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Stratigraphy, Chronology, and Social Context of David Malo's Kalepolepo Church Site from the Island of Maui

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Stratigraphy, Chronology, and Social Context of David Malo's Kalepolepo Church Site from the Island of Maui

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This paper examines data from the Kalepolepo Church Site on the island of Maui, an mid-19th century pondfield and church site. A series of pondfield layers were identified that precede the construction of the church, separated by regular flood intervals. A variety of material culture was recovered, including burnt charcoal, shell midden, pollen and phytoliths. Radiocarbon evidence indicates that the earliest pondfield floor dates to 1410 BP (table 1). Charcoal concentrations suggest early burning of coastal vegetation, corroborated by the pollen samples which suggest a sudden replacement of indigenous coastal vegetation by coastal grasses and shrubs. Extremely high concentrations of shell midden were recovered from the same contexts as the earlier pondfield layers and suggests the discarding of food debris. These data suggest very early human activity in and around Kalepolepo which may have included clearing and burning of local vegetation, and pondfield agriculture.

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This paper examines data from the Kalepolepo Church Site on the island of Maui, an mid-19th century pondfield and church site (figure 1). A series of pondfield layers were identified that precede the construction of the church, separated by regular flood intervals. A variety of material culture was recovered, including burnt charcoal, shell midden, pollen and phytoliths. Radiocarbon evidence indicates that the earliest pondfield floor dates to 1410 BP (table 1). Charcoal concentrations suggest early burning of coastal vegetation, corroborated by the pollen samples which suggest a sudden replacement of indigenous coastal vegetation by coastal grasses and shrubs. Extremely high concentrations of shell midden were recovered from the same contexts as the earlier pondfield layers and suggests the discarding of food debris. These data suggest very early human activity in and around Kalepolepo which may have included clearing and burning of local vegetation, and pondfield agriculture.

INTRODUCTION

This paper presents the results of excavations at Kalepolepo Church site in Kihei on leeward east Maui. This site was the location of an ancient coastal enclave that was intimately tied to the economy of the local communities there. Most studies on dryland agriculture have focused on upland leeward agricultural systems (Rosendahl 1994), yet few have focused on leeward coastal ponds because of the development inherent there. One of these pond areas is the site of Kalepolepo church, located in what would be considered a dryland coastal zone. Ethnohistorical and archaeological evidence indicates Kalepolepo was the location of a small coastal community who relied on a variety of means of subsistence including a coastal fishpond and pondfields located at the mouth of an intermittent stream. They would have relied upon a seasonal agricultural cycle due to the drier summer months and heavy rainfall in the winter (Handy 1972).

