DESIGN, CONSTRUCTION, & USE OF TRADITIONAL HALIBUT HOOKS

A TEACHING GUIDE FOR EDUCATORS
GRADES 6-8
DESIGN, CONSTRUCTION & USE OF TRADITIONAL HALIBUT HOOKS

A teaching guide for educators
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Introduction

This educational resource is based on a teaching unit on halibut fishing developed by Tlingit educator Angie Lunda for Sealaska Heritage Institute’s Opening the Box program, a math-and-culture academy for Southeast Alaska middle school students. The program teaches mathematical concepts through cultural heritage and knowledge and through hands-on learning.

Through the annual Opening the Box summer academy, students attend culture-based math camps where Native art practices, such as basketry, weaving and canoe making, are used to teach math. The teachers also increase their knowledge of Native cultural traditions, protocols and art as they affect mathematical learning.

Lunda’s unit, field-tested during the summer academy, teaches math concepts through ancient halibut-hook technology developed by the Indigenous people of Southeast Alaska. The unit embodies the core cultural value of Haa Aani: Honoring and Utilizing our Land.1

"I want students to come away with an appreciation for the brilliance, the creativity, the engineering ability of our ancestors, who were able to figure out ways to catch fish and thrive here in Southeast Alaska." Lunda said.


1 Haida: Ḵ̱itʼlit’ Tlagáa
Tsimshian: Na Ləgxyuubm
In surveys conducted after the Opening the Box Summer Academy in 2017, 97 percent of students said they felt more confident about their ability to do math after attending the camp, and 80 percent said they liked doing math more than they did before the academy.

Opening the Box, a partnership between SHI and the Juneau School District, was funded by a grant from the US Department of Education’s Alaska Native Education Program. SHI would like to thank all of the teachers, administrators, students, and parents who made this project possible.

Sealaska Heritage Institute is a private nonprofit founded in 1980 to promote cultural diversity and cross-cultural understanding through public services and events. SHI also conducts social scientific and public policy research and advocacy that promotes Alaska Native arts, cultures, history and education statewide. The institute is governed by a Board of Trustees and guided by a Council of Traditional Scholars, a Native Artist Committee, and a Southeast Regional Language Committee. Its mission is to perpetuate and enhance Tlingit, Haida, and Tsimshian cultures of Southeast Alaska.

“I want students to come away with an appreciation for the brilliance, the creativity, the engineering ability of our ancestors, who were able to figure out ways to catch fish and thrive here in Southeast Alaska.”

— Tlingit educator Angie Lunda, unit author
SEALASKA HERITAGE INSTITUTE TEACHING UNIT

Design, Construction & Use of Traditional Halibut Hooks

AUTHOR

Angie Lunda

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH

Math/Science, Middle School (Grades 6-8)
9 lessons, approximately 2 hours each

UNIT SYNOPSIS OR ABSTRACT

Students study archival halibut hooks to identify the features that made the hooks technologically successful. Students measure the head length and jaw hinge length of freshly caught halibut and use the measurements to derive the standard length and weight of the halibut. Students make and test the tensile strength of halibut line made from traditional materials. As a culminating project, students make a traditional halibut hook designed to catch the largest halibut possible based upon the tensile strength of the rope they tested.
CULTURAL CONNECTIONS FOR STUDENTS

Haa Aaní: Honoring and Utilizing our Land

Our ancestors, who have lived in this land for more than 10,000 years, taught us that everything has a Spirit.

Our ancestors protected the ownership of our land for their children and grandchildren just as we must do for future generations.

We use knowledge and science to protect our land and resources.

VIDEO: Core Cultural Values, Haa Aani: https://vimeo.com/235431280

GUIDELINES FOR CULTURALLY RESPONSIVE TEACHING AND LEARNING

A. A culturally-responsive curriculum reinforces the integrity of the cultural knowledge that students bring with them.

3. Incorporates contemporary adaptations along with the historical and traditional aspects of the local culture;

4. Respects and validates knowledge that has been derived from a variety of cultural traditions.

B. A culturally-responsive curriculum recognizes cultural knowledge as part of a living and constantly adapting system that is grounded in the past, but continues to grow through the present and into the future.

1. Recognizes the contemporary validity of traditional cultural knowledge, values and beliefs, and grounds students in the principles and practices associated with that knowledge;

2. Provides students with an understanding of the dynamics of cultural systems as they change over time, and as they are impacted by external forces.

C. A culturally-responsive curriculum uses the local language and cultural knowledge as a foundation for the rest of the curriculum.

2. Recognizes the depth of knowledge that is associated with the long inhabitation of a particular place and utilizes the study of “place” as a basis for the comparative analysis of contemporary social, political and economic systems;

5. Treats local cultural knowledge as a means to acquire the conventional curriculum content as outlined in state
standards, as well as an end in itself;

6. Makes appropriate use of modern tools and technology to help document and transmit traditional cultural knowledge.

D. A culturally-responsive curriculum fosters a complementary relationship across knowledge derived from diverse knowledge systems.

