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The Settlement and Abandonment of Two Hawaiian Outposts: Nihoa and Necker Islands

Paul L. Cleghorn[1]

ABSTRACT

Nihoa and Necker islands are small, isolated mountain peaks at the northwestern end of the main Hawaiian Islands. The environmental conditions at these two islands today are harsh (i.e., scarce rainfall, steep terrain, and rocky soil), making them seem inhospitable for human settlement. However, both islands contain numerous archaeological sites (Nihoa = 88; Necker = 52) indicating that both islands were extensively used in the past. This paper draws on data recovered from the Tanager Expedition in 1923–24, as well as new archaeological data obtained in 1984 by Bishop Museum archaeologists. The settlement patterns of the two islands are quite different: Nihoa is characterized by massive habitation sites and extensive agricultural terraces; Necker, on the other hand, has numerous religious shrines and almost no other types of sites. It is postulated that Nihoa supported a semipermanent population, while visits to Necker were probably always temporary. Utilization of Necker probably revolved around exploiting bird resources. Strong religious activities were probably associated with the use of Necker and it is postulated that some sort of "bird-cult" may have been involved, and that abandonment of the islands probably occurred as a consequence of overexploitation of the bird resources.

INTRODUCTION

Nihoa and Necker are small, isolated island remnants at the northwestern end of the main Hawaiian Islands (Fig. 1). Nihoa is located approximately 240 km NW of the island of Kaua'i, the westernmost main island in the chain, and Necker is located another 240 km NW of Nihoa (Fig. 1). Nihoa is a remnant volcanic mountain peak, with a land area of ca. 63.1 ha. Necker is an even more rugged volcanic ridge, with a land area of ca. 16.6 ha. Today these islands appear be inhospitable and unsuitable for human occupation, and in fact neither island was inhabited at the time of European discovery in the late 18th century. However, both of these islands contain numerous archaeological sites that indicate that they once supported sizeable human populations.

Nihoa and Necker were first archaeologically studied by Kenneth Emory and members of the Tanager Expedition, who in 1923 and 1924 recorded archaeological sites on the islands, collected surface artifacts, and conducted excavations (Emory 1924). In 1984, the islands were again investigated by Bishop Museum archaeologists (Cleghorn 1984). At this time previously recorded sites were evaluated for their condition and future research potential, additional sites were listed, and the boundaries of the agricultural complexes on Nihoa were expanded to include features not included by the Tanager Expedition (Emory 1924). The 1984 research resulted in records for 22 additional sites on Nihoa, an increase of 33%, and 3 additional sites on Necker, an increase of 6%. Perhaps more importantly,

1. Department of Anthropology, Bernice P. Bishop Museum, P.O. Box 19000-A, Honolulu, Hawai'i 96817, USA.

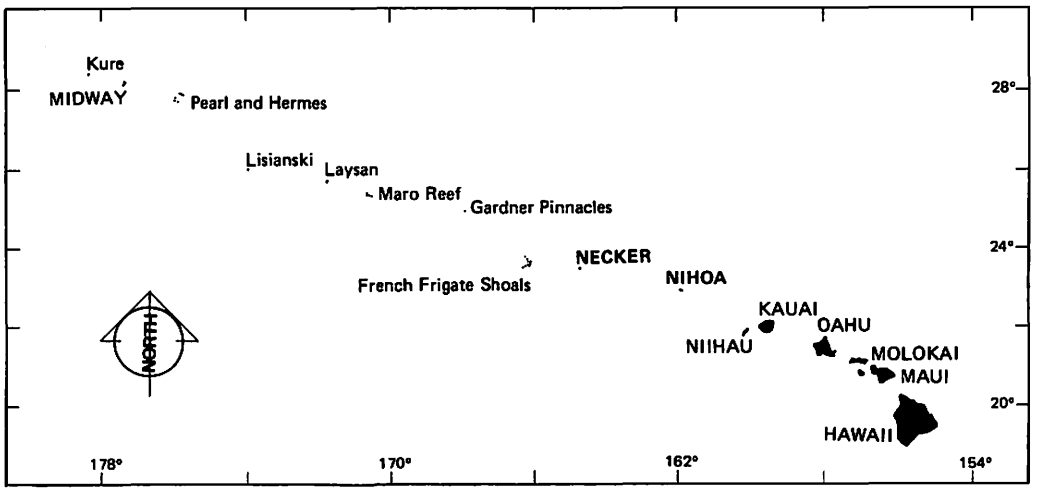

Fig. 1. Map of the Hawaiian Islands, showing the location of Nihoa and Necker islands.

the 1984 research provided an opportunity to reevaluate the archaeological resources of these two isolated islands and their prehistoric cultural relationship to the main Hawaiian Islands.

This paper briefly describes the environmental constraints faced by the prehistoric populations, as well as the archaeological remains on the two islands. This is followed by a reconstruction of the prehistoric activities pursued on each island. Finally, I offer explanations regarding the nature of the settlement on these two remote outposts of prehistoric Hawaiian culture.

NIHOA ISLAND

Environmental Setting

Nihoa is a remnant volcanic peak measuring 1.4 km long and averaging 450 m wide, with its highest point at 273 m above sea level. The 63 ha of land area is bounded on three sides by vertical cliffs ranging from 31 to 244 m high. These cliffs were formed by wave cutting and erosion.