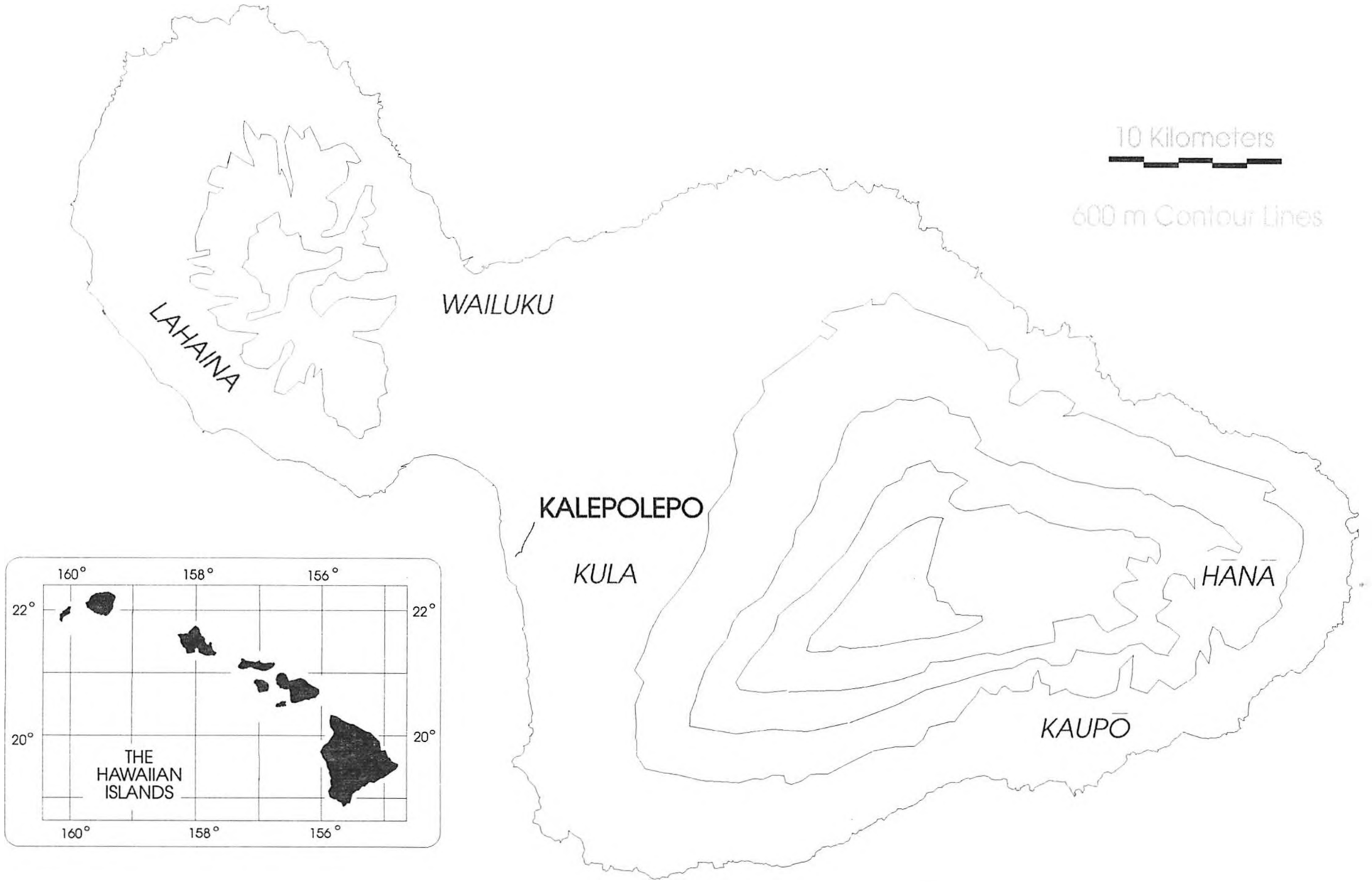

Figure 1. The island of Maui and the location of Kalepolepo.

Table 1 **Radiocarbon Calibration**

Laboratory Number:	Beta-85290
Conventional radiocarbon age:	1460+/- 80BP
Calibrated results: **(2 sigma, 95% probability)**	cal AD 430 to 695

The significance of this study derives from the relative importance of Kalepolepo as a coastal community. Most information on agricultural practices in this area describes a land well suited for some sweet potato cultivation. It is assumed that poi was in some way obtained from other areas such as Waikapu and Wailuku; areas of greater rainfall (Handy 1972). Yet, historical records (Kolb, et al.1997) suggest that a number of coastal pondfields provided opportunities for the production of wetland taro. Moreover, the stratigraphic record from Kalepolepo indicates the presence of a wetland pondfield that may have been used for very early taro production.

The information obtained in this study provides a basic chronological outline for land use at the coast pondfields of Kalepolepo. Carbon dating, charcoal concentrations and analysis of stratigraphy provide evidence to support early human habitation and utilization of available resources. It is important to note that one available resource appears to be enough intermittent stream flow to produce such a complex stratigraphy. The data will show that the Kalepolepo church site is an interesting exception to the notion that taro pondfields were not located in this region.

