

# Gifts from the Sea



## Lesson at a Glance

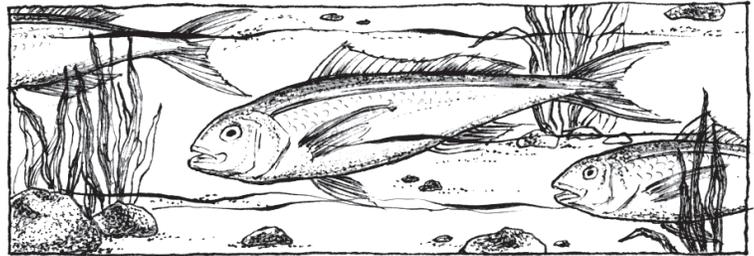
Students play a fishing game to discover optimum strategies for protecting and conserving “gifts from the sea.” They construct graphs and diagrams related to fish populations and research marine life cycles as extended activities. Students explore Hawaiian values and *kapu* that apply to caring for resources and write journal entries applying these values to their own lives.

## Focus Question

How did the ancient Hawaiian *kapu* system prevent overfishing and what are the best strategies for protecting and conserving our fisheries today?

## Hawaiian Values

*laulima* (cooperate, work together)  
*lokomaiika'i* (good hearted)  
*lōkahi* (balance, harmony)  
*mālama* (care for, preserve)



## Key Concepts

- The Hawaiian *kapu* system helped to prevent overfishing. Fish populations today have been declining steadily due to soil erosion from loss of forest cover, pollution, and overharvesting without regard to marine life cycles.
- By timing fishing and gathering to the life cycles of marine plants and animals, and limiting what we take, we could conserve these resources.

## Time

three class periods



## Performance Standards

- Depict information and relationships by constructing diagrams, charts and graphs.
- Conclude that humans are dependent upon the Earth’s resources and take responsibility toward natural resources.
- Illustrate that living things have definite life cycles, growth patterns and behaviors.
- Demonstrate comprehension of text by writing about theme/author’s message.
- Apply themes to own life experiences.

## Subject Areas

science, Hawaiian studies,  
language arts, math

## Materials

Momi's journal (provided)  
Values illustrations (provided)  
student data sheet (provided)  
16 buttons or other small objects  
a large, clear glass or plastic bowl filled with water  
a cup of soil  
a few small pieces of coral  
a towel  
cup of water colored with food coloring  
Sea Search CD-ROM (optional: check your school library  
for free copy provided to each public school in Hawai'i)



## Preparation

- Make a copy of the student data sheet for each student.
- Color a cup of water with food coloring.



## Teacher Background

In ancient Hawai'i, conservation of island resources and the sharing of those resources were integral parts of society. To ensure sustainability, the *ali'i* established the *kapu* system, which restricted fishing during certain times of the year, particularly during the reproductive phase of a marine animal's life cycle. If anyone was caught violating those fishing restrictions, they were immediately put to death.

King Kamehameha I placed a *kapu* (restriction) on sea fisheries for a period of five months. On the sixth month, he lifted the *kapu*, and the people were able to fish. The first catch was given to the *ali'i* and the *maka'āinana* (commoners). The second catch was given to the landlords of the *maka'āinana*. Once this was done, the *kapu* was lifted for a period of six months, and then restrictions were put into place for certain kinds of fish. This system was based on the life cycle of fish. It increased reproduction and growth of deep sea, reef and shoreline fish.

Today, the state Department of Land and Natural Resources, Division of Aquatic Resources (DAR) helps to regulate and enforce conservation of aquatic marine life in Hawai'i. But enforcing the regulations statewide has been very difficult. The state has been reluctant to take action to limit some commercial fishing due to lack of data to warrant it, and because of pressure by some in the commercial fisheries industry. Many fishers don't want to suffer losses now in order to have healthier fishing grounds in the future. However, there is growing concern among fishers and the general public that Hawai'i's nearshore fisheries are in decline and need to be sustainably managed. And there appears to be hope on the horizon with increased state funding for personnel to enforce fishing regulations statewide.

The statistics compiled by the DAR are incomplete,

but as the data on the student sheet provided with this activity indicate, there has been an overall decline in the annual reported catch for ehu (red snapper) and onaga (longtailed red snapper) over the last 45 years. These "bottomfish" occur along with 65 other species that dwell in deep water 180 to 900 feet below the surface. Twenty of these species are fished commercially.

The increase in commercial fishing in Hawai'i (and globally) has depleted the ocean fisheries. According to DAR, there are three ways to assess the health of fisheries. One way is to measure the percentage of immature fish in the catch. If half of a catch is immature, then the fishery is probably stressed. Another way is to measure the fishery's spawning potential ratio or SPR. Experts do this by determining the percentage of adult fish needed in a population to keep the fishery healthy. If the SPR falls below 20 percent, then the fishery is considered overfished and is in danger of collapsing. The last way to measure a healthy fishery is the catch-per-unit effort. This indicates whether it is becoming easier or harder to catch fish. The data on the Student Sheet indicate the average catch per commercial fishing trip for each of the years listed.