The island slopes steeply from north to south, with an average inclination of 23°, suggesting that the present island is the SW quadrant of the original landmass (Fig. 2). The terrain is deeply dissected by six dry drainages that create drastically steep valleys with slopes approaching 80° in many areas. These valleys are virtually devoid of sediment, which indicates that they were formed by streams of considerable power (Palmer 1927: 14). Given that many archaeological sites are found at the bottoms of these valleys (Fig. 3), it seems clear that the valleys were formed prior to the settlement of the island. Much of the rock on the island is extensively weathered; this and the steep terrain make foot travel across the island arduous and sometimes hazardous.

The soil is a very rocky loam with a high organic content. The organic material is derived from leaf litter deposited by woody shrubs that grow densely on the island. The soil is also extremely acidic (Yen 1969), which is probably the result of massive deposition of bird excrement on the island.

While no accurate rainfall figures have been kept for Nihoa, it seems likely, from the vegetation patterns, that the island receives between 500 and 750 mm of rain per year (Palmer 1927: 10); most of this is in the form of rain squalls that pass unpredictably across

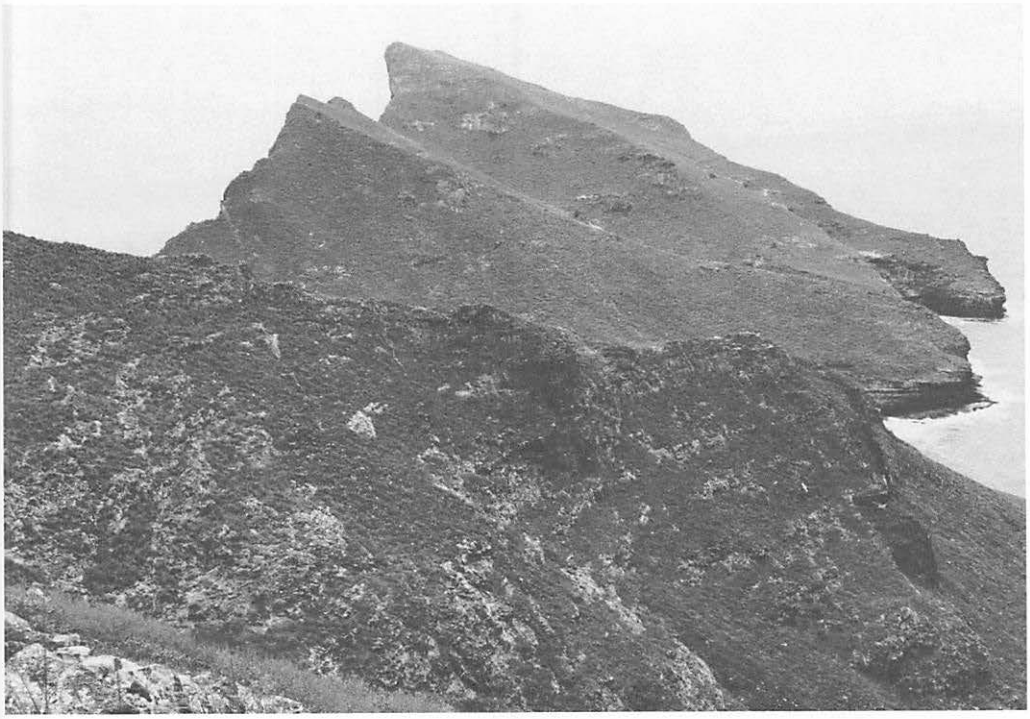

Fig. 2. General view of Nihoa Island looking towards Tanager Peak, facing east (Bishop Mus. Neg. No. Nh(a)7-25; photo by Eric Komori).

the island. Three fresh water seeps on the island produce several gallons of water per day each. These seeps could have provided a limited source of drinking water for the inhabitants of the island. However, this water has a high nitrogen and phosphorus content that is derived from guano leaching (Palmer 1927: 15).

The vegetation on the island reflects the harsh environmental conditions present there. The dominant plants are woody shrubs and various grasses that densely cover most of the island's land surface (see Clapp et al. [1977] for a detailed description of the vegetation on Nihoa). One species of tree exists on the island, an endemic *Pritchardia* palm. Both the shrubs and the palm could have provided fire fuel for the inhabitants, and the palm fronds could have provided thatch for dwellings.

Nihoa has, and undoubtedly had in the past, abundant natural food resources. Primary among these are the sea bird populations on the island. Seventeen species of sea birds consisting of ca. 500,000 individuals presently use Nihoa as a nesting spot (Anonymous 1984: 3.16). In addition to the sea birds, the island has resident seal and turtle populations, the shores have abundant shell fish populations, and the surrounding sea teems with fish.

Archaeological Remains

A total of 88 archaeological sites has been recorded on Nihoa (66 by the Tanager Expedition [Emory 1924] and 22 in 1984 [Cleghorn 1984]). The distribution of all of the archaeological sites reinvestigated and recorded in 1984 is shown in Fig. 3. In Table 1 I postulate functions for the enumerated sites. The postulated functions for individual sites are based on (1) morphological similarities with archaeological sites of known functions on the main Hawaiian Islands; and (2) artifacts and other cultural material associated with specific sites.