METHODS

There are many environment types across the Hawaiian archipelago. Wind patterns, and elevation differences help determine the amount of rainfall in each environmental zone. Windward sides of the islands tend to accumulate more precipitation, and leeward areas experience higher variability in rainfall. These areas range from extremely arid to lush green kula lands. The variable types of plants available make it possible to utilize leeward slopes which require divergent conventions for cultivation. With less water availability, terraces and mounds were built to help conserve water and prevent erosion. Two crops grown under these conditions were sweet potato, and dry taro. Sweet potato was a major staple of the dryland areas, yet locations that experienced higher rainfall successfully produced taro(Kirch 1985).

Wet taro was planted in pondfields, *loi*, that were constructed near a constant water source. The land chosen for the irrigated terraces was flooded over to soak the soil. Raised embankments were constructed and flat rocks were placed as a foundation to be covered with soil. The *loi* was then dug out and the bottom packed down to reduce water seepage into the soil. The water was then let in and the bottom once again packed. Planting did not begin until the next day to let the mud settle to the bottom.

Sweet potato planting generally began with clearing and burning off the surface vegetation. The soil was left fallow for about a month until water soaked in. Later, the new shoots were planted in mounds of soil. Winter floods jeopardized sweet potato crops. The plants could not handle the extremely wet conditions that often completely flooded the fields. At times of flooding, the crops were collected, and consumed immediately (Kamakau 1976).

Dry-taro planting took place in areas not suitable for pondfield cultivation. This type of taro production took place along streams. Planting on kula lands necessitated burning off the grass in preparation of the fields. The taro was planted on mounds of earth. The varieties of taro utilized for this type of cultivation handled well under wet conditions, and produced large plants.

KEALIA POND

Kealia pond, 5 km north of Kalepolepo, was the site for an archaeological inventory survey by Athens, Ward, and Tomonari-Tuggle (1996). The paleoenvironmental core from Kealia pond will be compared with the data from Kalepolepo to illustrate the difference in past use of the two sites. The profile of the core was broken down into zones. Zones B through E chronologically correspond to the stratigraphy of test unit 1 at Kalepolepo. About six stratigraphic layers which extend to the depth of 71 cm are included in the core within the corresponding zones. The stratigraphy and pollen analysis of Kealia indicate that there was no agricultural use of the pond (Athens, et al. 1996).

THE COASTAL ENCLAVE OF KALEPOLEPO

Kalepolepo is located along a strip of leeward Maui coastline called Kīhei (Fig 2). The history of Kalepolepo is dominated by tales of chiefly privilege as early as the late 1500s AD. Kalepolepo is known for its ancient royal fishpond, one of several located in Kīhei used for husbanding millet fish prized by the chiefs of Maui (Wilcox 1921). A small ancient village was also located in the area, and its economy was based upon the exploitation of local fishing grounds, fish husbandry, and the planting of wetland taro, sweet potato, and other food crops around the various coastal pools and swamps. The local foodstuffs were plentiful enough that in 1850, Captain John Joseph Halstead built the Koa House at Kalepolepo, which became a provisioning station for European whaling ships plying the area (Jenkins 1983).

Kalepolepo was also the site a of a small religious community organized by David Malo, an important Hawaiian chief and retainer of King Kamehameha as well as a Minister in the Congregational Church of Christ. Malo moved to Kalepolepo in 1843, after a renowned career as student, historian, writer, and General School Agent at Lahainaluna School. He preached under the trees in Kalepolepo, summoning his constituents by blowing a huge conch shell horn (Janion 1969). He orchestrated the construction of a stone church at Kalepolepo some 0.5 km inland from Kalepolepo fishpond, along side Waipu'ilani Gulch and a small coastal inland pond. The stone remains of the church are still visible and used for religious worship today. There is a small cemetery on the south side of the church as well as a number of unmarked graves, including a section on the north west side of the church dedicated for non-Christians who may have had the misfortune of dying in Hawai'i before they returned home (Rev. Morley Frech, personal communication 1995).

