The Legend and Science of the Bidarki

ALASKA SEAS AND RIVERS CURRICULUM
An Alaska Sea Grant K-8 Curriculum

Adapted from the Alaska Seas & Rivers Curriculum, Alaska Sea Grant (http://seagrant.uaf.edu/marine-ed/curriculum/home.html) and LiMPETS: Long Term Monitoring and Experiential Training for Students protocols (http://limpetsmonitoring.org/), with data from Anne Salomon, Simon Fraser University.

Objectives:

Students will understand how humans are connected to the ocean and other living things through our shared food resources. They will appreciate how traditional and local knowledge and scientific studies can help people better understand the dynamic forces at play in ocean ecosystems and make informed decisions about sustainable harvests.

Concept:

A case study of harvesting bidarki (katy chitons) in the Alaska Native villages of Port Graham and Nanwalek illustrates how complex factors can affect important marine resources. Drawing from traditional and local knowledge, archaeological data, and rigorous field research, the study helps illuminate how a variety of factors such as location and permanence of villages with strong subsistence practices, changing predator populations (especially sea otters), and shifts in availability of other marine invertebrates. Students have a chance to reflect on their own connections to the ocean and participate in a bidarki monitoring program in their local area.

Materials:

- Science notebooks
- Pencils
- Samples of local foods
- Handout: Bidarki Story
- Handout: Bidarki Data Sheet
- Laptop/computer and projector or SmartBoard
- Map of Alaska
- Bidarki photo or actual bidarki
- Rulers
- Clipboards
- Plastic coated paper clips
- 50 meter measuring tape
- Cones or other objects for marking boundaries

Preparation:

Collect samples of local foods such as berries, fish, or local plants.

Print out copies of the Bidarki Story for students: http://seagrant.uaf.edu/marine-ed/curriculum/grade-5/investigation-1.html#story

Visit a local intertidal area and determine an appropriate bidarki monitoring site. For your data to correspond roughly to the Anne Salomon's data, you need to set up a monitoring zone that spans the "high zone" of bidarki abundance to the "low zone" of bidarki abundance. The high zone is defined by the red algae Endocladia muricata (also called wire brush seaweed, for good reason!) and encrusting coralline algae. The "low" zone is defined by the brown ribbon kelp Alaria marginata and brown sea cabbage kelp Hedophyllum sessile. Choose a permanent monitoring site that encompasses these two zones and has easy to identify permanent markers at the horizontal end (such as large rocks).

This lesson is based on the collaborative study and book entitled Imam Cimiucia: Our Changing Sea by Anne Salomon, Nick Tanape, and Henry Huntington. You can purchase a copy of

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the book through http://seagrant.uaf.edu/bookstore/pubs/SG-ED-70.html or the book may be available for loan from your local library. If you have access to the book, use photos and quotes to supplement the story parts included in this lesson.

Introduction:

Bring in some samples of a food (berries, fish, edible plants, etc) that are found in your area and have students try them. Briefly discuss food sources for Alaskans now, and how they differ from food sources 100 years ago.

Activities & Procedures:

Tell students that they are going to read a story about human use of a resource from the ocean and how the people and the ocean ecosystem are interconnected.

Show students an example of a photo of a bidarki (black leather chiton, katy chiton, Katharina tunicata), and locate the villages of Port Graham and Nanwalek on a map of Alaska.

Distribute the introduction to the "Legend of the Bidarki" story, and read it together as a class, then divide students into four groups.

Ask groups 1 and 2 to be "residents of Port Graham and Nanwalek" and give them part 2a and part 2b to read. Groups 3 and 4 will be "University Scientists" and read parts 3a and 3b.

Let students know that they will report to the class the section that they read, and assign parts. Give the students time to read.

Ask Group 1 to explain to the class what they read in part 2a of the story. They could take turns, with one student asking each of the questions that the villagers had about the bidarki.

Discuss that part of the story and ask if students have any additional questions to ask.

Ask Group 2 to report on part 3a of the story, telling the rest of the class why scientists wanted to study the bidarki.

Discuss methods that scientists might use to try to answer some their questions.

Group 3 will report on part 2b of the story. Ask students to take turns reporting each of the statements that the elders told the scientists.

Finally, ask Group 4 to report on what scientist Anne Salomon found as a result of her study, part 3b.