As a way to replenish our fisheries, the DAR has imposed fishing restrictions on several kinds of fish. From December to February, the *'ama'ama* or striped mullet is off limits. It's unlawful to catch *akule* that are under 8 1/2 inches using a net during the months of July through October. The slipper lobster or *ula pāpapa* has many restrictions imposed on its catch. Fishers are unable to fish for this delicacy when the lobsters are reproducing between May and August. Fishers must not spear, mutilate or take the lobster if she is bearing eggs. During open season, the *ula pāpapa's* tail must be wider than 2 3/4 inches when caught.

The DAR has produced minimum catch-size rulers that provide a handy reference to minimum size and seasonal restrictions for some of our nearshore



marine life. See the Extended Activities for instructions to make these rulers.

The DAR has also imposed fishing regulations for some of the bottomfish species. It is **unlawful**:

- to take bottomfish with any trap, trawl, bottomfish longline or net (except scoop nets that can be used to bring fish that have been caught on board);
- to take or possess more than a total of five onaga, ehu or combination of both fish (unless you have a commercial marine license);
- to take or possess bottomfish while in a vessel that is drifting or anchored within any of the restricted fishing areas (There are 20 restricted areas around the Islands; information and maps are available from DAR).
- to take or possess bottomfish while on an unregistered boat (boat must be registered with the Department of Land and Natural Resources and must have a bottomfish fishing vessel identification number).

## Taking Action!

Fourth grade students at Pearl City Highlands Elementary School on O’ahu won Moanalua Gardens Foundation’s 1997 “Hawai`i Needs Care” contest with their innovative approach to conservation. Students mass-produced more than 200 minimum catch-size rulers to educate the public about catch sizes and seasonal limits. They wrote letters to fishing supply stores and distributed their rulers at the check-out counters of many stores on O’ahu. For more information about their project, check Moanalua Gardens Foundation’s web site: <http://www.pixi.com/~mgf>. Encourage your students to make a minimum catch-size ruler to share with their favorite fisherman or fisherwoman! (See Extended Activities for sample and directions.)

## Supplemental Resources

Akimichi, Tomoya, Conservation of the Sea: Satawal, Micronesia, *Traditional Fishing in the Pacific*, Honolulu: Bishop Museum, 1986, 22.

Environment Hawai`i, Volume 4, Number 9, March 1994. (This issue of this newsletter focuses on the bottomfish catch in Hawai`i. Available from Environment Hawai`i, 200 Kanoelehua Avenue, Suite 103-325, Hilo, HI 96720)

"Mālama I Ka `Āina, Mālama I Ke Kai." (An approx. 15 min. videotape that focuses on taking care of the ocean and shoreline, featuring Mo`omomi on Moloka`i. Available from Juniroa Productions, Inc. 928 Nu`uanu Ave. 5th Floor Loft, Honolulu, HI 96813.)

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## Benchmarks

Globally, fisher yields are increasingly viewed as a critical indicator of the health of our planet's biological resources. The table below is taken from the Ke Ala Hōkū Critical Indicators Report 1997-1998.

INDICATORS	BENCHMARKS				
	1960-69	1970-79	1980-89	1990-99	2000-10
Hawai`i's Fisheries Catch Per Unit Effort (lbs) of fish (The unit of effort refers to the number of hooks or traps set per hour.)	16,130	7,140	3,677	3,650	3,650

Source: *Hawai`i State Department of Land and Natural Resources, Division of Aquatic Resources.*



**Teaching Suggestions**

explain this strategy—why were fish only added to the ocean when some fish remained?

1. Tell students that Auntie Momi’s journal relates some fishing stories. But before they read it, they are going to play a fishing game to help them understand more about what Auntie Momi shares in her journal.

✓ 6. After the fourth harvest, discuss what happened in the game.

2. Have students sit in a circle on the floor. Place the large bowl in the center and explain that it represents the ocean. Add the pieces of coral to represent the reef and the 16 fish (buttons) to the bowl. (Alternatively, provide bowls and buttons to teams of students and let them play the game in small groups and report their results to the class.)

**Discussion Questions**

- What was the best strategy for harvesting from the sea? Why?
- What happens when each team is only concerned about harvesting the most fish possible?
- What’s the difference between self-interest and cooperation?