EXCAVATIONS

Following an earlier upland inventory survey (Kolb, Conte and Cordy 1997), excavations were conducted on the grounds of the Kalepolepo Church Site during the spring of

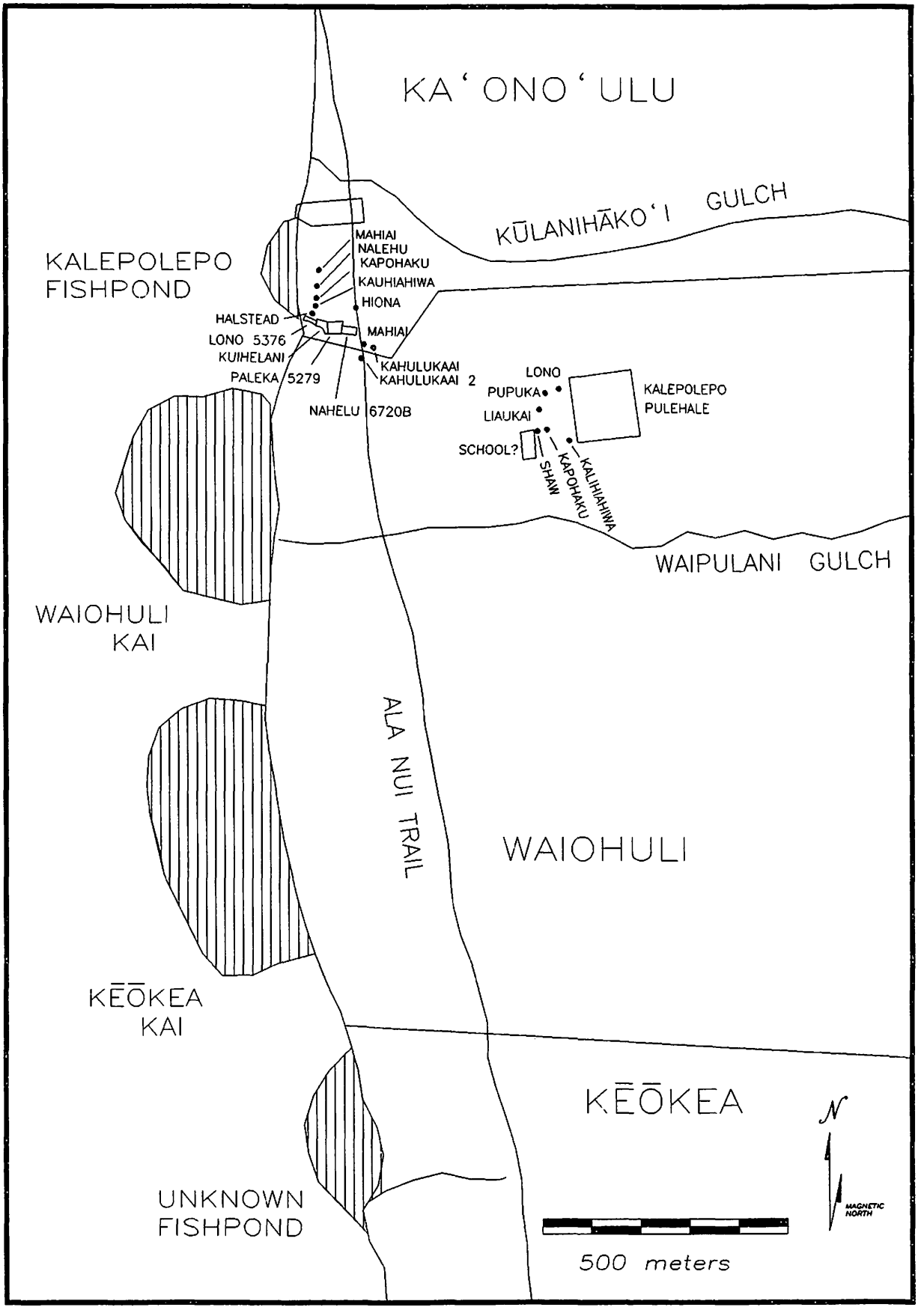

FIGURE 2. Kihei coastline (from Kolb, Conte, and Cordy 1997).