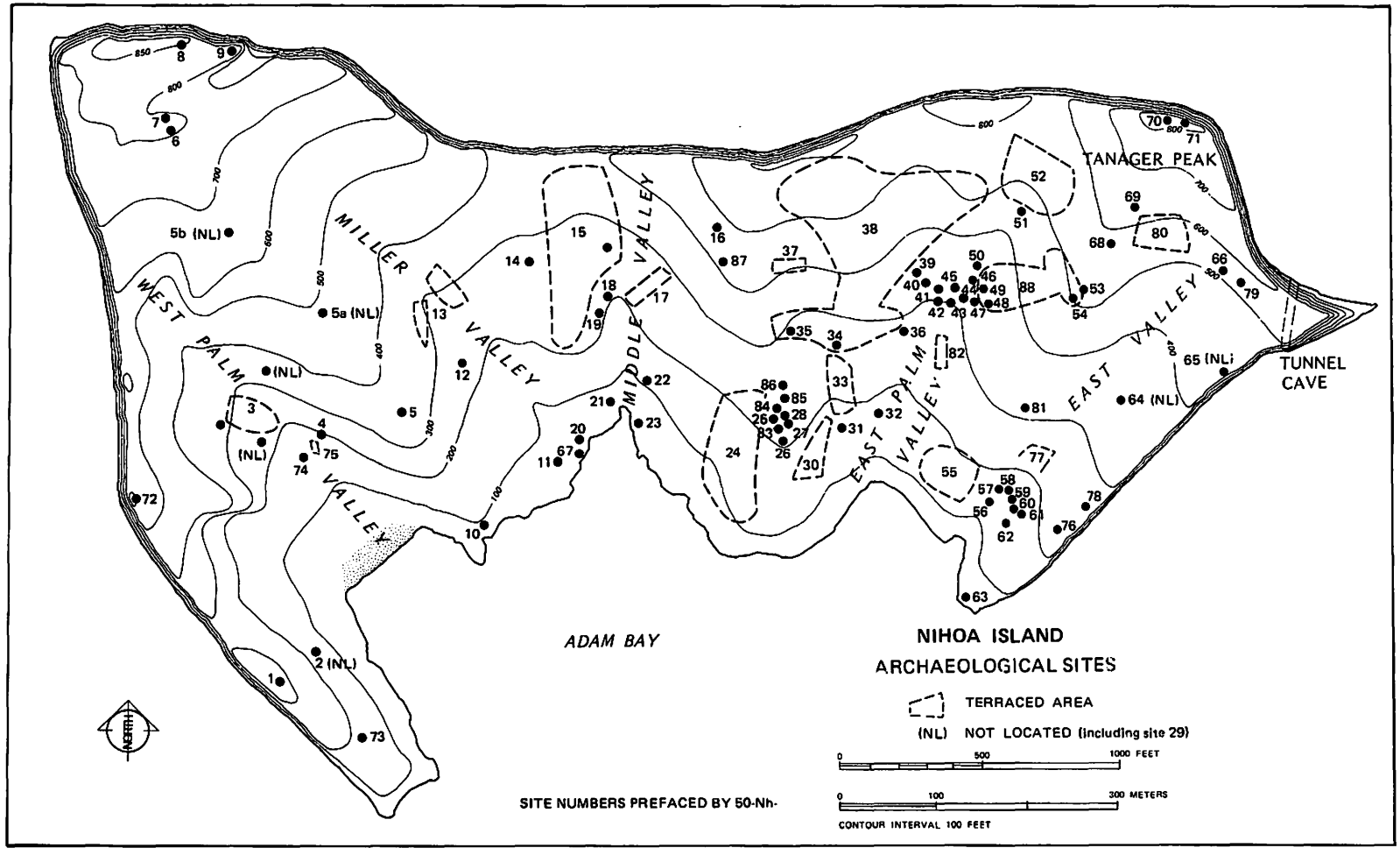

Fig. 3. Map of Nihoa Island, showing the location of archaeological sites.

Table 1. Nihoa Island: Archaeological sites and postulated functions.

Site no.	Postulated function	Site no.	Postulated function
50-Nh-1	shrine	50-Nh-45	habitation
-2	burial cave	-46	agriculture
-3	agriculture	-47	habitation
-4	habitation	-48	habitation
-5	shelter	-49	unknown
-6	shrine	-50	shrine
-7	water catchment	-51	shrine
-8	shrine	-52	agriculture
-9	shrine	-53	unknown
-10	shrine	-54	unknown
-11	shrine	-55	agriculture
-12	habitation	-56	habitation
-13	agriculture	-57	habitation
-14	agriculture	-58	habitation
-15	agriculture	-59	habitation
-16	agriculture	-60	habitation
-17	agriculture	-61	habitation
-18	habitation	-62	unknown
-19	habitation	-63	shrine
-20	shrine	-64	unknown
-21	shrine	-65	burial cave
-22	shrine	-66	habitation
-23	habitation	-67	habitation
-24	agriculture	-68	agriculture
-25	habitation	-69	habitation
-26	habitation	-70	unknown
-27	habitation	-71	habitation (?)
-28	habitation	-72	unknown
-29	unknown	-73	unknown
-30	agriculture	-74	agriculture
-31	agriculture	-75	agriculture
-32	habitation	-76	unknown
-33	agriculture	-77	agriculture
-34	habitation	-78	unknown
-35	agriculture	-79	habitation
-36	agriculture	-80	agriculture
-37	agriculture	-81	unknown
-38	agriculture	-82	agriculture
-39	agriculture	-83	agriculture
-40	habitation	-84	shelter
-41	habitation	-85	shelter (?)
-42	habitation	-86	unknown
-43	habitation	-87	habitation
-44	habitation	-88	agriculture

Archaeological sites on Nihoa are concentrated along the eastern half of the island, with the majority located in the single major drainage of East Palm Valley. The sites on Nihoa include (1) habitation sites, such as massive platforms (Fig. 4), rockshelters (Fig. 5), terraces, and enclosures; (2) religious sites, which are small terraces with single linear arrangements of upright dike stones (many of which have fallen) and numerous pieces of branch coral laying on the surface (Fig. 6); (3) agricultural sites, which consist of extensive complexes of earthen terraces covering over 10% of the island's land surface (Fig. 7); and (4) two burial sites that contained the remains of adult males and females, as well as children.

