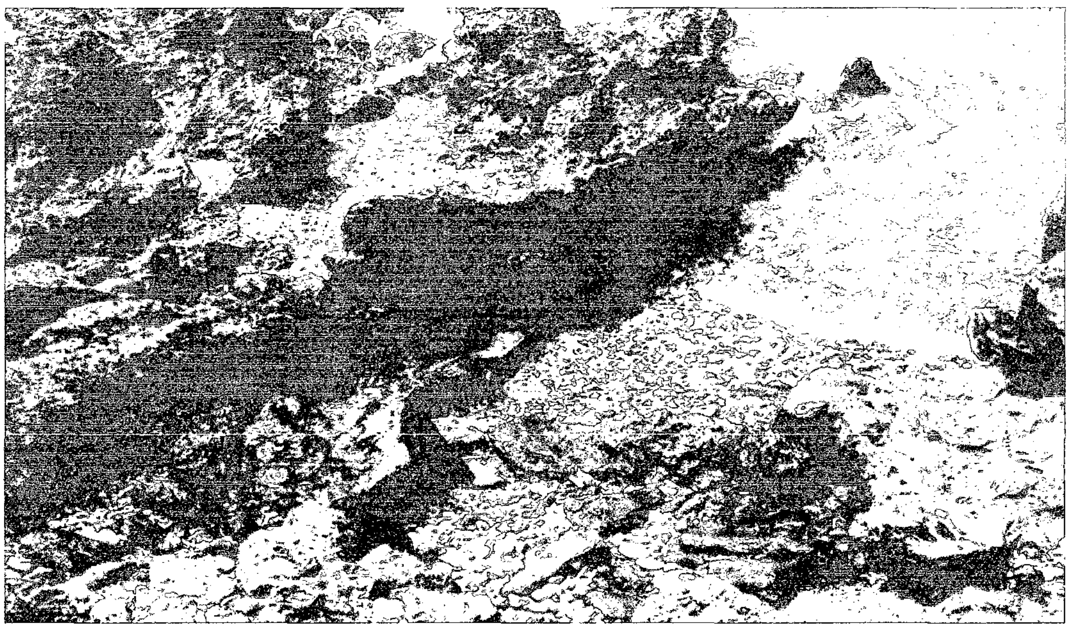

Figure 10: Shoreline Below Pahinahina Point. Photo by Author

In “Hawaiian Marine Shells” E. Alison Kay uses the “tripartite scheme” to define the biotic zones in which marine organisms are found (Kay 1977). These three zones are (1) the supralittoral zone, where terrestrial and marine animals co-exist on the upper reaches of the tidal zone, (2) the eulittoral zone, where marine animals are subject to intertidal immersion and emersion, and (3) the sublittoral zone, inhabited by marine animals that rarely appear above the surface (Kay 1977:12). The study area is rocky, sometimes ruggedly steep with massive basalt boulders or flattened tables of smooth lava extending out into tidal pools. In an informal reconnaissance of the coastline for marine invertebrate fauna in 2007- 2008 to examine the diversity of taxa that lives in the near shore today, a collection of shells and sea-urchin spine and test provided a reference collection for later identification of taxa recovered from the archaeological shell in the site midden. Lists of identified mollusks and echinoidea follow in Tables 2 and 3.

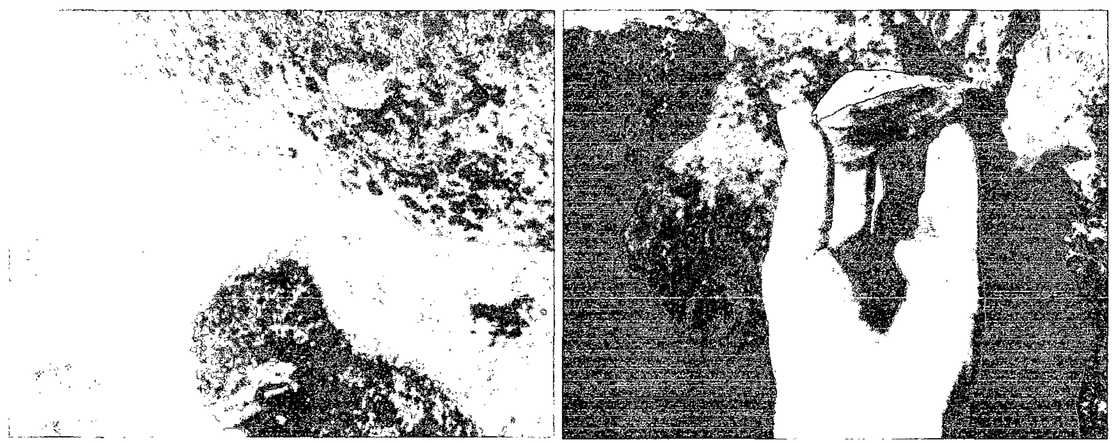

Figure 11: ***Cellana spp.*** **Limpet *(Opihi)*. Photos by Author**

Figure 12: ***Thaididae spp.*** **Drupes *(Maka'awa)*. Photos by Author**

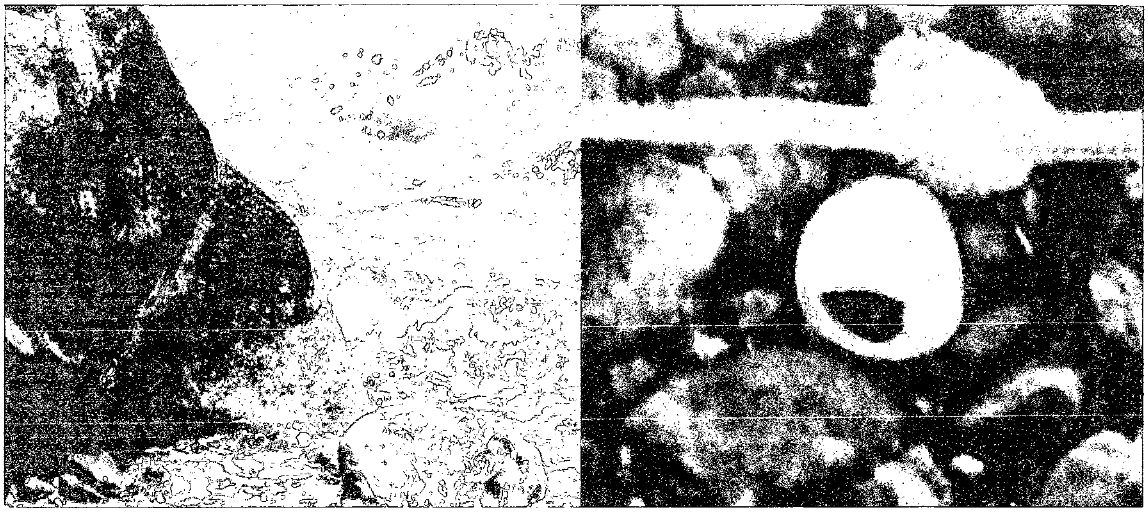

Figure 13: ***Nerita*****. Photos by Author**

Figure 14: Cowries. ***C. caputserpentis*** **(l);** ***C. mauritiana*** **(r). Photos by author**

Table 2: Echinoderm Taxa Observed in Tidal Zones of Study Area

ECHINODERM TAXON	COMMON NAME	HAWAIIAN NAME	TIDAL ZONE
Echinothrix diadema	Blue black urchin	*Wana*	Eulittoral, protected rocks
Echinothrix calamaris	Banded urchin	*Wana*	Eulittoral tide pools
Echinometra mathaei	Rock boring urchin	*Ina kea*	Eulittoral protected rocks
Echinometra oblonga	Rock boring urchin	*Wana*	Eulittoral protected rocks
Colobocentrotus atratus	Helmet urchin	*Ha 'uke uke kaupali*	Eulittoral exposed rocks
Heterocentrotus mammilatus	Red pencil urchin	*Ha 'uke uke ula*	Eulittoral protected rocks
Tripneustrus gratilla	Collector urchin	*Hawa'e maoli*	Eulittoral tide pools

Table 3: Molluscan Taxa Observed in Tidal Zones of Study Area

MOLLUSCAN TAXON	COMMON NAME	HAWAIIAN NAME	TIDAL ZONE
Cypraea caputserpentis	Snake head cowry	*Leho kupa*	Eulittoral, all
Cypraea maculifera	Reticulated cowry	*Leho kolea*	Eulittoral, reef
Cypraea mauritiana	Humpback cowry	*Leho ahi*	Eulittoral, reef
Drupa morum	Mulberry drupe	*Makaloa*	Eulittoral, basalt shorelines
Drupa rubusidaeus	Brilliant drupe	*Makaloa*	Eulittoral, basalt shorelines
Drupa ricina	Spotted drupe	*Makaloa*	Eulittoral, basalt shorelines
Conus distans	Distant cone	*Pupu ala*	Eulittoral, tide pools
Conus ebraeus	Hebrew cone	*Pupu ala*	Eulittoral, tide pools
Conus cattus	Cat cone	*Pupu ala*	Eulittoral, tide pools
Cellana exarata	Blackfoot opihi	*Opihi makaiauli*	Eulittoral, basalt shorelines
Cellana sandwicensis	Yellowfoot opihi	*Opihi alinalina*	Eulittoral, basalt shorelines
Nerita Picea	Black nerite	*Pipipi*	Supralittoral seaward rocks
Nerita polita	Polished nerite	*Kupe'e*	Eulittoral, basalt shorelines
Littoraria pintado	Dotted periwinkle	*Pipipi*	Supralittoral , landward rocks

In an underwater reconnaissance, we found the shallow waters of the small bays populated with several species of fish including surgeonfish (*Acanthurus leucopareius),* yellow tang *(Zebrazoma flavescens),* Moorish idol *(Zanclus cornutus)*, parrotfish, (*Scarus* *psittacus),* butterflyfish *(Chaetodon spp),* wrass (*Labroides spp.),* blenny *(Exallius brevis)* and boxfish (*Ostracion meleagris).* We also observed dolphin, black-tipped reef shark, and green turtle (*Chelonia mydus).*

Experimental Archaeology. A gathering experiment undertaken by three archaeologists along the shoreline of our study area in August of 2008 suggests that adults could easily gather enough shellfish to provide more than half the daily protein requirement of an adult (40g) in a very short time. In five minutes, we collected specimens of all size ranges of *Nerita picea,* or *pipipi,* one of the most commonly found marine shell species in the archaeological midden.

The catch yielded 148 snails, which when cooked, removed from the shell and weighed, yielded 26 grams of meat. This rich catch should be considered a maximum estimate as these shores are not as frequently harvested today. This implies that women and children would be able to supplement the family diet with quality nutrients at low risk and within a short time. This simple base of production by collection may have provided the margin required to maintain the subsistence economy while the larger contributions to the chiefs and elite maintained the political economy.

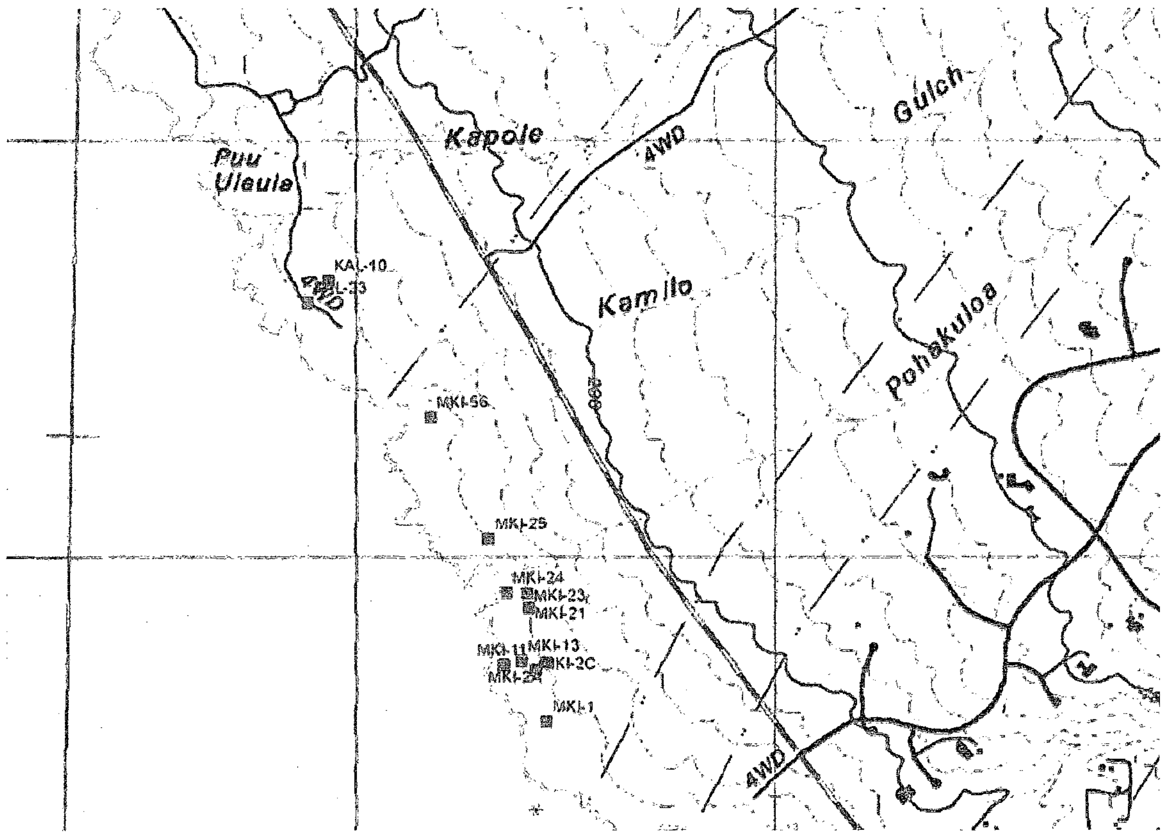

Figure 15: Study Area: Makiloa and Kalala *Ahupua'a*. Map from Julie Field.

Terrestrial Survey. In leeward North Kohala a series of archaeological surveys were conducted in 2007 and 2008 as part of a project combining the resources of the Hawaii Archaeology Project (HARP) Field School and the National Science Foundation SBE - Human Social Dynamics Research Project (Award # 0624238). The principal investigators are Drs. Oliver Chadwick, Michael Graves, Patrick Kirch, Thegn Ladefoged, Shripad Tuljapurkar, and Peter Vitousek.

In 2007 I worked in the capacity of a GSI (Graduate Student Instructor) for the HARP (Hawaii Archaeological Research Project) Field School, directed by Dr. Mark McCoy

(San Jose State University), and assisted Dr. Julie Field (Ohio State University), Dr. Kathleen Kawelu (University of Hawaii at Hilo) under the direction of Dr. Patrick Kirch. We were instructing undergraduates in field methods and survey techniques as we investigated leeward Kohala coastal habitation sites on Hawai'i Island.

In 2008 as part of the Hawai'i Biocomplexity Project and the Hawai'i Archaeological Research Project (HARP) Field School, in leeward coastal North Kohala, we were able to survey and record thirty-one compound and individual features.

Some of these architectural features had similar attributes, including a long axis running parallel to the coast, and perpendicular to the slope (Field 2008). The long axial wall was frequently higher than the other walls, and we referred to them as high-backed houses. Many appeared to have a central intrusion of stone extending in from the long back wall which may have served as a division of the interior which fits with the traditional model of separation of living spaces by gender. Few of the habitation sites surveyed had less than three associated structures or activity areas, linear alignments of stacked stone as small outbuildings, terraces and platforms. Virtually all of these habitation sites had marine shell or echinoderm isolates and scatters associated with them, relating them to the presence, production or labor of pre and post-contact Hawaiian women.

In 2007, I undertook the analysis of the invertebrate faunal materials from excavations of two habitation sites in Kalala *ahupua'a*, a land division of the District of North Kohala, in order to evaluate observable variation in size, frequency and distribution of invertebrate species between two archaeological habitation sites. KAL refers to Kalala *ahupua'a,* followed by the site survey numeric designation. These two sites were designated KAL-10 and KAL- 23. Based on the assumption that a site with more substantial structures and out-buildings would have been occupied by higher status individuals than a less complex and smaller site, the associated midden components would reflect that status difference in the size and variety of the invertebrate remains. The analysis of the shell from these two sites revealed larger, choicer mollusks were consumed in the larger site (KAL-10), and smaller mollusks were consumed in the smaller structures of KAL-23.

In 2008, I again joined Field, Kawelu and Kirch in Kohala as a research assistant in their continued investigation into household archaeology as part of the larger Human Social Dynamics Project. Invertebrate remains from one site (KAL-30) were analyzed for variations in frequency and distribution of species between KAL-10, KAL-23 and KAL-30. The objective of this investigation was to gather more invertebrate data from excavations within the habitation structures and compare midden components between sites for density of distribution within different structures or complexes of structures.

Field Methods. The areas of investigation were first surveyed by under the direction of Thegn Ladefoged (University of Auckland,) and Patrick Kirch (University of California at Berkeley). In 2007, Ladefoged with students from University of Auckland, began with a pedestrian survey, walking north-south transects spaced twenty meters apart, recording cultural modifications to the landscape in the form of linear alignments of stones, stone mounds, walls, enclosures and lithic and midden scatters. The sites were recorded using Trimble GeoXH GPS units for feature spatial data. Of the

86 hectares (212.51 acres) surveyed, 584 sites were recorded with the GPS, and of these 130 were more carefully recorded on survey forms (Field 2008).

Table 4: Sites Excavated in 2007

AHUPUA'A	SITE NUMBER	POSSIBLE FUNCTION	NO. OF EXCAVATIONS	AREA EXCAVATED (M^2)
Makiloa	MKI-1	Habitation, men's house	3	0.6
Makiloa	MKI-2	Habitation	3	1.25
Makiloa	MKI-11	Habitation	1	0.25
Makiloa	MKI-13	Habitation, unknown	1	-
Makiloa	MKI-21	Lithic scatter, production area	1	-
Makiloa	MKI-23	Habitation	2	0.25
Makiloa	MKI-24	Habitation	2	0.5
Makiloa	MKI-25	Habitation	3	0.75
Makiloa	MKI-56	Chief's residence	1	0.25
Kalala	KAL-10	Habitation	6	1.25
Kalala	KAL-23	Habitation	3	0.75

In an attempt to reduce the physical impact to the sites, small .50 x .50 meter test units were excavated either within or adjacent to the structures, usually near a wall so that charcoal could be collected from beneath the wall to radiocarbon date construction events. We used standard methods of excavation and with trowel, broom and dustpan we removed soil in arbitrary levels of five centimeters wherever possible. Excavated material was passed through nested sieves of 1/8 and 1/16 inch screen to extract the smallest cultural artifacts and faunal ecofacts (small sea urchin spines) from the units. In most of the units the density of the shell sample was found to be of adequate size based on the example of Campbell's sub-sampling ranges of shell weighing from 0-152 kg, to 200 grams per unit (Campbell 1981:220-223). Of eleven units analyzed, two samples weighed below 200 grams (see Table 5).

