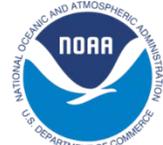


Fish Printing (Gyotaku)



Grade	4 th (could be scaffolded for all grades, K-12)
Time	35-45 minutes
Overview	Students use models of fish create gyotaku (fish prints), examine external structures of different fish, and infer the function(s) of each adaptation.
Objectives	<p><u>Understanding</u>: Students understand that adaptations help a fish succeed in its specific aquatic environment.</p> <p><u>Skills & Processes</u>: Students learn how to make readable fish prints with well-defined fish structures. They also learn how to identify the various structures & use rulers and calipers to take measurements of the structures including fins and body length, height, and width.</p> <p><u>Values</u>: Students gain appreciation for the diversity of fish and the specific aquatic habitats they inhabit.</p>
Essential Question	How do adaptations help organisms to survive in aquatic habitats?
Primary VA SOL	Science (2018): 4.1, 4.2
Related VA SOL	Math (2016): 4.8, 4.11

<u>Materials</u>	<u>Special Safety</u>
<ul style="list-style-type: none"> • Datasheet; 1/student • Laminated information sheet about each fish type (photo, fish & habitat description, food preferences) • Fish models to print (accurate to size); 1 fish/student • Rectangular piece of cardboard to hold the model while painting & printing; 1 piece/student • Paint brushes, preferably flat-tipped; 2/student (angled sponge brushes work very well) • Paint trays that hold 6 colors is ideal; 1 tray for every 2-3 students • Dry beaker at tables to hold brushes during painting; 1-2 beakers for up to 4 students • Beaker or cup for water to clean brushes after painting; 1 beaker/cup for every 2-3 students 	<p>Wear aprons or smocks to prevent staining clothes with paint.</p>

<ul style="list-style-type: none"> • Rice paper or other textured paper for the prints; 2-4 sheets/student (textured industrial paper towels work well & are inexpensive) • Tempera (easier to clean) or acrylic paints; at least 4 colors • Rulers with metric and U.S. Customary units • Calipers • Pencils • Reusable or disposable aprons; 1/student • Table coverings for each table (aim for reusable or recyclable) • Cloth towels (to clean up messes and to wipe brushes to dry cleaned fish models and to clean up messes) • Buckets (2) with warm slightly soapy water for washing the fish models once the prints are made • Sponges & small scrub brushes (for cleaning fish models) 	
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Set Up

Print datasheets for students. Cover tables (securing covers with tape is recommended). Prep each table with pencils, rulers, fish information sheets, paint brushes, paint trays, cardboard pieces, and beakers filled with water. Fill buckets for cleaning models with warm water & some dish soap.

(Alternate prep: Place all print-making items in an aluminum roasting pan or large plastic container. When ready for printing, distribute the paints, fish models, information sheet for the fish, and paper for printing.)

Instructional Strategy	
Recommended Grouping/Instructional style	Individual, hands-on activity
Steps	<ol style="list-style-type: none"> 1. Engage: Assess student knowledge about fish structures. Ask: <ol style="list-style-type: none"> a) What are some characteristics that fish have in common? Potential answers include fins, gills, scales b) What body parts does a fish use to swim? c) How are fish different from: mammals, insects, birds, frogs? d) Ask students to help you draw a fish on the white board. Ask students for descriptions of the various body parts and draw these on the board. Begin with fish body shape. Students should describe fins <ol style="list-style-type: none"> i. tail fin ii. dorsal fin—top of fish iii. ventral fins—bottom of fish; there should be one or two sets of ventral fins iv. a set of pectoral fins v. a set of anal fins vi. mouth vii. gills and/or gill covering viii. eyes.

