Coral Magunuson. THE CANOE HOUSE IN TRADITIONAL HAWAI'I. (Under the direction of Dr. Larry Babits), Department of History, November 1998.

Hawaiian canoe houses were examined in order to understand their roles in traditional Hawaiian villages and to determine the types and sizes of the vessels stored within. The first step was the identification of canoe houses using historical and archaeological descriptions. The second step was the identification of the boat house remains in an archaeological field context. The final step involved gathering data from previous archaeological projects and the survey conducted for this thesis at Kahikinui, Maui.

Identifiable by their long shape, canoe houses were located outside the littoral zone and close to canoe landings. Historical documents indicate that some canoe houses likely functioned as men's houses as well, an understandable conclusion since fishing and canoe manufacture were men's activities. Coastal villages were built around canoe landings and thus canoe houses.

Canoe house lengths appear to reflect canoe lengths. The latter conclusion receives support from the correlation between the average length of canoes recorded in historic documents with the average size of canoe houses recorded in the archaeological record. It is more problematic to determine the type of canoe stored within, since double and outrigger canoes could have similar lengths and were sometimes stored together. However, it is likely that double canoes, vessels belonging exclusively to the chiefly class, were stored in larger canoe houses.

THE CANOE HOUSE IN TRADITIONAL HAWAI'I

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by
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'aha	sennit
aho	small thatching sticks
ahupua'a	land division usually extending from the uplands to the sea, so called because of a boundary marker (*ahu*) marked with a pig (*pua'a*)
ala wai	channel or canal
ali'i	chiefly class
ama	outrigger float
'aumakua	family or personal gods, deified ancestors who might assume the shapes of animals
'awa	kava (*Piper methysticum*), the root being a source of a narcotic drink used in ceremonies
haku or *haku'aina*	lord, master, overseer
hala	screwpine (*Pandanus*)
halau	a long house
halau wa'a	canoe house
hale 'aina	eating house for women and young boys
hale hoahu	elevated structures on posts for food storage
hale mua	men's house
hale noho	dwelling house
hale papa'a	food storage house
hau	*Hibiscus tiliaceus*
heiau	house for the gods, high place of worship
holoku	cloak or loose fitting dress
'ie'ie	*Freycinetia arborea*
ihunui	canoe with a broad bow, hollowed from the large end of a log
'iliahi	sandalwood (*Santalum* spp.)
'ili'ili	pebbles
'ilima	*Sida fallax*
kahuna	priest
kahuna kālai wa'a	distinguished canoeman
kamani	*Calophyllum inophyllum*
kapa	cloth made from the paper mulberry bark

1 Definitions based on *The Hawaiian Dictionary* (Pukui and Elbert 1986).

kapu	taboo, prohibition
kauila	*Colubrina oppositifolia* or *Alphitonia ponderosa*
kaukahi	canoe with one hull or outrigger
kaulua	double canoe
kī	ti (*Cordyline fruticosa*)
kiapolo	specialized fishing canoe of unknown description
kioloa	long racing canoe
koa	canoe tree (*Acacia koa*)
konohiki	headman of an *ahupua'a* land division under the chief
ko'okahi	canoe holding one person
ko'okolu	canoe holding three people
ko'olua	canoe holding two people
ko'owalu	canoe holding eight people
kou	*Cordia subcordata*
kua or *kuku*	house where the *kapa* (bark cloth) was beaten
kū'ē'ē	double canoe with one hull shorter than the other
kukui	candle-nut tree (*Aleurites moluccana*)
kū'ula	stone alters or fishing shrines
lānai	porch, veranda or temporary shed
lapuwale	people who were of no account
lau hala	leaf of the *Pandanus tectorius*
lei	garland, wreath; necklace of flowers
lele'iwi	canoe with a broad bow ornament
lona	block of wood to support canoe out of the water
loulu	native fan palm (*Pritchardia*)
mai'a	banana (*Musa* sp.)
maka'āinana	commoner, subjects; people who attend the land
makai	in the direction of the sea
māmane	*Sophora chrysophylla*
ma'o	Hawaiian cotton (*Gossypium sandwicense*)
mauka	inland
moku	district
muku	starboard ends of outrigger booms (*'iako*)
naio	bastard sandalwood (*Myoporum sandwicense*)
naupaka	*Scaevola sericea*

niu	coconut (*Cocos nucifera*)
noa	sleeping house of chief's wives
ʻōhia-ai	mountain apple (*Syzygium malaccense*)
ʻōhiʻa lehua	*Metrosideros polymorpha*
ʻoihana waʻa	canoe builder
olonā	*Touchardia latifolia*
ʻōpelu	canoes with thickened bottoms
paʻiʻai	fermented paste of taro, sweet potato or breadfruit that is not easily spoiled
papamū	gaming board
pʻū	cover to protect cargo and keep water out of the hold
peʻa	menstrual hut
peleleu	double canoe with equal sized hulls
pepeiao	comb cleats to which the booms were lashed
piko	navel, umbilical cord
pili	*Heterogpogon contortus*
pohakuʻnai	stone canoe rubbers
poi	paste made from pounded taro
pola	platform or high seat between the hulls of a double canoe
pou	short canoe
pūkahi	specialized fishing canoe of unknown description
pūkolu	canoe with three hulls
puluʻamaʻu	reddish thatching material collected from the mountain
ualu	sweet potato (*Ipomoea batatas*)
ʻulu	breadfruit (*Artocarpus altilis*)
waʻa	canoe
waʻa lawaiʻa	deep, narrow fishing canoe with sides straight up and down
wauke	paper mulberry (*Broussonetia papyrifera*)
wiliwili	*Erythrina sandwicensis*

CHAPTER 1: HISTORY OF THE HAWAIIANS

Hawai'i is a chain of islands surrounded by the largest expanse of open water in the Pacific Ocean (Figure 1). The ancient islanders of Hawai'i oriented their lives to the ocean through fishing, traveling, playing, teaching and learning. One primary setting for conducting and contemplating these activities was the canoe house or *halau wa'a*, a rectangular structure built to protect Hawaiian canoes. The pivotal role of this structure in traditional Hawaiian society has been relatively overlooked by archaeologists and historians. This study attempts to place the canoe house in its functional and traditional contexts and then determine the size and type of vessels stored within them. To do so first requires an understanding of Hawaiian history.

When and where the Polynesian people, now known as Hawaiians, came from is open to debate. Hawaiian mythic tradition states that the navigator Hawaii-loa found the island group while on a long fishing excursion (Beckwith 1970:364). He then sailed home to the east coast of Ka-aina-kai-melemele-a-Kane (Land of the yellow sea of Kane)[1] to gather his family in an effort to settle the new lands. After moving to Hawai'i, Hawaii-loa occasionally returned to his homeland to find suitable mates for his children.

Archaeological studies suggest initial settlement of Hawai'i occurred between AD 400 and 900 (Kirch 1985). Recent pollen analysis, however, of a population growth curve for Hawai'i based on radiocarbon assays, proposes a date of AD 400 for initial

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1 Beckwith also notes the Kepelino version which claims Hawaii-nui was a fisherman from lands adjoining Kahiki-honua-kele and locates the Hawaiian Islands in the sea called O-kai-holo-a-ka-i'a or "Sea where the fish run" (1970:364-365).

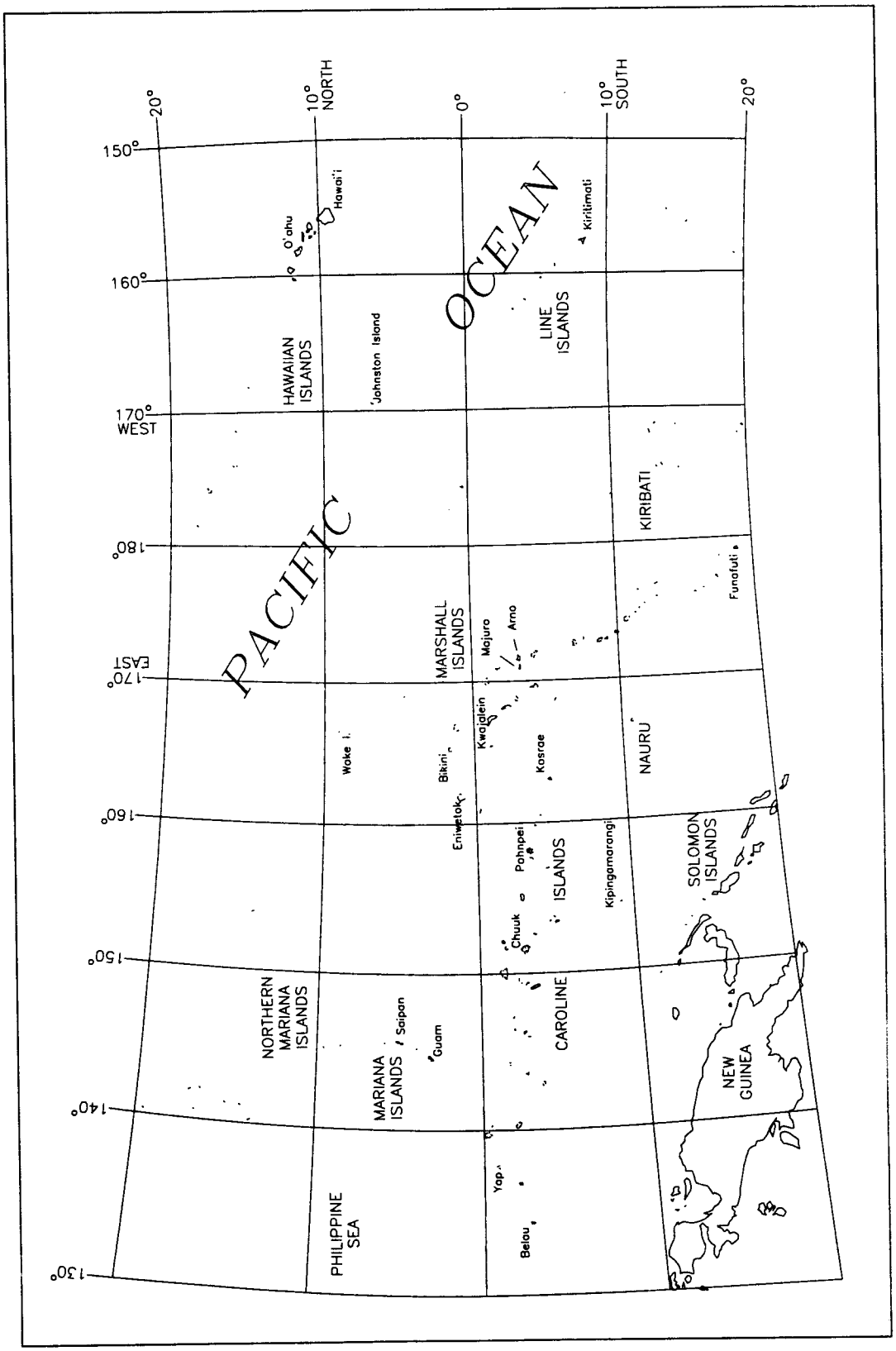

Figure 1. The Hawaiian Islands in the Pacific. Courtesy of Roger Blankfein.

settlement (Athens et al. 1997:21, 188). Researchers Michael Graves and David Addison (1995:394) concur, hypothesizing that settlement began prior to AD 500. Thus the first people to visit the Hawaiian Islands may have been explorers, like the legendary Hawaii–loa. In this scenario, they would have set sail in large canoes with the intention of discovering new lands (Bellwood 1978:43; Bishop 1940:2; Hiroa 1987[1957]:95; Finney 1977:1277; Kirch 1980:75; Suggs 1960:15, 81).[2] The voyages were presumably purposeful since, "viable populations of humans, plants and animals got through as well, and it is unlikely that these would be varied on some mere drifting canoe. . . it is virtually impossible to drift to many parts of Polynesia, and intentional sailing must have taken place" (Bellwood 1978:43). Polynesian navigators did not use sextants or compasses, instead they relied on their knowledge of stars, wave patterns, clouds and migratory birds to aid them on their journey. Modern Micronesian sailors regard long voyages as tests of endurance, not as difficult navigational exercises (Irwin 1992:101).

The early voyagers likely set sail from the Marquesas, Tahiti or both island groups.[3] There were probably multiple voyages. Historian Abraham Fornander (1996[1878-1880]) and Historian Kenneth Emerson (1978[1893]) examined stories about Hawaiian navigators such as Pa'oa, Mo'i-keha, Kila and La'a-mai-Kahiki, believing these to be actual accounts of voyaging expeditions occurring in the 12th and 13th centuries. There is probably some historical basis to these accounts, however Patrick Kirch (1980:66), an archaeologist, notes

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2 Andrew Sharp, an historian, does not agree with this idea, claiming that prehistoric methods of sailing and navigation were not adequate for the discovery of new islands or the deliberate return voyage of colonization. He believes Hawai'i was inhabited by accidental voyages (Sharp 1965).

3 Linguistic and archaeological evidence suggest the Hawaiians came from the Marquesas or Tahiti (Finney 1977:1283).

that "their validity would . . . be more acceptable to the scientifically minded if we had some independent evidence for such multiple settlement voyages to Hawai'i." Archaeologist Yosihiko Sinoto (1991) believes the evidence consists of fishhooks that appear simultaneously in Hawai'i and the Society Islands, although archaeologists Ross Cordy (1974) and Roger Green (1974) argue that these similarities are the result of independent invention.

Polynesian voyagers likely sailed the 2,300 miles that separate Hawai'i from Tahiti in large double canoes similar to ones used by later Hawaiians. Double canoes were the largest vessels known in the Pacific; recorded hulls measured more than 32.8 m in length.[4] Double canoes were constructed by lashing together two dug-out canoes athwartship. "The lashing that held it together permitted a measure of play in every joint in a situation where rigidity would have been disastrous" (Suggs 1960:77). A platform was constructed between the two hulls amidship, possibly with small huts. The vessels usually had one or two sails rigged to masts that were stepped into the main hull. Mat coverings over the hulls kept supplies dry. Missionary William Ellis toured Hawai'i in the early 19th century and noted that:

> We have every reason to believe the canoes of the natives were larger formerly than they are now, and yet we have known them to make several long voyages, beings sometimes a fortnight or three weeks at sea (Ellis 1979[1825]:315).

New plants and animals also arrived with the Polynesians, however it is unknown whether the plants arrived with initial colonization or were brought over by later voyages

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4 Ben Finney (1977), an anthropologist and University of Hawai'i professor, constructed a replica of a double-canoe, called the *Hōkūle'a*. She is 19 m long with two masts.

(Kirch 1985:65-66; Athens 1997; Athens et al. 1997:34). Edible plants included taro and sweet potatoes which could be cooked in underground earth ovens called *imu.* Usually they were mashed into an edible paste called *pa'i'ai* and slightly fermented. *Pa'i'ai* could last about six months. A little water was mixed with the *pa'i'ai* to form *poi*, a pudding-like starch. Other edible plants included *'ulu* (breadfruit or *Artocarpus altilis*), *niu* (coconut or *Cocos nucifera*), *hala* (*Pandanus*)[5], *'ōhia-ai* (mountain apple or *Syzygium malaccense*), *mai'a* (banana or *Musa* sp.) and *kukui* (the candle-nut tree or *Aleurites moluccana*)[6] which produces nuts with a laxative quality. The high oil content of *kukui* nuts also allowed them to burn slowly like a candle. Plants utilized for canoe building included *hau* (*Hibiscus tiliaceus*) for the *ama* (float) and *hala* (screwpine or *Pandanus tectorius*) leaves which were woven into mats for sails and *pā'ū* (covers to protect cargo and keep water out of the hold). *Wauke* (paper mulberry or *Broussonetia papyrifera*) was pounded into *kapa,* a fabric with which Hawaiians made clothing. In addition to plants, the Polynesians also brought dogs, pigs and chickens. The Polynesian rat (*Rattus exulans*) and lizard (*Gekkonidae*) were probably brought to Hawai'i in the holds of voyaging canoes inadvertently.

The first explorers encountered islands with considerable variation: rain forests and deserts on the same island. They also discovered elements of nature never before seen in their Central Polynesian homeland, most importantly active volcanism and snow. A general

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5 John Culliney (1988:176-177), author of *Islands in a Far Sea*, speculates that *hala* was first brought to Hawai'i as a food crop as well as for thatching and weaving material. When Hawaiians discontinued using it as a food source it reverted back to its wild state, which is poor in food quality.

6 The coconut and *kukui* generally do not show up in the paleoenvironmental record until after AD 1200. However, *kukui* has been observed ca. AD 876 and coconut ca. AD 987 (Athens et al. 1997:34).

description of the islands follows to orient the reader to the conditions faced by the early settlers.

The windward sides of the larger islands, such as Hawai'i, O'ahu, Maui, Kaua'i and Moloka'i, are lush and green with plentiful water because the volcanic mountains create orographic rainfall, facing the prevailing trade winds from the northeast. For example, Mt. Wai'ale'ale on Kaua'i is one of the wettest places on earth, receiving over 11,000 mm of rain annually (Giambelluca et al. 1986:17). Although the windward sides of the islands are lush, they do not have the protection of the drier leeward sides. Winds and storms tend to be stronger windward, carving deep valleys and high cliffs out of the mountains. The leeward coasts provided some protection from the wind, however, there is less rainfall. The leeward side of Hawai'i Island, for example, may receive as little as 250 mm of rain annually (Giambelluca et al. 1986:34). Two seasons were recognized by the Hawaiians: "Kau (May-October), the high-sun period corresponding to warm temperatures and steady trade winds; and Ho'oilo (November-April), the cooler period when trade winds are less frequent and widespread storm rainfall is more common" (Giambelluca et al. 1986:17).

The semi-arid conditions of the leeward coasts produced useful plants adapted to the harsh, dry conditions; the *wiliwili* tree (*Erythrina sandwicensis*) (used for canoe outriggers) was once common in dryland forests. Other trees found in dryland forests include the fragrant flowering *alahee* (*Canthium odoratum*) and *lama* (*Diospyros sandwicensis*), which produce edible orange fruits. Large forests of *loulu* (*Pritchardia*), Hawai'i's only indigenous palm, may have been distributed over much of the island landscape. *Mauka* or inland, the elevation generally increased. Trees, such as *māmane* (*Sophora chrysophylla*) and *kauila*

(*Colubrina oppositifolia* or *Alphitonia ponderosa*) increased in number as the elevation increased. At about 2,000 feet above sea level, large trees once grew in the cooler, wetter, mountain environment.[7] They included *koa* (*Acacia koa*) known as the canoe tree, *'iliahi* (*Santalum*), Hawai'i's sandalwood tree, and *'ōhi'a lehua* (*Metrosideros polymorpha*), a tree which can grow more than 100 feet high with a base of five or six feet in diameter. Its delicate red flowers were often used for *lei*. These trees still inhabit the lower mountain slopes on both sides of the islands. Other leeward coastal plants included *ma'o* (*Gossypium sandwicense*) or Hawaiian cotton, *'ilima* (*Sida* a shrubby to ground-spreading plant with little yellow flowers used in *lei* and *naupaka* (*Scaevola sericea*), a bright green shrub with little white flowers (Culliney 1988:170-214).

The islands also vary as one moves along the island chain: the older islands are located in the northwest and the youngest in the southeast.[8] The oldest islands have many deep valleys gouged out by erosion. These valleys become impassable for many species, such as the land, snail, enabling them to evolve into distinct species. The windward sides of the islands tend to be more heavily eroded. Steep cliffs make beach access difficult, if not impossible. The youngest and southeasternmost island is Hawai'i. It is largely covered with geologically recent lava that forms the long, gentle slopes of Mauna Loa, a shield volcano

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7 Changes in the environment brought about by introduced grazing animals, the European pig, and over-harvesting of trees have pushed the current forest elevation higher onto the mountains.

8 Kaua'i is estimated to be 3 to 4 million years old, while Hawai'i Island is only 1 million.

which rises 1,400 feet above sea level. Mauna Loa actively spews lava, while the other islands[9] are dormant, although Maui erupted as recently as ca. 1790[10] (Culliney 1988:18).

Lava from Hawaiian volcanoes is extremely hot (up to 1,200° C) and less viscous. It oozes out of the ground without the force often associated with andesitic volcanoes, such as Mt. St. Helens on the North American continent. Shield volcanoes, including the islands of Hawai'i, acquired their name from their shield-like appearance: a circular shape and gently sloping sides. People are usually able to escape Hawaiian lava flows, although houses have been engulfed by lava. Two types of lava are common in Hawai'i: pahoehoe and aa. Pahoehoe is a smooth, ropy looking lava that is easy to walk on. It sometimes gives the appearance of a paved sidewalk. Aa, however, is jagged and sharp. It forms after most of the gasses have escaped. Often a mass of jumbled boulders and clinkers are left in its wake. It is difficult to walk on and quickly tears up shoes or feet.[11] New lava is black, with few plants living in its cracks; as lava weathers it becomes light brown and pockets of nutrient rich sediment form in cracks and depressions providing food for plants.

Shield volcanoes can produce earthquakes which, in turn, trigger landslides or tsunamis. Landslides can bury everything below or send large sections of land plunging into the ocean. Tsunamis, "probably the most feared natural scourge to which Hawaii is subject" (Macdonald and Abbot 1970:255), are giant waves triggered by seismic action, rushing onto the land and sucking everything in their paths out to sea. Tsunamis have been known to

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9 A new island, Lo'ihi Seamount, is forming about 30 miles off the coast of Hawai'i Island. It is still about 3,000 feet beneath the surface of the ocean.

10 This deduction comes from the difference in maps drawn by two early explorers, La Pérouse in 1786 and Vancouver in 1793.

11 The Hawaiians built trails in the aa to make travel easier.

destroy entire villages in Hawai'i, erasing all signs of human habitation. A giant wave, estimated to have been 1,300 feet high, appears to have deposited coral chunks and volcanic beach debris on the Island of Lāna'i when the island's southern undersea flank collapsed long ago. It also appears to have left materials about 800 feet above sea level on neighboring islands (Culliney 1988:13).

As soon as Polynesian colonizers landed on the Hawaiian Islands, they began to modify their environment by planting food crops and building structures to protect themselves and their canoes from the environment. At the same time, rats (*Rattus exulans*) may have escaped from the holds of their canoes, quickly reproduced and spread throughout the islands. It is probable they ate nearly everything in their wake, causing great damage to native plant and bird populations. A single pair of rats could have been able to densely populate the island of O'ahu in 10 years (Alan Ziegler, personal communication in Athens et al. 1997:183). Athens et al. (1997:183) note that rapid change in vegetation would be the "ideal horizon marker for the human colonization of Hawai'i." The human population would have taken much longer to encroach upon inland regions. When they were ready to expand to inland zones, they encountered areas already decimated by rats. As time passed, the Hawaiians continued to alter the environment by clearing tracts of land by swidden or slash-and-burn techniques.

The Hawaiian population expanded following initial settlement, until each island became populated. Archaeological evidence indicates that before AD 1400, the population was sparsely settled along coasts of all major islands, relying heavily on marine resources. Between 1400 and 1600, there appears to have been a population expansion into the upland

regions, probably to exploit unused land and resources. Archaeologist Robert Hommon (1986:60) notes this could be a result of climatic variation, and that "the most significant climatic variable in Hawai'i is rainfall." Around 1600, Hawaiians began moving into arid, marginal lands that were often in danger of famine-causing droughts. These areas were heavily population by early Euro-American contact (1778).

The Hawaiians developed a unique system of land use and tenure. Each island was divided into large districts or *moku* encompassing numerous valleys and slopes. Each *moku* was in turn divided into smaller pieces of land called *ahupua'a* that spread in a pie shape from the ocean to the mountain (Handy et al. 1972:287-288). The *ahupua'a* provided the community with a wide range of resources, such as fish, shellfish, salt, coral, potable water, garden and agricultural areas, building supplies and raw materials for tool manufacture.

By late pre-contact times, *ahupua'a* became tax units for the *ali'i* (chief and nobles) administered by their managers or *konohiki*. Missionary C. S. Stewart describes tax collection between 1823-1825 in his journal:

> The support of the king is by an annual tribute from all islands, rendered at different periods by different districts and islands, as his majesty may direct. It consists of the produce of the country; hogs, dogs, fish, fowl, potatoes, yams, taro, bananas, melons, &c, &c,—of articles of manufacture, canoes, fishing-nets, tapa, mats, bird's feathers, unwrought hemp, &c, &c,. . . (Stewart 1970[1830]:130).

After contact, commoners or *maka'āinana* households, called *haku* or *haku'aina*[12] were responsible for tax collection. The senior male member of the family (*haku*) obtained

12 *'Aina* means land (Pukui and Elbert 1986:11). It is the term used to describe one's homeland, marking the countryman as a food producer (Handy et al. 1972:288).

this position due to his experience and competence. His authority was a matter of common consent (Handy et al. 1972:287-288).

An integral part of the Hawaiian social structure was the *kapu* (taboo) system. It originated from the "distinction between that which was sacred or divine and that which was common or earthly, between male and female" (Kukendall and Day 1976:11). The *kapu* consisted of a set of prohibitions to be followed or harsh punishments were inflicted: commoners could not touch the shadow or body of a sacred chief; and women could not eat with men nor could they eat a variety of foods such as pork, bananas, coconuts and certain types of fish. Punishments might entail removal of eyes, dismemberment or death.

Within the Hawaiian social organization, men and women had special tasks. "The building of houses, construction of canoes, making of fishing nets, wooden dishes and bowls, &c. are labours assigned to the men; while the manufacture of cloth in all its processes, and the plating of mats, &c. fall to the department of the women" (Stewart 1970[1830]:146). Grandparents taught their grandchildren the proper way activities should be performed. Different activities required different household structures; socially elite people needed more structures to fulfill their social obligations. Chiefs often had large compounds with seven or eight different houses: *heiau*, religious structure; *mua*, men's eating house which women were forbidden from entering; *hale 'aina*, women's house; *noa*, sleeping house of chief's wives; *pe'a*, menstrual hut; *kua* or *kuku*, house where the *kapa* (bark cloth) was beaten; *hale papaa* or *hale hoahu,* food storage house; and *halau wa'a*, canoe house (Bishop 1940:7; Judd 1975:21).

Significant changes occurred in the Hawaiian Islands beginning in the late 18th century.[13] When the first European explorers landed on Hawai'i Island in 1778, population pressures had already created tension between powerful island chiefs. Traditionally the Hawaiian Islands were divided into four autonomous warring units (Kirch 1988:422); each vying for control of the islands. After contact, Hawaiians no longer had to rely on spears, clubs, daggers and slingshots as weapons. Access to western weapons, such as cannon and guns, enabled chiefs "to impose [a] convincing and permanent defeat upon [their] competitor[s]" (Armstrong 1980:88). Ultimately, Kamehameha I (ca. 1758-1819) established rule over all the Hawaiian Islands, uniting Hawai'i for the first time in 1810. At the same time, the traditional religion was questioned among some of the young *ali'i,* as they attempted to take power away from the priests. One of the most significant changes was the abolition of the *kapu* system by King Kamehameha's son, King Liholiho[14] (1797-1824) in 1819. Once the *kapu* was gone, women like Ka'ahumanu, one of the wives of King Kamehameha, were able to directly influence politics. After 1820, the arrival of Christian missionaries further broke down the Hawaiian religious system. By 1848, the Hawaiian Kingdom instituted private ownership of land, which changed the formal manner in which land was held, from royal partitioning to fee simple. This act, known as the Great Māhele, divided all lands between the king, government, chiefs and commoners, while allowing foreign born residents to purchase Hawaiian land for the first time.

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13 The officers on Captain Cook's ships estimated the population of Hawai'i before the introduction of deadly diseases: Bligh recorded 242,200 people and King 500,000 people. King later revised his estimate to 400,000 people which is generally regarded as a good estimate (Dye and Komori 1992:114).

