

Gyotaku – Japanese Fish Printing

Key Concepts

1. Marine animals, such as fish, have physical features that indicate that they adapted to their environment.
2. The functions of marine animal body parts are related to their form and/or shape.
3. Much can be learned about the life history of an animal by observing its physical features.
4. Gyotaku is the Japanese art of fish printing used by ichthyologists to study fish.



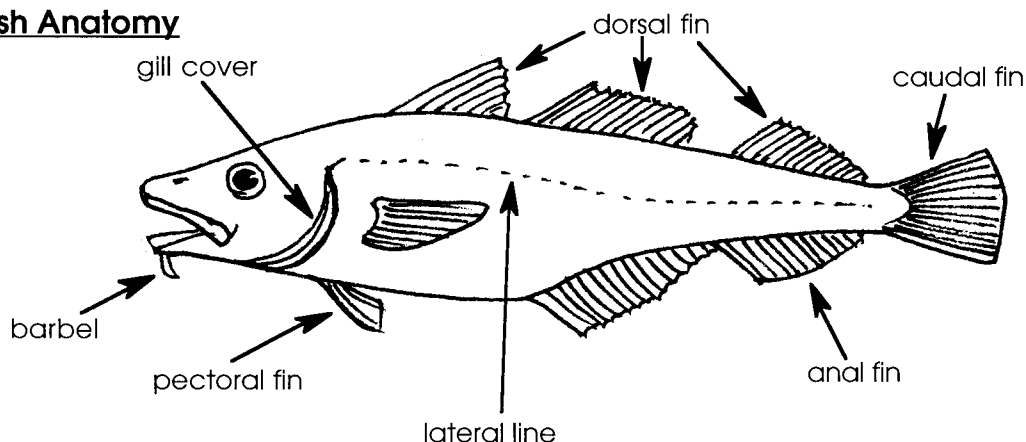
Background

For well over a century, Japanese have made prints from fish to record a sports catches and to document information about the fish. A well done fish print provides a valuable resource for future scientific study. Today, ichthyologists at various Japanese universities and at the University of Washington use fish prints to identify and to study different kinds (species) of fish.

Traditionally, fish printing is done with Sumi ink on rice paper or silk. Sumi ink consists of finely ground carbon particles suspended in a base similar to that of library paste. When available, octopus or squid ink is also used.

To help guarantee good printing results, it is useful to understand fish anatomy. A short lesson on fish anatomy follows.

Fish Anatomy



- 1. Fins:** Most fish have at least one dorsal fin, a caudal fin, an anal fin, a pair of pelvic fins, and a pair of pectoral fins. Often the first dorsal fin will have hard, sharp spines, while the other fins will have soft, flexible fin rays. The fin spines and rays are connected by a thin, fleshy material that readily collects excess mucus (and ink, during fish printing). For clear fish prints, the fleshy material should be carefully wiped off before and between prints. Some fish (trout and salmon) have a small fleshy adipose fin located between the dorsal and caudal fins. Depending on the fish species, fins may need to be propped up with modeling clay and pinned in place. This is especially true for the pelvic and anal fins and, sometimes, for the caudal.
- 2. Scales:** Fish scales vary in structure. Some kinds of scales make clearer prints than others. Fish such as perch and rockfish have hard, rough scales; their scales will turn out well in prints and these fish are easiest to work with. Sharks have sandpaper-like scales that are really modified teeth; they are difficult to print and require an extra thick coating of ink. Trout, salmon, and smelt have delicate “deciduous” scales that are difficult to print. Sometimes removing all scales and printing the “scale pocket,” the depression in which the scale lies, is best for these species.
- 3. Lateral line:** Most fish have at least one lateral line. The lateral line is a series of small organs used by the fish to sense turbulence and pressure changes. If you print carefully, the lateral line will be very striking in your prints.
- 4. Spines:** Many fish have spines around the head. Care is required to avoid being injured by the spines. These spines can poke through the paper. If properly printed, most of the fish’s spines will reproduce beautifully.
- 5. Mucus:** Fish secrete mucus from their bodies to protect themselves from parasites and disease and to help them “slip” through the water easily. The mucus tends to make a fish print less clear and dark in color. For this reason it is important to remove as much mucus as possible by washing the fish thoroughly. Mucus tends to collect on the fins, near the anus, gill cover, isthmus, and nostrils, and under the pectoral fins.
- 6. Body form:** Fish bodies vary greatly in shape. A flat flounder lies on the ocean bottom, while a round, bullet-shaped tuna needs to swim efficiently to capture prey. Usually, the flatter the fish, the easier it is to print.