Table 5: Total Weight of Shell and Echinoderm in Grams

TEST UNIT	TOTAL WEIGHT OF SHELL AND ECHINODERM (g)
KAL-30B	516.3
KAL-30A	805.3
KAL-23B TU 2	521.9
KAL-23A TU 3	895.4
KAL-23A TU 1	234.9
KAL-10C TU 6	622.7
KAL-10C TU 5	**163.2**
KAL-10C TU4	**168.7**
KAL-10B TU 3	633.7
KAL-10A TU 2	612.9
KAL-10A TU 1	541.0

Materials were sorted into bags labeled with the site designation, the test unit number, the cultural material or artifact, the date and a unique catalog number was assigned to each. Cultural materials included charcoal collected for plant identification and radiocarbon dating, volcanic glass, bone, marine and land shell, and lithic material. Artifacts such as fishhooks, sea-urchin spine files, beads, or coral abraders were bagged individually. Each excavation level was carefully recorded on level record forms, photographed, and a section drawing made if there was visible stratigraphy. A survey form with either plane-table and alidade or tape and compass maps detailing the structure, a written description of the structural attributes and excavation forms listing the cultural materials associated with each test unit was completed as a record of each site excavated, and thus thoroughly documented.

In 2008, our methods were adapted to cover a larger geographic area. We surveyed both coastal and upland sites in Makeanehu, Pahinahina, Kalala and Kaiholena *ahupua'a.*

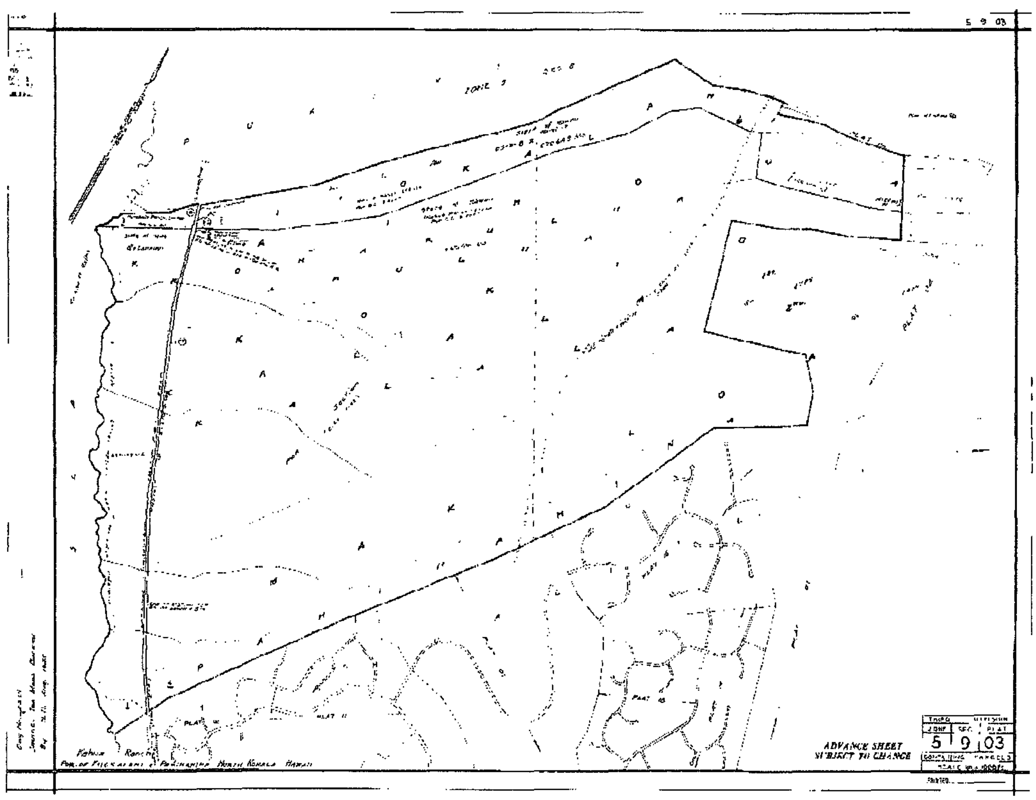

Figure 16: TMK Map of Pahinahina, Makiloa and Kalala Ahupua'a

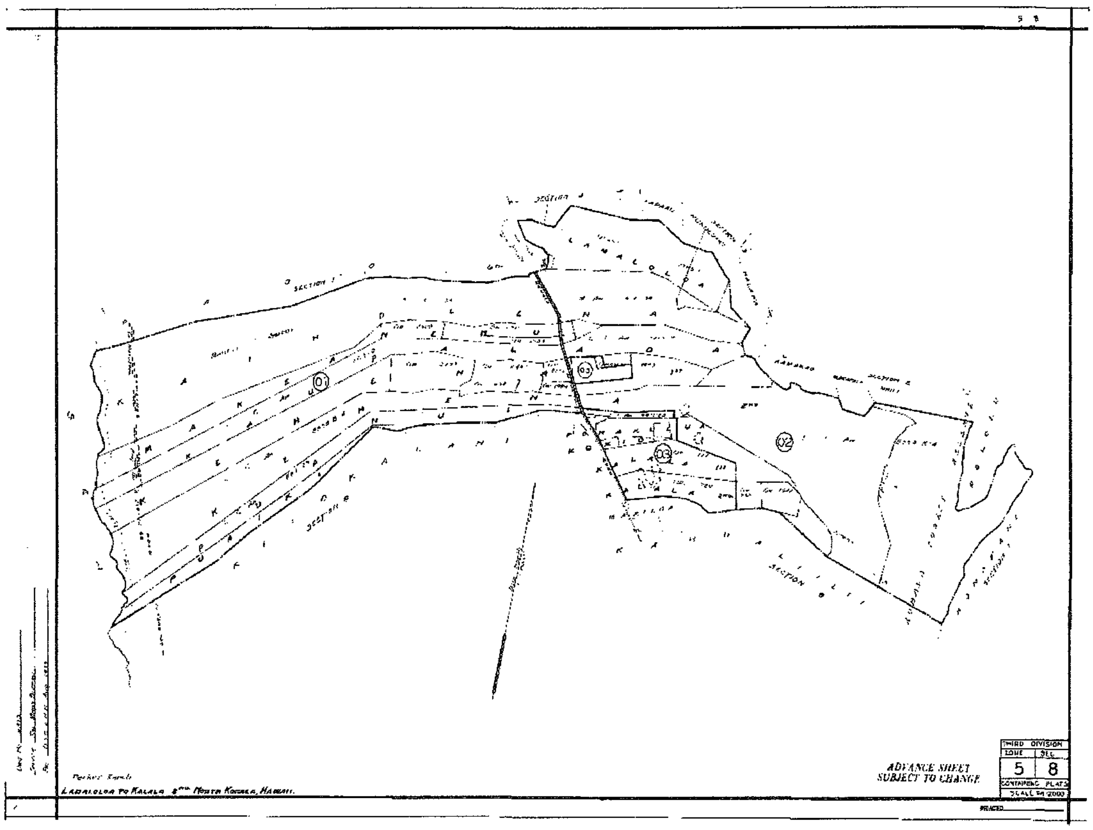

Figure 17: TMK Map of Makeanehu and Kaiholena Ahupua'a

We excavated areal units as large as 2 x 2 meters within the structures to locate hearths or other features, giving us a more accurate determination of each site's function. In order to facilitate these larger excavations, and the larger geographical areas surveyed, we limited the material we collected in the sieves to charcoal and modified cultural material or artifacts, discarding bone and shell. However, within the areal excavation units we retained a .50 m x .50 m "baulk" or berm of soil. Each berm was excavated in five cm. arbitrary levels. Each level was sieved and bagged separately as a control sample of the midden materials from the large areal units. The photo below (Fig. 18) shows the areal excavation and floor of the interior of KAL-30 A with a "baulk" of reserved material in the lower left, one half of which lies in KAL-30 A TU 1A and KAL-30 A TU 1B.

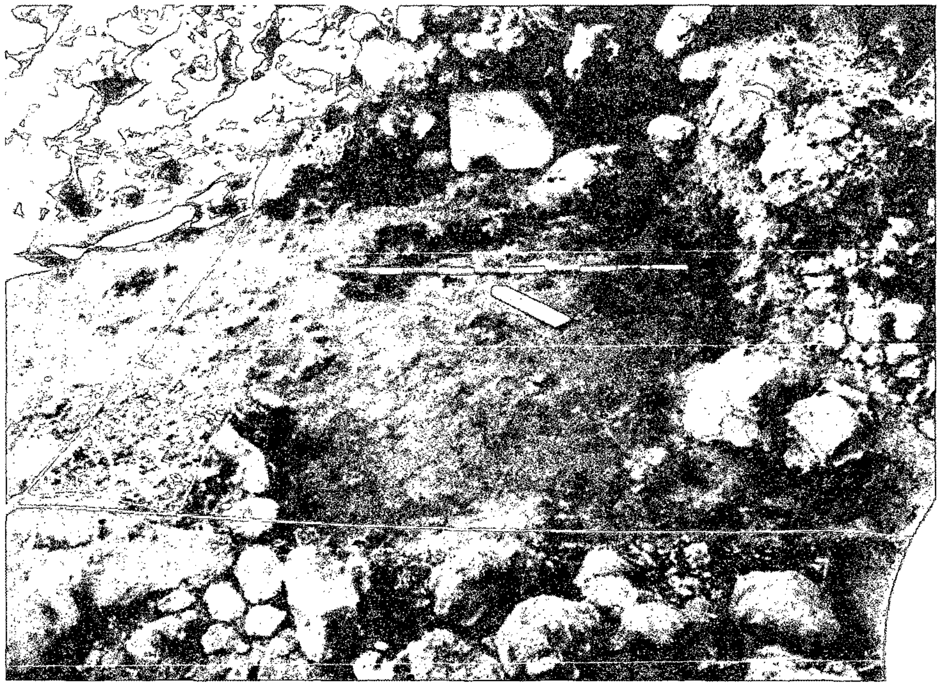

Figure 18: KAL 30A with Baulk Sample in Left Foreground. Photo by Author

The excavation of two .50 m x .50 m "baulks" provided control samples from sites KAL-30A and KAL-30B for vertebrate and invertebrate faunal materials, thus permitting a comparison of the midden components from these sites with the materials from the .50 m x .50 m test units excavated from neighboring sites in 2007.

Table 6 shows the *ahupua'a,* site number, possible feature function and the number of excavated units per site from the 2008 field season. Shell and echinoidea materials from KAL-30A and KAL-30B were included in the analysis for this thesis.

Table 6: Sites Excavated in 2008

AHUPUA'A	SITE NUMBER	POSSIBLE FUNCTION	NO. OF EXCAVATIONS
Kalala	KAL-30A	Habitation	2
Kalala	KAL-30B	Ritual	1
Kalala	KAL-5A	Habitation	1
Kalala	KAL-1	Ritual	1
Pahinahina	Pahinahina Point	Not Determined	1
Pahinahina	PHH-30	Habitation	1
Makeanehu	MKE-101	Habitation	3
Makeanehu	MKE-102A	Habitation	1
Makeanehu	MKE-102C	Habitation	1
Makeanehu	MKE-103	Habitation	2
Makeanehu	MKE-104	Habitation/Ritual	1
Makeanehu	MKE-105	Habitation	1
Makeanehu	MKE-106	Not Determined	1
Kaiholena	KHL-1	Habitation	1
Kaiholena	KHL-2A	Habitation/Ritual	1
Kaiholena	KHL-2D	Habitation	1
Kaiholena	KHL-10	Habitation	1
Kaiholena	KHL-12	Not Determined	1
Kaiholena	KHL-48	Habitation	1
Kaiholena	KHL-50	Habitation	2

Once the excavated materials were sieved and sorted, they were recorded in the excavation record and the artifact catalog. The catalogued bags of shell were separated by site, unit and by level. Each level bag of shell was weighed in bulk to provide a gross weight of shell for each level of each unit. Each level bag of shell was then sorted according to molluscan family characteristics of mainly *Cypraea* (cowry), *Thais* (drupes),*Conus* (cones), *Cellana,* (limpet) and *Nerita* and *Littoraria* (small rock snails).

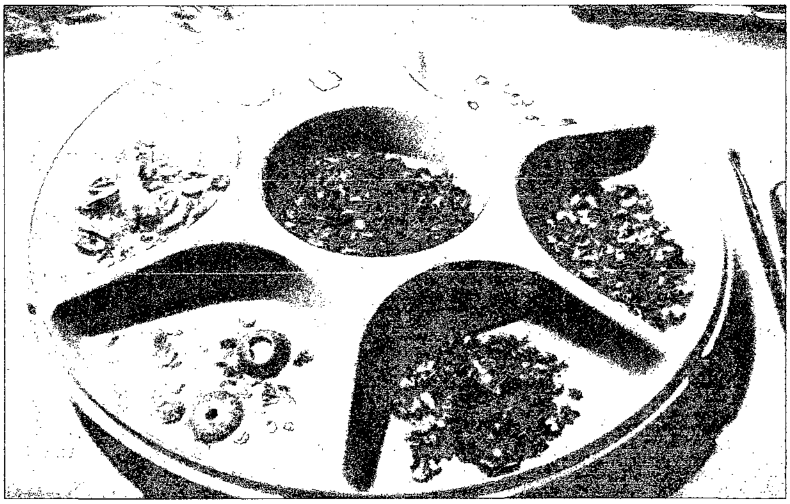

Figure 19: Example of Sorted Shell and Echinoderm. Photo by Author

Once the excavated materials were sieved, sorted and bagged they were recorded in the excavation record and the artifact catalog. The catalogued bags of shell were separated by site, unit and by level. Each level bag of shell was then weighed in bulk to provide a gross weight for each level of each unit. Each level bag of shell was then sorted according to molluscan family characteristics of mainly *Cypraea* (cowry), *Thaididae* (drupes), *Conus* (cones), *Cellana,* (limpet) and *Nerita* and *Littoraria* (small rock snails).

Using a shell reference collection obtained from shorelines adjacent to the sites surveyed and Hawaiian shell reference books (Hoover 1999; Kay 1977), archaeological specimens were speciated to the lowest taxa where identification was possible. Echinoderm was separated out and speciated using spine and test characteristics, as well as other invertebrates including crab, chiton and barnacle. After the shell was identified to the lowest taxa it was quantified by weight, number of identifiable specimens per species (NISP) and minimum number of individuals per species (MNI). Data were organized and calculated by site, test unit and level in Excel. Statistical data were calculated with SPSS. The results of these analyses are presented in Chapter 4 and the raw data can be found in table form in Appendix B.

Chapter 4: Analysis of Sites and Midden Content

Architectural attributes and recovered artifacts associated with "traditional" male or female activities can be evaluated for an interpretation of status and gender of the early occupants of these three sites. By following the guidelines (see Table 1) of earlier descriptions (Ellis, 2004; E.S. Handy, 1972) of households and later studies of comparative construction of high status households, ritual sites, simple households or activity areas, we can make informed interpretations of the structure function (Kirch, 1985; Ladefoged T., 1998). An analysis of the shell midden found within the sites provides another means for determining the function of the site and the status and gender of the occupants by examining inter-site density and composition, variation in taxa, the relative size of the invertebrates recovered and their spatial relationship to architectural features of status and gender.

The three sites described here occupy the coastal zone of Kalala *ahupua'a*. The complex of sites designated KAL-10, KAL-23 and KAL-30 were surveyed recorded and excavated during the 2007 and 2008 field seasons. In the first part of this section, I describe the architecture of the features, the results of the excavations and present a probable occupation timeline based on radiocarbon dates and artifact typology for KAL-10 and KAL-23. Tables of cultural materials excavated from each unit can be found in Appendix A.

Part 2 consists of the analysis of the shell density and variations in taxa and size range of the animals found in the midden. In addition, male linked artifact assemblages are identified by site and a comparison of midden components with sex linked activities is evaluated for each site. The raw quantification data for each site is found in Appendix B.

Part 1: Site Descriptions and the Results of Excavation

KAL-10 Complex Feature Descriptions. The KAL-10 complex consists of four features: KAL-10A, two conjoined enclosures attached at the south east corner of the larger enclosure, KAL-10B, a C-shaped enclosure about fifty meters south of KAL- 10A, KAL-10C, a rectangular enclosure with an attached J-shaped enclosure and KAL-10D, a pavement that may have been employed in ceremonial events. Midden was observed scattered across the forty meter complex and several .50 m x .50 m excavation units were placed within the enclosures; two in KAL- 10A, one in KAL-10B, and three in KAL-10C. The artifact assemblage from the excavations in the KAL-10 complex consisted of tools used in the manufacture of fishing gear, food remains including fishbone, medium mammal bone, a single specimen of bird bone, marine shell, charcoal and lithic materials. A complete list of excavated cultural materials can be found in Appendix A.

AMS radiocarbon dates for KAL-10B were obtained from a charcoal specimen identified as *pukuiawe* wood (Field 2008) from TU3, Level 3 and can be found in Appendix A. Although the radiocarbon dates place KAL-10B chronologically in the 20th century, only a single historic artifact (metal) was found within the KAL-10 complex, indicating the possibility of earlier dates of occupation.

No radiocarbon dates were obtained for KAL-23; however some early trade beads and a hook made of bent metal indicate an occupation during and perhaps before early post contact times. At this time, no radiocarbon dates are available for KAL-30, but the feature appeared to be constructed according to traditional building methods; no nails or milled wood were evident, and no lime or other mortar was used in the wall construction. A single historic artifact was recovered from KAL-30B TU 2, a fragment of a mid-18th century Brazilian trade coin.

KAL-23 Complex Feature Description

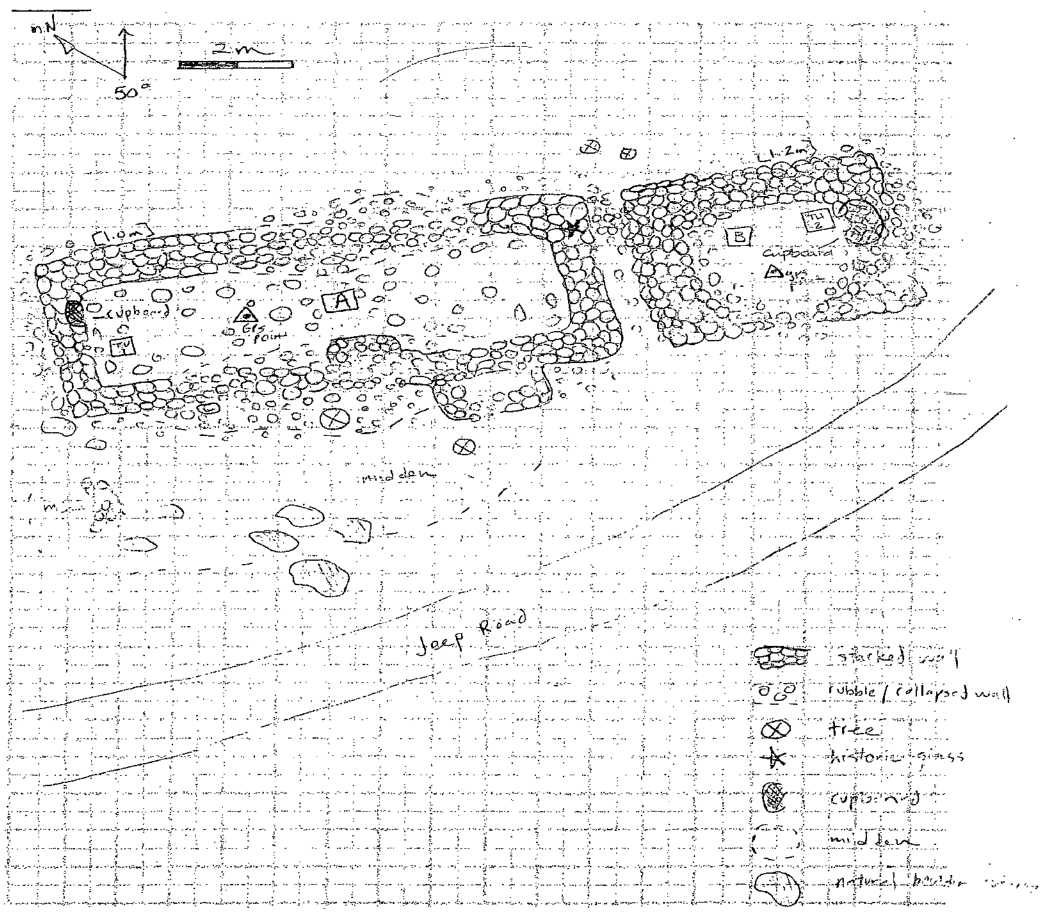

Figure 20: Field Sketch of KAL-23. Julie Field

A ridgeline habitation complex of several features including KAL-10 and KAL-23, were surveyed and excavated in the 2007 field season.