1. Draws parallels between knowledge derived from oral tradition and that derived from books;

2. Engages students in the construction of new knowledge and understanding that contribute to an ever-expanding view of the world.

**ALASKA STATE STANDARDS**

**MATHEMATICS STANDARD**

Investigate patterns of association in bivariate data.

8.SP.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8.SP.2. Explain why straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

8.SP.4. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects and use relative frequencies to describe possible association between the two variables.

Use functions to model relationships between quantities.

8.F.5. Given a verbal description between two quantities, sketch a graph. Conversely, given a graph, describe a possible real-world example.

Apply geometric concepts in modeling situations.

G-MG.3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
UNIT OVERARCHING UNDERSTANDINGS

UNIT ENDURING UNDERSTANDINGS

Our ancestors possessed extraordinary technological skills, developed over thousands of years, which allowed them to live and thrive in the environment of Southeast Alaska.

Our ancestors developed various technologies, including highly advanced fishing technologies.

We can use measurements from one part of an object to indirectly measure another part of the same object if we know the relationship between the parts.

We can use mathematics to model real-life relationships.

Related misconceptions:

Our ancestors were primitive and had to learn Western ways in order to succeed.

UNIT ESSENTIAL QUESTIONS

• What fishing technologies did our Tlingit, Haida, and Tsimshian ancestors use to catch halibut?

• How did they construct hooks and line capable of catching and landing such large fish?

• What can we learn from the halibut hooks/lines in archival collections?

KNOWLEDGE

Students will know...

Key terms: variable, regression analysis, line of best fit, tensile strength, otolith, fork length.

• Students will describe the life history and importance of halibut.

• Students will state the weight of a halibut given the length: \[ W=0.00018872 \ L^{3.24} \] (W = weight in pounds, L = overall length).

• Students will state the standard length of a halibut given the head length: \[ L=3.7H \] (L = standard length, H = head length).
SKILLS

Students will...

- Measure the head length and thickness of jaw hinge.
- Create a table and graph from raw (length and weight) data.
- Derive the equation for a line of best fit jaw hinge vs. weight.
- Calculate line of best fit.
- Predict the size of halibut a traditional hook can catch based on specific measurements.
- Construct a wood and bone halibut hook to target specific sizes of halibut.
- Make cedar bark rope/twine and calculate the tensile strength.

TRANSFER TASK(S) PERFORMANCE ASSESSMENTS

- Students will create a halibut hook and a sample of line – entirely from naturally occurring materials – engineered to catch a specific sized halibut (they wouldn’t make a hook to catch a 50-pound halibut with 10-pound tensile strength rope).
- Students will document their hook-line halibut rig with photos, journal entries, diagrams, measurements, and wisdom from their Elders to illustrate the engineering in the construction of their rig.
- Students will share their work products with teachers, Elders, parents, and other interested community members.
- Journal – record of learning:
  - Ladder of learning documenting initial ideas and reflecting growth in conceptual understanding as learning/experimentation progresses.
  - Diagram/plans for fish hooks
  - Diagrams/plans for rope construction
  - Photos of works in progress
  - Lab reports/results of experiments (tensile strength of rope)
  - Measurements of halibut mandibles from various sizes of halibut
- Student self assessment, daily reflections in journal:
  - What went well today?
  - What questions do I have?
  - What do I need to work on tomorrow?
- End of unit video reflection. Students show their hooks/line and share their learning.
DESIGN, CONSTRUCTION & USE OF TRADITIONAL HALIBUT HOOKS | OVERVIEW

LEARNING EXPERIENCES

LESSON PREPARATION

OVERVIEW

This unit is designed for students entering 6th, 7th, or 8th grades. The content focus of the curriculum will be math. Because the unit will focus on fishing, the best possible learning environment would be on a remote beach site that was historically used as a fishing site. As much as possible, the activities should take place outdoors.

INTRODUCTION TO UNIT


Show pictures of large halibut, traditional halibut hooks, lines, rigs; copies of Hillary Stewart’s *Indian Fishing*.

If possible, have an Elder or cultural specialist talk to students about halibut fishing and the importance of halibut to the people of Southeast Alaska – both historically and currently.

VIDEO: Sheldon Museum and Cultural Center, Tlingit Fishing, Halibut http://www.sheldonmuseum.org/Vignettes/tlingitfishing.htm

Halibut can reach gigantic proportions in local waters, sometimes reaching six feet in length and weighing over 400 pounds. To ensure a manageable size catch, Native fishermen devised a special halibut hook, which would only be taken by a 30-50 pound fish. A large fish could sink a canoe or severely injure the fisherman. Moreover, this medium range halibut was considered superior for drying.

The wooden halibut hook was a V-shaped affair with an obliquely set bone or steel barb. The wood was usually carved with symbolic figures, often heraldic or associated with the Shaman, such as the skeleton, devilfish, or land otter.

Hooks were usually baited with fish and lowered with a line of red cedar fiber, braided sinew or the strong stem of giant kelp.