Materials

For each group of 4 or 5 students:

- 1 very fresh fish
- newspaper to cover work surfaces
- one pound of plastic modeling clay
- approximately 50 straight pins
- 6 ounces of water-base ink or alternative ink/paint
- jars or containers for mixing ink and paints
- tap water for mixing ink and paints
- 1 stiff 1/2" brushes or ink brayers
- small artist's brush (optional for eyes, signatures)
- fish key from "Name that Fish", other fish keys and guides for identification

For each student:

- 3 sheets of rice paper, newsprint, or other moisture tolerant paper
- T-shirt or cotton cloth if you use fabric paint

Teaching Hints

Fish printing provides a hands-on opportunity to learn about fish anatomy through a highly tactile experience as students will be handling real fish. This activity complements the "Fins" and "Name That Fish" activities.

To help guarantee good printing results, it is useful to understand fish anatomy. Conversely, fish printing provides an excellent opportunity to share information with your students about form and function in fish. Refer to the "Background" section of this activity for a primer in fish anatomy.

This activity can be done in small groups with each group having a fish to identify, study, and print. It can also be done as a station or center activity. One adult might monitor a small group at the printing station while other students work on more self-directed activities from this unit.

You will need fresh fish that are easily obtained at most supermarkets. Select fish that have bright red gills, clear eyes, and a fresh smell. The fish may have a cut up the middle. Make sure that it has not been cut anywhere else on the body. Fish with rough scales, spiny rays, and a pronounced lateral line make the best and most dramatic prints. Rock fish and bottom fish are good ones to use. Smooth skinned fish like salmon and true cod do not print as well. Flounders print well but they are more delicate and do not hold up to excessive handling. Try to find fish that represent different habitats and adaptations.

Also try making prints from squid, herring, and shrimp. An octopus or octopus arm is exciting to print. Specialty seafood markets often offer exotic sea life.

One fresh, firm rock fish can be used to make 15 to 20 prints or more. Two of these fish would suffice for this activity but students will benefit from having several fish of different varieties, one for each small group. Fish can be frozen before printing and afterwards for use again.

Traditionally, fish printing is done with Sumi ink which consists of ground carbon particles in a base similar to that of library paste. The advantage of using Sumi ink is that the ink is non-toxic and that you can eat the fish after printing without concern. Sumi ink is available at most art stores. For beginning fish printers, thick water-based inks are easiest to use. Water-based linoleum block printing ink is an excellent ink. Black is traditional. It is a good color to work with, but you may want to try other colors.

Tempera paints work well and are more easily available than are some of the inks. Fabric paint can be used to make lasting prints on T-shirts and other cotton materials. It is non-toxic. If you buy primary colors, you or your students can mix many colors and shades. The mixing provides a good art experience. Dilute the paint with water so that it brushes onto the fish easily. For permanence, the paint needs to penetrate the fabric. However, if too much paint is used it will “bleed” and the print will not be crisp. Acrylic fabric paints are permanent after a 48-hour drying period. They do not need to be heat-set.

Gyotaku prints are traditionally made on rice paper or silk. They may be made on newsprint, tissue paper, cloth or any absorbent surface. Paper with some degree of flexibility works best since it fits the contours of the fish. Since rice paper is expensive, you might prefer to start with newsprint. Experiment with different papers and applications to achieve different effects. Since this can be a somewhat messy activity, be sure to cover desk tops with newspaper and provide paper towels for hands. Waxed paper is handy for covering paint smears on the table that might otherwise print with the fish. The paper can be torn into small pieces and the pieces reused. After painting the fish, a piece of waxed paper slipped under the tail is helpful and will prevent the paint from getting onto the tabletop.