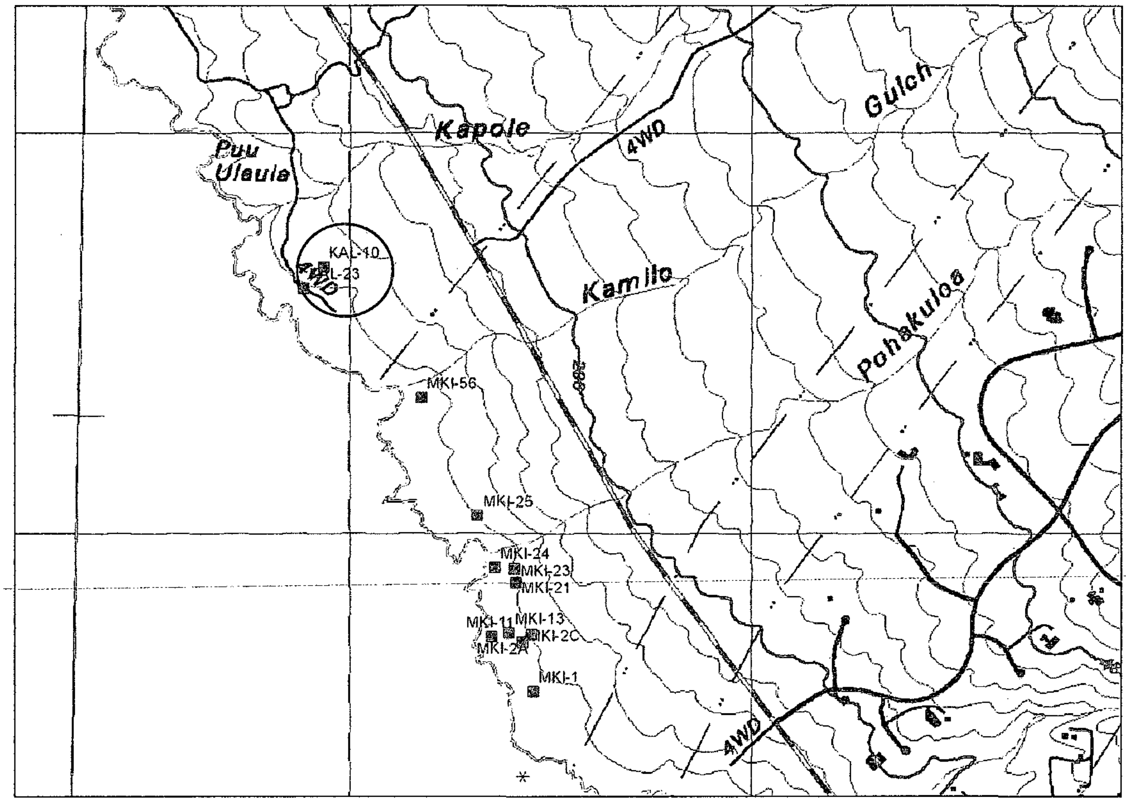

Figure 21: KAL-23 and KAL-10 Complexes Circled on GIS Map. Map From Julie Field.

The KAL-10 complex occupies an area above KAL-23, which is located on the eastern edge of an unpaved "jeep road" running parallel to the coast of Kalala *ahupua'a*. The lower complex of KAL-23 consists of two adjoining roughly rectangular stone features constructed of stacked cobbles and boulders forming walls of up to eleven courses of dry stacked masonry. Shorter north and south walls form the ends of the enclosures and the longer west (*mauka*, or towards the mountain) walls form the higher back. The ocean-facing front of the structures consists of a low wall and a stone platform extending east (towards the ocean, *makai*). The larger complex of habitation structures including KAL-10, extend down a ridgeline (*mauka* to *makai*) and may be part of an extended family *kauhale*, or traditional Hawaiian household. These residential complexes were used either seasonally as a fishing site or as part of a permanent coastal settlement of fishing communities. William Ellis, in his 1823 circuit of the island says of this area, "The coast was barren; the rocks volcanic. The inhabitants were all fishermen; Mr. Thurston was informed that the inhabitants of the plantations, about seven miles in the interior, were far more numerous than those of the sea shore" (Ellis 2004:217).

KAL-23A is long high-backed enclosure 10 m in length on its north south axis and 4 m in width on the east west axis. The rear wall consists of up to seven courses of dry stacked stone, and the low front extends east onto the jumbled remains of a low terrace or platform of broken pahoehoe lava and water worn basalt cobbles and small boulders. The surface of the terrace and the surrounding ground are scattered with shell. The interior of the structure is thickly overgrown with buffel grass, but when cleared shows visible midden, some historic glass and ceramic. A quart sized bottle of pale lavender glass was tucked into the south wall, as well as some large *opihi* (*Cellana sp.)* shells, formerly used as small cups, vegetable peelers and scrapers. An area of interior wall fall extends about 1.5 m from the back wall into the interior floor about 3 m south of the north wall. A small feature of stone lined slabs set into the north wall form a "cupboard". Elongated water worn basalt stones 30-50 cm in length are distributed throughout the structure and may have previously stood upright, one of the characteristics of a *hale mua,* or men's house.

Two .50 m x .50 m test units were placed within this structure, TU 1 in the northwest corner and TU 3 along the midline of the south wall. The surface of TU 1 was a loose organic duff in fine, dry sediment with marine midden visible. A single fragment of stoneware ceramic with thin black glaze was retrieved from the surface. Continued excavation to 10 centimeters below surface (cmbs) revealed a thin layer of cultural material overlying sterile decayed lava bedrock, comprised of marine shell and sea urchin spines, fishbone, charcoal, three more pieces of the same ceramic and unburned shells of *kukui* nut (*Aleurites moluccana*). This type of nut grows in the mesic valleys of Kohala from 0-2290 ft (0-700m) and requires an annual precipitation rate of from 25-170 inches (640 -4290 mm) of rainfall annually (Krauss 1993; Elevitch 2006). The oily kernel was a staple in Hawaiian households as a source of light, as a food relish, and in fishing practices. As the tree requires more precipitation than that occurring in our study area (5-20 inches of rainfall annually) it is unlikely that it grew in the environment of our sites and may indicate reciprocal relationships with *ohana* living in other areas.

The layer of cultural material was relatively shallow in this unit, and a second test unit was opened in the south section of the feature, KAL-23A TU 3. KAL-23 TU 3 contained cultural materials to 15 centimeters below datum (cmbd), excavated in three 5cm levels. The surface was a dry loose soil thickly intermingled with the roots of buffel grass. Shell was visible on the surface. Upon excavation, Level 1 continued as dry, loose sediment, the roots of dry grasses, and artifacts including marine shell and sea urchin spines and test, fishbone, a dog tooth, lithic flakes, volcanic glass and charcoal. Historic components include a fish hook made of bent metal, broken ceramic beads and another metal fragment. Level 2 sediment deposits were dry, loose dark brown soil with inclusions of a lighter red brown soil and pockets of dark gray brown midden. Midden soil was present in a pocket in the center of the test unit containing shell, fishbone, and charcoal. Level 3 (10-15cmbs) was dark yellowish brown sediment with thick inclusions of saprolitic rock, and small ash pockets at the top of the level.

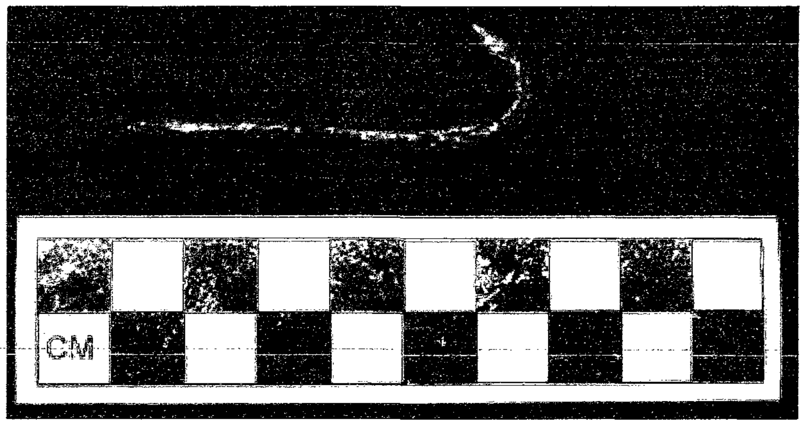

Figure 22: Metal Fish Hook. Photo by Julie Field

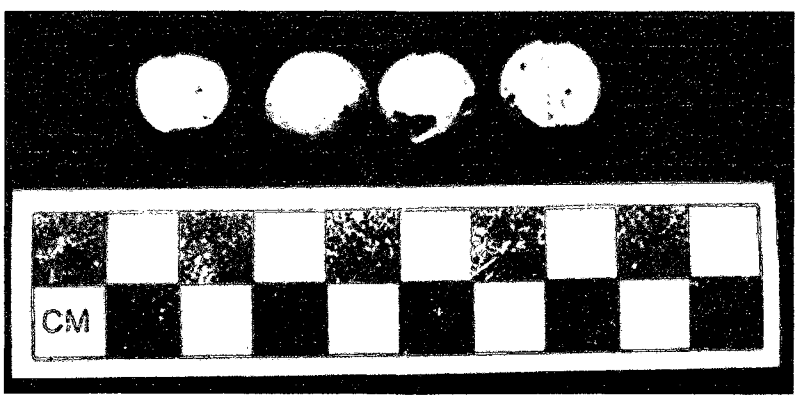

Figure 23: Historic Ceramic Trade Beads. Photo by Julie Field

From 10-12 cmbs, midden materials and an early historic artifact (terracotta trade bead) are recovered in dry screening (1/16" and 1/8"). Below this a thick substratum of compacted yellow brown soil and decayed bedrock were encountered. We found this type of sediment to be the top of the sterile substrate in most cases, and no further cultural materials were evident. Excavation was terminated at this point and no profile was drawn.

KAL-23 B is another rectangular enclosure about half the length of KAL- 23A and the same width, 5 m long and 4 m in width.

Figure 24: KAL-23B TU 2 Views from NE. Photo by Julie Field

A distance of 1 m separated the south wall of KAL-23A and the north wall of KAL-23B. The walls were in an excellent state of preservation; the rear west wall was 1 m in height, built with eleven courses of dry stacked lava and water worn basalt cobbles and boulders. There were some water worn stones topping the walls, and a large very well preserved "cupboard" feature with a slab lintel was set into the south east interior wall. When the overgrowth was cleared within the structure, a layer of beach sand with small pebbles and water rolled coral and shell covered a section of the floor near the cupboard. The structure opening faces the ocean, and was probably built in the same construction event as KAL-23A (Field, 2008). A single .50 x .50 m test unit, KAL-23B TU 2, was placed within this feature, in front of the cupboard wall.

KAL-23B TU 2 was excavated to a depth of 45 cmbs, with the first 10-12 cmbs containing a mixture of soil and beach sand, functioning as a paving feature. The cupboard measured 70 cm deep by 65 cm wide. Four cobbles, which fell into the structure from the surrounding walls, were lying on the surface of the unit. The northeast quadrant was dominated by a thick grass root system. The surface matrix was a mixture of soil, beach sand, plant debris, and roots. With the exception of the beach sand pavement and the deeper soil deposition of KAL-23 B TU 2, the excavated cultural materials were consistent with those of KAL-23 A. In Level 3 (10-15 cmbs) the quantity and variety of shell, bone and charcoal increased and continued to appear near the southern wall of the enclosure. At 20-25 cmbs the northeast quadrant of the unit reached sterile, but the remaining area continued with cultural materials to 45 cmbs. A different sand surface of about 2 cm in depth was encountered in the two south quadrants indicating an earlier "paving" event and occupation. Fragments of metal, glass, ceramic bead and marine and terrestrial faunal remains indicated a mixture of pre-and post-contact artifact typologies. Based on the artifact typology, it is probable that the construction and use of KAL-23A and KAL-23 B was a comparatively late event. However, throughout its use, the presence of marine shell and echinoderm remains consistent, and in the absence of construction nails and remnants of milled wood, these features were probably initially constructed according to traditional forms using dry stacked stone, lashed wood poles and grass or pandanus thatching.

Although it was initially thought that the larger feature (KAL-23A) was a habitation, and the smaller structure (KAL-23B) was a storage or cooking structure, there are characteristics of these two structures that may lead to a different interpretation; beach sand pavement, distinct separation and close association with the adjacent structure, and the sturdy preservation of KAL-23B.

Beach sand on the surface of an enclosure, as in KAL-23B, was encountered at another coastal habitation site (MKE-5). In combination with small water rolled pebbles and coral, it provides a relatively smooth, level surface as a pavement. A sand pavement would not be appropriate in a cooking area, especially where earth ovens (*imu*) are used to prepare food, a small hearth for broiling foods or for warmth is a more likely explanation for the ashy soil inclusions in KAL-23B. These two structures are only one meter distance from each other. They are closely associated, yet separate. In the tradition of separate living and activity areas for men and women, a valid explanation for this construction would be the larger KAL-23A as the *hale mua* for the men and older boys, and the adjacent KAL-23B as the *hale aina* for a woman. The *hale aina* for common women would have been a smaller structure, "just a small shed beside the ground oven in which the food was cooked once a day" (Handy 1991:302). Both structures contain well made features in their stone slab "cupboards", and they do not share a common wall, as is seen in other storage unit construction additions. This sturdy structure could have been used as a store house for fishing gear, but the ashy subsurface deposits in the soil would seem to contraindicate that function. Wooden bait sticks, woven fish traps, plant fiber nets, fishing lines, gourd and fiber containers would not be stored in close proximity to an activity that involved an enclosed fire.

KAL-23 appears to be a residential feature with two separate but closely associated habitation structures fitting the description of a traditionally gender-segregated *kauhale.* The artifact assemblage is that of a late occupation by Hawaiians engaged in fishing and collecting marine resources. A metal fish hook and ceramic beads are of late introduction, as well as the fragments of a brown-glazed earthenware ceramic, but no objects associated with manufacturing fishing gear are recorded. Invertebrate food resources are well represented by the marine shell and sea-urchin test and spine. The excavated materials from these features are listed in Appendix A.

KAL-30 A and B Complex Feature Descriptions. KAL-30 is a compound structure located just to the south of Pu'u Ulaula (Red Hill), in Kalala *ahupua'a*. It is a rectangular stone enclosure of two to six courses of dry stacked boulders and cobbles with an unpaved interior surface of soil.

Figure 25: KAL-30B View to the North. Photo by Author

Substantial surface midden of shell, water worn coral and charcoal were clearly visible. Its preservation was good, situated on a weathered a'a slope in the coastal physiographic zone, 0-100 ft. (0-30.5 m) above shoreline. The northern component of the compound structure is designated KAL-30 A, and the southern component is KAL-30 B.

KAL-30A is a rough rectangle approximately 10 meters in length, with the long axis of its rear wall oriented north to south and its shorter side walls of 4-5 meters in length oriented east to west. The remnant of a short (5 m) wall on an east west axis defined the northern end of the structure and the southern end extended into KAL-30B, described below. The walls were in good condition with a small faced section on the exterior of the long wall. Shell was scattered in the interior and in front of the enclosure. The interior surface was reddish brown, very soft soil with mottled ash deposits from a significant recent fire that burned several acres in the area. Much of the surrounding buffel grass and *kiawe* has burned to the roots leaving the structures easily visible.

Two areal units were placed side by side in the south half of KAL-30A TU 1A and KAL-30A TU 1B, with a .50 x .50 m baulk reserved between the two units as a midden sample. The dimensions of the units were determined by dividing the interior space of the feature at the midpoint of the longest axis along the rear wall, then dividing that into two side by side units, TU 1A to the north, and TU 1B to the south. Only artifacts and charcoal were collected from the larger excavations, the purpose of this field excavation being the location of features such as hearths within the structures and the opportunity to collect samples of charcoal from beneath the wall of the feature for radiocarbon dating. Hearth features were recorded in both TU 1A (Feature 1 at 14 cmbd) and in TU 1B (Feature 1 at 5-20 cmbd), at about a meter distance from each other.

TU 1B, located in the southern half of KAL-30A measured 198cm x 157cm, and was excavated in six levels to a depth of 40 cmbd. Feature 1, a possible hearth, occupied an area beginning 45 cm west of the rear rock wall face and encompassed a roughly rectangular surface area of about 420 cm². Feature 2, a possible ash dump, occupied the NE corner of the unit and contained ash and midden. Occasional water worn pebbles were noted as possible paving components and subsurface charcoal was collected for dating. Artifacts retrieved included sea-urchin spine files, volcanic glass, coral abraders, cut mammal bone, modified shell and a hamerstone and a full list of excavated materials is found in Appendix A.

KAL-30A TU 1A measured 2.1 m x 2.0 m and contained a hearth feature located in the middle of the test unit, occupying a soil deposition level similar to the hearth feature in TU 1B. Although dates from the charcoal of the two features might be compromised by the large quantities of surface ash from the recent fire, the depths of the feature deposits indicate a contemporaneous construction event. The location of side by side hearth features in one structure may be associated with the *'ai kapu* practice of maintaining two separated cooking ovens for men and women.

The southern component of the compound structure designated KAL-30B, was significantly different from KAL-30A in its construction. It contained two separated enclosures, a square northern enclosure and rectangular southern enclosure, together encompassing a length of 13.5 m, and a width of 7.0 m. It was situated east of a flat rectangular activity area; the western *(makai)* edge was a low lying terrace. Substantial midden was present on the surface of the terrace and a cowry shell octopus lure was collected. Two stone lined pits were situated in the south wall of the structure. The eastern pit was collapsed, but the western pit was in good condition, with a few pieces of marine shell found within. The northern wall of the structure also contained a stone lined pit in good condition with four water worn coral cobbles adjacent to the pit. In addition, pieces of branch coral (10+) were observed in and around this pit with a few water worn coral pebbles as well. Numerous (20+) water worn cobbles and boulders were placed on the walls of this structure. A large coral head (25 cm x 20 cm) sat in the collapsed *makai* wall of the square enclosure. A cupboard feature was situated in the northeast corner of this enclosure, measuring 31cm wide, 35 cm high, and 124 cm in depth.

The presence of the branch coral, water rounded stones and the large coral head found associated with this part of structure increases the probability that this had a ritual, rather than residential function (Kirch and Sharpe 2005). Additionally, an increase in the presence of echinoderm remains matches that found in a ritual structure excavated at Kahikinui (Jones and Kirch 2007).

