
Native Hawaiian Water Collection Systems in Lava Tubes (Caves) and Fault Cracks

Puna-Ka'u Districts, Hawaii

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Abstract

The coastal plains of the Puna and Ka'u Districts of the Island of Hawaii are a contradiction to the popular view that the Island of Hawaii is a lush tropical rain forest or a vegetated landscape with abundant water sources. This section of the island lies in the rain shadow of Mauna Loa and Kilauea Volcanoes and receives less than 30 inches of annual precipitation. When rain does come, it is in the form of sudden downpours, giving residents of the area little time to collect and conserve water. Due to the porous nature of the rock, there is no standing surface water.

In spite of these harsh climatic conditions, archaeological evidence indicates that an extensive agriculture complex existed not only along the coast, but into the most remote parts of what is called the Ka'u Desert. Passing through these agricultural areas are historic and pre-historic trail systems. These trail systems apparently played a significant supporting role for exchange between the ahupua'a (classic land divisions of Hawaii) and the geopolitical districts.

The question arises as to how could vast agricultural complexes and heavy foot travel over miles of arid land exist without dependable water sources? While planting-pits and mounds were designed to make the most efficient use of available water and conserve moisture (Carter, 1990:9), people involved in planting also needed potable water for survival. Most publications and research papers dealing with the early populations of this area make only oblique reference to springs and wells which the populations depended upon.

The Federal Cave Resource Protection Act (1988) has served as the impetus for the National Park Service to look closer at the lava tubes, caves, and fault cracks within Hawaii Volcanoes National Park. Past visitors to these underground areas found large volumes of standing water in fault cracks, and abundant drip areas within the lava tubes. Recent observers noted that in most cases, where the cracks and caves were located in the arid sections of the park, there has been extensive modification or utilization of these water sources by the early Hawaiians and others. The variety of western containers used for collection indicates that these water sources were used during historic times. William Ellis described similar water sources in his narrative of his trip around the island in 1823 (Ellis, 1979).

This report is directed at documenting recent observations and stimulating further research into early Hawaiian water collection systems. It also explores the implications that power and political influence of early chiefs in the arid portions of Hawaii could have been linked to the control of the water resources.

Historical Perspective

The area that now encompasses Hawaii Volcanoes National Park was divided into two major geopolitical districts, Ka'u and Puna. The district divisions extended from the coast, near Apua point, toward the uplands and the area of Kilauea caldera. Within these major land divisions there were numerous smaller divisions or ahupua'a. Ahupua'a were established to utilize resources from the sea to the mountains. This concept of land use provided villages with a variety of resources necessary for survival. The ahupua'a was at times divided into smaller divisions, but still keeping in mind the concept of sea to mountain resource utilization (Handy; Pukui, 1976:4). Travel between the land divisions was a regular occurrence. Prehistoric foot trails were used through the early 1900s. Foot travel gave way to horses, mules, and donkeys, resulting in well developed trail systems which crossed through different districts around the island.

It is difficult to visualize the extent of Native Hawaiian occupation of the Ka'u coast line in pre-contact days. The abundant archaeological features and pre-historic village sites indicate continuous use. During his visit, William Ellis noted that the Kealakomo village area, the remains of which are located just west of the Chain of Craters Road, was "populous, though desolate looking." While he did not record exact numbers of villagers, he estimated that 500 individuals attended religious services presented by the missionaries in the village (Ellis, 1979:188-189).

William Ellis was very aware of the lack of available water along the main trail systems in an area from South Kona to Kalapana. He noted that the first spring in 100 miles was encountered near what is now Pahala. He made a point of describing his guides' search for a cave located in the Ka'u desert where "clear water, filtered through the rocks, fell into calabashes placed there to receive it" (Ellis, 1979:170). Ellis continued to record how water was procured and its quality until he passed the village of Kealakomo (Ellis, 1979:188-189). Water continued to be a concern, even into recent times. In oral interviews with the kapuna (elders) of the Kalapana village area, reference is made to the lack of water and the need to procure it from sources in the mountains (Langlas, 1990).

Historical records and research indicate that water was a major concern. Observations were made in village sites in Ka'u that wells located near

the ocean provided barely potable water (Kelly, 1969:24). The Ka'u Hawaiians placed a high value on the ability to locate potable water. The knowledge and skill needed to carry out this task was apparently so specialized that it was assigned to certain kahuna (experts in a specific practice) (Kelly, 1969:26).

The wells, caves, and cracks which have water in them seldom have trails to them. Occasionally they have fortified entrances with living spaces in the passages beyond the walls. This suggests that water was a controlled resource and its location was not offered as general knowledge.