Fig. 4. Massive habitation platform (Site 50-Nh-43) in East Palm Valley, Nihoa, facing east (Bishop Mus. Neg. No. Nh(a)6-14; photo by Eric Komori).

All of the archaeological sites on Nihoa resemble those found on the main Hawaiian Islands: construction is by the same dry-walled masonry techniques using multiple stacking of stones combined with core filled walls; and architectural forms are equivalent—enclosures, platforms, terraces, walls, etc. The shrines on Nihoa have counterparts on the island of Lana'i (Emory 1924: Plate Vb) and at the Mauna Kea Adze Quarry on the island of Hawai'i (McCoy 1977, 1981).

The archaeological sites on Nihoa have produced a rich artifact assemblage. The artifacts recovered include hammerstones, grindstones, stone adzes, shell and bone fishing gear, and stone jars and bowls. All artifacts have counterparts on the main islands and their presence indicates that a wide range of activities was being carried out on Nihoa.

As only one charcoal sample produced two radiocarbon dates from Nihoa, a good chronology for the settlement of this island is lacking (Cleghorn 1984: 10). The two dates (520 ± 200 B.P. and 1060 ± 90 B.P. [uncorrected]) just barely overlap at two standard deviations between ca. A.D. 1036 and 1070. However, these dates are helpful in delineating the occupation of the island when coupled with the knowledge that the island was abandoned at the time of European discovery in A.D. 1789 (Emory 1928: 8). Provisionally then, Nihoa may have had a 700 year prehistoric occupation between A.D. 1000 and 1700.

Postulated Activities

The types of sites present on Nihoa combined with the artifact assemblages that have been recovered allow me to postulate the activities that were carried out on this remote island.

The number, complexity, and sheer mass of the habitation sites, combined with the presence of remains of both adults and children, suggest that the population on Nihoa was

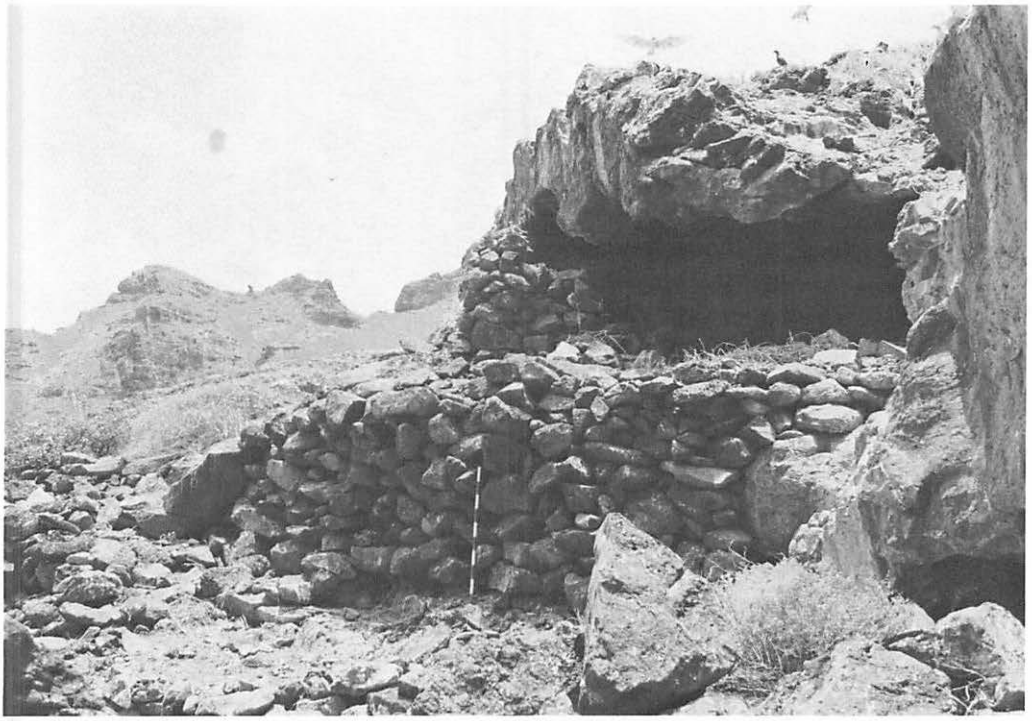

Fig. 5. Rockshelter (Site 50-Nh-57) in East Valley, Nihoa, facing west (Bishop Mus. Neg. No. Nh(a)8-25; photo by Eric Komori).

Fig. 6. Nihoa shrine (Site 50-Nh-1), facing north (Bishop Mus. Neg. No. Nh(a)7-36; photo by Eric Komori).

Fig. 7. Agricultural terraces on Nihoa (Site 50-Nh-55), facing north (Bishop Mus. Neg. No. Nh(a)9-18).

at least semipermanent. Based on the number and size of the habitation structures on the island, Kenneth Emory (1928: 12) made the reasonable estimate that ca. 100 people could have lived on Nihoa at any given time.

