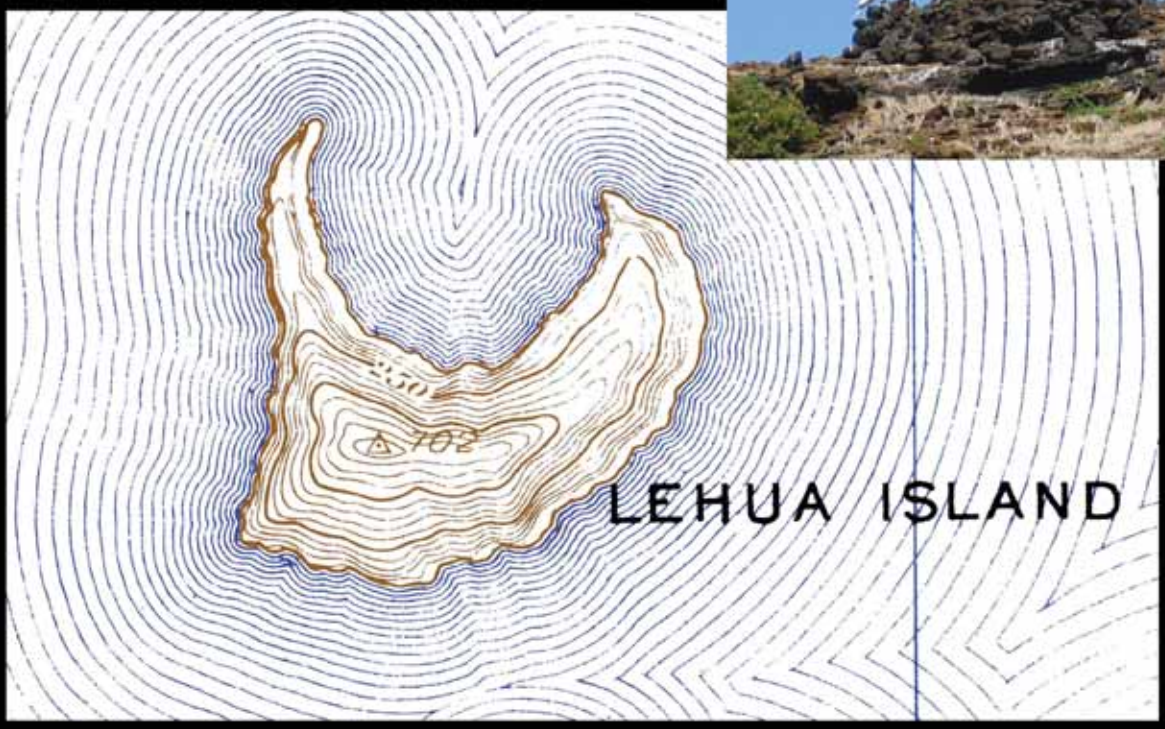
ARCHAEOLOGICAL INVENTORY SURVEY:

LEHUA ISLAND
WAIMEA DISTRICT (NI'IHAU), COUNTY OF KAUA'I



Department of Land and Natural Resources
DIVISION OF STATE PARKS

FINAL REPORT
February 2009

ARCHAEOLOGICAL INVENTORY SURVEY:

LEHUA ISLAND
WAIMEA DISTRICT (NIʻIHAU),
COUNTY OF KAUAʻI
TMK: 1-1-01:2

Prepared for:

U.S. Fish and Wildlife Service
and
Department of Land and Natural Resources,
Division of Forestry and Wildlife

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DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
ARCHAEOLOGY PROGRAM

FINAL
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ACKNOWLEDGEMENTS

We would like express our gratitude to the US Fish and Wildlife Service, and especially Chris Swenson, for allowing us the opportunity to survey one of the last truly wild areas in Hawai'i, for providing assistance throughout the project , and patiently awaiting the final report. We would also like to thank Ken Wood for his guidance and logistical support during our fieldtrips. Nancy McMahon of SHPD assisted in the initial inventory survey, and Eric Komori kindly post-processed GPS data and assisted with the site location maps. Finally, special thanks to Dr. Tom Dye and Jeff Putzi, who freely gave of their valuable time to assist with the field survey on Lehua.

EXECUTIVE SUMMARY

At the request of the U.S. Fish and Wildlife Service and the State Division of Forestry and Wildlife, an archaeological inventory survey of Lehua Island was conducted under the direction of archaeologists with the Department of Land and Natural Resources, Division of State Parks. Field survey was conducted September 27-28, 2003 and July 13-17, 2004 by State Parks staff archaeologists, SHPD Kaua'i archaeologist, and experienced volunteers. The intent of the project was to conduct a complete inventory of the Islet's archaeological resources to assess potential impacts of a proposed ecosystem restoration project to enhance habitat for native flora and fauna. All of the cultural sites recorded on Lehua should be preserved, and the historic lighthouse features possess potential for adaptive re-use in support of the project.

Lehua Island, located about 0.75 mile (1.2 kilometers) to the north of Niçihau, is Federal property, under the U.S. Coast Guard, which operates a solar-powered navigational light at the summit. It is also a State of Hawaii designated Seabird Sanctuary managed by Hawai'is Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). Management and restoration of the biological resources on Lehua is being coordinated jointly by the U.S. Fish and Wildlife Service and DLNR-DOFAW.

The project area includes all of Lehua Island, also known as Lehua Rock and Lehua Islet. Lehua is an eroded, crescent-shaped tuff crater that encompasses a total of approximately 291 acres (118 hectares). The survey encompassed approximately 15 acres or about 5% of the total acreage of the island. The survey area was restricted by the steepness of the slopes on both the interior and exterior of the crescent. Though the total area covered by the survey represents a small percentage of the island, it covered all areas likely to contain archaeological features, including all slopes less than circa 20˚, and the majority of the island's crest. The location and recording of sites was accomplished through pedestrian survey, photographic and descriptive documentation, and detailed tape and compass mapping at 1:50 scale.

Sixty-five features were recorded during the survey, and subsequently grouped into three sites Site 50-99-01-01 includes three clusters of traditional *ahu* features spread along the crescent rim of the island comprising 36 features in total. Site 50-99-01-02, composed of several clusters of traditional features situated on the southern flank of the island adjacent to the shoreline, comprises 19 features in total. Site 50-99-01-03 consists of two clusters of early twentieth century features associated with the construction and maintenance of the Lehua navigational Light, comprising 10 features in all.

The *ahu* features of Site –01 are located on the crescent rim of the island. These were roughly grouped into 3 clusters, with the first concentrated at the island's summit. The second grouping extends in a gentle arc atop the crest of the east horn. Three additional *ahu* were recorded on the rim of the west horn. Most of the *ahu* are groupings or irregularly shaped pilings of tuff and basalt cobbles and boulders. While several of the *ahu* show some evidence of stacking, most lack a well-defined shape or form. The tuff appears to have been gathered from nearby sources and some may have been quarried from the vertical joints or other outcroppings. All of these *ahu* have been used by seabirds for roosting and nesting and exhibit a coating of guano. The site remains open to multiple functional interpretations. Though the *ahu* appear to date to the pre-contact period based on style and occasional branch coral in association, the possibility exists that they are later features. . Kaunuakalä (altar of the sun) is the name for the island's summit. This implies a religious function for Lehua's crest. It is possible that one or more of these *ahu* constitute remains associated with this connotation. The features of site -01 may yet hold clues to their function. In particular, their distribution in relation to celestial phenomena has not been explored, and further historical research could also yield additional testable hypotheses. They are significant for the information they may yield about the Hawaiian use of small islets in the pre-contact period. The construction form and style of the *ahu* do not appear distinctive, but the location and distribution of them may be culturally significant based on their function, which is not presently known. If their function is wholly or in part ritual in nature, the *ahu* composing site -01 possesses cultural significance to contemporary Hawaiians.

The nineteen features comprising site -02 collectively represent use of Lehua for ritual and short-term habitation in the pre-contact period. Three of the features represent temporary habitation. Features 1 and 4 are evidence of subsistence activities on Lehua, and Feature 19 is a small shelter with a lack of other associated remains. Two platforms, Features 3 and 5, are the most substantial traditional features on Lehua. Located at the *makai* end of finger ridges to each side of the landing, these platform locations frame a panoramic view of the northern end of Niçihau and the channel that separates Niçihau from Lehua. Both platforms contain branch coral, which in combination with their prominent locations, suggests a religious function. Feature 2 appears to represent a small religious site, with the midden component the result of offerings. The quantity of faunal remains is substantial, suggesting use of the feature over an extended period of time. As traditional religious sites, they possess cultural significance to contemporary Hawaiians. The remaining 13 features of the site are all small *ahu*. Most are less than a meter in diameter and less than 50 cm high. None are distinctive for their construction, and most are collapsed to some degree. They are similar in construction to the features of site -01 on the crescent rim. As with those summit *ahu*, the function of these remains unclear, possibly associated with bird catching or gathering, ritual, commemoration of island visits, or locational

markers. None of the *ahu* of site -02 was tested, and results of testing the large *ahu* on the crescent rim indicates that there is little to be gained from sectioning this feature type. Via association with the more formal features of the site, as well as construction style, they are believed to represent pre-contact features. still possessing potential to yield information about traditional use of Lehua. As with Site -01, if the *ahu* function is ritual in nature, they possess additional cultural significance to native Hawaiians.

The Lehua navigational light and associated features all date to the 20th century, spanning the period from 1931-1989. The features are situated in two clusters, one near the island's summit and a second on the south flank . Only Feature 3 at the summit is clearly associated with the original light, and was either the base for a support feature, or possibly the original light foundation. Feature 1 (the current automated light) dates to circa 1989, however it may be built atop a remnant of an earlier feature. Feature 2 appears to be a relatively modern structure, which likely functioned as the base for a weather station. All of the features on the southern flank appear to date to circa 1931. The features supported a derrick, a building to house a gasoline-powered hoist engine, and an acetylene gas supply house. Correlating the extant foundations to the former features would require more research. Feature 10, located astride a small channel, functioned as a boat mooring. These features of Site -03 are of mild historical interest, representing a feat of ingenuity and physically difficult engineering, as well as early 20th Century historic navigation patterns. Today they also provide among the only level spots on Lehua, and are therefore valued as campsite amenities and possess the potential to be adaptively utilized to support resource management activities. They were significant for information on Hawaiian history that they have yielded or are likely to yield, and now that they have been sufficiently documented, should be considered "no longer significant".

In order to clarify functional and chronological interpretations of the two traditional site complexes, limited testing of selected features, as well as one area devoid of features, was undertaken following the completion of the surface survey. The largest *ahu* feature of Site -01 was sectioned to look for clues regarding construction style and age. Cultural materials were lacking, and no additional information could clarify the age of the feature. Results did suggest that the *ahu* of Lehua's crest were at one time more formally constructed, and their present condition is a result of collapse. Within site -02, subsurface testing of Feature 1 provided two radiocarbon dates on wood charcoal. These samples provided earlier than expected date ranges (850 $\pm$ 50 BP and 680 $\pm$ 40 BP). In-depth analysis of these results suggests they may reflect use later than the radiocarbon age indications, but they provide solid evidence that site -02 dates to the pre-contact period. Taxa identification on recovered charcoal revealed only native Hawaiian taxa, further supporting this chronological interpretation.

Subsurface testing of an area devoid of surface features but with developed soil was conducted to evaluate the potential for subsurface deposits, with negative results. Surface collection and preliminary analysis of midden remains from Feature 2 support a religious function for this disturbed platform. Branch coral samples were collected from the ceremonial Features 3 and 5 in the hopes of refining the chronology of traditional use of Lehua.

Site 50-99-01-03, comprising the two clusters of features associated with the historic Lehua navigational light, was not tested, as there was sufficient historic documentation of the site age and function, and no further information could be garnered from subsurface excavations.

INTRODUCTION

An archaeological inventory survey of Lehua Island was conducted under the direction of archaeologists with the Department of Land and Natural Resources, Division of State Parks in 2003 and 2004 at the request of the U.S. Coast Guard, the U.S. Fish and Wildlife Service (Pacific Islands Coastal Program), and the State Division of Forestry and Wildlife. The inventory and assessment of archaeological sites on the island has been completed in compliance with the Section 106 process (Federal Historic Preservation) and HRS, Chapter 6E. This proposed project was determined to have "No Adverse Effect" on significant historic sites by the Hawaii State Historic Preservation Officer (Young 2005), provided that a final archaeological inventory report be submitted and accepted by SHPD. This report has been prepared in support of that requirement, and includes the results of archaeological testing and data recovery conducted subsequent to the preliminary inventory survey (Yent and Carpenter 2004).

OFFSHORE ISLET RESTORATION PROGRAM

There are an estimated 50-60 islets in the Hawaiian Islands. The relative isolation of these islets has made them a refuge for seabird colonies, rare plants, and insects. Thirty-six (36) of these islets were designated seabird sanctuaries in 1981. However, their proximity to the main islands has also made these islets vulnerable to rats, insects, and weeds. It is this vulnerability that led to the formation of the Offshore Islet Restoration Committee with participation by the U.S. Fish and Wildlife Service, State Division of Forestry and Wildlife, Nature Conservancy, Bishop Museum, University of Hawaiçi and the National Park Service. The goal of this program is to inventory the natural and cultural resources on this islets and islands, assess the threats and impacts to these resources, and develop plans to restore native habitat to promote the preservation of native flora and fauna.

Lehua Island is Federal property, under the U.S. Coast Guard, which operates a solar-powered navigational light at the summit. It is also a State of Hawaii designated Seabird Sanctuary managed by Hawai'is Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). Management and restoration of the biological resources on Lehua is being coordinated jointly by the U.S. Fish and Wildlife Service and DLNR-DOFAW.

Lehua is one of the offshore islands which harbors a substantial seabird population. Initial field surveys by the U.S. Fish and Wildlife Service Pacific Islands Coastal Program were conducted between 2001 and 2003 to evaluate the biological diversity of Lehua Island. This research has led to the formulation of management recommendations for the protection and enhancement of the indigenous and endemic biota. A listing of all the biological and botanical

resources has been compiled as the basis for these recommendations (Wood, et. al. 2003).

Per the 2005 *Final Environmental Assessment for the Lehua Island Ecosystem Restoration Project*, (USFWS and DLNR 2005), the selected actions of the Offshore Islet Restoration program at Lehua Island include:

1) Eradication of the introduced alien European rabbit (*Oryctolagus cuniculus*) and Polynesian rat (*Rattus exulans*) on Lehua Island, as these species prevent or suppress ecological regeneration, followed by implementation of a long-term ecological restoration strategy;

2) Adoption of a preventive strategy to reduce the potential for invasive species to be accidentally reintroduced to Lehua Island during and after restoration activities occur (island biosafety / quarantine strategy);

3) Reintroduce appropriate native species that cannot effectively recolonize on their own; and

4) Monitor project actions for effectiveness and overall restoration success.

Eradication of the introduced rabbit population was achieved through intensive hunting efforts in 2005-06 under the actions proposed in the 2005 Final EA. Due to a change in methodology, the proposed eradication of rats from Lehua required a supplemental EA in order to evaluate additional potential impacts associated with the project. The *Final Supplemental Environmental Assessment: Lehua Island Ecosystem Restoration Project* was issued in October 2008.

PROJECT LOCATION

Lehua Island is located about 0.75 mile (1.2 kilometers) to the north of Niçihau and about 17 miles (31 kilometers) west of Kauaçi (Figure 1). Lehua is separated from Niçihau by the Lehua Channel, a 3,800-foot wide and 7 fathom deep channel. This channel is also known by the name Haliçi (Tava and Keale 1989: 100). Lehua, as well as Ni'ihau, are considered part of the Kaua'i district of Waimea. Lehua is defined as TMK 1-1-01:002.

SURVEY AREA DESCRIPTION

Lehua Island, also known as Lehua Rock and Lehua Islet, is an eroded tuff crater associated with a secondary phase of volcanic activity from the volcano that created Niçihau Island (Palmer 1937). The northern half of the crater has eroded,

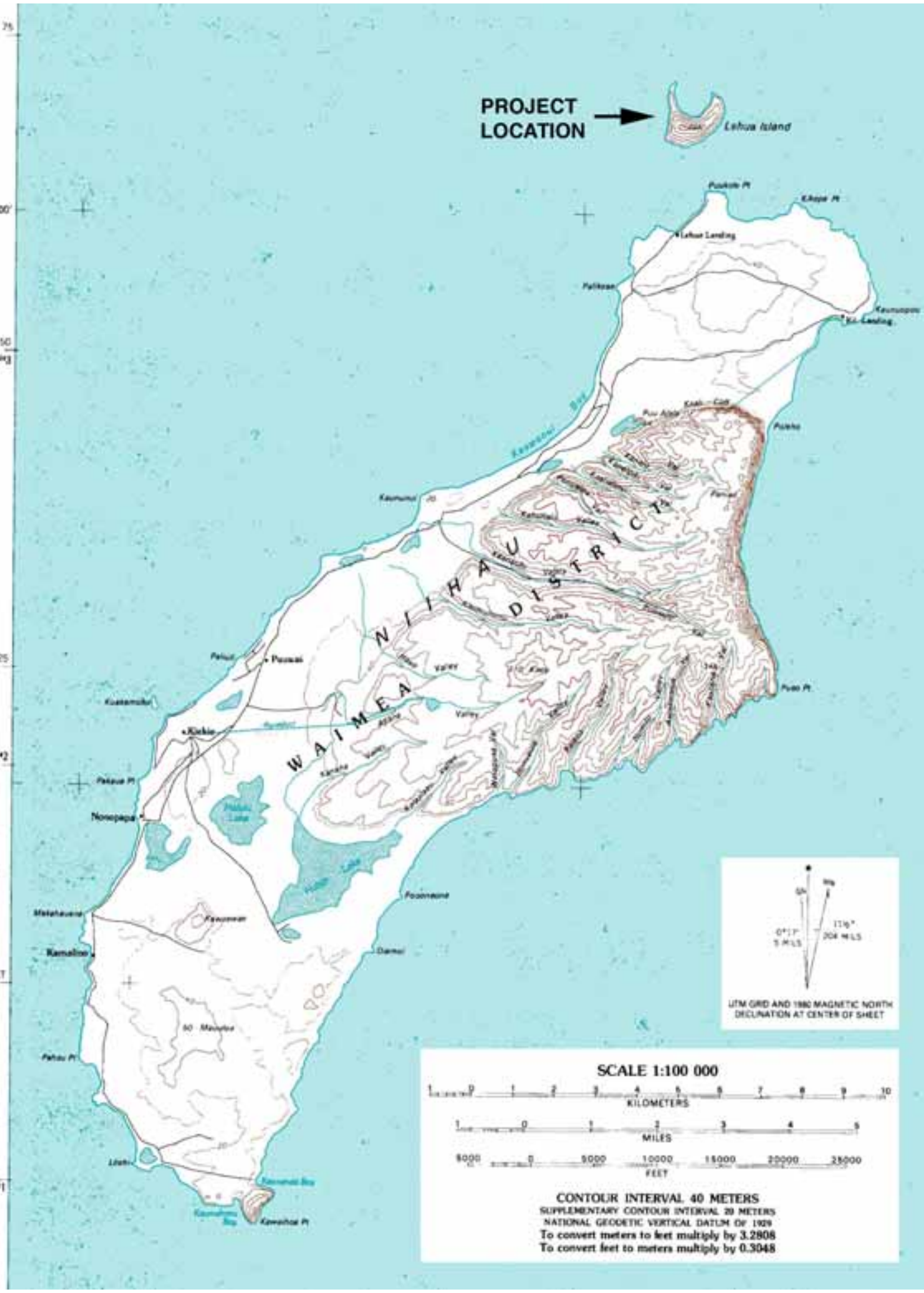


FIGURE 1: Location of Lehua Island off the Northern Tip of Ni'ihau (USGS).

leaving the crescent-shaped southern half of the crater that encompasses a total of approximately 291 acres (118 hectares)[1]. The crescent is defined by "horns" on the west and east that create a small, 2,900-foot (918 meters) wide embayment (Photo 1). The crest line of the crater measures 9,250 feet (2,737 meters) in length. The summit is located at an elevation of 702 feet (213 meters) above sea level and is situated slightly west of center on the crest line (Photo 2). The width of the crescent at the summit is about 2,600 feet.

The western horn extends northward about 4,000 feet from the summit with a gradual decline in elevation from the summit to the northern end of the western horn where the elevation is 250 feet (Photo 3). The width of the west horn at the northern tip is 600 feet. Approximately 350 meters south of the northern end of the west horn is a natural arch or bridge that may reflect a fault line.

The eastern horn extends from the summit for a distance of about 5,350 feet. The northern tip of the horn drops from an elevation of 400 feet to sea level. The width of the eastern horn averages 1,500 feet (Photo 4). On the interior face of this horn is a marine bench located just above sea level and containing seawater. The bench measures around 50 meters wide and 200 meters long.

PHOTO 1: Aerial View of Lehua Island (Google Earth)

[1] According to the 2005 EA, the three-dimensional surface area of Lehua is approximately 310 acres, and they note that previously reported acreage estimates vary.

PHOTO 2: Lehua Island viewed from the east-northeast.

PHOTO 3: West horn of Lehua Island from the summit, view NW of the interior slope.

PHOTO 4: East horn of Lehua Island from the crescent rim, view NW of the interior slope.

PHOTO 5: Southeast flank of Island showing steep slopes and nearly vertical sea cliffs

The crater has been eroded by rain, springs, wind and waves. The interior slopes of the crescent are steep with eroded, stepped ledges (2m wide and 1.5-2.0m high), wave-cut benches, burrows created by nesting birds, and sparse vegetation. The exterior slopes have an average slope of 30˚ with wider wave cut benches along the shoreline that form raised level bluffs. The wide erosional bench on the southern exterior is protected from southerly storm waves by Niçihau. Associated with these benches are sea cliffs that vary from 30 to 200 feet in height along the southern exterior (Photo 5). Rainfall and springs have eroded numerous small gullies and drainage channels along the exterior slopes.

A natural landing is located along the central southern exterior face of the crescent where there is a surface of tuff at sea level. Two sea caves are located immediately west of this landing.

ENVIRONMENTAL SETTING

The environment of Lehua Island is characterized as arid and barren. There is a general lack of vegetation due to both climatic and soil conditions on the island. The climate of Lehua Island is characterized as arid with strong, continuous winds. While the Hawaiians may have used the island in the past to gather bird eggs, catch birds, and fish, the island is inhabited today by only a large population of seabirds.

GEOLOGY

Lehua and Kaçula, located to the south of Ni'ihau are similar cones with craters created by volcanic activity. Lehua was created by an explosive pyroclastic volcanic eruption of ash and fine basalt particles from a vent of the Niçihau volcano when hot magma came into contact with water. In these eruptions of ash and fine particles, the wind sorts the ash and creates a layered or bedded deposition. This sorting and wind conditions at the time of the eruption also influence the shape of the crater. When the ash becomes cemented soon after deposition, it is referred to as tuff. Traversing the horizontal bedding are numerous vertical joints that allow for greater water access which hardens the tuff. These joints are evident on the crater rim where the softer tuff has eroded from around them (Photo 6).

There were several phases of the eruption and due to the steepness of the crater slopes, much of the ash slid down into the sea-filled center of the crater (Palmer 1937: 19-20). The tuff material from Lehua has created a number of tiny islets close to the north shore of Niçihau (ibid).

There are 3 types of tuff reflecting the phases of the volcanic eruption (ibid):

Pre-summit tuff - Tuff deposited during the oldest phase of the eruption. This tuff is exposed along the south shore and is characterized by the horizontal bedding. There was wave erosion with down-faulting on the west side of the crater before the next phase of volcanic activity.

Summit tuff - Middle phase with the greatest volume of tuff. Found on the crest and most of the outer and inner slopes. This tuff was deposited as far as Niçihau and the islets off the northern tip of Niçihau are believed to be from this eruptive phase. Stream and wave erosion followed this deposition, along with some reef growth in the bay. Evidence of landslides along tip of east horn and part of the west horn.

Post-summit tuff - Youngest phase with ash deposits at the end of the eastern horn and part of the western horn. Contains reef rock suggesting some level or coral reef formation between the Summit and Post summit phases.

The tuffs are traversed by a number of vertical joints. These joints are where air and moisture have gotten into the ash and created harder surfaces.

The southern exterior flank of the crescent is the most accessible. There is a relatively level bluff or bench between the steep slope and the shoreline that is dissected by gullies. Two sea caves have been eroded into this slope (Photo 7).

FLORA

The plant cover on Lehua Island is characterized by low growing shrubs and crawling groundcovers. The botanical surveys conducted between 2001 and 2003 indicate the presence of 22 native plant species and 27 non-native naturalized species (refer to Wood et. al. 2003 for complete listing). The first botanical survey in 1931 by Caum noted the presence of *panini* cactus and lantana. In 1963, visitors to Lehua described the *panini* as gone (Richardson 1963). There is no *panini* or lantana on the island today. There are references to the Robinson family, owners of Niçihau, making an effort to exterminate lantana from Lehua to prevent its spread to Niçihau (Tabrah 1987:134).