	<p>ix. They may also mention scales although not all fish have these (such as catfish).</p> <p>e) Use this group created sketch to assess knowledge of fish structure and identify knowledge gaps. Leave the diagram on the board to help students label their fish prints.</p> <p>2. Explore: Each student makes one or two fish prints. One will be used to measure the body shape and external structures of their fish and to infer the function(s) of each external adaptation. The other print will be used in math class at school to identify and outline geometric shapes of their fish body and structures—make this print if teachers plan to engage their students in the mathematical analysis activity.</p> <p>a) Distribute one fish model, and one paper per student per print. Ask them to write their name in a corner of the paper.</p> <p>b) Make sure your fish is clean and dry before you start.</p> <p>c) Place the fish on the cardstock/cardboard</p> <p>d) Demonstrate how to paint the fish model and make the print. Points to stress:</p> <ol style="list-style-type: none"> i. You want your print to show the fish features; therefore, make sure you can see the features through your paint (don't glop the paint on the model). ii. Think about the color(s) you want to use before you begin painting. iii. Paint quickly because the paint could dry before you make your print. <p>e) Select your brush size, dip it into the desired paint color and lightly brush the color on the model, creating a light coating. Use the paint brush(es) to paint a THIN layer of paint over the fish, making sure to paint the body, mouth, eye, and all the fins.</p> <p>f) Optional: Students may select different colors to paint the various fish structures: fins, tail, eye, mouth, body.</p> <p>g) Position your paper above your model and position it BEFORE you place it so that your print will be centered. You can shift your paper, so the fish is facing a bit upward or downward to simulate movement.</p> <p>h) Once the paper is placed on top of the painted fish DON'T move it. Moving the paper will create a blurred print.</p> <p>i) Gently blot or pat the paper making sure that the paper touches all parts of the fish. Use fingers to pat the body sides and the fins, especially where the fins</p>
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meet the body. Make sure not to move the paper while blotting the fish.

- j) Gently peel the paper off the fish when you are finished rubbing: peeling it from one end to another works well. View your print. The paper will be wet so make sure not to smudge it.

3. **Optional:** Without adding more paint, make a second print. This print will be lighter than the first print. Select the better of the two prints for the next section of this activity. Save the second print for later; it will be used in math class.

4. **Explain:** Fish Print clarification and analysis

- a) Identify the various external body features of your fish displayed on your print and measure body length and height using a ruler and a caliper. Record measurements on your datasheet.
- b) Identify the types of fins your fish has. Count your fish's number of fins, including the tail fin.
- c) Measure the size of the tail, the fins on the top of the fish and the fins on the bottom. Make sure to measure length and width of each.
- d) Note the position of the fish eyes. (Are they on the side of the head or facing forward?)
- e) Describe the scales. Are they easy or difficult to see? Are they relatively small, large? What is their shape?
- f) Observe these physical characteristics and record these on your datasheet:

- i. Body shape
- ii. Eye placement
- iii. Tail fin shape and size
- iv. Top fin(s) shape and size
- v. Bottom fin(s) shape and size

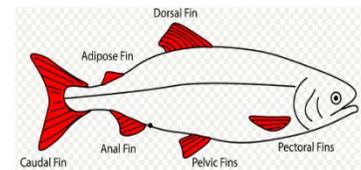


Image larger on datasheet

- g) Make inferences about the functional adaptations for each of the fish characteristics and record this on the datasheet.
- h) What type of aquatic habitat do you think your fish is adapted to and why do you think this?
- i) Consider the type of water body your fish might live in and WHERE in that water it might live: near the bottom, in the aquatic plants, near the surface, behind a rock, constantly swimming, etc.
- j) Do you think your fish is a prey, predator, or both? Why do you think this?

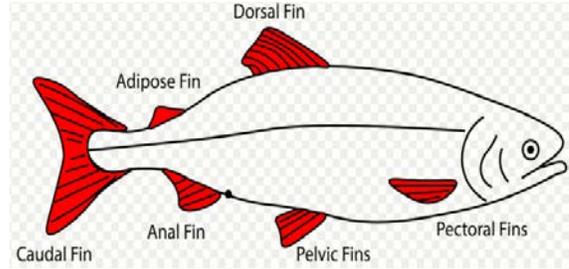
Extensions

- Fish Comparisons
 - Compare your fish characteristics with at least two other fish. Make inferences about the other fish:
 - Predator or prey?
 - Slow, moderate, or fast swimmer?
 - Optimal habitat: stream, river, pond, lake?
 - Lives near the bottom, mostly among the aquatic plants, near fast moving areas, etc.?
 - Research
 - Investigate the habitat where your fish is found and identify the typical color and color patterns (if any) of the fish for which you made a print. Explain how these colors and/or color pattern adaptations could help your fish survive in its habitat.
 - Create and color a sketch of your fish in its natural habitat. Does your fish blend in or stand out? What plants and other animals would you find in this habitat?
- Mathematics of Shape Math (2016) 4.11 (identify and compare geometric shapes)
 - Use your second fish print and visualize/generalize outlines of the geometric shapes for the fish's body and fins. Identify these shapes and sketch a geometric abstraction of your fish. Compare and contrast the geometric shapes of the different fins. How are they similar? Different?
- Gyotaku (Japanese fish printing) history. You Tube video, 3:37 minutes: https://youtu.be/k_mG-Ka4mv8 Excellent cartoon that Explains how gyotaku originated; its purpose, and how it came to be regarded as an art form. This video could be shown before or after students create their gyotaku prints.