14 Liholiho ruled as King Kamehameha II.

By the end of the 19th century, Hawai'i was becoming a westernized country. The location was an ideal stopover for whaling vessels and trading ships, which allowed "American commercial and social influence [to create] ties between the islands and the United States" (Armstrong 1980:90). The use of a western monetary system replaced the traditional system of wealth redistribution and further undermined a Hawaiian society that had relied upon chiefly tribute, family redistribution and reciprocity. In 1894, the Hawaiian Islands ceased to be under the control of the Hawaiian monarchy when American-backed revolutionaries armed themselves, marched to Iolani Palace and dethroned Queen Lili'uokalani. Hawai'i was annexed by the United States soon thereafter and became a state in 1959.

CHAPTER 2: CANOE MORPHOLOGY AND FUNCTION

The canoe is the transport vessel that led to the discovery and subsequent colonization of the Hawaiian Islands. Until the modern era, it remained an indispensable tool for food and resource gathering as well as warfare. This chapter describes Hawaiian canoes as a base for understanding canoe house design.

Two canoe types were used in the Hawaiian Islands: double (Plate 1) and outrigger (Plate 2). The Polynesians probably brought sailing technology with them since canoes are found in other parts of the Pacific. It is likely they sailed to Hawai'i in large double canoes capable of withstanding the forces of the open Pacific Ocean. Once settled in the Hawaiian Islands, they constructed double canoes for deep ocean sailing, and perhaps, defensive purposes, and outrigger canoes for use near shore. As the Hawaiian class system evolved, restrictions were placed on who could own and use double canoes. By the time of European

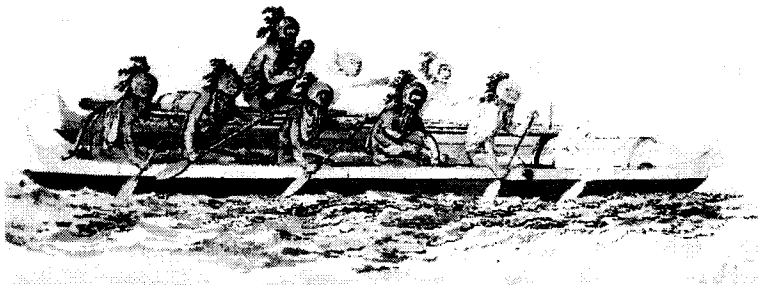


Plate 1. A double canoe with warriors by Webber in 1779, an artist with Captain Cook (Holmes 1981:53).

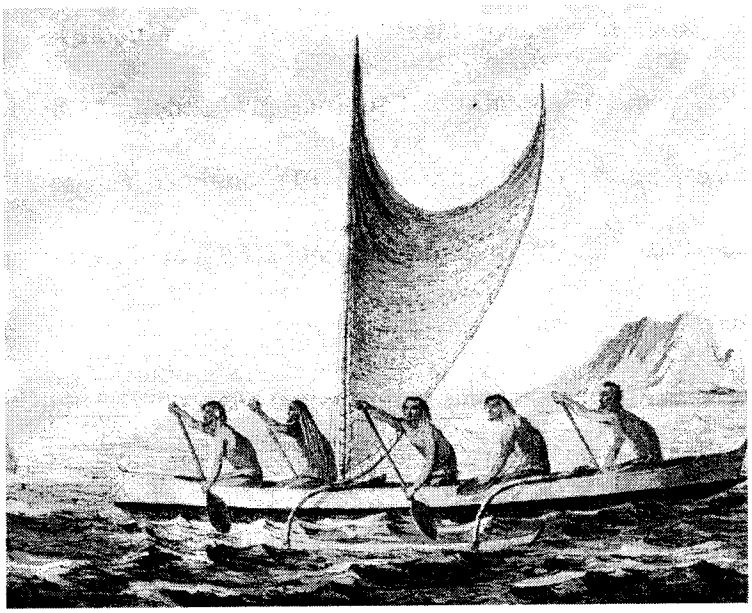


Plate 2. Illustration of an outrigger canoe by Webber in 1779 (Holmes 1981:53).

arrival, only *ali'i* were permitted to own double canoes; *maka'āinana* were restricted to outrigger canoes. The class difference between double and outrigger canoe owners was apparent to Louis Claude De Saulses De Freycinet (De Saulses De Freycinet 1978:85) when he toured Hawai'i in 1819:

> It appeared to us that the double canoes were reserved for the king and the principal chiefs. They are also the only craft in the country suitable for warfare, and only these canoes were used for that purpose in the olden days.

The same year, J. Arago also observed the class distinction when his sailing ship stopped in Hawai'i:

> A great number of canoes soon surrounded the corvette, a still greater number came towards us from all parts of the coast; some were steered by women. . . At nine o'clock a large canoe, better formed that the others, and paddled by twelve men, brought on board the Chief of the town (Arago 1971[1823]:62).

When George Gilbert, midshipman for Captain Cook, entered Kealakekua Bay, Hawai'i Island in 1778, he observed "upwards of 1,000 Canoes" (Gilbert 1982:101), both outrigger and double canoes. Hommon (1975), an archaeologist, estimates the ratio of canoes to people as "probably in the 1:20 to 1:30 range," a reflection of the canoe as a communally owned vessel. Regions with wood for canoe construction and easily accessible canoe landings probably had more and larger canoes since trees were easier to obtain and use.

Double and outrigger canoes were subdivided by their size, function and form based on the difficulty of the landing, the number of people and the intended number of passengers and paddlers. These characteristics were used in naming canoe styles. Outrigger canoes or *kaukahi* have one hull. This canoe style can be broken into additional categories based on seating capacity: *ko'okahi* (canoe holding one person), *ko'olua* (canoe holding two people), *ko'okolu* (canoe holding three people), *ko'owalu* (canoe holding eight people), etc. Other outrigger canoe styles include *kioloa* (long racing canoe), *pou* (short canoe), *lele'iwi* (canoe with a broad bow ornament) and *ihunui* (canoe with a broad bow made from the butt end of a log). A *wa'a lawai'a* is a deep, narrow fishing canoe with sides that are straight up and down. The *pūkahi* and *kiapolo* were specialized fishing canoes of unknown description (Holmes 1981:109; Malo 1951[1898]:131).

Andrew Bloxam, a naturalist on the research vessel *Blonde,* observed a number of single canoes on 3 May 1825, all of which were:

> extremely neat and well made, several carrying six or eight men. They were very narrow, scarcely affording room to crush into, some in the broadest part not exceeding 12 inches. They are about 2 feet deep, and all possessed an outrigger and mat sail. The outrigger consists of a

> strong piece of very light wood, in a curved form. On these two pieces the sail when not used is placed. They row very fast with their broad paddles and easily keep up with the ship when going moderately. They are often upset in them, but being excellent swimmers, they soon right them and bale out the water. Those we saw are about 16 to 18 feet long (Bloxom 1925:22).

De Saulses De Freycinet described canoes he saw in 1819:

> Not one piece of metal is used in the construction of canoes, the main part of which consists of a single hollowed-out tree trunk that the worker shapes in a manner he considers to be most suitable for speed in the water.
>
> Some of the canoes are made to a degree of admirable perfection in all their details, especially the end pieces, that is the parts brought together at the bow and stern, which could not possibly be joined better or more artistically. Nor can one help being amazed at the skill and intelligence demonstrated in joining various parts of these floating machines so solidly that they are almost indestructible under the pressure of sea water, even though it is achieved only by means of braided-fiber lashings. The same type of sennit is used in fastening the float of the single canoes and in holding together the double canoes, and it also makes a mooring line of incredible strength (De Saulses De Freycinet 1978:85).

Double canoes or *kaulua* are generally of two styles: the *kū'ē'ē* (canoe with one hull shorter than the other) and *peleleu* (a large canoe with equal sized hulls[1]). Hawaiians experimented with the number of hulls on their canoes, even creating a *pūkolu,* or canoe with three hulls; however, the experiment failed (Hiroa 1987[1957]:255; Malo 1951[1898]:131). De Saulses De Freycinet described the steerage of double canoes he saw in Hawai'i:

> Between the canoe hulls that hold the paddlers, a platform is constructed for passengers and cargo. Ordinarily, a man located at the stern of each canoe steers it with a large paddle; sometimes, though, we saw a rudder fixed in the center of the space that separates them (De Saulses De Freycinet 1978:85).

---

1 King Kamehameha I built a fleet of *peleleu* to serve as his war canoes in 1796 (Kanahele 1995).

Hawaiian canoes, both outrigger and double, functioned primarily as fishing vessels (double canoes had additional purposes that are discussed below). During large fish drives, as many as 60 canoes with more than 6,000 people assisted with nets, canoes and related activities (Holmes 1981:109-111). Participating canoes varied in size from small, single man outriggers to large canoes (both outrigger and double), 40 to 60 feet long. Missionary Abner Wilcox observed a "somewhat novel sight of the natives going out in their canoes to catch fish" in Honolulu on 15 April 1837. "I counted at one time on the water no less than 89 canoes, and presume there were many more. In shape they very much resemble the new moon and move very swiftly" (Damon 1950:67).

Canoe sizes and shapes were physically restricted by the types of landings that would be used as well as typical ocean conditions in the sailing area. Much of the Hawaiian coastline is rugged with difficult landings. Hiram Bingham, an early missionary to Hawai'i, described such a coast on Hawai'i Island while traveling by canoe in 1822:

> The mountains along the shore, for eight or ten miles are very bold, some rising abruptly from the ocean, exhibiting the obvious effects of volcanic fires; some, a little black, appear like towering pyramids. . . Into the nooks between them a few houses are crowded, they are almost inaccessible except by sea. It would seem, however, that some hundreds of the natives live in this forbidding part of the island, subsisting doubtless, chiefly on fish. They pass from one little neighborhood to another, in canoes (Bingham 1822:248).

Small canoes, often between 12 and 18 feet long, were constructed for use at difficult landings requiring canoe ladders. These canoes were light (ca. 30 to 150 pounds) so they could be quickly transported up steep inclines. Canoe ladders, an important development along the precipitous coasts of the islands, were wooden devices constructed to provide stable footing over difficult, slippery terrain (Figure 2, Plate 3). Without these ladders, deep

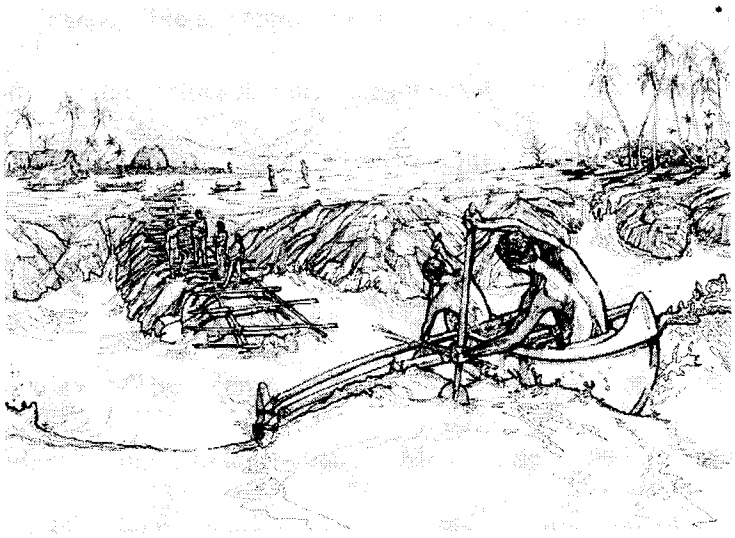


Figure 2. Illustration of canoe paddlers preparing to use a canoe ladder (Black in Holmes 1981:102).

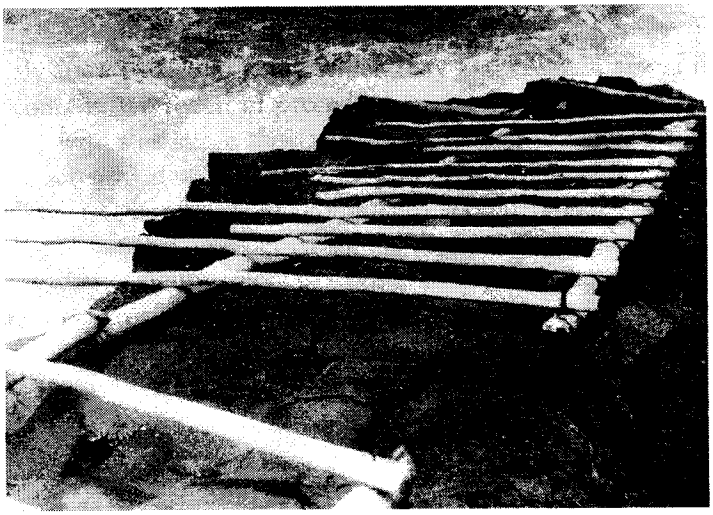


Plate 3. Detail of an abandoned canoe ladder at Kahauale'a, on the windward side of Hawai'i Island, taken in 1931 (Holmes 1981:100).

water fish would be inaccessible to people along much of the coast. The small canoes used with the ladders often featured thicker bottoms to withstand the process of dragging. They also had rockered hulls to withstand rough waves that plagued steep, rocky shores.

In 1793, Archibald Menzies (1920:178), botanist for Captain Vancouver, observed from his canoe "a most dreary tract of the most rugged rocks of lava scattered here and there with some fishermen's huts" between Kona and Kau, on the island of Hawai'i. This coastline was a dangerous place to land a canoe. Menzies described his adventurous landing:

> we came to a small village named Manu-Ka where we found our chief Luhea's residence, and where we landed before his house at a small gap between rugged precipices against which the surges dashed and broke with such violence and agitation and with such horrific appearances that even the idea of attempting chilled us with utmost dread. We however quietly submitted ourselves to their guidance, and were highly pleased to see the extraordinary dexterity with which they managed this landing. Having placed their canoe in readiness before the gap, they watched attentively for a particular surge which they knew would spend itself or be overcome in the recoil of preceding surges before it could reach the rocks, and with this surge they dashed in, landed us upon a rock from which we scrambled up the precipice, and in an instant about 50 or 60 of the natives at the word of command shouldered the canoe with everything in her and clambering up the rugged steep, lodged her safely in a large canoe house upon the brink of a precipice, to our utmost astonishment (Menzies 1920:178).

In 1819, De Saulses De Freycinet also had the opportunity to observe a treacherous landing:

> In Raheina [Lahaina] we saw a canoe moving toward the coast while the wind was blowing from the open sea and the waves violently bursting into foam over the reef. We trembled at the fate of this embarkation, but the man and the women who were in it showed no sign of worry or anxiety; with the speed of an arrow, they crossed the space of several cable lengths and landed, so to speak, dry, up on the shore. One of our boats most certainly would have submerged or crashed under such circumstances (De Saulses De Freycinet 1978:79).

While Ellis was touring the Hawaiian Islands between 1822 to 1823, he was amazed at the skill of the canoe paddlers, especially while landing a canoe with a canoe ladder:

> After traveling a mile and a half along the shore, we came to Kehena [on Hawai'i Island], a populous village; the people seemed, from the number of their canoes, nets, &c. to be much engaged in fishing. Their contrivance for launching and landing their canoes, was curious and singular.
>
> The bold coast is formed of perpendicular or overhanging rocks, from forty to sixty feet high, against which, this being the windward part of the island, the swell beats violently.
>
> In one place, where there were a few low rocks about thirty feet from the shore, they had erected a kind of ladder. Two long poles, one tied to the end of the other, reached from these rocks to the top of the cliffs. Two other poles, tied together in the same manner, were fixed parallel to the first two, and about four or five feet distant from them. Strong sticks, eight or ten feet long, were laid across these at right angles, and about two or three inches apart, which being fastened to the long poles with ieie, (the tough fibrous roots of a climbing sort of plant, which they find in the woods,) formed the steps of this ingenious and useful ladder.
>
> The canoes of the place were light and small, seldom carrying more than one man in each. A number were just land, as we arrived at the place. Two men went down, and stood close to the water's edge, on the leeward or southern side of the rock.
>
> The canoes were paddled up one at a time. The person in each, then watching a convenient opportunity, rowed swiftly to shore, when the rolling billow carried the canoe upon the rock, and it was seized by two men who stood there to receive it. At the same instant that it was grasped on each side by the men on the rock, the one in the canoe, who steered it, jumped into the sea, swam to the shore, and assisted them in carrying it up the ladder to the top of the cliff, where they placed it upon curiously carved stools, made of the wood of the erythrina, and returned to the rock to await the arrival of another canoe. In this way five or six were brought up while we stood looking at them (Ellis 1979[1825]:198).

Large canoes frequented coastlines with easier landing access since they did not possess the maneuverability nor the lightness to be moved up steep cliffs without great exertion. Instead, they were pulled onto shore. Palm fronds or *hau* branches were laid upon

the ground to create a slippery surface and protect the hulls from damage while the canoes were dragged along the ground. In order to protect the bottoms of canoes, the bottoms were sometimes purposefully thickened. These vessels were called *'ōpelu*. Thickening not only increased canoe longevity, but also increased its buoyancy. Although the added weight tended to slow down canoes and decrease maneuverability, increased buoyancy allowed the crafts to carry more fish (Holmes 1981:112).

Kings and principle chiefs often traveled by canoe. The following accounts describe this travel.

> In the forenoon of the 4th [December 1786 on the west end of Molokai], Teereteere, the King, paid us a visit. He came in a large double canoe, attended by two young men, who we under*f*tood were his nephews, and a number of other Chiefs. The King is a good-looking man, and appears about forty-five or fifty years old. . . (Dixon 1968:97-98).

> Liholiho made journeys to the heiau Hikiau to impose the kapu. He sailed by double canoe to Kikiay every evening on the nights of Hilo and Kane to observe these kapu periods. While others paddled, Liholiho and the person who carried his possessions just sat on the *pola* platform built on the booms that held the canoes together. One canoe was securely lashed to the other by cleverly braided sennit cords which formed a pattern worked out by those trained in this art. They sat by each pepeiao [comb cleats to which the booms were lashed] because it was higher at these places (Ii 1959:129).

Menzies observed King Kamehameha and his entourage approach their ship on 22 February 1793:

> We were at this time surrounded by the greatest concourse of natives in their canoes that we ever saw collected together afloat in these islands. Upon the most moderate computation we were pretty certain their number could not be short of three thousand, besides the beaches being lined with vast crowds of them gazing from shore. But these did not altogether belong to the villages contiguous to the bay; curiosity brought many of them on this occasion from the northward and southward of it for several leagues, a great number of them followed us in the morning into the bay.

> A little after both vessels anchored, Kamehameha came in great state from the shore accompanied by a number of double canoes that stopped at a little distance from our stern, while the king in his canoe was paddled with great rapidity round both vessels, which occasioned no little hurry and confusion among the canoes that surrounded us to open an avenue for him. Numbers of them were over-turned, and some of them nearly run over. He stood upright in the middle of the canoe with a fan in his hand, and was gracefully robed in a beautiful long cloak of yellow feathers, and his under dress consisted of a loose gown of printed cotton girdled on with a sash which he said had been given to him by Captain Cook (Menzies 1920:67).

Besides using canoes for ocean travel, *ali'i* traveled over land in their canoes. They did not want to walk among the common people, so sometimes they were carried aloft in their double canoes. An example of this was recorded by the missionary Hiram Bingham in 1824, when he observed a procession following the death of a king during which the king's widows were paraded through villages:

> Kamamoaloo, dressed in ancient mode, rode high above the head of the multitude upon a large new whale boat lashed firmly on a rack of poles 30 feet in length by 20 in breath, borne on the shoulders of 70 or 80 men. . .
>
> Much in the same manner as the favorite queen, two others, Kinau and Kekauoneohe, were borne each along on a large double canoe, rigged like the boat of Kamamoaloo (Bingham 1824:246).

Although canoes were primarily used for fishing, they had other uses, including warfare. Approaching enemy canoes carried warriors who flung slingstones and other missiles. Within arms' length, canoe men fought with clubs and spears. War fleets sometimes included many canoes, as attested by the large fleet of 1,200 double canoes and 10,000 men collected by King Kamehameha I during his conquest of the islands in the mid-1790s. Arago noted during his trip to the Sandwich Islands in August of 1819,

> The number of his [Kamehameha I] canoes was immense; we see more of them here in a paltry village, than you would find in all the

> Mariannes. . . His troops increased in proportion to his wants, and, proud of serving under a Chief so powerful and warlike, the people enlisted joyfully, the moment their prince wished to attempt any new enterprise (Arago 1971[1823]:105).

Ellis noted, however, that "The Sandwich Islands not being surrounded with coral reefs, there is but little smooth water; and the roughness of the sea, most likely, induced them generally to select terra firma for their theatre of war" (Ellis 1979[1825]:101). In addition to fighting vessels, double canoes were used as transports to shuttle warriors. The ability of Kamehameha I to quickly move his men to Wai'alae and Waikiki on O'ahu Island when he learned that Kalanikupule had decided make war, helped Kamehameha I overthrow his opponent (Kanahele 1995:87, 94-96).

Although canoes were mostly used for ocean travel, some were used on inland water bodies such as rivers, subterranean lakes and fishponds. These canoes do not always appear as reliable as their ocean going counterpart. Old ocean-going canoes may have been used in these calm waters. Captain Dixon described his adventures on a leaky vessel in 1787 when he embarked on a river tour on Hawai'i Island:

> My waterman (if I may *f*o call the man who belonged to the canoe) now got into her, and we proceeded up the river; he jumped out only to bale the water, which, being leaky, *f*he made pretty fa*f*t. By the time we had cruised about two miles up the river, the afternoon was pretty far *f*pent (Dixon 1968:129).

Another tour was described by De La Vergne, who journeyed through three subterranean, water-filled passages in Haena, on Kauai Island:

> In order to enter it, the Kanakas lighted, in addition to their torches, the garland like chains of kukui nuts with which they had come equipped. From a nearby grass house they also brought a small canoe. This was certainly necessary for exploring the two caverns (underground lakes as they actually are) communicating with one another. The first lake measures about seven and a half acres. The water is unbelievably clear

> and quite deceptive as to its depth. I was astonished to find, after sounding for its bottom, a depth of forty meters about twenty meters from the bank. . . The natives have named this lake Wai-a-kana-loa, literally Water of Terror (De La Vergne 1898:120).

Descriptions of canoes on fishponds are rare. One, recorded in 1853 by George Bates, described a canoe on a fishpond in Honolulu:

> These fish-ponds are not unfrequently a source of much gratification to the fatigued and hungry traveler. On entering a native house just at sunset, and after a day's hard riding, it is not uncommon for a good-natured old dame to step up to him, pass her hand across his chest, and ask him, with a material solicitude, "if he is full!!" On receiving a negative reply, out runs a young girl, or one of her sons, and launches a small canoe on the waters of the pond. It is easy to guess the nature of their errand. In an incredibly short time, having been baked amid ample folds of the dark green ti leaf (*Dracaena terminalis*), a huge calabash of fish, accompanied with broiled taro and poi, as the taste of the traveler may be suited, is spread before him (Bates 1854:115).

Hawaiians constructed canoes with great care because they were important tools for fishing, warfare and travel. Canoe making often took two to three years (Holt 1979:52). The canoe builder, or *'oihana wa'a*, was a skilled craftsman in charge of construction activities and religious ceremonies connected to canoe construction. The god of canoe building was Ku, or "rising upright," which referred to the rising sun. Various forms of Ku include Ku-moku-hali'i (chief of the canoe builders), Kupa-ai-ke'e (explained as adze that eats the superfluous parts and inventor of the beveled adze for canoe building), Kupulupulu (the chipmaker), Ku-holoholo-pali (steadies the canoe when it is carried down steep places), and Ku-pepeiao-loa and -poko (the long and short eared gods of seat braces by which the canoe is carried). The wife of Ku was the female deity Lea, whose visible incarnation was the *alapaea* or woodpecker (Beckwith 1970:15-16).

> When a tree was felled for a canoe hull, Lea, represented by the bird, kindly gave expert advice as to the soundness of the tree. If, when the

> bird appeared, it walked the whole length of the trunk without pausing, the wood was sound. On the other hand, if the bird stopped and pecked at the bark, the tree had a hollow or flaw at the spot pecked as was thus condemned by the higher authority" (Hiroa 1987[1957]:254).

The hull of the Hawaiian canoe was usually made of *koa* wood felled in the *mauka* region of the islands, about two or three miles from the shore (Gilbert 1982:127). These canoes were "the largest and most valuable kind. They are very neatly formed, and, although of great length, are light and swift on the water" (Bennett 1970:236). Occasionally canoes were made of drift logs that floated across the Pacific Ocean and landed on a beach (Holmes 1981:24).

After a tree was selected, the *'oihana wa'a* (prospective canoe owner) and assistants took offerings of pig, red *kumu* fish and *'awa* to the site and slept beside the tree. Prayers and sacrifices were performed before the men began to fell the tree by cutting two notches about 3 feet apart, one above the other. The intervening wood was cut off and then the notches were continued around the tree. Once the cuts went around the tree, they were deepened until the tree fell down (Hiroa 1987[1957]:254). The log was preliminarily shaped where it fell. Bark was removed and the basic shape cut in order to make the canoe lighter for transportation. When the canoe was ready to move, additional prayers and ceremonies were performed. Then:

> Great care was exercised in lowering the hull over steep places or cliffs, and it was evidently this need for special help that led to inclusion of Kuhooholopali (Ku-the-guider-over-cliffs) among the various names of Ku. And so with hauling chants and general pleasure, the hull was safely conducted to its haven in the canoe house (Hiroa 1987[1957]:256).

Menzies journeyed upland from Kealakekua on 27 February 1793, and noticed:

> the path became more and more rugged, with numerous dead trees lying athwart it and in every direction, which made our progress slow and tedious. The wood continues close and impervious on every side, excepting by little tracks here and there, where cut-down trees or canoes had been dragged into the path to take them down to the sea side (Menzies 1920:82).

Once a canoe reached its village, it was dragged into a canoe house or *halau wa'a* to be finished. When Ellis toured the Hawaiian Islands between 1822 and 1823, he "walked on to Pahoehoe, where we entered a large house, in which many workmen were employed in making canoes" (Ellis 1979[1825]:75). The workmen used tools such as stone adzes and stone canoe rubbers (*pohaku 'ānai*) for forming the craft. Afterwards "the body of the canoe [was] generally covered with a black paint, made by the natives with various earthy and vegetable material, in which the bark, oil, and burnt nuts of the *kukui* tree are the principal ingredients" (Ellis 1979[1825]:243). Once the hull was complete, additional features were added to the canoe. If the vessel was a double canoe, two canoe hulls would be joined together. An outrigger canoe, on the other hand, would be attached to booms formed from *hau* (*Hibiscus tiliaceus*) or *'ōhi'a lehua* (*Metrosideros macropus*) poles. The *ama,* or float, for outrigger canoes was constructed from *wiliwili* (*Erythrina sandwicensis*) or *hau* (*Hibiscus tiliaceus*) wood (Hiroa 1987[1957]:255; Ii 1959:129).

Canoes were lashed together to allow some movement in the joints so the vessel would be flexible in heavy seas. A long, rigid vessel could "fall prey to the vibration and torsion which its was subjected to on the high seas" (Suggs 1960:70). The lashings were sometimes made from *'aha* (sennit) or coconut fibers plaited with great care and skill (Bishop 1916:18). They were created by twisting and braiding the short fibers of the inner husk of the coconut into thick strands and pulling repeatedly over the thighs (Kanahele

1995:36-37). *Olonā* (*Touchardia latifolia*) made a strong cordage, with a tensile strength second only to ramie. Cordage and lashings were also made from *'ie'ie* (*Freycinetia arborea*), *niu* (*Cocos nucifera*), *hala* (*Pandanus tectorius*), *'uki'uki* (*Dianella sandwicensis*) and *'ahu'awa* (*Cyperus javanicus* and *C. hypochlorus*). *Hau* was also an important lashing (Bloxom 1925:59):

> the natives are very careful as the bark is used for making very strong rope, and the wood is very light and well adapted for the outriggers of their canoes. A chief only can give orders to have them cut, and should a common person dare touch them he would be subjected to severe punishment.

