



Fish Features and Habitats

Lawrence Hall of Science

This activity outline was developed for use in a variety of informal venues. By design, it provides the content, pedagogy and strategy necessary for implementation by both the novice and experienced informal educator. It is expected that this outline will be adapted and improved upon by the user. We welcome your feedback!

Synopsis of the Activity

Learners observe fish behavior while paying close attention to body structures (including tail shape, body shape, and mouth shape and position). Using those observations, they try to make generalizations about what different body structures may indicate about fish behavior and habitat. Based on their generalizations, learners make predictions about the behavior and habitats of new fish.

Audience

This activity is meant for a general audience and works best with a group of 2-5 with one or two facilitators. Learners over the age of 8 will probably be the most successful with all of the concepts addressed here. However, younger learners also get a lot out of the activity—especially when they sort the fish.

Setting

This activity can be conducted anywhere on the ISEI floor where you can display fish in a few small observation tanks. This activity would also work well in front of a large aquarium exhibit.

Activity Goals

- To engage the learner to think about fishes as if they were a biologist studying them.
- Through observations of body structure and coloration, the learners will draw some conclusions about the fish's behavior and habitat (especially its movement, what it eats, strategies for defense, and where it lives).
- To encourage learners to ask questions and discover that they can make observations and gather evidence to make explanations.

Concepts

- Investigating the observable structures and behaviors of fish can provide a lot of information about how the fish lives and moves in its habitat.
- Biologists can make predictions about fish's behaviors and habitat based on their tails, bodies, mouths and coloration.
- There is a connection between body structures and their function.

Ocean Literacy Principles

Principle 5: The ocean supports a great diversity of life and ecosystems.

5.c. Some major groups are found exclusively in the ocean. The diversity of major groups

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of organisms is much greater in the ocean than on land.

5.e. The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. Most of the living space on Earth is in the ocean.

Materials

- 1 transparent tank per fish species. This activity seems to work best with at least 5-7 species. Try to get fish with a variety of mouth, body, and tail shapes if possible. (If you have a large aquarium exhibit to set up in front of, you may still want small tanks so that visitors can begin with a focused observation—this is especially useful for younger visitors.)
- If you are doing this activity in front of a large tank, provide pictures of the fish in the tank you are observing for sorting purposes (especially for younger learners)
- Laminated pictures of other fish with a variety of tail, body and mouth shapes as well as coloration patterns
- A table that allows all fish species to be viewed simultaneously
- Color photographs of the habitats for each of the fish species you choose
- Appropriate food for each species
- Paper, crayons or markers, and possibly clipboards
- Optional: Fish wheel materials (See COSIA Activity – Fish Wheels)

Prep Section

Collect fish

Collect appropriate food for each fish species

Find out a bit about each fish species, but it is ok not to know everything about it.

Be prepared, but be ready to discover (or rediscover) some things along with the visitor.

Know where each fish species you plan to use comes from (habitat) so that you can direct visitors to the appropriate pictures of habitat for further investigation of the fish's adaptations.

Procedure and set up

- Collect fish and observation tanks. If a fish species usually spends time in small schools, put a few individuals together in the observation tank.
- Set observation tanks up on a cart or table. Make sure there is enough room for visitors to view all of the fish at once. This may limit the number of observation tanks you choose to have.
- Set out pictures of habitats next to the observation tanks containing the fish species that live in those habitats.
- Set out pictures of other fish species not present in the observation tanks.
- Set out pictures of fish species in your observation tank if you are setting up in front of a big tank.
- Feed fish as visitors approach observation tanks so that they can observe feeding behavior.
- Set up a place on the table, close by or on clipboards to allow visitors to draw features of the fish's body.

Guiding Questions

The questions used by the facilitator are the key to this activity. The intent of the questions is not to barrage the learner with one after another or to get them to respond with a known (or unknown) fact, but rather to engage them in observing the fish and generating their own generalizations. Through this process they will have first hand experience with the fish and start to develop an understanding of the predictive nature of different fish body structures.

Below there are examples of guiding questions to focus the learner on different aspects of fish body structures. In the first part the questions are broken up into two groups, initiating questions and follow-up questions. Often facilitating the observation of the fish can be achieved by pairing an initiating question with one or more follow up questions. The order of these questions is not necessarily a suggested order. If a particular fish or attribute of the fish attracts a visitor, don't start the conversation with "Have you seen any of these before?" Rather focus on the interest of the learner and let the conversation flow from there.