1995 in order to provide complementary data on coastal subsistence. Kalepolepo Church was viewed as an ideal location, given its relative undisturbed ground surface in the context of the extensive coastal develop that took place in the area since the 1950s. The stone foundation of the church is in good condition, having been reconstructed in the 1960s by the Bishop Museum. The surrounding vegetation consists of introduced trees and flowers, although the drier periphery of the property consists of kiawe trees and grass.

Figure 3 shows the area surrounding Kalepolepo Church and cemetery. The overall research scope called for limited test excavations around the periphery of the property thereby avoiding the church and cemetery grounds. The church itself was excavated and stabilized by the Bishop Museum in the 1970s. We excavated a total of 5 sq m in the vicinity of the church. Test units were 1m x 1m in size and their locations were chosen by random and judgmental procedures. Units 1-3 were placed along a random east-west transect 18.5 m north east of the church. Unit 4 was places south of the cemetery, while Test Unit 5 was placed against the north wall of the church, in order to provide some stratigraphic context for the church foundation. The ultimate goal was to find out something about the local subsistence and provide some chronological information as to the occupation of the coastal region.

STRATIGRAPHY

Test unit 1 provided the most useful stratigraphic record at the site. Table 2 shows the breakdown of the stratigraphy of test unit 1. The sedimentary profile consists of loam, humic clay, silty clay, stream gravel, and course and fine sands extending some 23 layers from the surface to the water table (320 cmbd, or cm below datum; a fixed arbitrary measurement point). The gravel and course sands suggest periodic fluvial disturbances while the patterns of undulating fine sands suggest periodic accumulation of windblown particles. Table 1 presents the descriptive details of the substrata.

Two alternating types of sediment are visible in the profile. These types vary in the