The lashings for the canoes were so strong that they "are almost indestructible under the pressure of sea water. The same type of sennit . . . also makes a mooring line of incredible strength" (De Saulses De Freycinet 1978:85).

CHAPTER 3: OVERVIEW OF CANOE HOUSES

Canoe houses, or *halau wa'a*, shelter canoes from the sun, wind and rain in a mode similar to the relationship between modern garages and automobiles. Canoe houses were less common than garages, however, because they were communal structures and could store more than one canoe (Emory 1924:51). Their locations within traditional Hawaiian villages were dictated by two factors: accessibility to water and location of canoe construction materials. Canoe houses were important structures in traditional coastal Hawaiian villages and are still used today by canoe racing teams. Their primary function is to protect the canoe from sun and rain which can crack or rot the wood and wind which can abrade. Canoe houses are therefore more common in areas lacking protective tree cover or year-round sailing conditions. Historical documents indicate that canoe houses were used for more than canoe storage. Inside these thatched structures canoes were constructed, travelers lodged and temporary churches established. It is probable that canoe houses sometimes served as men's meeting houses.

Travelers to and around the Hawaiian Islands often observed canoes simply resting on the beach exposed to the elements (Plate 4), or sometimes only lightly protected. For example, when Mr. Bishop (1827:16) visited Hawai'i Island in 1827, he noted that the Hawaiians merely "drew our canoe on shore." In 1845, Judge Gorham Gilman of Hawai'i observed a little bay ". . . on the shore [of Hawai'i Island] of which we noticed several canoes, and a few miserable huts" (Gilman 1908:5). Oftentimes, canoes were covered only with palm fronds "to ward off sun and rain" (Scott 1968:603). Early photographs and

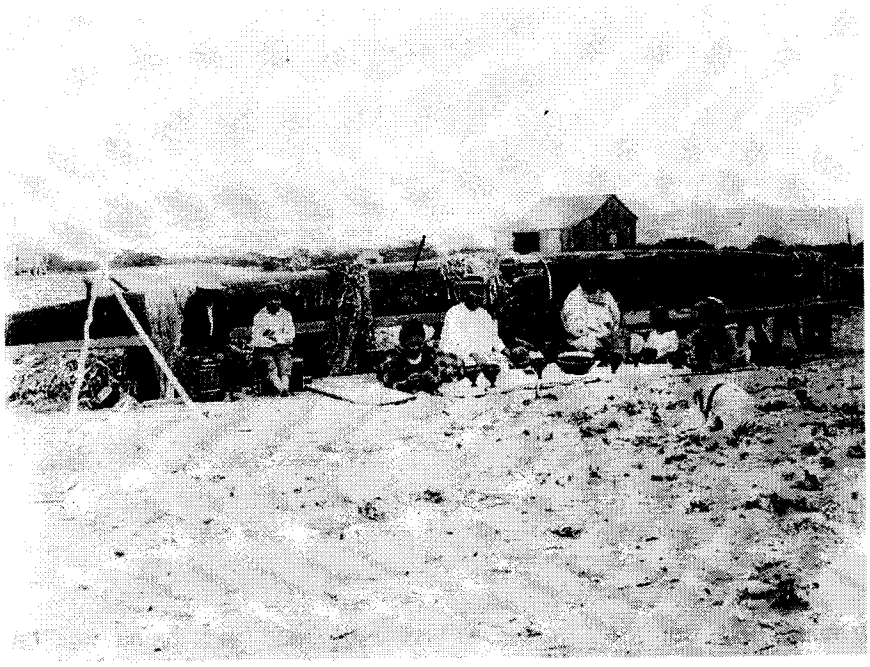


Plate 4. Canoe resting upside down on canoe stands at the beach, photograph ca. 1900. Courtesy of Bishop Museum.

paintings also show canoes laying on the beach in the shade of a tree or covered with palm fronds or mats (Plate 5).

Although canoes were left out in the open, the best place for long-term storage was the canoe house. Captain Peter Puget noted in his log book on 27 February 1793 that Hawaiians, "are exceedingly careful in the preservation of their canoes and indeed it appears to be one [of] their principal Considerations, those of large Dimensions are always in houses, as are also the Smaller ones not immediately in use" (Puget 1791-1795). Storing canoes in canoe houses required disassembling the vessel by removing the outrigger on single canoes or separating hulls on double canoes. Ellis made a note of this during his travels around Hawai'i between 1822 and 1823: "The trade-winds blowing along the shore very fresh, and directly against us, obliged us to leave our canoe at this place. Mauae and his companions

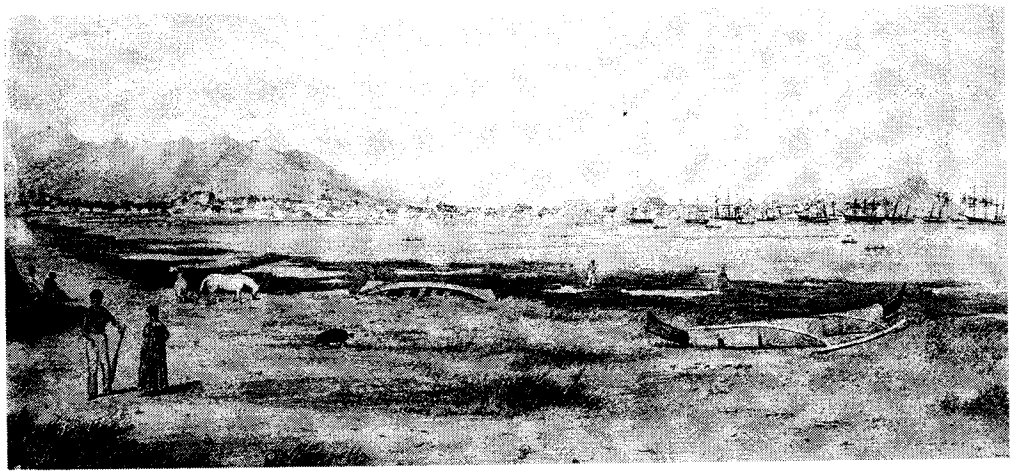


Plate 5. *Lau hala* mats covering outrigger canoes in Honolulu to protect them from the sun. Painting by James Gay Sawkins in 1850 (Holmes 1981:202).

having drawn it into an adjacent shed, took off the outrigger and left it, together with the mast, sails, and paddles, in the care of the man at whose house we had lodged" (Ellis 1979[1825]:129). Plate 6 shows the outrigger of a canoe leaning against the side of a canoe house. The purpose of canoe houses become obvious in Arago's observations in 1819, "on reaching the shore. . . are some sheds, which shelter from the rain and wind a prodigious number of canoes, both single and double, remarkably handsome and well finished" (Arago 1971[1823]:65). The area Arago described was probably associated with *ali'i* or the chiefly class since he describes double canoes, vessels restricted to their use (De Saulses De Freycinet 1978:85) (see Chapter 2: Canoe Morphology and Function). On O'ahu, Peter Corney observed that "Several of the king's old vessels are hauled upon shore and sheds built over them" (Corney 1896:97). When De Saulses De Freycinet toured King Kamehameha's compound on Hawai'i in 1819, he saw at least four sheds "intended for the construction of the great war canoes" (De Saulses De Freycinet 1978:4). Not all Hawaiian

Plate 6. Outrigger leaning against a canoe house, ca. 1890. Note the constructed rock walls supporting the thatched roof structure. Courtesy of Bishop Museum.

villages with their thatched houses were favorably reviewed. Between 1823 and 1825, Stewart recorded his first impressions of the Hawaiian village:

> The huts seen scattered along the beach, looked more like the sties and kennels of pigs and dogs, than the abodes of men (Stewart 1970[1830]:89).

Like many structures, the location of the canoe house was dictated by its intended use. It is most efficient to locate a canoe house close to a landing so that the canoe has to be carried or dragged only a short distance (Plate 7). Archaeological evidence, which includes all currently recorded canoe houses at the State Historic Preservation Division in Honolulu (see Chapter 4: Archaeological Study of Canoe Houses), supports this conclusion because most (89 percent) of the structures were located 60 m or less from the ocean. Primary documents also indicate canoe houses were located near the water: Captain Dixon walked to a beach in 1786, where there was "a large hou*f*e, which Abenooe had for *f*toring away his canoes"

Plate 7. Two men dragging an outrigger canoe on rollers towards the water after removing its protective mat covering, ca. 1900. Courtesy of Bishop Museum.

(1968:126). In 1793, Menzies (1920:178) observed ". . . a canoe house on the brink of the precipice [right above the ocean]." In 1819, "some sheds" were observed near the shore that stored, "a prodigious number of canoes" Arago (1971[1823]:65). Also, an undated (probably prior to 1848) paper written in the Hawaiian language (found in the basement of the Public Archives in Honolulu) explains that "the canoe arrived at the shore and entered the canoe shed" (Pukui 1939:157). In 1853, Bates (1854:189) observed a canoe house "near the banks of the stream," and Ii (1959:66) wrote, "Just makai of that place [wharf of rocks] was a canoe landing, and eastward from there stood the canoe shed of Kamehameha."

Canoe houses were built by the Hawaiians using methods and traditions handed down from their ancestors. John Whitman, a visitor to Hawai'i, noted in his journal between

1813 and 1815 that, "the natives have many superstitious notions respecting the situation of their houses. They never build one with a door towards the mountains or remove one nearer to them, that they may escape the displeasure of the Etour (or God) believing that he would punish them with some severe calamity if they should violate his taboo" (Holt 1979:52). Te Rangi Hiroa (Peter Buck), a leading scholar and anthropologist who worked for the Bishop Museum between 1936 and 1951, studied different types of Hawaiian houses and divided them, based on early sketches and historical records, into those with stone walls and those without walls; with either gabled (roof sloping down from a central ridge) or hipped (inclined angle formed by the junction of two sloping sides) roofs (Figure 3). It is likely canoe houses were also constructed without stone in areas with few rocks, however, these canoe house types are not easy to locate since they do not have surviving surface structures. They may be visible as patterned surface staining or encountered as postmolds during extensive areal excavation. Houses constructed with stone walls were common in rocky areas.

Canoe houses were built with the same techniques used to construct other buildings in Hawai'i (Plate 8) (Ellis 1979[1825]:124). Hawaiians collected rocks and fashioned them into walls by either stacking them one on top of the other (stacked) or by placing large rocks on the outer edges of the wall and filling the interior of the wall with smaller, pebble-sized

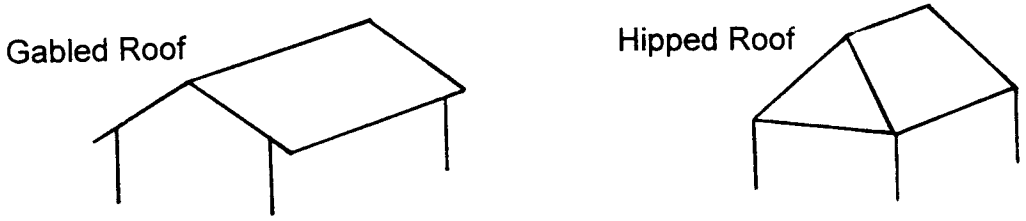


Figure 3. Gabled and hipped roofs.

rocks (core-filled): no mortar was used. Canoe houses with rock walls were sometimes modified or reused as habitation structures. Ellis observed that canoe houses were "frequently occupied as dwellings." Plate 9 illustrates a rock wall foundation probably constructed for a canoe house but reused by two fishermen as a dwelling house. Reuse of canoe houses may introduce biases into the archaeological record since rocks may have been moved or removed from canoe house walls, causing them not to be identified as such.

Canoe houses were distinguished from other structures, such as dwelling houses (*hale noho*), by their shape, purpose and proximity to the ocean. A canoe house was a *halau,* or long building open at one end (see Plate 8), constructed to hold canoes, rigging, paddles and fishing equipment. Other *halau* consisted of *hula* and meeting houses. They were probably distinguishable from canoe *halau* by their proportions and locations, however, there is the possibility that they are indistinguishable. Most other buildings were *hale*, small structures with a boxy shape. Dwelling houses were a common form of *hale* discernible from canoe *halau.* They were generally:

> not more than eight or ten feet long, six or eight feet broad and from four to six feet high. . . They make little use of these dwellings, except to protect their food and clothing, and to sleep in during wet and cold weather; and most generally eat, sleep, and live in the open air, under the shade of a *kou,* or breadfruit tree (Stewart 1970[1830]:183).

Additional buildings found in traditional Hawaiian villages include *mua* (men's eating house), *aina* (eating house for women and young boys), *kua* (house for beating *kapa*), *pe'a* (menstrual hut), *heiau* (house for gods), *hale papa'a* (food sheds) and *hale hoahu* (elevated structures on posts) (Bishop 1940:7).

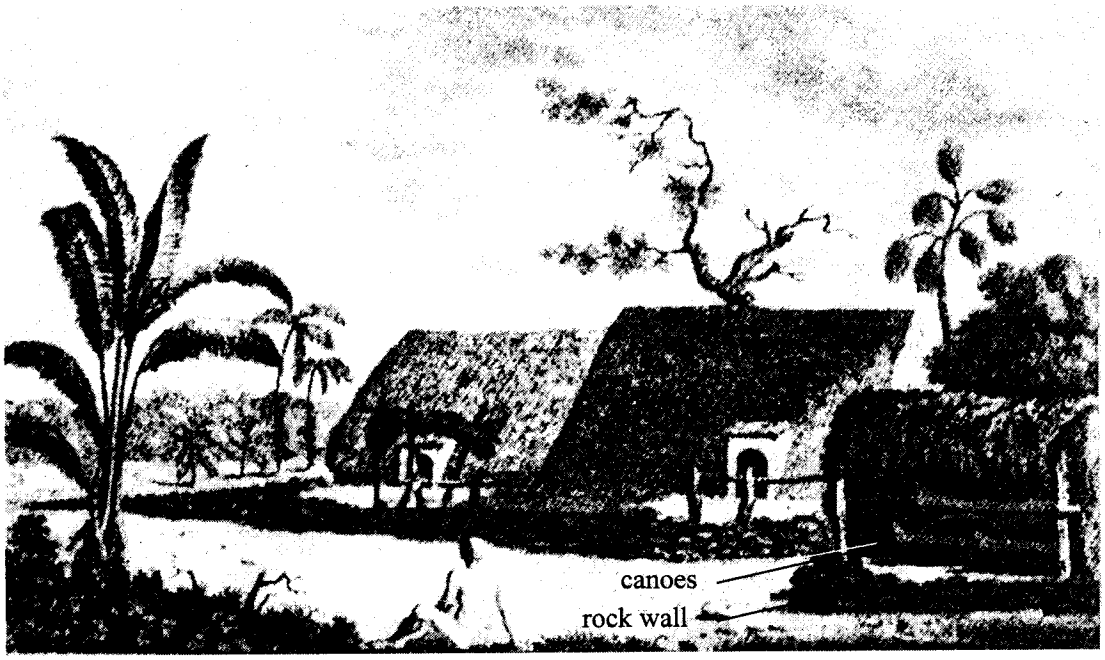


Plate 8. Drawing of a canoe house on Hawai'i Island by Ellis (Hiroa 1987[1957]:101). Note rock walls at the base of the canoe house.

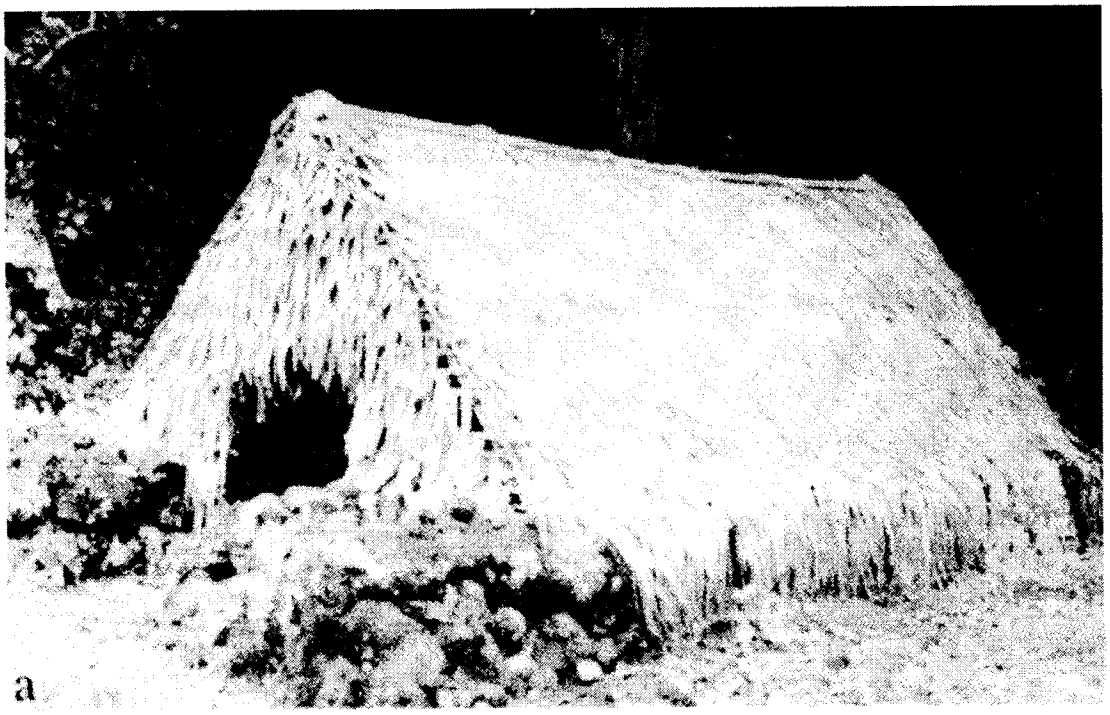


Plate 9. Canoe house reused by fishermen in Hana, Maui, photographed by Emory in 1936 (Hiroa 1987[1957]:80).

A structure's purpose is reflected not only in its shape and design, but also in the types of associated features and artifacts. Canoe houses would be expected to have canoes and fishing related materials. Since some of these items are bulky, such as the canoe, paddles and nets, there would have to be enough room to store the equipment. Features associated with canoe houses often included net drying areas and fishing shrines. Nets needed to be thoroughly dried prior to storage so that they would not rot. This was done in places where the sharp rocks had been removed, usually near the canoe house (Ashdown 1970:5). Mat sails and lines may have been dried in the net drying area. Canoe house floors were also cleared of sharp rocks, sometimes they were even paved with small, rounded pebbles called *'ili'ili.* This smooth surface reduced the risk of injury to nets and sails and made a more comfortable place to work or sit. Canoes were set above the floor on blocks called *lona* (Emerson 1978[1893]:7). The canoe landing may have been paved as well. If a canoe was dragged, it would not be damaged on sharp rocks, and if it was carried, the carriers did not need to worry about stumbling.

Fishing shrines, or stone altars (*kū'ula*) were also associated with canoe houses, since the canoes were used for fishing (Emory 1924:52). The fishermen presented two fish from their first catch to a fish god by laying it on top of the *kū'ula*: one for the male *'aumakua*[1] and the other for the female. In *Hawaiian Antiquities,* Malo notes that gods worshipped by fishermen, "were various and numerous, each one worshipping the god of his choice" (Malo 1951[1898]:208). Some fish gods were Ku-ula-kai (Ku of abundance in sea), his son Aiai

1 *'Aumakua* are family gods, personal gods, or deified ancestors who might assume the shape of different animals (Pukui and Elbert 1986:32).

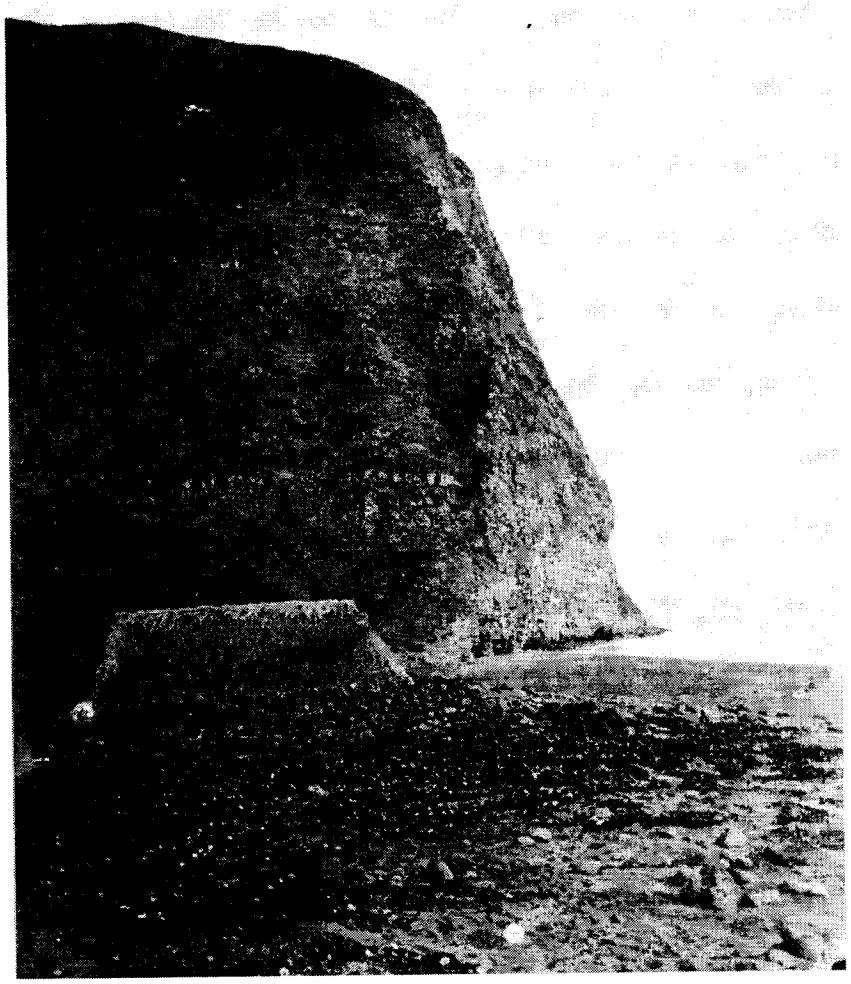


Plate 10. Canoe house located near the water in Waipi'o Valley, Hawai'i Island, ca. 1890. The structure appears to be of walled-hipped construction. Courtesy of Bishop Museum.

and his son Punia-iki, a demigod. Ku-ula-kai was represented on earth by the ruling chief of East Maui called Kuula (Beckwith 1970:19-20).

Although there are clues to distinguish canoe houses from other structures, it is difficult to differentiate *ali'i* from *maka'āinana* canoe houses. *Ali'i* canoe houses tend to be larger in order to hold double canoes. They were constructed of the best wood and finest

thatching. The wood needed to be straight, flawless and strong. The thatching used the most durable materials and was tightly woven. Also, *ali'i* structures were associated with a large number of outbuildings to reflect their status (Malo 1951[1898]:122). In contrast, the *lapuwale,* or "people who were of no account . . . only cared for a little shanty" (ibid.).

House construction, including that of canoe houses, generally required the direction of experts (exceptions to this include *lapuwale* dwelling houses). Since the *maka'āinana* canoe house was a communal structure (Emory 1924:51), the whole community was "required to take part in the labor, though to each party a distinct work was allotted.—While some went to the mountains to procure the timber for the frame, others pulled grass for thatch, or made the twine with which the frame was to be held together, and the thatch fastened on" (Jarves 1847:41). Canoe houses, as with all buildings belonging to chiefs, "occupied the best situations" (Emory 1924:51), such as the sites with views and abundant resources.

Hawaiian houses were usually constructed in the same way, regardless of their purpose. The first step was to clear an area for the structure. Rock walls were then built, if the structure was to have walls. The next step was framing. If rock walls were not used, the builders would begin by framing, or "planting in the ground a number of posts, six or eight inches in diameter, in a row, about three or four feet apart, which are to support one side [lengthwise] of the house" (Ellis 1979[1825]:224). Poles were inserted into the ground for both sides of the house. Those used for chiefly construction were round, smooth and straight with the bark removed. Other houses might have poles without bark. Wood for poles usually consisted of *naio* (bastard sandalwood or *Myoporum sandwicense*), *uhiuhi*

(*Mezoneuron kauaiense*), *kauila* (*Colubrina oppositifolia or Alphitonia ponderosa*), *māmane* (*Sophora chrysophylla*), *kamani* (*Calophyllum inophyllum*), *koa* (*Acacia koa*) and less often *ʻōhiʻa lehua* (*Metrosideros macropus*) (Judd 1975:20). The top of the posts were either cut and grooved or had forked branches in which small poles were horizontally lashed (Corney 1896:91). Next, a high post with a notch on top was lashed to the middle of each end to support the ridge-pole. The rafters were then lashed to the ridge-pole. Small poles were laid across each other above the ridge-pole. The space between the poles was closed up with sticks lashed in horizontal lines, 2 or 3 inches apart, and extended from the ground to the top of the roof. When this framing was completed, the structure was ready for thatching (Ellis 1979[1825]:224).

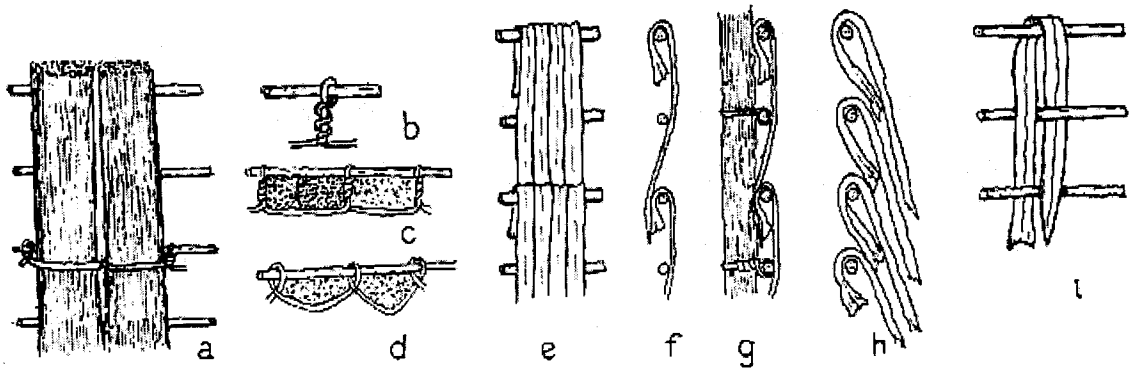
Women and children collected thatching materials (Judd 1975:21). There were different types of thatching: *pili* (*Heterogpogon contortus*), *lau hala* (leaf of the *Pandanus tectorius*), *maiʻa* (banana or *Musa* sp.) and *kī* (ti or *Cordyline fruticosa*) (Figure 4). *Pili,* a long grass, was bound into small bundles and tied to the small sticks along the side of the wall with sennit or cord. *Pili* thatching lasted the longest. Thatching made with pandanus, banana or ti involved taking individual leaves and weaving them around the horizontal sticks. This form of thatching "gives a neat appearance, resembling a kind of coarse matting on the inside, while the ends of the leaves hang down without" (Ellis 1979[1825]:224). Bishop (1916:12) observed, that "The better [houses] were thatched with lau-hala (pandanus leaf) or with la-i." Wilcox commented that *lau hala*:

> was a beautiful thatch to look at when it was all on. . . I've watched the Hawaiians so often. They would bring the leaves in bundles, tied cleverly with a special kind of knot, then wet them, and lay them on very exactly so that they overlapped. Each leaf was tied separately to the

> small thatching sticks, aho, the natives called them. They worked all the way along the length of the roof, bending the thick butt end of each leaf down around the aho and tying it firmly with a peculiar twist of the stout aho fiber. They could work pretty fast too, if they'd a mind to. No, they never bothered to strip off the thorn. They were very clever and quick about it. A lahala [*lau hala*] is like a cat, you know, it won't scratch if you stroke it the right way! And it made a good thick thatch, often 18 inches thick (Damon 1950:277).