Initiating Questions:

- Have you seen any of these before? Where did you see it?
- What is it doing?
- Do any of the fish look the same? How are these fish the same/different?
- What do you notice about its body/tail/mouth position?
- How do you think it protects itself?
- What do you notice about how it's eating?

Follow up questions:

- What makes you think that?
- What's your evidence?
- How might you test that?
- Do you notice any similarities between this organism and the others in the tank?
- How are they different?
- How can you tell?

Activity Description

Invitation

Introduce yourself and invite visitors to come over and take a look at some of the fish. Notice what the visitors are interested in and facilitate a conversation based on their interests. Color, shape, movement and feeding behavior of the fish are organized into separate sections below so that the facilitator can play off the interests of the visitor. Some questions to ask to start the conversation include:

- "Are you interested in fish?"
- "Do you have a fish tank at home?"
- "Hey, what do you think it is doing?"
- "What do you notice about these fish?"
- "Did you have a chance to see it eat something?"

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Encourage the learners to get right up close to the fish and make observations to share with everyone else. You might try: let's see if everyone can come up with something different they notice about the fish.

Diversity of Fishes

“How are all these fish the same?”

“In what ways are they different from each other?”

“Which fish looks the most interesting to you? Why? What makes it interesting?”

“Do any of the other fish have that same feature?”

“How many different tail shapes can you find?”

“How many different mouths (or body shapes or colors and patterns) can you find?”

Body Parts of Fish

“What do you notice about the mouths (or tails or shape) of the fish?”

“Can you find another fish with that same shape of mouth (or tail or body)?”

Tail Shape and Body Shape

“How would you describe the shape of the tail (or body)?”

“How would you describe the tail (or body) shape on the fish that seems to swim the fastest?”

“Which ones are moving slowly?” “How would you describe their tail (or body) shape?”

Sometimes it helps to give younger visitors choices or let them draw the shape—does it look more like a V? (make a v-shape with your fingers) or more rounded or square? (hold out your whole hand with fingers together to demonstrate shape). Have the learner show you which one they think it is with their hands. Ask them to find other fish with a tail with that same shape.

Sorting Activity

Encourage the learner to sort the fish by tail, body, or mouth shape.

“Do any of the fish here have the same tail (or body or mouth) shapes as each other?”

You might move the observation tanks next to each other as the learner sorts the fish by tail or body shape. You can then ask the learner what they notice about the groups of fish.

“Do the fish with the v-shaped tails or the rounded/square tails swim faster?”

“Do the fish with the torpedo-shaped bodies or the pancake-shaped bodies swim faster?”

Mouth Shape and Eating

“How is this fish catching and eating its food? Let's watch this fish eat and see what it does.”

What does its mouth look like?

How do you think that type of mouth might help it to catch food?

What type of food do you think it eats with that kind of mouth?”

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For younger visitors you might reference other animals that they may have experience with, “What is a shark’s mouth like? What do they eat? How do you think they eat?” If you’re set up in front of a large aquarium, you can give younger learners pictures of the fish in the tank to sort as they notice similarities within the large aquarium display

Coloration Patterns

If visitors notice coloration of the fish, ask them some of these guiding questions:

What do you find interesting about the color or pattern?

Do you think this type of coloration might help the fish survive in its habitat?

How might it help? What makes you think that?

Show the visitors some pictures of the fish in its habitat.

Do these pictures seem to support your ideas about the color and where it lives?

Why or why not?

Is there anything else you notice in the picture?

How could you be more sure about the ways that the coloration pattern might help it to survive in its habitat?

Is there something we could try here in the observation tank to test your ideas?

Application and Generalizing

Show visitors pictures of other fish not in your display area. You might ask some of the following guiding questions:

“Which of these fish do you think might swim the fastest?”

“What makes you think that?”

“What do you think this fish might eat?”

“What makes you think that?”

“Where do you think this fish might spend most of its time?”

“What makes you think that?”

What could you say about the color pattern on a fish and where it might live?

“What would you say about the shape of a fish’s tail (or body) and how fast it swims?”

You might tell the visitors that biologists make these same type of observations about fish features and use their observations to make predictions about where fish live and whether they are fast or slow swimmers.

After visitors have participated in the activity for several minutes, have them tell a newcomer what they observed and what they are thinking about. Encourage them to engage with each other.

If you’re at an aquarium, challenge the visitors to use the new information they’ve gained from their fish observations to make new observations and draw conclusions about the behaviors and habitats of other fish in the aquarium. You might also supply them with the Fish Wheels pattern (see Fish Wheels activity) and have learners make their own fish wheel to take away and use when observing other fish in the aquarium. Encourage them to come back to tell you what they discovered.