Sometime after the 1930s, Sourbush (*Pluchea spp.*) and Abutilon (shrub in the mallow family) became the dominant shrub vegetation. These shrubs are important as nesting sites for the red-footed booby population. The other major non-native species is buffelgrass (*Cenchrus ciliaris*).

PHOTO 6: Vertical joints visible on the rim of the east horn.

PHOTO 7: Shoreline along the southern exterior showing landing and channel.

Rabbits (now eradicated), the arid climate, strong winds, and small pockets of soil are limiting factors for vegetation growth on Lehua Island. Much of the vegetation is found along the southern side of the crescent where sediments have accumulated in gullies and atop the raised shoreline benches (Photo 8). This vegetation is predominantly *paçuohiçiaka* (*Jacquemontia ovalifolia*), a vine that was noted as a prevalent plant by Caum in 1931 and the dominant plant today (Wood et al. 2003).

FAUNA

Seabirds. The island is populated by a large number (approximately 3,000 or more) of native seabirds, including the red footed and brown booby, wedge-tailed shearwater, petrel, and noddy. The red-footed booby is by far the most numerous of the seabirds, with nests in the *Pluchea* shrubs (Photo 9). The black noddy inhabit the two sea caves in large numbers. The black-footed and Laysan albatrosses dominate the interior face of the crescent during their nesting season.

Rabbits. It is uncertain when rabbits were introduced to Lehua Island, but the population was well-established in 1931-32 when the first botanical survey was conducted (Caum 1936). During a subsequent survey of the birds of Lehua in 1963, it was noted that there were only a moderate number of rabbits, rather than being overrun as described by Caum in the 1930s (Richardson 1963). The rabbits displayed a distinctive black and white pelage pattern and at the time of the archaeological survey were especially numerous in the gully areas by the landing on the southern exterior slope (see Photo 8). As previously mentioned, the population has subsequently been eradicated.

Rats. Polynesian rats were likely introduced to Lehua prehistorically. Rats of an unspecified species were first recorded on Lehua by Caum (1936). Surveys in 2003-2004 confirmed the presence of a population of *Rattus exulans* (Polynesian rat) on the island (Wood et. al. 2006).

Marine Fauna. Monk seals were seen hauling up on the southern shoreline during the field visit. The waters around Lehua are frequented by dolphins, humpback whales, green sea turtles, and sharks.

PHOTO 8: Vegetation pattern along southern exterior slope. Note rabbits.

PHOTO 9: Use of pluchea bushes by nesting red-footed booby.

HISTORICAL OVERVIEW

Lehua Island is believed to be named for the *lehua lei* left on the island by Hiçiaka when she accompanied her sister, Pele, on her first visit to Hawaiçi. The *lei* was left when their brother, Käne-çäpua, decided to stay on Lehua (Pukui et al. 1976: 131).

There is no evidence that Hawaiians occupied Lehua Island for more than a couple of days at a time, with the exception of one reference suggesting longer occupation in the 19th Century (Tava and Keale 1989). Although Lehua is larger than Necker or Nihoa Islands that were inhabited prior to Western Contact, Lehua would not have been an attractive site for long-term occupation. It is dry, barren, and windy with no fringing reef, beaches, or canoe landings. Much of Lehua consists of steep slopes with little soil, sparse vegetation cover, and few freshwater seeps. Lehua offers subsistence via fishing and bird hunting, but agricultural opportunities are hampered by the steep slopes and the cemented tuff soils.

TRADITIONAL HISTORY AND PLACE NAMES

The following place names have been recorded for Lehua Island (Tava and Keale 1989: 99-100) (Figure 2):

Kanukuapuaça - The southwestern point of the island that has the appearance of a pig's snout.

Kaunuakala - The summit of Lehua.

Keaulepe - The arch on the western horn. It is said that a man tried to pry the land apart to prove his love, but it took him two attempts.

Keananoio - The cave of the *noio* bird.

Haliçi - The boat landing and the name of a *punawai* [spring] and channel between Lehua and Niçihau.

Waihunaakapaoço - Another *punawai*. Fish would climb up into the cracks and hide themselves. When men visited, the fish jumped back into the ocean. When the men investigated, the found freshwater dripping off the rocks and running to the ocean. So the men built a *punawai* to catach the water for drinking. Name translates as "hidden waters of the *paoço* (fish)".

Papaloa - "Long Reef"

Waikulu - "Dripping Waters." Fresh water seeps from these rocks.

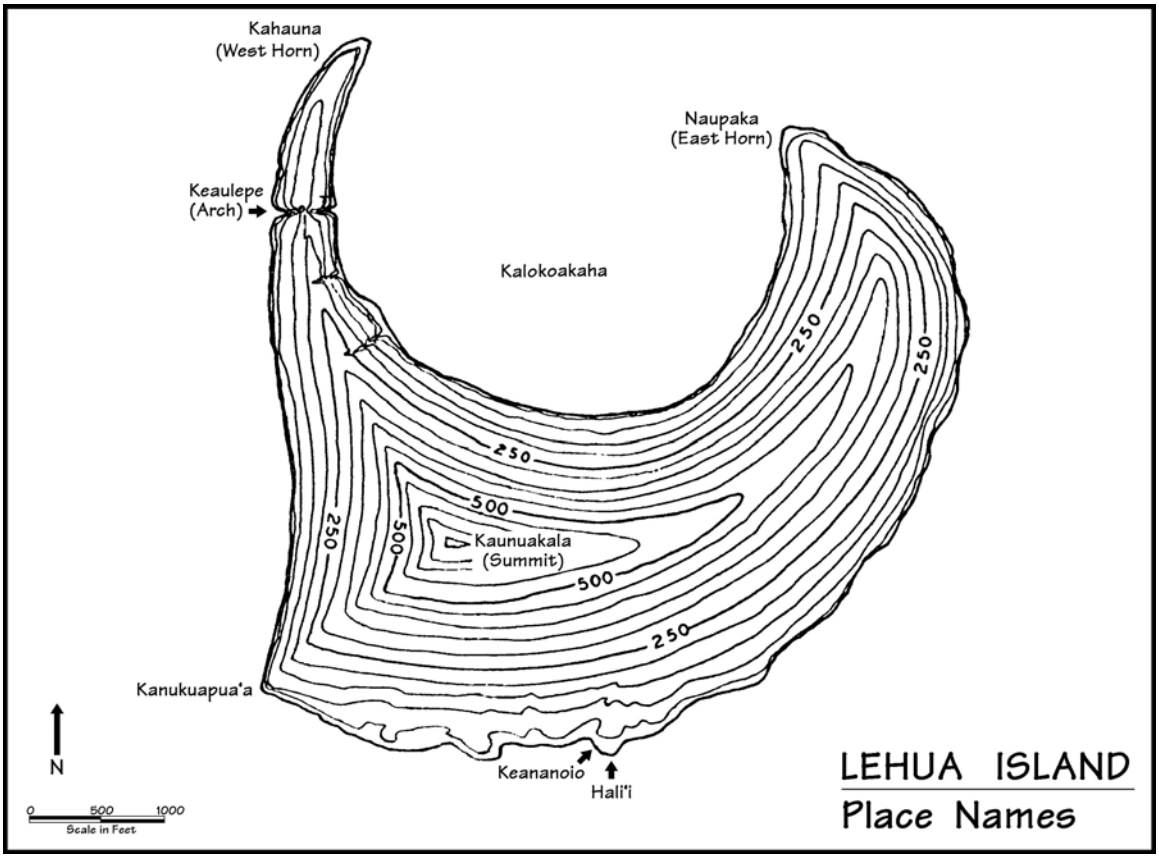


FIGURE 2: Map of Lehua Island showing location of various place names.

[The following place names were given with no further definitions]

Kahauna	["the stench" - maps indicate this refers to the west horn]
Minolii	
Kalokoakaha	[possibly "the sliced open lake/pond" - maps indicate this refers to the inner crescent]
Naupaka	[maps indicate this refers to the east horn]
Keanamoi	["cave of the *moi*" – no location given]
Kapoliolehua	["the bosom of Lehua" – no location given]
Kukaiaiki	
Moae	The wind of Lehua Island.

There are also several words and phrases attributed to Lehua (ibid):

Kapoliolehua - "Cradled in the bosom of Lehua" Refers to the *lehua* flower left by Hiçiaka on her first visit.

Aia i ka mole o lehua - "At the foundation of Lehua" Said of one who has been gone a long time.

Ke hao aela ka makani koa pua ia o Lehua –
"The wind beats Lehua, barrenness is her flower" Describes the natural conditions of the island.

Aina nui o Niçihau piliwale mai o Lehua –
"Great is the land of Niçihau and Lehua is nearby".

Kukaiaiki was the shark of Lehua and the Kaulakahi Channel between Kauaçi and Niçihau (ibid: 21). His cave was located on the west side of Lehua. Kukaiaiki was the son of Kuhaimoana, the shark god that migrated to Niçihau with Pele from Tahiti and lived in a cave at Kaçula. These sharks were *aumakua* for the people of Niçihau. The stories of Kuhaimoana also make reference to the importance of the birds of Kaçula (Tava and Keale 1989: 101):

Ailana o Kaula I ka mole olu home pohai mau ana manu
"The island of Kaçula is the ancestral home of the birds".

Several Hawaiian *oli, mele*, and *hula* mention Lehua Island, often in the context of listing the islands north of Kauaçi. Two examples are as follows (Emory 2002: 8):

From the *mele* of Hiçiaka:

Ea mai ana ma Nihoa	Comes from Nihoa,
Ma ka mole mai o Lehua	From beyond Lehua.

From the chant recounted by Kawela Mahunaaliçi:

Ea mai ana ke ao ua o Kona	The rain cloud of the south comes,
Ea mai ana ma Niho-a,	Comes from Nihoa,
Ma ka mole mai o Lehua,	From beyond Lehua,
Ua iho a pulu ke kahakai.	Rain has flooded the beach.

The following verse from *He Mele no Kane* (one of 6 in the *mele*) was collected by Emerson, and may refer to the freshwater seeps on the south side of the island:

E u-i aku ana au ia oe,	A question I ask of you:
Aia i-hea ka Wai a Kane?	Where is the water of Kane?
Aia i Kau-lana-ka-la,	Out there with the floating Sun,
I ka pae opua i ke kai,	Where cloud-forms rest on Ocean's breast,
Ea mai ana ma Nihoa,	Uplifting their forms at Nihoa.
Ma ka mole mai o Lehua;	This side the base of Lehua;
Aia i-laila ka Wai a kane.	There is the water of Kane.

USE OF SEABIRDS BY PRE-CONTACT HAWAIIANS

Seabirds were important in pre-contact Hawaiçi as a source of food. Their bones were used to make bone points and the tail feathers of the tropicbird (*koaçe*) were used for *kahili* (Emerson 1864: 103). The large *iwa* (frigate bird) was caught by hand, eaten, and the feathers used for *kahili* and for decorating the Makahiki image (Malo 1951: 40). Other seabirds mentioned as edible are the *kaçupu* (albatross), *çä* (booby), *mölï* (Laysan albatross), and *noio* (brown noddy) (ibid). While Kaçula Island is noted in several references as a source of birds for Hawaiians, there were no references found that mention Lehua as a source of birds. However, the large population of seabirds today on both Lehua and Kaçula suggests that Lehua Island was also an important locale for gathering seabirds.

How the Hawaiians gathered the seabirds is not well documented. Malo makes reference to catching the *iwa* by hand on Kaçula and Nihoa and it is possible that many of the seabirds could be caught while nesting. The use of spears, clubs, snares, nets, and stones has been documented for forest birds and waterbirds. There was a stone implement recorded from "Bowl Cave" on Necker Island that Kenneth Emory discussed as a possible bird-snaring perch, similar to forms used in New Zealand (Emory 2002: 96).

The habitat of the nesting seabirds varies, but most of these nesting sites would be accessible to Hawaiians. The habitats and associated birds* noted on Lehua Island are:

Burrows - petrels and shearwaters
Cliffs & caves - noddy and tropic bird
Rock piles - brown booby
On vegetation – red-footed booby
*Albatrosses were not on-island at the time of the survey, but prefer open ground.

Archaeological excavations in a lava tube at South Point (Site H-8) on the Island of Hawaiçi indicate that seabirds were a major part of the diet in the early occupation layer, ca. A.D. 700. The number of bird bones declined in later occupation layers, suggesting that human consumption may have reduced the bird populations (Kirch 1985: 86).

Excavations along the Nä Pali Coast of Kauaçi also show a fairly large amount of bird bone in the midden. A rock shelter in Kalalau (Site Kal-4, State Site No. 50-30-02-7084) was tested by State Parks archaeologists in 1983. The dating of this cultural sequence is limited to volcanic dates from a middle cultural deposit, ca. A.D. 1650-1700. The bird bone, specifically petrel and shearwater, is most abundant in the earliest occupation layer. The bones were from the body, legs, and wings, but no skulls were present, which could reflect butchering and/or preparation methods (Yent and Ota 1983: 62-65). In this early occupation, molluscs, fish, and bird were the major components of the midden with an absence of mammal bone. In the more recent occupation layers, the quantity of bird bone in the midden had dropped substantially. However, there was a relatively high number of bird bone points in the artifact assemblage during the later occupation. It is believed that these points were used to extract the animal out of the shell of molluscs, such as *pipipi*.

A series of excavations were conducted at Nuçalolo Kai, a coastal flat to the west of Kalalau along the Nä Pali Coast. These excavations also indicated a high amount of bird bone in both the midden and as a material to make bone points. A major excavation at Site 50-30-01-196 by Bishop Museum between 1959 and 1964 exposed a stratigraphic sequence of occupation from circa A.D. 1380 until 1920. Current research is being conducted by graduate students at the University of Hawaiçi at Mänoa on the bird bone in the midden and the manufacture and use of bird bone points. Testing of other sites in Nuçalolo Kai by State Parks archaeologists in 1985 and 2000 found that bird bone was more abundant at Kalalau than Nuçalolo Kai, but bird bone remained an important material for the production of bird bone points (Yent 1985; Major and Carpenter n.d.). The excavations in 2000 found that bones of albatross, shearwater, and petrel were represented in the deposits. At Nuçalolo, the role of sea birds in the diet appears to be limited in comparison with the molluscs, fish, and urchins (Yent 1985: 48).

Limited excavations were conducted at several of the bluff shelters on Nihoa. Bird bone awls or needles were noted at one bluff shelter (Site 58) (Emory 2002: 35). There is no mention of the presence/absence or abundance of bird bone as midden. However, Emory suggests fish, birds, and bird eggs would have been abundant (ibid: 12).

WESTERN CONTACT

William Bayly, astronomer with the Cook expedition, made several entries in the logbook of the HMS Discovery regarding Lehua Island:

"To the north of Neehow [Niçihau] is a small Island called Oreehooa [Lehua] & two small Islands to the S.W. - Atowrooa [Kaçula] & Mogoo Papappa or Flat Island as Mogoo is an Island-& Papappa-flat. These three are uninhabited, which together with Neehow belong to the King of Atawooi [Kauaçi]."

(Bayly, March, 1779)(Adm 55/20 back of p. 180)

Captain James Cook sailed in the vicinity of Niçihau, Kaçula, and Lehua and landed on Niçihau in 1778. He noted the language, dress, tatoos, houses, crops, and the *makaloa* mats made by the inhabitants. In return for the sweet potatoes and yam, he left 3 goats, 2 pigs, pumpkin, onion, and melons. He estimated the population of Niçihau at 10,000.

Captain George Vancouver raised issue with some of Cook's information and sailed to Lehua in 1792 to correct this information:

"A report having prevailed that Captain Cook had erroneously separated Oreehooa [Lehua] from Onehow [Niçihau], it being asserted that inhabitants walked from one place to the other; and that Captain King had been misinformed as to the number of inhabitants being four thousand. As these facts could be easily ascertained, we steered over for Oreehooa, and passed within a quarter or half a mile of its shores. It was soon proved that Oreehooa is positively separated from Onehow by a channel about a mile in breadth; and though the depth of the sea appeared by its colour to be irregular, it was manifestly far too deep for the people to walk across from one island to the other . . . . With respect to the population, Captain King must doubtless have been led in an error. The island of Oreehooa is of very small extent, and wholly composed of one rugged, naked, barren rock, to all appearance destitute of soil, and presenting no indication of its being, or having ever been the residence of human creatures." (Vancouver 1984: 897-8)

POST CONTACT HISTORY

The islands of Kauaçi, Niçihau, Lehua, and Kaçula were under the control of King Kaumualiçi until 1810 when he ceded the islands to Kamehameha I. At this time, oral traditions suggest that Niçihau had a population around 5,000 (Gay 1981: 43). Sweet potatoes, yams, and salt were products from Niçihau that were traded with the whaling ships and trading vessels. In fact, Niçihau was known as the

"Yam Island" by many sea captains traversing the Pacific (Joesting 1984: 189). In 1828, Kamehameha III offered to exchange Lehua Island for a Western ship, but the offer was not accepted (Broeze 1988:53).

The population of Niçihau after Western Contact appears to have been reduced by numerous migrations to Kauaçi, including Häçena, Kalalau and Nuçalolo along Nä Pali Coast, as well as Waimea and Kekaha. Some of these migrations in the 1700s may have been due to droughts. Around 1800, there was a major migration that reduced the population to an estimated 4,000. A final migration took place around 1858 when the government raised the lease prices on Niçihau (Tava and Keale 1989: 46). During the Great Mähele of 1848-51, there were no claims or Land Commission Awards on Lehua.

There is a reference to the people of Niçihau moving to Lehua when they heard their island was up for sale (Tava and Keale 1989: 99). Niçihau was purchased for $10,000 by Elizabeth Sinclair from King Kamehameha V in 1864. These new owners started a ranching operation, introducing sheep and cattle to the island. There is another mention of people migrating from Niçihau to Lehua when the Sinclairs ordered all dogs to be killed to protect the livestock and many Niçihauans refused to kill their dogs (ibid: 46). However, there is no physical evidence on Lehua that this migration occurred or that "many people once lived on Lehua" (ibid: 99). By 1868, the population of Niçihau had declined dramatically, to an estimated 300 people.

The owners of Niçihau leased Lehua from the Territory of Hawaiçi to protect the seabirds that nest there and to eradicate weeds, such as lantana, which could be carried to Niçihau and damage the grazing lands.

NAVIGATIONAL LIGHT

Lehua was transferred by the Territory of Hawaiçi to the federal government for a lighthouse reservation in 1928 (Dean 1991: 154). The U.S. Lighthouse Service established an automatic gas light on the summit of Lehua on April 24, 1931. Referred to as the Lehua Rock Light, this navigational aid was one of the most difficult to establish in Hawaiçi and holds the record as the highest beacon in the U.S. Lighthouse Service. The Coast Guard used the landing on the southern side of the island to unload construction materials from boats (Photo 10). On a 60-foot high bluff to the west of the landing, they built a derrick, a small building to house the gasoline engine for the hoist, and an acetylene gas supply house. A pipeline ran the gas from the supply house to the light. The light at the summit was mounted on a concrete tower (Photos 11-12). In 1989, the unit was changed to a solar-powered light atop a fiberglass pole. The Coast Guard now maintains the light by helicopter, rather than boat (ibid.).

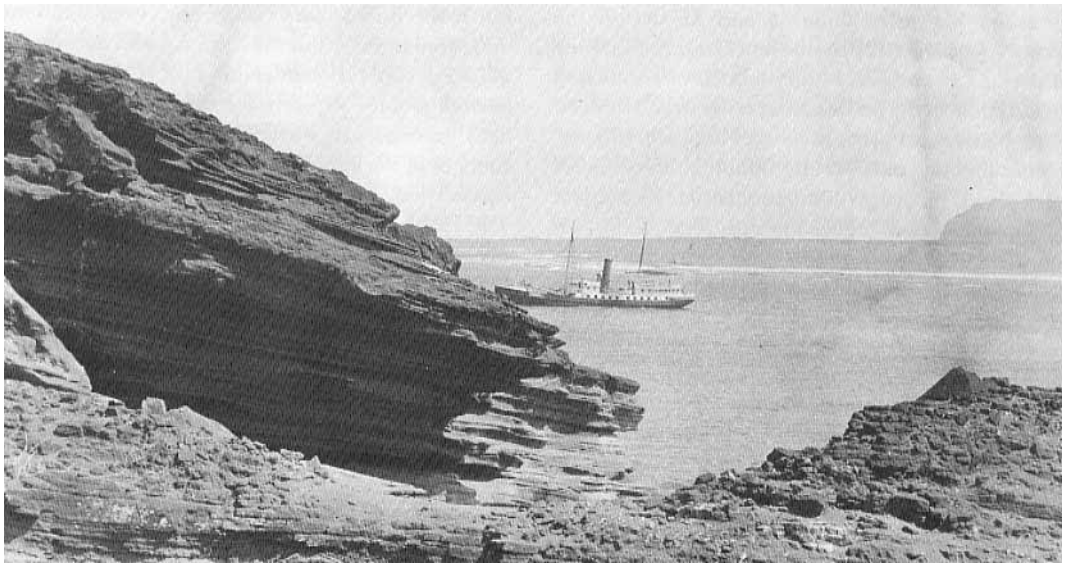


PHOTO 10: The lighthouse tender Kukui at anchor off Lehua Island during construction of Lehua Rock Light in 1931. Taken from Dean (1989: 161).

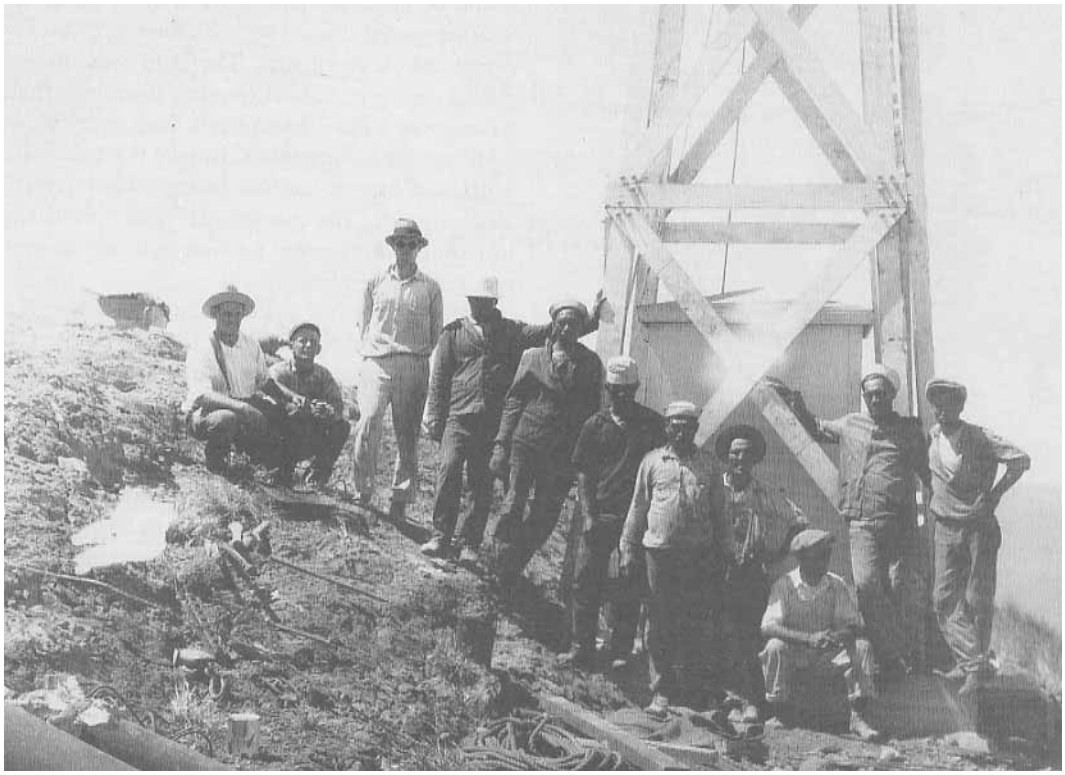
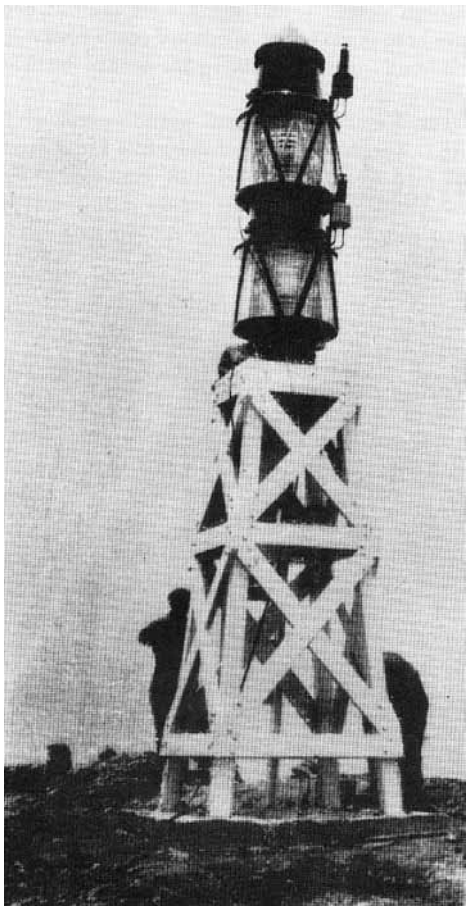


PHOTO 11: Construction crew upon completion of the Lehua Rock Light in 1931. Taken from Dean (1989: 156).