Corners of the structure were sometimes covered with fern leaves such as *pulu 'ama'u* since these were stronger than *lau hala* and could be better secured. The Hawaiians collected the soft, reddish *pulu 'ama'u* from the mountains "and bound it very thick along the edges" (Damon 1950:277). The thatching process started at the lower extremities of the structure. This allowed the material to overlap as it moved upwards, forming a barrier against the rain.

Thatched houses usually lasted about five years. Those built for natives tended to last seven to ten years. According to Ellis, however, houses built for foreigners were poorly



—Thatching: **a**, binding *pili* grass bundles to purlin; **b**, detail of braid twist; **c**, **d**, cross section; **e-h**, pandanus thatching technique; **i**, ti-leaf thatching technique.

Figure 4. Different methods of thatching (Hiroa 1987[1957]:103).

constructed and did not last more than three years: "In less than twelve months after my own grass house was built, the rain came through the roof from one end to the other, every time there was a heavy shower" (Ellis 1979[1825]:227).

Not all canoe houses were thatched huts. There were also caves and niches under bluffs near the ocean (Emory 1924:38). Canoes and supplies appear to have been temporarily stored until the fishing season resumed and the sea was calm. Sam Ka'ai, a resident of Honokōhau Bay, Maui, remembers canoes kept in caves and in canoe landing houses along the beach (Ka'ai 1992). Also, archaeologists surveying for the Mauna Lani Resort Project on the northwest side of Hawai'i Island observed a depression in an aa field with a curvilinear wall abutting the side of the depression, "suggestive of a storage structure intended to hold a canoe" (Landrum et al. 1994:49).

Before a new canoe house could be occupied, it was blessed by a Hawaiian *kahuna* (priest) who offered a prayer called *kuwa.*[2] A tuft of thatching, called *piko,* the umbilical cord of the house, was left untrimmed so the *kahuna* could cut if off during the ceremony (Judd 1975:21). "The *kahuna* stood on the outside of the house, ax in hand, and holding a block under the thatch to obtain a solid object on which his blow should fall, he timed the stroke of the ax to the cadence of the prayer" (Malo 1951[1898]:124). The following is an example of a *kuwa*:

> *Ku Lanlani ka pule a Keoloalu i ke akua.*
> *O Kuwa wahia i ke piko o ka hale o Mea.*
> *A ku! A wa! A moku ka piko!*
> *A moku, a moku iho la!*

---

2 Houses for *ali'i* were also consecrated by *kahuna* blessings (Malo 1951[1898]:84, 122).

> Orderly and harmonious is the prayer of the multitude to God.
> Kuwa cuts not the *piko* of the house of Mea.
> He stands! He cuts! The thatch is cut.
> It is cut! Lo it is cut! (Malo 1951[1898]:125).

Finished canoe houses were also used to store paddles and fishing equipment such as nets, lures, hooks, lures and lines (Plate 11). They were also places to repair equipment (Handy et al. 1972:286) and for men to talk (Emerson 1978[1893]:15). "Fishing, the making of fishing gear and canoes, the care and housing of canoes and fishing gear, fighting, and the making of weapons were essentially men's activities (although there is in Ha'u the recollection of famous women warriors)" (Handy et al. 1972:301). While women were not allowed to fish for deep sea fish and generally prohibited from activities within canoe houses, women warriors were an exception. Distinguished canoe men (*kahuna kālai wa'a*) instructed their disciples in navigation (Emerson 1978[1893]:19). It is also likely that fishermen showed young boys how to make lures, hooks and fish nets. In areas with few outbuildings, canoe houses probably served the dual purpose of men's houses (*hale mua*) because men and women were not supposed to eat together. In addition, it allowed men to sit and discuss their concerns without interference (Ii 1959:58, 111). Malo (1951[1898]:122) indicates that not everyone was privileged enough to have extraneous outbuildings nor perform expensive consecration ceremonies:

> People who were of no account (*Lapuwale*) did not follow [house consecration] practice. They went in and occupied their houses without any such ceremony. Such folks only cared for a little shanty, anyway; the fire-place was close to their head, and the *poi* dish conveniently at hand; and so, with one house, they made shift to get along.
>
> People who were well off, . . .those of respectability, of character, persons of wealth or who belonged to the *alii* class, sought to do

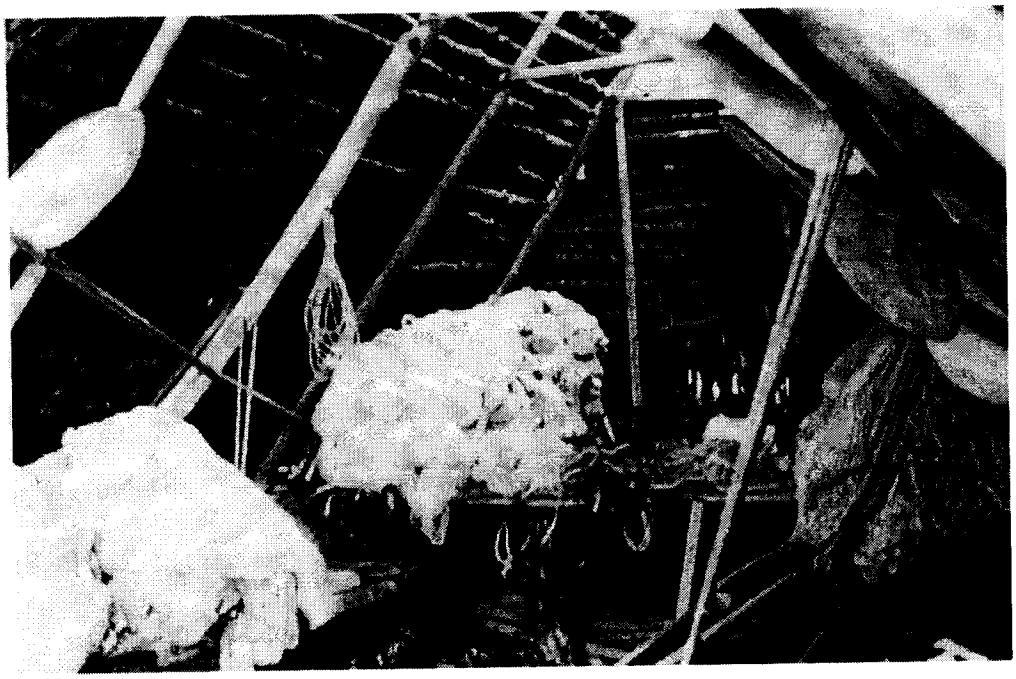


Plate 11. The interior of a canoe house in Hana, Maui, 1931. Courtesy of Bishop Museum.

> everything decorously and in good style; they had separate houses for themselves and their wives.

From these statements it is plausible to infer that canoe houses functioned as men's houses in places where people were less well off, since both canoe houses and men's houses were restricted to men and taboo to women. Additional historical accounts support this conclusion: in 1841, Reverend John Paris traveled to the Ka'alu'alu area of South Point on the Island of Hawai'i, and went "to the house of our leader which was prepared for our lodging for the night. *Hale hookipa* it was called, house of refreshing and rest. It was a large grass canoe house" (Paris 1926:14). The name of the canoe house and the fact that it was prepared for lodging and rest suggests this canoe house was also a men's house. Another historical source implies canoe houses probably served the dual functions of canoe house and men's house. Captain Dixon noted in his journal, February 1787: "By the time I got on the

beach, dinner was nearly ready, and a large houſe, which Abenooe had for ſtowing away his canoes, was appropriated for our reception" (Dixon 1968:126).

Canoe houses also seemed to serve as guest quarters and churches in historic times when the need arose. In 1812, Ellis took the opportunity to preach to the Hawaiians inside a canoe house. He walked to Pahoehoe, on the island of Hawai'i, and "entered a large house, in which many workmen were employed in making canoes. About fifty people soon after assembled around us. We asked them if they would like to hear about the true God" (Ellis 1979[1825]:75). In that same year, missionaries sailed to Hilo to spread the word of God. "On their arrival, they found none to welcome them among the stupid natives, but obtained shelter in a large thatched canoe-house, which the Oahu chiefs had appropriated to their use" (Anderson 1870:55). Additional instances of canoe house use were mentioned by missionary Sereno Bishop (1916:21) who wrote, "during our absence at general meeting in Honolulu in 1835, the great church was burned by some incendiary, and the services were then conducted in a large canoe-shed of the Governor, which was vacated for the purpose."

Canoe houses were sometimes abandoned as people moved out of villages or populations decreased. These two factors were stimulated by European contact. Europeans who owned ships and plantations enticed men to work for them, creating new centers of activity away from traditional villages (Handy et al. 1972:301). The anthropologist Hiroa (1987[1957]:76) wrote, "country people were attracted to coastal centers for trade and out of curiosity." Village populations were further reduced by the introduction of new and deadly diseases (see Chapter 1: History of the Hawaiians). Although women of the villages remained, canoe-related activities ended when the men left or died because, as Handy et al.

(1972:301) notes, "Nowhere, and never . . . did women enter fishing operations other than on the reefs, in lagoons, and along shore."

Natural catastrophes also played a role in destroying coastal villages. Tidal waves were, and still are, serious threats. A large wave struck Hilo on 7 November 1837, and forced "a mountain wave of the Ocean up on to the land at our station, sweeping off 66 houses, most of the canoes and many persons. Eleven were drowned, others were picked up by the boats of a whale ship then laying in the Bay" (Damon 1950:90-91). Another tidal wave pounded Hawai'i Island on 2 April 1868. George De La Vergne recorded his observations in great detail:

> At several places the quake-riven cliffs were spewing cascades of muddy lava that descended into the sea, while along the beach the inhabitants were fleeing in despair. After its movement of withdrawal, the sea began to flow back coastward again, rolling powerful bullows into the shore, piling one wave upon another, so that, traveling with incredible speed, they finally broke against the island, submerging and engulfing everything. Indeed, this gigantic rush of seawater surpassed by more than ten meters the level of the highest earlier tides. The force was so frightening and the sound so resonant that it seemed as if the whole island were plunging into the abyss of waves. Men, women, children, canoes, dinghies, houses- all disappeared within the wink of an eye in a confused mass of uprooted trees, collapsing cliffs, boards floating at random, human beings and animals struggling against death like playthings in the grip of an irresistible power. Several times the sea subsided and then returned, hurling here and there all sorts of debris, in which cadavers collided and became locked with the bodies of the dying. Then, little by little, the ocean grew calm. As far as the eye could penetrate, one found no trace of fishing villages. Everywhere one saw only waste, desolation, ruin (De La Vergne 1898:215).
>
> Daybreak made it possible for us to catch sight of a flag hoisted atop a hillside. But the village itself we could find not a trace. Neither our captain, familiar with the whole coast, nor our pilot, whose home town was Keauhou, recognized any of it. The black rocks that normally served them a guideline had disappeared. The coastline had been leveled and most of the cliffs had collapsed. Here and there along the beach remnants of roofs, broken planks, and tattered shreds of cloth

> were the only indications of where once stood fishermen's huts (De La Vergne 1898:224).

The villages of the ancient Hawaiians devastated by tidal waves were usually rebuilt. Village chiefs provided supplies such as timber and food in emergency situations; they were responsible for their subjects. Tidal waves continued to hit Hawai'i and the people persisted in rebuilding. With the introduction of gasoline engines, larger boats and commercial fishing enterprises, traditional fishing methods disappeared. Although canoe houses are still constructed, they are now associated with canoe racing clubs and their method of construction has changed dramatically. They are now 'modern' structures built with concrete.

Canoe houses were important structures in traditional coastal villages in Hawai'i. They not only protected the Hawaiian's fishing vessels and gear, they also provided shelter to travelers and may have served as men's houses in poor regions where few outbuildings existed. Canoe houses are identifiable by their location and *halau*-shape. The *ali'i* canoe houses may be distinguishable from those of the *maka'āinana* by their size and association with a greater number of outbuildings. Also, *ali'i* canoe houses needed to be able to hold double canoes, thus probably requiring them to be larger. Eventually Hawaiians adopted western methods of livelihood and abandoned the canoe house as a storage area for fishing vessels. Storms and waves scattered canoe house thatching and disturbed rock walls. Traditional canoe house foundations now exist as parts of abandoned coastal towns in areas not yet buried below modern development.

CHAPTER 4: ARCHAEOLOGICAL STUDY OF CANOE HOUSES

An archaeological approach to the study of canoe houses begins by examining evidence left by ancient peoples. Physical and material evidence can be measured, compared and sometimes dated. Archaeology has the potential to provide new data and substantiate firsthand accounts supplied in historical documents. This study of canoe houses focuses on their identification in an archaeological context, their size in relationship to canoes stored inside, and the possibility of identifying the type of canoes stored inside.

Archaeological research for this thesis was gathered from previous archaeological reports and files located at the Department of Land and Natural Resources, State Historic Preservation Division (SHPD), in Honolulu and Maui. Much of the data was found in a computerized data base, other materials exist in their files and library. Thesis research uncovered data for 86 canoe houses (see Appendix A: Canoe House Data). An additional 16 canoe houses were found and recorded during a week-long coastal survey of Kahikinui, Maui (see Appendix B: Kahikinui Data and Maps) with Dr. Boyd Dixon, the Maui/Lāna'i Island Archaeologist, and volunteers Kevin Magnuson, Anna Loomis and Tanya Lee. This chapter summarizes archaeological research conducted in Hawai'i, with a focus on Kahikinui, Maui.

Archaeological research projects conducted along Hawaiian Island coasts often have encountered canoe houses. In the 1800s, Ellis (1979 [1825]) noted the importance of these features. Early archaeologists, however, concentrated on the description of artifacts (Brigham 1902, 1906), temples and shrines (Stokes 1909; Thrum 1906; Emory 1921, 1924, 1928; McAllister 1933a, 1933b). After World War II, the chronological potential of

Hawaiian archaeology was realized when Dr. Kenneth Emory of the Bishop Museum taught a class in archaeological field techniques for the University of Hawaii and uncovered a deep, well stratified deposit in Kuli'ou'ou Rock-shelter, O'ahu (Emory et al. 1959). This was the first Hawaiian archaeological site investigation that utilized radiocarbon dating. The site was found to be 946 years old, plus or minus 180 years, and dispelled earlier notions that Hawaiian archaeology had no great time depth (Kirch 1985:15-16).

During the 1950s and 1960s, archaeologists concentrated on dating initial settlement of the islands (Emory et al. 1959; Emory and Sinoto 1961, 1969). During the late 1960s, archaeologists began focusing on regional settlement patterns. By the 1970s, significant funding from governmental agencies and private developers became available for privately contracted archaeology. Although numerous archaeological projects were conducted throughout the Hawaiian Islands during this period, many of them did not include detailed field information or regional syntheses of their findings. Time constraints, lack of experienced field personnel and insufficient funds often played a role in the amount of detail in archaeological site recordings.

During the 1980s and 1990s, site recording became more consistent as field methods were standardized. By this time, however, many sites were destroyed, especially those in prime beach locations favored by high *ali'i*. These were probably areas where many *ali'i* canoe houses were located. Today, sites with canoe houses still remaining tend to be isolated or in politically pre-contact, marginal areas. This fact introduces a bias into the archaeological data that needs to be recognized: few canoe houses belonging to powerful

ali'i remain standing, and those recorded prior to 1980 did not always include detailed measurements.

The first step required to study canoe houses in the archaeological record is their identification. A canoe house or *halau wa'a* is defined in the *Hawaiian Dictionary* as a "long house" (Pukui and Elbert 1986:52). In order to recognize a canoe house in the field, one must understand their purpose, know their attributes and predict their locations. As seen in Chapter 3: Overview of Canoe Houses, historical period canoe houses were long, thatched structures located near the ocean for canoe storage. Sometimes they had stone walls at their base and other times they did not. Although their shape was distinct, their construction did not differ much in design from other buildings.

In archaeological reports at SHPD, structures identified as canoe houses are long, with rectangular or parallel sided rock walls. Canoe houses were not identified in areas without rock walls since non-rock structure types lack visible surface remains. Only structures identified in archaeological reports and files from previous archaeological projects and from the coastal Kahikinui survey were used in the data base for this thesis. Features identified as probable canoe houses were distinct from the majority of village structures: they tended to be twice as long as they were wide, long enough to hold a canoe and located near a canoe landing (see below for a descriptive analysis for Hawaiian canoe houses).

Problems were encountered during canoe house research that resulted from biases in the archaeological record. For instance, although the study included all known canoe houses in SHPD files, as well as canoe houses recorded during a coastal survey at Kahikinui, Maui, the assemblage is probably not characteristic of the full range of canoe houses that once

existed in Hawai'i since most of the sheds identified presumably belonged to *maka'āinana*. The *ali'i* also had canoe houses and, according to 18th and 19th century sources, some were very large. Canoe houses built for voyaging canoes were probably even larger, and may not have been recognized as such; in fact, no structure was identified as a voyaging canoe house. Many of these structures were also probably located in prime coastal real-estate areas that have since been heavily developed and now form resorts and housing developments.

A number of factors influence the preservation of canoe houses, such as the length of abandonment, possible reuse of the feature and environmental factors. Canoe houses were sometimes abandoned as people died or populations moved, and warfare was especially prevalent during early historic times. Many abandoned structures may have been reoccupied; as canoe houses, dwelling houses, storage huts, pig pens, etc. Natural catastrophes could also destroy canoe houses and force people to move; tidal waves, typhoons and fires were all recorded during the historic period.

Human behavioral variability is probably one of the most difficult factors to recognize in the archaeological record. Although there likely were regional variations between the different Hawaiian Islands, they are difficult to quantify. The paucity of canoe shed data was too limited to permit statistical analysis. However, archaeological data suggest that permanent canoe houses were only constructed where necessary, with locally available construction materials. Therefore there would be a difference between the windward and leeward sides of the islands. Areas with ample shade or calm bays tended to have less canoe houses because the vessels were probably often in use and could be stored under trees or mats. Understanding these adaptive strategies is important because they are

responsible for the organization underlying the archaeological record. Examining the canoe house through an archaeological or cultural landscape perspective encourages the investigation of organization at a regional level (Rossignol and Wandsnider 1992). This is especially important in Hawai'i, where each village or hamlet formed an interconnected network based on family ties and reciprocity.

Data collected from archaeological reports are often limited by the definition of a canoe house, since not all report authors chose to functionally identify a structure. As Kirch (1985:36) notes:

> There is a certain danger, however, in applying functional terms to site survey data. It can at times be extremely difficult to determine the function of stone structures, especially on the basis of surface survey data, and there is the potential pitfall of assuming *a priori* what one should in fact be attempting to determine through careful survey and excavation.

Another problem pertains to identifying canoe houses in the archaeological record since structures rarely have surface artifacts indicating their purpose. Rather, archaeologists must look to the spatial context to determine their function. For example, it is always possible that a structure identified as a canoe house was in fact a *hula halau* (house of dance instruction) or men's house, since these are also described as long houses. When villages located in upland regions were examined for structures resembling canoe houses, however, they were not found, suggesting that most coastal features identified as canoe houses are probably for canoe storage.

Traditional Hawaiian culture centered on fishing, so canoe houses were significant structures in their daily life. Coastal villages were located in areas with sheltered canoe

landings so that people would have easy access to ocean resources. The area surveyed for this thesis provided examples of villages oriented towards the maritime resources (Plate 12).

As long as the population remained small, sufficient fertile land was available near the ocean, especially in windward settings. However, between AD 1400 and 1600, expanding populations began moving into more marginal leeward areas. Small villages or hamlets were established in dry, rugged areas like Kahikinui, Maui, the occupants farming upland forests. Fishing and marine resources remained important to upland settlers who also sought routes to transport new canoes to the ocean. Kirch (1980:34) observed:

> The majority of Hawaiian prehistoric sites are found in areas below about 450 meters elevation, a distribution pattern reflecting both the

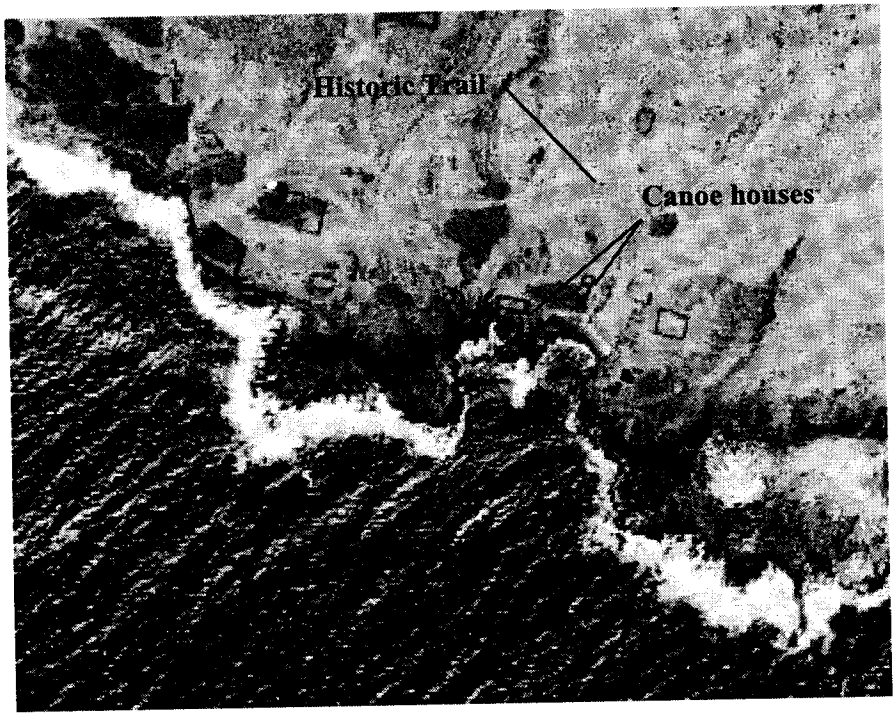


Plate 12. Aerial photo of coastal Kahikinui showing Hawaiian village features. Note the two canoe houses and their proximity to the ocean.

> Hawaiian orientation to the sea and the agricultural productivity of the lowland valleys and slopes.

The community exchange network in the *ahupua'a* permitted coastal villagers in marginal areas to focus primarily on fishing. This adaptive strategy relied on relatives living in more fertile upland regions to exchange staples such as dryland taro and *ualu* (sweet potato, *Ipomoea batatas*) and medicinal and wild plants for fish, shellfish and seaweed. In Kahikinui (Figure 5), relatively abundant marine shells and fish bone have been archaeologically recovered from many upland sites (Dixon et al. 1997). It is also likely that occupation of the fishing villages was seasonal, since ethnohistoric accounts mention winter months as most optimal for leeward Maui fishing due to calmer winds (Sterling 1978:196). An important part of the research for this thesis was an examination of canoe houses in the field. One week was spent surveying a 7 mile stretch of coastline in Kahikinui, on the south coast of Maui (Figure 6). The survey area covered six *ahupua'a* with over a dozen intact traditional coastal villages which permitted an inter-village comparison of canoe houses. Since Kahikinui receives little rainfall (usually 500 mm or less annually [Giambelluca et al. 1986:17, 47]), vegetation tends to be sparse and surface features are easily discernible on the rugged coastline. Sixteen probable canoe houses were identified during the survey.

Coastal villages in Kahikinui were observed to be clustered around areas of easy ocean accessibility (Kirch 1997:3-4). At least one canoe house was identified in each *ahupua'a* during the present study. Canoe houses were especially important in Kahikinui because there were probably few shade trees (Plate 13) and canoe use would have been restricted by the seasonally rough ocean conditions. During intermittent weather conditions, canoes could have been disassembled and stored. Part of the Kahikinui coastline is marked

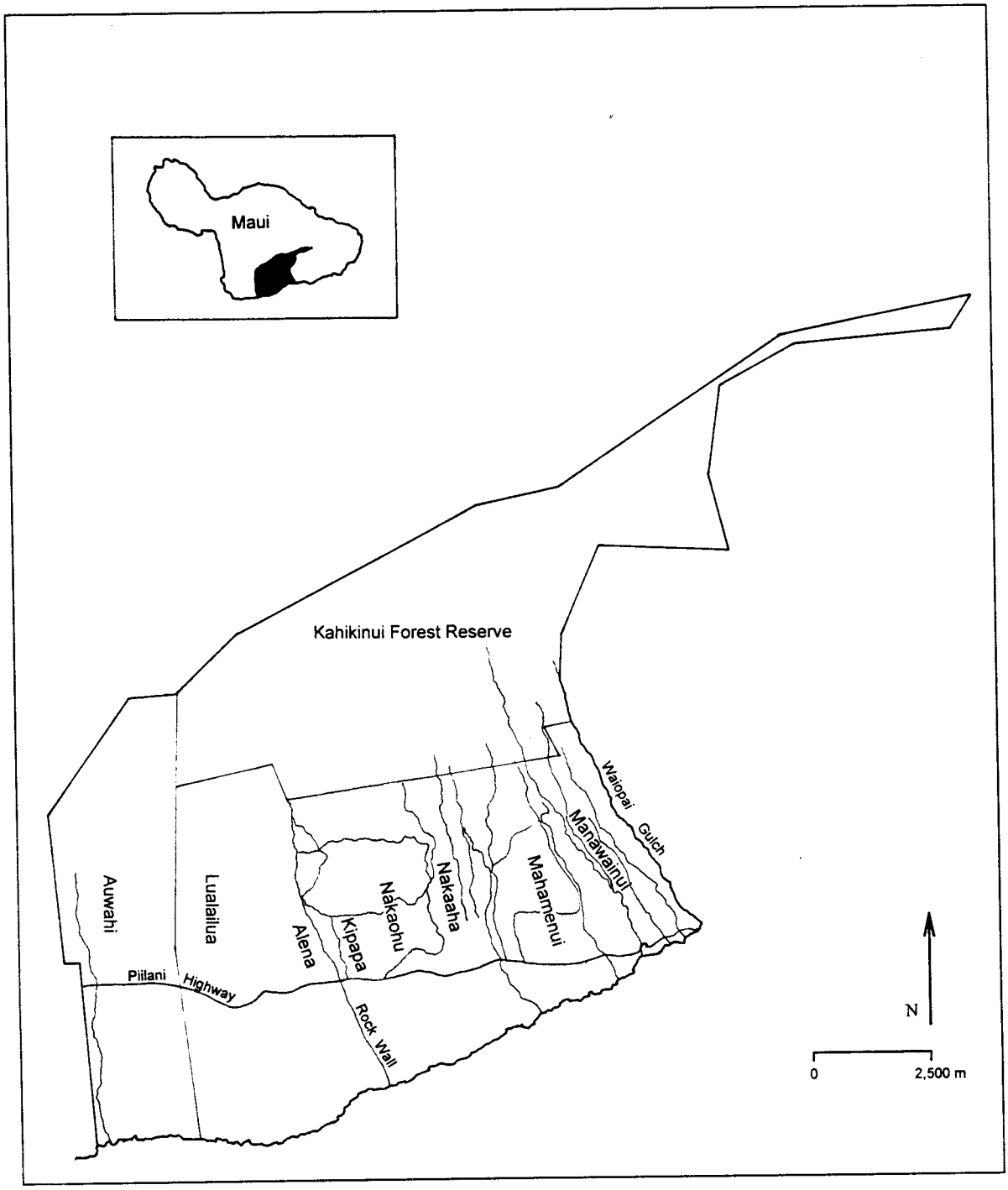


Figure 5. *Ahupua'a* located at Kahikinui on the Island of Maui.

by steep cliffs 30 to 50 m high. Gaining access to the water there would have been difficult, and in some cases it is likely canoe ladders were employed (see Chapter 2: Canoe Morphology and Function).

Stone wall foundations in Kahikinui indicate the presence of abandoned thatch buildings. Few trees would have existed in the area, so most of the lumber would have been carried down the mountain. It is therefore likely that the use of rock walls was a response to existing resources: rocks were readily available and lumber was not. In areas without rock, canoe houses may have only been thatched structures.

The following descriptive analysis[1] uses data from the SHPD, archaeological reports and information collected during the Kahikinui survey. Sixteen possible canoe houses were identified during the field research, bringing the number of canoe houses recorded in Hawai'i to 102. The data indicate most structures (89 percent) recorded as canoe houses were less than 60 m from the water. Figure 7 shows the distribution of canoe houses from the ocean. These data support the supposition that Hawaiians located canoe houses close enough to the water to transport canoes without unneeded exertion, yet far enough away to stay out of storm waves.