Stone sinkers carried the line to the bottom and wooden floats carved in animal forms alerted the fishermen to a bite. The entire assembly was kept afloat with inflated bladders, allowing the fisherman to set several lines at once. Halibut were consumed fresh or dried.

Lead a discussion on traditional methods of catching halibut.
LESSONS

LESSON 1: INTRODUCTION TO THE PACIFIC HALIBUT

Use the IPHC lesson plan to introduce Pacific halibut. Download and present the PowerPoint using the included slide notes. Watch the video.

VIDEO: Pacific Halibut in the Ocean Ecosystem, International Pacific Halibut Commission YouTube: https://www.youtube.com/watch?v=i2rSP5kdsLU

This 11-minute video can serve as an introduction to the Pacific Halibut – lifecycle, basic facts – and shows underwater footage of halibut in natural environment.

Students work in groups to create posters:

- Spawning/early life history/life span
- Size range
- Habitat
- Food habits

Lesson Materials & Resources

- iPads or computers
- Poster paper/markers

LESSON 2: HALIBUT FISHERIES

Use the IPHC lesson 2 plan to discuss Pacific halibut fisheries. Download and present the PowerPoint using the included slide notes (only the first 13 slides). Lead a discussion building upon what students know about halibut fishing. This would be a great time to bring in a commercial or subsistence halibut fisherman to talk about her experiences, show photos, and show some actual fishing hooks/gear.

VIDEO: Many Halibut with a 37-inch Capture, IPHC YouTube: https://youtu.be/VHovJ9Ei5ck

This 4-minute video shows underwater footage of a 37-inch halibut investigating a baited hook (commercial C-hook), striking the bait, and being caught.

VIDEO: Halibut Hooking Location, IPHC YouTube: https://youtu.be/2GChmFGsydI

Most halibut caught on circle hooks are hooked in the corner of the jaw. Most of these halibut are hooked on the white side. This is the result of taking the bait and then swimming up and away. The gangion pulls along
the corner of the white-side jaw, and the fish is hooked (or sometimes not). Sometimes halibut are hooked in the corner of the dark-side jaw. This is the result of the bait being suspended or for some reason not lying on the bottom. When the halibut takes this hook, it then swims down and away, with the gangion pulling out of the dark-side corner of the jaw, resulting in a dark-side hooking.

**Lesson Materials & Resources**

- Download the IPHC lesson plans, PowerPoints, and other teacher resources here:
  [http://www.iphc.int/edu.html](http://www.iphc.int/edu.html)

**LESSON 3: INDIRECT MEASUREMENT**

Students record shoe size (convert all to men’s sizes) and height. Make a table and graph with height as the independent (x-axis) variable and shoe size as the dependent (y-axis) variable. Discuss: if we couldn’t see someone’s feet but could see how tall he or she was, could we make a good guess as to his or her shoe size? Vocabulary: x-axis, y-axis, graphing in quadrant I, line-of-best-fit, indirect measurement. Make connections between the shoe size vs. height graph/analysis and the halibut length vs. height data table. Graph the L/W data. Describe the shape of the graph. (Positive or negative? Linear or non-linear? Etc.)

Line of best fit: This activity allows the user to enter a set of data, plot the data on a coordinate grid, and determine the equation for a line of best fit. See [http://illuminations.nctm.org/Activity.aspx?id=4186](http://illuminations.nctm.org/Activity.aspx?id=4186)

**Lesson Materials & Resources**

- Graph paper or iPads
- Tide tables with halibut length/weight

**LESSON 4: HALIBUT HOOKS**

Students work in small groups to examine a wooden halibut hook. What are the critical measurements if you are going to carve a halibut hook? Make drawings in journal.

After making journal entries, watch the following video and study the drawings in *Indian Fishing* - make additional notes about how to construct the hook.

**VIDEO:** Native Halibut Hook (Haida)
[https://www.youtube.com/watch?v=9bLnAgQ_qV0](https://www.youtube.com/watch?v=9bLnAgQ_qV0)

This video shows a Haida fisherman/carver talking about the traditional halibut hook, how it works, how it can be designed to catch a medium sized halibut, and how the design is a precursor to the modern circle hook.
Explore the history of the Native halibut hook and its role in creating the modern day circle hook commonly used for halibut fishing.

**Lesson Materials & Resources**

- Collection of halibut hooks, circle hooks, twined cedar bark, bull kelp stipe (dried), carved wooden floats, buoy made from seal bladder (or photo)
- Rulers, calipers, journals, pencils
- Several copies of *Indian Fishing* by Hillary Stewart; SHI halibut hook measurement data, at least one traditional wooden halibut hook per group

**LESSON 5: COLLECTING DATA**

Students measure the halibut head length and use the mathematical relationship to derive the overall length and weight of the fish. Students use a caliper to measure the jaw hinge thickness and make a table and graph correlating the jaw hinge thickness (y-axis) to the weight of the halibut (x-axis).