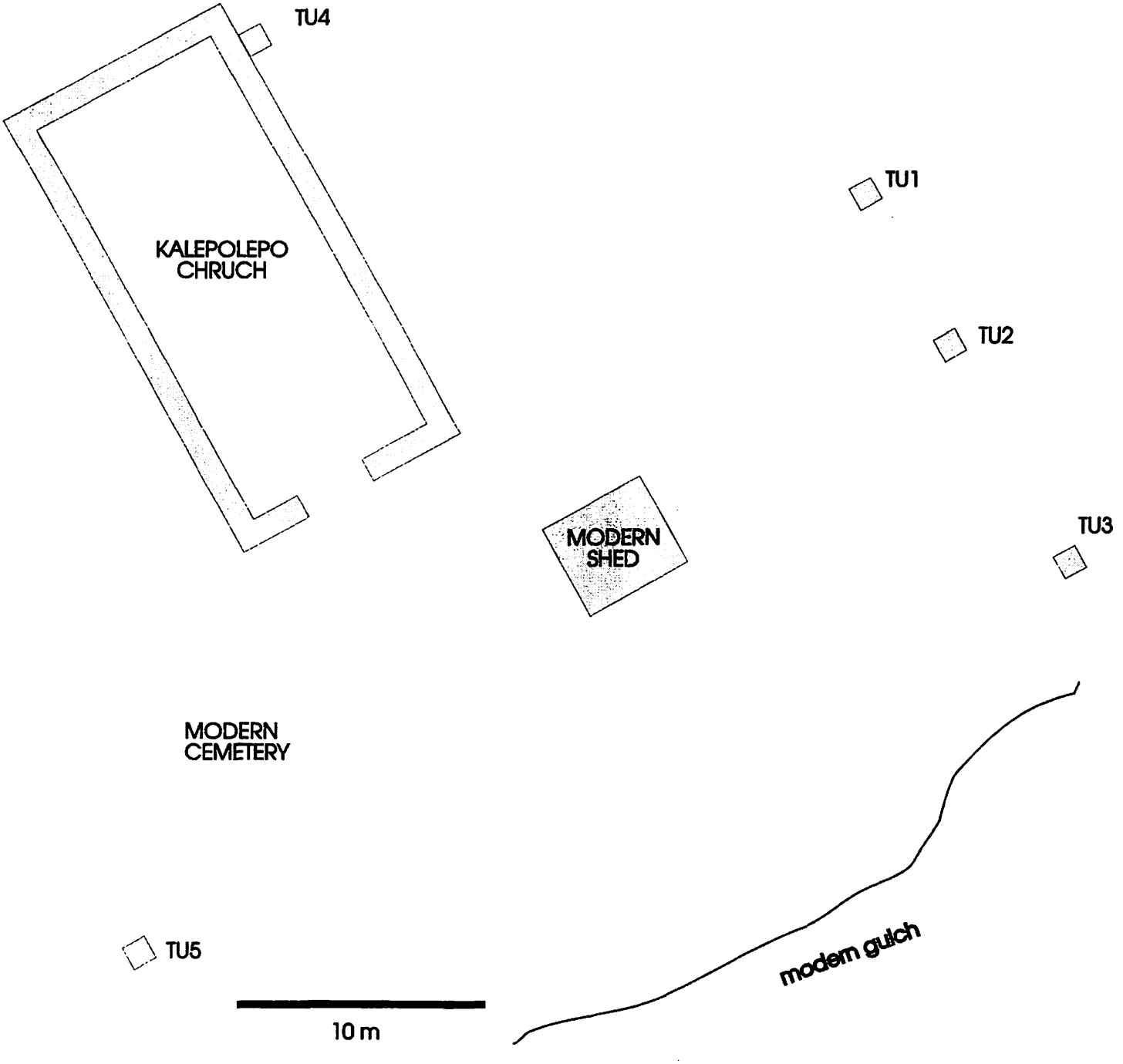

Figure 3. The location of excavation units in relation to Kalepolepo church.

Table 2 STRATIGRAPHY

LAYER	SOIL	MUNSEL	PARTICLE SIZE	INCLUSIONS	FINDS
I	silt/loam	10YR 3/4	fine/med	1% pebbles	pebble alignment
II	sand/gravel	10YR 4/2	fine/med	80% ww pebbles/cobbles, red/blk cinder	
III	silt/loam	10YR 3/4	med/coarse	30% ww pebbles	landsnail
IV	silt/loam	10YR 3/4	med/coarse	<1% basalt charcoal red/brn mottling	
V	silt/sand loam	7.5YR 3/2	fine		
VI	silt/loam	7.5 YR 3/2	med	<1% basalt charcoal flecks	
VII	sand	7.5 YR 2/0		charcoal flecks	
VIII	silt/loam	7.5 YR 3/2	med	<1% basalt	
IX	sand	7.5 YR 2/0		charcoal flecks	
X	silt/loam	7.5YR??	med	<1% basalt charcoal flecks	
XI	clay/silt	5YR 5/8	fine/med	<1% basalt	
XII	sand	7.5YR 2/0		charcoal	landsnails
XIII	silt	???	fine/med	<2% basalt ww pebbles charcoal	pluver tibia
XIV	gravel	7.5YR 2/0			
XV	silt	10YR 3/4	fine/med	ww basalt charcoal	urchin spines
XVI	gravel	7.5YR 2/0		charcoal mottling	urchin spines
XVII	sand	10YR 2/2	fine	20% ww peb. charcoal, mottling of 7.5YR 6/2	
XVIII	clay/silt	7.5YR 2/0	fine	mottling of 5YR 5/8	
XIX	sand	10YR 2/2	fine/med	<1% basalt	
XX	silt	10YR 3/2	med/coarse		
XXI	silt	10YR 3/2	fine/med		
XXII	clay/silt	10YR 3/4	???	10% basalt	
XXIII	???	7.5YR 3/6	???	10% basalt	

overall particle size and depositional process. Aside from slight differences in inclusions, the pattern appears to be consistent. Layers I, III, IV, VI, VIII, X, XI, XIII, XV, XVIII, XX, XXI, and XXII all comprised of a fine silty loam or silty clay. The upper layers, I, III, IV, VI, VIII, and X, were a fairly consistent silt/loam matrix. The lower layers vary from silt to a silty clay sediment. Deposition of these sediments apparently occurred within the context of relatively slow energy fluvial activity within what was an inland coastal pond at the mouth of an intermittent stream. Layers II, V, VII, VIV, XII, XIV, XVI, XVII, and XIX consist primarily of larger grained sands, gravel, and stream worn pebbles. These layers appear to have been laid down in the context of higher energy colluvial action within what was the runoff of an intermittent stream.