PHOTO 12: Navigation light on Kaʻula that resembles light built on Lehua (Dean, 1989: 159).



PREVIOUS ARCHAEOLOGY

The survey conducted over 10 days between September 2003 and August 2005 represents the first systematic archaeological work conducted on Lehua Island. However, other researchers who visited Lehua Island in the early 20th Century provided some insight into the archaeological sites on the island.

A geological study conducted by Harold Palmer between 1928 and 1931 noted a platform built of rocks near the southern cliff edge at an elevation of 60-65 feet (Palmer 1937: 8). He discussed this site with Dr. Kenneth Emory who said it was probably built by bird hunters or possibly fisherman. Palmer states that no other features of archeological or ethnological interest were seen on Lehua (ibid: 8-9).

Two photographs and a map in the collection of the Bishop Museum show a platform feature on the southern coast, presumably the one mentioned above (Bishop Museum Anthro Records). This corresponds to Site 02, Feature 3 in this report. These photos were apparently taken in 1931, as one of them shows the lighthouse tender *Kukui* at anchor in the channel in the same position as Photo 10 (see p. 19). *Panini* (cactus) is visible in the same photo, another clue that the 1931 date is likely correct. One of the photographs is a detailed view of the platform looking upslope (north). It is significant in that is shows that the feature has been little-altered in the intervening seven decades, with the exception of the collapse of a portion of the underlying substratum on its west side. Of potential interest to biologists is the complete absence of any visible birds in either of photographs. An enlargement of the USGS map of the island with the platform location plotted is on file with the photos. It is plotted accurately, with the note "Approximate Location of Stone Platform". These two photos with corresponding map and the mention by Palmer are the only known recordation of any archaeological sites on Lehua prior to the present survey.

PREDICTIVE MODEL

In order to predict the types of sites and distribution of these sites and features on Lehua Island, information about the other islands to the north of Kauaçi was reviewed in addition to the historic background research. The islands of Necker and Nihoa to the northwest of Lehua and Kaçula to the southwest of Niçihau serve as a comparison for understanding the Hawaiian occupation and use of these small islands. While Niçihau to the west of Kauaçi is the largest and remains occupied by Hawaiians today, the island is privately owned and archaeological surveys have been restricted. Surprisingly, the distant islands of Nihoa and Necker are far better studied than the offshore islands of Ka'ula and Lehua. Archaeological surveys have been conducted to varying degrees on each of these islands (Emory 2002).

Kaçula is approximately 19 miles southwest of Niçihau. The island consists of 136 acres with steep, high cliffs and a summit at 562 feet above sea level. Like Lehua, it is a crescent shaped remnant of a volcanic crater. Ocean access to the island is limited to periods of calm ocean conditions and one must scale the steep cliffs. The U.S. Coast Guard built a navigational light on the summit, similar to the one on Lehua Island, but service was discontinued in 1948 (Dean 1991: 154). This island is noted for its abundance of seabirds, especially terns and boobies. One reference states that Kaçula was a rendezvous point for people during the summer months when they went to catch birds or gather olivine for octopus lures (Tava and Keale 1989: 101). The island is also noted for its *opihi* on the sea cliffs that were plentiful and very large. The *mele* and legends support a strong connection between Kaçula and Niçihau and suggest that Kaçula was a special place. In fact, it is said that the natives of Niçihau thought more of visiting Kaçula than visiting Oçahu or Kauaçi (ibid). References state that the island was inhabited in ancient times (ibid). However, it appears that the population was always very small and temporary. There is reportedly a *heiau* on the western edge of the summit and Edgecomb who led the construction of the light recorded 3 sets of stone walls at the top, near the north end, as the only evidence of human occupation (Dean 1991:156). Palmer suggests that these structures were windbreaks and may have been used by fishermen to signal the location of schools of fish to canoes in the water (Palmer 1937:9).

A brief archaeological assessment of Ka'ula Island was conducted in the 1990s (Robins, pers. comm.). Unfortunately, the results of this survey have not been made public.

Nihoa, approximately 150 miles northwest of Niçihau and Kauaçi, is a small volcanic island, 156 acres (63 hectares) in size with 2 summits at about 850 feet above sea level. In contrast with Lehua and Ka'ula, Nihoa was clearly inhabited prehistorically. Based on the extent of agricultural terraces, it is estimated that 12 acres were in cultivation, probably growing sweet potato, and there are numerous house platforms. A population of 170-220 has been postulated (Emory 2002: 12), though Kirch (1985) believes this is an overestimate, suggesting that the island would have been unlikely to support over 100 people. In addition, Nihoa contains ceremonial platforms denoted by uprights, including dike prisms, and coral. Water sources consist of several seeps. In the 1920s, the vegetation was limited to *loulu* palms in two valleys, as well as grasses and shrubs. A large bird population now inhabits the island.

Recent dating of corals collected from nine ritual sites on Nihoa indicate that these sites were utilized in the 16th Century, with the dates ranging from 1515-1570 CE (Kikiloi, pers. comm.).

Necker, or Mokumanamana Island, located 300 miles northwest of Niçihau, is more like Lehua as both are remnants of volcanic cones. Necker comprises just 41 acres (16 hectares) with the summit at 278 feet. It receives only about 25" of rainfall annually and there are but two small seeps of groundwater. The island is barren with a cover of native grasses and shrubs. The crest of Necker is marked by 33 "marae", defined as rows of upright slabs set in low platforms (ibid: 59). A number of unique stone carved human figures have been collected on the island, adding to the intriguing theory that Necker was settled for a time in isolation, possibly even by a marooned group of Polynesians (Carlquist 1970, in Kirch 1985). An alternate theory for the shrines of Necker is that they were built by groups who voyaged to the island on "pilgrimages" from Nihoa or the main Hawaiian Islands. There is little evidence of housesites or cultivation plots on the island, but several bluff shelters have been identified. Therefore, it does not appear that Necker supported a large population and the occupation may not have been permanent, but it appears to have been an important religious site based on the large number of ceremonial features (ibid: 117).

Kaçula, Lehua, Nihoa, and Necker Islands are all characterized by their relatively small size, their steep slopes with limited vegetation cover, and their large bird populations. Visitors to these islands have commented on the abundance of tern, booby, and frigate birds in the air and nesting on the ground and atop vegetation. The islands of Kaçula and Lehua were probably not inviting places for human occupation because they were difficult to access, except under calm ocean conditions, and there was little level land or soil development for habitation or agriculture. Instead, these islands likely were important resource areas for fishing and bird gathering. The presence of *koça* and *heiau* structures suggest that these islands were also significant in the religious realm.

Based on this survey of the other small volcanic islands to the north of Kauaçi and the environmental setting of Lehua Island, it is predicted that long-term occupation and agricultural sites will be absent or very limited. Temporary habitation sites along the shoreline are possible. Religious sites, including *ahu, koça*[2], and small *heiau*, would be more likely to be present. The presence of these sites on the crescent rim and shoreline promontories would be predicted. Like the other islands, Lehua was probably significant for its bird resources and fishing in waters around the island. Therefore, if any cultural deposits are present, these deposits are likely to contain bird bone, fish bone, and molluscs.

[2] The tem *Ko'a* is generally taken to refer to a fishing shrine. However, in the context of Lehua, such features would be just as likely, if not more so, to represent bird-catching shrines. According to native Historian Kamakau (1976:133), "On islands inhabited by birds, the bird catchers who caught birds by imitating their cries and then snaring them (*kono manu*), or who smoked them out of their nesting holes (*puhi manu*), or who drew them out from their holes (*pu manu*) also set up *ko'a* to give life to the land by an abundance of birds."

METHODS

On September 27-28, 2003, a preliminary archaeological inventory survey was conducted by State Parks archaeologists Martha Yent, M.A. Principal Investigator, and Alan Carpenter, B.A., accompanied by Nancy McMahon, M.A., Kauaçi Island Archaeologist with the State Historic Preservation Division. Two survey transects were conducted during the two days (Figure 3):

Transect 1 - From the landing and walking west along the exterior southern slope of the crater, a survey was conducted atop the raised coastal bluff that is dissected by a series of erosional gullies and drainage channels running downslope to the coastline. At a distance of approximately 2,500 feet (750 m) west of the landing is the point known as Kanukuapuaça. The survey transect followed the ridge line from this point to the summit. This route traverses the steep exterior slope of crescent for a distance of approximately 1,500 feet (450 m). From the navigational light at the summit, a survey was conducted along the crescent rim toward the end of the East Horn, a distance of approximately 4,000 feet (1,200 m).

Transect 2 - From the landing and walking east along the coastline of the exterior southern slope, a survey was conducted atop the raised bluff dissected by gullies and channels. This bluff is an extension of the bluff running west from the landing to Kanukuapuaça (Transect 1). This survey covered a distance of approximately 1,600 feet (500 m) from the landing. The total length of the bluff as covered by the two transects is approximately 4,500 feet.

Between July 13-17, 2004, follow-up survey work and test excavations were carried out under the direction of Alan Carpenter, field supervisor with the generous assistance of volunteer participants Thomas Dye, Ph.D., and Jeff Putzi, B.A. Survey transects followed and expanded upon the earlier survey work.

Transect 3 – This transect followed the earlier Transect 1, but was extended to include approximately half of the length of the crest of the west horn, roughly 500 m from the summit. It also encompassed the sloping point of the east horn to the very northern brink of passable land.

Transect 4 – Roughly followed and expanded on Transect 2. It examined the region upslope of the earlier transect and expanded the survey northeastward on the south flank for a distance of roughly 300 m (100 feet).

During the survey, each archaeological feature was assigned a temporary site number and the approximate location plotted on a map of the island. GPS

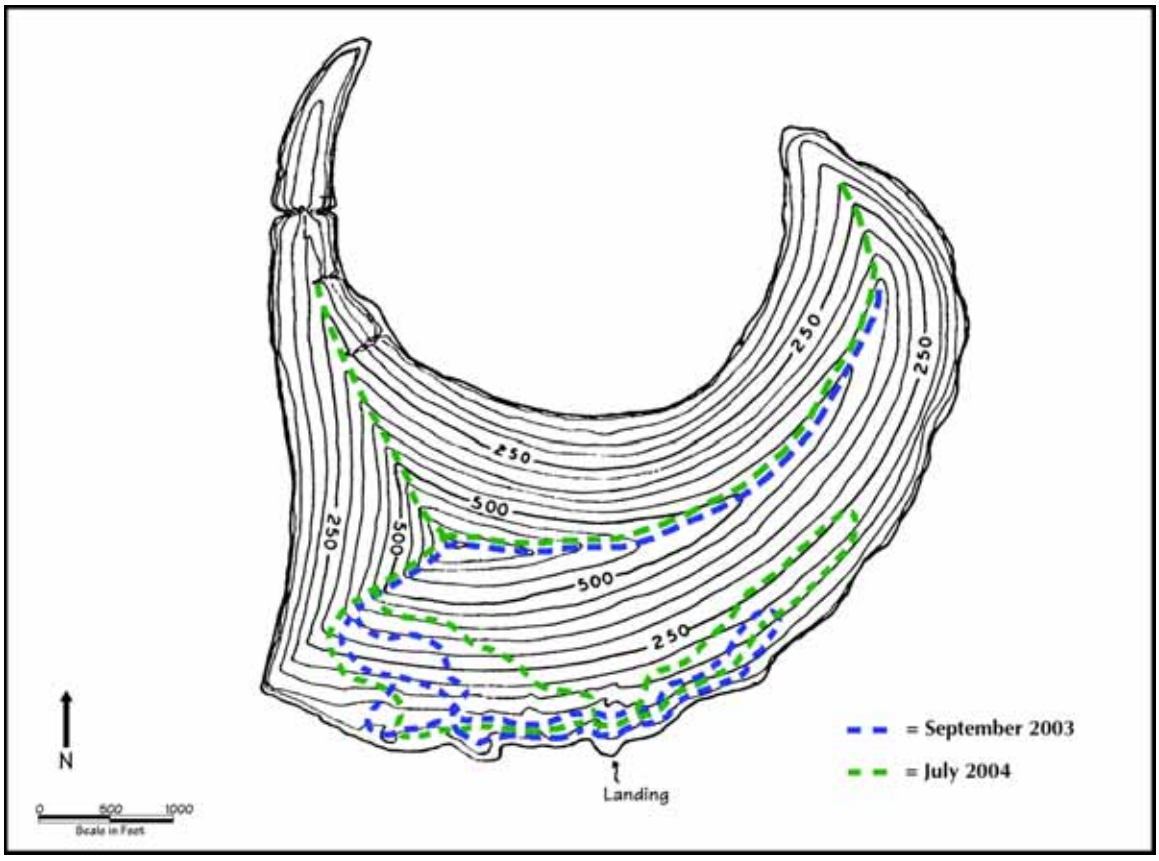


FIGURE 3: Transects walked during the Lehua archaeological survey.

readings were also taken at each feature for a more precise mapping[3]. Each minor feature was measured (length, width, and height), briefly described and photographically documented. Site boundaries were clearly defined by the extent of surface remains, as all areas with constructed surface features were built atop cemented tuff, precluding a corresponding subsurface component which could have extended the boundary of the site. Plan-view and profile maps were drafted for the two platform features (Site –02, Features 3 and 5), for the largest *ahu* on the crescent rim (Site –01, Feature 23), and for the small terrace feature (Site -02, Feature 1). These features were mapped via tape and compass

[3] On the initial survey trip (9/03), GPS points were collected with a Garmin unit without differential correction. On the subsequent survey (7/04), points were collected with a Trimble unit, then post-processually differentially corrected. When points were taken using both instruments, the differentially corrected results are shown in the site location figures, reflecting a greater precision. However, subsequent comparison of corrected and non-corrected points indicate that the accuracy was quite comparable (typically within less than 5 m, and often within circa 1-2 m) with the uncorrected points. Given the barrenness of the island, this degree of precision is more than sufficient to assure accurate relocation of features.

at a scale of 1:50. Aluminum site tags were affixed to all traditional features recorded during the survey, engraved with assigned field numbers (see Table 1). Tags were not affixed to the historic navigational light features.

The survey encompassed approximately 15 acres or about 5% of the total acreage of the island. The survey area was restricted by the steepness of the slopes on both the interior and exterior of the crescent. Though the total area covered by the pedestrian survey represents a small percentage of the island, it covered all areas likely to contain archaeological features, including all slopes less than circa 20˚, and the majority of the island's crest (see below).

Excavation was conducted to provide subsurface data regarding the age, function, construction and stratigraphy in locations chosen to show the range of variability evident from surface architecture. One test unit was placed in an area with soil development but devoid of surface features, situated such that the potential for previous use was deemed highly likely. Each unit was adapted to the feature type or landform, and included a stratigraphic trench, two test units, and one shovel probe. All excavation was done by hand and screened through 1/8" mesh. Limited surface collections were also conducted. The excavation units are discussed individually under **Findings**, below.

Collections from the excavations were brought to the State Parks office in Honolulu for cataloguing, analysis and storage. Charcoal, found in just one test excavation, was submitted for identification to determine the lowest possible taxon, and to aid in selection of taxa for radiocarbon dating submission. Taxa identification was performed by Gail Murakami of the International Archaeological Research Institute, Inc. Wood Identifcation Laboratory in Honolulu. Radiocarbon analyses of wood charcoal and marine shell were pefrformed by Beta Analytic, Inc., of Miami. All excavated materials are being stored in the State Parks office in Honolulu with the exception of materials submitted for dating. Project notes, photographs, etc. are similarly on file in the Division of State Parks office.

Following initial analyses on materials collected from one test unit containing a firepit, additional data was desired to determine site chronology. After consultation with SHPD, Carpenter returned a third time to Lehua, in August of 2005, to excavate the remainder of this feature.

JUSTIFICATION FOR LESS THAN 100 PERCENT COVERAGE

The coverage of the survey was dictated predominantly by the island's topography. Transects conformed to areas known to, or possessing the potential to contain archaeological features. In areas not walked, visual surveys were

conducted from multiple vantage points. The almost complete lack of potentially obscuring vegetation, combined with the terrain make it extremely unlikely that any features were missed during the survey. Physical characteristics of the island virtually preclude the majority of it from containing archaeological features. By region, these include the following areas:

West Flank. The west flank is characterized by exceedingly steep slopes (typically 30˚ or greater) and vertically oriented tuff layers which hamper the natural creation of level ledges (Photo 13). Not only is it not suited for the placement of structural features, it is quite hazardous to survey without climbing equipment. No caves are known or were visible on this slope, and the shoreline margins are steeply cut and routinely battered by large waves.

Inner Crescent. The inner crescent is less sloped than the west flank and characterized by stepped natural terraces at its upper margins. It is still markedly sloped however (20˚ or greater) (Photo 14), and is characterized by erosional gullies from the shoreline to roughly two-thirds of the way to the crest. The inner shoreline is steeply cut by wave action and in places a level wave cut terrace exists just above sea level, usually holding ponded seawater (Photo 15).

Northern End of East Flank. Approximately 400 meters east of the landing, the last of a series of tilted slabs situated along the southern shoreline of the island gives way to a steeply sloped flank (circa 30˚) cut by erosional gullies (Photo 16). This slope abruptly gives way to low sea cliffs on the lower end, making shoreline access impossible. We proceeded approximately 500 m (1/3 mile) beyond the easternmost recorded feature and noted no features whatsoever. The slope becomes increasingly steep and less deeply dissected as one progresses further toward the east horn. It would have been extremely difficult to construct features on this landscape, and similarly difficult for them to have survived.

Northern End of West Horn. The crest of the west horn is much more eroded and apparently less stable than the east horn, as evidenced by deep fissures and an uneven, crumbling surface (Photo 17, 18). This makes the area much more difficult to access and presumably much less likely to contain features. It remains, however, the only area not physically covered during the survey which reasonably possesses the potential to contain surface. Based on the remainder of the rim survey, the crest of this ridge may contain additional *ahu*. The likelihood is judged to be very small, based on visual observations and the fact that others who have traversed this area reported seeing no such features.

PHOTO 13: Detail of west flank from summit.

PHOTO 14: Detail of inner crescent slope, west horn in background.

PHOTO 15: Inner crescent shoreline.

PHOTO 16: Steep dissected slope at northern end of east flank.

PHOTO 17: Northern extent of west horn.

PHOTO 18: Exterior (west) view of west horn.

FINDINGS

SUMMARY OF INVENTORIED SITES

Sixty-five (65) features were recorded during the survey[4], and subsequently grouped into three sites. These include Site 50-99-01-01, three clusters of traditional *ahu* features spread along the crescent rim of the island; Site 50-99-01-02, several clusters of traditional features situated on the southern flank of the island adjacent to the shoreline; and Site 50-99-01-03, two clusters of early twentieth century features associated with the construction and maintenance of the Lehua navigational Light. A single outlier feature has been assigned to Site 02. A listing of the features located during this survey, correlation of field and permanent feature numbers, along with locations and site descriptions is summarized in Table 1 and plotted in Figure 4. Following is a summary of surface feature types by site, with detailed site descriptions following.

Site 50-99-01-01

Thirty-six (36) *ahu* features were located on the crescent rim of the island. These were roughly grouped into 3 clusters, with the first concentrated at the island's summit. The second grouping extends in a gentle arc atop the crest of the east horn. Three (3) additional *ahu* were recorded on the rim of the west horn. The crescent rim varies from relatively narrow and steep at the summit to broader and more level toward the east horn where the width of the rim averages approximately 4 meters. The rim of the west horn is markedly steeper, narrower and marred by erosional cracks and other irregularities (see Photos 17-18 p. 31). The interior (north) slope adjacent to the rim is stepped with steep erosional terraces while the exterior (south) flank tends to be more uniformly sloping and less steep. Along the length of the crescent rim are numerous vertical joints. The softer tuff around these joints has eroded, leaving these denser features as raised outcrops along the length of the rim (see Photo 6, p. 9). Vegetation on the rim and upper slopes tends to be sparse with a few scattered pluchea bushes and a ground cover of *çuhaloa* (*Waltheria indica*). The vegetation is slightly more abundant near the summit.

Most of the *ahu* are groupings or irregularly shaped pilings of tuff and basalt cobbles and boulders. While several of the *ahu* show some evidence of stacking, most lack a well-defined shape or form. The tuff appears to have been gathered from nearby sources and some may have been quarried from the vertical joints or other outcroppings. All of these *ahu* have been used by seabirds for roosting and nesting and exhibit a coating of guano.

[4] Seventy-one features were actually recorded in the field. Several were determined to be non-cultural upon further examination, and thus eliminated from the final inventory.

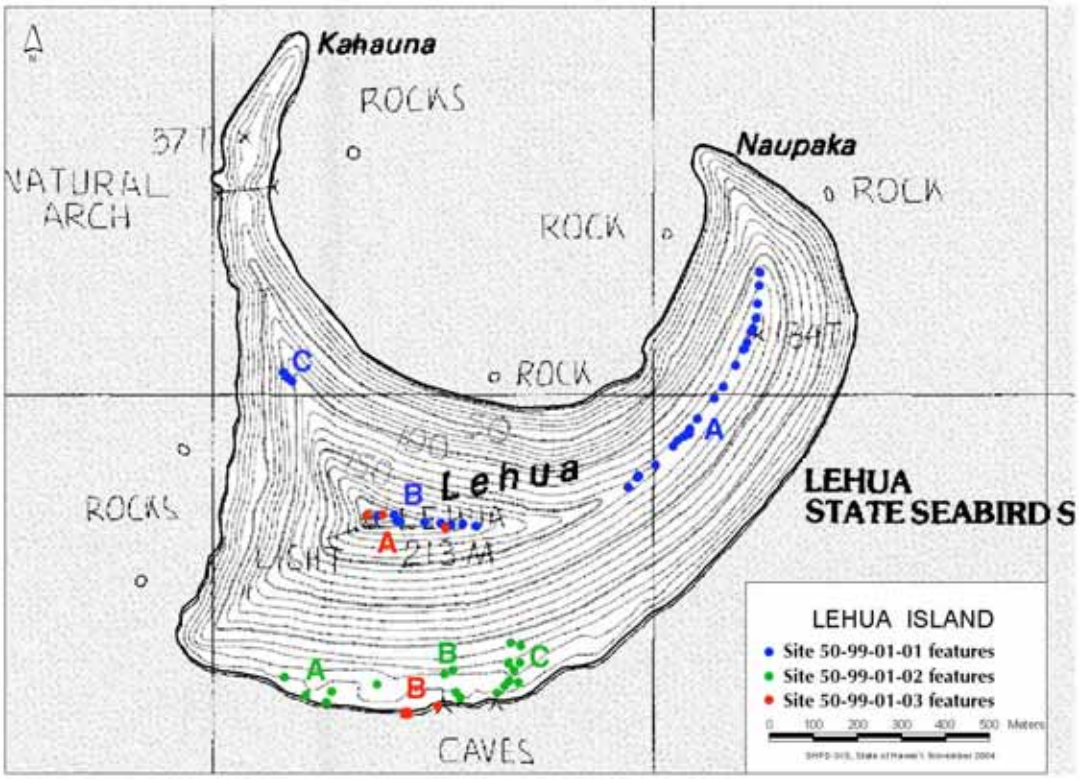


FIGURE 4: Lehua archaeological site locations

Three (3) of the features near the summit are constructed of concrete and metal rebar, including the platform for the current navigational light at the summit. The other concrete platform may be associated with the navigational light or may have been the foundation for a weather station. As these features are historic and unrelated to the traditional stone features, they were assigned their own site designation (see Site 50-99-01-03, below).

The use of these *ahu* by seabirds for nesting, suggests that the features may have been constructed for this purpose. By providing these nesting locations, the Hawaiians may have been facilitating the catching of the birds. Oftentimes, the functional interpretation of *ahu* is that they are markers. Some these *ahu* are visible from offshore and may have had some locational or directional function. Only a few of *ahu* have coral associated with them which could imply a religious function, such as a shrine for bird catching or for fishing. They all appear to be built directly atop the landform with no associated subsurface component.

As these are not major features (in fact, some are little more than a few grouped boulders and cobbles), they were not individually mapped in detail. Each was measured (length, width, height) and photographed. However, since the function and age of these features was open to multiple interpretations, the largest and most well-constructed *ahu* feature (Feature 23), was selected for detailed recording and testing.