**VIDEO:** Halibut hooking behavior, or, how halibut find and attack baited hooks, and often get hooked in the process.
http://www.iphc.int/research/biology/hook.html

Students examine at least 50 halibut heads and measure thickness of jaw hinge.

Measure head length. Students should work in teams with one person handling the fish and one person recording the data as measurements are taken.

Record data in journal.

After measuring the head length and thickness of the jaw hinge, students calculate the length of the fish according to the formula:

Length = 3.7 (Head Length). Then students complete the table using the guide comparing length to round weight (the weight of the fish with head and guts) or use the formula: \( W=0.00018872 \ L^{3.24} \) (W = weight in pounds, L = overall length)

**Lesson Materials & Resources**

- Tote of halibut heads, calipers, rubber gloves, Rite in the Rain paper/pens, tarps, garden hose and access to water spigot, meter sticks

**LESSON 6: MAKING CORDAGE**

**VIDEO:** Making cordage from cedar bark
https://www.youtube.com/watch?v=j2RYQGno_do
If possible have an Elder or cultural specialist demonstrate twining technique. Each student should make at least 24 inches of cedar bark cordage; imagine if they were attempting to make 20-30 fathoms (120-180 feet)! How long would that take?

Lesson Materials & Resources
- Cedar bark, Rubbermaid tubs for soaking, pocket knives
- Several copies of Cedar by Hillary Stewart

LESSON 7: TESTING TENSILE STRENGTH
Test the tensile strength of the sample of line. Each student should test their sample.

VIDEO: Fishing Knot Tensile Test Rig - with 3D Animation
https://www.youtube.com/watch?v=Yzyx9bwoGGo

Each student should record the breaking strength of the line. Compile all data and calculate the average breaking strength. Discuss any outliers. Based on the strength of the cordage, what is the maximum size halibut you should target? Based on the maximum size halibut you can land, how should you design your halibut hook? Make notes in your journal.

Lesson Materials & Resources
- Simple tensile strength rig (Construct this prior to use)

LESSON 8: MAKING HOOKS
Make halibut hooks: follow the plans in the halibut hook unit created by teacher Henry Hopkins. Have an experienced carver demonstrate and offer assistance as needed. This will take several class periods and perhaps extra time during the evenings.

Lesson Materials & Resources
- Alder, cedar, bone, twine, or spruce root

LESSON 9: VIDEO REFLECTIONS
Each student creates a 3-5 minute video describing the process of making their halibut hook and line and testing the line. Should include any reflections on the process.

During the culminating ceremony, students share their videos with their families and show off their halibut hooks!

Lesson Materials & Resources
- iPads
RESOURCES & MATERIALS

Alaska Department of Fish and Game, Pacific Halibut (*Hippoglossus stenolepis*) species profile:

International Pacific Halibut Commission. A collection of underwater video footage taken by the IPHC showing halibut in the field.
https://www.youtube.com/playlist?list=PLww0sbZpeo2eJGRvddE3K4w03GKiUp8ID


Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"
   Part 1: https://vimeo.com/197533673
   Part 2: https://vimeo.com/197536381
Lesson 1: Introduction to Pacific Halibut
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 1 (2 hours)

OVERVIEW
Students will be introduced to the species.

OBJECTIVES
Students will describe the life history and importance of the halibut.
  • Life history: spawning, larval, and juvenile stages, adulthood
  • Migration
  • Life span/Size range
  • Habitat
  • Food habits

LEARNING EXPERIENCES

ACTIVITIES
Display and discuss the PowerPoint presentation IPHC Lesson 1 (see Resources). Be sure to click on the video link in lesson 1 to see underwater video footage of halibut approaching a baited hook.

Distribute one copy of the Alaska Wildlife Note on halibut to every student. Students may also use iPads or computers to search the other resources listed to the right.
Divide class into groups of five. Assign each student in the group one of the five topics listed under the objectives; have students make a poster on their topic to teach the rest of their group about the topic.

**EVALUATION**


**RESOURCES & MATERIALS**

- iPads or computers
- Download the IPHC lesson plans, PowerPoints, and other teacher resources here: https://www.iphc.int/the-commission/outreach-and-education
- Poster paper/markers

**OTHER RESOURCES**


Alaska Department of Fish and Game, Pacific Halibut (*Hippoglossus stenolepis*) species profile http://www.adfg.alaska.gov/index.cfm?adfg=halibut.main


Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"
  - Part 1: https://vimeo.com/197533673
  - Part 2: https://vimeo.com/197536381
Pacific Halibut

The Pacific halibut (Hippoglossus stenolepis) was called “haly-butte” in Middle English, meaning the flatfish to be eaten on holy days.

**General description:** Halibut are more elongated than most flatfishes, the width being about one-third the length. Small scales are imbedded in the skin. Halibut have both eyes on their dark or upper side. The color on the dark side varies but tends to assume the coloration of the ocean bottom. The underside is lighter, appearing more like the sky from below. This color adaptation allows halibut to avoid detection by both prey and predator.