Supporting the semipermanent occupation hypothesis is the presence of extensive agricultural terraces on the island, which are even more extensive than Emory first thought (Cleghorn 1984). Given the dryness of the island, sweet potato, because of its hardy nature, was probably the dominant crop grown in the 6.5 ha of agricultural terraces. Using the same experimental yield data for sweet potatoes as Emory (1928: 12), it appears that 64

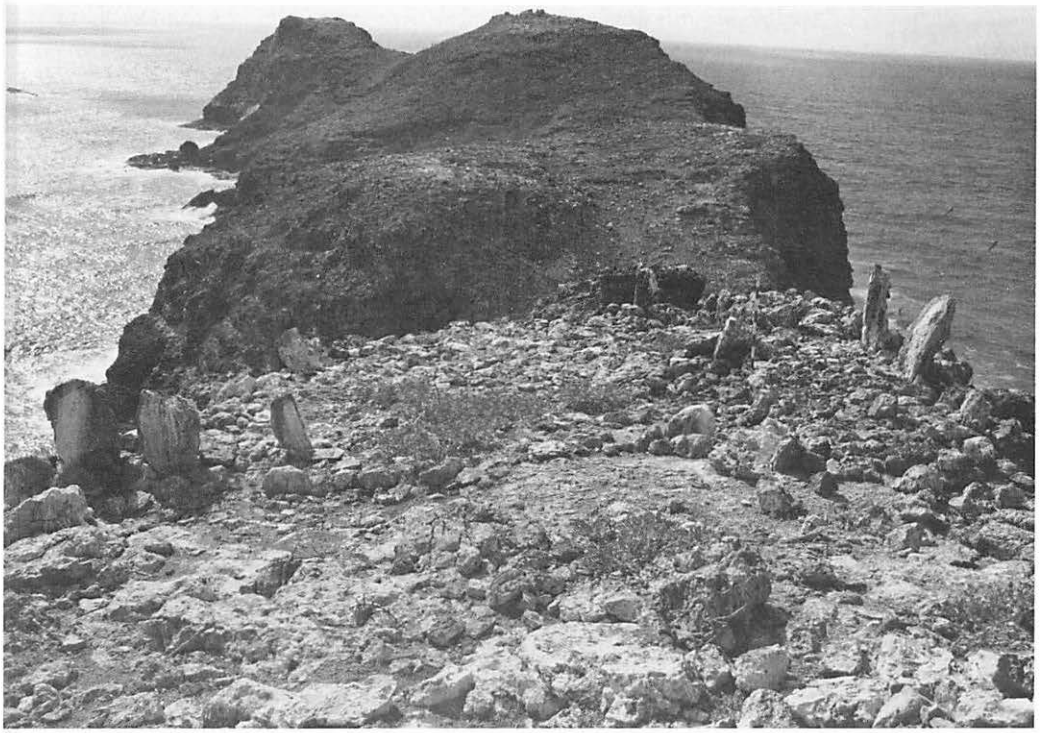

Fig. 8. General view of Necker Island, facing east; Site 50-Nk-2 in foreground (Bishop Mus. Neg. No. Nk(a)3-34a; photo by Eric Komori).

tons of sweet potatoes could have been produced annually. With a population of 100 individuals, about 1.8 kg of sweet potatoes would have been available daily per person. This quantity of sweet potatoes plus the abundant naturally occurring food resources of fish, shell fish, birds, and bird eggs clearly suggests that a semipermanent population could have existed on Nihoa.

Also supporting the semipermanent occupation hypothesis is the fact that stone adzes and stone bowls were manufactured on the island (indicated by the presence of both unfinished and finished specimens of these artifact types). It seems highly unlikely that such manufacturing activities would be carried out if the occupation of the island was temporary or restricted to brief visits.

NECKER ISLAND

Environmental Setting

The environment of Necker is similar to that of Nihoa, though it is possibly harsher. Necker Island, covering ca. 16.6 ha, is a small remnant volcanic ridge (Fig. 8) measuring 1,219 m long by an average 152 m wide. Near-vertical cliffs encircle the island, and the highest point on the island is 84 m above sea level. The exposed volcanic strata slope downward to the north, indicating that the original island extended to the south and southwest of the present landmass (Palmer 1927).

There is very little soil on Necker, and most of the island consists of bare outcroppings of rock. Palmer (1927: 23) thought that none of the island's original ground surface remained, and that "at least a few hundred feet of overburden rocks have been removed from all parts of the island." This massive erosion undoubtedly occurred prior to human

occupation of the island, because the archaeological sites show none of the effects of the erosion.

The rocky terrain and lack of soil on the island combined with sparse rainfall (ca. 500–630 mm per year) has resulted in an impoverished flora. There are only five plant species on Necker, which are very sparsely distributed.

Fresh water for drinking could have been obtained from two small seeps that produce an estimated five gallons of guano-tainted water each per day (Palmer 1927: 23).

Like Nihoa, Necker is rich in natural food resources. Sixteen species of sea birds, with over 100,000 individuals, nest on Necker (Anonymous 1984: 3.16). Turtles and seals also frequent the shores, and the waters contain abundant shell fish and fish resources.