Current Observations

There are very few documented references on Native Hawaiian water sources in the national park area. A few detailed descriptions were found in the reports of archaeological surveys of the coastal area of the park. These descriptions noted brackish water wells at village sites and an impressive crack that was located, prior to the 1989 lava flows, north of the Waha'ula Heiau. This crack contained a small lake of water approximately 12 meters long and three meters wide and between two and seven meters deep. Ala' or water worn stones had been placed at the water's edge (Carter, 1990:3).

One large cave, located in the Hilina Pali area of the park, is commonly referred to as Calabash Cave. In the early 1920s park visitors or employees found several wooden bowls or calabashes used for water collection. Located in this same area is the only other cave where detailed documentation of water collection has been made. Cleghorn and Cox (1976), in the process of describing the Hilina Pali Petroglyph Cave, gave a clear description of 50 gourd remains, a wooden bucket, and a wire bail. They recognized the significance of this site as a water collection area that was utilized into historic times. Cleghorn and Cox also conducted a small study to determine the productivity of collecting water from drip locations in caves. They found that they could collect over 630 milliliters of water a day from four drip locations. (Cleghorn and Cox, 1976).

In 1990, during field trips designed to familiarize a select group of National Park Service managers to the diverse resources in park caves, the extent of water collection activity in the caves of the park became evident. Particular attention was given to point out subtle archaeological features which an untrained person may miss. While specif-

ically looking for manmade features in the cave, subtle rings of rock were noted along cave passages. Careful examination also disclosed remains of gourds within the rock rings, as well as an occasional shell stopper. These rings were cradles for water collection containers similar to those described by Cleghorn and Cox (1976), and were readily found in many passages. Once the staff became sensitized to this activity, water collection areas were found in virtually every cave they entered in the arid sections of the park.

The significance of water collection in caves became more evident as park employees started to explore the 'Ainahou cave system, currently the longest lava tube system known in the park. Segments of this cave system are believed to extend from the coast to the summit caldera. Over eight kilometers of these segments have been verified. A portion of the cave located below the Poli-o-Keawe Pali was described in the 1960s by a Native Hawaiian employee of the park (Hauanio, 1965-1969). He spoke of finding a cave with a walled passage and a small low entrance tunnel built through its base. He did not enter the cave.

In 1964, Colin D. Smart, while carrying out an extensive archaeological survey for the national park, described this same fortified entrance. His

brief surface survey of the passage beyond the fortified entrance documented rows of rock, delineating work and living spaces, and assorted cultural items lying on the surface (Smart, 1965). His report, however, makes no mention of water collection sites.

Several National Park Service employees visited this same section of the 'Ainahou cave in 1990 after receiving a report of a vast amount of charcoal and other cultural features from visitors who had recently visited the cave. During this initial trip and subsequent visits, employees traversed over three kilometers of cave passage that had been intensely used throughout its length for water collection activities.

This segment of the 'Ainahou cave, described by Hauanio and Smart, has been called the Puna-Ka'u Water Cave. Its entrance is a double collapsed skylight into the passage. The area of the skylight contains a variety of petroglyphs and platform structures. The upslope section of the passage is blocked by a constructed wall, which initially had a single tunnel opening near its center base. This opening was about one meter high framed by a one-meter long capstone. The original entrance passage enters the interior of the cave between two constructed platforms that must be crawled