Distribute the conclusions to the story and read them together as a class.

Discuss the interconnections in the story using a graphic organizer: On the board or overhead projector, ask students to help fill in "bubbles" to represent the various parts of the ecosystem near Port Graham and Nanwalek, including:

- People who live in the villages
- Bidarki
- Sea Otter
- Sea Star
- Cod or Halibut (substitute subsistence harvest in times when bidarki were scarce)

As a class, draw arrows between the bubbles to indicate the type of interactions that took place in the story.

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Each student should replicate (and/or add to) the graphic organizer in their science notebook as the discussion takes place.
Talk about the problem that people in the villages face and possible solutions to that problem.

Then, explain that you are going to monitor the size and abundance of bidarkis (or other common subsistence food) in your local area.

Prepare for a field trip to the intertidal zone by reviewing safety and how to be a beach steward. See the "Be a Beach Steward" lesson for more information. Bidarkis inhabit the mid- to low-tide zone of rocky areas, so you'll want to go to a rocky beach at low tide. It is important to allow students some time for guided exploration of the area before conducting intensive monitoring projects, so consider including components of the Coast Walk Lesson if your class hasn't participated in another recent field trip to the intertidal zone.

Explain that students will use scientific protocols to count and measure all the individuals of bidarkis in a designated area. This area will be marked or documented with photographs so that it can be surveyed again in the future.

Ask students to consider whether they think the bidarkis on this beach have high abundance and are large in size. What factors might be influencing this?

Have them write a hypothesis in their science notebooks about bidarki size and abundance on this beach relative to other Alaskan beaches.

Begin by finding and pointing out a bidarki to the entire group. Demonstrate how to use the rulers (or if in a crack, the paper clips) to measure the length of the individual.

Mark the boundaries of your monitoring plot with cones or tape measures.

Break students into teams of two or three, and have them systematically search the whole permanent study area for bidarkis.

They should designate one person in each group as the recorder. This person is responsible for completing the data sheet. The others should be searching—and should tell the recorder what they see as they see it. The team should look carefully in cracks and crevices and under ledges.

Remind students to also calculate the area in square meters for the monitoring plot by multiplying the length in meters by the width/height in meters.

Wrap-up:

Once the groups have collected their data, gather together as a class either at the beach or back in the classroom.

Have students share the data collected, and work together as a class to calculate the average total abundance of bidarkis by drawing from each group's data.

To get abundance per square meter, divide this number by the area of the monitoring plot.

Then, calculate the average abundance for each size class designated on the data sheet.

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Finally, calculate the average size of bidarkis in the designated area.

Was their hypothesis supported? Do bidarkis seem abundant on the beach? Do they seem to be large in size? This is difficult to decide without something to compare it to, so provide students with data from past surveys on the beach or from other locations.

Anne Salomon's study of bidarkis near Port Graham and Nanwalek revealed a mean size of approximately 42.5 millimeters in 2003 and 2004. A small survey in China Poot Bay revealed a mean size of approximately 80 millimeters on a beach that is closed from any harvesting by people. Contact the Center for Alaskan Coastal Studies for access to bidarki surveys from other areas and to add your data for comparison with other sites.

Extensions & Lesson Connections:

Using data from past years, have students graph the abundance and average size of bidarkis over time.

Have students create poster or powerpoint presentations on the data collection process and analysis to share with others. This can be incorporated into the "Celebrate the Sea Party" described in Unit 6.

Have students conduct community interviews about changes in technology, natural resources, and ecosystems with a focus on how subsistence and commercial resources have changed over time. See the "Community Interviews" lesson for guidance.

This lesson pairs well with the "Fishing over Time" and "Fishing for the Future" lessons.

Evaluation:

Ask students to reflect in their science notebooks on these questions:

1. How did modern technology affect the way that the people in Nanwalek and Port Graham used the ocean?

2. What factors might influence the abundance and size of bidarkis on this beach?

3. Whose responsibility is it to take care of the ocean and its resources?

4. How do scientists help solve problems of conserving the ocean's resources?

Assess student understanding as demonstrated by their completed graphic organizers and science notebook responses, observations, and hypotheses. Observe student cooperation, effort, and adherence to protocols and safety guidelines during data collection.