Site 50-99-01-02

Nineteen (19) features were found on the relatively level bluff along the southern coastline between Kanukuapuaça and a point about 250 m east of the landing. Three feature clusters and one isolated feature make up the site. This bluff is a transition from the steep exterior slope of the crater to the steep sea cliff. The bluff is dissected by numerous gullies running to the shoreline. This erosion is fostered by seeps and slopewash during rains. Small finger ridges are elevated between the gullies. The finger ridges are marked by outcrops of tuff and burrows of seabirds. Most of the cultural sites are located on the *makai* ends of these finger ridges.

Several features were initially recorded within the gullies. First thought to be cultural features of unknown function, the follow-up survey of July 2004 noted significant changes to several of them in the intervening 10 months, including gain/loss of stone and soil material. This indicated that they are dynamic natural features created by erosional processes and therefore couldn't possibly have survived in the active gullies for a period of 50 years. Based on this evidence we eliminated them from the final inventory of archaeological features.

Most of the vegetation on the coastal bluff occurs in the gullies where there are seeps and waterholes. At the time of the survey, the vegetation was dominated by pluchea bushes and a ground cover of *paçuohiçiaka* (*Jacquemontia ovalifolia*). These vegetated gullies are heavily populated by seabirds roosting on the bushes and burrowing into the softer soil of the gully walls.

The "landing" is located centrally along the southern shoreline. Most of the southern coastline is marked by vertical sea cliffs, averaging 50-60 feet (15-18 m) high, but the landing is an eroded terrace at sea level which provides moderately difficult walking access up onto the bluff.

The traditional Hawaiian feature types composing site -02 include small platform structures, *ahu*, and boulder alignments. Most of these sites are marked by heavy deposits of guano from seabirds using the features as a place to roost.

The two platforms, Features 3 and 5, are the most substantial traditional features on Lehua. Located at the *makai* end of finger ridges to each side of the landing,

these platform locations frame a panoramic view of the northern end of Niçihau and the channel that separates Niçihau from Lehua. Both platforms contain coral suggesting a religious function. Adjacent to Feature 3 on the west side of the landing are two other features that contain shell midden. Feature 2 appears to represent a heavily disturbed platform feature with remnants of the boulder alignment that defined the sides of the platform. The shell midden is suggestive of a habitation site situated on the raised bluff near Feature 3. Another shell and coral scatter (Feature 4) on the bluff to the west of Feature 3 is also suggestive of short-term occupation in this area.

Feature 5, a platform to the east of the landing, lacks shell midden. The site includes both coral and red basalt boulders in its construction. There is an *ahu* feature in the northeast corner of the platform that is frequented by birds and heavily covered with guano.

Site 50-99-01-03. Lehua Rock Light Ruins

The Lehua navigational light and associated features, originally constructed in 1931, qualifies as an historic site due to its age. The original light with its supporting structures and outbuildings no longer exists, having been replaced in 1989 with a modern light feature. Possible remnants of the original light foundation at the summit, as well as foundations associated with light support structures on the southern coastline still remain, however. These features, though located within the geographic boundaries of sites 01 and 02, represent a distinct time period and function, and are therefore assigned a distinct State site number.

Cluster A, made up of three concrete and metal features is located on the crescent rim, just east of the island's summit.

Feature Cluster B, comprising 6 features, is located on a moderately sloping bluff above the southern shore near the landing area, the site of the present campsite area. The features are distributed along edge of steep sea cliff to about 30 m inland. This is a complex of 6 concrete platform structures associated with the construction and maintenance of the original Lehua Navigational Light at the island's summit. Feature 10 is located at the shoreline a little to the east and associated with boat landing and mooring.

TABLE 1: Archaeological Sites on Lehua Island

Site #50-40-01-01 *Crescent Rim*

Feature #	Type	Function	Temporary Site No. (2004)
1	Ahu	ritual / marker	T-4
2	Ahu	ritual / marker	T-5
3	Ahu	ritual / marker	T-6
4	Ahu	ritual / marker	T-7
5	Ahu	ritual / marker	T-8
6	Ahu	ritual / marker	T-9
7	Ahu	ritual / marker	T-10
8	Ahu	ritual / marker	T-11
9	Ahu	ritual / marker	T-12
10	Ahu	ritual / marker	T-13
11	Ahu	ritual / marker	T-14
12	Ahu	ritual / marker	T-15
13	Ahu	ritual / marker	T-16
14	Ahu	ritual / marker	T-17
15	Ahu	ritual / marker	T-18
16	Ahu	ritual / marker	T-19
17	Ahu	ritual / marker	T-20
18	Ahu	ritual / marker	T-21
19	Ahu	ritual / marker	T-22
20	Ahu	ritual / marker	T-23
21	Ahu	ritual / marker	T-24
22	Ahu	ritual / marker	T-25
23	Ahu	ritual / marker	T-26
24	Ahu	ritual / marker	T-27
25	Ahu	ritual / marker	T-28
26	Ahu	ritual / marker	T-29
27	Ahu	ritual / marker	T-31
28	Ahu	ritual / marker	T-32
29	Ahu	ritual / marker	T-32
30	Ahu	ritual / marker	T-33
31	Ahu	ritual / marker	T-34

TABLE 1 (Cont'd): Archaeological Sites on Lehua Island

Site #50-40-01-01 *Crescent Rim*

Feature #	Type	Function	Temporary Site No. (2004)
32	Ahu	ritual / marker	T-35
33	Ahu / Platform	ritual / marker	T-37
34	Ahu	ritual / marker	T-59
35	Ahu	ritual / marker	T-58
36	Ahu	ritual / marker	T-60

Site #50-40-01-02 *South Coast Flank*

Feature #	Type	Function	Temporary Site No. (2004)
1	Alignment	windscreen	T-1
2	Platform	ritual	T-2
3	Platform	ritual	T-3
4	Surface scatter	refuse	T-40
5	Platform	ritual	T-43
6	Ahu	ritual	T-44
7	Ahu	ritual	T-56A
8	Ahu	ritual	T-56A
9	Ahu	ritual	T-56A
10	Ahu	ritual	T-46A
11	Ahu	ritual	T-46B
12	Ahu	ritual	T-46C
13	Ahu	ritual	T-47
14	Ahu	ritual	T-48
15	Ahu	ritual	T-49
16	Ahu	ritual	T-50
17	Ahu	ritual	T-51
18	Ahu	ritual	T-52
19	Wall	shelter	n / a

TABLE 1 (Cont'd): Archaeological Sites on Lehua Island

Site #50-40-01-03 ***Lehua Rock Light Ruins***

Feature #	Type	Function	Temporary Site No. (2004)
1	Concrete platform	lighthouse	T-38
2	Concrete platform	lighthouse related	T-36
3	Concrete foundation	lighthouse related	T-30
4	Concrete platform	lighthouse related	T-41A
5	Concrete platform	lighthouse related	T-41B
6	Concrete platform	lighthouse related	T-41C
7	Concrete platform	lighthouse related	T-41D
8	Concrete pillar	lighthouse related	T-41E
9	Concrete platform	lighthouse related	T-41F
10	Metal rings	boat mooring	T-42

DETAILED SITE DESCRIPTIONS

Site 50-99-01-01. Crescent Rim *Ahu* Features

CLUSTER A (FEATURES 1-23)

This group of twenty-three *ahu* extend in an arc spanning roughly 1300 meters along the crest of the east horn (Figures 4 and 5). They are irregularly spaced and situated on the crescent rim or slopes and ledges adjacent to the rim. Along this stretch of the rim, the crest is rather broad (circa 4 m wide) and flat.

Feature 1 (T-4)

Location: About 400m from the easternmost end of the East Horn; on eastern slope adjacent to the crescent rim.

Description: *Ahu* of tuff cobbles and small boulders. Grouped without real stacking or distinct form. Measures 75cm (N-S) x 100cm x 25cm high (Photo 19).

Feature 2 (T-5)

Location: South of Feature 1 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders. Grouped without real stacking or distinct form. Measures 150cm (N-S) x 85cm x 15cm high (Photo 20).

Feature 3 (T-6)

Location: South of Feature 2 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders with some angular, red basalt boulders. Grouped without real stacking or distinct form. Measures 150cm (N-S) x 120cm x 35cm high (Photo 21).

Feature 4 (T-7)

Location: South of Feature 3 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders with 3 basalt cobbles. Several tuff slabs placed on edge, but tuff tends to be grouped without real stacking or distinct form. Measures 110cm (N-S) x 100cm x 30cm high (Photo 22).

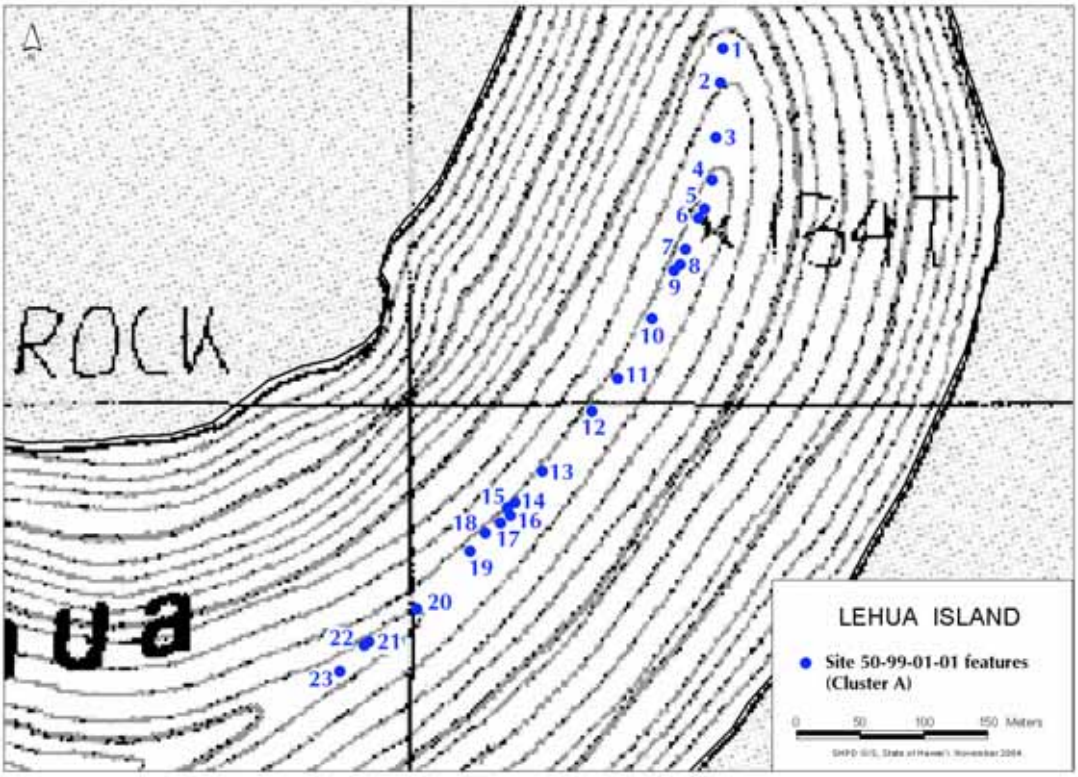


FIGURE 5: Site 50-99-01-01, Cluster A feature distribution.

PHOTO 19: Site 50-99-01-01, Feature 1. View E.

PHOTO 20: Site 50-99-01-01, Feature 2. View E.

PHOTO 21: Site 50-99-01-01, Feature 3. View E.

PHOTO 22: Site 50-99-01-01, Feature 4. View E.

Feature 5 (T-8)

Location: South of Feature 4 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders with basalt cobbles and small boulders. Tuff tends to be grouped without real stacking or distinct form. Measures 200cm (N-S) x 140cm x 55cm high (Photo 23).

Feature 6 (T-9)

Location: South of Feature 5 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders with 4 basalt cobbles. Tuff tends to be grouped without real stacking or distinct form. Measures 160cm (N-S) x 95cm x 30cm high (Photo 24).

PHOTO 23: Site 50-99-01-01, Feature 5. View E.

PHOTO 24: Site 50-99-01-01, Feature 6. View E.

Feature 7 (T-10)

Location: South of Feature 6 on the crescent rim of the East Horn.

Description: *Ahu* of tuff cobbles and small boulders. Tuff tends to be grouped without real stacking or distinct form. Measures 120cm (N-S) x 70cm x 20cm high (Photo 25).

Feature 8 (T-11)

Location: South of Feature 7 on the crescent rim of the East Horn.

Description: *Ahu* of tuff boulders with some tuff slabs. Tuff is piled with irregular form. Measures 160cm (N-S) x 135cm x 50cm high (Photo 26).

Feature 9 (T-12)

Location: South of Feature 8 on the crescent rim of the East Horn.

Description: *Ahu* of tuff and basalt cobbles and boulders. Tuff is piled with irregular form. Measures 140cm (N-S) x 125cm x 30cm high (Photo 27).

Feature 10 (T-13)

Location: South of Feature 9 on the crescent rim of the East Horn; located between 2 vertical joints.

Description: *Ahu* of red basalt boulders covered with guano. Stones are piled with irregular form. Measures 80cm (N-S) x 70cm x 30cm high (Photo 28).

Feature 11 (T-14)

Location: South of Feature 10 on the crescent rim of the East Horn; located between 2 vertical joints.

Description: *Ahu* of red basalt cobbles and small boulders. Stones are piled with irregular form. Measures 150cm (N-S) x 80cm x 30cm high (Photo 29).

PHOTO 25: Site 50-99-01-01, Feature 7. View W.

PHOTO 26: Site 50-99-01-01, Feature 8. View W.

PHOTO 27: Site 50-99-01-01, Feature 9. View W.

PHOTO 28: Site 50-99-01-01, Feature 10. View E.

PHOTO 29: Site 50-99-01-01, Feature 11. View E.

Feature 12 (T-15)

Location: South of Feature 11 on the crescent rim of the East Horn; constructed atop a vertical joint.

Description: *Ahu* of red basalt cobbles, small black basalt boulders, and tuff cobbles and pebbles. Grouped without real stacking or distinct form. Measures 200cm (N-S) x 210cm x 65cm high (Photo 30).

Feature 13 (T-16)

Location: South of Feature 12 on the crescent rim of the East Horn; adjacent to a vertical joint.

Description: *Ahu* of small tuff boulders with some tuff slabs. Some collapse of tuff onto the adjacent ledge and one piece of branch coral. Measures 100cm (N-S) x 70cm x 30cm high (Photo 31).

PHOTO 30: Site 50-99-01-01, Feature 12. View E.

PHOTO 31: Site 50-99-01-01, Feature 13. View E.

Feature 14 (T-17)

Location: South of Feature 13 on the crescent rim of the East Horn; on E slope just below the rim.

Description: *Ahu* of tuff boulders and red basalt cobbles. Grouped without real stacking or distinct form. Measures 100cm (N S) x 80cm x 10cm high (Photo 32).

Feature 15 (T-18)

Location: South of Feature 14 on the crescent rim of the East Horn; on E slope just below the rim.

Description: *Ahu* of small angular basalt boulders with guano. Grouped without real stacking or distinct form. Measures 100cm (N-S) x 100cm x 20cm high (Photo 33).

Feature 16 (T-19)

Location: South of Feature 15 on the crescent rim of the East Horn.

Description: *Ahu* of small red basalt boulders with guano. Grouped without real stacking or distinct form. Measures 120cm (N S) x 90cm x 10cm high (Photo 34).

Feature 17 (T-20)

Location: Southwest of Feature16 on the crescent rim of the East Horn.

Description: *Ahu* of red and black basalt cobbles and small boulders with tuff cobbles and boulders. One piece of coral. Grouped without real stacking or distinct form. Measures 160cm (N-S) x 160cm x 40cm high (Photo 35).

Feature 18 (T-21)

Location: About 5m west of Feature 17 on the crescent rim of the East Horn; between 2 vertical joints.

Description: Two *ahu* of red basalt cobbles and small boulders. Grouped without real stacking or distinct form. Measures 100cm (N-S) x 140cm x 35cm high (Photo 36).

PHOTO 32: Site 50-99-01-01, Feature 14. View E.

PHOTO 33: Site 50-99-01-01, Feature 15. View W.

PHOTO 34: Site 50-99-01-01, Feature 16. View E.

PHOTO 35: Site 50-99-01-01, Feature 17. View E.

PHOTO 36: Site 50-99-01-01, Feature 18. View E.

Feature 19 (T-22)

Location: Southwest of Feature 18 on the crescent rim of the East Horn; on ledge on W slope of rim between 2 vertical joints.

Description: *Ahu* of red basalt cobbles and small boulders. Grouped without real stacking or distinct form. Measures 135cm (N-S) x 110cm x 30cm high (Photo 37).

Feature 20 (T-23)

Location: Southwest of Feature 19 on the crescent rim of the East Horn; stacked atop a vertical joint.

Description: *Ahu* of tuff cobbles and small boulders with scattered basalt. Grouped without real stacking or distinct form. Measures 140cm (N-S) x 110cm x 35cm high (Photo 38).

PHOTO 37: Site 50-99-01-01, Feature 19. View E.

PHOTO 38: Site 50-99-01-01, Feature 20. View E.

Feature 21 (T-24)

Location: Southwest of Feature 20 on the crescent rim of the East Horn; stacked abutting ledge off the rim.

Description: *Ahu* of tuff cobbles and small boulders. Stacking without distinct form. Measures 190cm (N-S) x 140cm x 60cm high (Photo 39).

Feature 22 (T-25)

Location: Southwest of Feature 21 on the crescent rim of the East Horn; stacked on ledge adjacent to rim.

Description: *Ahu* of tuff cobbles and small boulders. Grouped without real stacking or distinct form. Measures 140cm (N-S) x 110cm x 35cm high (Photo 40).

PHOTO 39: Site 50-99-01-01, Feature 21. View E.

PHOTO 40: Site 50-99-01-01, Feature 22. View E.

PHOTO 41: Site 50-99-01-01, Feature 23. View E.

Feature 23 (T-26)

Location: Southwest of Feature 22 on the crescent rim of the East Horn; It is the most westerly feature within Cluster A.

Description: *Ahu* of tuff cobbles and small boulders. Stacking without distinct form. Measures 300cm (N-S) x 250cm x 80cm high (Photo 41, previous page). This feature is the largest of the *ahu* along the crescent rim.

Feature 23 was selected for additional study and was mapped (Figure 6) and a test trench was excavated through it (see TEST EXCAVATIONS, below).

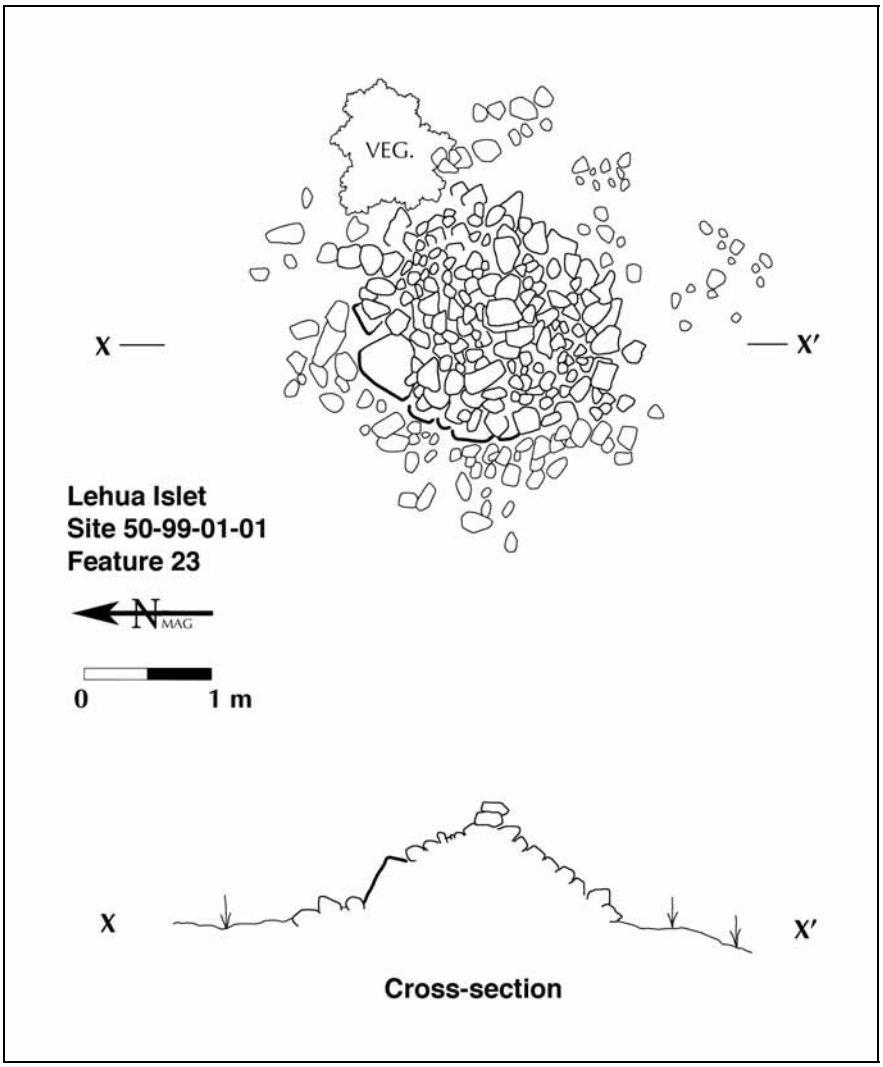


FIGURE 6: Site 50-99-01-01, Feature 23. Plan view map and section.

CLUSTER B (FEATURES 24-33)

This group of nine *ahu* and one possible platform remnant extend in a line spanning approximately 250 meters along the crest of Lehua, from the summit eastward (Figure 7). They are irregularly spaced and situated on the crescent rim or slopes and ledges adjacent to the rim. They are interspersed with more recent features associated with the navigational light (Site 50-99-01-03, Cluster A). The condition of the traditional features has likely been impacted by construction and maintenance of these modern structures.

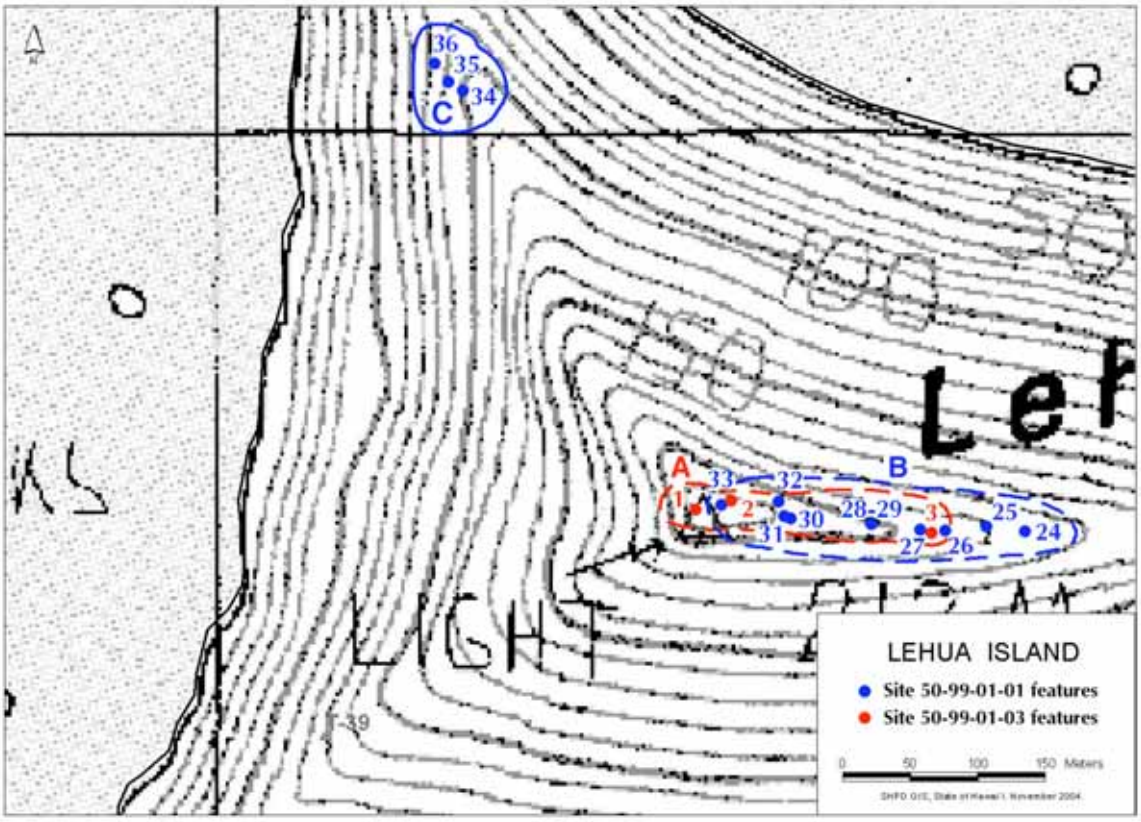


FIGURE 7: Site 50-99-01-01, Clusters B and C feature distribution (in blue).

