UNIT 1
The Physical Setting

"A fishpond is like a beautiful smile in the sparkly Pacific Ocean."

Rachel Luczon, Grade 4
Kilohana School, Moloka'i
The Physical Setting

"Fishponds, loko ʻiʻa, were things that beautified the land, and a land with many fishponds was called a ʻfai land (ʻāina momona)."

Samuel Mānuaikaiani Kamakau (1869)

Fishponds are either human-made or natural enclosures of sea water (kai), freshwater (wai), or brackish water (wai kai) used for the raising and harvesting of various edible fish and plants. Fish farming has long been practiced throughout the world by many cultures. In Egypt, 4,500-year-old drawings in the tombs of the pharaohs show tilapia and mullet as food sources. The Chinese have raised common carp in dirt fishponds as early as 4,000 years ago, and they continue to do so today. Fishponds are known to have existed in ancient Mesopotamia and Assyria, and the nobility of Rome built both freshwater and saltwater ponds for raising fish. They were particularly fond of eels, as food and as pets.

While rock-wall fishtraps, similar to the loko ʻume iki in Hawaiʻi, are found in parts of Southeast Asia and throughout the Pacific, the fishpond totally unique to Hawaiʻi is the loko kuapā. The Polynesian settlers of Hawaiʻi developed a variety of fishponds and fishtraps to increase the availability of aquatic plants and animals for food as part of their ahupuaʻa aquaculture and agriculture system. The loko ʻume iki were most notably built along the southern coast of the island of Molokaʻi.

The development of loko ʻiʻa (fishponds) for the specific purpose of sheltering and nurturing fish for consumption began as early as the 13th century in Hawaiʻi. The impressive fishpond walls we see today were built by thousands of workers passing stones from hand to hand.

The Hawaiian fishpond of the loko kuapā style is made of a massive stone wall extending on to the reef flat. In these walls Hawaiians built ʻauwai kai (channels) that allowed the exchange of water with each changing of the tide. The ʻauwai kai caused a swift current that attracted fish depending on which way the tide was flowing. A defining characteristic of the Hawaiian fishponds was the placement of a wooden mākahā (sluice grate) in the ʻauwai kai (or ʻauwai in freshwater fishponds). This grate controls what goes in and out of the pond and allows for the easy collection of fish with the changing tide. The construction of fishponds using mākahā represented a major milestone in the evolution of the Hawaiian people as it marked the transition from a hunter/gatherer existence to that of a farmer. In this case, however, it was the fish being farmed using the water as the pasture. The location of the pond was not by chance, as characteristically a fresh water source (such as a stream or spring) fed into the fishpond. The fresh water percolating through the ground or flowing from streams brings with it minerals and trace nutrients that enter into the pond and act as fertilizer for phytoplankton and algae, on which herbivorous fish like ʻamaʻama (striped mullet) and awa (milkfish) feed.
Without any external input, the loko kuapā ecosystem could support approximately 500 pounds of fish per acre. The true genius of the design, however, is seen in the way fish were stocked into the fishpond. The pua (fry) stages of certain kinds of fish and invertebrates migrate to the brackish water environment inside of the fishpond, undoubtedly attracted by the large amount of food and the safe haven of the nursery habitat. While still small, the fry can easily squeeze between the individual bars of the mākāhā and once inside of the fishpond they feed and grow rapidly. Soon, the fish are so large that they can no longer exit through the mākāhā and they become part of the fishpond community.

**The Ahupua'a**

Ahupua'a are traditional units of land in Hawai'i that vary in shape and size. They are political and ecological land units designed to meet a community's need for food and materials. Ahupua'a generally range from summit peaks or ridge crests, extending down slope, becoming wider as the land slopes downward and to the outer edge of the reef. The boundaries between adjacent ahupua'a usually conform to valley walls or ridges. The general concept of the ahupua'a is that the human community living within its boundaries would be self-sufficient in obtaining the resources needed for survival such as fish, water and land to grow kalo (taro), medicinal herbs, and trees for canoes and shelter. However, due to the wide range of elevation, rainfall and topography in the Islands, there are a number of ahupua'a that don't conform to this generalized ideal. For example, on O'ahu, the ahupua'a of Wai'anae reaches beyond Wai'anae valley to include a wedge of land that extends to the summit of the Ko'olau range. In early times, this extended boundary enabled people living in the arid leeward area of Wai'anae valley to gather resources from the wetter Ko'olau area.

People also shared resources among ahupua'a to obtain plants that only grow in certain areas. Fili grass, which was prized for thatching, grows best in dry leeward areas. Hala trees, which provide materials for weaving, grow best in wet windward valleys. Koa trees large enough for canoes were found in koa forests that typically grow at elevations above 3,000 feet on the larger islands.