CHRONOLOGY AND CHARCOAL

Two chronological dates were obtained from these excavations, one using relative stratigraphy, the other a TU1 charcoal sample submitted for radiocarbon dating. Stratigraphic evidence from TU5 indicates that layer IV (80 cmbd) dates to the mid 1800s. This was the approximate basal depth of the coral and basalt fill upon which the church was constructed. Carbon dates were taken from high charcoal concentrations at 247 to 286 cmbd. The calibrated sigma date range of Layers XX-XXI is 1400+/- 60 BP. The details of this sample are shown in Table 2. Extremely high charcoal concentrations were found in layers XVIII, XIX, and XX. Both the charcoal found at the time of excavations and the microscopic analysis rise in concentration at about 230 to 250 cmbd. Four samples were taken for a separate microscopic analysis from the depths of 170, 210, 250, and 290 cmbd. The sample from 250 cmbd contained a concentration of 79.9 mm sq/cc (mm squared per cubic centimeter). The other three samples resulted in a concentration of 20 mm sq cc.

Charcoal comparisons between Kalepolepo and Kealia Pond reveal a striking difference. Microscopic and excavated charcoal of Kalepolepo are much higher than at Kealia pond. Even the lowest amounts of charcoal at Kalepolepo (which could represent background

noise) are equal to the highest levels at Kealia pond. Moreover, a pattern of high charcoal concentrations especially punctuate the lower strata, particularly between 150 and 290 cmbd.

POLLEN ANALYSIS

A total of 4 samples were collected and analyzed for pollen and charcoal traces. The details for each charcoal sample is listed in Table 3. Pollen and spore were poorly preserved throughout the core, occurring in relatively low concentrations consistent with windblown deposition and soil oxidation. The sample submitted from 170 cmbd had the highest concentration of palynmorths (7190/cc) Unfortunately poor preservation did not allow for a clear interpretation of the pollen at the site. It is possible that the intermittent water flow may have affected the preservation. The four samples taken were the same as for the microscopic charcoal analysis. The sample taken from 170 cmbd suggested a presence of dry mesic forest growth including shrubs and grasses. At 210 cmbd the Cheno-am (shrub) is still present, but the information for other pollen types was simply absent. The last two samples from the lower depths resulted to be inconclusive due to preservation problems. Despite the difficulties involved with the pollen interpretation at Kalepolepo, the information may still be used to compare to Kealia pond as will be discussed later.

FAUNA

The most interesting information from the faunal record at this site corresponds to the same depth as the high charcoal levels. From 230 to 260 cmbd, large amounts of invertebrate remains were recovered. Many sea urchin spines along with Turbo, Hipponix, Littorina, and Nerita are present at this depth in fairly high numbers. It is known that all of these were utilized by humans. Vertebrate remains were also found. The vertebra of shark or ray (Chondriches) were found in layer XX among the invertebrate shells. The bone of a plover (Pluvalialis) was also found in layer XVIII.

Table 3 **Comparisson of charcoal between Kalepolepo and Kealia Pond**

Kalepolepo: test unit 1		**Kealia Pond: core 1**	
Depth	Charcoal	Depth	Charcoal
100cmbd	7.3g	0-19cmbs	15&9 mm sq/cc
150cmbd	30.5g	19-46cmbs	22 mm sq/cc
170cmbd	26.6 mm sq/cc	53-55cmbs	22 mm sq/cc
190 cmbd	5.8g	62-131cmbs	31 mm sq/cc
210 cmbd	26.6 mm sq/cc	134-135cmbs	32.4 mm sq/cc
230-250 cmbd	10.2-12.5 g		
250 cmbd	79.7 mm sq/cc		
280-290 cmbd	10.9g		
290 cmbd	21.8 mm sq/cc		

DISCUSSION

Our excavations reveal a series of underlying pondfield soils that extend back 1400 years, considerably early for leeward coastal occupation.