Feature 24 (T-27)

Location: About 250 meters east of the summit on the crescent rim; stacked on ledge adjacent to the rim. From this point toward the summit, the rim becomes steeper with less flat, level area.

Description: *Ahu* of tuff cobbles and small boulders, including slabs set on edge. Stacking with some form. Additional tuff boulders under the ledge. Measures 220cm (N-S) x 150cm x 45cm high (Photo 42).

PHOTO 42: Site 50-99-01-01, Feature 24. View E.

Feature 25 (T-28)

Location: West of Feature 24 on the east slope of the crescent rim.

Description: *Ahu* of tuff cobbles and small boulders, including slabs set on edge. Grouping with some stacking and rectangular form. Some rocks have been used to make initials. Measures 160cm (N S) x 120cm x 30cm high (Photo 43).

Feature 26 (T-29)

Location: West of Feature 25 on the east slope adjacent to the crescent rim.

Description: *Ahu* of tuff cobbles and small boulders. Scattered branch coral in site area. Grouped without real stacking or distinct form. Measures 75cm in diameter x 25cm high (Photo 44).

PHOTO 43: Site 50-99-01-01, Feature 25. View NE.

PHOTO 44: Site 50-99-01-01, Feature 26. View E.

Feature 27 (T-31)

Location: West of Feature 26 and Site 03, Feature 3 on the southern slope adjacent to the crescent rim.

Description: *Ahu* of tuff cobbles and small boulders. Grouped on slope without real stacking or distinct form. Measures 130cm (N-S) x 110cm (E-W) x 25cm high. More pluchea bushes in the area (Photo 45).

Features 28, 29 (T-32)

Location: West of Feature 27 on the southern slope adjacent to the crescent rim.

Description: Two *ahu* of tuff cobbles and small boulders. Grouped on slope without real stacking or distinct form. Larger pile on E measures 120cm (N-S) x 100cm (E-W) x 15cm high and smaller pile measures 60cm in diameter (Photo 46).

Feature 30 (T-33)

Location: West of Features 28 and 29 on the crescent rim.

Description: *Ahu* of tuff cobbles and small boulders. Stacking with rectangular form. Measures 190cm (N-S) x 160cm (E-W) x 40cm high (Photo 47). *Uhaloa* groundcover.

Feature 31 (T-34)

Location: About 5m south of Feature 30 on the crescent rim; crescent rim is about 4m wide with pluchea bushes and *uhaloa*.

Description: *Ahu* of tuff cobbles and small boulders with black basalt and coral pieces scattered throughout. Stacking without distinct form. Measures 140cm (N-S) x 160cm (E-W) x 30cm high (Photo 48).

Feature 32 (T-35)

Location: West of Feature 31 on the southern edge of the crescent rim; ground cover of *uhaloa*.

Description: *Ahu* of tuff cobbles and small boulders, including several slabs, with small black basalt boulders. Grouped on slope without real stacking or distinct form. Measures 100cm in diameter x 15cm high (Photo 49).

PHOTO 45: Site 50-99-01-01, Feature 27. View E.

PHOTO 46: Site 50-99-01-01, Features 28 (left), 29 (right). View E.

PHOTO 47: Site 50-99-01-01, Feature 30. View E.

PHOTO 48: Site 50-99-01-01, Feature 31. View E.

PHOTO 49: Site 50-99-01-01, Feature 32. View E.

PHOTO 50: Site 50-99-01-01, Feature 33 (rock scatter in foreground). View E.

Feature 33 (T-37)

Location: West of Feature 32 and immediately adjacent to Site 02, Feature 2 on the southern slope of the crescent rim.

Description: Remnant platform or *Ahu* of tuff cobbles, small boulders, and slabs with scattered black basalt cobbles. Piled into rectangular shape with several slabs laid flat on the surface. Measures 390cm (N-S) x 160cm (E-W) x 30cm high (Photo 50, previous page).

CLUSTER C (FEATURES 34-36)

This group of three very small *ahu* are clustered in a line covering approximately 30 meters along the upper crest of the west horn (Figure 7, p. 56). They are built atop the crescent rim on small level spots. Along this stretch of the west horn, the crest is quite narrow and steep. These features are nearly inconspicuous, and could have been easily constructed in a few minutes each, making it questionable that they are of any antiquity. A pair of natural hollowed out level shelters, of suitable size to allow a person to lay down in, are located just below these *ahu* on the west. These shelters contained no soil or cultural materials.

Feature 34 (T-59)

Location: Midway down the sloping crest of the west horn, about 300 meters below the summit.

Description: Very rough possible *ahu* of circa 6-8 small tuff boulders. Little more than a concentration on the surface, possibly tumbled. Measures 100cm (N-S) x 140cm (E-W) x 30cm high (Photo 51).

Feature 35 (T-58)

Location: 13 m downslope (north) of Feature 34 on the crest of the west horn.

Description: Roughly circular *ahu* of circa a dozen small tuff boulders, 1-3 stones high. Measures 100cm (N-S) x 115cm (E-W) x 30cm high (Photo 52).

Feature 36 (T-60)

Location: Downslope (north) of Feature 35 on the crest of the west horn.

Description: Very small roughly circular *ahu* of piled small tuff and basalt cobbles, 1-2 stones high. Measures 55cm in diameter x 25cm high (Photo 53).

PHOTO 51: Site 50-99-01-01, Feature 34. View S.

PHOTO 52: Site 50-99-01-01, Feature 35. View W.

PHOTO 53: Site 50-99-01-01, Feature 36. View SW.

Site 50-99-01-02. South Flank and Coastal Bluff Features

This site, distributed along the sheltered southern coastline of the island, comprises 19 traditional features ranging from a single upright stone to a medium-sized platform (Figure 8). It appears to represent the primary area utilized by Hawaiians for traditional uses, including temporary habitation and ritual. Facing Ni'ihau, the location offers a sheltered landing and the most gently sloping landforms on Lehua.

CLUSTER A (FEATURES 1-4)

This group of four features is concentrated in an area along the southern coastline of the island. The region is characterized by major gullies, raised outcrops, and sea caves (Figure 8, Photo 54). This cluster collectively represents the only evidence for habitation use found during the survey. It is also noteworthy that the features are situated near the largest freshwater seep observed on the island, providing a critical resource for survival in such a bleak landscape.

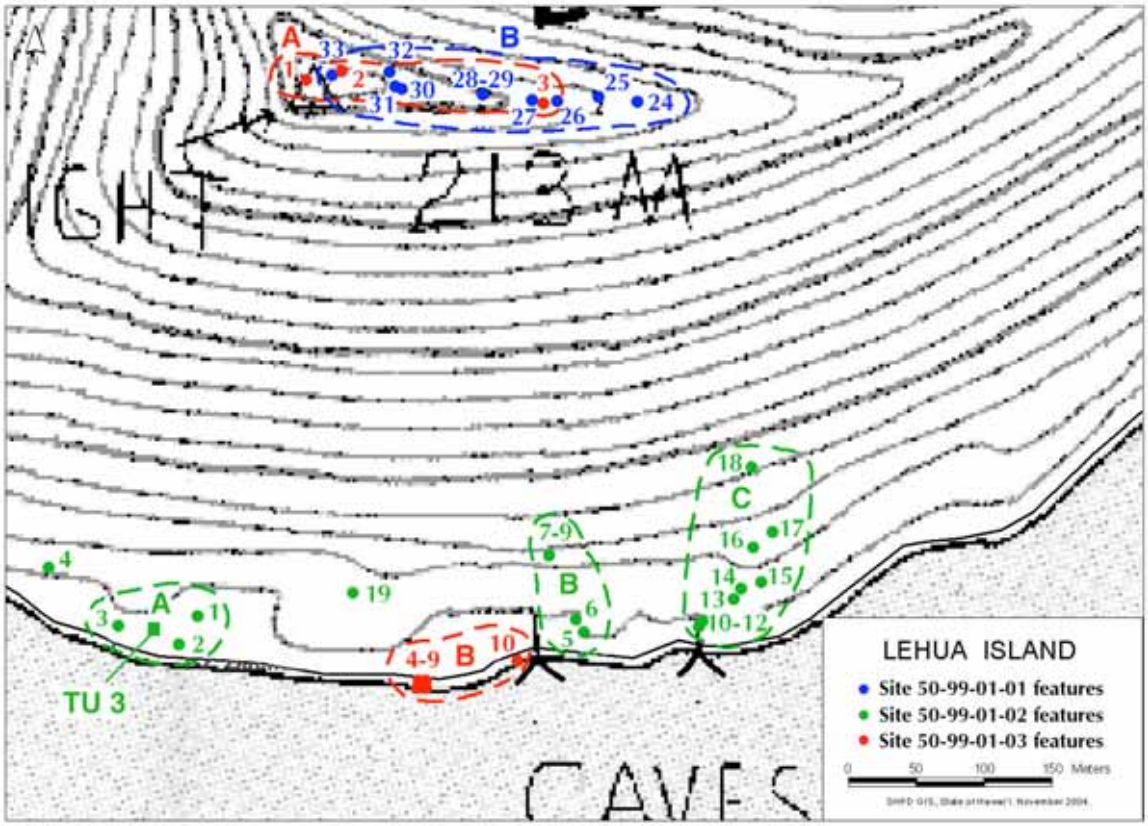


FIGURE 8: Site 50-99-01-02 feature distribution (in green).

Feature 1 (T-1)

Location: Coastal bluff, approximately 250 m west of the landing and approximately 100 m inland of coastline on southern, lower slope of the crescent.

Description: Alignment of 4 upright tuff slabs set parallel to the contour of the slope with an additional 2 boulders at the W end (Photos 54-55, Figure 9). This alignment creates a small terraced area just above a small gully. Although obviously constructed, the function of this feature was not readily apparent. Initially it was thought to be either an erosion control feature or possibly a planting area.

To aid in determining its function, Feature 1 was tested (see TEST EXCAVATIONS, below). Results indicate that it functioned as a windbreak, protecting a small cooking hearth. This represents subsistence during temporary habitation use of the area. Given a lack of other habitation features, this suggests that habitation was of very short duration. Radiocarbon results provided astonishingly early dates for the site, which are discussed further under test excavation results.

PHOTO 54: Site 50-99-01-02 overview showing feature locations. View E. The photo is taken from the raised outcrop upon which Feature 3 is located.

PHOTO 55: Site 50-99-01-02, Feature 1. View N.

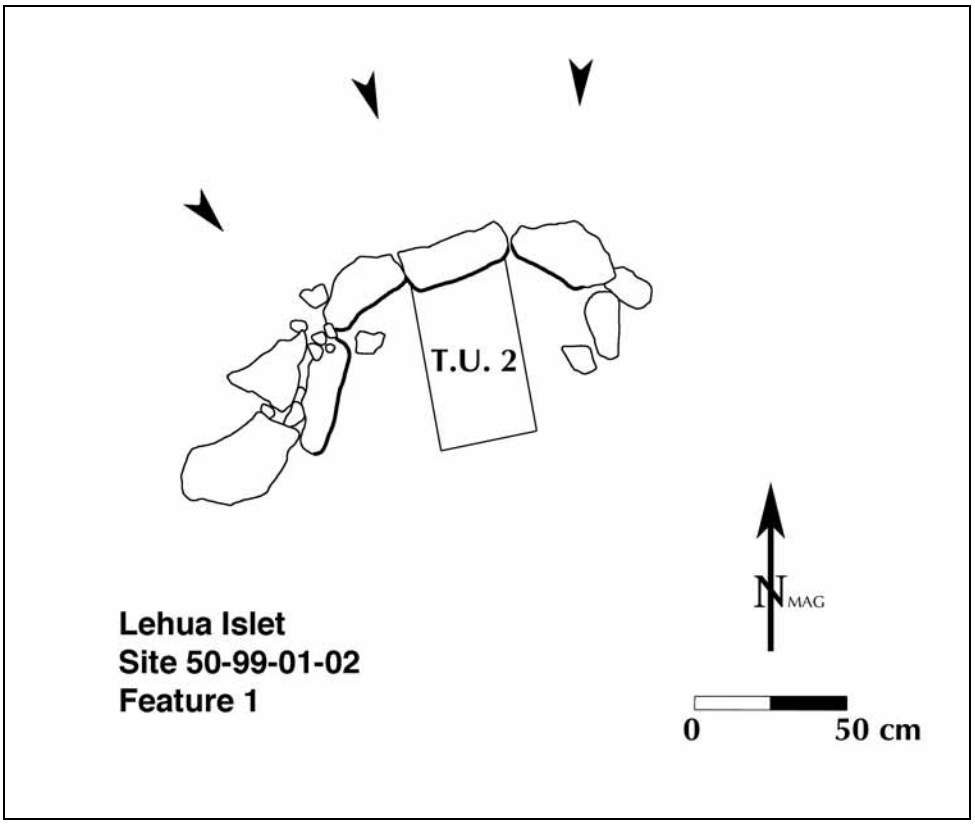


FIGURE 9: Site 50-99-01-02, Feature 1. Plan view showing location of TU-2.

Feature 2 (T-2)

Location: Coastal bluff, approximately 400 m west of landing and about 5 m from the edge of the sea cliff on a prominent raised outcrop.

Description: Disturbed stone and coral filled platform (Photo 56). Apparent dimensions prior to looting or other disturbance are approximately 2 m square, but damage makes it difficult to precisely determine boundaries. East side and NE corner are defined by alignments of volcanic cinder boulders. To the west of the feature is what may be a backdirt pile of concentrated coral and pencil urchin spines (Photo 57), suggesting the feature was previously pilfered for artifacts. Most of the coral is small in size, circa 10-20 cm branch coral fragments (Photo 58). The backdirt pile is either deflated or the feature contained little or no soil at the time of excavation. Given the significant quantity of branch coral combined with the feature's very prominent location overlooking the sea, Feature 2 likely represents the quite damaged remnant of a small *ko'a* (fishing shrine).

Surface collection was conducted at Feature 2 (see SURFACE COLLECTION, later).

PHOTO 56: Site 50-99-01-02, Feature 2. View S.

PHOTO 57: Site 50-99-01-02, Feature 2. Possible looter's backdirt pile. View S.

PHOTO 58: Site 50-99-01-02, Feature 2. Detail of branch coral scatter within remnant platform.

Feature 3 (T-3)

Location: Coastal bluff, approximately 500 m west of landing and 20 m from the edge of the sea cliff. Situated at the *makai* end of a finger ridge with a commanding view of the ocean and Niʻihau across the channel.

Description: The feature consists of a stone faced and filled platform. The stacked walls are composed of locally available dark gray and reddish brown subangular tuff boulders (Photos 59-61, Figure 10). The fill and paving consist of predominantly cobbles and a few small boulders of the same material. The feature appears to have been constructed in a single event, and exhibits no visible interior features. The overall size of the feature at present is 6.2 m (E-W) by 3.7 m (N-S), with the long axis of the platform oriented parallel to the shoreline. The latter measurement represents the actual width of the platform. The length, however, cannot be accurately determined as a portion of the tuff substrata has slid away on the western side. This has left the *makai* edge of the feature with a shorter length of wall (4.2 m) than the *mauka* side (6.2 m). The entire west end of the feature was lost in this landslide episode (Photo 62). From the amount of stone visible in the crack formed when the substratum collapsed, as well as comparison with a photograph of the feature taken circa 1931 (see PREVIOUS

PHOTO 59: Site 50-99-01-02, Feature 3. Situation of platform atop finger ridge. View W.

PHOTO 60: Site 50-99-01-02, Feature 3. Makai (downslope) wall. View N. Left side of feature has been lost due to collapse of underlying substratum.

PHOTO 61: Site 50-99-01-02, Feature 3. Mauka (upslope) wall. View S. Picture illustrates prominent view of the island of Niʻihau across the channel.

PHOTO 62: Site 50-99-01-02, Feature 3. Detail of collapsed western side of platform . View NW.

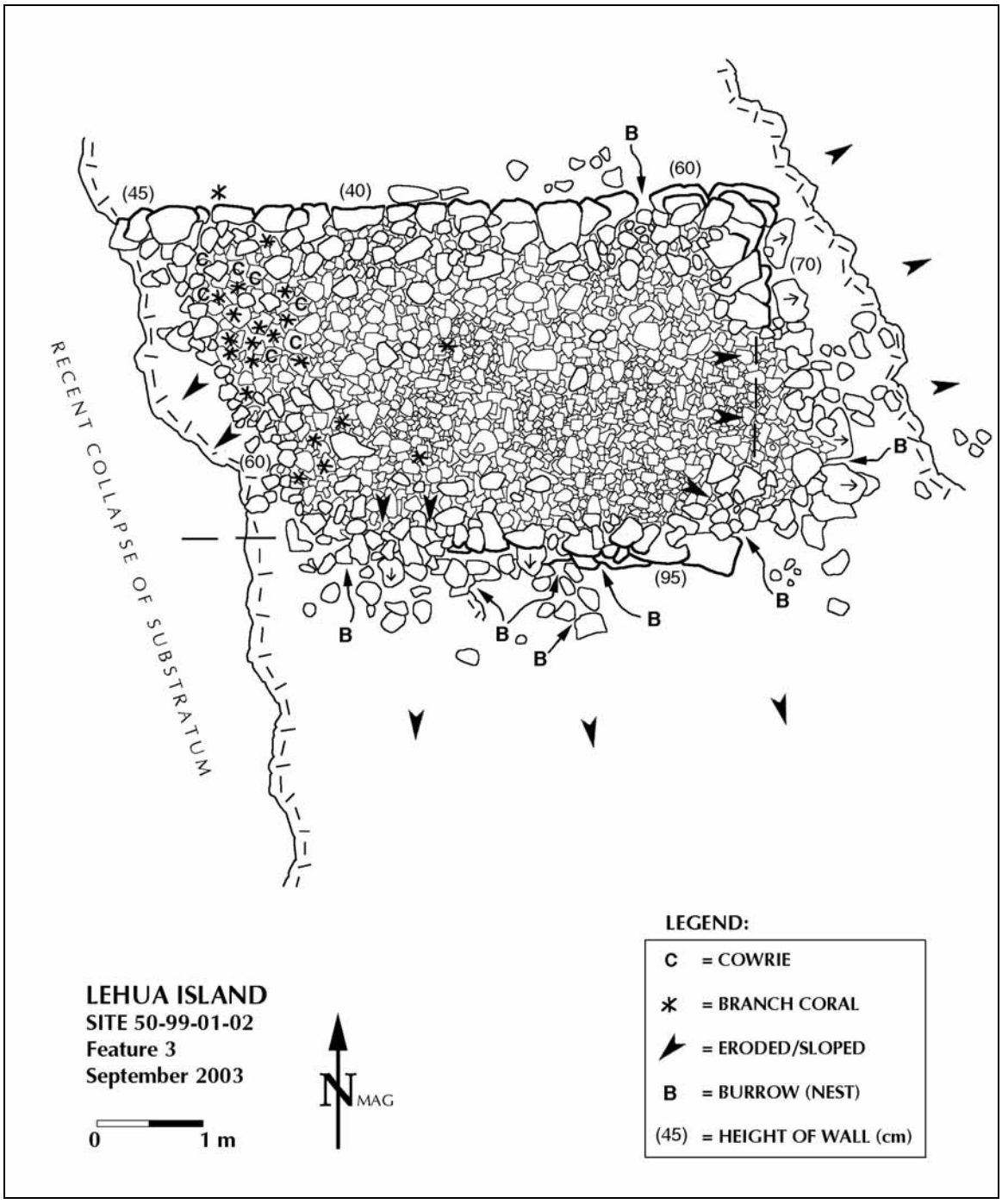


FIGURE 10: Site 50-99-01-02, Feature 3. Plan view.

ARCHAEOLOGY), it appears that only a small portion of the site was lost, but there is no way to accurately determine the precise amount.

The feature has a nearly level surface, although collapse has occurred on the east and south sides of the feature, which has led to some of the fill material eroding from these sides as well.

Due to the natural slope of the land upon which the feature was built (the slope is to the south, or *makai*), the feature was built up higher on the *makai* (south) end than on the *mauka* (north) end. Thus the north wall is only 1-3 stone courses, and ranges from 40-60 cm in height. This lower height has resulted in less collapse than the other walls, and this wall retains the greatest integrity. In places a single stone placed upright serves as the facing. The highest stacked section is at the eastern end of the wall, where the underlying finger ridge also slopes to the east.

On the eastern wall, the northern end retains some stacking (to a maximum of 3 courses and 70 cm), but much of it has collapsed. Large boulders lie in a pattern below the wall, suggesting that someone may have previously attempted to stabilize or repair it, but it is also possible that the stones simply collapsed in this configuration. Based on the height of the interior platform fill, it appears that the east wall had a maximum former height of approximately 1.2 m.

The southern (*makai*) wall retains some stacking from the southeastern corner to about 3 m west of the corner. The maximum height of the wall at present is 95 cm, where it is 3 courses high. The western end is collapsed to varying degrees, and gives way to the aforementioned landslide damage. It appears that the maximum height of wall facing on this south wall was approximately 1.1 m. This wall has also been utilized and perhaps modified by birds for nesting. At the time of the survey, there were 5 active Wedge tailed Shearwater burrows in this wall, as well as 1 each in the east and north walls. Large Boobies were also roosting on the platform. It seems possible that repeated roosting by large seabirds could cause some collapse of facing stones.

The surface of the platform was filled and paved with subangular tuff cobbles and occasional small boulders. The surface remains most intact in the western end, much of the fill has eroded from the eastern side where the facing has collapsed. This has also occurred along the southern edge to a lesser extent. The depth of fill likely ranges from about 30 cm to a little over a meter, and it appears to simply sit atop gently sloping bedrock. There is a concentration of small pieces of branch coral and large, broken cowry (*Cypraea* sp.) shells on the western surface of the platform.

A few *'opihi* (*Cellana* sp.) shells are concentrated near the center of the platform. No other cultural materials were observed. The branch coral suggests that

offerings were made here, and perhaps the other shells represent offerings as well. The lack of waterworn coral or stones, as well as a complete lack of any midden or artifact materials, either on the site or in the surrounding area, suggest that the site was not utilized for habitation. The obvious functional interpretation for this feature is that it is a ceremonial site, a shrine related to fishing or, perhaps, bird gathering. The size and form could also lead to the interpretation of the site as a burial platform, but this seems very unlikely given the relatively thin depth of fill over bedrock, and the prominent situation of the feature.

The overall integrity of this site is fair. It has been impacted predominantly by the natural collapse of the island. It will continue to suffer as the island erodes.

Due to the perceived religious function of this feature, and the fact that excavation would not likely produce either dateable material, artifacts or additional construction details, no testing was conducted on the platform. Testing also was likely to contribute to further destabilizing the feature due to its precarious, eroding condition. Given recent advances in dating of marine corals, it may be possible to precisely date the use of Feature 3 using that technology in the future.

Feature 4 (T-40)

Location: Coastal bluff to west of landing and west of Feature 3 platform; adjacent to dry falls.

Description: Surface scatter of shell midden, mostly cowry, in an area about 3 m in diameter. Generally indicative of subsistence/temporary habitation use of the area.

CLUSTER B (FEATURES 5-9)

This group of five features is concentrated in an area along the southern coastline of the island, just east of the landing and about 300 m east of Cluster A (see Figure 8). The region is characterized by gullies, raised outcrops, and sea caves. The sites are distributed along a single finger ridge oriented north-south.

Feature 5 (T-43)

Location: On the coastal bluff, approximately 30 m east of landing on a prominent finger ridge on the southern slope. The site offers views of the Island of Ni‘ihau across the channel.

Description: Platform feature, similar in situation to Feature 3, but this feature is smaller and lower than Feature 3, measuring 3.5 m long (E-W) by 2.1 m wide (N-S) (Photos 63-65, Figure 11). As with Feature 3, the long axis of the platform is oriented parallel to the shoreline. The exterior walls of the platform are just 1-2 courses high, and range in height from just 10 cm at the low point of the north wall to 30 cm on the high point of the south (downslope) wall. The platform has a very low double-faced wall 60 cm wide on the north (upslope) edge, whose north side is contiguous with the exterior of the platform. The interior face of this wall is just one stone and 25 cm high. The interior face is obvious at the western side, but in the center of its alignment, it appears to have been taken apart, apparently to construct a small *ahu* 45 cm high at the northeast corner of the platform. This *ahu*, roughly stacked, sits above the rest of the feature and is utilized by seabirds as a roosting spot. The stones utilized in the facing are brown to reddish brown subangular tuff. There is a single subrounded bright red-pink basalt stone in the northwest corner.

The surface of the platform is flat, but slopes slightly to *makai* (southeast). It is filled and paved with subangular tuff cobbles and pebbles, as well as some waterworn coral cobbles. A few basalt *ʻiliʻili* were also present. Scattered branch coral is present throughout the surface as well. This coral, which likely was placed as offerings, suggests a ceremonial function for this site. As with the larger platform to the west, no other cultural materials suggestive of habitation are present on or surrounding the site. A burial function is precluded by the thin nature (ca. 25 cm) of the central platform fill over bedrock.