**Life history:** Spawning takes place during the winter months with the peak of activity occurring from December through February. Most spawning takes place off the edge of the continental shelf in deep waters of 200 to 300 fathoms. Male halibut become sexually mature at 7 or 8 years of age while females attain sexual maturity at 8 to 12 years. Females lay two to three million eggs annually, depending on the size of the fish. Fertilized eggs hatch after about fifteen days. Free-floating eggs and larvae float for up to six months and can be transported several hundred miles by North Pacific currents. During the free-floating stage, many changes take place in the young halibut, including the migration of the left eye to the right side of the fish. During this time the young halibut rise to the surface and are carried to shallower water by prevailing currents. In the shallower water, young halibut then begin life as bottom dwellers. Most young halibut ultimately spend from five to seven years in rich, shallow nursery grounds like the Bering Sea.

Young halibut, up to 10 years of age, are highly migratory and generally migrate in a clockwise direction east and south throughout the Gulf of Alaska. Halibut in the older age classes tend to be much less migratory. Older fish often use both shallow and deep waters over their annual cycle.

Research indicates that there may be small, localized spawning populations in deep waters such as in Chatham Strait in northern Southeast Alaska. However, because of the free-floating nature of eggs and larvae and subsequent mixing of juvenile halibut from throughout the Gulf of Alaska, there is only one known genetic stock of halibut in the northern Pacific.

Halibut growth rates vary depending on locations and habitat conditions, but females grow faster and live longer than males. The oldest recorded female was 42 years old whereas the oldest male was 27 years old. Halibut are the largest of all flatfish. The largest recorded sport caught halibut was 459 pounds near Unalaska in 1996.

**Food habits:** Being strong swimmers, halibut are able to eat a large variety of fishes including cod, turbot, pollock, and some invertebrates such as crab and shrimp. Sometimes halibut leave the ocean bottom to feed on pelagic fish such as sand lance and herring.

**Commercial fishing:** Commercial halibut fishing probably began in 1888 when three sailing ships from New England fished off the coast of Washington state. As the industry grew, company-owned steamers carrying several smaller dories, from which the fishing was actually conducted, dominated the halibut fishery. Subsequently, smaller boats of schooner design in the 60- to 100-foot class were used in the fishery. These boats carried crews of five to eight and were specifically designed for halibut fishing. Today, many types of boats are used in the halibut fishery. Most of the old-style halibut schooners have been replaced by more versatile craft that may also be used in commercial salmon seine, troll, gillnet, and crab fisheries.

Halibut gear consists of units of leaded ground line in 100 fathoms lengths referred to as “skates.” Each skate has approximately 100 hooks attached to it. "Gangens," or the lines to which the hooks are attached are either tied to or snapped onto the ground line. A “set” consists of one or more baited skates tied together and laid on the ocean bottom with anchors at each end. Each end has a float line with a buoy attached. Hooks are typically baited with frozen herring, octopus, or other fresh fish. Depending on the fishing ground, depth, time of year, and bait used, a set is fished 2 to 20 hours before being pulled. Longlines are normally pulled off the ocean floor by a hydraulic puller of some type. The halibut are cleaned soon after being boated and are kept on ice to retain freshness.

**Sport fishing:** Sport fishing for halibut in Alaska is a very popular activity, with over 65 percent of the effort and harvest occurring in Kachemak Bay, Southeast Alaska, the Kodiak area, and near the mouth of Deep Creek in Lower Cook Inlet.

Halibut taken by sport anglers are generally 15 to 20 pounds in weight, however, fish over 150 pounds are frequently caught. The current Alaska state record for a sport-caught halibut is 458 pounds, and a fish must weigh at least 250 pounds to qualify for the state’s trophy fish program. Anglers use stout saltwater fishing gear to harvest halibut. The effort and interest in catching these delicious fish is increasing each year. In Southeast Alaska, halibut are second only to king salmon in sport angler preference.

Halibut, along with salmon, provided subsistence for several Pacific Coast native groups. Much folklore is found concerning halibut. Each fish hook used by Alaska natives was carved with special designs to bring good luck and large fish. The halibut were smoked and dried for winter use.

Fishing for Pacific halibut is regulated by the International Pacific Halibut Commission. Members from the United States and Canada meet yearly to review research, check the progress of the commercial fishery, and make regulations for the next fishing season. The management of halibut fishing by this commission is intended to allow a maximum sustainable yield of halibut.