Elevation above sea level also appears to play an important role in canoe house location. All the identified canoe houses were located less than 23 m above sea level. Most (73 percent) of the recorded locations are 2 to 10 m above sea level. Only 10 percent are below 2 m and 17 percent are above 10 m. Canoe houses were probably built just upland of the littoral zone (biogeographic region between the lowest shoreline edge and high water

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1 The statistics program used for all statistical analysis was SPSS 6.1 for Windows Student Version (1994).

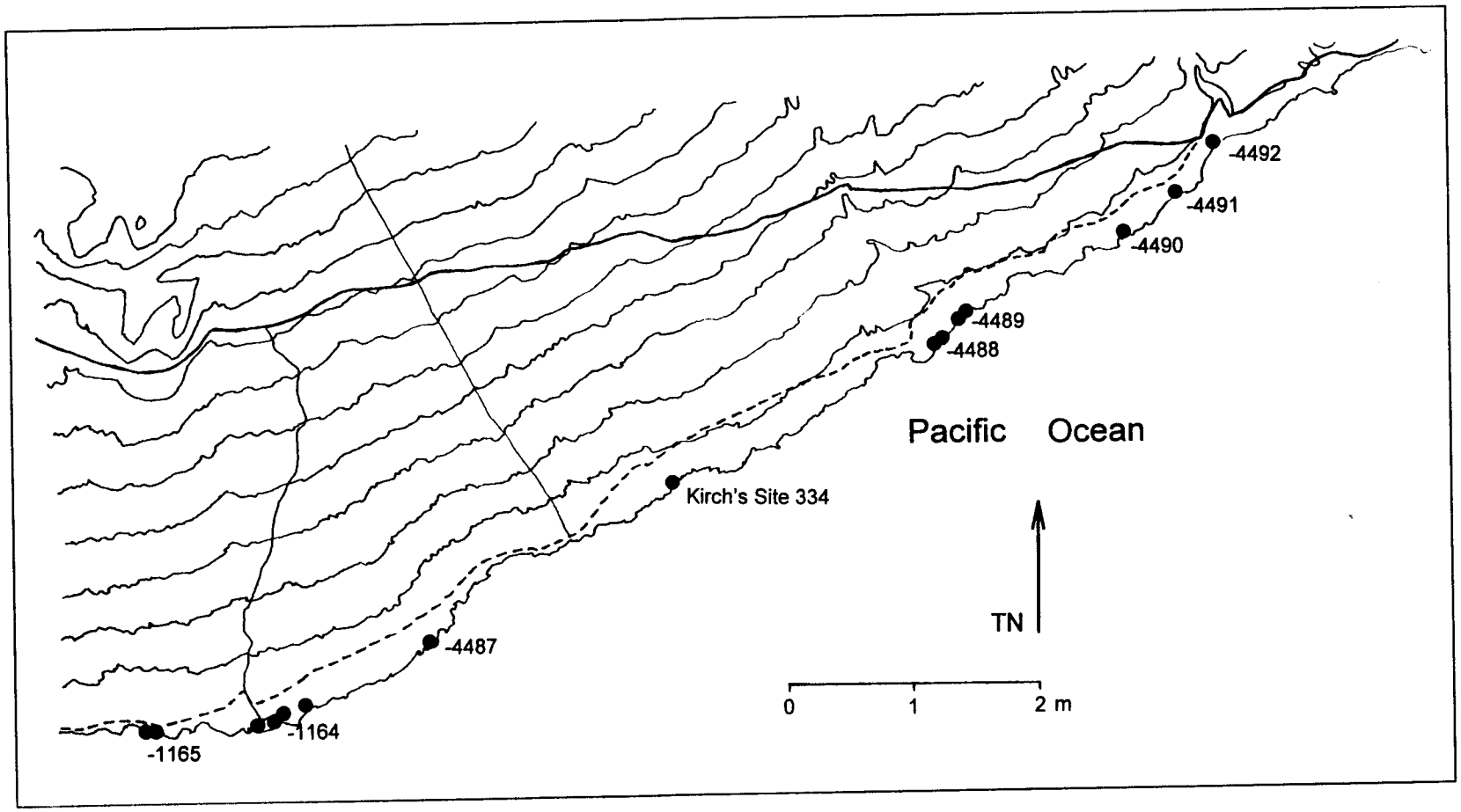

Figure 6. Canoe houses located during the survey of coastal Kahikinui.

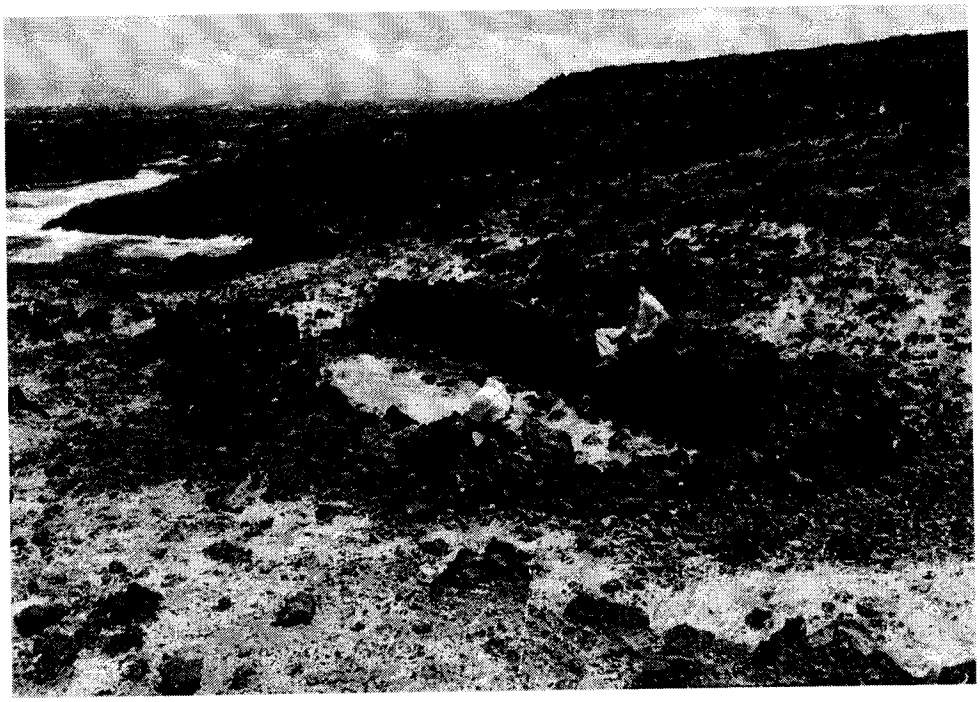

Plate 13. Few trees grow along the coast of Kahikinui, Maui. Site T10, a canoe house, is easily discernable on the barren landscape (Coral Magnuson and Boyd Dixon in photograph).

line), the elevation and distance from the water reflecting this. Exceptions, such as those located above 10 m, may have been constructed at cliff edges or when more canoe houses were required than fit at this zone. Other factors affecting canoe house locations are biases caused by storm or tidal waves destroying nearshore structures and 19th and 20th century construction along calm bays and beaches. The results of this study suggest that the location of canoe houses may be the result of a traditional selection for safe conditions coupled with the preservation of only certain modern settings for archaeological recording.

Length and width of canoe houses are important indicators of the size of vessels housed inside. It is hypothesized that canoe houses were constructed with 1 or 2 m of storage space at the far (end opposite the main door) side of the structure based on an

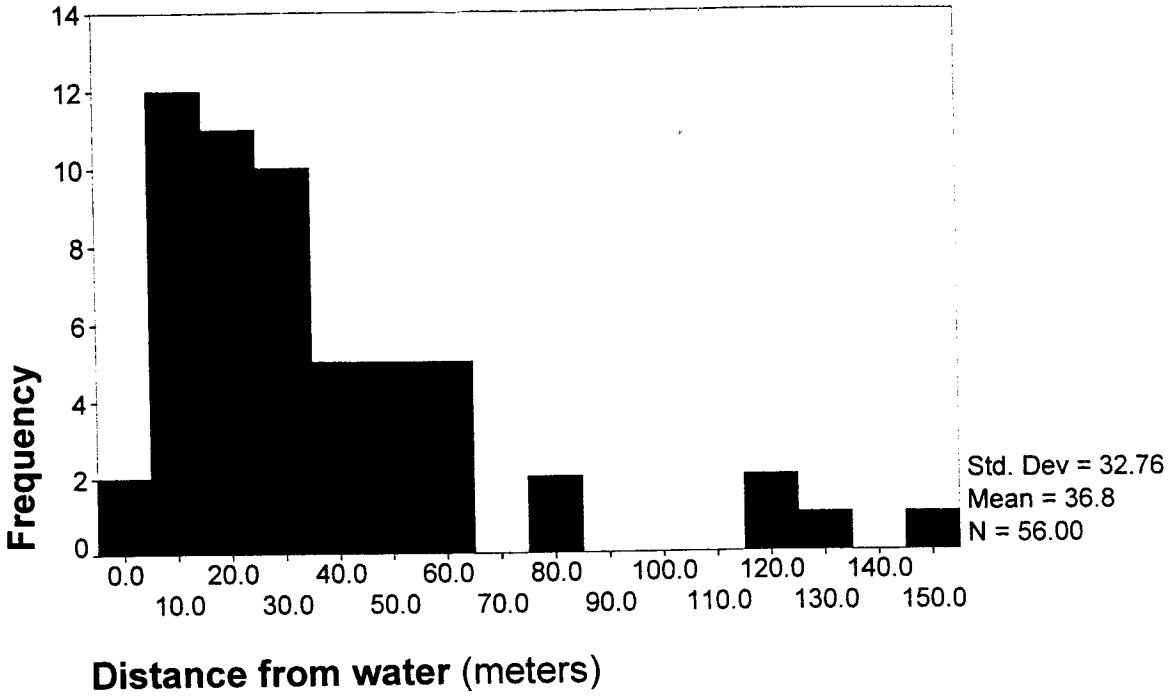

Figure 7. Histogram showing the distribution of canoe houses from the water. Note that most are within 65 m.

exterior photograph of a canoe house (see Plate 11). With the addition of storage space, the interior of the canoe house would be approximately 2 or 3 m longer than its canoes. This is confirmed by historical data introduced in Chapter 1 that showed that most canoes ranged in length from 3.66 to 18.29 m, so it would be expected that the inner length would be between 5.66 and 21.29 m. Archaeological data also reintroduces this idea since most (91 percent) of the canoe houses fall within this midsize category. The length of recorded canoe houses does not suggest use by voyaging canoes, based on comparisons with modern reconstructions (the *Hōkūle'a* is ca. 18 m in length and may reflect a small voyaging canoe). The external

length,[2] about 1 m longer than the internal length, also suggests that most canoe houses recorded in the archaeological data were constructed for average sized canoes; 95 percent of the canoes fall within the midsize category. The sample of very short canoe houses (1.6 to 6.2 m) forms 5 percent of the sample. These structures were highly eroded and their lengths appeared truncated, suggesting that they too, may have fit in the midsize category. Figure 8 shows the distribution of canoe house lengths.

The interior widths of canoe houses were investigated to determine the size and type of canoes stored within. Most (86 percent) internal canoe house widths are between 2 and 5 m, which would allow for two or more canoe hulls[3] as well as room for men to work on fishing gear, repair canoes and use the facility as a men's house. The narrowest houses, 1.1 to 1.9 m wide (7 percent), would easily contain one canoe and fishing equipment. The widest interiors, 5.2 to 10 m, were not very common, just seven percent of the sample, and may reflect *ali'i* canoe houses. Even these canoe houses, however, could have been used for outrigger canoes. No width measurement was distinct, therefore it could not be determined if any of the features identified as canoe houses were constructed for *ali'i* canoes, let alone voyaging canoes. External widths tended to be ca. 2 m wider than the interior, based on the average thickness of the walls.

As mentioned in Chapter 3, canoes were disassembled prior to storage in canoe houses. This creates problems when trying to identify the status of the canoe house owner.

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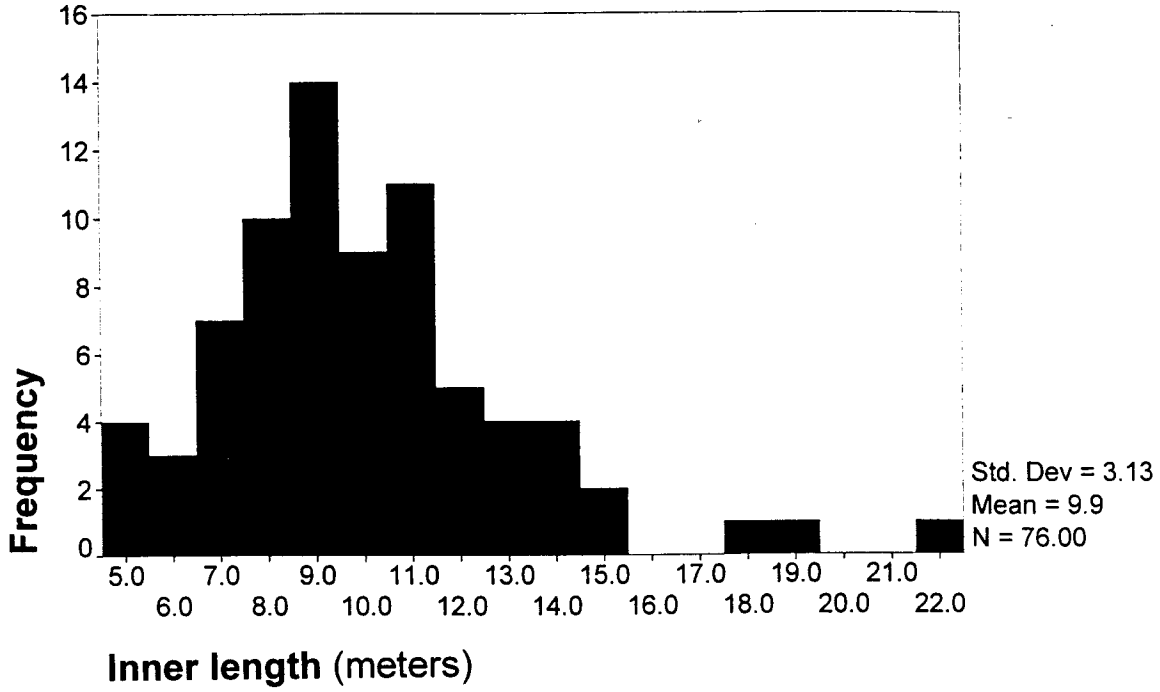
2 The inner dimensions were often not mentioned in reports, therefore the remainder of the analysis will focus on external measurements.

3 Canoe hulls observed historically had widths around 0.3 m (see Chapter 2) (Bloxom 1925:22; Lyman 1971:19).



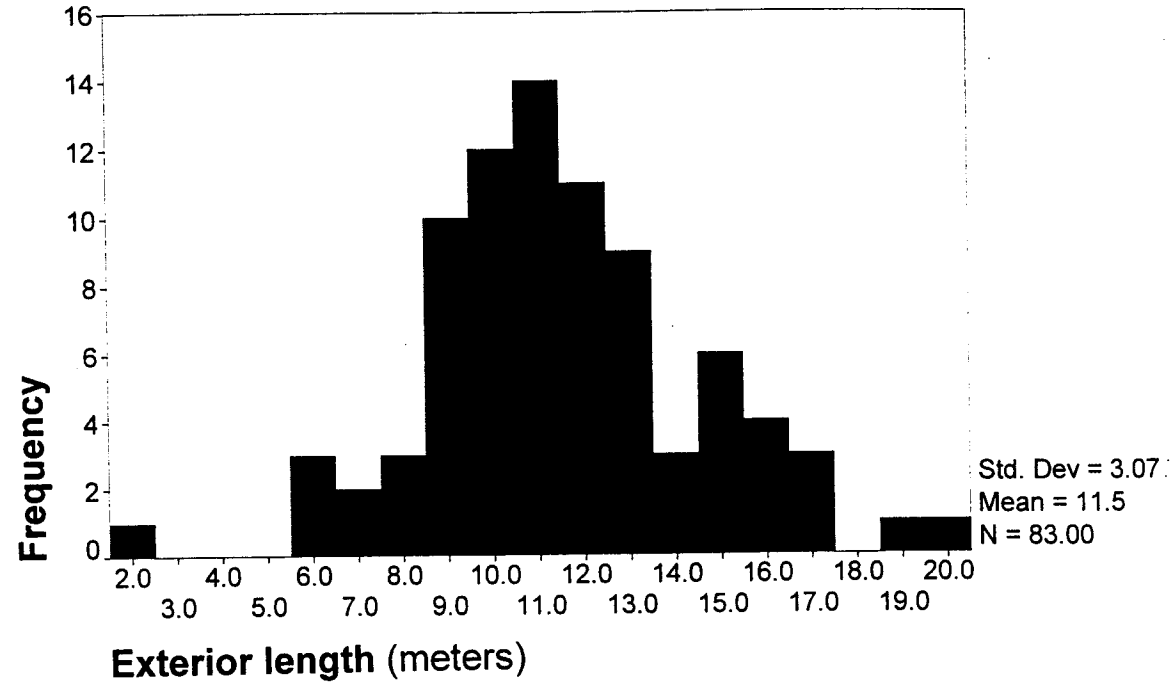
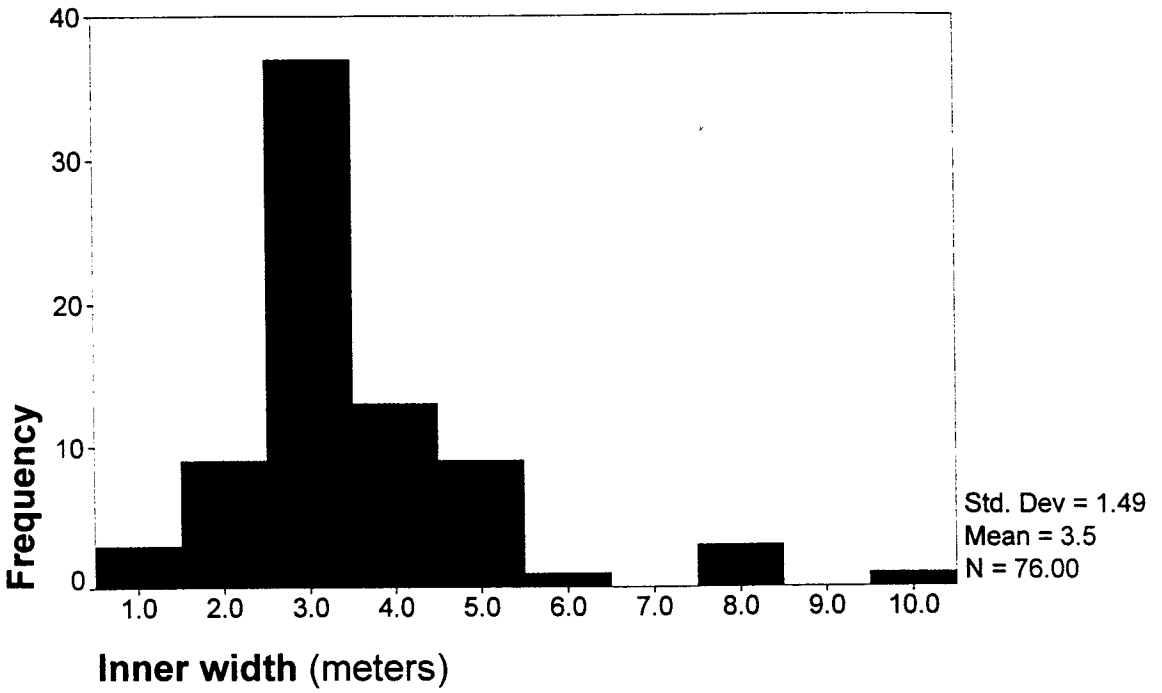


Figure 8. Histograms showing the distribution of canoe house lengths. The top figure is the inner length and the bottom figure is the total or exterior length.

Hawaiian canoe hulls were approximately the same width, and identifying a communal structure built for the *maka'āinana* and one built for the *ali'i*, who often had numerous canoes, is extremely difficult based on width alone. However, it is likely that *ali'i* did own larger canoe houses for prestige purposes. Figure 9 shows the distribution of canoe house widths.

The shape of canoe house foundations is generally (91 percent) an elongated 'U'-shape with the open part of the feature functioning as a door (Plate 14). Four percent are found to be simply open ended structures, or two parallel alignments (Plate 15), with two open parts functioning as doors.[4] In the latter case, the main door used for the followinganalysis is defined as the door facing the canoe landing. If this is not apparent, it is the widest door. Four percent of the 'U'-shaped canoe houses have small 'back' doors or breaks in the wall structure that appear to be doors. Two different door types were distinguished: restricted and non-restricted (Figure 10). Restricted is defined by the terminal points of the 'U' which make an abrupt inward turn towards each other, causing the doorway to become smaller than the canoe house; non-restricted structures do not have an inward curve to the wall so the doorway is the same size as the canoe house width. The main doors were between 0.5 and 8.5 m wide with most doors measuring between 0.8 and 3.3 m. Maximum canoe house widths are a reflection of non-restricted doorways. In fact, most (62 percent) canoe houses with recorded door measurements have non- restricted doorways. The following graph shows the door size distribution (Figure 11). It is plausible that door

4 Additional features not included in the door width category are caves and modified outcrops, which form the remaining 2 percent.



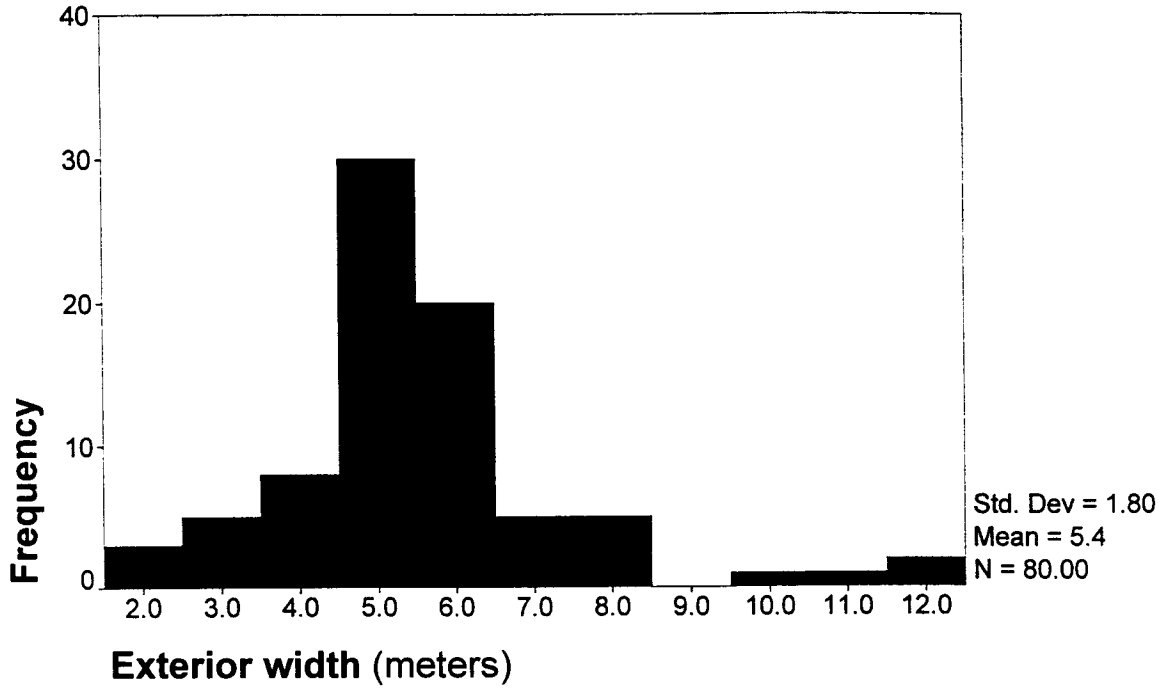


Figure 9. Histograms showing the distribution of canoe house widths. The top figure is the inner width and the bottom figure is the total or exterior width.

Plate 14. 'U'-shaped canoe house, Site 9, located in Kahikinui, Maui.

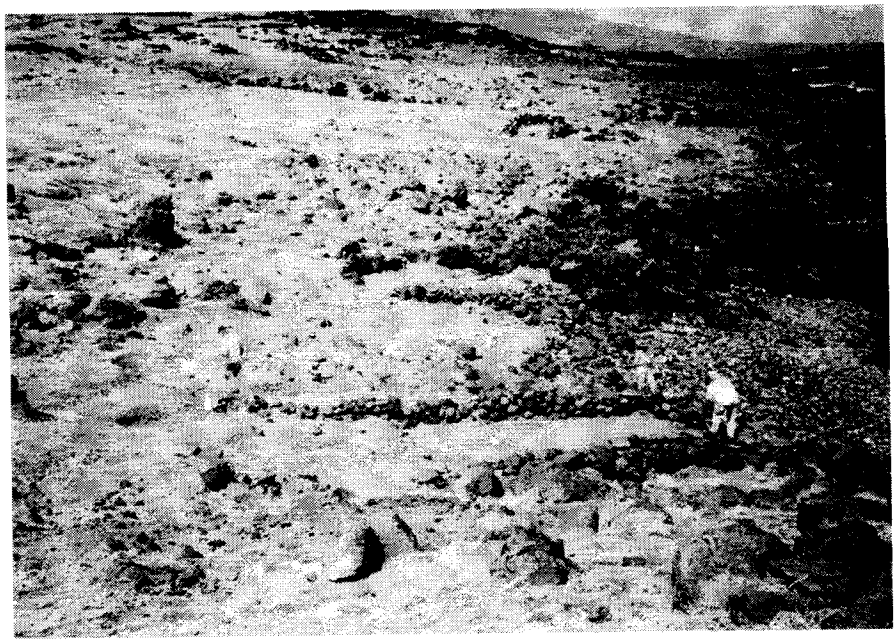


Plate 15. Parallel shaped or open ended canoe house, Site 14, located in Kahikinui, Maui.

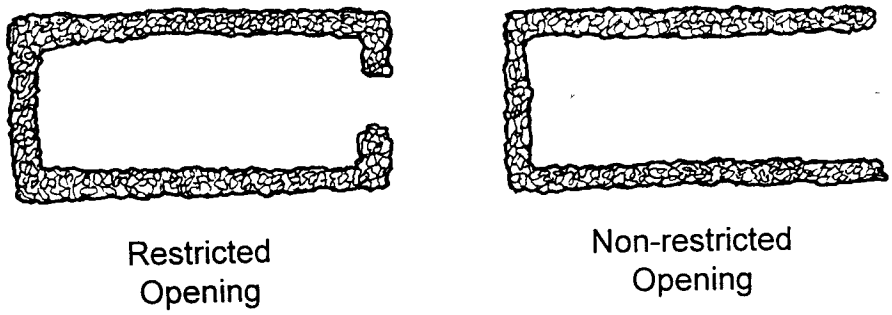


Figure 10. Restricted and non-restricted door openings seen on canoe houses.

size reflects the width necessary to carry the canoe inside. A canoe with wider hull may have required additional door width, especially if the canoe was heavy and needed to be dragged along the ground on rollers. Restricted and non-restricted doors may well be stylistic in nature, since villages seemed to have predominately used one door type. If door shapes were functional, they may have kept out wind, sand or animals, or made it difficult for people outside the houses to see inside.

All canoe houses recorded in the data base have stone walls. Two types were observed in pre-contact Hawaiian structures: core-filled and stacked (Figure 12). Core-filled walls were created by stacking large cobbles and small boulders on the outside of the wall and filling the interior with smaller rocks, often pebbles and small cobbles. Core filling accounts for 56 percent of the known wall types. Stacked walls consist of rocks, usually cobbles and small boulders, placed on top of one another; they account for 33 percent of the sample. Four percent of the sample contained both core-filled and stacked rock walls, while seven percent were too deteriorated for identification. Although core-filled rock walls appear older than stacked walls, further investigations are necessary to substantiate this hypothesis. It is possible they are differences in style or a reflection of available rock size.