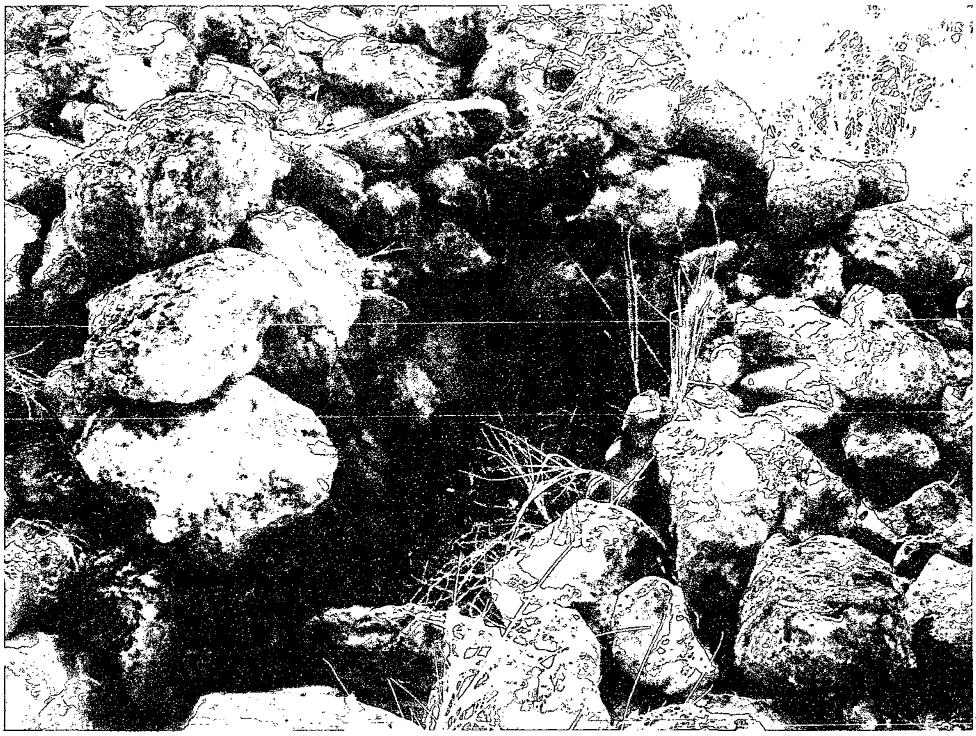

Figure 26: Detail of KAL-30B Construction. Photo by Author.

KAL-30B TU 2 was placed in the eastern (*mauka*) half of the northernmost square enclosure of the structure, as an areal excavation (106 cm x 185 cm) to locate features within KAL-30B. The artifacts retrieved from this test unit were an assemblage of fishing related tools noted previously; sea urchin spine files, cut pearl shell, coral abraders, cut bone, shell scrapers, and although its function is uncertain, volcanic glass. Fish bone and pig teeth were also found as well as a remarkable fragment of a Brazilian coin in Level 3 (10-15 cmbd) later identified as a trade coin from the mid-18th century. The density and relative quality of the cultural material found in this unit set it apart as a possible shrine or ritual offertory feature. The remains of fish and shellfish were less fragmentary as compared to the other sites, fragmentation occurring if they were consumed and the remains discarded. These appeared to be placed whole in a single location. A .50 m x .50 m baulk was retained as a bulk midden sample, and marine shell and echinoidea samples were quantified and speciated from this sample. Lists of the materials excavated from KAL-30B TU2 can be found in Appendix A.

A Comparison of Male and Female Artifact Characteristics. Although it may be difficult to associate the material remains of many of the activities women engaged in as part of their daily labor, men's activities may be more easily associated with durable material artifacts. In the coastal habitation sites, the primary economic activity of men was fishing, particularly benthic and pelagic fishing using poles with hook, line and lures, large nets and spears. The artifacts found include shell and bone hooks, bone and shell hook blanks, and the materials used in the manufacture of fishing implements, including sea urchin spine files, coral abraders and volcanic glass (Kirch 1985). If we confirm the presence of such male associated artifacts, and the remains of food that women would have been restricted from eating such as pig or the larger fish, we could infer a male-linked activity site. Table 7 shows male activities linked with artifacts.

Table 7: Linked Male Activities and Artifacts

MALE ACTIVITY	ARTIFACTS
Fishhook manufacturing	Stone tools, Fishhooks, Hook blanks, Bone, Pearl shell, Abraders, Files, Volcanic glass
Ritual Observations	Branch Coral, Water-Worn Basalt Upright Stones
Woodworking	Stone Adzes, Adze Retouch Flakes
Feasting/kapu food consumption	Pig Bone, Dog Bone, Large Pelagic Or Benthic Fish Bone

The absence of such artifacts and food remains could then infer a female-linked activity site. An index of gender attributed artifacts was created by assigning a value of 1 for the presence of male-linked materials and a value of 0 given to their absence in each artifact assemblage from site complexes KAL-10, KAL-23 and KAL-30. This index is shown below in Table 8. The total number of male linked artifacts per site gives us the index

Table 8: Presence/Absence Male-Linked Artifacts by Site

ARTIFACTS	KAL-10A	KAL-10B	KAL-10C	KAL-23A&B	KAL-30A&B
Pig/dog NISP	1	1	1	1	1
Adze flakes	0	1	0	0	1
Fish hooks	1	1	0	0	1
Coral abrader	1	1	1	0	1
Sea Urchin files	0	1	1	0	1
Totals	**3**	**5**	**3**	**1**	**5**

The Chart below (Fig. 27) shows the comparative ranges of the gender indices across sites as they fall between quantities of two and five male linked artifacts.

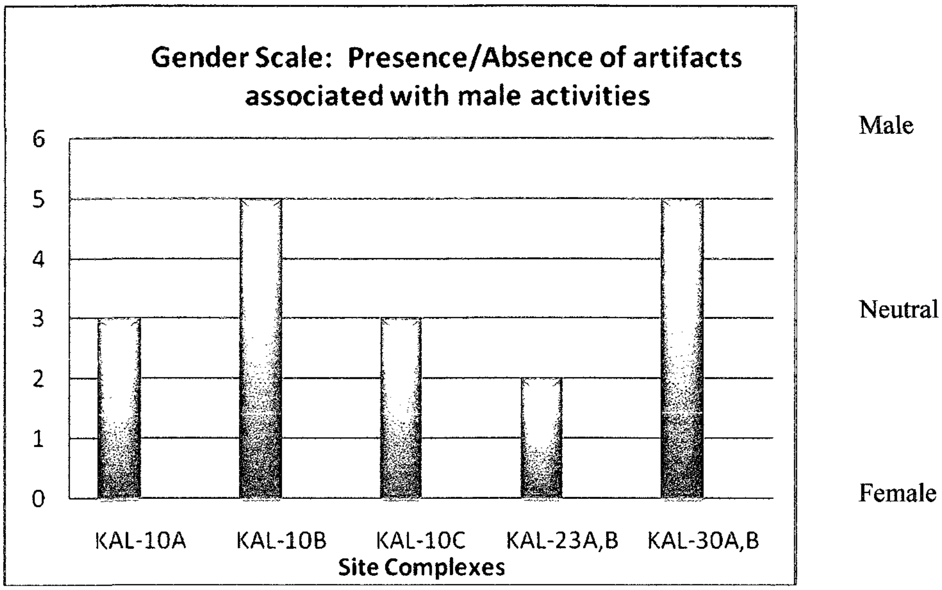

Figure 27: Comparative Range of Male Linked Artifacts

Sites KAL-10A and KAL-10C fall in the median range (3) while KAL-10B and KAL-30 fall in the male range (5). The paucity of male linked artifacts in KAL-23 places it in the female range (2).

The application of this index to the artifact assemblages from these sites and others may provide us a larger sample to test, making this an effective tool for bringing women's activities into the light. In addition, a review of cultural materials related to women's activities that would preserve fairly well include objects of stone, turtle shell, bone, shell, and ivory. Figure 28, below, shows a material assemblage of artifacts associated with women's activities listed by stone, bone and shell. These artifacts are rarely, if ever noted in the archaeological record as female linked artifacts, and locating them in the context of low-index male linked activity areas might further confirm the archaeological feature as a male or female activity area.

Stone Artifacts	Bone Artifacts	Shell Artifacts
•Kapa anvil	•Needles and Bodkins	•Vegetable scrapers
•Dye bowls	•Kapa grooving tool	•Bark peelers
•Kapa weight stones	•Shell fish pick	•Gourd stoppers
•Food Processing	•Mat leaf splitter	•Coconut graters
•Fiber macerators for olona or other fibrous vines.	•Turtle shell scraper for olona	•Kapa polisher
•Opihi ku'i (limpet pry)	•Bone "awl" for twined baskets and fish traps	•Olona or lauhala scraper
•Dye mortar and pestle		•Shell ornaments
•Small stone sinkers		•Small cups for herbal medicines
•"hammer" stones		•Burnishing shells
		•Shell adzes or "choppers"

Figure 28: Material Assemblages in Stone, Bone and Shell Associated with Women's Activities

The content, concentration and relative size of marine invertebrate remains associated with these artifact assemblages offer valuable insight into the presence of the common woman in pre-contact Hawaii, in the complex cultural dynamic of the domestic and political environment. Using shell as a means of interpreting site function, changes in consumption patterns, and timelines of seasonal occupation are just a few of the uses of midden studies. At this time, locating the common woman in the spaces and tools of gender segregated activities may be somewhat ephemeral and difficult to substantiate, but the common woman's presence is firmly stamped on the landscape by the ubiquity of a signature contribution, marine shell.

Part 2: Analysis of the Shell Midden

The marine shell recovered from excavation were (1) identified to taxa of shellfish and echinoidea, (2) weighed in grams, (3) minimum number of individuals (MNI) per taxon counted, and (4) the number of identified specimens (NISP) per taxon was counted. The complete data set is tabulated in Appendix B listed by site, excavation unit, and level.

In the first part of this chapter, I describe concentration indices depicting shell density, calculated by dividing total shell weight by the volume (m^3) of excavated soil in each unit. Next, the five main genera of identified molluscan taxa, *Cypraea,* (cowry) *Cellana,* (limpet) *Conus,*(cones) *Thais,* (drupes) and combined *Nerita/Littoraria*, (nerites and periwinkles), are described to represent the relative shell composition of the midden components. Finally a comparison of relative individual size of the five main genera has been calculated by dividing the total shell weight by the minimum number of individuals (MNI) representing the dominant shell categories. This is not the ideal method of determining shell size, but it gives us a general idea of differences in average size.

Relative Concentration of the Midden. Figure 31 shows the concentration of shell by weight in grams per cubic meter of soil (g/m^3) for the features excavated. KAL-30B had the highest density of shell present (+10,000 g/m^3) with KAL-10C TU4 the least, with only 1500 g/m^3. The median concentration index occurs at 6,000 g/m^3; values from 8,000-12,000 represent a high concentration index and values between 0-4,000 g/m^3 represent a low concentration index. Overall, when we compare sites, KAL-30 has the highest density and KAL-10 and KAL-23 have both medium and low densities.

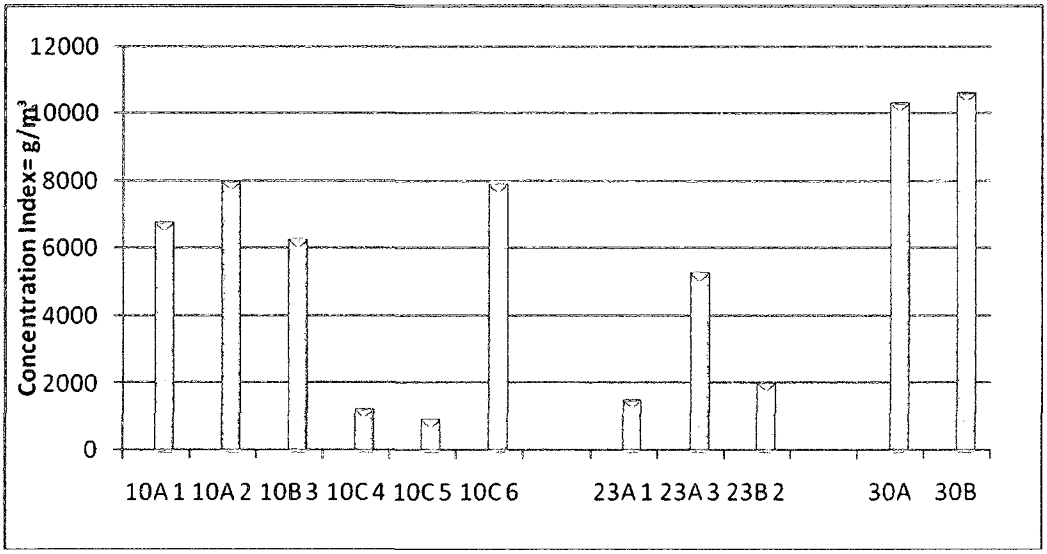

Figure 29: Relative Concentration Indices for All Sites.

Midden Composition. The table and charts below illustrate the midden composition for each site feature, calculated in percentages (wt/m³) of the five main genera identified from each test unit. In all of the sites tested, three different patterns of dominant taxon composition emerge; site features with dominant *Cypraea* spp. (Pattern A), site features with dominant *Nerite/Littoraria* spp. (Pattern B), and site features with dominant *Thaididae* spp. (Pattern C). Figures 30-39 show representations of the relative composition of the midden for each test unit excavated and are labeled A, B or C according to the dominant genus represented in the midden. The distribution patterns of dominant genus may indicate selection bias based on differences in gathering areas, seasonal periods of gathering, differences in distribution of choice taxon based on status, or differences in consumption patterns based on age, status or gender. A comparison of these patterns with architectural and artifact assemblage analysis for gender and status allows associations between those factors and the durable household remains of the shell midden.

Cellana and *Conus* spp. quantities indicated a lesser presence in the midden. Although the shells were found in abundance along the shoreline, and as live specimens of the mollusks were observed in and around the rocks, their comparatively poor representation in the midden was unexpected. Some comments about this finding follow the descriptions of the dominant shell distribution patterns.

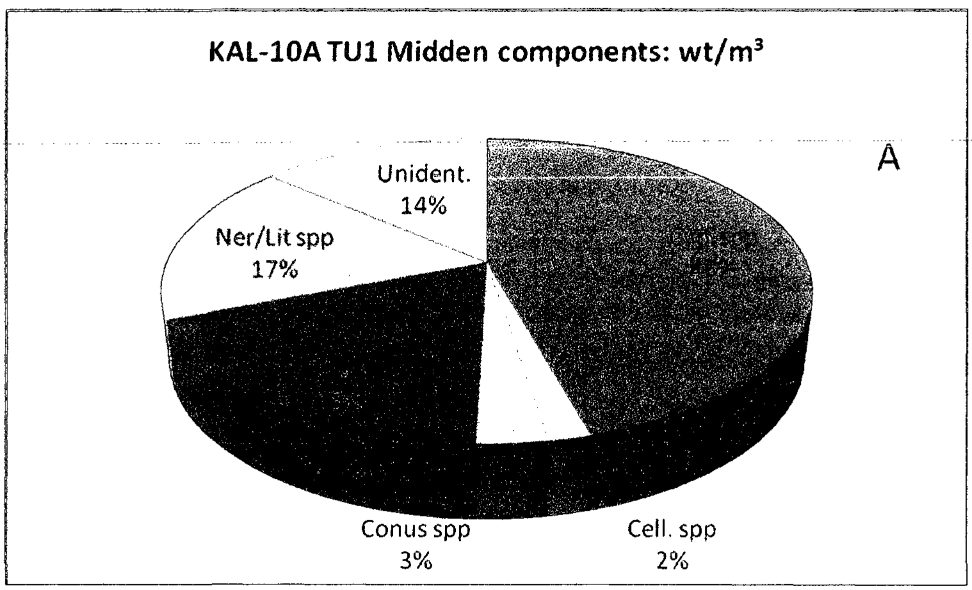

Figure 30: KAL-10A TU 1 Shell Distribution by Weight (g)

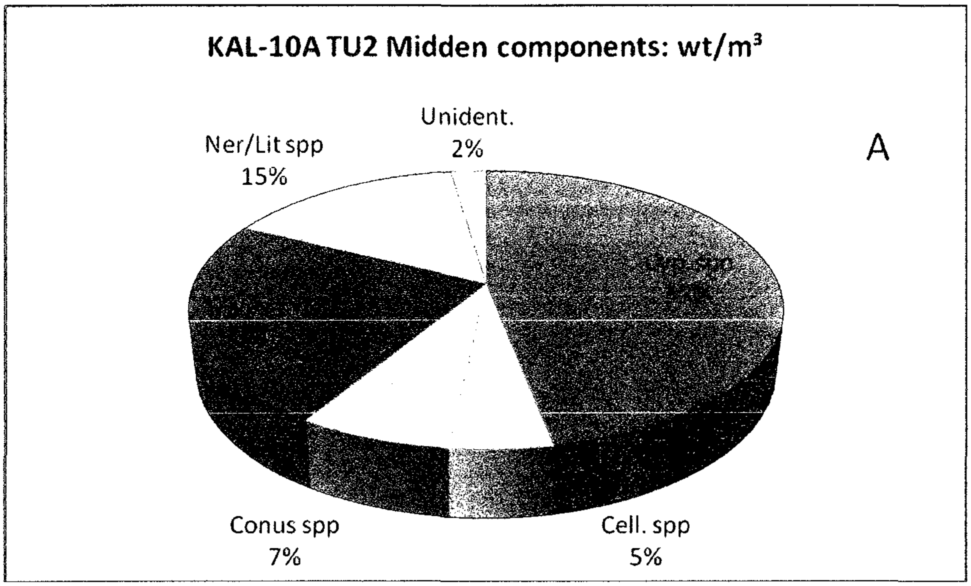

Figure 31: KAL-10A TU 2 Shell Distribution by Weight

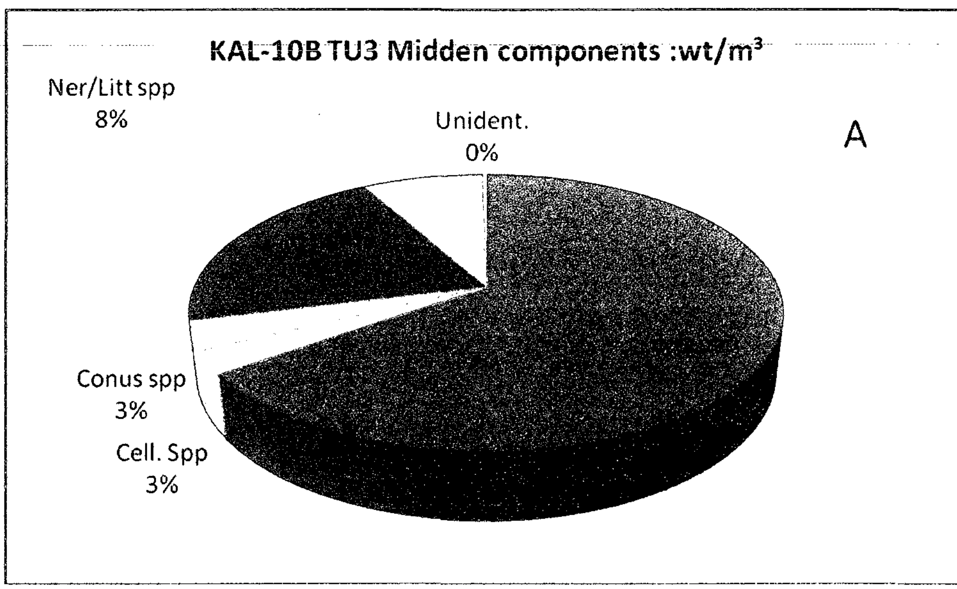

Figure 32: KAL-10B TU 3 Shell Distribution by Weight (g)