3. Divide the class into four teams and explain the rules of the fishing game:

✓ 7. Have students return all 16 fish to the ocean and play the game again. This time, stop after the first harvesting period and:

- The **most** fish a team can have at any one time is 16.
- There will be 4 “harvesting periods” of 30 seconds.
- During these “harvesting periods,” each team may harvest all of the fish, some of the fish or none.
- For every 4 fish the team harvests, they will receive one point.
- For every fish remaining in the ocean after the harvest, one fish will be added, up to a total of 16 fish.

After the next harvesting period:

- Explain that pesticides from crops and gardens on the land have washed into streams and are now being carried into the ocean.
- Add some colored water to the bowl and remove two more fish.
- Continue playing the game and discuss the outcome.



4. After each 30 second “harvesting period,” ask each team how many fish were harvested. Have each team record the number of fish they harvested and divide by 4. Each team will receive one point for every four fish harvested.

5. Collect the “harvested fish” from each team. If fish remain in the ocean after the “harvesting period,” a new fish will be added for each two fish that remain up to a total number of 16 in the “ocean.” Ask students to

- ✓ **8.** After playing the game, ask students to define “sustainability” (using resources wisely today so that we don’t borrow from future generations’ ability to meet their needs) in their own words. Ask groups of students to construct diagrams that depict ways that human activities affected the fish population.
- ✓ **9.** Distribute the data sheet and have students plot the figures on a graph. Ask students to describe what these data mean in terms of their future and the actions we need to take today.

1.25 inches: `opihī (shell size)  
 5 inches: āholehole\*, manini\*  
 7 inches: `ama`ama\*, moi, pāpio, weke, kumu\*  
 9 inches: awa\*, `ō`io\*, kala\*, `ōpelu kala\*, bass\*  
 10 inches: oscar  
 12 inches: tunacare

Also add the following information to the ruler:

minimum weight: 1 lb: uhu\*, ulua\*, pāpio\*, onaga\*,  
 `ōpakapaka\*, uku\*  
 3 lbs: `ahi

daily bag limits: moi-15; ulua & pāpio-20; `oama-50;  
 bass-10; channel catfish-3; trout-7; tunacare-3; oscar-3  
 closed seasons: kona crab, lobster (May-August)

\* Minimum size applies to sale of fish, not home consumption, and also to spearing of fish.

Laminate rulers or cover them with contact paper and share them with family and friends.

- Visit an area on your island where people are harvesting marine resources sustainably and recycling water effectively. On Moloka`i, the Mo`omomi Project is helping in that effort by diverting nutrient-rich lo`i runoff into nearby fishponds. On O`ahu, The Wai`anae Coast Community Alternative Development Corporation is promoting backyard aquaculture, phone: 696-7241.

- Ask students to interview some fishers in their communities to find out what their perceptions are of the declining fisheries in Hawai`i and what should be done about it.

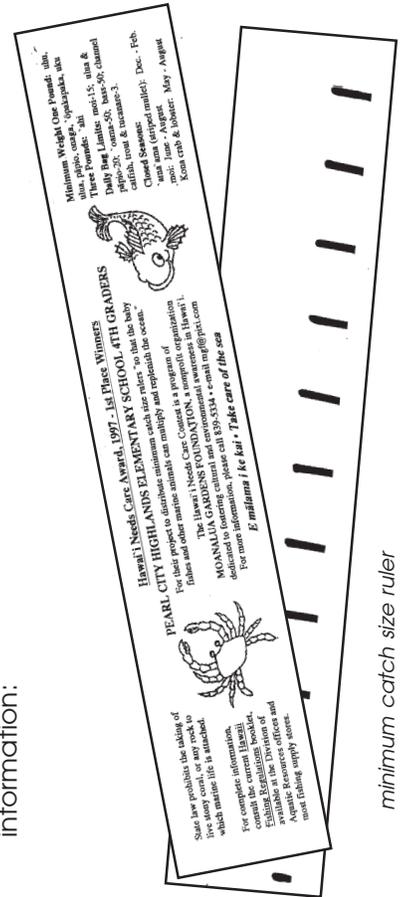
- Challenge students research the life cycle of one type of marine animal and write restrictions (kapu) for harvesting this animal based on its life cycle. (Note: The Hawai`i State Department of Land and Natural Resources distributes a pamphlet with this information called Current Live Fish Facts for Bottom Fishes of Hawai`i.)

- ✓ **10.** Give each student a copy of Auntie Momi’s journal (weeks five - six) and have students take turns reading aloud to the class. Move the canoe cut-out along the voyaging line constructed in activity one, *The Remarkable Journey*. Discuss the fishing kapu presented in the journal.

- ✓ **11.** Have students write journal entries about the values described in Auntie Momi’s journal. Have students reflect on how they can incorporate these values into their daily lives.

### Extended Activities

- Make minimum catch size rulers. Cut out a long rectangular piece of oak tag (or file folder) 12 inches long and mark the oak tag in inches using a ruler. Mark minimum catch sizes on the ruler using the following information:



# Gifts from the Sea

# Meeting Standards

**Focus Question:** How did the ancient Hawaiian *kapu* system prevent overfishing and what are the best strategies for protecting and conserving our fisheries today?