This feature is in fair to good condition. It has suffered minor collapse, particularly on the west wall, and has apparently had a portion of the low rear wall rearranged to form a small *ahu* sometime after its initial construction. The greatest impacts to the site are natural erosion and bird activity.

Feature 6 (T-44)

Location: Coastal bluff to east of landing on a finger ridge facing Niçihau; about 10 m north of Feature 5 on same finger ridge.

Description: *Ahu* of stacked tuff (cinder with basalt pebbles measuring 1.6 m (N-S) x 1.0 m x 40 cm high. Additional piling along E side of bluff next to the *ahu* (Photo 66).

PHOTO 63: Site 50-99-01-02, Feature 5. View NW. Note guano-covered *ahu* in rear corner.

PHOTO 64: Site 50-99-01-02, Feature 5. View S.

PHOTO 65: Site 50-99-01-02. Detail of *ahu* in NE corner and branch coral. View N.

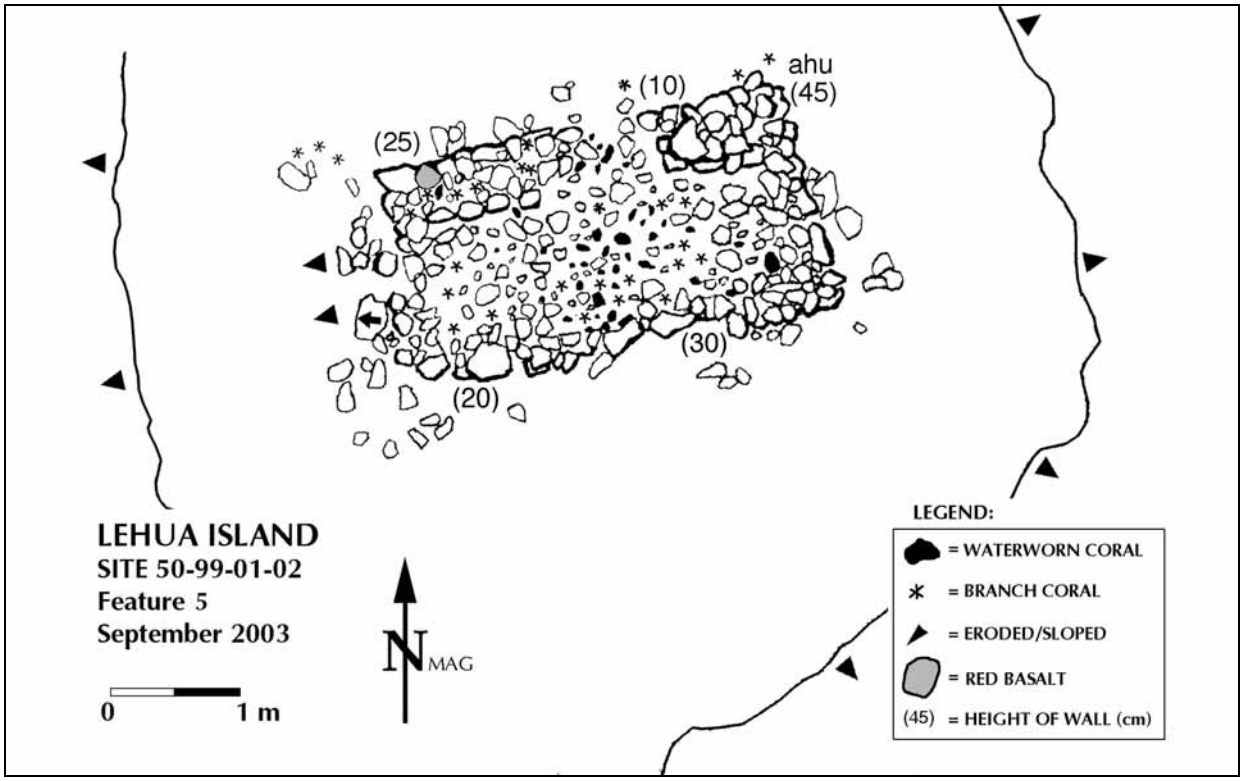


FIGURE 11: Site 50-99-01-02, Feature 5. Plan view

PHOTO 66: Site 50-99-01-02, Feature 6. View S.

Feature 7-9 (T-56A)

Location: Grouping of 3 small features approximately 50 meters upslope of Features 5 and 6 on same finger ridge.

Description: Feature 7 is a roughly rectangular *ahu* of piled cobbles to small boulders of tuff and basalt, measuring 90 cm (N-S) by 120cm (E-W) by 50 cm high (Photo 67).

1.5 meters *mauka* (north) of Feature 7 is a small piled *ahu* of small boulders (Feature 8) measuring 80 cm in diameter by 20 cm high.

Feature 9 is located circa 3 m *makai* (south) of Feature 7 and consists of a single upright placed angular dikestone, 40 cm high.

PHOTO 67: Site 50-99-01-02, Feature 7. View S.

CLUSTER C (FEATURES 10-18)

Feature 10-12 (T-46A-C)

Location: Coastal bluff, approximately 60 m east of landing; group of 3 features on finger ridge to east of Cluster B (Photo 68).

Description: Feature 10 is an *ahu* measuring 155 cm (E-W) by 150 cm (N-S) by 40 cm high of predominately small tuff boulders with a few basalt boulders and cobbles.

Feature 11 is 2.5 meters to the west of Feature 10. It consists of a small grouping of tuff boulders approximately 1 m in diameter.

PHOTO 68: Site 50-99-01-02, Feature 10. View W.

Feature 12 is located about 5 m south of Feature 10. It consists of a low piled *ahu*, maximum 2 stones high of tuff boulders and cobbles with a few basalt boulders incorporated. The *ahu* measures 170 cm (N-S) by 145 cm (E-W).

Feature 13 (T-47)

Location: Coastal bluff to east of landing; about 20 meters north of Feature 10.

Description: Grouping of tuff (cinder with basalt pebbles) along west edge of finger ridge with scattered small basalt boulders (Photo 69). Covers an area 6 m (N-S) by 3 m (E-W).

Feature 14 (T-48)

Location: Coastal bluff to east of landing; about 10 meters north of Feature 13 on same finger ridge.

Description: *Ahu* of small basalt boulders and heavily covered with guano. Measures 80 cm in diameter and 50 cm in height (Photo 70).

PHOTO 69: Site 50-99-01-02, Feature 13. View W.

PHOTO 70: Site 50-99-01-02, Feature 14. View S.

PHOTO 71: Site 50-99-01-02, Feature 15. View SW.

Feature 15 (T-49)

Location: Coastal bluff to east of landing; about 20 meters east of Feature 14 on same finger ridge.

Description: *Ahu* of piled small tuff boulders near the center of the finger ridge (Photo 71). *Ahu* measures 1.5 m (N-S) by 1.0 m by 45 cm high.

Feature 16 (T-50)

Location: Coastal bluff to east of landing and further up same finger ridge containing Features 10 through 15.

Description: Smalll *ahu* of all basalt boulders stacked along the west side of the finger ridge (Photo 72). Covers an area of 60 cm in diameter and 40 cm in height.

PHOTO 72: Site 50-99-01-02, Feature 16. View SW.

PHOTO 73: Site 50-99-01-02, Feature 17. View SE.

Feature 17 (T-51)

Location: Coastal bluff to east of landing and about 30 meters northeast of Feature 16 on same finger ridge.

Description: Upright basalt boulder with guano surrounded by grouping of tuff boulders (Photo 73, previous page). Site measures 70 cm (N-S) by 120 cm by 70 cm high.

Feature 18 (T-52)

Location: Coastal bluff to east of landing, highest feature in Cluster C, on finger ridge above features 10-17.

Description: *Ahu* of all basalt boulders stacked along the W side of the finger ridge (Photo 74). Measures 70cm (N-S) x 80cm x 70cm high.

PHOTO 74: Site 50-99-01-02, Feature 18. View SW.

ISOLATE FEATURE

Feature 19 (T-61)

Location: Coastal bluff, midway between Clusters A and B of Site -02, about 100 meters west of camp. Atop raised coastal shelf, which corresponds to southern (*makai*) edge of gully paralleling shoreline.

Description: Short dry-stacked wall at *mauka* edge of raised coastal shelf. (Photo 75). This double-faced, core-filled wall measures 220 cm in length (oriented 245˚ magnetic) by 90 cm wide by 60 cm high (south side). It is constructed straddling a small ledge such that the base of the north (*mauka*) face extends about 65 cm below the base of the south face to meet a lower ground surface. The south facing is constructed of 3-4 courses of tuff boulders/cobbles with a couple of basalt stones, while the north facing consists of 5-7 courses of the same material for a maximum height of 125 cm. there is a small level area on the gulch (north) side of the feature, measuring approximately 3 m by 1 m. This suggests that the wall functioned as a small windbreak, providing shelter for a solitary sleeper. There are no cultural materials in association with the wall, which is built directly atop bedrock. Though it appears to be constructed of traditional methods and materials, there is no way to definitively date the feature.

PHOTO 75: Site 50-99-01-02, Feature 19. View N.

Site 50-99-01-03 - Lehua Rock Light Ruins

The Lehua navigational light and associated features, originally constructed in 1931, qualifies as an historic site due to its age. The original light, supporting structures and outbuildings no longer exist, replaced in 1989 with a modern light feature. Remnants of the original light foundation at the summit, as well as foundations associated with light support structures on the southern coastline still remain, however. These features, though located within the geographic boundaries of sites 01 and 02, are temporally and functionally distinct from other remains on the island, and have therefore been assigned a separate state site number.

CLUSTER A (FEATURES 1-3)

This cluster comprises three features located on the crescent rim, just east of the summit (Figure 11).

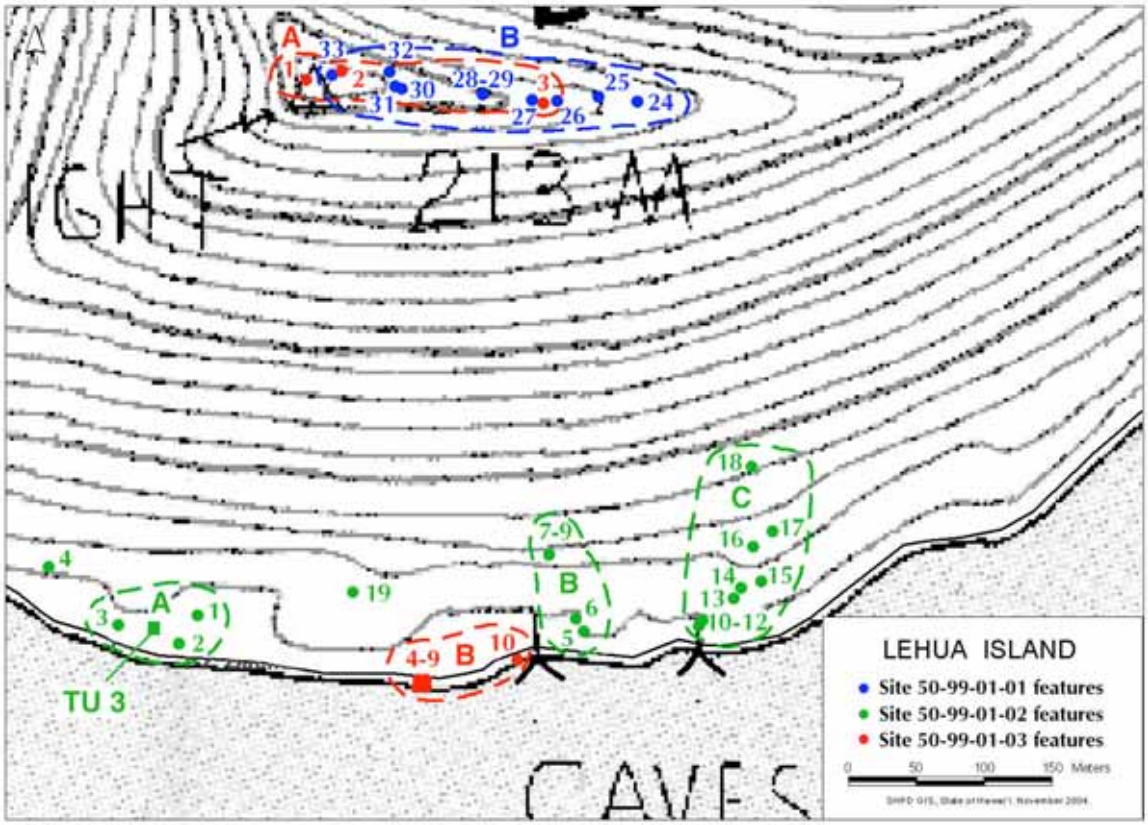


FIGURE 11: Site 50-99-01-02, Clusters A and B feature distribution (in red).

Feature 1 (T-38)

Very near the precise summit of the island sits the present day automated light, installed circa 1989. It sits atop a square concrete base built atop a cluster of boulders. It is not known whether these boulders are part of or were salvaged from an earlier feature. The concrete platform, painted white, measures 121 cm on a side (Photo 76). As shown in the archival photo in Dean (1989) (Photo 8a in this report), the original lighthouse foundation was situated slightly below the crest of the island, therefore Feature 1 does not correspond to that earlier feature. Our survey did not positively locate the precise spot of the original light foundation.

Feature 2 (T-36)

About 30 meters east of Feature 1 is a square concrete platform measuring 92 cm on a side. It contains an embedded center metal post base and a metal rebar "hook" at each corner (Photo 77). This may represent an abandoned weather station. It is not permanently affixed to the ground surface, and may be more appropriately deemed a portable fixture. It is doubtful that this feature is over 50 years old.

PHOTO 76: Site 50-99-01-03, Feature 1. Automated navigational light. View E.

PHOTO 77: Site 50-99-01-03, Feature 2. View E.

PHOTO 78: Site 50-99-01-03, Feature 3. View E.

Feature 3 (T-30)

Located approximately 65 meters east of Feature 1 is perhaps the only identified remnant structure associated with the construction of the original light. Situated just east of the crescent rim, the feature consists of a series of 8 metal posts (nuts and bolts) in concrete creating 2 parallel rows of 4 (Photo 78, previous page). Locally available cobbles are embedded in the concrete. It measures about 2 m long by 1 m wide. There are additional wood and metal fragments in the immediate area. Presumably Feature 3 is associated with construction and use of the navigational light, and may represent the remains of a winch site, used to aid in hauling construction materials to the rim. It is also possible that it in fact represents the remains of the light foundation itself, though this seems unlikely given its location some distance from the summit.

CLUSTER B (FEATURES 4-10)

Feature Cluster B, comprising 7 features, is located on a moderately sloping bluff above the southern shore near the landing area, the location of the present campsite area (Figures 11, 12, Photos 78, 79). One feature is located at the landing itself. Features 4-9 are distributed along the edge of steep sea cliff to about 30 m inland. This is a complex of 6 concrete structures associated with the construction and maintenance of the original Lehua Navigational Light at the island's summit. Feature 10 is located at the shoreline a little to the east and associated with boat landing and mooring.

Feature 4 (T-41A):

Situated immediately adjacent to the sea cliff, this U-shaped concrete platform measures 85x103 cm and 95 cm high. It contains 5 rusting metal bolts.

Feature 5 (T-41B):

This rectangular concrete platform secures 2 metal rings and measures 125x180 cm and 25 cm high.

Feature 6 (T-41C):

Another rectangular concrete platform containing 2 metal rings, measuring 165x130 cm and 60 cm high.

Feature 7 (T-41D):

The largest rectangular concrete platform, this feature contains 5 embedded

metal bolts and wooden slats. It measures 175x150 cm.

Feature 8 (T-41E):

Square concrete pillar with metal ring; measures 15 cm on a side and 10 cm high.

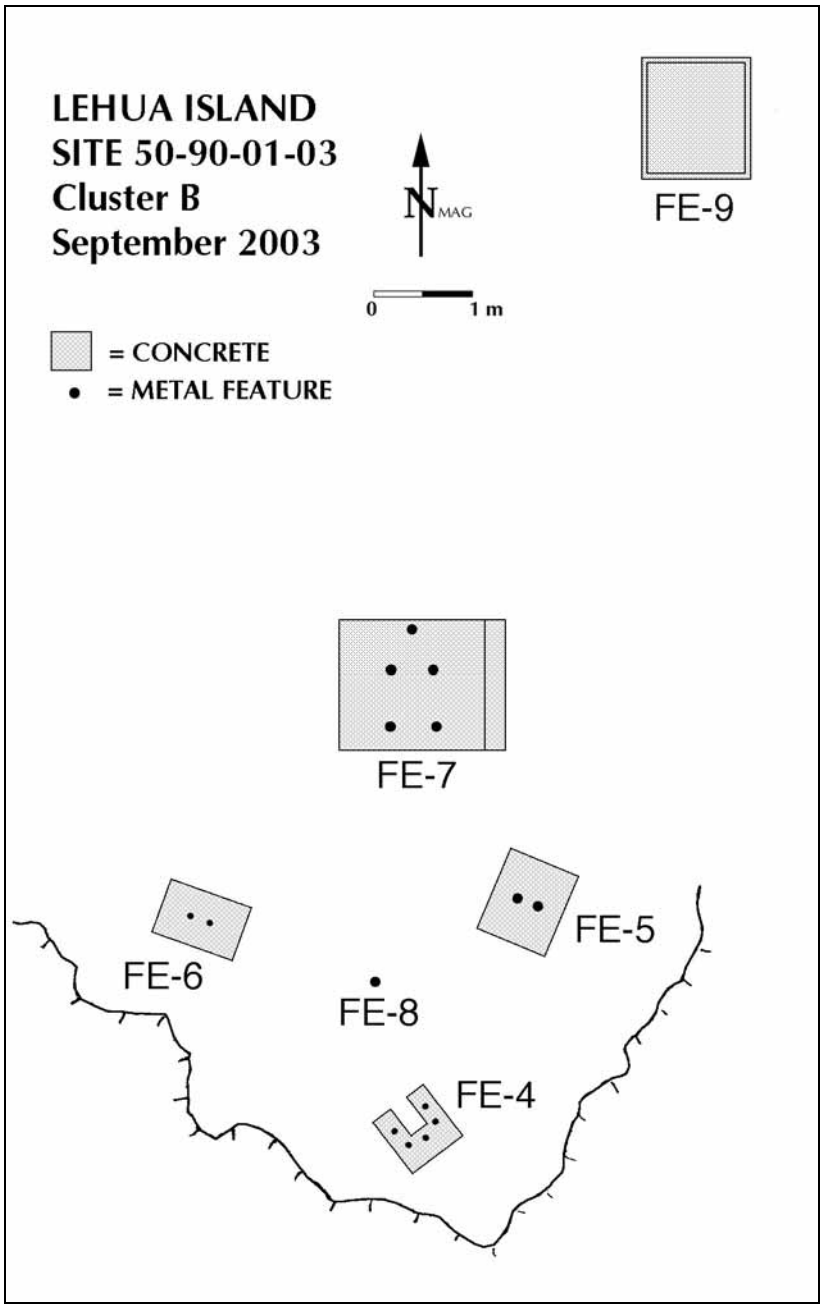


FIGURE 12: Site 50-99-01-03, Cluster B. Schematic plan view.

PHOTO 78: Site 50-99-01-03, Cluster B, Historic Light Features Situated on Cliff Edge. View W.

**PHOTO 79: Site 50-99-01-03, Cluster B Features on Cliff Edge. View S.
Visible in photo are Features 5, 6 and 7.**

Feature 9 (T-41F):

This feature consists of a square concrete platform measuring 150 cm on a side.

Feature 10 (T-42):

Location: On shoreline adjacent to western sea cave; to east and below Feature Cluster B.

Description: Two large metal rings embedded in tuff on each side of a narrow channel leading into a small sea cave (Photos 80, 81). They are believed to be associated with landing and construction/maintenance of the original navigational light.

Presumably all of the features in Cluster B date to circa 1931. According to Dean (1991), in this area were a derrick, a building to house a gasoline-powered hoist engine, and an acetylene gas supply house. Correlating the extant foundations to the former features would require more research, but it seems logical that the derrick would have been placed right at the edge of the sea cliff (Feature 4), and that the hoist engine would be on a larger platform nearby (Feature 7). Features 5, 6, and 8 probably were associated with the hoist and derrick operation. The gas house would presumably have sat atop Feature 9. From here a pipeline was constructed to the light on the top of the island. Pieces of the original copper gas line, as well as a parallel cable or electrical wire, which may be a later addition, remain on the surface heading up the steep slope toward the summit. As this was effectively a portable piping system, it was not assigned a feature number. Feature 10 sits on either side of an artificial-looking channel (Photo 80). There is no known reference to a channel being blasted in association with the lighthouse building, however, so it is likely that the channel is natural, or perhaps only slightly modified for use as a boat landing.

PHOTO 80: Site 50-99-01-03, Feature 10. Channel where metal rings are affixed. View E.

PHOTO 81: Site 50-99-01-03, Feature 10. Mooring rings. View W.

TEST EXCAVATIONS

In order to clarify functional and chronological interpretations of the two traditional site complexes, limited testing of selected features, as well as one area devoid of features, was undertaken following the completion of the surface survey. Site 50-99-01-03, comprising the two clusters of features associated with the historic Lehua navigational light, was not tested, as there was sufficient historic documentation of the site age and function, and no further information could be garnered from subsurface excavations.

Site 50-99-01-01. TU-1.

This site comprises the 36 *ahu* features distributed in 3 clusters along the crest of the island. Most were very diminutive features, some consisting of little more than a few grouped stones. All are constructed directly atop exposed windswept tuff with virtually no soil development. Therefore, testing of these features was deemed highly unlikely to provide additional information about function or provide dateable materials. However, the largest of the crest features (Feature 23) was though to be the most likely to preserve cultural materials within it, and testing might elicit structural details not obvious due to its collapsed state.

Test Unit 1, a 2 meter long by 1 meter wide trench oriented N-S was laid out to section through Feature 23, an *ahu* measuring 3 m (N-S) by 2.5 m by 80 cm high at its center (highest) point (Figure 13, Photo 82).

"Excavation" consisted of removing collapse from the western half of the feature, exposing what we perceived to be a foundation alignment of boulders, followed by alternately removing boulders and cobbles by hand and sweeping up the fine silt within the cavities, roughly working from the top of the feature to the base. As expected, there was no stratigraphy evident within the feature, and just a single type of soil was noted within the feature and below it: a fine, dry, loose, yellowish-brown (10YR 5/6), aeolian silty sediment. Photos 82-87 detail the excavation sequence from start to completion, including post-excavation reconstruction of the feature. The unit was excavated to tuff bedrock.

35 cm below the top of the feature, a rat's nest was uncovered, indicated by a concentration of twigs, grass, feathers and insect casings.

Within the screened matrix were tuff pebbles, bird guano, and insect casings. Beginning at 50 cm below the top of the feature and continuing down to the base at 74 cm below the top, a few faunal remains were uncovered, including bird bones (3), rat bones (4), fish remains (1 bone, 1 scale), and a single small *'opihi* (Cellana sp.) shell fragment. These were all interpreted to be the result of seabird

and rat utilization of the feature and surrounding area, and not culturally deposited.

Structurally, there was evidence for a semi-circular, set alignment of tuff boulders, in some cases stacked two courses high (Figure 14). It is presumed that this alignment represents former base of the feature, and that stones extending beyond this alignment are the result of later collapse. From the observed portion of this alignment, the original diameter of the feature can be estimated at 140-150 cm, or roughly half of the size of the feature in its present form.

The results of the testing indicated that the *ahu* features of site -01 were originally more formally constructed and more compact than their present form exhibits. It also illustrates that the features capture and contain a significant amount of aeolian soil and some faunal remains, though the latter is likely the result of rat collected matter as opposed to culturally deposited. No dateable materials were found, nor any artifacts.

Given recent advances in dating of corals, selecting one of the few samples of branch coral in association with one of these *ahu* is the most promising way to provide a construction/use date for these enigmatic features. No coral was collected from these features during the survey.