Spread the ink or paint onto the fish from the head toward the tail. This helps keep the scales lined up and together. It also prevents paint from getting under the scales. For spreading the ink, paint brushes work well, although ink brayers, or rollers leave no trace of brush strokes. The eye is usually left unpainted during printing so that it will stand out by contrast when printed. Later it can be filled in or dotted if students wish. Signing the print is important. Encourage students to think of themselves as artists and to sign their art.

A good source of further information on Japanese fish printing is Leaflet 2548 “Gyotaku - Japanese Fish Printing” from California Sea Grant. The publication is available free of charge from: Extension Marine Resources Specialist, University of California, Davis, California. Art stores are another source of flyers about Gyotaku print making.

Key Words

biologists - scientists who study living things

characteristics - distinguishing features or attributes

gills - the breathing organs of many aquatic animals

gyotaku - (g-yo-tah-koo) Japanese fish printing

ichthyologist - a person who studies fish.

key out - to identify by characteristics using a chart

life history - the changes in an organism from birth to death

physical features - observable characteristics

prints - in this case, lines or image left by pressing an object onto paper

water-base ink - ink that can be mixed with water

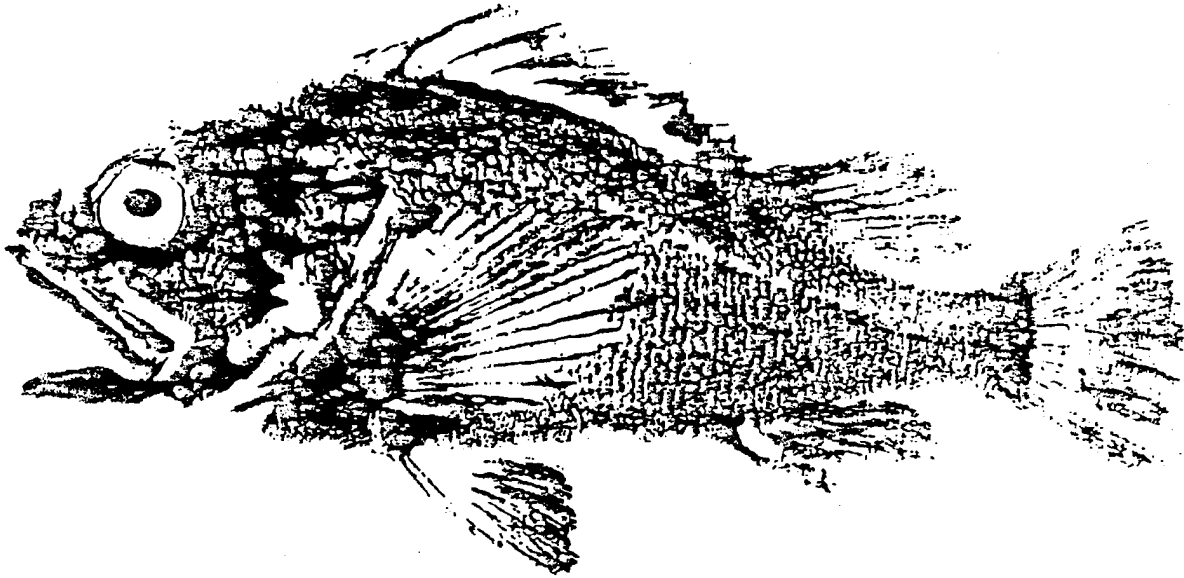
Extensions

1. Have your students measure the length of the fish they printed. Ask them to predict the **average** length of the fish print-images made from their fish. Have them check their predictions by measuring and determining the **average** length of the prints. Discuss results. Ask students why the results may have differed from their predictions. What are some precautions scientists must take when they use fish prints to study fish. Hint: prints are not always an accurate recreation of the actual specimen. Discuss the uses of averaging.
2. From observing the physical features of the fish, have your students make up a dichotomous key to separate the different fish printed.