Standard	Student Tasks	Assessment: Meet Criteria	Assessment: Exceed Criteria
<p>✓ <b>6</b> Conclude that humans are dependent upon the Earth's resources and take responsibility toward natural resources.</p>	<p>In small groups, students discuss the following questions based on the fishing game:</p> <ul style="list-style-type: none"> <li>• What was the best strategy for harvesting from the sea? Why?</li> <li>• What happens when each team is only concerned about harvesting the most fish?</li> </ul> <p>What's the difference between self-interest and cooperation?</p>	<p>During their discussion:</p> <ul style="list-style-type: none"> <li>• student groups write out the answer to each question;</li> <li>• each group shares its answers with the whole class.</li> </ul>	<p>Student writes a short paper describing the difference between self-interest verses cooperation as it relates to harvesting natural resources.</p>
<p>✓ <b>7 + 8 + 9</b> Depict information and relationships by constructing diagrams, charts and graphs.</p>	<p>In small groups, students discuss the following questions after the fishing game:</p> <ul style="list-style-type: none"> <li>• How does this game demonstrate "sustainability"?</li> <li>• In what ways do human activities on land affect fish populations in the sea?</li> </ul> 	<p>Each group will:</p> <ul style="list-style-type: none"> <li>• define "sustainability in students' own words and share their definitions with the class;</li> <li>• construct a diagram that depicts how human actions affect fish populations.</li> </ul> <p>Each student will:</p> <ul style="list-style-type: none"> <li>• construct a graph that depicts bottomfish catch in Hawai'i over an 45-year period;</li> <li>• write conclusions from the data that is graphed.</li> </ul>	<p>Students create a display that tells the story of our dwindling bottomfish catch and share their display with others in the school or community.</p> 

<p>✓ <b>10</b> Illustrate that living things have definite life cycles, growth patterns and behaviors.</p>	<p>In small groups, students will discuss the following questions after reading Aunty Momi's journal:</p> <ul style="list-style-type: none"> <li>• Why was the ancient kapu system so important to Hawaiians?</li> <li>• Why is it important to understand the life cycle of fish and other marine life that we harvest?</li> </ul>	<p>During their discussion:</p> <ul style="list-style-type: none"> <li>• student groups write out the answer to each question;</li> <li>• each group <b>shares its answers with the whole class.</b></li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• research the life cycle of one type of marine animal;</li> <li>• write restrictions (<i>kapu</i>) for harvesting this animal based on its life cycle.</li> <li>• research the actual harvesting restrictions for the marine animals they are studying;</li> <li>• develop a life cycle diagram that shows harvesting and <i>kapu</i> seasons for marine animal studied.</li> </ul>
<p>✓ <b>11</b> Demonstrate comprehension of text by writing about theme/ author's message. Apply themes to own life experiences.</p>	<p>Students will reflect on the values learned in Aunty Momi's journal.</p>	<p>Student's journal will have:</p> <ul style="list-style-type: none"> <li>• a daily entry for one week reflecting on a value described in Aunty Momi's journal;</li> <li>• at least two entries showing how a particular value is applied to student's life.</li> </ul>	<p>Student's journal will have a daily entry for two weeks showing how different values are applied to student's life.</p>



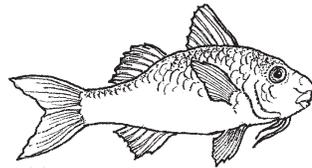
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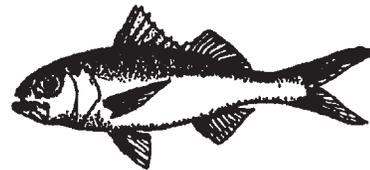
# Student Data Sheet



Is Hawai'i's bottomfish catch declining? Make a graph by plotting the catch for these two fish over a 45-year period. Note: These data are in average pounds caught per commercial fishing trip in the main Hawaiian islands.



ʻulaʻula koaʻe (onaga)  
(in pounds per trip)



ʻulaʻula (ehu)  
(in pounds per trip)

year	ʻulaʻula koaʻe (onaga) (in pounds per trip)	ʻulaʻula (ehu) (in pounds per trip)
1950	566	564
1955	547	222
1960	364	242
1965	411	275
1970	345	161
1975	419	194
1980	415	79
1985	266	63
1990	205	82
1995	100	44

Source: *Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region: 1995 Annual Report*, Western Pacific Regional Fishery Management Council, Honolulu, 1996.

What can you conclude from these data?

More than half of the onaga catch in recent years has been immature fish. What does this tell us about the fishery?

What should we do to care for Hawai'i's fisheries? Why?