Archaeological Remains

A total of 52 archaeological sites have been recorded on Necker (49 by the Tanager Expedition [Emory 1924] and 3 in 1984 [Cleghorn 1984]). The distribution of sites is shown in Fig. 9 and the sites are enumerated, with postulated functions, in Table 2.

The majority (n = 33; 63.5%) of these sites are religious shrines, which Emory (1924: 59) termed "*marae*" because of their formal similarity to *marae* of the Society Islands. The construction and design of Necker Island *marae* are standardized (Fig. 10). At one end is a low rectangular platform, or *ahu,* atop which are set a series of unmodified upright stone slabs. A cleared area, or court, fronts the *ahu* and contains two or more upright slabs. While these distinctive shrines are similar to the *marae* in the Society Islands, there are also counterparts, albeit not widespread, on the main Hawaiian Islands. Shrines of this form have been recorded atop the mountains of Mauna Kea (McCoy 1977, 1981) and Mauna Loa (Emory 1943) on the island of Hawai'i, and atop Haleakala on the island of Maui (Emory 1970).

In addition to the religious sites, 17 other sites (primarily rockshelters) may have been used for shelter. The function of two other sites cannot be determined.

The sites on Necker have produced a rich and varied artifact assemblage. Artifacts collected by the Tanager Expedition (Emory 1924) include stone adzes, grindstones, sinkers, stone bowls, and small human images formed of stone. Most artifacts collected have counterparts on Nihoa and the main islands. The more than 11 small, human male figures found on Necker, however, are unique. These highly stylized stone images are much more refined than any of the stone images found on the main Hawaiian Islands and show only general similarities to wooden images from the main islands.

The chronology of Necker Island's settlement, like that of Nihoa, is problematical. Two radiocarbon age determinations are available from the lower levels of a single rockshelter (Site 50-Nk-40, "Bowl Cave") on the island. A charcoal sample produced a date of 166 ± 200 B.P. (uncorrected); and a wood sample, submitted for radiocarbon dating 30 years later, produced a modern date of less than 250 B.P. (Emory explains the modern date as being the result of contamination during storage on open shelving [letter on file in the Anthropology Department, Bishop Museum]). At least two interpretations of these dates can be offered: (1) the occupation of the island was quite late (i.e., the late 1700s); or (2) the occupation was earlier, say in the 1500s. The first interpretation does not seem plausible, because the island was uninhabited at the time of European discovery in 1786 (Emory 1928: 53) and because the design of the shrines suggests that they may be of an early form of architecture (cf. Emory 1970). The second interpretation seems more reasonable.

Postulated Activities

The most obvious activity pursued on Necker was connected with the carrying out of religious rituals; the presence of 33 shrines on 16.6 ha seems phenomenal. Additionally,