Compared to the pondfield cores taken from nearby Kealia pond, Kalepolepo has a much greater amount of deposition. Zones B and C at Kealia date from about 2000 to 1300 years B.P. and occupy a depth of 131- 62 cmbs. Zone C a Kealia has been dated at 1300 to 350 years B.P. from 53- 55 cmbs. The Amount of soil deposition from the time range in question at Kealia pond is much less than that of Kalepolepo. Only about 71 cm is correlated to the time of Polynesian occupation. Kalepolepo, however, exhibits a greater amount of fluvial to colluvial deposition suggesting that Kalepolepo was located near an erosional water source. According to Athens, the charcoal found at Kealia Pond has been attributed to natural ignition due to volcanic eruptions. The charcoal concentrations for Kealia pond are as follows: zone C at 22 mm sq/cc, and zone B at 0.9 -3.1 mm sq/cc. These measurement s are much lower than those of Kalepolepo which had a level of 79.7 mm sq/cc at 250 cmbd. According to Athens, the amount of 20mm sq/cc would be consistent with agricultural clearing practices (1996). The layers at Kalepolepo which held very dense concentrations of microscopic charcoal also produced 10.2 gm of charcoal that were large enough to be removed at the time of excavation. This amount would be about 3 to 4 times greater in density than that of the microscopic concentrations. The excavated charcoal came from the depths of 92- 105 at 7.3 gm, 147- 154 cmbd at 30.5 gm., 190 to 197 cmbd at 5 gm., 215- 224 cmbd at 3.6 gm., 224-233 cmbd at 12.5 gm., and 278- 286 at 10.9 gm. These large amounts could be the result of burning episodes for agricultural reasons. Comparison of the pollen analyses form these areas is a difficult since the layers of high charcoal concentration at Kalepolepo did not contain any preserved pollen due to the highly oxidized soil. The complete lack of information in the lower layers at Kalepolepo do not allow for the ruling out of Polynesian habitation in the area.

CONCLUSIONS

As mentioned earlier, the area of Kalepolepo has been utilized by humans as early as the late 1500s. Historically, Kalepolepo was known for fishing, the cultivation of taro, sweet potato, and other crops. The stratigraphy from test unit 1 was particularly deep and complex. Twenty three layers reached down to about 310 cmbd. These layers most often alternated in particle size which indicates the process of deposition by an intermittent water source. The availability of water may have provided for the early establishment of human settlement at Kalepolepo. The stratigraphy at Kealia pond was much less complex, only of six layers which reached to 71 cm in depth can be compared to the chronology at Kalepolepo.

Charcoal and midden also suggest early human activity at Kalepolepo. Extremely high levels of charcoal concentrations overlap large amounts of invertebrate remains known to be used by the prehistoric settlers of the islands. The depth and layers of these also correspond with the layers from which the early radiocarbon date was obtained.

The results of this excavation indicate that the environment at the Kalepolepo church site would have been able to support irrigated agriculture. The stratigraphy exhibits the presence of an intermittent stream that fed into an inland coastal pond. The complex stratigraphy, charcoal, and midden of test unit one suggest the presence of early human activity including the use of a stream for agricultural irrigation at a leeward coastal occupation site.

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I would not have been able to complete this project without the help of Michael Kolb. It was his initial offer to begin this as an independent study on Hawaiian archaeology. He provided me with the raw data that was used for this paper. He also helped me with the writing process, provided maps, and historical background on the area of Kalepolepo. A slightly different version of this paper, co-authored by myself and Michael Kolb will be submitted for publication in an archaeological journal.

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-Jeanne Pepalis

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