Fish Adaptations Datasheet (Fish printing)

My name: _____

My fish is a _____



Mark an "X" by the box for each type of fin your fish has.

Type of fin	Does your fish have this fin? Mark with an "X"
Tail fin (back of the fish)	
Dorsal fin (at the top)	
Anal fin (on the bottom near the back)	
Pectoral fin (on the bottom in between the anal and pelvic fins)	
Pelvic fin (on the bottom near the front of the fish or on the side of the fish's body)	
Adipose fin (a special type of fin on the top of the fish near the back)	
TOTAL number of fin types	



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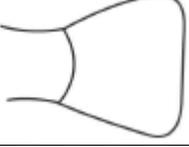
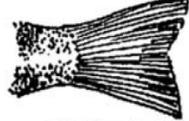
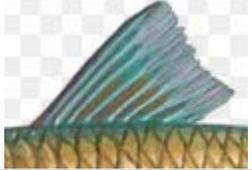
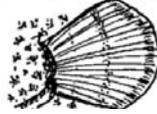
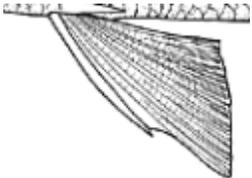
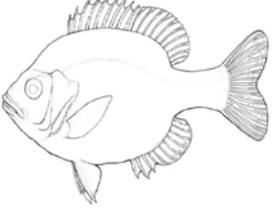
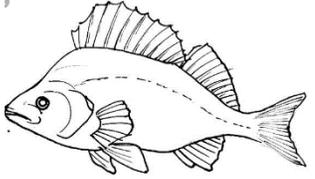
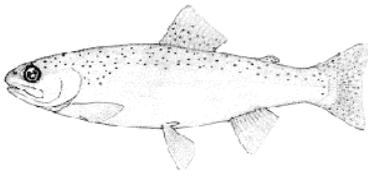
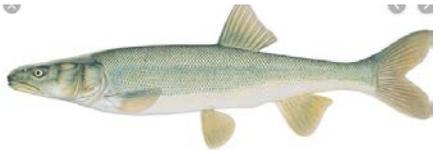


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Examples of fish blending into their different habitats

Fin Types and Body Shapes.

Circle the type of fins and body shape your fish has.

Feature	Slowest (1 pt)	Slow (2 pt)	Medium (3 pt)	Fast (4 pt)	Points
Tail Fin Main Power					
Dorsal Fin Keeps fish upright					
Pectoral Fin For turns & stops					
Body Shape					
Total Points					

Add up your fish's points and circle the total for your points.

4-5 = Very Slow 6-7 = Slow 8-9 = Medium 10-11 = Medium Fast 12-13 = Fast 14-15 = Very Fast 16 = Super Fast

How fast does your fish swim? _____

Fish Adaptations and Advantages.

Make inferences based on your fish's' features. Use the word bank for ideas.

Fish Feature & Word Bank	Feature/Adaptation	Survival Benefit
Use the word bank for ideas	What does your fish look like?	How does this feature help your fish survive where it lives? <u>Adaptations (to help survive):</u> Swimming speed Turning ability/steering Balance Hide/Blend in/Camouflage/Easily seen
Body shape Long/Short Narrow/Thin/Thick Oval/Rectangular/Round		
Color & Color patterns Dark/Light Spots/Stripes/Mottled Different colors on top & bottom		
Fins (look at the fin chart) Rounded/Forked/Triangular/Squarish Spiny/Smooth Long/Short/Tall Top/Bottom Near front/Middle/Near rear		

My Brook Trout Journal

What are some life needs for an adult Brook trout?

What is something you could do to improve an adult Brook trout's habitat?



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