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Suggest that visitors keep their observations in mind the next time they visit an aquarium or friend's house and observe their pet fish.

Example Interaction between a docent and a group of visitors:

Visitors and docent are observing a fish with a forked tail (e.g., a bala shark). They've already noticed the v-shape of the tail.

Docent: How do you think the v-shaped tail might be useful for the fish?

Visitor 1: It looks like it's swimming kind of fast.

Docent: Are there other fish with v-shaped tails that are swimming fast?

Visitor 1: Yeah, these two have v-shaped tails, too (points to tiger barbs and some feeder fish). They're all swimming pretty quickly.

Docent: Did anyone else notice that?

A few visitors nod.

Visitor 2: Look, these other fish that don't have v-shaped tails (makes a non v-shape with hand) are swimming a little slower.

Docent: Do you think the tail shapes can tell us anything about how the fish may move?

Visitor 2: Well, it seems like fish with v-shaped tails swim faster than fish with more round tails.

Docent: Let's watch the fish for a little while and see if our theory holds up. Is there anything else you notice that might determine how the fish swim?

Notes:

Role of educator:

- Try to adopt the role of “guide on the side” rather than “sage on the stage.” Rather than simply imparting information, be a facilitator of learning and co-investigator, seeking evidence and explanations alongside the visitors.
- Engage visitors in investigating fish themselves.
- Invite visitors to come over and look at the fish in the tank and then engage them in a discussion of the fish and their body structures and behaviors.

Questioning:

- Try to ask more broad questions with multiple possible responses that encourage higher level thinking, rather than focused questions with single answers.
- Care needs to be taken not to badger the visitors with questions. Give room for exploration and for visitors to make observations, think, wonder and discuss amongst themselves.

Related Activities/Extensions/Modifications

- Make a fish wheel to use throughout the rest of the aquarium (see Fish Wheels activity).
- Design a fish to live in a habitat that you create. Remember to include all the adaptations for survival that it needs.
- http://www.mbayaq.org/lc/teachers_place/activity_fish_mystery.asp
- http://www.sheddaquarium.org/sea/interactive_module.cfm?id=7#
- <http://sv.berkeley.edu/showcase/flash/fish.html>

Background

Fish are one of the most successful of the groups of animals with backbones—the vertebrates—and consist of over 50% of all the living vertebrate species. In addition to being one of the most numerous groups, they are also among the most diverse. The incredible variety of forms and behavioral adaptations for survival seen in fish are a reflection of the complex and diverse habitats available to them in their ocean and freshwater homes.

The tremendous diversity in fish is the result of numerous adaptations since fish first evolved over 500 million years ago. The interplay of these adaptations has shaped fish in countless ways, but each form or shape has evolved to allow fish to successfully feed, swim, escape predators, and reproduce in their habitat. These adaptations can be grouped into categories of size, shape of body and tail, coloration patterns, location of mouth and size of teeth and gill rakers. Close observation of these fish adaptations can lead to predictions about their behavior and choice of habitat within ocean or freshwater environments.

The shape and position of fish fins are related to their body shape and the location of the center of buoyancy of the fish. The differences between fish in their fin shape and location are adaptations for their habitat and behaviors and are reflected in their locomotion and maneuvering abilities. For example, the lower part of the tail fin in bottom dwellers such as rays is usually reduced, but it is enlarged in the flying fish, which may use it to help them jump out of the water. Other examples of adaptations include the dorsal fin of remoras, which is modified as a sucker to allow it to hitchhike on sharks, and the dorsal fin of anglerfishes, which attracts prey to its large mouth.

Fish usually have the streamlined—or fusiform—shape, which is very efficient in the water, but they do show a great range of departures from this typical shape. Each of these departures is an adaptation to a specific way of life, which puts a premium on something other than fast swimming.

Vocabulary

Fish: animals that are typically cold-blooded, covered with scales, and equipped with two sets of paired fins and several unpaired fins. However, some species of fish are lacking one aspect of this definition (e.g., eels have no fins and clingfish have no scales). Fish are abundant in the sea and in fresh water, with species being known from mountain streams (e.g., trout) as well as in the deepest depths of the ocean (e.g., gulpers and anglerfish).

Habitat: a place that has all of the necessities for an organism to live, grow, and reproduce (e.g., food, water, air, shelter)