**Types of Fishponds and Fishtraps**

- Inland Freshwater Fishponds
  1. loko i'a kalo or loko lo'i kalo
  2. loko wai

- Brackish Water Shore Fishpond
  3. loko pu'uone or hakuone

- Brackish/Saltwater Large Walled Fishtrap with Lanes
  4. loko 'ume iki

- Brackish/Saltwater Fishpond on Reef Flats
  5. loko kuapā

- Small Saltwater Fishtrap or Fish Shelter
  6. umu
  7. pā

"loko i'a kalo or loko lo'i kalo" "loko wai"
Politically, the ahupua’a were governed by a konohiki (land manager) who oversaw the right to use the resources within the ahupua’a and served as an intermediary between the chief and the haku’ohana, or representative of the resident families or commoners (maka’a‘ina). Konohiki were responsible to chiefs of greater rank (ali‘i nui or ali‘i) that ruled over a moku (an island or district). Within the ahupua’a, individual families were allowed to cultivate and inhabit smaller sections of land or ‘ili. The konohiki also directed the people in the building and repair of fishponds whenever the ali‘i nui commanded.

During the Makahiki (great annual harvest festival), an entourage of ali‘i (chiefs) sometimes numbering 100 people or more, would tour the island, traveling from one ahupua’a to another. At the boundary of each ahupua’a, the residents placed an offering of some of their food crops, fish harvest, and feathers from forest birds for the touring ali‘i. The offerings were placed at an ahu (collection of stones) that was adorned with the head of a pig (pu‘a‘a). The people in each ahupua’a would provide shelter and food for the ali‘i and all those who traveled with them.

Types of Fishponds and Fishtraps

The types of fishponds or fishtraps built by the Hawaiians in a specific location were directly related to the physical attributes of a particular ahupua’a. “No two fishponds or fishtraps are identical in construction, shape, or internal components” (Kikuchi, 1973). The sizes of the ponds are random, as the early Hawaiians utilized nearly all of the naturally occurring bodies of water available. The size was determined by the topography. Perhaps the simplest in construction and the most diversified were the various fishtraps. Many of those used in Hawai‘i are similar to those found throughout Polynesia.
Pā (a wall, fence, or enclosure) is a primitive type fishtrap that has a single lane to guide fish at low or high tide, but not at both. The purpose of all lanes was to guide the fish into an enclosure where they could be caught with nets.

While the topography of a few ahupua'a allowed for the construction of all types of ponds or traps, most land divisions could utilize only two or three types. For example, the largest number of loko kuapā (70) were built along the shores of O'ahu. The island of Hawai'i had few loko kuapā but the largest number of loko puʻuone. Along the island of Moloka'i, 13 loko 'ume iki were known to have existed (Farber, 1997). Some ahupua'a weren't suited to any ponds or traps.

The importance of fishponds in Hawai'i prior to European contact is illustrated by their numbers and distribution. In 1778, when Captain Cook arrived, about 360 fishponds were identified. In 1990, DHM Planners, Inc., conducted a thorough survey of fishponds and fishtraps in the six major islands and concluded the number to be 488, some distinguished only by remnants of the pani wai (walls) or mākahā (sluice grates). The large number of ponds and traps on O'ahu (178) and Hawai'i (138) reflects the large human populations and the suitability of the landscape with its streams, estuaries, broad plains, and flat coastal reefs for the construction of fishponds. On O'ahu, 23 ponds were located around the shores of Kāne'ohe Bay. Some of the remaining ponds around Kāne'ohe Bay are Waikalua, He'eia, Kahalu'u, Nu'upia and Mōli'i. Until 1999, when the caretaker retired, Mōli'i pond was the oldest continuously operated pond in the state. The numbers of fishponds and fishtraps on the other islands were as follows: Moloka'i (74), Kaua'i (50), Maui (44), and Lāna'i (4) with the one pond on Ni'ihau not included. The sizes of loko kuapā ranged from one to 523 acres and loko puʻuone from several acres to 300 acres. The largest and most noticeable of the shoreline ponds, the loko kuapā, are the type that most people regard as Hawaiian fishponds (Farber, 1997).

The activities in this unit help students to explore different types of fishponds and fishtraps and to understand how these structures were built to take advantage of different physical features within an ahupua'a. The introductory Grades 4 - 5 lesson in this unit focuses on the first six types of fishponds and fishtraps identified in the illustrations on the previous pages. The pā is introduced in the Grades 6 - 8 Pacific Patterns activity.

References

DHM Planners, Inc. and The Bernice Pauahi Bishop Museum. 1990. Hawai'i Fishpond Study: Islands of Hawai'i, Maui, Lana'i, and Kaua'i. Honolulu, HI.