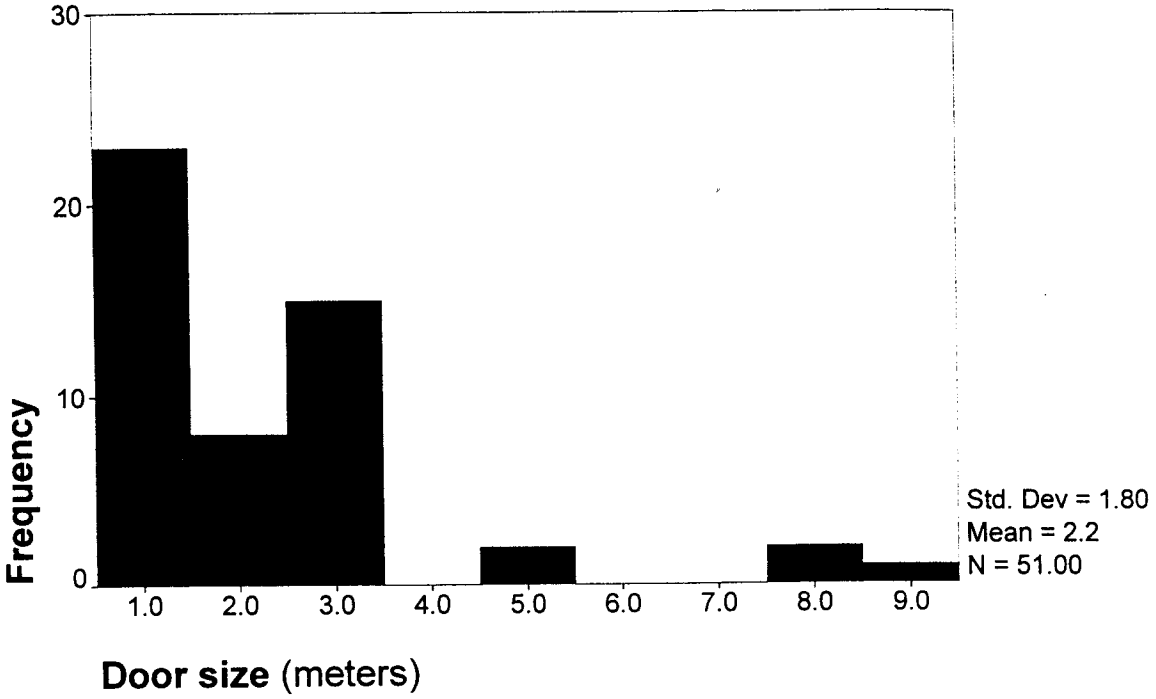


Figure 11. Histogram showing canoe house door size distribution.

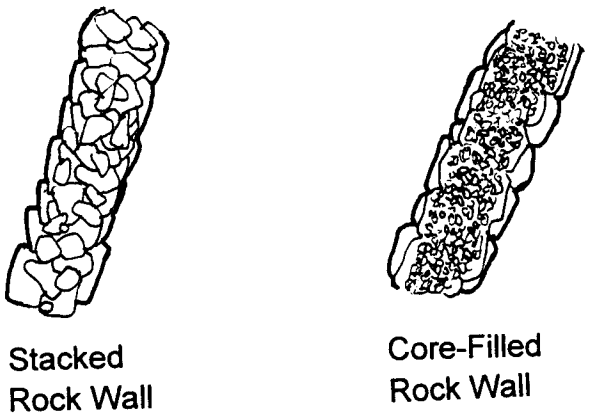
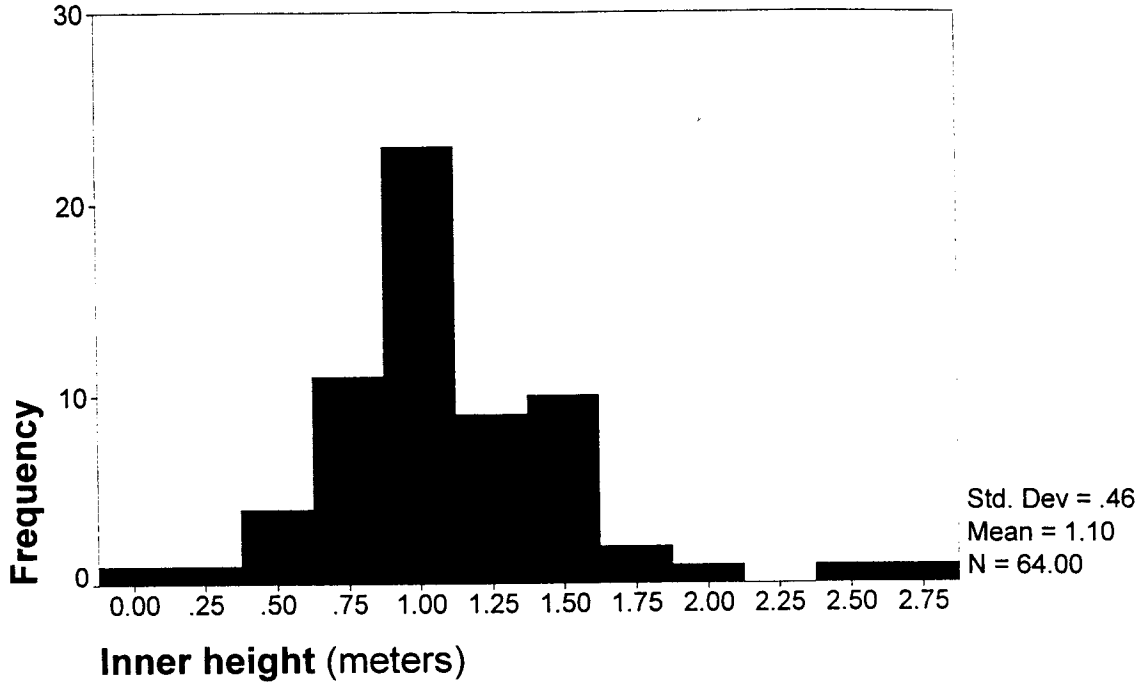


Figure 12. Diagram of stacked and core-filled walls.

If the natural rocks in the area of the canoe house are water-rounded, then the canoe house tended to be built of rounded cobbles; if the natural rocks are subangular, then the canoe house tended to be built of subangular rocks. Most available bedrock in Hawai'i is basalt, therefore, most of the canoe house walls are constructed of basalt; coral boulders and cobbles were also used, especially in areas with coral beaches.

Recorded exterior wall heights range between ground level and 2.7 m, with more than half (69 percent) of the canoe houses in the sample having wall heights between 0.6 and 1.4 m. Interior wall heights were similar to exterior heights (an isolated case utilized a 7 m high boulder outcrop for one wall). The graph below shows the distribution of wall heights (Figure 13). Wall heights may have been influenced by scarce timber or local topography in which one wall is built higher than another to compensate for uneven terrain. Wall heights were increased after the introduction of grazing animals, such as goats and cows, to protect property (Kirch 1997:57). With ". . . the introduction of cattle, goats, and other ungulates it became necessary for the Native Hawaiian people to construct high stone walls to support their thatched houses so that the *pili* grass thatch was not literally eaten from around them" (Kirch 1997:25). Kelly (1983:112) relates the function of a wall to its constructed height, suggesting that a wall height of ca. 1.4 m was necessary to restrain cattle, and a height of 1.8 to 2.4 m was required to contain pigs and goats. Twenty-five percent of the sample is more than 1.4 m high, suggesting these walls may have been constructed historically to keep out cattle. Only six percent are more than 1.8 m high, implying pigs and goats were not a problem.

Another attribute of some canoe houses is paving, generally a gravel-sized rock floor



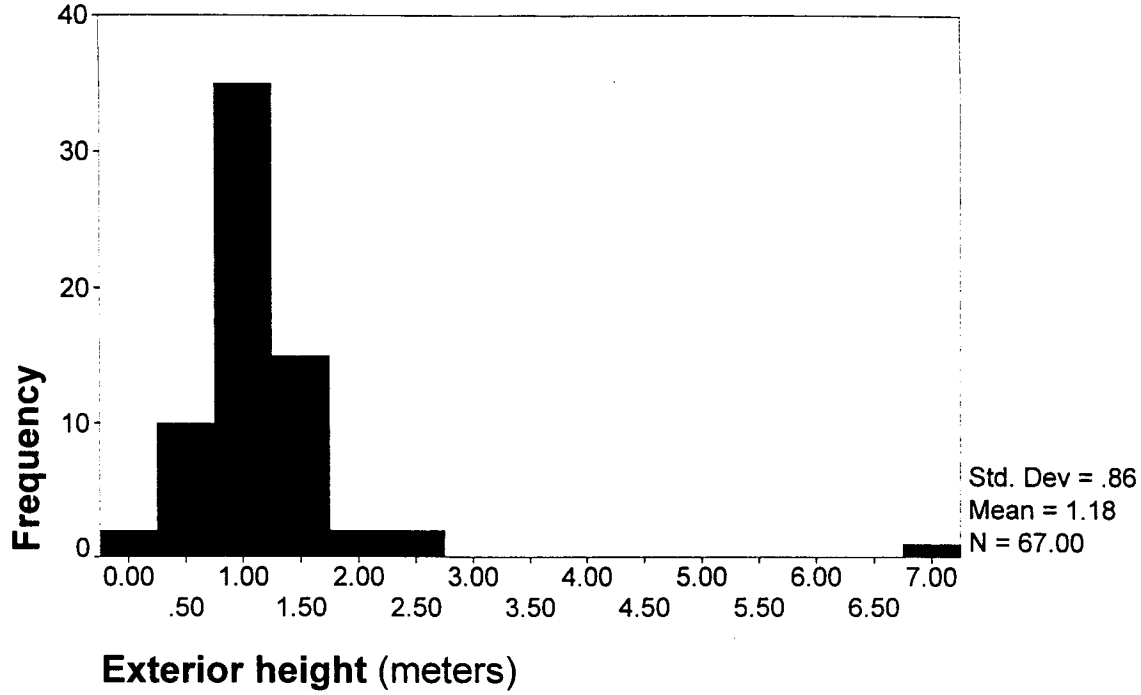


Figure 13. Histogram showing the distribution of canoe house wall height. The top figure is the inner height and the bottom figure is the exterior height.

covering. Two types of paving were observed in canoe houses: *'ili'ili* and aa gravel. *'Ili'ili* paving consists of rounded waterworn basalt gravel which is carried up from rocky beaches. Aa gravels, on the other hand, are found in canoe houses near or on aa flows. This type of lava is particularly sharp and difficult to walk on, so aa paving may have been supplemented by matting or grass coverings. Thirty-three percent of the canoe houses described did not indicate the presence or absence of paving. Where paving was mentioned, 64 percent of the canoe houses did not have pavings. *'Ili'ili* pavings were observed in 25 percent of the sample, aa pavings in two percent, and possible pavings in 10 percent. Packed natural soil or sand was also used as flooring.

Midden (generally marine shell and bone) observed inside canoe houses indicates that activities taking place inside structures probably included food consumption. These canoe houses likely served as men's houses since, according to the *kapu* system, men were supposed to eat in separate structures without women (see Chapter 3: Overview of Canoe Houses). In some cases, midden may be debris from fishing, the results of snacks, or from the structure's reuse when it no longer functioned as a canoe house. Many (39 percent) canoe house descriptions at SHPD did not mention the presence or absence of midden. Of those that did comment on midden, 34 percent recorded midden and 66 percent observed no midden.

Artifacts (generally stone, coral or shell tools and manufacturing debris) are also indicators of activities that occurred in canoe houses. They attest to the long term use and reuse of structures, although since few canoe houses were excavated, a recorded artifact assemblage usually reflects only observed surface artifacts. Artifacts were not mentioned in

54 percent of the canoe houses; of the canoe houses with artifacts, 56 percent are artifacts directly related to fishing and canoe maintenance. These artifacts include three octopus lures, one grindstone, one hammerstone and two assemblages of files and basalt lithics. One *papamu* or gaming board was observed and may indicate a dual use of the canoe house as a men's house. One *kapa* beater was also recorded, a tool commonly used by women to pound the paper mulberry plant into a cloth called *kapa.* Its location inside the feature may indicate that the structure was used by women, that men made *kapa* beaters for women, a secondary reuse of the feature or even that men also made *kapa.*

In addition to traditional Hawaiian artifacts, artifacts of foreign manufacture were recovered from 19 percent of the canoe houses, suggesting pre- to post-contact continuity or later reuse of traditional features. In some canoe houses, such as at Site 334 at Kahikinui (Kirch 1997:57), early 19th century bottle glass and glass beads were found, suggesting the canoe house was probably reused as a domestic structure. Such artifacts may also have been important status items in early historic Hawai'i, and therefore were used and stored in men's houses/canoe houses. Abandonment of canoe houses began after western contact in 1778 when introduced diseases decimated populations (Stannard 1989) and new jobs drew men away from their traditional villages (Sahlins 1992). Modern artifacts, totaling 13 percent of the observed surface artifacts, indicated reuse of house features into the present.

In conclusion, canoe houses played an important role in traditional Hawai'i and their archaeological study has significantly increased the understanding of canoe house manufacture and use. In addition, this study can be provide insights into village subsistence activities (through midden and tool analysis) and ascertain social status of village inhabitants

(identification of canoe houses likely holding *ali'i* double canoes). Canoe houses were not static structures; they changed as the people's needs and wants changed. Standardized canoe house identification in the archaeological record is therefore critical so that regional variation in the canoe house can be examined through time.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

The study of canoe houses is important because they form a significant part of a traditional Hawaiian maritime village housing and have the potential to provide information related to village organization and subsistence related activities. The intent of this thesis was to place the canoe house in its functional and traditional context and then try to determine the size and type of vessels stored within them. Historical data provided information pertaining to the functional and social operation of the canoe house and archaeological research furnished physical attributes such as size, location and associated features.

Canoe houses were rarely mentioned in historical documents, probably because they were regarded as little more than common and widespread storage places to the western explorers and researchers recording their view of Hawai'i. When they are mentioned, it is often because of the activities taking place inside, such as lodging, dining and discussions, which suggest the canoe house was also a men's house; a probable supposition since fishing and canoe construction activities were considered men's activities (Handy et al. 1972:299, 301).

Early accounts usually depicted canoe houses described as 'large, thatched houses' (Anderson 1870:55; Bishop 1916:21; Dixon 1968:126; Ellis 1979[1825]:75; Paris 1926:14), indicating the size difference between canoe houses and other village structures such as habitation, cooking and menstrual huts. Coastal communities were sometimes small, especially in marginal areas that subsisted primarily on fishing and trading with upland villagers, and therefore had few outbuildings. Activities were likely combined inside buildings: men's house, canoe house and resting house.

Canoe houses were constructed to store canoes during periods of inactivity, a fact noted by Captain Puget (1791-1795) in his journal. When the vessels were stored, they were disassembled: the outrigger was removed or the double canoes divided, depending on the type of vessel. In regions prone to high surf, such as the large winter waves on the north and leeward shores of the islands, and the rocky steep shoreline of Kahikinui, Maui, for example, canoes were utilized seasonally or when ocean conditions permitted sailing. In areas where canoes could be used regularly, such as Waikiki, they might have been covered with mats or palm fronds or tipped upside down in the shade of a tree for protection.

Historical records also indicate Hawaiians were willing to land canoes in areas considered dangerous by the western observers. In Kehena, on Hawai'i Island, a landing was constructed up the 40 to 60 ft high cliff to some rocks in the ocean about 30 ft away (Ellis 1979[1825]:198). Lyman (1906:25) describes riding inside a canoe on waves that were breaking "with furious bursts of foam upon the rocky shore. . ." into a sheltered pool and Menzies (1920:178) rode a wave in a canoe to a rock from which 50 or 60 Hawaiians grabbed the craft and hauled it and everything within it up a rugged steep cliff. These landing descriptions, and others like them, are significant because they indicate that canoes were used during times and at places often considered too dangerous or difficult by people unfamiliar with the Hawaiian sailing tradition and suggest that coastal villages were focused around canoe landings. Coastal villages also appeared centered around canoe landings at the five *ahupua'a* examined during a coastal archaeological survey of Kahikinui, Maui. Each *ahupua'a* had a village or cluster of structures along the coast, with at least one canoe house. Fishermen and their families wanted to live near the fishing grounds, and therefore

constructed their villages and canoe houses "around bays and beaches, or isolated localities along the coast where fishing was practicable" (Handy et al. 1972:286).

Archaeological reports were an indispensable component to this thesis because the data supported historical documents, provided a description of canoe houses so they can be located in the archaeological record, revealed regional variation and roughly predicted the size of canoes stored within and the owner's social status. Canoe houses occur in coastal village locations and are different in plan view from other village structures: they are long rectangular structures, whereas other structures are shorter and more square. Canoe houses are located near landings, the difficulty of which determines the maximum size of the vessel which, in turn, is reflected in the size of the canoe house. Landings in protected bays with gently sloping beaches allowed launching of large vessels. The vessels could be slid along leaves or wooden rollers. As the difficulty of the launch increased, the size of the vessel decreased. Areas requiring canoe ladders tended to have smaller canoes since they were transported up steep precipices.

Since canoe houses were constructed to store canoes, it was postulated canoes would fit inside and that their approximate size could be determined by the interior canoe house dimensions. Canoes were generally between 3.7 and 5.5 m long, a size reflected by canoe houses observed in the archaeological record. A 1931 photo (see Plate 11) suggests that many canoe houses had storage areas at the end opposite the door. The area appears to be about 1.0 m long, so it is likely the canoe house was at least 1 m longer than the canoe in order to provide room to store the fishing equipment and associated sailing gear. Therefore,

since canoe houses were constructed for canoes, their length appears to reflect the size of canoes to be stored within the structure. with enough room for gear storage.

Social status is another factor that dictated the size of a canoe and thus its house. People with limited access to lumber and tools were restricted to fewer, and perhaps smaller, vessels. These people were lower on the social scale since they lived in marginal areas with restricted resources. *Ali'i*, on the other hand, had control of the locations and supplies. Emory noted (1924:51) "The finest house sites occupied the best situations and were therefore the abodes of chiefs." Identifying the social status of canoe house owners is difficult, but size and location can provide a starting point for their categorization. Only consist of 7 percent of the sample data are canoe houses in the 5.2 to 10 m wide category and these may be composed of *ali'i* canoe houses since their widths suggest use by double canoes. It can not be ruled out, however, that these canoe houses were used by outrigger canoes. No canoes houses were found by other researchers or during the Kahikinui survey that suggested voyaging canoes, probably because they are not included in the canoe house data base since they were not identified as canoe houses or were previously destroyed.

An indispensable part of this thesis research was the archaeological survey of coastal Kahikinui, Maui, since it allowed the examination of consecutive *ahupua'a,* and more than a dozen villages or clusters of structures. Firsthand observations of the coastal structures provided insights into canoe house locations and their identification. They were usually positioned closest to the water of any structure, with a path to a plausible canoe landing. Their size and shape probably reflect that of the canoes which were stored inside. Observing canoe houses in their traditional setting provided a glance into the ancient life ways of the

Hawaiians and illuminated the skills used by coastal fisherfolk to survive on their isolated islands in the middle of the Pacific Ocean.

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APPENDIX A: CANOE HOUSE DATA

Table A-1. Canoe House Data Used for Statistics and Associated References.

Island	State Site Number	Feature	Inner Length (m)	Outer Length (m)	Inner Width (m)	Outer Width (m)	Reference
Maui	50-50-09-01287	A	10.5	11.5	4.3	5.5	Connolly 1973j.
	50-50-14-01018	B6-3	18.0	16.0	3.0	6.0	Connolly 1973b
	50-50-14-01385	3	10.5	10.5	3.3	5.6	Connolly 1973i
		4	8.9	10.8	3.3	5.5	Connolly 1973i
		6	5.0	7.5	2.2	5.0	Connolly 1973i
		7	9.0	11.4	2.5	4.9	Connolly 1973i
		13A	9.5	11.5	2.5	4.5	Connolly 1973i
		13B	11.3	13.2	2.6	4.7	Connolly 1973i
		13C	13.5	15.8	3.8	5.7	Connolly 1973i
		14D	6.8	9.5	3.6	6.4	Connolly 1973i
		24	5.0	9.8	1.8	4.6	Connolly 1973i
	50-50-14-01481	4	4.0	7.5	9.0	3.0	Eblé and Cleghorn 1995
	50-50-14-01823	40	11.5	13.0	3.5	5.0	Sinoto and Rogers-Jourdane 1979
	50-50-15-00180	–	–	–	–	–	Eblé and Cleghorn 1995
	50-50-15-01165	A	11.0	13.0	4.0	6.0	Connolly 1973a
		B	11.0	13.0	4.0	6.0	Connolly 1973a
	50-50-17-00521	16	7.8	9.1	4.2	5.5	Connolly 1973d
	50-50-16-00528	5	6.8	8.9	3.2	4.8	Connolly 1973f
		8	10.0	11.6	2.5	5.0	Connolly 1973f
	50-50-16-00531	10	10.0	12.0	5.0	7.0	no author-SHPD files
	50-50-14-01002	1	–	9.0	–	5.0	Connolly 1974d
	50-50-17-01113	3	10.0	12.0	5.0	7.0	Connolly 1974b
	50-50-17-01124	–	–	–	–	–	Connolly 1973g
	50-50-16-01148	–	–	–	–	–	Connolly 1974c
	50-50-15-01164	1	7.5	10.5	3.0	6.0	Connolly 1974a
		2	6.5	10.0	3.0	4.5	Connolly 1974a
		3	9.0	11.25	4.5	6.25	Connolly 1974a
		4	5.0	7.0	2.0	4.0	Connolly 1974a
	50-50-14-01238	H	–	10.0	–	5.0	Connolly 1973c
	50-50-14-01280	v	–	–	–	–	Connolly 1973e
	50-50-14-01472	A1	7.5	12.5	3.0	7.0	Connolly 1973e
		A2	7.5	11.0	3.0	7.7	Connolly 1973e
		A3	10.0	12.5	3.0	6.0	Connolly 1973e
		A4	8.5	12.0	2.5	5.5	Connolly 1973e
		A5	7.5	10.0	3.0	5.5	Connolly 1973e
	50-50-14-03136	A	–	9.0	–	4.5	Yent 1993
Hawai'i	50-10-01-02308	–	–	–	–	–	Tomonari-Tuggle 1981
	50-10-01-02311	–	13.33	15.83	2.92	4.58	Tomonari-Tuggle 1981
		–	8.33	9.17	2.08	4.17	Tomonari-Tuggle 1981
	50-10-01-2315	–	9.07	1.0	3.33	6.67	Tomonari-Tuggle 1981
		–	9.47	10.41	2.25	3.96	Tomonari-Tuggle 1981
		–	6.86	8.22	3.08	5.86	Tomonari-Tuggle 1981
	50-10-01-02317	–	12.68	4.08	3.29	5.16	Tomonari-Tuggle 1981
	50-10-04-02358	F7-28	21.4	16.5	6.4	11.8	Pearson 1969
		F8-31	12.8	–	3.7	–	Pearson 1969
	50-10-04-02367	–	15.23	19.49	2.61	11.88	Hammatt and Folk 1980
	50-10-04-02376	–	13.71	16.15	7.61	10.05	Hammatt and Folk 1980
	50-10-04-02377	–	13.71	16.76	7.61	10.66	Hammatt and Folk 1980

Table A-1. Canoe House Data Used for Statistics and Associated References (cont.).

Island	State Site Number	Feature	Inner Length (m)	Outer Length (m)	Inner Width (m)	Outer Width (m)	Reference
Hawai'i	50-10-04-02378	–	12.18	14.62	5.18	7.62	Hammatt and Folk 1980
	50-10-04-02381	–	10.66	10.66	10.0	–	Hammatt and Folk 1980
	50-10-04-04099	–	8.7	10.5	3.2	5.6	Barrera 1995
	50-10-04-04151	A	8.7	10.5	3.2	5.6	Barrera 1995
	50-10-05-04009	38	7	8.53	3	4.57	Bonk 1968
		43	–	8.84	–	2.13	Bonk 1968
	50-10-05-04156	15	–	15.09	–	6.61	Bonk 1968
	50-10-10-17111	8	5.8	6.2	1.4	2.0	Landrum and Williams 1994
	50-10-04-02394	6	–	–	–	–	Bonk 1968
	50-10-14-02452	6	11.5	15.24	3.0	7.62	Bonk 1968
	50-10-14-02452	9	–	–	–	–	Bonk 1968
	50-10-14-02452	10	–	–	–	–	Bonk 1968
	50-10-14-04041	–	12.07	14.15	3.66	5.85	Tuggle and Griffin 1973
	50-10-14-04121	E1	10.0	–	3.0	–	Tuggle and Griffin 1973
	50-10-14-04121	E2	10.67	11.89	3.66	4.88	Tuggle and Griffin 1973
	50-10-14-04121	E3	15.24	19.07	4.57	6.4	Tuggle and Griffin 1973
	50-10-14-04050	–	–	–	–	–	Tuggle and Griffin 1973
	50-10-14-04121	–	–	–	–	–	Tuggle and Griffin 1973
	50-10-14-04056	–	–	–	–	–	Tuggle and Griffin 1973
	50-10-14-04040	–	–	–	–	–	Tuggle and Griffin 1973
	50-10-19-19194	–	–	–	–	–	Head et al. 1995
	50-10-19-19202	–	–	–	–	–	Head et al. 1995
	50-10-27-01907	C	–	14.5	–	5.0	Rosendahl 1985, Donham 1986
	50-10-45-19012	–	7.0	9.0	–	–	Ewart and Luscomb 1974
	50-10-46-04278	–	–	–	–	–	Carse 1984, Cordy 1989
		–	10.0	–	–	–	Carse 1984, Cordy 1989
		–	12.2	–	2.75	–	Carse 1984, Cordy 1989
		–	–	–	2.75	–	Carse 1984, Cordy 1989
		–	11.0	–	–	–	Carse 1984, Cordy 1989
	50-10-46-19022	–	–		2.75	–	Hudson 1932
Molokai	50-60-01-00050	–	–	–	–	–	Weisler 1984
	50-60-01-00052	–	–	–	–	–	Weisler 1984
	50-60-01-00063	63	11.27	13.1	3.05	4.87	Summers 1971
	50-60-02-00017	18	6.09	6.09	1.07	3.0	Phelps 1941, Summers 1971
		19	6.1	6.1	1.08	3.0	Phelps 1941, Summers 1971
Lāna'i	50-40-98-00085	B/C	9.0	9.5	2.0	4.0	Kaschko and Athens 1987
		B	9.0	11.25	5.0	7.5	Kaschko and Athens 1987
	50-40-98-00100	–	–	–	4.57	–	Emory 1924

APPENDIX B: KAHIKINUI SURVEY DATA AND MAPS

Table B-1. Canoe House Data Gathered from a Coastal Survey at Kahikinui, Maui.