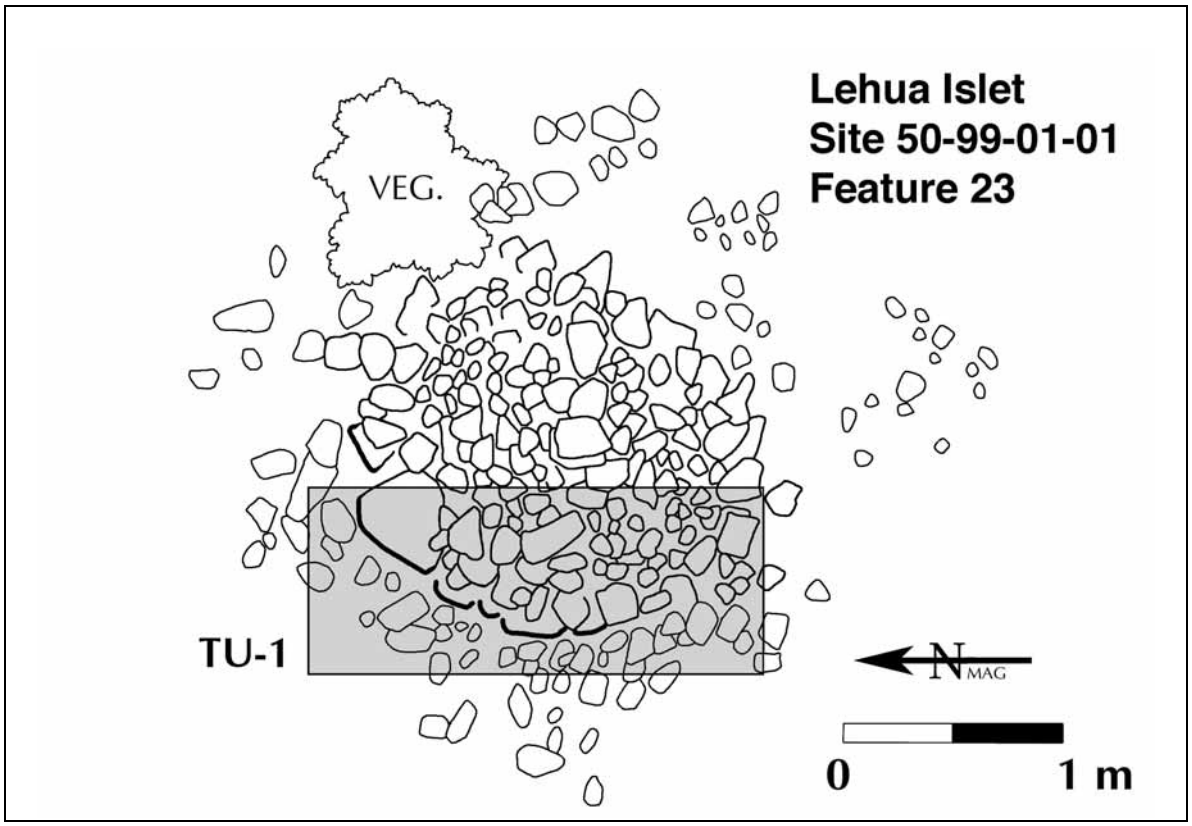


FIGURE 13: Plan view of Feature 23 showing TU-1 location.

PHOTO 82: Feature 23 Prior to excavation. View E.

PHOTO 83: TU-1 after clearing of collapse. View E.

PHOTO 84: TU-1, fill stones removed, foundation visible. View E.

PHOTO 85: TU-1, excavation in progress. View E.

PHOTO 86: TU-1, BOE and profile view. View E.

PHOTO 87: Feature 23, reconstructed following excavation. View E.

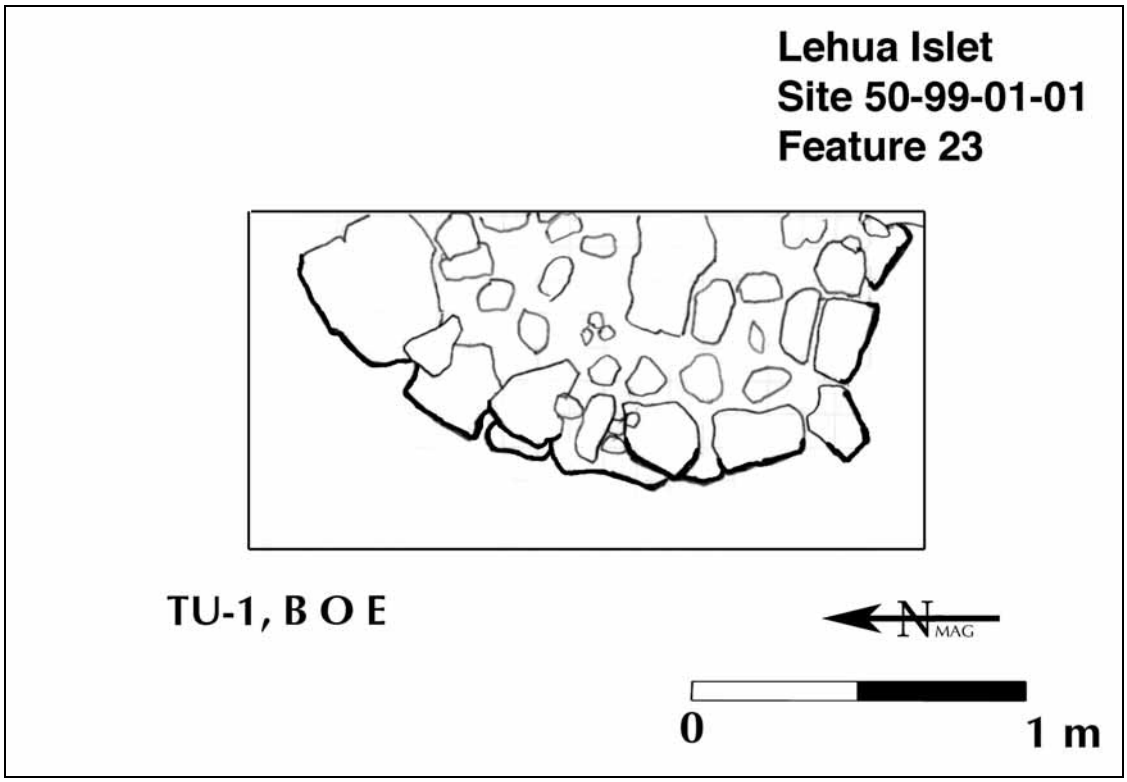


FIGURE 14: Plan view of BOE, showing intact base alignment. TU-1.

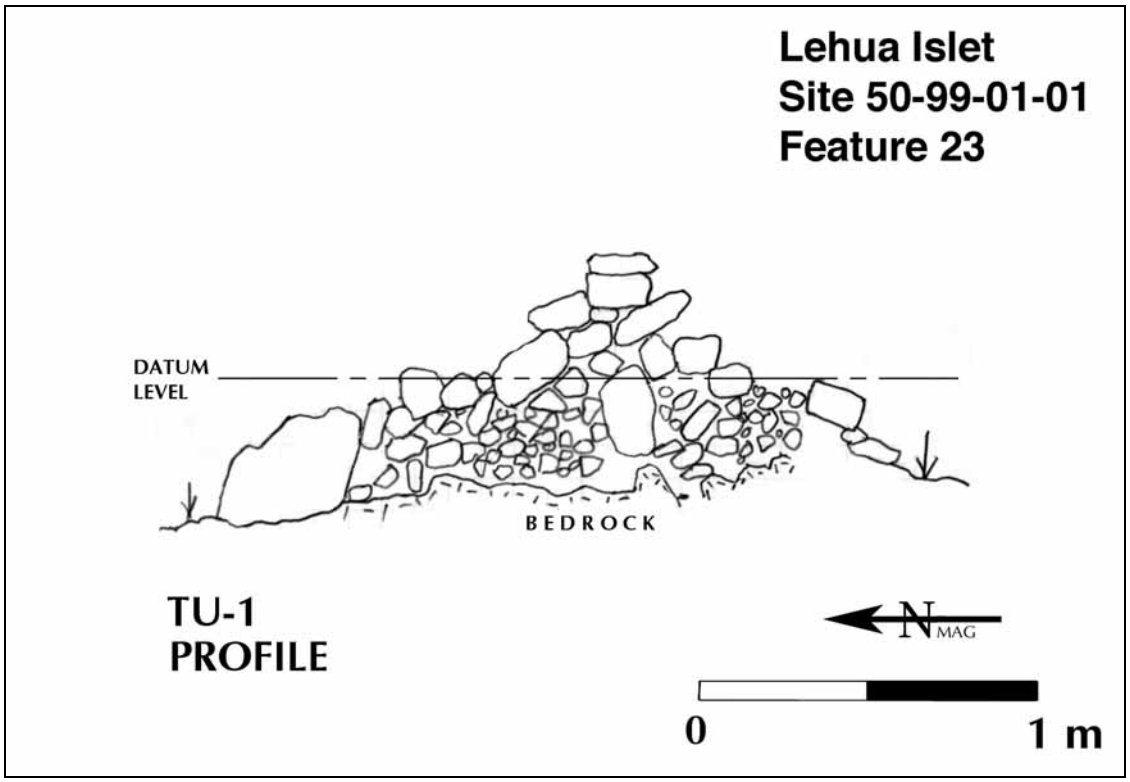


FIGURE 15: Profile view of TU-1 sectioning Feature 23.

Site 50-99-01-02. TU-2 and 3.

Site -02 comprises 19 features, composed of 3 clusters and one isolated wall, located on the gently sloping bluff along the southern coastline distributed on either side of the landing. Most of the features are located on the *makai* ends of finger ridges, with one located in the only small "valley" on Lehua containing stable soil development

The traditional Hawaiian feature types composing site -02 include small platform structures, *ahu*, and boulder alignments. Nearly all of these features are diminutive, and built directly upon tuff bedrock, providing little to no opportunity to learn anything further about their construction or chronology through excavation.

The two platforms, Features 3 and 5, are the most substantial traditional features on Lehua. Both platforms contain coral suggesting a religious function. For this reason, and given that each lacks underlying soil deposits and are devoid of other cultural materials on the surrounding surface, they were not tested. Such an intrusion would likely not yield additional information about these features and would potentially destabilize them further. A single sample of branch coral was collected from Feature 3, and another from Feature 5, to allow for future dating of these features. We do not presently have access to this dating technology.

This left few options for testing with the potential to provide additional information about the function or age of Lehua sites

TU-2

Test Unit 2, a 70 cm by 40 cm wide unit oriented roughly N-S was laid out up against the base of the facing of stones forming Feature 1, an upright alignment measuring 3 m (N-S) by 2.5 m by 80 cm high at its center (highest) point (Figure 16, Photo 88). The surface of the unit sloped to *makai*, and was excavated to bedrock, encountered at depths between 3 and 15 cm below surface.

Excavation revealed a single cultural feature (a firepit, Feature A), placed directly on bedrock, capped by later deposition (Figures 16 and 17, Photos 88-91). The dense charcoal filled component of Feature A was irregular in shape and very thin (maximum thickness 4 cm), composed of a layer of blackened silt containing charcoal. The outline of the feature, resembling a "figure 8", may indicate at least two distinct use episodes. A very dark gray layer of silt surrounded and capped the charcoal concentration. This thin (0-7 cm thick) feature contained a few fishbone fragments, charcoal flecking, and basalt flake debitage. The

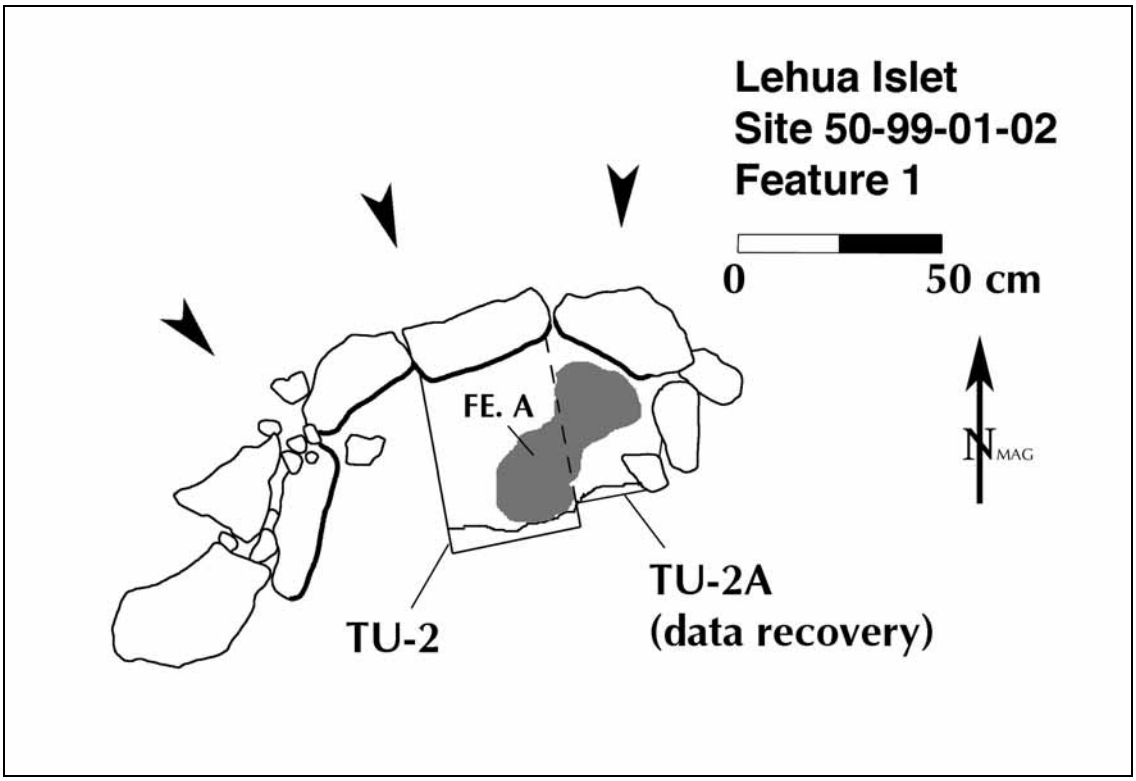


FIGURE 16: Plan view of Feature 1 showing location of TU-2 and extension 2A.

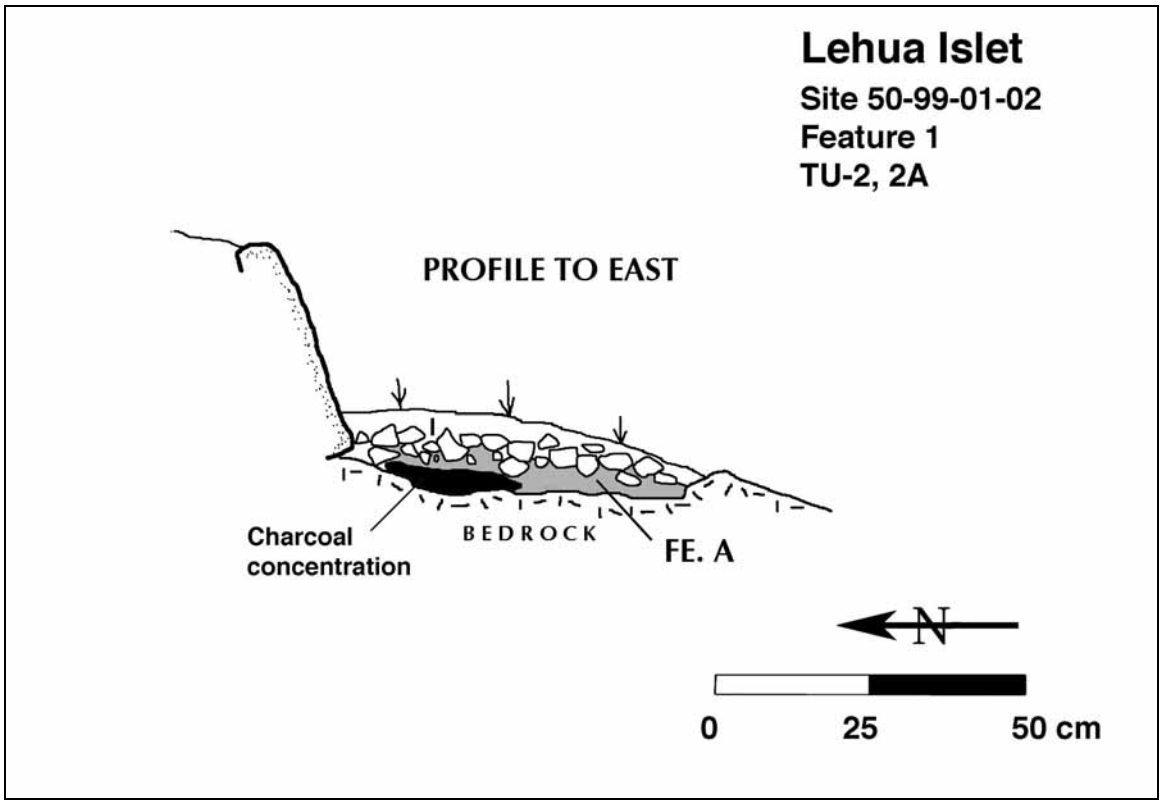


FIGURE 17: Profile view of TU-2.

PHOTO 88: TU-2, surface condition. View N.

PHOTO 89: TU-2, base of Layer I. View N. Note cobble lens.

PHOTO 90: TU-2, Feature A, indicated by dark gray stain. View N.

PHOTO 91: TU-2, BOE. View N.

interface between Feature A and the overlying Layer I soil was marked by a lens of small subangular basalt cobbles which may have served as a cooking bed. Layer I extended from surface to a maximum depth of 8 cmbs, capping the cobble lens. Layer I, a dark brown silty clay, contained mammal and fish bone, basalt flake debitage, and a single *'opihi* (*Cellana* sp.) shell fragment. These cultural materials found above the interface with Feature A suggest continued use of the location after the firepit had been abandoned. All cultural materials collected from TU-2 are summarized in Table 2.

A shovel probe test of the soil deposit immediately above (north) of the upright slab alignment revealed no cultural component, with soil corresponding to that of Layer I. Results of TU-3 (see below) located just west of Feature 1 were also negative, indicating that this site was not part of a larger habitation area.

TU-2 Stratigraphy

Layer I	0-8 cmbs	10YR 4/3 (Brown) silty clay; dry; compact; crumb; friable; slightly sticky & plastic: subangular-subrounded basalt pebbles-sm. cobbles.
Feature A	5-15 cmbs	10YR 3/1 (Very dark gray) silty clay; dry; compact; crumb to single-grain; very friable; slightly sticky & plastic; subangular-subrounded basalt pebbles-sm. cobbles.

TABLE 2: Cultural Materials Collected from TU-2

Layer	Material	Weight	Notes
I	marine shell	1.1 g	*Cellana* sp. (*'opihi)*
I	bone (fish)	0.8 g	non-diagnostic
I	bone (mammal)	6.3 g	medium-sized mammal
I	basalt debitage	10.4 g	11 total
Fe. A	bone (fish)	< 0.1 g	tiny fragments
Fe. A	basalt debitage	14.0 g	15 total
Fe. A	charcoal	18.0 g	

Results of this excavation indicate that the slab alignment (Feature 1) was constructed to serve as a windbreak for a small cooking fire. The cultural materials, particularly the flake debitage, suggested that this feature originated in the pre-contact period. However, the excellent state of preservation of such a diminutive feature presented the alternative idea that it could be much more recent.

Taxa identification of collected charcoal was the first post-excavation analysis undertaken to help define the period of use for Feature 1. All collected charcoal from the firepit was submitted to the Wood Identification Laboratory (WIL) at IARII in Honolulu. Three native tree taxa were identified, and no historic introductions. These data supported the interpretation of a pre-contact use period for the site. However, no short-lived taxa or plant parts were positively identified.

A sample of *Hao* (cf. *Rauvolfia sandwichensis*) was submitted to Beta Analytic in Florida for AMS dating. The sample returned a conventional radiocarbon age of 850 $\pm$ 50 BP, with 2 Sigma calibrated results (95% probability) of Cal AD 1050-1100 (Cal BP 900 to 850) and Cal AD 1140 to 1270 (Cal BP 810 to 680). Full radiocarbon results as presented by Beta can be found in Appendix A of this report. This was a surprisingly early date for this feature. Based on the condition of the feature, we had expected a late pre-historic/early historic result. To check this result, we felt another sample should be submitted for comparison.

Options included submitting a second sample from those collected in the initial excavation, or, since a portion of the firepit remained unexcavated, return to Lehua to expand the excavation and hope that a short-lived taxon of wood could be found. After consultation with SHPD, it was determined that the best course of action would be to return and seek out additional dateable charcoal. This was deemed "data recovery", although in effect it was simply an expansion of TU-2 (Figure 16). On the subsequent trip, the unit was expanded eastward, exposing the remainder of the firepit. In this eastern area of the alignment, the firepit remnants were concentrated closer to the edge of the upright slabs. Though the charcoal lens was contiguous throughout the unit, it did form an unusual shape, possibly the result of two overlapping concentrations representing distinct use episodes.

Post-excavation analysis on TU-2A was limited to seeking additional material for dating. Taxa ID was again performed by IARII's WIL, and this time just a single taxon was identified, Ho'awa (cf. *Pittosporum* sp.), the fourth native tree identified from this single small firepit. Though we were thwarted in our efforts to acquire a short-lived plant remain, the diversity indicated by these identifications is also of interest.

A second charcoal sample (the Ho‘awa) was submitted to Beta Analytic for comparative purposes (also AMS). This second sample returned a conventional radiocarbon age of 680 ± 40 BP, with 2 Sigma calibrated results (95% probability) of Cal AD 1270-1320 (Cal BP 680 to 630) and Cal AD 1350 to 1390 (Cal BP 600 to 560). See Appendix A for full results. Again, an unexpectedly early date, but later than the first sample and without overlapping ranges.

A literal interpretation of these two radiocarbon results would suggest a very early utilization of the island by Hawaiians, and reuse of Feature 1 spanning a couple of centuries. Though certainly not out of the realm of possibility, it seems unlikely that these two dates reflect actual use of the firepit, which would suggest intermittent use of Lehua beginning as early as 1050 CE. In addition to suggesting an extremely early utilization by Hawaiians of a marginal environment, it would certainly have to revise our thinking about site preservation. Given that the pit is associated with such an ephemeral-looking feature, which would have had to survive virtually intact for the better part of a millennium, we must consider alternate possibilities.

These dates could be skewed by in-built age. It does not seem likely that there were ever any centuries-old trees growing on Lehua given its extremely dry environment and lack of soil, but at least two other possibilities exist. First, the wood could have been brought by the fire-maker from Ni‘ihau or Kaua‘i, if he knew that no wood could be procured locally. The second possibility is that driftwood found its way to Lehua’s shore and was either from old trees, or was preserved in the dry environment for a very long time before being utilized.

One colleague outlined the following interpretations of these dating results based on a Bayesian analysis:

> The assumption here is that the fire-pit was used for a short period of time and not over and over for several hundred years. From an archaeological perspective, it is an event.
>
> The downside is that the calibration of the burning event is not constrained in any way at the late end. The ages of the trees are both earlier than the burning event, but there is nothing that is later than the burning event. I've modeled the burning event as a uniform distribution over the interval AD 800--1950. The Bayesians call this an uninformative prior, because is gives no information about when the event happened, except to say that it had to happen sometime during the period when humans were in Hawaii.
>
> The results of the calibration indicate the trees grew during a period whose early bound is AD 836--1253 and whose late bound is AD 1283-1484 at 67% confidence. The burning event took place AD 1709-1949 at 67% confidence.

> The model puts no constraint on the length of the interval between when the trees died and the fire was built. At 67% confidence, this interval is between 1 and 278 years. Because there are no constraints on the late end of the calibration, the model considers intervals as long as 500-600 years.
>
> I'm not sure how we'd model this kind of constraint, i.e. that the fire was built within x years of when the trees died. Is there any way to know for certain how long a tree was dead before it was burned? Is there any way to rule out the possibility that the trees used in the fire were driftwood and quite old?
>
> According to the model and the 14C information, there is a 62% probability that the fire burned before Cook arrived in 1778.
>
> I'm guessing that you would like results that indicate earlier use of the island (as would I). This would involve either some additional information or assumptions. Assuming that the fire was made immediately after the tree with the late date was harvested (can we assume this???) and that the fire-pit represents an archaeological event rather than a longer term process, then the fire event matches the late bound for the tree growing period, or AD 1283-1484 at 67% confidence. This assumption means the older date was from a tree that was 75 to 320 years old (67% confidence) when the fire was burned.
>
> Assuming the fire-pit was used for an extended period and that all the wood was harvested while the trees were young and burned just after it was harvested, then the fire-pit was in use 65-709 years at 67% confidence (Dye, pers. comm. 2008).

Any interpretation of these dating results involves some assumptions, and unfortunately, the isolated nature of the find (stratigraphically) provides no *terminus post quem* other than the date of initial Polynesian arrival to the Hawaiian Islands. Similarly, there is no late bound, or *terminus ante quem*, for the feature. One could reasonably argue that the lighthouse makers cooked meals here in 1931 based on the appearance of the windbreak feature and the relatively shallow depth of the overlying soil.

The interpretation we are most comfortable with is that use of Feature 1 dates to the precontact period, but a wide range of possibilities exist for just how far back the use predates Cook's arrival in 1778.

PHOTO 92: TU-3 location. View E. Also note location of Feature 2, discussed under "SURFACE COLLECTION" in the following section.

TU-3

Test Unit 3 was placed in a small "valley" between the raised ridges upon which Features 1 and 3 were situated (refer to Figure 8, p. 66). The location was selected to test for the presence of subsurface cultural deposits in one of the few areas on the island with significant, stable soil development (Photo 92). Situated on a gentle slope within a relatively broad (for Lehua) "valley", this locale is near the protected landing, a large freshwater seep, and the ceremonial features (Features 2 and 3). This combination of factors suggested that this location was among the only areas on the island likely to hold evidence of habitation, despite a lack of surface remains.