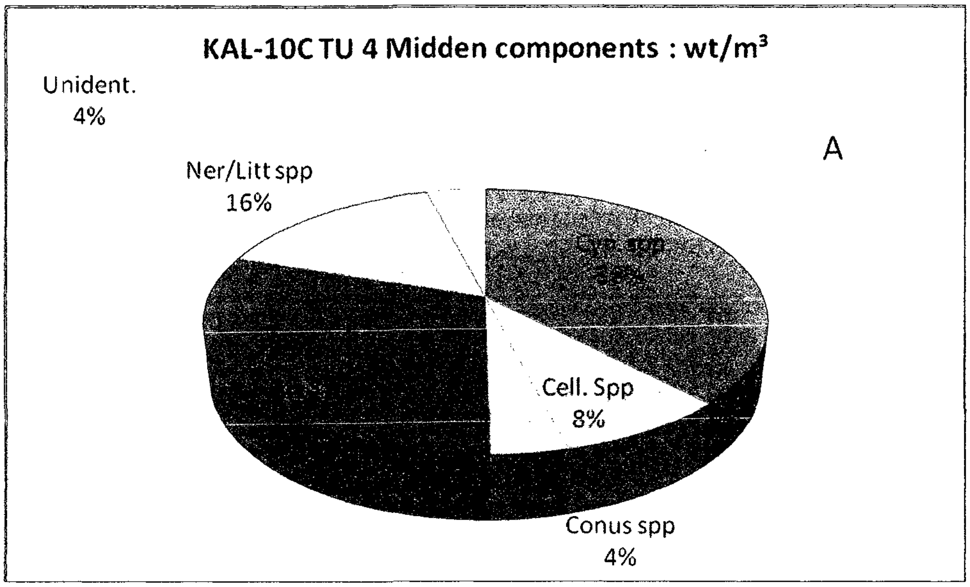

Figure 33: KAL-10C TU 4 Shell Distribution by Weight (g)

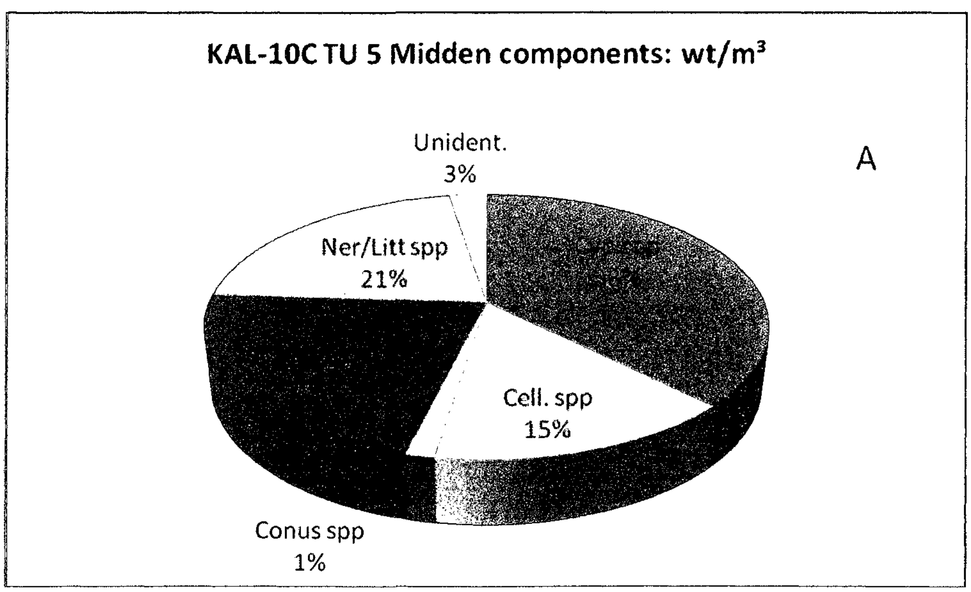

Figure 34: KAL-10C TU 5 Shell Distribution by Weight (g)

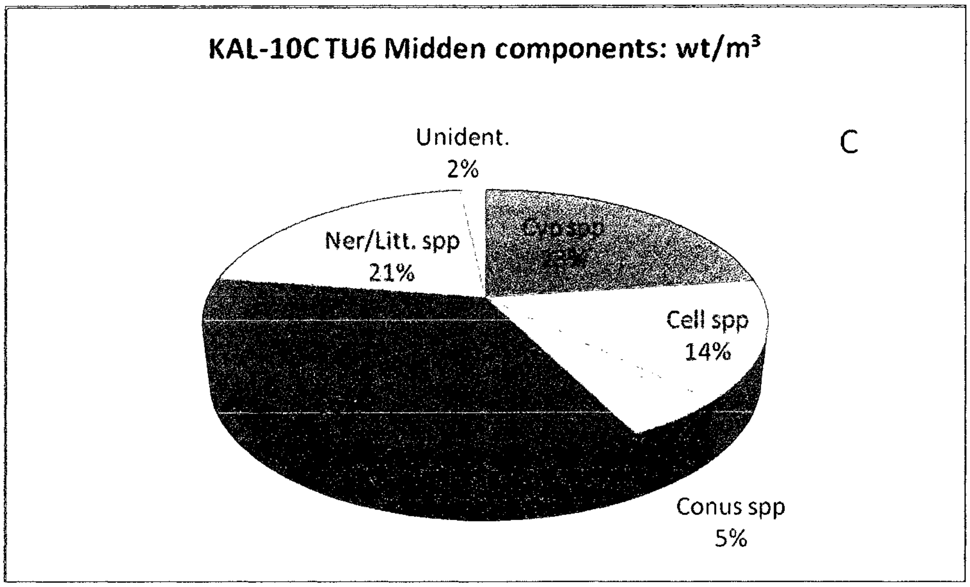

Figure 35: KAL-10C TU 6 Shell Distribution by Weight (g)

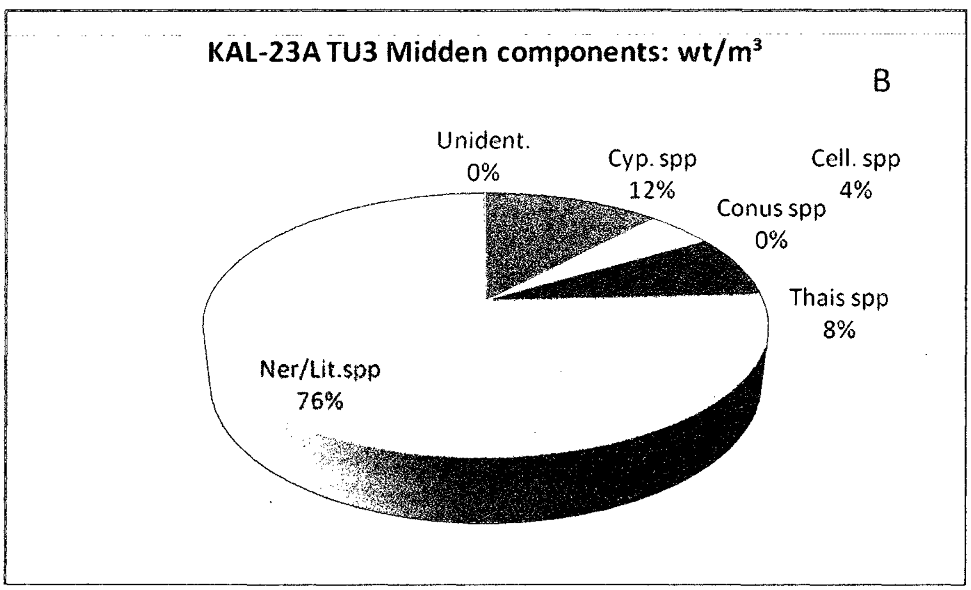

Figure 36: KAL-23A Shell Distribution by Weight (g)

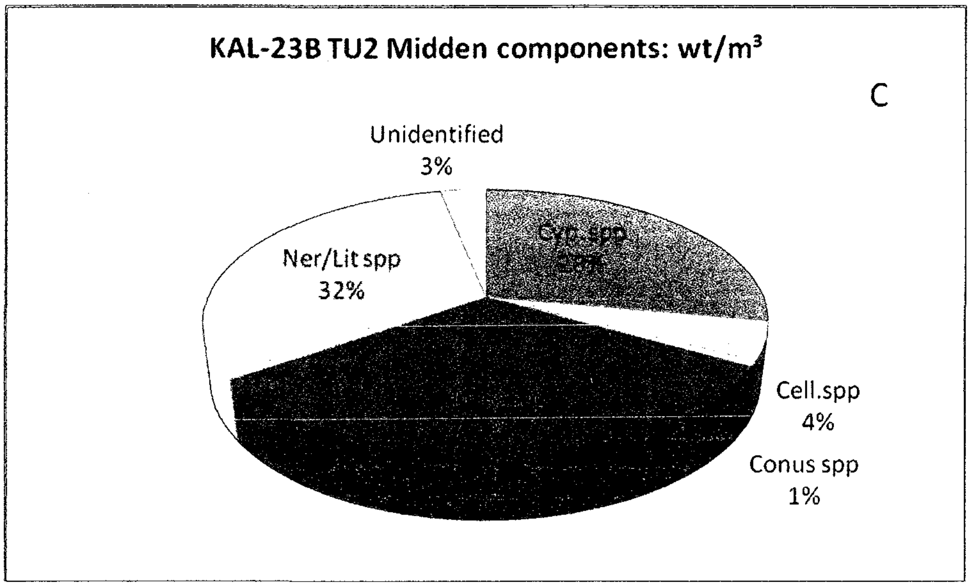

Figure 37: KAL-23B Shell Distribution by Weight (g)

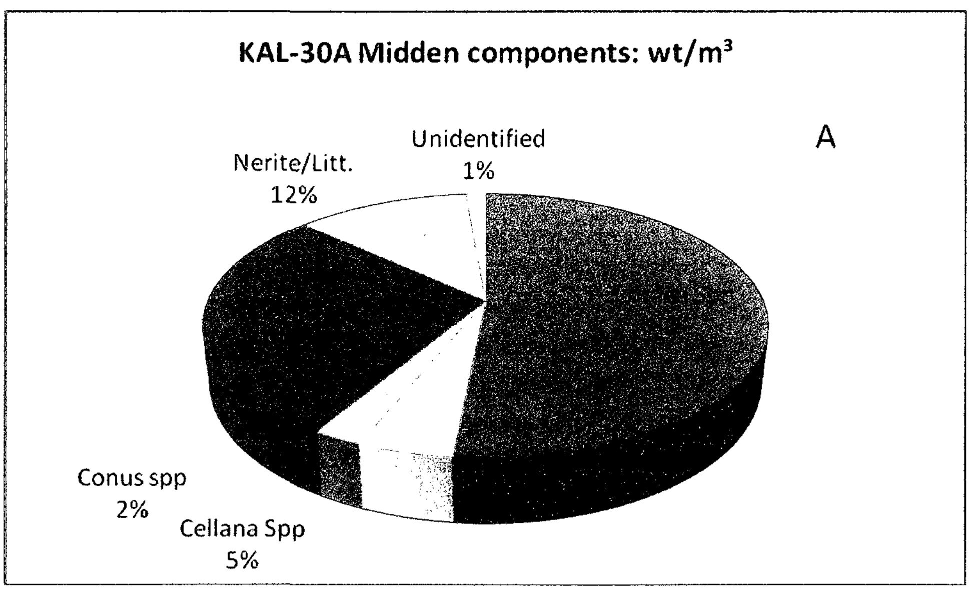

Figure 38: KAL-30A Shell Distribution by Weight (g)

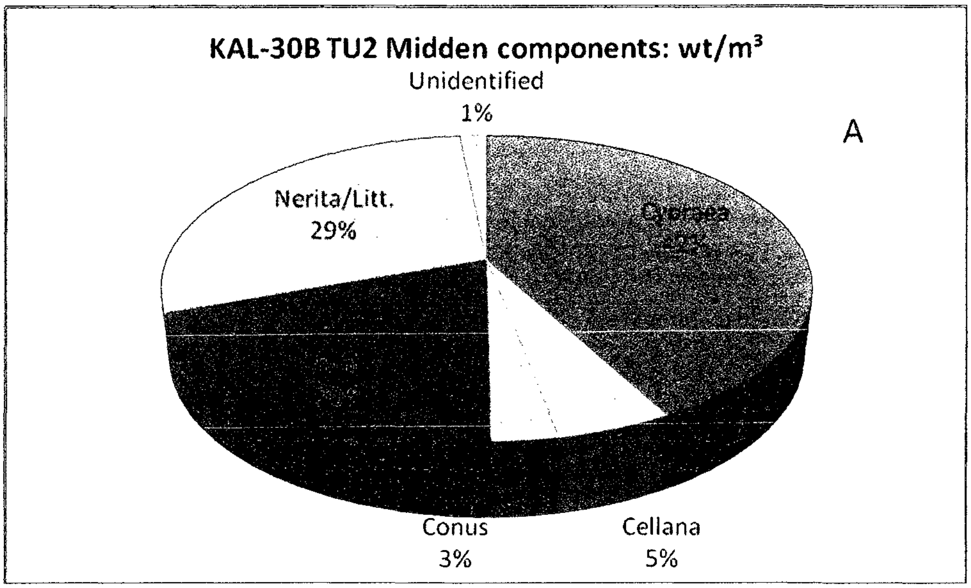

Figure 39: KAL-30B Shell Distribution by Weight (g)

Analysis of Composition Patterns. Dominant composition patterns for *Cypraea* (A), *Nerita/Littoraria* (B), and *Thaididae* (C) from each site tested were identified for all test units. Pattern A with dominant *Cypraea* spp occurred primarily in the KAL-10 complex and in KAL-30. *Cypraea* spp. identified in order of highest frequency were *C. caputserpentis* (snake head cowry), followed by *C. maculifera,* (reticulated cowry) and *C. mauritiana* (humpbacked cowry). These meaty animals are found in between the cracks and crevices of the rough basalt and lava in the seaward eulittoral zone. They are encountered in the midden both as artifacts (octopus lures) and food remains.

Pattern B with dominant *Nerite* and *Littoraria* spp. occurred in KAL-23B TU 3, comprising 76% of the total midden volume. These small rock snails appear to have been casually consumed, their tiny remnants found everywhere on the coastal landscape. The small black *Nerita picea* was the most commonly identified, followed by the periwinkle

Littoraria pintado. These animals are easily gathered from the rocks along the shore, *Littoraria* in the supralittoral zone, and *Nerita* in the wetter eulittoral zone, but occasionally clustered together feeding on algae.

Pattern C with dominant *Thaididae* spp. occurred in two site features, KAL-10C TU 6 at 35% (by weight/m³) and KAL-23A TU 3 at 32% (by weight/m³). *Thaidid* species were most frequently encountered as drupes, small to medium sized gastropods found in the near shore pools and rocks. The most common drupes identified were *Drupa rubisidaeus* followed by *D. ricina, D. morum* and *Morula granulata.* The drupe shells found in the midden were remarkable for the ubiquitous pattern of breakage, the edge of the fluted lip, the siphonal canal, the beads and nodules of the spire, and the tiny bumpy concavity of the broken body whorl. Although small, they appear to be a favored food; the condition of the broken shells in the midden indicate that it is more difficult to get at the snail's body than the more commonly found *N. picea.* Drupes are readily identifiable by brightly colored patterns on the interior and exterior of the shell, but many of the shells recovered from the midden were gray and ashy, so may have been consumed cooked.

Unexpected Results for Conus and Cellana. Although the shells of *Conus* spp. were found in abundance on the shore, their presence in the midden was less so, comprising between 0-5percent of the excavated midden shell. One possibility for their low frequency could be that they may not have been commonly used as a food source. Some of the predaceous cones deliver toxins through a toothed proboscis, and in Hawaii are called *pupu poniuniu* or "dizzy shell" (Hoover: 1999). Thus, people, and especially children may have been cautioned against collecting them. Indeed, outside of Hawaii fatalities from venomous cones have been documented from the common textile cone (Hoover 1999:134), and *C. geographicus* (Flecker 1936). Cone shells were used as ornaments in necklaces and bracelets, as scrapers and smoothers and as gourd bottle stoppers (Hiroa 1957). Those most commonly identified in the midden were *Conus ebraeus, C. distans* and in KAL-30, *C. cattus.*

Cellana spp. comprised between 2-15% of the shell excavated, and the Hawaiian limpets known as *'opihi* were found most abundantly in KAL-10C TU5. The relatively low percentage in the midden was somewhat unexpected, as *'opihi* remain a favorite in the Hawaiian sea food diet (McCoy 2008), and Jones and Kirch found *Cellana exarata* in Kahikinui to be one of the choice selections in their elite sites (Jones and Kirch 2007). We observed large shells tucked into the walls of KAL-23, and several shells were recovered with edge wear indicating use as scrapers. Live specimens of *Cellana talcosa, C. sandwicensis,* and *C. exarata* were observed on the rocks along the shoreline.

Gender Links and Taxon Distribution. When the gender linked artifact assemblages and taxon distribution were compared, correlations were found in distribution particularly in the *Cypraea* genus and the combined *Nerite/Littoraria.* Nerites, small rock snails that live at the shoreline are easily gathered, available to everyone, and ubiquitous in all sites. This genus was observed in the highest concentration by volume in a female linked site, KAL-23. *Cypraea* with a high meat weight and value as a shell tool was observed in the highest concentration by volume in KAL-10 a primarily male-linked site.

Individual size of selected taxa. Relative size of individual animals was obtained by adding the total weight of each genus identified and dividing that by the total MNI for each genus. Thus, we have a total weight of 75g of *N. picea* for a minimum count of 233 individuals from KAL-30B, calculating a median weight for that taxon of 0.32 g in that particular feature. At another feature, KAL-10A 2, the total weight for *N. picea* is 84.4g with a count of 386 individuals, the median weight is 0.21g, which roughly indicates a smaller sized animal consumed at that particular site. Although each genus has a variable size range for individual species, (ex. *C. mauritiana* and *C. caputserpentis*), this method is useful for simple comparisons across sites.

Table 9: Cross-site Comparison of Median Weight

TEST UNIT	KAL 10A 2	KAL 10A2	KAL 10B3	KAL 10C4	KAL 10C5	KAL 10C6	KAL 23A1	KAL 23A2	KAL 23B2	KAL 30A	KAL 30B
GENUS											
Cypraea	12.85	3.81	8.4	4.73	2.6	7.52	2.66	4.87	3.22	3.46	4.7
Cellana	1.5	1.53	0.96	1.5	2.07	2.45	1.53	1.44	0.55	0.93	0.9
Conus	3	5.87	1.98	1.2	0.46	3.77	1.66	0.1	2.7	0.84	1.95
Thais	3.49	1.55	1.44	1.65	1.19	3.07	0.93	1.37	1.49	0.92	0.93
Nerite/Lit.	0.71	0.22	0.15	0.23	0.12	0.34	0.22	0.34	0.2	0.25	0.31

The charts that follow show relative size of genera in a cross-site comparison.