Ahupua'a	State Site Number	Feature Number	Inner Length (m)	Outer Length (m)	Inner Width (m)	Outer Width (m)	Inner Height (m)	Outer Height (m)
Alena	50-50-15-1164	4	8.5	10.3	4.5	5.0	1.20	1.20
	50-50-15-1164	5	8.2	10.0	3.2	4.6	0.91	1.05
	50-50-15-1164	6	9.3	11.7	2.8	4.9	0.94	1.41
	50-50-15-1164	7	19.0	20.0	3.0	5.4	0.36	0.88
	50-50-15-1164	8	5.4	7.1	2.3	3.9	0.90	0.90
	50-50-15-4487	9	9.8	10.5	3.5	5.2	0.89	1.05
Lualailua	50-50-15-1165	2	11.0	13.3	5.0	7.5	1.21	1.55
	50-50-15-1165	3	8.7	10.4	3.5	5.0	0.91	1.51
Nakaihu	Kirch's Site 334	10	10.4	12.4	4.0	6.2	1.15	1.05
Nakaaha	50-50-15-4488	12	8.3	8.8	2.5	3.6	0.96	0.40
Mahamenui	50-50-15-4489	13	8.4	9.6	2.4	4.6	1.00	1.17
	50-50-15-4489	14	10.6	1.6	3.3	5.4	1.00	0.75
	50-50-15-4490	15	13.3	15.0	2.5	4.9	1.30	0.95
	50-50-15-4491	16	13.7	14.8	3.2	5.1	1.10	0.80
Manawainui	50-50-15-4492	17	7.3	8.0	3.0	4.4	0.80	1.00

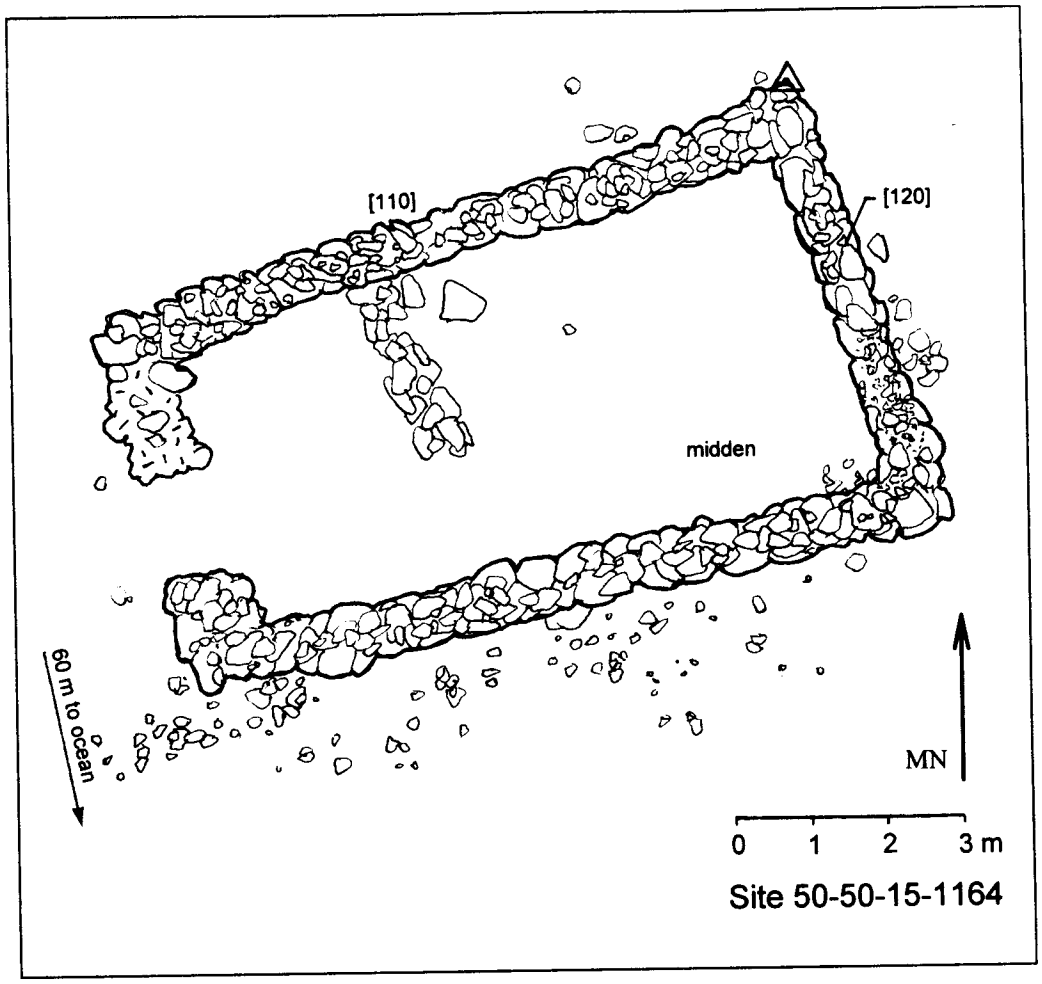

Figure B-1. Site 50-50-15-1164, canoe house Feature 4.

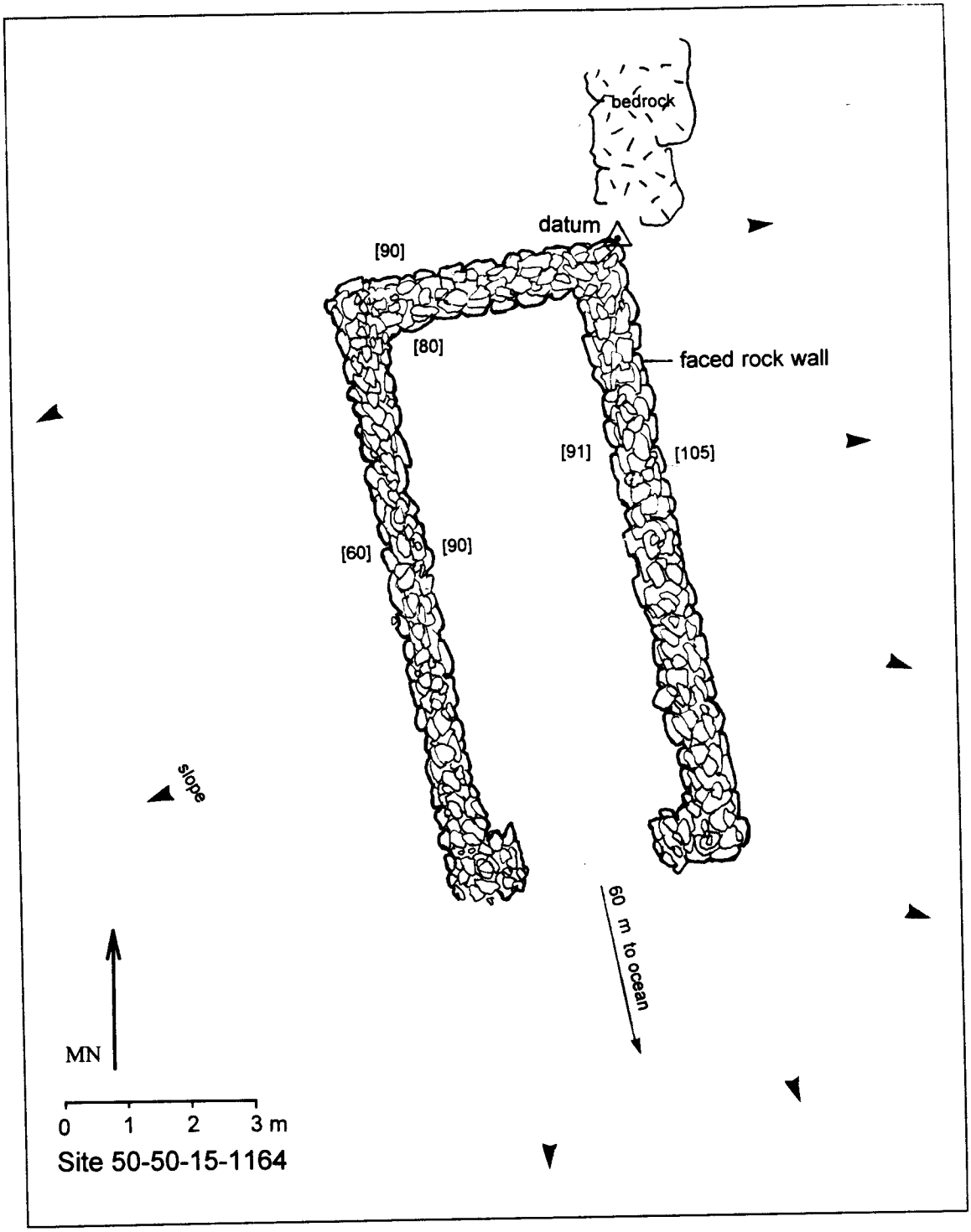

Figure B-2. Site 50-50-15-1164, canoe house Feature 5.

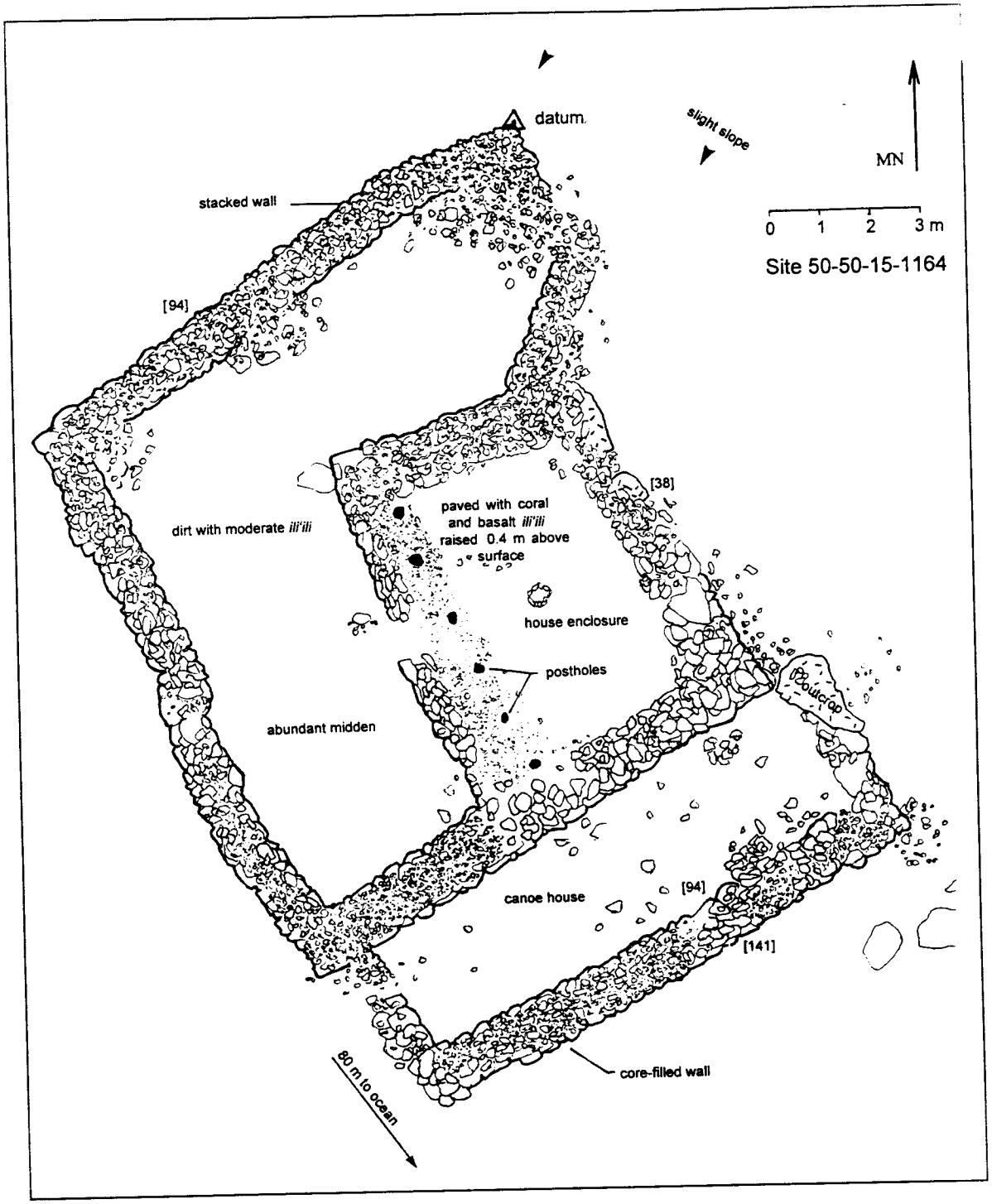

Figure B-3. Site 50-50-15-1164, canoe house Feature 6. It is attached to an habitation compound with house platform and enclosed section, probably a garden area.

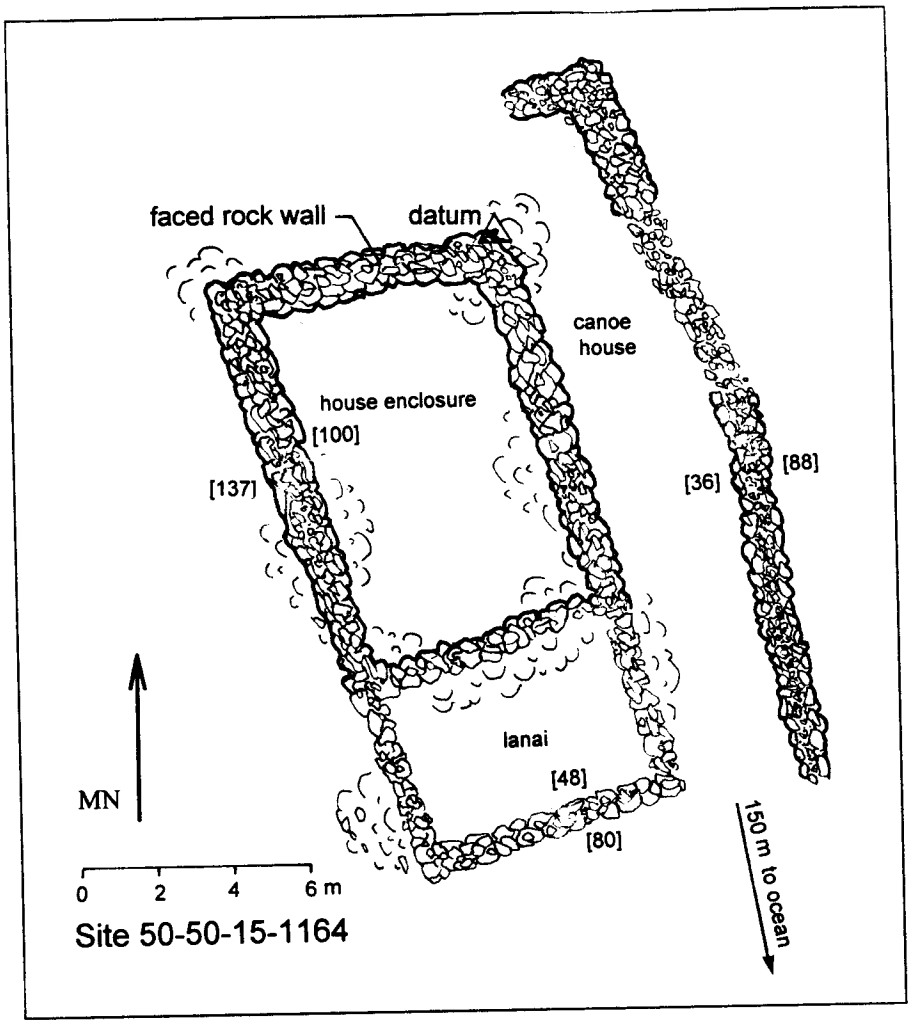

Figure B-4. Site 50-50-15-1164, canoe house Feature 7.

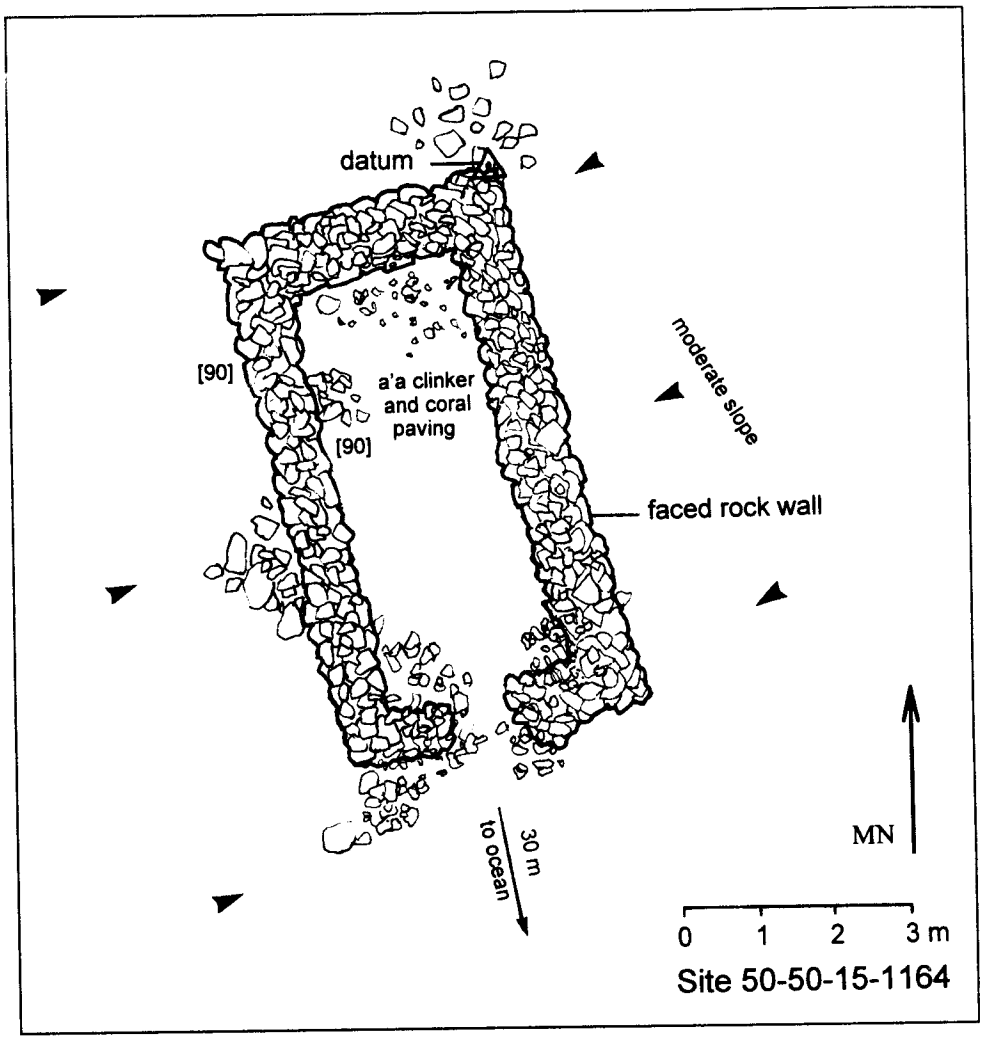

Figure B-5. Site 50-50-15-1164, canoe house Feature 8.

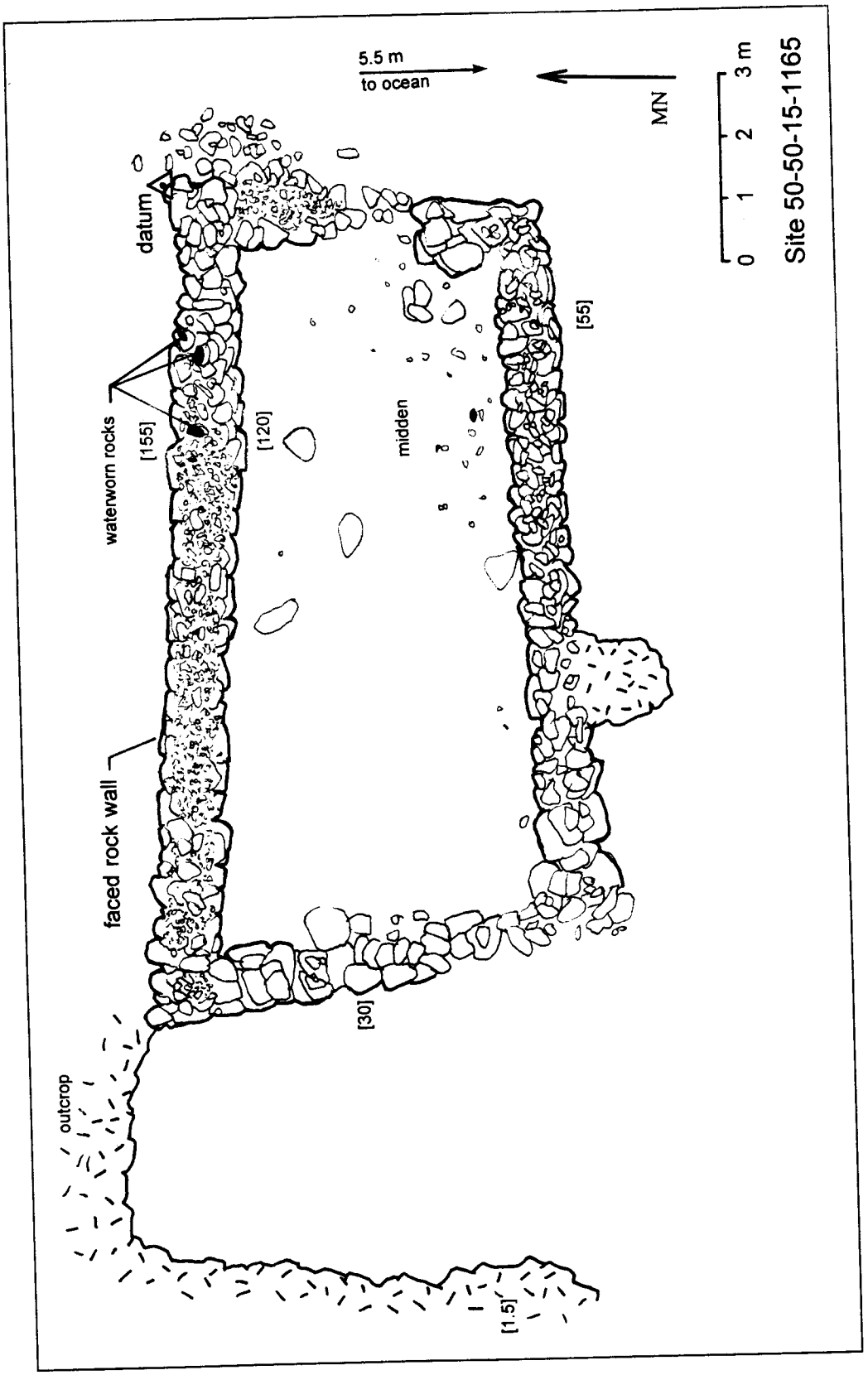

Figure B-6. Site 50-50-15-1165, canoe house Feature 2.

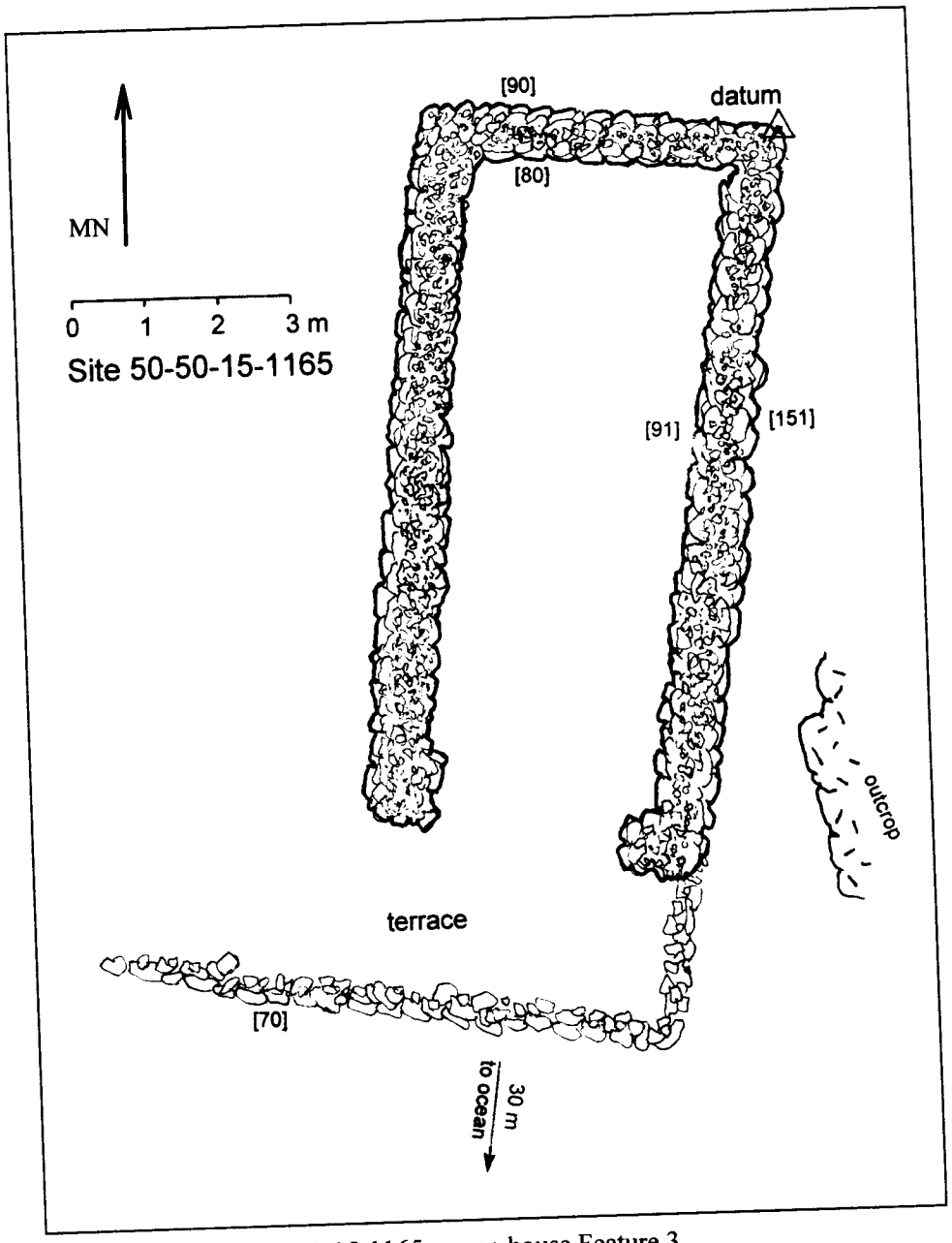

Figure B-7. Site 50-50-15-1165, canoe house Feature 3.

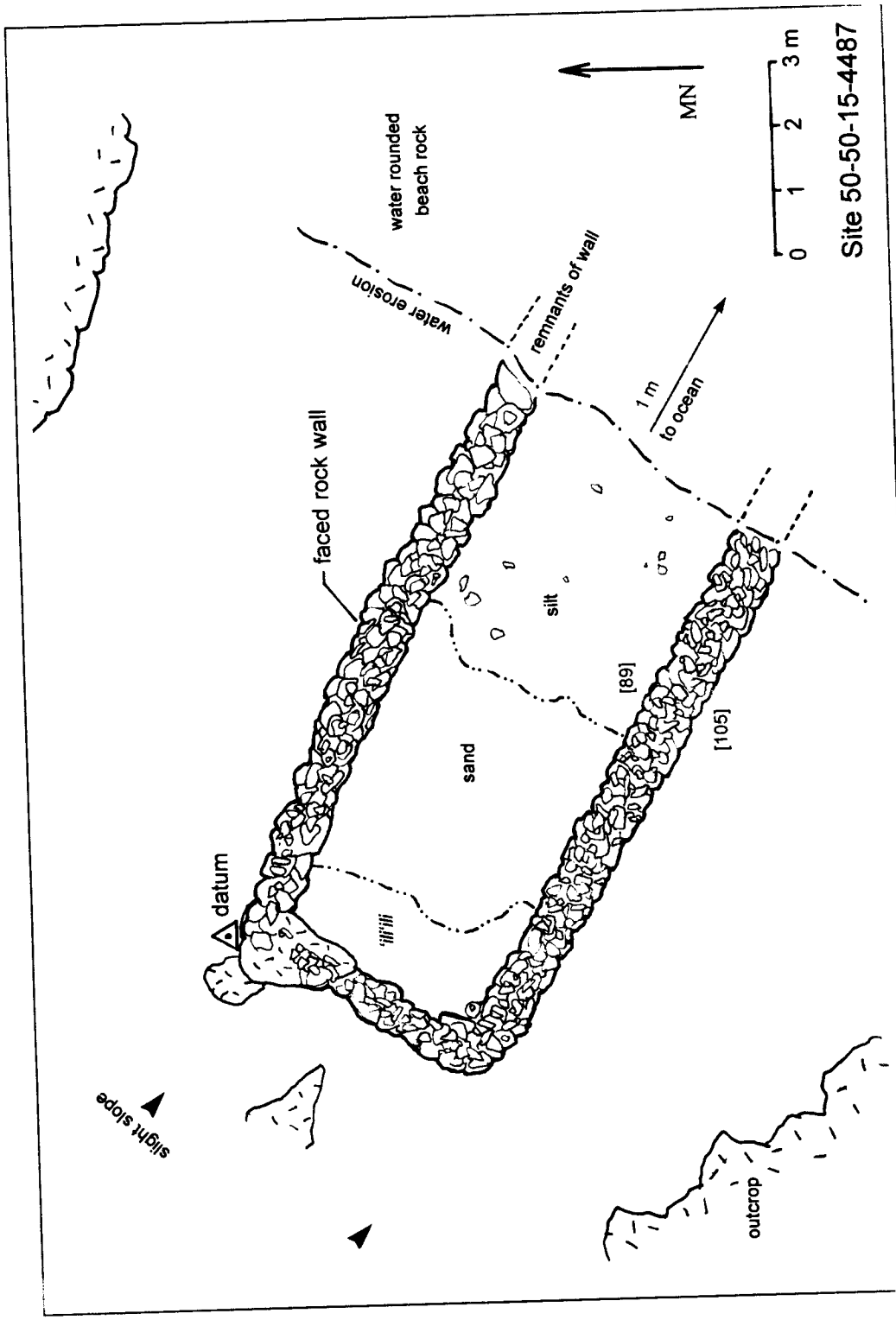

Figure B-8. Site 50-50-15-4487, canoe house Feature 9.