**Text:** Mike Bethers
**Illustration:** Ashley Dean
**Revised and reprinted 2007**

Alaska Wildlife Note on Pacific Halibut:
## Poster Session Rubric

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coverage of the Topic</strong></td>
<td>Details on the poster capture the important information about the topic and increase the audience’s understanding.</td>
<td>Details on the poster include important information but the audience may need more information to understand fully.</td>
<td>Details on the poster relate to the topic but are too general or incomplete. The audience needs more information to understand.</td>
<td>Details on the poster have little or nothing to do with main topic.</td>
</tr>
<tr>
<td><strong>Use of Graphics</strong></td>
<td>All graphics are related to the topic and make it easier to understand.</td>
<td>All graphics are related to the topic and most make it easier to understand.</td>
<td>All graphics relate to the topic.</td>
<td>Graphics do not relate to the topic.</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>Information is very organized with clear titles and subheadings.</td>
<td>Information is organized with titles and subheadings.</td>
<td>Information is organized, but titles and subheadings are missing or do not help the reader understand.</td>
<td>The information appears to be disorganized.</td>
</tr>
<tr>
<td><strong>Layout and Design</strong></td>
<td>All information on the poster is in focus and can be easily viewed and identified from 6 ft. away.</td>
<td>Most of the information on the poster is in focus and the content is easily viewed and identified from 6 ft. away.</td>
<td>Most of the information on the poster is in focus and the content is easily viewed and identified from 4 ft. away.</td>
<td>Much of the information on the poster is unclear or too small.</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td>All sources (information and graphics) are accurately documented.</td>
<td>All sources (information and graphics) are accurately documented, but there are a few errors in the format.</td>
<td>All sources (information and graphics) are documented, but information is incomplete or many are not in the desired format.</td>
<td>Some sources are not accurately documented.</td>
</tr>
<tr>
<td><strong>Mechanics</strong></td>
<td>No grammatical, spelling or punctuation errors.</td>
<td>Almost no grammatical, spelling or punctuation errors.</td>
<td>A few grammatical, spelling, or punctuation errors.</td>
<td>Many grammatical, spelling, or punctuation errors.</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>The presentation was the appropriate length. It did not seem hurried or too slow. The presenter spoke clearly and distinctly and established eye contact with the audience.</td>
<td>The presentation was the appropriate length but seemed slightly hurried or too slow. The presenter spoke clearly most of the time and established eye contact with the audience.</td>
<td>The presentation was the appropriate length but seemed very hurried or too slow. The presenter spoke clearly and distinctly only some of the time and/or established little eye contact with the audience.</td>
<td>The presentation was too long or too short. The presenter did not speak clearly most of the time and established little eye contact with the audience.</td>
</tr>
</tbody>
</table>

Poster Session Rubric:

www.sealaskaheritage.org
Lesson 2: Halibut Fisheries
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 2 (2 hours)

OVERVIEW
Introduction to the Pacific halibut fisheries.

OBJECTIVES
Students will compare and contrast commercial, subsistence, and sport fisheries.
LEARNING EXPERIENCES

ACTIVITIES

Set: “Have you ever caught a halibut?” Discuss.

Display and discuss the PowerPoint presentation IPHC Lesson 2 – the first 13 slides (see Resources). This video provides an overview of the various halibut fisheries.

If possible, invite a commercial fisher, a sport or charter fisher, and a subsistence fisher to share their stories of halibut fishing. Encourage guest presenters to bring a sample of their gear and photos to share.

“Share the pen” to create a Venn diagram comparing/contrasting the three main halibut fisheries. Be sure to allow time for students to share their personal halibut fishing stories.

Students make notes in their journals reflecting on the pros/cons of each halibut fishery. “If I were a halibut fisher, I would want to be a _________ because …”

EVALUATION

Teachers collect journals and read for student understanding of the three main halibut fisheries. Address misconceptions if evident.

RESOURCES & MATERIALS

- Overview of subsistence fishery: https://alaskafisheries.noaa.gov/sites/default/files/subsistence-halibut-overview.pdf
- Overview of sport fishery: https://alaskafisheries.noaa.gov/fisheries/sport-halibut
- Download the IPHC lesson plans, PowerPoints, and other teacher resources here: https://www.iphc.int/the-commission/outreach-and-education
- iPads or computers for student use
Lesson 3: Indirect Measurement
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 3 (2 hours)

OVERVIEW
Students measure height and compare to shoe size to illustrate the ability to predict height based upon shoe size and vice versa.

OBJECTIVES
Students will accurately and precisely measure heights of all class members. Students will construct a table and graph of data. Students will predict the height of a person of a known shoe size and vice versa.
LEARNING EXPERIENCES

ACTIVITIES

Set: Do tall people tend to have larger feet than short people? What size shoes does the world’s tallest man wear? Discuss.

Students measure height and length of foot (these measurements must be precise). Make a table and graph with height as the independent (x-axis) variable and foot length as the dependent (y-axis) variable. Relate foot length to shoe size.

Discuss: If we couldn’t see someone’s feet but could see how tall he or she was, could we make a good guess as to his or her shoe size?

Vocabulary: x-axis, y-axis, graphing in quadrant I, line-of-best-fit, indirect measurement.

Students sketch graphs in journals.

Make connections between the shoe size vs. height graph/analysis and the halibut length vs. height data table. Graph the L/W data. Describe the shape of the graph. (Positive or negative? Linear or non-linear?)

EVALUATION

Teachers collect journals and read for student understanding of indirect measurement. Address misconceptions if evident.