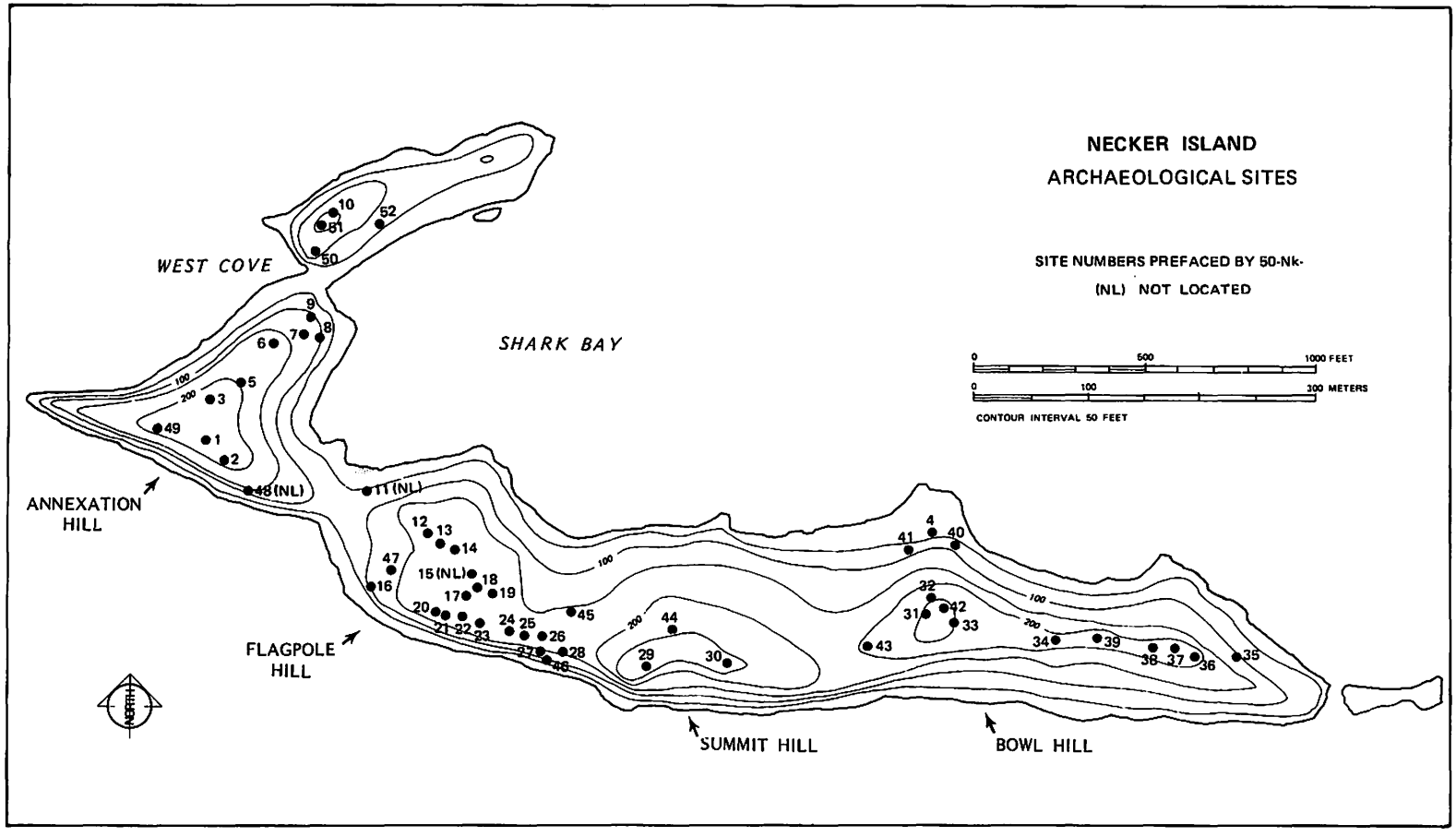

Fig. 9. Map of Necker Island, showing location of archaeological sites.

Table 2. Necker Island: Archaeological sites and postulated functions.

Site no.	Postulated function	Site no.	Postulated function
50-Nk-1	shrine	50-Nk-27	shrine
-2	shrine	-28	shrine
-3	shrine	-29	shrine
-4	habitation	-30	shrine
-5	shrine	-31	shrine
-6	shrine	-32	shrine
-7	shrine	-33	shrine
-8	shrine	-34	shrine
-9	shrine	-35	habitation
-10	shrine	-36	habitation
-11	shrine	-37	unknown
-12	shrine	-38	unknown
-13	shrine	-39	unknown
-14	shrine	-40	habitation
-15	shrine	-41	habitation
-16	shrine	-42	unknown
-17	shrine	-43	unknown
-18	shrine	-44	unknown
-19	shrine	-45	unknown
-20	shrine	-46	habitation
-21	shrine	-47	unknown
-22	shrine	-48	habitation
-23	shrine	-49	unknown
-24	shrine	-50	habitation
-25	shrine	-51	unknown
-26	shrine	-52	habitation

some limited amount of stone working was probably practiced given the presence of a single hammerstone and two grindstones. The presence of six adzes is enigmatic because of the lack of wood on the island for the adzes to be used on.

Several lines of evidence suggest that human use of Necker was limited to brief and temporary visits: (1) the lack of large or complex habitation sites; (2) the lack of evidence for agricultural activities; and (3) the scarcity of water and fuel for fire. The prevalence of religious structures and the absence of a permanent population has led to Necker being termed a "mystery island" in the popular literature of Hawai'i.

SUMMARY AND DISCUSSION

The remnant volcanic peaks of Nihoa and Necker are relatively isolated from the main Hawaiian Islands. Both islands are extremely rugged, dry, and support only scrub vegetation, all of which make them relatively inhospitable. On the other hand, both islands support extremely large bird populations and have abundant marine resources.

While neither island was inhabited at the time of European discovery, each contains numerous archaeological sites indicating that the two islands were occupied in the prehistoric past. Radiocarbon dates, while not without problems, suggest that Nihoa and Necker were utilized from ca. A.D. 1000 to A.D. 1700. The structural remains on the islands resemble archaeological sites generally found in Polynesia, with specific correlates in Hawai'i. This, combined with similarities in the artifact types, makes it clear that human utilization of these two remote islands was by prehistoric Hawaiians.

While there are similarities between the archaeological resources of the two islands that indicate they share a common cultural history, there are also important differences. The most important and interesting differences relate to the patterns of settlement.

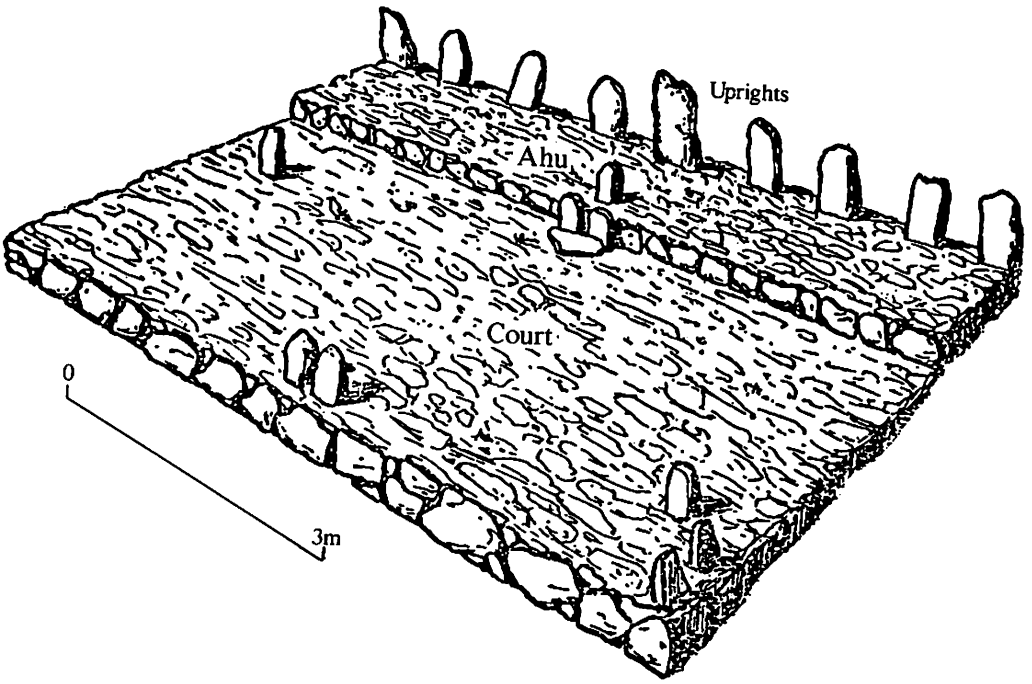

Fig. 10. Plan view of Necker Island *marae* (after Emory 1928: fig. 25a).