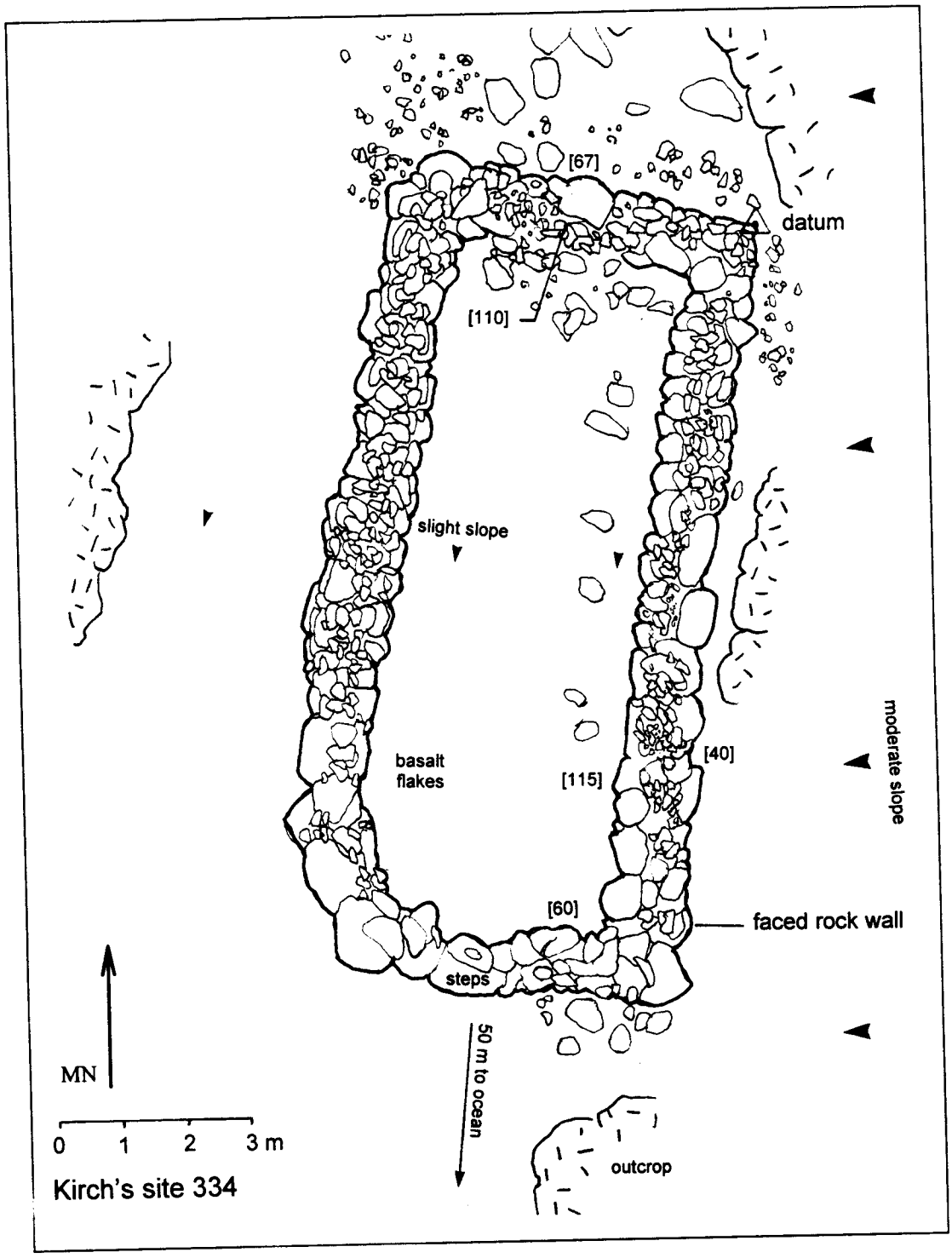

Figure B-9. Canoe House from Kirch's Site 334.

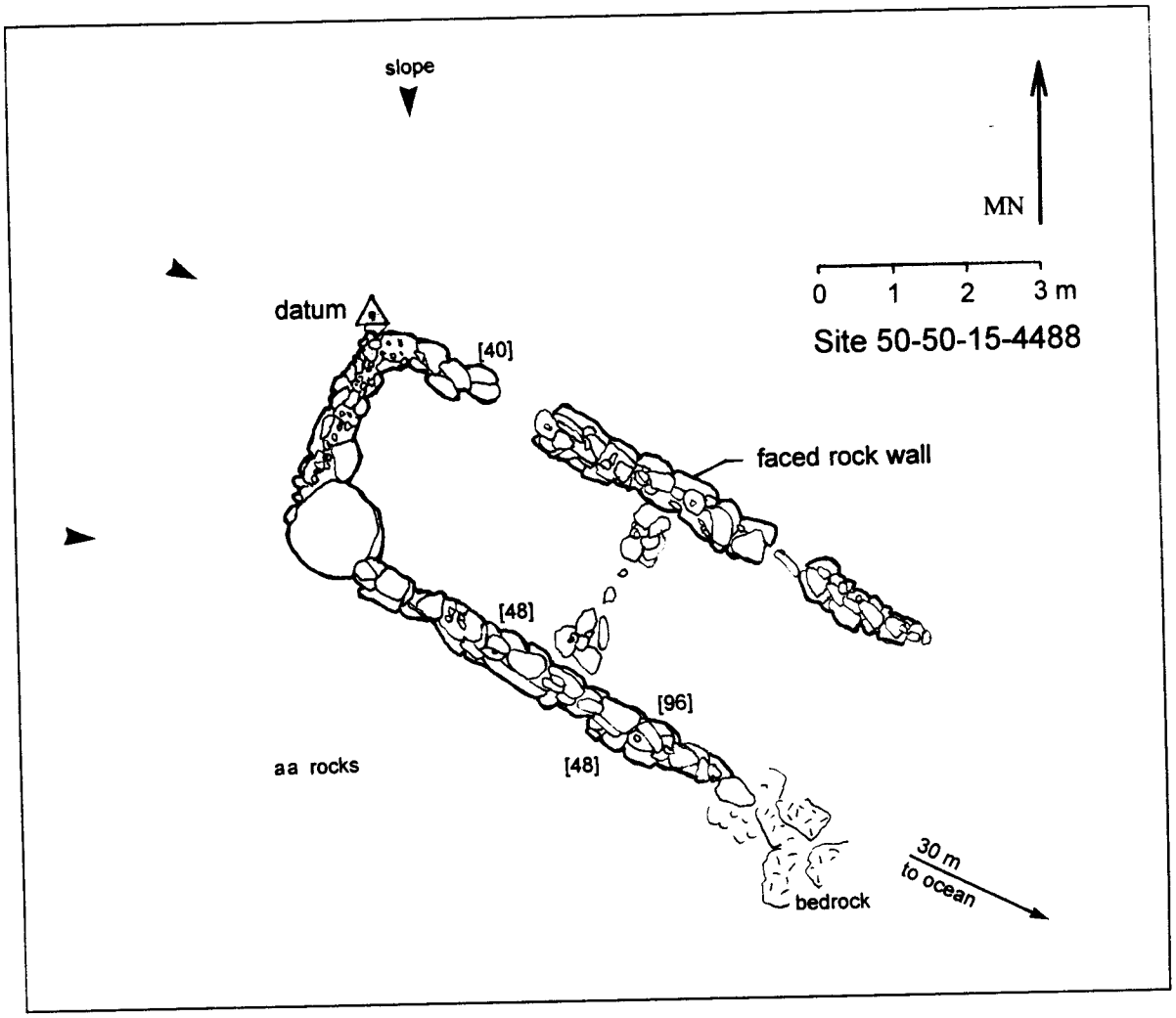

Figure B-10. Site 50-50-15-4488, canoe house Feature 12.

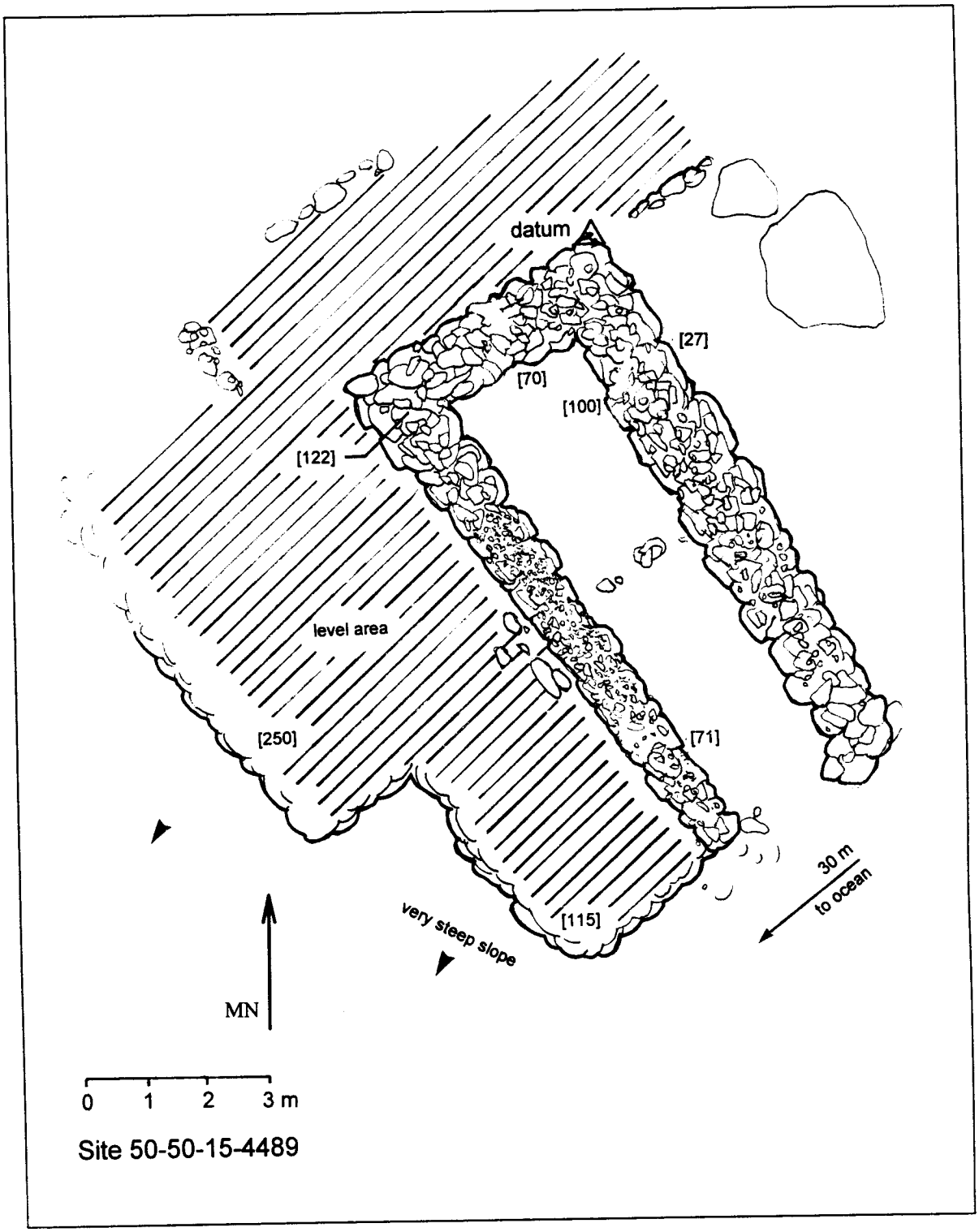

Figure B-11. Site 50-50-15-4489, canoe house Feature 13.

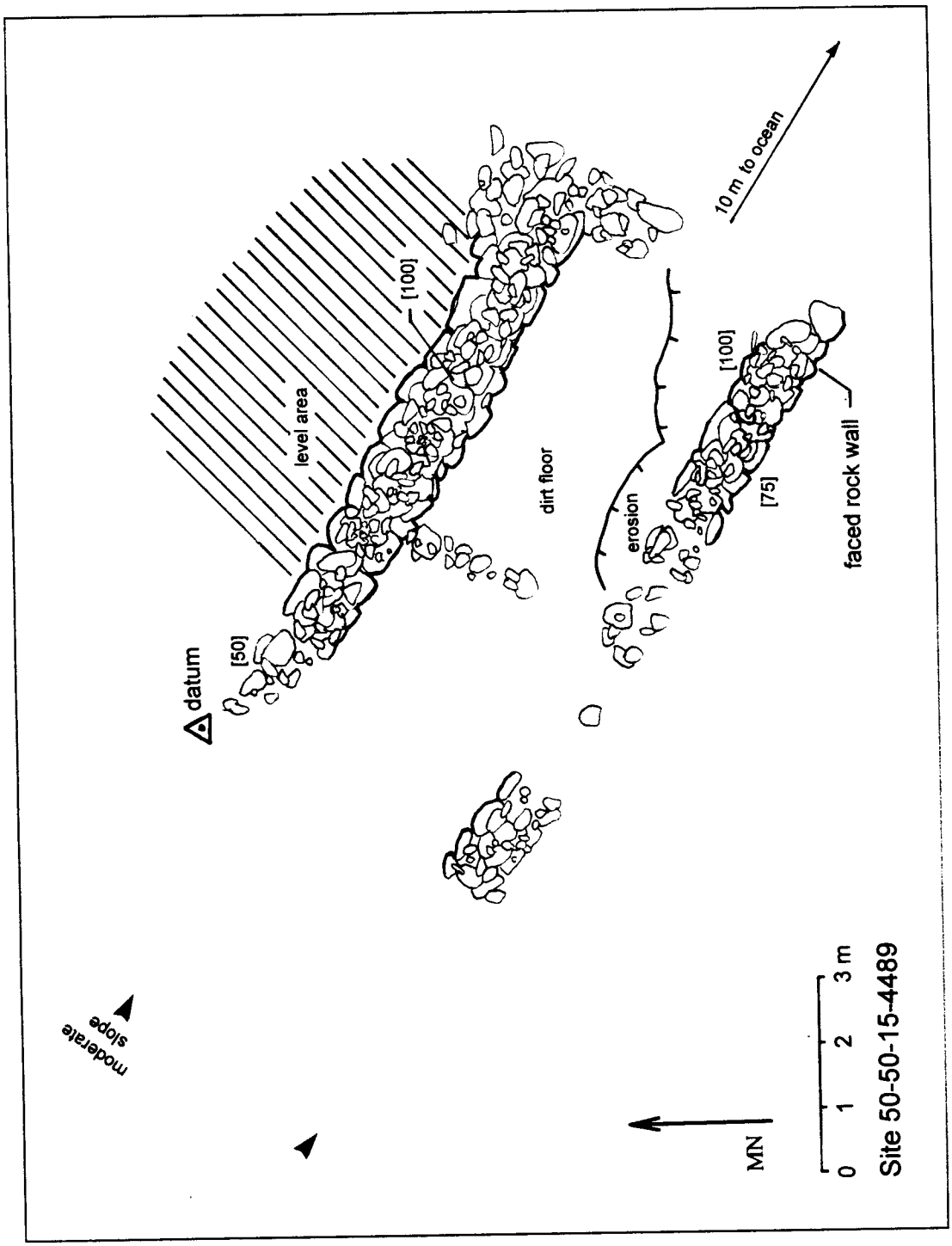

Figure B-12. Site 50-50-15-4489, canoe house Feature 14.

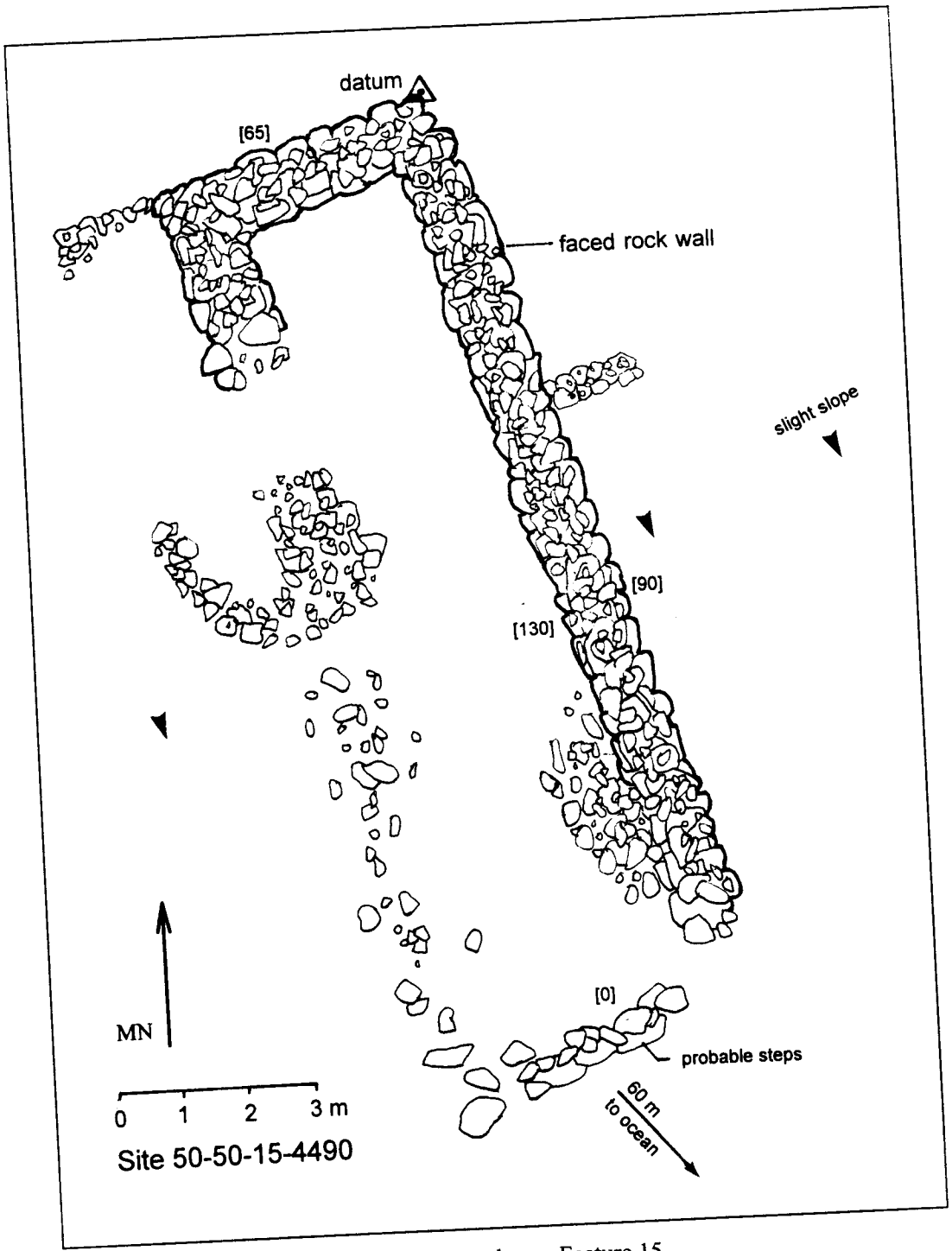

Figure B-13. Site 50-50-15-4490, canoe house Feature 15.

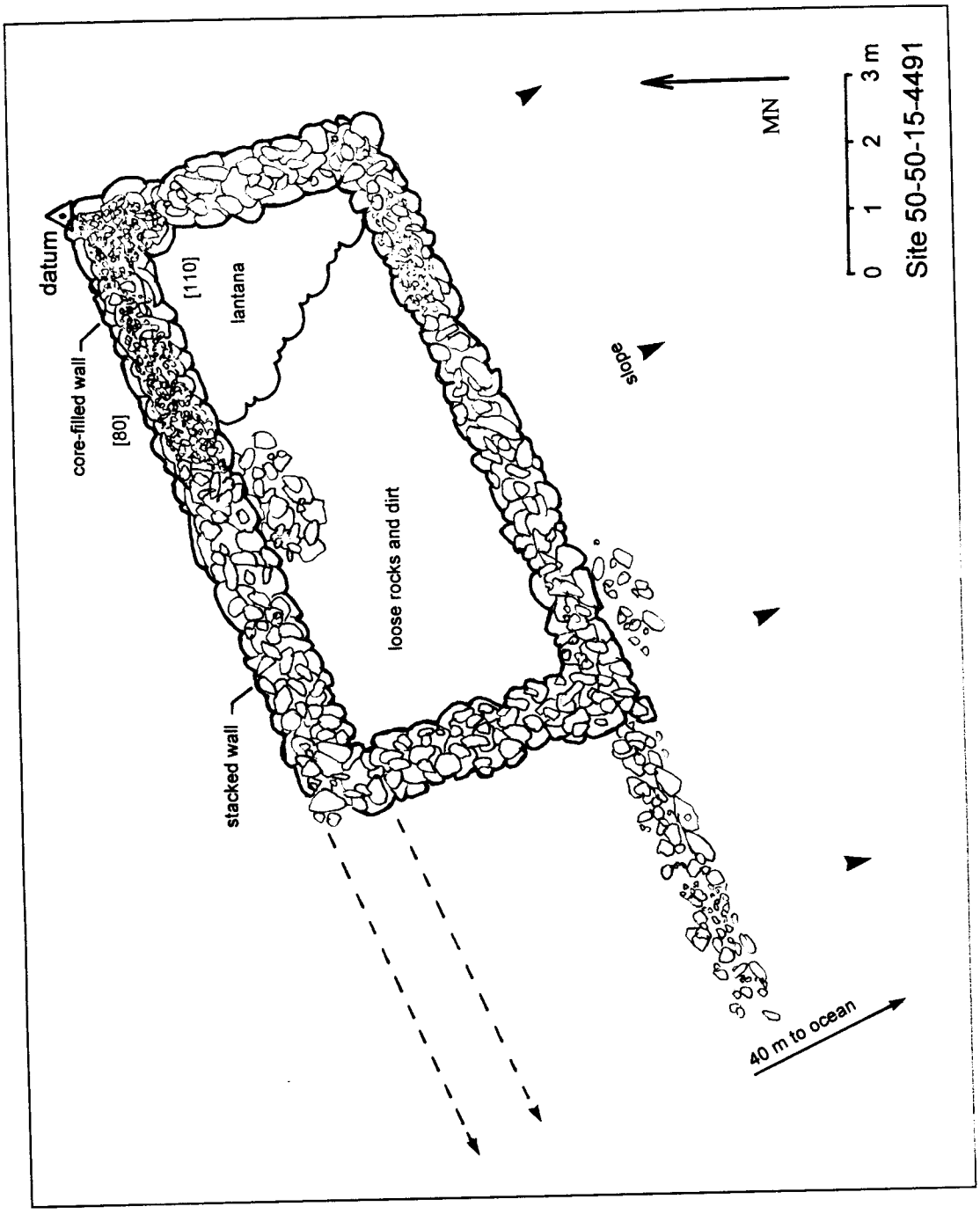

Figure B-14. Site 50-50-15-4491, canoe house Feature 16.

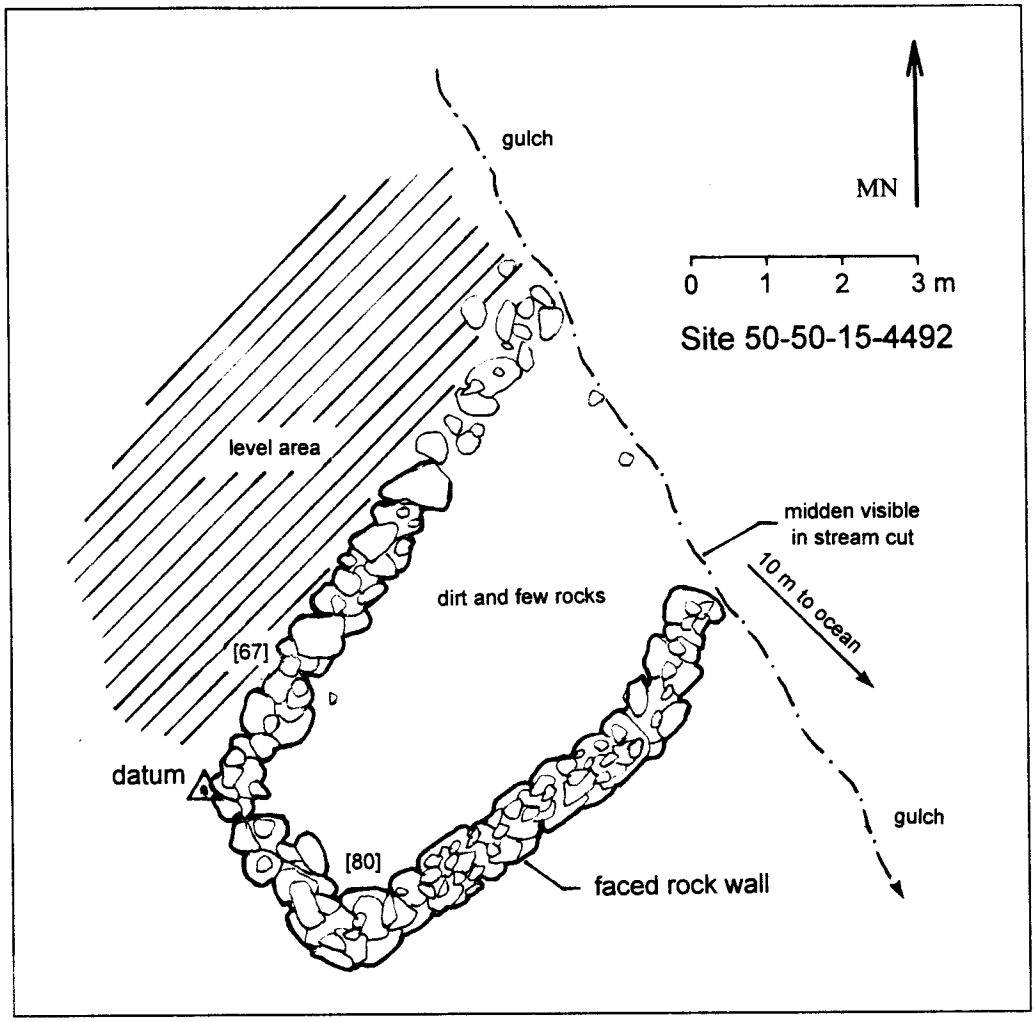

Figure B-15. Site 50-50-15-4491, canoe house Feature 17.