RESOURCES & MATERIALS

- Rulers, meter sticks, measuring tapes, calipers (to introduce how to measure using a caliper)
- Free online graph paper: https://incompetech.com/graphpaper/square.html
- Igor Vovkovinskiy stands 7 feet, 8 inches tall. He wears size 24 shoes (might use as the anticipatory set): https://www.youtube.com/watch?v=sMKIqoU9H6k
- iPads or computers for student use
- This data set shows us the differences between height and shoe size in a sample size of 199: http://www.statcrunch.com/5.0/viewreport.php?reportid=30241
- Image of ruler showing how to measure from the zero mark rather than the end: http://science.halleyhosting.com/sci/ibbio/inquiry/error/ruler4.jpg
Ruler Measurement

To measure accurately, start measuring from zero, not from the end of the ruler.

Shoe Size and Height Scatter Graph
Lesson 4: Wooden Halibut Hooks
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 4 (2 hours)

OVERVIEW
Students work in small groups to examine a traditional wooden halibut hook. What are the critical measurements if you are going to carve a halibut hook? Make drawings in journal.

OBJECTIVES
Students will discover, describe, and illustrate the design of a traditional halibut hook including:
- Length of each arm
- Angle made where arms meet
- Angle where barb meets upper arm
- Distance between tip of barb and lower arm
- Position where line is attached to lower arm
LEARNING EXPERIENCES

ACTIVITIES

Set: Show video of Haida fisherman/carver talking about the traditional halibut hook, how it works, and how it can be designed to catch a medium sized halibut.

VIDEO: https://www.youtube.com/watch?v=9bLnAgQ_qV0

Explore and measure halibut hooks; study pictures and drawings of hooks.

Make a plan for the construction of a halibut hook.

Halibut hooks at the Alaska State Museum. Photo by Chuck Smythe
EVALUATION

Students share their hook designs in small groups then each group shares one important design consideration with class. Chart all design considerations.

RESOURCES & MATERIALS

- Traditional wooden halibut hook video: https://www.youtube.com/watch?v=9bLnAgQ_qV0
- Halibut hooks, circle hooks, twined cedar bark, bull kelp stipe (dried), carved wooden floats, buoy made from seal bladder (or photo)
- Rulers, calipers, journals, pencils
- Several copies of Indian Fishing by Hilary Stewart; SHI halibut hook measurement data, at least one traditional wooden halibut hook per group

OTHER RESOURCES

Yá č’ídaγu aam čáatl dusyeegi at: A Tlingit, Haida, and Tsimshian Halibut Hook Sourcebook by Dr. Chuck Smythe, Sealaska Heritage Institute.

Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"

Part 1: https://vimeo.com/197533673
Part 2: https://vimeo.com/197536381
Lesson 5: Collecting Data
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 5 (2 hours)

OVERVIEW
Students measure halibut heads to refine design considerations for their halibut hooks.

OBJECTIVES
Students will describe the relationship between the thickness of a halibut’s jaw to its weight.
LEARNING EXPERIENCES

ACTIVITIES

Set: Halibut hooking behavior - or - how halibut find and attack baited hooks, and often get hooked in the process:

VIDEO: https://www.youtube.com/watch?v=6JYDiYng9b8&feature=youtu.be

Distribute halibut heads evenly between small groups of students.

Students will measure the head length for each halibut head at their table. See “Measuring Head Length” below.

Students will use the calipers to measure the thickness of the jaw hinge. See “Measuring the Thickness of the Jaw Hinge” below.

Collect jaw hinge thickness and weight data from each group and display it in an Excel spreadsheet. Generate a graph and manually add line of best fit. Can students predict hinge thickness for a given weight? Discuss.

Record notes in journal.

EVALUATION

Respond to prompt in journal: “I would expect a 40 pound halibut to have a jaw hinge thickness of _____ because …” Have volunteers share responses; discuss.

RESOURCES & MATERIALS

• Calipers and meter sticks
• Tote of at least 50 halibut heads
• Rubber gloves, plastic sheeting to cover desks
• Calculators
• Table: Halibut length and weight: http://www.iphc.int/publications/bulletins/lenwtimp.pdf

OTHER RESOURCES

This book can be read prior to handling the halibut heads to introduce students to the idea of respect for resources and all living things:

Recording Data in a Table

<table>
<thead>
<tr>
<th>Specimen Number</th>
<th>Head Length</th>
<th>Length: L = 3.7H</th>
<th>Weight (from table)</th>
<th>Thickness of Jaw Hinge</th>
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Measure head length and record in data table.

Multiply head length by 3.7 to determine the length of the halibut. Use the provided Halibut Length/Weight Chart to determine the weight of each halibut; record in a table.