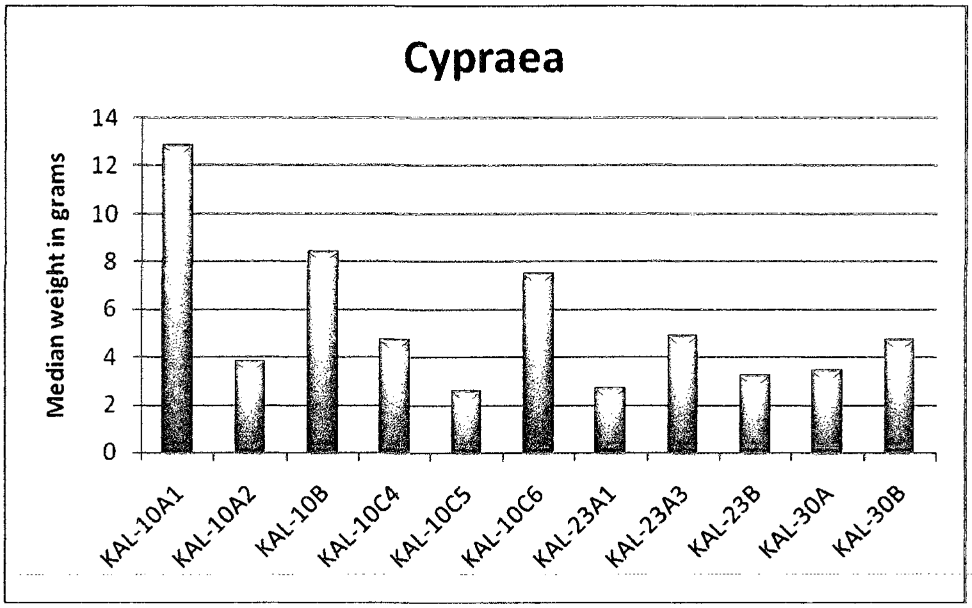

Figure 40: Median Weight (g) for All *Cypraea* spp. in All Test Units

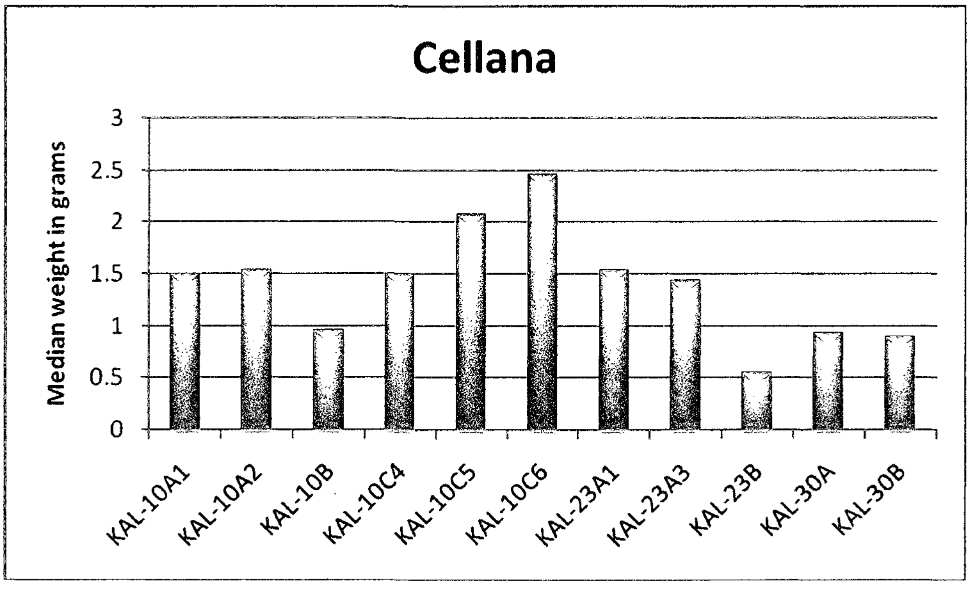

Figure 41: Median Weight (g) for *Cellana* spp. in All Test Units

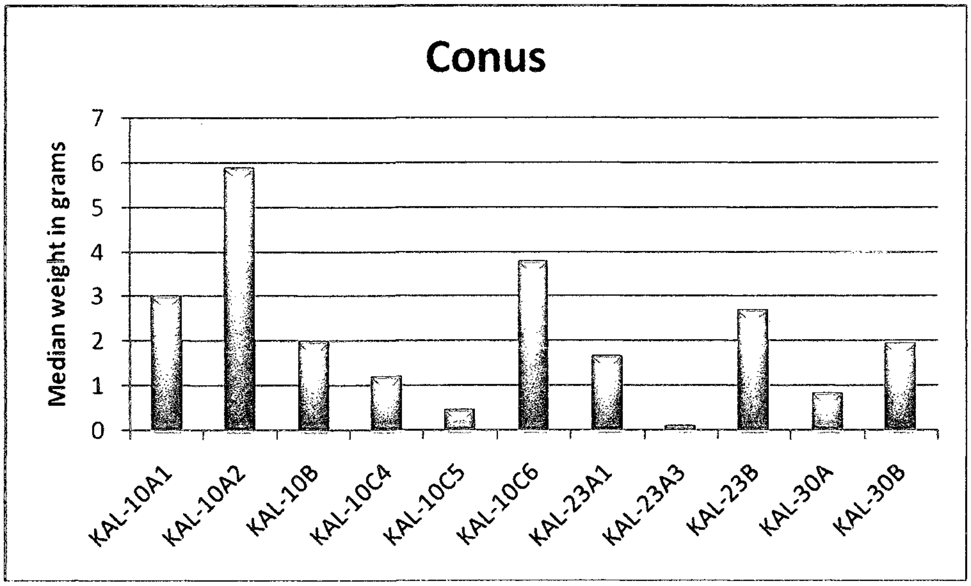

Figure 42: Median Weight (g) for *Conus* spp. in All Test Units

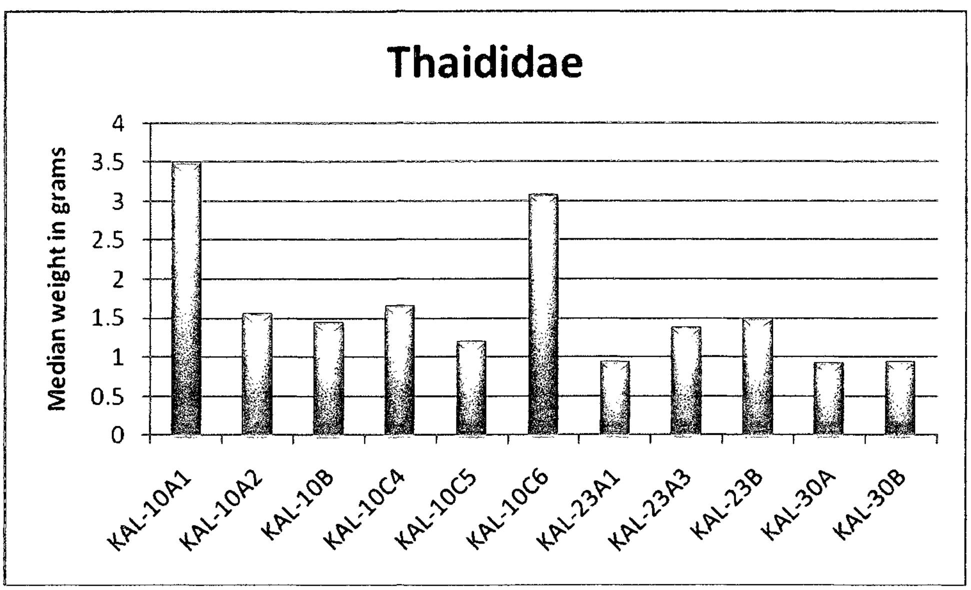

Figure 43: Median Weight for *Thaididae* spp. in All Test Units

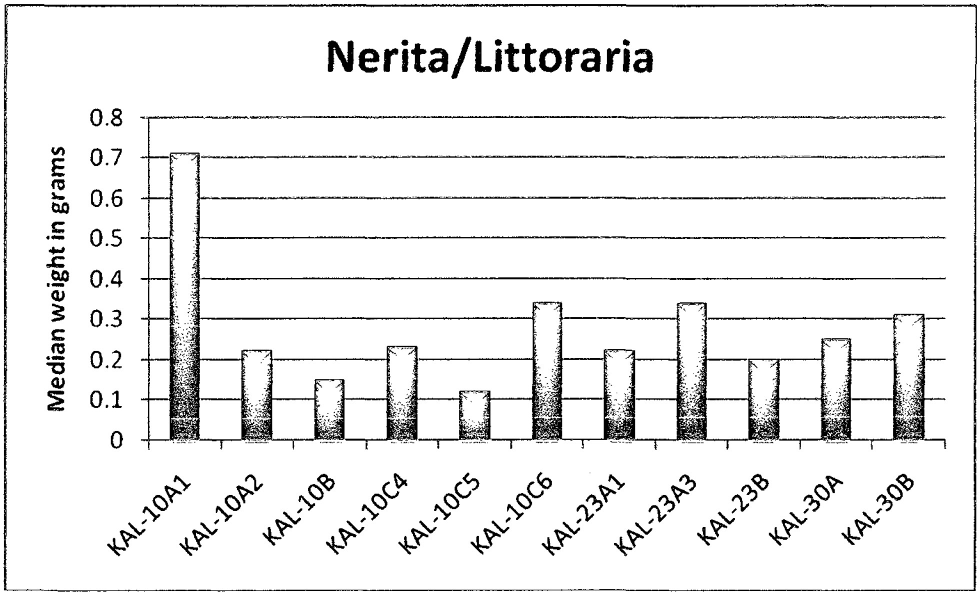

Figure 44: Median Weight (g) for *Nerita/Littoraria* spp. in All Test Units

Table 10 shows a comparison of the largest and the smallest median weight for each genus in all test units.

Table 10: Largest and Smallest Median Weight of Genus in All Test Units

GENUS	LARGEST MEDIAN WEIGHT	SMALLEST MEDIAN WEIGHT
Cypraea	KAL-10A1	KAL-10C5
Cellana	KAL-10C6	KAL-23B2
Conus	KAL-10A2	KAL-23A3
Thais	KAL-10A1	KAL-30A
Ner/Litt	KAL-10A1	KAL-10C5

Largest Sized Individuals. KAL-10A TU1 contained the highest proportion of larger individuals, with three out of five genera, *Cypraea, Thaididae* and *Nerite/Littoraria.* The largest cowries, *C. mauritiana,* which can grow to a size of about 5 ½ inches (14 cm) and *C. maculifera* to about 2 ½ inches (6.35 cm) (Hoover 1999), were used both as food source and as tools. When used as tools, they remained either whole for use as a burnishing or polishing tool, presumably after the meat was removed, or pierced on the posterior dorsal surface of the body for the line used to attach it to a stone sinker, hook and line and used as an octopus lure (Kamakau S. 1976). These modified cowries were collected as artifacts and not configured in this study, however the remains of broken tools may have been discarded along with food remains, so until a more careful study of breakage patterns and shell modification techniques for *Cypraea* is undertaken, differentiating between broken shell tools and food refuse remains questionable.

The largest *Thaididae* found in KAL-10A TU1 were identified as *D. ricina* and *D. rubusidaeus*. *D. ricina* has a thicker, heavier shell and can grow to about 1 1/4 inch (31 mm), and *D rubusidaeus* has a lighter shell, but grows to about 2 ½ inches (63.5 mm) (Hoover 1999). Of the largest *Nerites* and *Littoraria* identified in KAL-10A TU1, the primary taxon was *Nerita Picea.* These are the common black rock snails found on the basalt boulders and rocks at the shoreline, and can grow to ½ inch, (13 mm).

This concentration of large sized individuals in KAL-10A TU1 can be attributed to selection of the largest and best by status, associated with the architectural complexity and size of the feature, and to gender occupation, with an above average index of male-linked artifacts found at this site complex.

Smallest Sized Individuals. KAL-10C TU5 contained the highest proportion of smaller individual specimens with two of five of the genera represented, the smallest *Cypraea spp.* and *Nerita/Littoraria spp.* This test unit also had the lowest midden concentration index with a total shell weight of only 163.2 grams, less than the minimum sample size of 200 grams. The site scored above average in the male-linked artifact index.

Factors Affecting Size of Individual Specimens. Some of the factors that may affect the size of individual specimens include differences in acquisition such as seasonal gathering periods in which some species may not have reached full maturity after spawning, restriction from or access to favorable gathering areas, inexperienced or less selective gatherers, or extended periods of time between the occupation of a site where mollusks are gathered (Classen 1998; Thomas 1999). In addition to size difference factors in acquisition, size differences in distribution of the mollusks include status of the individual receiving a portion of the catch, reciprocal arrangements between households, offerings for rituals, or the occupation of the recipient requiring the large shells for tool use, such as shell adzes, scrapers, kapa burnishing tools or cowry shell lures (Kirch 1985).

Summary of Relationships. To summarize the relationship between shell density, dominant genus patterns, median size of individual shells, gender indices and status, we must have calculable values for each of those factors, quantifiable in the case of marine shell, and qualified by archaeological and cultural attributes of status and gender. In the following summary table, shell concentration density is measured as total shell weight in grams divided by the total volume excavated (g/m^3) ranging between 0 and 11,000 g. Values of 0-3,000 g. would be categorized as low; 3-6,000 g. would be medium and 6-11,000 g. high. The dominant genera is the family of shell with the highest representation in the midden composition; *Cypraea* (Pattern A), *Nerita/Littoraria* (Pattern B) and *Thaididae* (Pattern C). Median size of individual specimens refers to the relative size of shells from the three dominant genus patterns for each site. The median size for *Cypraea* ranged from the smallest (2.5 g) to the largest (13 g) with 0-4.3 g small, 4.3-8.6 g medium and 8.6 and above, large. *Nerita/Littoraria* (Pattern B) median size ranged from 0.1 g to 0.7 g, with 0-2.6g as small, 2.6-5.2g medium and 5.2g and above, large. *Thaididae* (Pattern C) sizes ranged from 1g to 3.5g with 0-1.16g small, 1.16g to 2.32g medium and 2.32g-3.48 large.

The gender index is based on the presence/absence of male linked artifacts in a site on a scale from no artifacts (0) to the highest number of male linked artifacts (5). 0-1.6 artifacts indicate non-male (female) activities, 1.6-3.2 indicates gender neutral activities and 3.2-5 indicates a male activity space.

Status is more difficult to quantify, but we can qualify status presence with architectural attributes, location on the landscape, and the artifact assemblages. The

KAL-10 complex is a higher status habitation based on its relative size, the number of related structures, its elevated placement and the number and quality of artifacts. The KAL-23 complex consists of only two structures, is smaller in size and occupies a lower elevation, has a less extensive artifact assemblage and can be categorized as a lower status household. The KAL-30 complex consists of two related structures, one of which (KAL-30B) is architecturally more complex than the other and whose artifact assemblage indicates a possible ritual space. These relationships are explored in the next chapter.

Table 11: Summary Table of Relationships

SITE	SHELL DENSITY	DOMINANT GENERA	MEDIAN SIZE	GENDER INDEX	STATUS
KAL-10A 1	High	*Cypraea*	Large	Neutral	Higher
KAL-10A 2	High	*Cypraea*	Small	Neutral	Higher
KAL-10B 3	High	*Cypraea*	Medium	Male	Higher
KAL-10C 4	Low	*Cypraea*	Small	Neutral	Higher
KAL-10C 5	Low	*Cypraea*	Small	Neutral	Higher
KAL-10C 6	High	*Thaididae*	Large	Neutral	Higher
KAL-23A	Medium	*Thaididae*	Small	Female	Lower
KAL-23B	Low	*Nerita/Littoraria*	Small	Female	Lower
KAL-30 A	High	*Cypraea*	Small	Male	Higher
KAL-30 B	High	*Cypraea*	Small	Male	Higher

Chapter 5: Discussion

Status and gender were crucial factors in the production and consumption of goods, as well as the division of labor and service in the structure and maintenance of the political economy of pre-contact Hawaii (Linnekin 1990; Sahlins 1958; Malo 1987; Kamakau 1976; Kirch and Jones O'Day 2003). A discussion of the archaeology of the three households analyzed in this study show us how gender and status can be deduced from the surviving cultural materials and food remains found within them.

First, the artifact assemblages and their associations with coastal marine resources will be examined for their relationship to gender. Second, distinctions of status will be considered from the implications of shell concentration indices, size, and the architectural contexts in which they were found. Third, the role of marine resources and their contribution to the stability of the domestic and the political economy will be considered.

Part 1: Gender

Where previously the ethnohistoric records of the 18th century voyaging Europeans (Cook and King 1784; Samwell 1967), the Christian missionaries in the early 19th century (; Andrews 2003; Beyer 2003; Ellis 2004; Grimshaw 1989) and the Hawaiian scholars later in the 19th century (I'i 1959; Kamakau 1964; Malo 1951) presented us with portrayals of Hawaiian women as hypersexual, immoral and indolent, the archaeology of the household midden tells a different tale. Women contributed significantly to the domestic economy of each of the households analyzed in this study. The work of gathering, carrying and distributing shell fish and echinoidea was evident in all sites.

The densest concentrations of shell were found in Pattern A sites, which also contained the highest male-linked artifact assemblages (KAL-30), and the largest and most architecturally complex habitation site (KAL-10). The northern component of KAL-30 (KAL-30A) contained two side by side hearth features within the house floor, and may have functioned as a cooking structure. Within the traditional *kauhale* model, men would be responsible for the major cooking tasks, baking large fish, taro and sweet potatoes, so the density of the shell concentration in association with a male linked cooking activity would further confirm this as a male-linked site.

The southern structure (KAL-30B) appeared to have some characteristics of a shrine, with components of branch coral, a fragment of a coin, and the remains of animals that appear to have been deposited whole. As the main collectors of mollusks, women would be expected to consume more shell fish, and therefore a strong correlation would exist between shell density and women's activity sites. This is clearly not the case in KAL-30, and alternative explanations should be considered.

One explanation is that commoner men were consuming large amounts of shellfish while higher value catches went in increased quantities to the chiefs. A redistribution of resources could have been caused by political actions such as war or raids. Only one historic artifact was recovered from this site, a fragment of an 18th century coin minted in Brazil as a "trading coin", making the object possibly contemporaneous with the 18th

century wars between the chiefs of Maui and Hawai'i. This particular time period placed great demand on the food resources required to maintain and feed the warring armies.

At KAL-23, a site with a female linked artifact index, we find *Nerita/ Littoraria*, (Pattern B) and a different artifact assemblage. This site contained a high concentration of historic artifacts, including early contact period ceramic trade beads and a fish hook fashioned from a bent piece of metal. As noted earlier, women engaged in active trading or received gifts for sexual favors. One interpretation is that the beads and ceramic may have been gifted or bartered for. Midden at this site contained the greatest volume of *Nerita/Littoraria* spp. Occurring in the supralittoral zone on rocks, outcrops and shallow tide pools, these shellfish could easily have been gathered by younger children. The architecture of KAL-23B indicated that it was constructed contemporaneously with KAL-23A, was closely adjacent to (1 m) and although distinctly separate, the two structures were clearly related. This fits with a description of a traditional gender segregated residence, where women, girls and very young boys would eat in one house, the *hale aina*, and the men and older boys in the *hale mua* (Kirch 1985: 251). If young children were gathering at the shore with their mothers, they would eat what they gathered with their mothers at the *hale aina*, and the small rock snails easily gathered along the shallow reaches of the shoreline were probably a favorite prey.

Part 2: Status

Status of Hawaiian households has been qualified by archaeologists using several factors. Kirch lists the following in "Feathered Gods and Fishhooks",

> (1) the number of structures in a complex; (2) the presence/absence of formal temples; (3) the presence/absence of burial platforms; (4) relative frequency of pig and dog bone (as status foods); (5) density and range of formal artifacts; (6) the presence/absence of non-local stone tools and flakes; (7) the relative density of midden remains; and (8) the topographic setting and proximity to critical resources (Kirch 1985: 254).