Test Unit 3 consisted of a 30 cm diameter shovel probe placed in roughly the center of the broad flat area. It was excavated by hand trowel, and all excavated material was sifted through 1/8" screen. Other than the thin surface vegetation horizon of dry shrub and roots, just a single soil stratum was encountered (Figure 18). The unit was excavated to tuff bedrock (42 cmbs), and no cultural

materials were encountered save for a single weathered fragment of *'opihi* shell (*Cellana* sp.) at 20-30 cmbs.

TU-3 Stratigraphy

Layer I	0-42 cmbs	10YR 4/3 (Brown) silty clay; dry; compact; crumb; friable; slightly sticky & plastic; Occasional subangular-subrounded basalt/tuff pebbles.

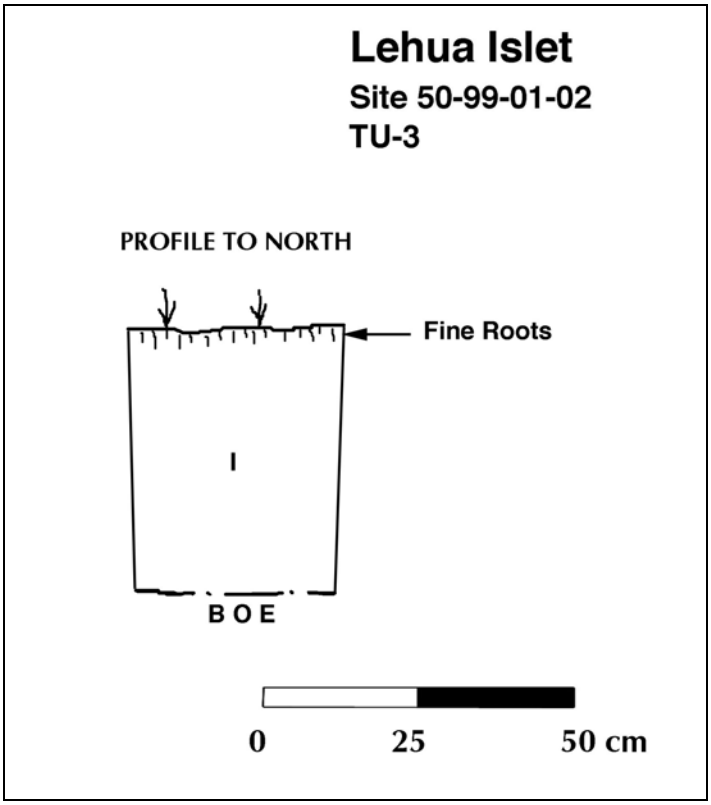


FIGURE 18: Profile view of TU-3.

The results of this unit indicate that there was no intensive cultural use of this area. Given the other cultural remains in the surrounding area, it appears that the area was only used sparingly, for ritual and perhaps occasional overnight stays. There is no evidence for prolonged habitation in this area, clearly the most likely locale to support a population on the island.

SURFACE COLLECTION

Three features within Site 50-99-01-02 were the subject of surface collection. Though trenching or subsurface testing was deemed unlikely to provide significant information about these features, two were sampled for dating materials, and a third for functional clarification.

Features 3 and 5 are the two ceremonial platforms situated on prominent ridges to either side of the landing. Each contained numerous branch coral offerings on the platform surfaces. A single fragment of branch coral was collected from each. Though we did not have access to this Thorium-230 dating technology during the project, it is hoped that these can be dated via this method in the near future. This method provides potential to tightly define a period for ritual use of Lehua Island.

Feature 2, a very disturbed feature which appears to represent a looted platform, was a greater challenge to assign a tentative function to. Its situation atop a prominent bare rock outcrop overlooking the ocean's edge (Photos 93, 94), combined with a number of branch coral fragments scattered throughout its disturbed remnants point to the likelyhood that it functioned as a *ko'a*, or shrine dedicated to fishing or bird catching, Adjacent to its main disturbed core, however is a concentrated pile of coral, rock and midden remains, in amounts not noted anywhere else on the island. Midden in these quantities would normally be interpreted as evidence of subsistence. Given that the feature had already been heavily disturbed, and having previously realized the potential research value of re-examining looted deposits (Dye et. al. 2002), a surface collection of the presumed backdirt pile was undertaken (Photo 94, also refer to Photo 57, p. 69).

The entire "backdirt" pile was screened through 1/8" mesh to collect all midden remains save for tiny fragments that could slip through that size mesh. Coral and large rocks were left behind, and all midden was bagged in bulk along with small pebbles of basalt, tuff, and coral. Parks resources did not allow for a full anaylsis of these collected remains, but a preliminary sampling and sorting of the collected materials was conducted. Approximately 50% of the nearly 2 kilogram sample was sorted into broad categories of remains, including bone, urchin, and easily identifiable shellfish remains. These results are presented in Table 3.

Though these results are not comprehensive, there are a variety of remains present at the site. It was clear from the faunal remains that a variety of species' and size ranges are represented within the fish bone component, and there were also a significant number of bird bones collected.

PHOTO 93: Site -02, Feature 2 location. Feature is located where individual is standing atop outcrop . View E.

PHOTO 94: Site -02, Feature 2. View S. Note extremely disturbed condition. White coral concentration at upper right was the portion screened and collected.

TABLE 3: Cultural Materials Collected from Surface of Site -02, Feature 2

	Species	Weight	Notes
Echinoidea (urchins)	not sorted	467.9 g	dominated by pencil urchin
Gastropoda	*Cellana exerata* (*'opihi*)	242.3 g	
	Drupa spp.	31.4 g	
	Cypraea spp. (cowry)	18.8 g	
	Trochus intextus (Hawaiian top)	11.9 g	
	Turbo intercostalis	6.0 g	
	Nerita picea (*pipipi*)	0.4 g	
Vertebrates	unsorted bone	105.9 g	dominated by fish, some bird
	scale (fish)	3.2 g	
	TOTAL	**887.1 g**	

The lack of certain cultural remains is also noteworthy. There was a complete lack of charcoal within this context, and no faunal remains exhibited any evidence of burning. Similarly there was a notable absence of artifacts or modified remains. None of the hundreds of recovered pencil urchin spines possessed evidence of modification, an artifact type typical for nearshore sites where fishing was a common subsistence activity. If our interpretation of this pile as a byproduct of looting is correct, one would expect for artifacts to have been pilfered. However, it is rare in such cases that all artifacts, including more marginal and hard to recognize types, as well as broken implement, are removed. The evidence here suggests that there were few to no artifacts present

to begin with. This fact, combined with the lack of charcoal and the inhospitable location of this feature, strongly suggest that the midden remains are the result of offerings to *akua* rather than subsistence for visitors to Lehua.

These limited data support the interpretation that Site -02, Feature 3 functioned as a *ko'a*. Despite the extremely disturbed nature of the site, the collected remains still possess additional research value, as a means to gain insight into particular aspects of ritual on Lehua, and of fishing and bird-gathering sites in general.

FUNCTIONAL AND CHRONOLOGICAL INTERPRETATION

SITE 50-99-01-01

The three clusters of *ahu* features located on the crescent rim of the island remain open to multiple functional interpretations. Though they appear to date to the pre-contact period based on style and occasional branch coral in association, the possibility exists that they are later features.

The use of these *ahu* by seabirds for nesting suggests that the features may have been constructed for this purpose. By providing these nesting locations, the Hawaiians may have been facilitating the catching of the birds. An argument against this interpretation is the fact that birds were likely much easier to come by on the lower flanks of the island. Oftentimes, the functional interpretation of *ahu* is that they are markers. Some these *ahu* are visible from offshore and may have had some locational or directional function, possibly providing triangulation points for offshore fishing locations. Only a few of *ahu* have coral associated with them, which could imply a religious function. Kaunuakalä (altar of the sun) is the name for the island's summit. This implies a religious function for Lehua's crest. It is possible that one or more of these *ahu* constitute remains associated with this connotation.

All of the *ahu* appear to be built directly atop the landform with no associated subsurface component. Testing of the largest *ahu* confirmed the lack of an underlying deposit, but did indicate that the features were capable of capturing significant amounts of windborne sediment. As expected, no dateable materials or artifacts were found in association, therefore the testing accomplished little to clarify the functional or chronological interpretation of these features, which will remain enigmatic for now.

SITE 50-99-01-02

The nineteen features comprising site -02 collectively represent use of Lehua for ritual and short-term habitation in the pre-contact period.

Three of the features represent temporary habitation. Features 1 and 4 are evidence of subsistence activities on Lehua, and Feature 19 is a small shelter with a lack of other associated remains.

Feature 1 provided two radiocarbon dates on wood charcoal. These samples provided earlier than expected date ranges (850 $\pm$ 50 BP and 680 $\pm$ 40 BP). In-depth analysis of these results suggests they may reflect use later than the radiocarbon age indications, but they provide solid evidence that site -02 dates to the pre-contact period. Taxa identification on recovered charcoal revealed only native Hawaiian taxa, further supporting this chronological interpretation.

Two platforms, Features 3 and 5, are the most substantial traditional features on Lehua. Located at the *makai* end of finger ridges to each side of the landing, these platform locations frame a panoramic view of the northern end of Niçihau and the channel that separates Niçihau from Lehua. Both platforms contain branch coral, which in combination with their prominent locations, suggests a religious function.

Feature 2 appears to represent a heavily disturbed platform feature containing remnants of the boulder alignment that defined the sides of the platform. A heavy midden component was initially interpreted as suggestive of a habitation site situated on the raised bluff. However, analysis of collected surface remains from this feature, in combination with it's exposed prominent location make it more likely a small religious site, with the midden component the result of offerings. The quantity of faunal remains is substantial, suggesting use of the feature over an extended period of time.

The remaining 13 features of the site are all small *ahu*, ranging from a single propped upright stone to a rough grouping of stones 170 cm by 145 cm. Most are less than a meter in diameter and less than 50 cm high. None are distinctive for their construction, and most are collapsed to some degree. They are similar in construction to the features of site -01 on the crescent rim. As with those summit *ahu*, the function of these remains unclear, possibly associated with bird catching or gathering, ritual, commemoration of island visits, or locational markers. None of the ahu of site -02 was tested, and results of testing the large *ahu* on the crescent rim indicates that there is little to be gained from sectioning this feature type. Via association with the more formal features of the site, as well as construction style, they are believed to represent pre-contact features.

SITE 50-99-01-03

The Lehua navigational light and associated features all date to the 20th century, spanning the period from 1931-1989. The features are situated in two clusters, one near the island's summit (Cluster A) and a second on the south flank (Cluster B). Only Feature 3 at the summit is clearly associated with the original light, and was either the base for a support feature, or possibly the original light foundation. Feature 1 (the current automated light) dates to circa 1989, however it may be built atop a remnant of an earlier feature. Feature 2 appears to be a relatively modern structure, which likely functioned as the base for a weather station.

All of the features in Cluster B appear to date to circa 1931. The features supported a derrick, a building to house a gasoline-powered hoist engine, and an acetylene gas supply house. Correlating the extant foundations to the former features would require more research, but logic suggests that the derrick would have been placed right at the edge of the sea cliff (Feature 4), and that the hoist engine would be on a larger platform nearby (Feature 7). Features 5, 6, and 8 probably were associated with the hoist and derrick operation. The gas house would presumably have sat atop Feature 9. Feature 10 functioned as a boat mooring.

SIGNIFICANCE DETERMINATIONS

SITE 50-99-01-01

The three clusters of *ahu* distributed along Lehua's crest may yet hold clues to their function. In particular, their distribution in relation to celestial phenomena has not been explored, and further historical research could also yield additional testable hypotheses. For this reason they are significant under Criterion D for the information they may yield about the Hawaiian use of small islets in the pre-contact period. . The construction form and style of the *ahu* do not appear distinctive, but the location and distribution of these *ahu* may be culturally significant based on their function, which is not presently known. If their function is wholly or in part ritual in nature, the *ahu* composing site -01 possess additional significance under Hawai'i Criterion E, which denotes cultural significance to contemporary members of an ethnic group.

SITE 50-99-01-02

It is possible that excavation through one of the two well-preserved platform features (Features 3 and 5) could yield additional information about pre-contact use of Lehua. It would certainly be of value to conduct dating on the branch coral samples collected from these two features to help refine the period of significance. Should such results be obtained, that information will be submitted to SHPD as a supplement to this report. As traditional religious sites, they possess cultural significance to contemporary Hawaiians. These features therefore retain significance under Criteria D and E.

Features 1, 2, and 19 have been recorded, excavated and/or collected thoroughly and are unlikely to yield additional information. Feature 2, a likely remnant of a traditional religious structure, retains significance under Hawai'i Criterion E.

The remainder of the features, the traditional *ahu* and surface midden scatter, are significant under Criterion D, still possessing potential to yield information about traditional use of Lehua. As with Site -01, if the *ahu* function is ritual in nature, they possess additional significance under Hawai'i Criterion E.

SITE 50-99-01-03

These features are of mild historical interest, representing a feat of ingenuity and physically difficult engineering, as well as early 20th Century historic navigation patterns. Today they also provide among the only level spots on Lehua, and are therefore valued as campsite amenities and possess the potential to be adaptively utilized to support resource management activities. They are significant under Criterion D, and now that they have been sufficiently documented, should be considered "no longer significant".

TABLE 4: Site Significance

Site #	Significance Criteria	Mitigation Recommendation
50-99-01-01	D, E	Preservation
50-99-01-02	D, E	Preservation
50-99-01-03	D	No further work needed Preservation/adaptive re-use

SUMMARY AND RECOMMENDATIONS

The smaller islands, islets, and atolls to the northwest of Kauaçi exhibit varying degrees of occupation and use by pre-contact Hawaiian populations. Results of our survey suggest that Lehua was never permanently settled, but was visited intermittently for ritual purposes and likely for resource gathering. A virtual lack of artifacts and developed soils suggest that no agriculture, and very little subsistence was ever attempted on the island. Radiocarbon dates collected from a single firepit suggest this use may have begun as early as the 11th Century CE, though alternate interpretations of these dating results are possible.

The sites present on the exterior south flank of the crater suggest that Hawaiians were landing on the island and constructing religious sites and probably fishing and collecting birds while on the island. The proximity of Niçihau and the lack of occupation sites on Lehua indicates that people probably only came over on day trips, but lived on Niçihau or Kauaçi. This notion is supported by a complete lack of any surface artifacts suggestive of fishing gear manufacture. The thin soils and topography of Lehua Island cannot support agricultural pursuits and the windy, barren conditions would not have been inviting for habitation. The lack of a quality canoe landing would suggest that Hawaiians visited Lehua only during periods of good weather and calm surf. Historical references to a 19th Century occupation of Lehua is not supported by the archaeological evidence.

Lehua is only 0.75 mile from Niçihau and this may account in large part for the lack of permanent occupation and the limited temporary habitation. These results support the idea that habitation was attempted on the more remote islands of Nihoa and Mokumanamana (Necker) due to their greater distance and isolation from the main islands. Such remote, "over the horizon" places would have required development of habitation and subsistence to support visitors for greater periods, whether they arrived there deliberately or accidentally. Lehua, and by extension other offshore islets in the main Hawaiian archipelago, were locales too marginal to eke out a living when the relative bounty of a large island was within sight, thus the ritual activities undertaken on these offshore islets were conducted without the development of a supporting subsistence and habitation system.

RESOURCE MANAGEMENT RECOMMENDATIONS

The distribution of sites recorded during the inventory survey indicated that the majority of sites are located on the crescent rim and on the finger ridges at the base of the southern flank. Sites were nearly absent in the drainage channels and gullies due to the erosional processes within these areas. Management of these

sites involves impacts and threats from erosional factors, birds, and human visitors.

The sites on the finger ridges may potentially be threatened by water erosion that widens the gullies adjacent to the ridges. As gullies widen, the width of the ridges containing platform and *ahu* sites is narrowed. The ceremonial platforms (Site -02, Features 3 and 5) cover much of the width of the ridges on which they are constructed. Feature 3, the largest on the island, has already lost a portion of its western side due to collapse of the underlying landform. Sites on ridges adjacent to the sea cliffs may also be threatened by erosion of the shoreline due to high surf hitting the outer flanks. It would be difficult to mitigate these erosional impacts because of the natural conditions, but the two significant platforms should be monitored and if threatened, it may be possible to stabilize the gully walls adjacent to the platforms. If the preservation of these sites is threatened, additional archaeological research should be conducted to insure that complete information about the sites has been obtained. It is recommended that the sites be monitored on a regular basis by those visiting or working on Lehua Island and any changes or threats to the site should be reported to the Archaeology Branch of the State Historic Preservation Division.

The birds are using the sites, especially the *ahu*, as roosting and nesting sites. The bird's impact on these sites is the deposition of guano, but the birds do not appear to be moving the rocks. It is not recommended at this time, that any action be taken to discourage the birds from using these sites. In fact, this use of sites by the birds may reflect a long-standing tradition on these small offshore islands.

Landing on Lehua Island is permitted by the Department of Land and Natural Resources. Only Site -02, Feature 2 along the southern shore exhibits evidence of deliberate disturbance. Recognizing that researchers and volunteers will be on Lehua Island in the future as part of the restoration project, it is recommended that the workers be briefed about the archaeological sites and the following management recommendations are proposed:

- All visitors to the island should be briefed about the location, appearance, and fragile nature of the archaeological sites.

- The responsible individual(s) on the permit should monitor workers to insure that they do not walk upon or over the archaeological sites.

- No rocks or other materials associated with the sites should be moved or removed.

A monitoring program should be established to allow archaeologists to regularly check the condition of the sites inventoried during this survey and record new sites. If changes or threats are identified, more specific management actions should be developed and implemented.

The historic Lehua navigational light features (Site -03) are far less likely to be impacted by the actions of people. These features are also valued as campsite amenities and possible support features for the continued restoration goals on Lehua. They are ideal candidates for adaptive re-use, and in fact it would be less impactful to the traditional sites of the island if these features were utilized rather than new support facilities built. Should changes to these features be proposed, the State Historic Preservation Division should be consulted, and any alterations should be thoroughly documented per their recommendations.

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APPENDIX 1:

WOOD TAXA IDENTIFICATION RESULTS

Radiocarbon Screening Results of a Charcoal Sample from Lehua Island
(T.U. 2, Fe. T-1)

Gail M. Murakami
August 18, 2004

Identification	**Common/ Hawaiian Name**	**Habit/Origin**	**Part**	**Weight, g**
cf. *Canthium odoratum*	*Alahe‘e*	Tree/Native	Wood	12.21
cf. *Thespesia populnea*	*Milo*	Tree/Native or Polynesian Introduction	Wood	1.46
cf. *Rauvolfia sandwicensis*	*Hao*	Tree/Native	Wood	0.77

Radiocarbon Screening Results of a Charcoal Sample from Lehua Island
(Site 02, Feature 1, T.U. 2 Extension, Pit Fill Feature A, 38-44 cm bd)

Gail M. Murakami
May 13, 2008

The entire sample consisted of one taxon, summarized below. This adds another taxon to the previous identifications from Lehua Island of *alahe‘e* (*Canthium odoratum*), *milo* (*Thespesia populnea*), and *hao* (*Rauvolfia sandwicensis*).

Identification	**Common/Hawaiian Name**	**Habit/Origin**	**Part**
cf. *Pittosporum* sp.	*Hō‘awa*	Tree/Native	Wood

APPENDIX 2:

RADIOCARBON RESULTS

BETA ANALYTIC INC.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Alan Carpenter — Report Date: 10/6/2004

State of Hawaii — Material Received: 9/21/2004

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 195943	840 +/- 40 BP	-24.5 o/oo	850 +/- 40 BP

SAMPLE : SP-LEH-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1050 to 1100 (Cal BP 900 to 850) AND Cal AD 1140 to 1270 (Cal BP 810 to 680)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 permil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number: **Beta-195943**

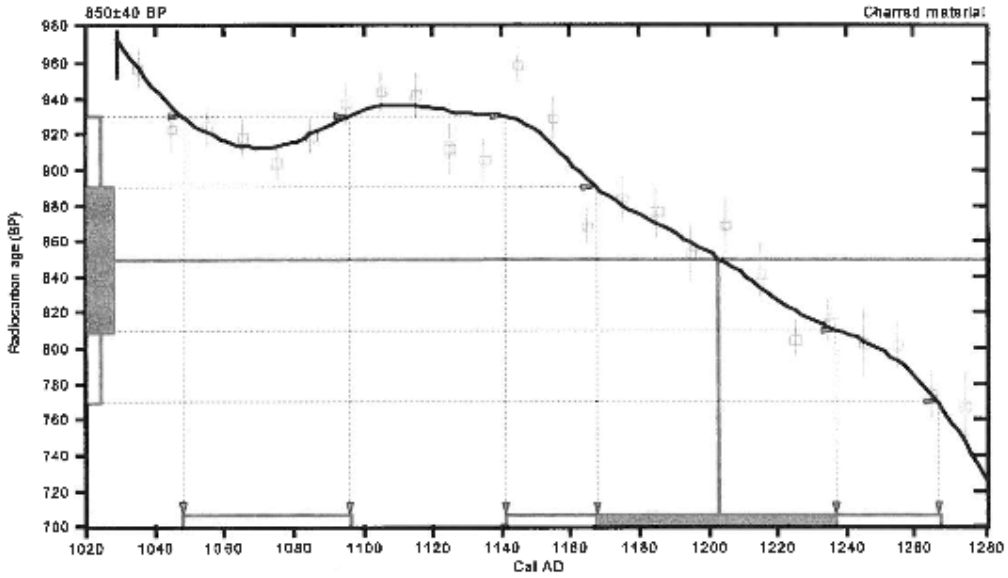
Conventional radiocarbon age: **850±40 BP**

2 Sigma calibrated results: **Cal AD 1050 to 1100 (Cal BP 900 to 850) and**
(95% probability) **Cal AD 1140 to 1270 (Cal BP 810 to 680)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1200 (Cal BP 750)

1 Sigma calibrated result: Cal AD 1170 to 1240 (Cal BP 780 to 710)
(68% probability)



References:

Database used
Intcal98

Calibration Database

Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-323

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Alan Carpenter

Report Date: 6/27/2008

State of Hawaii

Material Received: 5/23/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 244884	700 +/- 40 BP	-26.3 o/oo	680 +/- 40 BP

SAMPLE : SP-LRH-3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1270 to 1320 (Cal BP 680 to 630) AND Cal AD 1350 to 1390 (Cal BP 600 to 560)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.3:lab. mult=1)

Laboratory number: **Beta-244884**

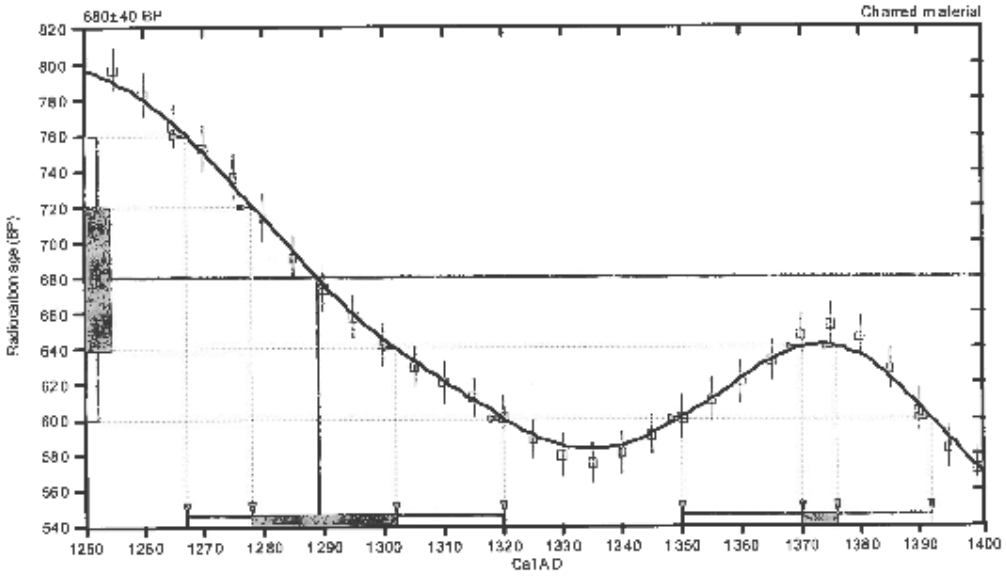
Conventional radiocarbon age: **680±40 BP**

2 Sigma calibrated results: **Cal AD 1270 to 1320 (Cal BP 680 to 630) and**
(95% probability) **Cal AD 1350 to 1390 (Cal BP 600 to 560)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1290 (Cal BP 660)

1 Sigma calibrated results: Cal AD 1280 to 1300 (Cal BP 670 to 650) and
(68% probability) Cal AD 1370 to 1380 (Cal BP 580 to 570)



References:

Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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