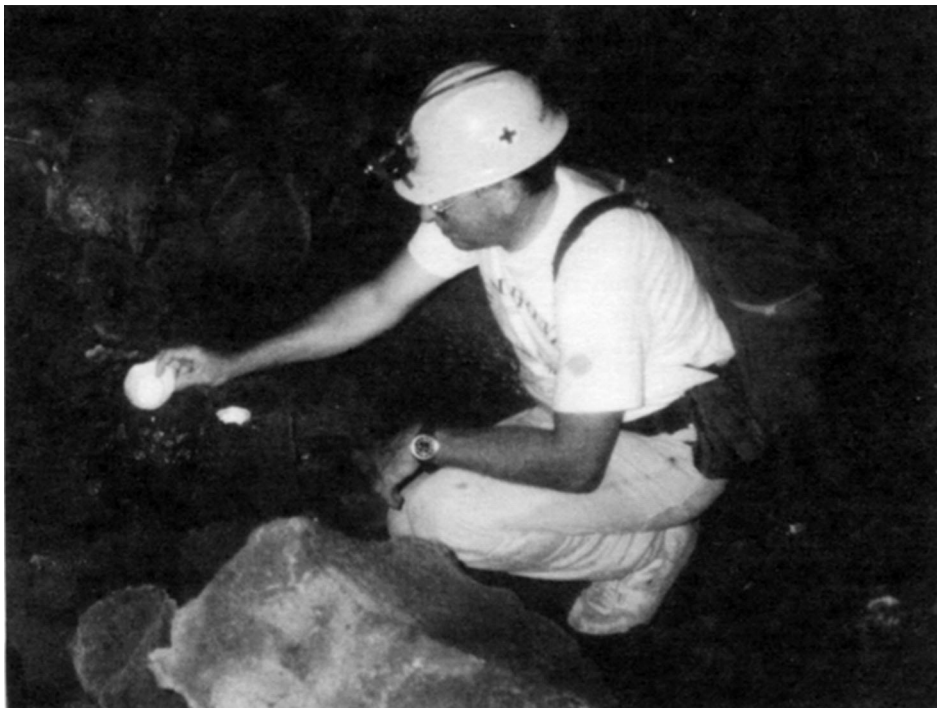


Figure 1 – The author holding a large opihī shell used by native Hawaiians as a drinking cup at a natural water catchment basin in 'Ainahou Ranch Cave, Hawaii Volcanoes National Park, Hawaii. (photo by William R. Halliday)

through, producing a highly defensive entrance. Beyond the wall, the next 30 meters of passage contain a series of low rock alignments dividing work or living areas on each side, with a center rock lined trail containing abundant charcoal and midden. This first segment ends at another constructed wall over 10 feet high that blocks a second floor chamber.

At the base of the wall, a small pit connects to a lower section of the cave. For approximately the next 1.5 kilometers, the cave is a consistent tunnel of two to three meters wide and one to three meters high. At many points along the floor of this passage, where water is dripping, constructed rock rings were found that had been used as a cradle for a gourd or calabash. In many cases the decayed remains of the gourd could be seen, as well as several shell stoppers (Hiroa, 1964:57, fig. a). In one area, water had collected in a small depression in the rock floor. At the edge of the water, a large opihī (limpet) shell was found with a drilled hole at its edge. This suggests that some sort of a fiber cord may have been attached to the shell similar to those shells which are noted in Hiroa's *Arts and Crafts of Hawaii* (Hiroa, 1964:22, fig. 8). This and other occurrences of large opihī shells associated with natural water pockets indicates that standing water sources were used by Hawaiians on-site while in the cave passages.

Charcoal and torch fragments with burnt ends were also found near most of the water collection points. In areas where occasional running water had entered the passage, large amounts of charcoal several inches deep had been deposited. The abundance of charcoal suggests frequent and continuous use of this cave passage.

After about one kilometer, the passage passes under another skylight. This entrance area has numerous petroglyphs and historic Hawaiian names carved in calligraphic type script. The skylight was modified by enlargement and with the construction of stone steps. The cave continues beyond this skylight with frequent water collection points. In the rough breakdown areas of this segment, constructed stone paths were noted. This segment finally ends in a small collapsed skylight a short distance from the face of the Poli-o-Keawe Pali.

The 'Ainahou system continues from the upper face of the escarpment in several long segments to the 1,000 meter level of Kilauea. Throughout its length, it continues to follow the Puna-Ka'u district boundary. In these upper segments, the water

collection activity becomes less frequent. The exception is one segment that is entered through a large collapsed skylight containing rock alignments and abundant ti plants, both associated with living areas. The segment above this living area contains stone trails and water collection devices ranging from gourd collection containers through five gallon cans with the tops cut off, coffee cans, and remains of wood barrels. The abundance and variety of water collection devices in this area suggests that this was a major water source well into the early 1900s when cattle ranching occurred in the area that is now the national park. These observations of water collection activities in the lower sections of the 'Ainahou cave system suggest that it provided Keauhou, one of the largest ahupua'a on the Island of Hawaii, with dependable water for its populations in the arid coastal area.

As Handy and Pukui (1976) noted, the ahupua'a system of land use provided the Hawaiians a method of dividing control of an area or island while still providing the basic needs of subsistence for each group. Potable water, like fish and woodland products, was also a necessary resource for survival. This suggests that in arid sections of the island, the population and political strength of an ahupua'a could be strongly influenced by control of a dependable water source such as the 'Ainahou cave.

The Native Hawaiian water collection features in the 'Ainahou cave system represent just one of numerous culturally significant activities which have been associated with the cave. The passages also contain hearths, petroglyphs, and living areas which have not yet been examined. The abundance of the cultural features found in this cave, as well as the numerous biological and geological features, indicates that the cave systems in the national park may be untapped sources of knowledge of the biological, geological, and historic past of Hawaii. It is imperative that as the National Park Service proceeds to identify, map, and inventory these delicate resources, extreme care be taken by all to preserve these "time capsules" of the island of Hawaii and its people.

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