This research suggests that there are status differences associated with not only the density of the midden (7), but also the in the patterns of species distribution. Larger, meatier species like *Cypraea* and *Cellana* were found in higher status households (Pattern A), and smaller, easier to catch species like *Nerita/Littoraria*, (Pattern B) and *Thaididae* (Pattern C) were found in a lower status households.

By these measures, KAL-10 was likely occupied by a higher status family. The site is architecturally more complex and consisted of several related structures appropriate to the *kauhale* model, with its occupants enjoying a better view of the ocean for spotting schools of fish, and tracking the canoes engaged in fishing. The site's midden was dominated by *Cypraea*, (Pattern A) and one of the features contained the largest percentage of *Cellana.* Differences in status among the occupants of the sites studied were indicated by thick concentrations of large *Cypraea* and *Cellana*, the result of a selective process for the larger portions and tastier meat of these mollusks distributed to the individuals with higher status. The KAL-30 complex also followed Pattern A, but the relative size of the *Cypraea* was much less that those found in KAL-10.

The two Pattern C sites, KAL-10C 6 and KAL-23-A3, contained 35% and 32% *Thaididae* spp. (drupes) respectively. KAL-10 contained larger specimens of the drupes than those found in KAL-23. Drupes were found in all sites and ranged between 8-35%, with most sites containing about 20%, but the largest specimens and the highest midden composition percentage of drupes were found in the higher status site.

Less architecturally complex and occupying a lower elevation on the ridgeline, KAL-23 B TU 2 had a Pattern B midden composition dominated by the small rock snails. These animals provided adequate nutrition when eaten in enough quantity, but required more labor to gather enough to eat, an activity lower status individuals without the choice of the better shell fish gathering areas would be more willing to perform.

Thus, we found (1) Pattern A with larger, choicer and denser concentrations of mollusks in the higher status complex, (2) Pattern B with smaller, easy to gather mollusks in lesser concentrations in the lower status site. These two patterns of distribution demonstrate an association between mollusk remains and the status of the individuals consuming them.

With mollusks, as well as most other fauna individual size differences in animals of the same taxon can be attributed to several factors, the frequency of harvesting, collection locales, greater and lesser spawning episodes and the selectivity of the gatherer. With so many possible explanations for size distribution across sites, precautions must be taken in assigning one factor over another to account for these differences.

Part 3: Political Economy

The ethnohistoric record of the activities and contributions of common women to the political economy of pre-contact Hawaiian society provides us with a deficient representation of women. The skills, tools and products of women's valuable contributions have only been preserved in museums, outside the archaeological context of provenience. In some cases, women's activities have been reinterpreted as the work of men (Linnekin 1990).

This study evaluated associations between the common woman's skill as a fisher and gatherer of marine resources, and the patterns of resource distribution across status and gender. The density of the shell concentration, the variable patterns in midden composition and the comparative size of individuals described differences in consumption patterns; selection of choicer animals for higher status individuals and occupants of male-linked activity sites, and smaller, less choice animals for lower status individuals and female-linked activity sites.

Marine shell was ubiquitous across sites, and provided the bulk of protein consumed by the population studied (Kirch 1979) and was the direct result of the *maka'ainana* woman's labor (Jensen 2005; Pukui 1986). An artifact (a Portuguese trade coin) dating from a period of fierce challenges between warring chiefs with massive armies and regular coastal raiding (Westervelt 1923; Kamakau 1961; Cordy 2000) was associated with dense shell concentrations. Shell concentrations would increase when an increased reliance on shellfish in a coastal fishing habitation site occurred when other food sources were diverted to support political activities.

Within the larger political structure, women were able to provide food for the subsistence of the households along the coast. In addition, they gathered easily transportable gifts when visiting other members of their *ohana*, perhaps returning to the household with a supply of the raw materials for cordage or nets, a few sweet potatoes or corms of taro. At times when the men returned from fishing with a poor catch, were conscripted for wars, contributed their labor to building projects for their chief (Kolb 1994), or were otherwise engaged in activities restricted from women's participation, the women gathered shell fish, sea vegetables and tasty sea urchins as a basis for domestic subsistence, supporting the men's activities in the political realm.

By distributing the choice shellfish in generous portions to individuals with high status, women built favorable relationships with those who could provide support, seen in the denser concentrations of shell in higher status households. Gathering favored foods and heaping them up in front of small fishing shrines and domestic altars as found in the offertory in KAL-30 B, propitiated gods and goddesses and increased protection and power for the household. Women were able to free the men to perform the ritual and political duties required of the larger political economy, thus maintaining their right to remain in their households.

Chapter 6: Conclusion

Women's contribution to domestic, political and ritual components of Hawaiian society can be found in the archaeological record of female linked activities. Marine invertebrate remains on the cultural landscape provide us with a clearer picture of the presence and practices of women as they interacted with the natural environment and the complex cultural sphere of Hawaiian society. Three factors were determined to discern patterns in the female linked activity of collecting shellfish and distributing the food source to various households; density of distribution, variability of taxa in the midden deposit and relative size of specimens from five molluscan genera. These three factors are linked to the architecture of the structures inferring status or lack of status, the artifact assemblage linking the shell with male or female activities and occupations, and the time periods in which the shell was deposited through associations with historic artifacts and radiocarbon dates.

Differences in the composition of the shell assemblage were examined here as a result of taxon selection and distribution according to status and gender. Higher status and male linked activity sites contained higher proportions of choice, large shellfish. Relative density of shell deposited during possible times of military conquest and political re-organization indicate a relationship between resource distribution and political actions, which we see specifically in increased shell density indicating higher consumption of shellfish and diversion of catches of larger fish to support these actions. Lastly, although selection and distribution by size of individual animals was demonstrable in higher status male linked sites, that factor requires corroboration in a larger sample size, and a study that includes other metric data such as aperture and length in whole specimens for size ranges of individual taxa recovered in the shell sample in addition to shell weight.

In all, associations between the female occupation of shellfish gathering, consumption and distribution can archaeologically link pre-contact *maka'ainana* women with their domains of agency, and their important roles in the complex social structure of their homes, their economic production, and their religious observations.

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APPENDICES

APPENDIX A

Tables of excavated materials for KAL-10, KAL-23 and KAL-30

KAL-10

Table 12: KAL-10A1

SURFACE	LEVEL 1	LEVEL2	LEVEL3	LEVEL4
Shell, Urchin	Shell	Charcoal	Historic metal	Shell, Urchin
Urchin	Urchin	Bone	Charcoal	Bone
	Charcoal	Shell, Urchin	Bone	Charcoal
	Volcanic glass	Volcanic glass	Shell, Urchin	Rock crystal
	Bone	Lithic material	Volcanic glass	Lithic material
	1/16th bulk sample	1/16th bulk sample	Lithic material	Volcanic glass
			Coral file	1/16th bulk sample
			Cut bone	
			1/16th bulk sample	

Table 13: KAL-10A 2

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3
Shell	1/16th Bulk sample	Charcoal	Shell
	Shell, Urchin	Lithic material	Volcanic Glass
	Rock Crystal	Bone fishhook portion	Charcoal
	Bone	Shell, Urchin	Bone
	Bone Fishhook	Bone	
	Charcoal	1/16th sample	
	Shell		
	Volcanic Glass		

Table 14: KAL-10B 3

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3
Shell	Cut bone	Shell	Bone
Charcoal	Charcoal	1/8th bulk sample	Shell
	Bone	1/16th bulk sample	Charcoal
	Shell	Charcoal	Coral file
	Coral Abrader	Bone	Urchin spine file
	Lithic materials	Urchin spine file	Lithic material (2)
	Bone fishhook portion	Pearl shell (possibly modified)	Cut bone
	Urchin spine file	Cut bone	1/16th bulk sample
	1/16th bulk sample	Lithic material	
		Pearl shell fishhook	
		Adze fragment	

Table 15: KAL-10C 4

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Basalt Awl	Charcoal	Shell, Urchin	Shell, Urchin	Bone
Charcoal	Shell, Urchin	Bone	Charcoal	Charcoal
Shell, Urchin	Bone	Charcoal	Bone	Shell, Urchin
Bone				

Table 16: KAL-10C 5

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Shell	Shell	Bone	Shell	Shell	Charcoal
	Bone	1/16th bulk sample	Charcoal	Charcoal	Shell, Urchin
	Charcoal	Shell	Bone	Bone	Bone
	Lithic material	Lithic material	Pigment	1/16th Bulk sample	
	Ocherous pigment	Charcoal	1/16th Bulk sample		
	1/16th bulk sample	Shell bead			
		Coral abrader			
		Urchin spine file			
		Ocherous pigment			
		Volcanic glass			

Table 17: KAL-10C 6

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3
Shell	Urchin spine file	Pearl Shell	Lithic material
	Modified sea urchin mouth parts	Bone	Shell, Urchin
	Shell, Urchin	Modified sea urchin mouth parts	Shell, Urchin
	Charcoal	Charcoal	Modified sea urchin mouth parts
	Lithic material	Shell	Cut bone
	Coral file	Lithic material	Charcoal
	Bone	1/16th Bulk sample	1/16th Bulk sample
	Pearl Shell		
	1/16th Bulk sample		

Table 18: KAL-23A 1

SURFACE	LEVEL 1	LEVEL 2
Historic Ceramic	Historic Ceramic	Shell
Shell	Charcoal	Kukui Shell
	Shell	Bone
	Bone	Charcoal
	Kukui shell	Bulk sample
	Bulk sample	Lithics
		Shell scraper

Table 19: KAL-23B 2

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7
Shell	Shell urchin	Charcoal	Charcoal	Shell, urchin	Charcoal	Charcoal	Shell, urchin
Soil sample	Bone	Shell, urchin	Bone	Charcoal	Bone	Bone	Charcoal
	Lithic	Bone	Shell, urchin	Bone	Shell, urchin	Shell, urchin	Bone
	Kukui shell	Lithic	Lithic	Lithic	Lithic	Lithic	Bulk sample
		Kukui shell	Kukui shell	Ceramic bead frag.	Hist. metal	Ceramic bead frag.	Soil sample
		Historic metal	Historic metal	Bulk sample	Kukui shell	Rock crystal	
		Bulk sample	Historic glass		Bulk sample	Bulk sample	
			Bulk sample				

Table 20: KAL-23A TU 3

LEVEL 1	LEVEL 2	LEVEL 3
Historic metal fish hook	Bone	Shell
Shell, urchin	Shell	Bone
Bone	Charcoal	Ceramic trade bead
Ceramic trade bead	Ceramic trade bead	Volcanic glass
Lithics	Historic metal	Charcoal
Volcanic glass	Volcanic glass	Lithics
Historic metal	Lithics	Bulk sample
Charcoal	Bulk sample	
Bulk sample		

Table 21: KAL-30 A TU 1A

SURFACE	LEVEL 1	LEVEL 2	LEVEL 3	FEATURE 1	LEVEL 4	LEVEL 5
None	Volcanic glass	Charcoal	Volcanic glass	Charcoal	Charcoal	Charcoal
	Lithic material	Volcanic glass	Lithic material	Volcanic glass	Pearl shell	Cut shell
	Pearl shell	Lithic material	Charcoal	Shell and sea urchin	Volcanic glass	Cut bone
	Quartz	Pumice file	Pearl shell	Adze fragment	Shell scraper	Volcanic glass
	Sea-urchin spine file	Coral abrader	Quartz	Pearl shell	Quartz	Pearl shell
		Adze fragment	Cut-pearl shell		Sea-urchin spine file	Lithic material
		Pearl shell	Shell scraper		Sea-urchin spine file	*Kukui*nut shell
		Cut bone	Sea-urchin spine file		Cut bone	Bonefish hook fragment
		Strombus bead	Sea-urchin spine file		Shell scraper	Quartz
		Cut pearl shell	Sea-urchin spine file			Sea-urchin spine file
			Coral abrader			Sea-urchin spine file
						Coral file

Table 22: KAL-30A TU 1B

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL5	LEVEL 6
Sea Urchin spine file		Charcoal		Charcoal	Charcoal
Volcanic glass		Volcanic glass		Volcanic glass	Volcanic glass
Coral abrader		Lithic material		Sea Urchin spine file	Lithic material
Cut bone		Cut bone		Modified cone shell	
Sea Urchin spine file		Pearl shell		Modified shell	
Hammer stone					
Sea Urchin spine file					

Table 23: KAL-30 B

SURFACE	LEVEL 1	LEVEL2	LEVEL3	LEVEL4	LEVEL5
Fish tooth	Coral abrader fragments	Pearl shell	Pearl shell	Charcoal	Charcoal
	Kukui nut shell	Pearl shell	"Brasil" coin	Coral abrader	Pearl shell
	Urchin spine file	Charcoal	Volcanic glass	Fish bone	Volcanic glass
	Rock crystal	Pig tooth	Lithic material	Lithics	Pig tooth
	Basalt flakes	Pearl shell	Charcoal	Volcanic glass	Pearl shell
	Carved bone	Lithic material	Carved sea urchin spine	Urchin spine file	Basalt Flakes
	Urchin spine file	Volc.glass	Fish maxilla	Pig tooth	
	Pearl shell	Cut shell	Pearl shell	Ground stone	
	Urchin spine file	Urchin spine file	Pig tooth frag.		
	Urchin spine file	Cut pearl shell	Cut bone		
		Bone			
		Pearl shank			
		Cut bone			
		Shell scraper			
		Cut shell			

Table 24: AMS Radiocarbon Dates From KAL-10B (Field 2008)

Lab No.	Location	Material	Measured Radiocarbon Age	$^{13}C/^{12}C$ Ratio	Conventional Radiocarbon Age	Calibrated Age Range BP (2 σ probabilities)*
Beta-243702	KAL-10B TU 3	Pukuiawe wood	141.4 ± 0.5 pMC	-21.2	140.3 ± .5 Pmc	Post 0 BP (within the last 50 years)

*Calibrations performed with OxCal 4.0 (Bronk Ramsey 1995, 2001) using the atmospheric data from Reimer et al. (2004).

APPENDIX B Tables of Shellfish and Echinoderm Quantities for Each Test Unit

Table 25: KAL-10A TU 1 Shellfish

KAL-10A TU1 Shellfish	Level 1			Level 2			Level 3			Level 4		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	1	1	1	129		21	48.3	4	9	4	5	67
Cypraea maculifera	6.1	1	1	19.7		2				0.1	1	1
Cypraea other	1.5	1	1				20.4	2	4	1.3	3	2
Cellana exarata				0.3		2	0.3	1	1	0.2	1	4
Cellana sandwicensis				3.4		2	0.3	1	1	0.4	1	4
Cellana other				3.7		4	0.3	1	1	0.1	1	2
Conus ebraeus				1.4		1						
Conus distans				0.4		1	2.8	1	2			
Conus pennaceus										1	1	2
Conus chaldeus				4		4						
Conus other				2.8		3	2.2	1	2	0.4	2	2
Drupa ricina	1	1	1	14.6		12	11.8	3	8	9.7	4	14
Drupa rubusidaeus										15.2	15	46
Thaidid other	7.3	1	1	9.6		19	25.2	3	13	0	0	0
Trochus							1	1	3			
Littorina pintado				0.5		5	0.5	6	6	0.2	3	3
Neothais harpa				0.9		1	1	1	2	0.1	1	1
Nerita picea	1.4	7	7	45.2		197	18.9	60	85	13.2	43	107
Nerita polita				1.3		1						
Nerite other							4.2	1	12			
Strombus							1.2	1	1			
Tugali oblonga										0.1	1	1
P. granocostatus										0.3	1	1
Unidentified				60			7.5	3	4	1.7	8	37
Total Shellfish	18.3	12	12	296.8	0	275	145.9	90	154	48	91	294

Table 26: KAL-10A TU1 Echinoderm

KAL-10A TU 1 Echinoderm	Surface			Level 1			Level 2			Level 3		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus							1.7	1	1		1	1
Hetercentrotus mamillatus					1	1	0.1	1	1			
Echinometra mathaei					1	1	0.1	1	1		1	2
Echinothrix diadema					1	1	9	1	1			
Tripneustes gratilla					1	1	2.2	1	1			
Unidentified Echinoderm				5.8			1.2			11.9		
Total Echinoderm	0			5.8	4	4	14.3	5	5	11.9	2	3

Table 27: KAL-10A TU2 Shellfish

Shellfish KAL10-2	Weight	MNI	NISP	Weight	MNI	NISP	Weight	MNI	NISP	Weight	MNI	NISP
Cypraea caputserpentis	42.9	14	39	145.8	40	250	31.9	9	56	4.3	1	9
Cypraea maculifera				40.1	3	13						
Cypraea other	5.5	3	3				4.1	2	4			
Cellana exarata	1	2	2				6.3	2	2			
Cellana sandwicensis	1.9	3	3	17.2	10	58	0.7	1	3			
Cellana other				0.5	1	1						
Conus ebraeus				0.7	1	1						
Conus distans	6.1	3	3	9.3	1	1				13.5	1	1
Conus pennaceus										0.8	1	1
Conus other	3.1	2	2	5.2	10	14	2.4	3	5			
Drupa ricina	21.1	7	12	26	16	58	5.1	7	10	0.4	1	2
Drupa rubusidaeus	4.3	6	9	28.6	30	129	12.3	12	24	2.4	5	9
Drupa morum				28.2	3	12						
Drupella elata				1	2	2						
Thaidid other	3.3	2	6	4.9	5	26				0.4	2	2
Trochus				1.4	3	9	0.3	1	1			
Littorina pintado				1	8	8						
Nodilittorina picta				0.3	1	1	0.5	2	2			
Planaxis labiosa				0.5	1	1	0.5	4	4			
Imbricaria olivaeformis				0.5	1	1						
Nerita picea	8.9	27	27	59.2	282	412	14.2	70	126	2.1	7	21
Nerita polita	2.2	2	2									
Strombus	1.5	1	1	1.5	1	1						
Chiton				0.3	1	1						
Oyster				2	2	2						
Unidentified				10.7	6	103	1.1	4	19	1.7	2	25
Total Shellfish	12.6	70	111	374.5	428	1104	79.4	117	256	25.6	20	70

Table 28: KAL-10A TU2 Echinoderm

KAL-10-A TU 2 Echinoderm	Surface			Level 1			Level 2			Level 3		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus				2.3	1	22	0.3	1	7	0.2	1	5
Hetercentrotus mamillatus				2	1	18	0.2	1	2			
Echinothrix calamaris												
Echinothrix diadema				3.3	1	85	0.5	1	21	0.1	1	4
Tripneustes gratilla	0.5	1	2									
Unidentiied Echinoderm				0.8	1	20	1.4	3	40	0.4	1	16
Total Echinoderm	0.5		2	8.4		145	2.4	6	70	0.7	3	25