Answer Key

Answers will vary depending upon the fish species used. This exercise is included to increase students' observation and inference skills.

Gyotaku – Japanese Fish Printing



For over a 100 years, Japanese have made prints from fish. The prints look exactly like the fish. They are works of art. The prints are used to record a sports fisher's catch.

The fish prints help scientists get information about fish, too. Scientists who study fish at the University of Washington have used fish prints. The fish prints help them identify and study different kinds of fish.

The art of Gyotaku (pronounced, g-yo-tah-koo) is a good way to gain an understanding of the beauty of marine animals. You can also use this technique for making prints of shells, rocks, flowers and other items.

STUDY YOUR FISH

Before you make your print, learn about your fish. Look it over and gently examine it. Use a book about fish to find out more. The following questions will help you understand more about your fish.

Physical Features of the Fish

You can write or make a drawing to answer the questions below.

1. What is the shape of your fish's body?

2. How do you think this body shape could help your fish to move and to protect itself?

3. Are there any spines on your fish? If so, describe them.

4. Are the scales rough or smooth? What shape are they?

5. How many fins are there and where are they located?

6. What is the shape of its mouth?

7. How do you think this shape helps the fish catch and eat its food?

8. Where are the eyes located? Are they on the top, same or opposite sides of the head, or low on the head?

9. What color(s) is/are your fish?

10. How do you think the color could help your fish?

11. What do you think your fish eats? Why do you think this?

12. What do you think eats your fish? Why do you think this?

Using A Fish Key

The next step is to identify your fish. Use fish keys and guides, or information from your teacher.

13. What kind of fish is your fish. Can you name it?

Habitat

14. Where do you think your fish lives? (Please circle your answer.)

bottom of the sea

mid water

surface

sand

rocky place

in sea plant beds (kelp, eelgrass, or other)

15. What clues about your fish causes you to choose this habitat?

16. Draw a picture of your fish's habitat.

CHALLENGE: write or draw the life history of this fish. A life history tells:

- where the eggs are laid
- how the eggs develop
- where the young fish spend their time
- where the adult fish spend their time
- when the adults spawn (reproduce), and
- how long the fish usually lives.

Use what you have found out already. Make guesses or look in books and magazines.

MAKE A GYOTAKU FISH PRINT

Now that you know something about your fish, here's how to make a Gyotaku print.

Here's what you'll need to make your own fish prints:

- a very fresh fish
- newspaper
- plastic modeling clay
- straight pins
- water-base ink or paint
- a stiff 1/2" brush or ink roller
- rice paper, newsprint, or other paper, or cloth
- paper towels, sponges or rags for cleaning

1. Use soap and water to clean the outside of the fish as completely as possible. The cleaner the fish, the better the print. Be very gentle so you don't break spines or loosen scales. Dry the fish well. Gently pat it with a paper towel. **Avoid rubbing it.**
2. Place the fish on a table covered with newspapers. Spread the fins out over some clay. Use pins to hold them in this position. Continue to dry the fish.
3. Brush on a thin, even coat of ink. **Important: Brush in one direction from head to tail.** Leave the eye unpainted for now. Later you can paint it in on the paper if you like. Carefully blot up any excess ink or paint that smears on the table. Blot up any paint that forms "pools" on the fish. You can cover big smears with pieces of waxed paper so they won't print onto your paper. Reuse the waxed paper when making other prints.

4. Carefully lay a piece of newsprint or rice paper over the top of the entire fish.
5. Use your fingers to gently press the paper over the surface area of the fish. Be careful not to move the paper too much because this results in making double prints.
6. Carefully remove the paper. Start at the head and peel it backwards, towards the tail. Soon you will see your fish print on the paper!
7. Use a small brush to sign your print. Paint the eye if you like. Hang up the print to dry.
8. Are you using non-toxic paint or ink? If so, wash off the fish and prepare it for dinner!