Measuring the Thickness of the Jaw Hinge

Use calipers to measure the thickness of the jaw hinge. Record in the table. This measurement will be used to determine the correct gap between the barb of the hook and the lower arm of the hook.
### Halibut Length/Weight Chart (Imperial)

Length (inches), Net Weight (lbs, dressed, head-off, slime and ice deducted), Round Weight (lbs)

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<th>Net wt (lbs)</th>
<th>Round Wt (lbs)</th>
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Lesson 6: Making Cordage
Design, Construction & Use of Traditional Halibut Hooks

OVERVIEW

Introduction to the Pacific Halibut

OBJECTIVES

Students make 12-20 inches of cordage by twining strips of red cedar bark suitable for halibut line.
LEARNING EXPERIENCES

ACTIVITIES

Show the video: Making cordage from cedar bark

VIDEO: https://www.youtube.com/watch?v=j2RYQGno_do

Working in small groups, have an expert weaver demonstrate twining technique for making cordage.

Each student should make 12-20 inches of cordage for testing tensile strength.

EVALUATION

Students should end up with 12-20 inches of red cedar bark cordage thin enough to tie to halibut hook and thick enough to potentially catch a medium sized halibut.

RESOURCES & MATERIALS

- Cedar bark prepared in ½-inch strips
- Tubs of water for soaking
- Expert weaver to demonstrate

OTHER RESOURCES

Several copies of Cedar by Hilary Stewart

Yá ch’iagu aan cháatl dushyëgí at: A Tlingit, Haida, and Tsimshian Halibut Hook Sourcebook by Dr. Chuck Smythe, Sealaska Heritage Institute.

Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"
  
  Part 1: https://vimeo.com/197533673
  
  Part 2: https://vimeo.com/197536381
GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 7 (2 hours)

OVERVIEW
Students test the tensile strength of the red cedar bark cordage they twined using a spring scale.

OBJECTIVES
Students will make observations about the breaking strength of their cordage and adjust the designs of their hooks accordingly.
LEARNING EXPERIENCES

ACTIVITIES

Set: Fishing Knot Tensile Test Rig - with 3D Animation: https://www.youtube.com/watch?v=Yzyx9bwoGGo

Each student should record the breaking strength of the line. Compile all data and calculate the average breaking strength. Discuss any outliers. Based on the strength of the cordage, what is the maximum size halibut you should target? Based on the maximum size halibut you can land, how should you design your halibut hook? Make notes in your journal.

EVALUATION

Each student records the breaking strength of the cordage they twined in the previous lesson. Journal check.

RESOURCES & MATERIALS

- Fishing scale
- Simple device for testing tensile strength
- Journals

OTHER RESOURCES


Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"
  Part 1: https://vimeo.com/197533673
  Part 2: https://vimeo.com/197536381
Lesson 8: Making Hooks
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 8 (2 hours)

OVERVIEW
Making a two-part wooden halibut hook.

OBJECTIVES
Students will make a halibut hook to the specifications derived from the jaw hinge thickness and breaking strength of their cedar bark cordage.

The angle between the upper and lower arms of the halibut hook is traditionally measured with the thumb. Photo by Chuck Smythe
LEARNING EXPERIENCES

ACTIVITIES

The expert carver demonstrates how to make a halibut hook. Each step is shown using a document camera. Teachers and other assistants check student work and assist/answer questions. This may take several class periods.

EVALUATION

Successful completion of halibut hook.

RESOURCES & MATERIALS

- Expert carver to demonstrate step-by-step how to make a halibut hook (Donald Gregory).
- Pre-cut wooden blanks (yellow cedar) for each arm of the halibut hook
- Carving knives
- Band Aids
- Journals

OTHER RESOURCES

SHI Tlingit Halibut Hooks unit developed by Henry Hopkins and Caplan Anderson.

Yá ch’áagu aan cháatl dusyeegi at: A Tlingit, Haida, and Tsimshian Halibut Hook Sourcebook by Dr. Chuck Smythe, Sealaska Heritage Institute.

Video: Presentation by unit author Angie Lunda, "Understanding by Design: Tlingit and Haida Halibut Fishing Technologies"

Part 1: https://vimeo.com/197533673
Part 2: https://vimeo.com/197536381
Lesson 9: Video Reflections
Design, Construction & Use of Traditional Halibut Hooks

GENERAL UNIT DESCRIPTION

UNIT SUBJECT, GRADE LEVEL/AUDIENCE, LENGTH
Math/Science, Grades 6–8
Lesson 9 (2 hours)

OVERVIEW
Students reflect on what they have learned during the halibut hook unit.

OBJECTIVES
Students describe the process of making a halibut hook and line.
LEARNING EXPERIENCES

ACTIVITIES

Each student creates a 3-5 minute video describing the process of making their halibut hook and line and testing the line. Should include any reflections on the process.

During the culminating ceremony, students share their videos with their families and show off their halibut hooks!

How to shoot video with your iPhone or iPad

1. Launch the Camera app from the Home screen of your iPhone or iPad.
2. Swipe from left to right across the bottom to switch from Photo to Video mode. (Or just tap the word Video.)
3. Tap the Record button to start your video.
4. Tap the Stop button to end your video.

EVALUATION

Each student video includes:

- Description of the process of measuring the halibut, twining the cordage, testing the breaking strength
- Explanation of the size of halibut the hook is designed to catch
- Student reflections on the process

RESOURCES & MATERIALS

- iPads
- Journals
- Completed halibut hooks/lines