Table 29: KAL-10B TU3 Shellfish

KAL 10B TU3 Shellfish												
LEVEL	Surface			1 (cmbd)0-5			2(cmbd)5-10			3(cmbd)10-15		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea maculifera	16.5	1	1	27.6	6	21	32.3	3	14			
Cypraea other	0.4	1	1	44.2	3	169				2.1	1	14
Cerithidiidae				4.4	1	1						
Cellana exarata				5.3	5	57	1.3	1	8			
Cellana sandwicensis				1.5	3	22	2.8	1	24	3.4	7	17
Cellana other	2.5	1	1	0.6	4	4						
Cassidae				4.5	1	1						
Conus distans				7.8	1	2						
Conus other	0.2	2	2	12	5	8	0.7	2	3			
Conus textus							1.1	1	2			
Drupa ricina	4.2	3	4	39.7	18	80	9.8	4	17	3.8	2	7
Drupa rubusidaeus	0.9	2	2	20.3	31	66	17.5	20	82	8.8	9	30
Drupa morum							11.7	4	14			
D. noduliferum							0.1	1	1			
Purpura aperta				19	14	187						
Trochus				0.4	3	3						
Littorina pintado				0.7	7	7	0.5	3	3	0.5	4	4
Nodilittorina picta				1.1			0.2	3	3	0.1	1	1
Nerita picea	1	3	4	1	1	1	37.5	164	252	7.5	38	53
Nerita polita							1.5	1	1			
Nerite other							0.3	1	1			
Ostreidae							1.8	1	7			
Unidentified							1.2	2	5	0.9	3	5
Total Shellfish	33.3	16	21	250.3	122	756	155	222	570	33.1	69	149

Table 30: KAL-10B TU3 Echinoderm

KAL-10B TU3 Echino.	Surface			Level 1			Level 2			Level 3		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus				10.6	1	169	5.3	1	92	1.7	1	19
Hetercentrotus mamillatus	0.1	1	1	11.8	1	98	10.1	1	51	1.2	1	9
Echinometra mathaei				0.2	1	4	0.2	1	9	0.1	1	1
Echinothrix diadema				19.3	1	750	18	2	543	2	1	35
Tripneustes gratilla				3.7	1	84	1.9	1	57	0.6	1	16
Unidentiied Echinoderm				9.4	6	151						
Total Echinoderm	0.1	1	1	55	11	1256	8.5	10	133	2.2	3	38

Table 31: KAL-10C TU 4

KAL 10C TU	Level 1			Level 2			Level 3			Level 4			Level 5		
Shellfish	Weight	MNI	NISP	Weight	MNI	NISP	Weight	MNI	NISP	Weight	MNI	NISP	Weight	MNI	NISP
Cypraea caputserpentis	8.8	2	7	14.3	3	21	5	3	9	1.2	1	4	0.8	1	4
Cypraea maculifera				28.7	1	4									
Cypraea other	2.1	1	4				0.7	1	1						
Cellana exarata	8.1	3	9	0.6	1	1				1.8	1	1			
Cellana sandwicensis				1.5	1	5							0.2	1	3
Cellana other				0.8	1	1				0.5	1	1			
Conus distans										4.3	1	2			
Conus other	0.5	1	1				0.7	1	1	0.4	1	1	0.1	1	1
Drupa ricina	5.1	4	8	2.6	3	4	2.5	3	4	2.2	1	3			
Drupa morum				8.3	1	1									
Drupa rubusidaeus	7.1	8	25	7.5	6	16	1.8	1	10	0.9	2	2			
Purpura aperta	11.6	1	4												
Littorina pintado	0.2	1	1	0.3	1	1									
Nodilittorina picta				0.1	1	1				0.1	1	1			
Nerita picea	16.3	65	109	3.6	18		1.7	7	18	1.9	9	14	1.4	7	14
Total Shellfish	59.8	86	168	68.3	37	55	12.4	16	43	13.3	18	29	2.5	10	22

Table 32: KAL-10C TU4 Echinoderm

Echinoderm	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP
Colobocentratus atratus				0.4	1	1				0.1	1	16	0.2	1	7
H. mammillatus	1.5	4	1	0.2	1	3									
Echinothrix diadema	1.1	1	24	1.1	1	1	0.3	1	1	0.2	1	14	0.2	1	12
Tripneustes gratilla										0.2	1	9			
Unidentified	0.8	2	22	3.8			0.7	2	53	1	3	18	0.6	2	20
Total Echinoderm	3.4	7	47	5.5	3	5	1	3	54	1.5	6	57	1	4	39

Table 33: KAL-10C TU 5 Shellfish

KAL-10C TU 5												
LEVEL	1 (cmbd)0-5			2 (cmbd)5-10			3 (cmbd)10-15			4 (cmbd)15-20		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	5	2	24	7.7	3	17	0.7	1	10	2.4	2	4
Cypraea maculifera							0.9	1	2	1	2	2
Cypraea other	11.1	1	4	7.7	2	13						
Cellana exarata	10.5	1	4	0.2	1	1						
Cellana sandwicensis	3.4	1	2	0.1	1	2						
Cellana other	0.1	1	1				0.1	1	1	0.1	1	1
Conus other				1.4	2	3						
Drupa ricina				4	2	5						
Drupa rubusidaeus	3.5	6	13	3.8	5	12	2	3	5	0.9	1	1
Drupa morum				7.3	1	2						
Nerita picea	5.7	24	51	11.8	40	84	1.7	9	24	1.5	8	12
Nerite other										0.2	1	1
Unidentified	1.1	4	14	1.3	5	27				0.11	3	
Neothais harpa	0.1	1	2	0.1	1	1						
Total Shellfish	40.5	41	115	45.4	63	167	5.4	15	42	6.21	18	21

Table 34: KAL-10C TU 5 Echinoderm

KAL-10C TU 5 Echinoderm	Level 1			Level 2			Level 3			Level 4		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus	0.9	1	23	1.3	1	20	0.7	1	10	0.5	1	7
Hetercentrotus mamillatus	4.1	1	17	2.8	1	16	1	1	8	0.2	1	2
Echinometra mathaei	0.1	1	1	0.2	1	4						
Echinothrix diadema	10.6	1	164	20.2	2	404	4	2	60	3.5	3	45
Tripneustes gratilla	1.2	1	24	2.1	1	60	0.6	1	18	0.7	1	8
Unidentified Echinoderm	4.4	3	93	4.9	3	93	0.8	2	21	0.9	2	13
Total Echinoderm	21.3	8	322	31.5	9	597	7.1	7	117	5.8	8	75

Table 35: KAL-10C TU 6 Shellfish

KAL-10C 6 Shellfish	Surface			Level 1			Level 2			Level 3		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	0.1	1	1	13.9	4	14	8.8	3	6	3.8	1	5
Cypraea maculifera	4.6	1	1	5.3	1	4	32	2	31	28.8	1	11
Cypraea other				24.8	2	19				13.3	2	33
Cellana exarata				8.6	5	8	8.2	7	37	0.7	2	6
Cellana sandwicensis				24.1	4	11	25.7	8	18	13	2	5
Cellana other	2	2	2	3.5	5	28						
Conus distans				17.1	2	2						
Conus other				0.9	2	2	6.7	2	3	5.5	2	2
Drupa ricina	1.8	1	1	14.5	7	17	22.6	7	30	13.1	3	14
Drupa rubusidaeus	1.6	2	2	9.7	11		31.5	13	44	18	12	60
Drupa morum				10.8	2	5	59.8	6	16	22.3	3	
Siphonaria normalis										0.1	4	4
Littorina pintado	1.2	3	3	4.5	20	20	5.6	16	16	1.3	8	8
Neothais harpa							0.5	1	1			
Nerita picea	9.4	28	28	40.6	136	156	29.1	77	94	27.6	70	85
Nerita polita				0.7	1	2	3	1	3			
Ear shaped operculum?				0.9	1	1						
Cymantium intermediae				2.5	1	1						
Unidentified				5.4	3	23	2.2	4	11	2.6	3	12
Total Shellfish	20.7	38	38	188	207	313	235.7	147	310	150	113	245

Table 36: KAL-10C TU 6 Echinoderm

KAL-10C 6 Echinoderm	Surface			Level 1			Level 2			Level 3		
Echinoderm	**Wt**	**MNI**	**NISP**	**WT**	**MNI**	**NISP**	**WT**	**MNI**	**NISP**	**WT**	**MNI**	**NISP**
Echinothrix diadema				1.1	1	19	3.9	1	55	9.3	2	150
Tripneustes gratilla							0.3	1	8	2.2	1	37
Unidentified Echinoderm				2.1	2	40	4.1	2		5.4	3	67
Total Echinoderm				3.2	3	59	8.3	4	81	16.9	6	254

Table 37: KAL-23A TU 1 Shellfish

KAL 23A 1									
LEVEL	**Surface**			**1 (cmbd)0-5**			**2 (cmbd)5-10**		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	0.6	1	1	5.8	3	10	11.9	4	24
Cypraea maculifera				1.9	1	3	6.7	1	1
Cypraea other							2.4	1	11
Cellana exarata				4	2	11	2.5	2	16
Cellana sandwicensis	1.8	1	3	5.5	5	9	3.9	1	14
Cellana other				1.7	1	30	0.6	1	11
Conus other				1.7	1	1	3.3	2	5
Drupa ricina				1.4	2	4	2.3	2	4
Drupa rubusidaeus	3	2	2	1	2	7	5	5	30
Drupa morum				0.4	1	1			
Nerita picea	0.7	2	2	2.1	10	24	4.6	21	35
Unidentified				0.5	1	9	0.4	1	13
Total Shellfish	6.1	6	8	26	29	109	43.6	41	164

Table 38: KAL-23A TU 1 Echinoderm

Level	Surface			Level 1			Level 2		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus				0.2	1	4	0.3	1	5
Hetercentrotus mamillatus							0.5	1	6
Echinothrix diadema							0.5	1	12
Unidentified Echinoderm				0.4	2		0.7	1	18
Total Echinoderm				0.6	3	4	2	4	41

Table 39: KAL-23A TU3 Shellfish

LEVEL	1 (cmbd)0-5			2 (cmbd)5-10			3 (cmbd)10-15		
Shellfish KAL-23A TU3	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	29.3	6	56	36.8	10	56	2.8	1	10
Cypraea maculifera	7.8	1	10	17.2	1	3	7.5	1	3
Cypraea other	0.9	1	12						
Cellana exarata	10.4	3	99	3.3	3	33	0.4	1	8
Cellana sandwicensis	13.9	4	81	4.8	2	17	1	2	7
Cellana other	4.5	10	35	0.8	2	6			
Conus other				0.1	1	1			
Drupa ricina	17.9	6	39	9.4	8	25	4.7	2	13
Drupa rubusidaeus	13.4	12	59	12.2	11	71	3.1	4	17
Drupa morum	2.5	1	4	1.4	1	1			
Thaidid other	1.3	3	25						
Littorina pintado	1.3	12	12	1.2	6	6	0.2	3	3
Nerita picea	563	313	393	63	184	272	17.6	54	76
Unidentified	0.9	4	10						
Total Shellfish	667	376	835	150.2	229	491	37.3	68	137

Table 40: KAL-23A TU3 Echinoderm

KAL-23A TU 3 Echinoderm	Level 1			Level 2			Level 3		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus	2	1	35	1	1	16	0.1	1	9
Hetercentrotus mamillatus	6.1	1	22	1.8	1	9	1.4	1	1
Echinometra mathaei				0.1	1	1			
Tripneustes gratilla	0.1	1	4	0.3	1	1	0.2	1	5
Unidentiied Echinoderm	3.5	3	67	3.1	3	57	0.7	3	15
Total Echinoderm	11.7	6	128	6.3	7	84	2.4	6	30

Table 41: KAL-23B TU 2. Surface to Level 4

KAL 23B TU 2 Surface to Level 4	Surface			Level 1			Level 2			Level 3			Level 4		
Shellfish	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP
Cypraea caputserpentis	1.6	1	1	0.2	2	1	5.7	2	9	19	3	48	11.9	3	39
Cypraea maculifera										7	2	9			
Cellana exarata										4.3	3	7	0.9	2	9
Cellana sandwicensis				0.1	1	1	0.1	1	2	6.7	2	3			
Cellana other							0.4	3	6	1.3	4	10	0.9	1	4
Conus ebraeus															
Conus distans													1.2	1	1
Conus other										0.7	3	3			
Drupa ricina				0.9	1	5				8.6	4	17	6.4	4	8
Drupa rubusidaeus							1.3	3	6	21	11	51	13.3	6	10
Drupa morum							2	1	1	7.6	1	2			
Drupa spp										3.7	4	44	5.6	5	30
Littorina pintado				0.4	2	2	0.1	2	2	1.5	10	10	1.4	7	9
Neothais harpa										0.2	1	1	0.8	1	1
Nerita picea				2	5	1	4.5	13	27	12.1	133	192	22.6	85	106
Unidentified							3	4	66	4.8	6	41	0.4	3	3
Total Shellfish	1.6	1	1	3.6	11	10	17.1	29	119	98.5	187	438	65.4	118	220

Table 42: KAL-23B TU 2 Surface to Level 4

KAL-23B TU2 S-4	Surface			Level 1			Level 2			Level 3			Level 4		
Echinoderm	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP	WT	MNI	NISP
Colobocentratus atratus							0.1	1	1	1	1	20	1	1	
Hetercentrotus mamillatus							1	1	1.4	8.1	1	4	12.5	1	7
Echinothrix diadema				0.1	1	5	0.6	1	18	2.7	1	52	2.2	1	42
Tripneustes gratilla							0.1	1	2				0.1	1	1
Unidentified Echinoderm				0.7	3	18	1.7	3	22.4	6.8	6	100	3.7	3	51
Total Echinoderm				0.8	4	23	3.5	7	20	18.6	9	176	19.5	7	101

Table 43: KAL-23B TU 2 Level 5-7

LEVEL	5 (cmbd)20-25			6 (cmbd)25-30			7 (cmbd)30-35		
Shellfish KAL-23B Lev. 5-7	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	15.7	4	25	23	5	31	16	4	30
Cypraea other	2.6	2	26	9.1	2	7	0.6	1	4
Cellana exarata	0.2	1	1	0.7	2	5	0.3	1	4
Cellana sandwicensis				1.1	2	8	4.4	3	4
Cellana other	0.1	1	1	0.1	1	5	0.4	2	3
Conus lividus	0.5	1	1	0.3	1	1			
Drupa ricina	4.8	3	4	10.1	5	13	5.5	5	9
Drupa rubusidaeus	1.2	1	4	12.1	7	18	3.3	3	12
Drupa ssp				2	5	18			
Buccinidae spp				0.8	1	1			
Drupa spp	3.3	4	26	1.5	3	12			
Trochus	0.6	1	4				0.1	1	1
Littorina pintado	1	6	6	3.3	13	14	0.7	3	3
Nerita picea	16.9	82	127	26.8	117	157	19.4	66	137
Phenacolepus granocostatus	0.5	1	1						
Unidentified	0.7	3	20				2.4	3	44
Total Shellfish	47.4	110	245	90.9	164	290	53.1	92	251

Table 44: KAL-23B TU 2 Echinoderm Level 5-7

KAL-23B Echinoderm	**Level 5**			**Level 6**			**Level 7**		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus	0.9	1	16	0.8	1	14	1	1	22
Hetercentrotus mamillatus	1.1	1	8	1.2	1	8	3.3	1	6
Echinometra mathaei				0.1	1	2			
Echinothrix diadema	3	1	71	4.5	1	84	3.3	2	63
Tripneustes gratilla	0.5	1	23	0.5	1		0.9	1	27
Unidentified echinoderm	2.3	5	57	3.5	5	79	2.5	3	47
Total Echinoderm	7.8	9	175	10.6	10	187	11	8	165

Table 45: KAL-30 A

KAL-30A	Level 1			Level 2			Level 3			Level 4		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	67.7	18	203	113.8	24	186	113.8	29	134	28.1	10	44
Cypraea maculifera	12.6	1	8	30.4	1	12	3.5	1	2	5	1	3
Cypraea other										3.8	1	1
Cellana exarata	1.7	1	21	4.9	3	24	2.5	3	9	0.3	1	3
Cellana sandwicensis				3.9	2	18	11.1	6	10	1.6	2	2
Cellana sp.	1.5	3	3	5.3	7	29	1.2	5	2	0.5	1	1
Conus ebraeus							9.9	2	2			
Conus distans	0.9	1	1									
Conus cattus	2.5	1	2	3.4	2	2	6.1	3	4			
Conus sp	2.4	4	8	1	1	2	1.3	2	3			
Costellaria							0.3	1	1			
Drupa ricina	11.4	7	8	27.8	22	50	27.3	13	37	8	4	5
Drupa rubusidaeus	7.8	24	24	13.7	36	39	31.6	32	62	5.3	6	15
Drupa ssp	17.2	8	115	14.7	12	118	17.8	16	71	7	10	40
Morula granulata				1.2	2	2						
Thais intermedia				3.1	1	1	4	3	3			
Trochus							0.7	2	2			
Littorina pintado	0.2	3	3	1.6	13	13	2.3	9	9	0.2	1	1
Nerita picea	5.9	28	98	20.5	80	107	51.6	157	169	8.6	33	45
Isognomen perna				0.5	1	2				0.1	1	1
Unidentified	4.3	3	111	6.3	6	74						
Total Shellfish	136.1	102	605	252.1	213	679	285	157	169	68.5	71	160

Table 46: KAL-30 A Echinoderm

KAL-30A Echinoderm	Level 1			Level 2			Level 3			Level 4		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus	0.1	1	2	1.3	1	22	0.4	1	4	0.8	1	8
Hetercentrotus mamillatus	1.9	1	10	6.3	1	50	5	1	22	0.6	1	5
Echinothrix diadema	0.1	1	4	3.2	1	59	3.4	1	4	0.5	1	14
Unidentified echinoderm	4.1	3	30	1.1	3	15	0.4	3	14	0.3	3	18
Total Echinoderm	7.8	6	48	12.9	6	146	9.2	6	44	2.2	6	45

Table 47: KAL-30 B Shellfish

KAL-30B	Level 1			Level 2			Level 3		
Shellfish	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Cypraea caputserpentis	19.1	4	44	20	5	30	28	6	57
Cypraea maculifera	8.3	1	4	4.6	2	5	17	1	11
Cypraea other	2.1	1	7	16	4	61	3.3	1	33
Cellana exarata	0.7	1	1	1.4	2	8	0.6	1	5
Cellana sandwicensis	4	2	2	1.7	3	5	1.7	2	11
Cellana sp.	0.1	1	2	2.1	1	1	1.2	2	8
Conus chaldeus	1.8	1	1						
Conus sp	5.8	2	4				0.2	1	1
Drupa ricina	5.7	5	5	4.5	7	7	5.7	3	13
Drupa rubusidaeus	13.3	14	15	10	14	31	5.8	9	27
Drupa ssp	6.4	3	25	2	3	12			
Thais intermedia	1.5	1	1						
Littorina pintado	1.6	7	7	2	9	9	1.2	5	5
Nerita picea	35.4	103	154	27	84	126	12	46	49
Nerita polita							1.2	1	1
Isognomen perna	0.6	1	4						
Unidentified	2.6	3	30				1.8	4	20
Total Shellfish	109	150	306	91.3	134	295	79.7	82	241

Table 48: KAL-30 B Echinoderm

KAL-30B Echinoderm	Level 1			Level 2			Level 3		
Echinoderm	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**	**Weight**	**MNI**	**NISP**
Colobocentratus atratus	1.7	1	17	2.8	1	36	2.5	1	41
Hetercentrotus mamillatus	9.6	1	46	6.9	1	49	18	2	106
Echinometra oblonga							0.4	1	4
Echinothrix diadema	13.1	1	296	20	1	364	24	1	390
Tripneustes gratilla				3.5	1	85	5.4	1	105
Unidentified echinoderm	1.3	2	108	5.3	3	57	5.1	5	55
Total Echinoderm	25.7	5	467	38.5	7	591	55.4	11	701