The pattern of settlement on Nihoa appears to have been, if not permanent, then at least semipermanent. The island contains numerous habitation structures, many of which are massive and required a tremendous expenditure of labor to construct. In addition to these substantial habitation sites, much of Nihoa has been artificially terraced for agricultural purposes. Finally, two burial sites containing the remains of adults and children were found on the island. All these data suggest that Nihoa probably supported a relatively permanent population for relatively long periods of time. Life on Nihoa, while probably not luxurious, may not have been as hard as we would believe based on the harsh environmental conditions present today. Food (both naturally occurring resources and cultivated produce) was probably abundant, and water, though not plentiful, was probably adequate.

The pattern of settlement on Necker was quite different. It is inconceivable that Necker supported anything but a temporary settlement. There are no substantial habitation structures or agricultural field systems on the island. Habitation seems to have been confined to small, slightly modified rockshelters, and the lack of soil on the island precluded any form of agricultural practice. Religious sites, or *marae,* are the most numerous type of archaeological site on the island. The prevalence of religious sites indicates that ritual was an important activity on the island and leads to the supposition that Necker was religiously important to the prehistoric Hawaiians.

The question of why these two remote islands were settled is perhaps the most perplexing problem facing us. While the problem has no definite answers, and perhaps never will, reasonable speculations can be made. Nihoa and Necker were probably first discovered by exploring Hawaiians who noticed the swarming sea birds around the islands. The first use of the islands probably revolved around exploiting these bird populations for meat, eggs, and feathers.

The first sojourns to Nihoa and Necker were probably temporary and brief. The explorers

must have noticed that Nihoa possessed good, rich soil and probably soon conducted experiments to see if crops (most likely sweet potatoes) would grow there. The experiments were undoubtedly successful, because so much of the island is terraced into agricultural plots. With a harvestable supply of vegetable crops available on Nihoa, groups could have stayed on the island for longer periods of time, exploiting the available natural resources. The majority of the massive habitation structures were probably built and used during this period.

The settlement and use of Necker is much more perplexing. The mystique surrounding this barren little island is based on the dominance of religious shrines over all other types of structures. Emory (1928: 120) believed that Necker was settled by people from Tahiti and that the "Necker Culture" was an older form of culture in the Hawaiian Islands. He also noted that "Necker Island obviously held a strong mystical attraction for the ancient Hawaiians yet tradition is quite silent about it" (1928: 120). The naturalist Sherwin Carlquist (1980: 387) expressed the popular view that the shrines on Necker were built by people who were marooned on this barren isle. Kirch (1985: 97–98) agreed with Carlquist.

It seems highly unlikely that the 33 shrines on Necker were built by one group of people at one time, especially when one considers the different orientations of the shrines and the fact that some of the shrines were built abutting other shrines. It seems more likely that Necker was repeatedly visited and that the stays on the island were short-term. The most obvious purpose for traveling to this island would have been to exploit the bird populations there. However, this utilitarian explanation only partially reflects the prehistory of Necker. The great number of religious structures on Necker indicates that religious ritual was the pervasive element of the culture on the island, and, as Emory (1924) noted, there must have been strong religious reasons for making the dangerous journey to this isolated island. What these religious reasons may have been is pure speculation at this point, though it seems likely that they would have been associated with the exploitation of the bird resources.

Comparative ethnography (Handy 1927) indicates that birds were commonly associated with the supernatural in Polynesian religion, and the concept of birdmen is also widespread (Barrow 1967). The best descriptions that we have of a bird cult in Polynesia come from Easter Island (Metraux 1940). On Easter island, considerable ritual surrounded the gathering of the first bird egg of the season, and success in this contest resulted in considerable socioeconomic rewards (Metraux 1940: 331–41).

I would suggest that the shrines on Necker functioned for some sort of religious ritual associated with the harvesting of birds and bird eggs on the island. If some sort of ritualistic cult took place on Necker, the obvious staging area would have been Nihoa. It is easy to imagine canoe loads of people sailing from Nihoa to Necker to spend a few days conducting rituals on individual shrines and collecting bird resources before sailing back to Nihoa.

We currently have no information on the nature of these rituals, though one might speculate that they were quite standardized and male oriented. These speculations are based on the standardization of the shrines and the fact that exclusively male stone images were found on the island. Further clues about the nature of the activities must await controlled excavations of the shrines.

The exploitation of bird resources, with the associated ritualistic activities, probably continued for as long as there were sizeable numbers of birds on the islands. Overexploitation of the bird resources on both islands was a likely consequence of these activities. A drastic decrease in the number of birds would have made it unproductive to continue exploitation activities, which may explain why, after some 700 years of productive use, these Hawaiian outposts were abandoned.

ACKNOWLEDGMENTS

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