

Activity Title: Fish Tales

Learning Objectives

1. To develop an understanding that every ocean habitat poses unique challenges to the organisms that live there.
2. To introduce/reinforce the concepts of morphology and adaptation i.e. how organisms have developed specific characteristics to promote survival.
3. To enhance awareness that organisms from the same habitats can develop similar morphologies to cope with common challenges.

Ocean Literacy Principles

#5 -- The ocean supports a great diversity of life and ecosystems (sub categories a,b,d,e,f,g,h and i)

National Science Standards and Benchmarks:

U. Unifying Concepts and Processes	A. Science as Inquiry	C. Life Science
E.U.1 Systems, order, and organization	E.A.1 Abilities necessary to do scientific inquiry	E.C.1 Characteristics of organisms
E.U.3 Change, constancy, and measurement		E.C.3 Organisms and environment
E.U.4 Evolution and equilibrium	E.A.2 Understandings about scientific inquiry	
E.U.5 Form and function		

Supplies and Materials

Pictures/Power Point presentation of fish from different habitats

- Chart papers or white board for student discussion
- Posters of different habitats
- Assessment worksheet
- Arts and crafts materials, e.g., Pre-cut shapes from construction paper (Circles, Triangles, Squares and Rectangle of different sizes), Pipe cleaners, Glue, Scissors, Color Markers

Background

Understanding how organisms adapt to their environments are key areas of research for biologists and ecologists. This activity encourages student to reflect on the selective pressures that organisms experience and reinforces their understanding by applying the concept to novel environments

Duration

1 hour in a formal classroom setting; 15 – 30 minutes in an informal setting

Audience

The activity can be adapted for audiences ranging from grade 1 to 6. It was originally designed for

the 5th grade level.

Procedure

The activity is designed in accordance with the learning cycle; divided into 4 sections. The duration for each section is noted in the parentheses () as applied to a formal classroom setting.

Engagement/ invitation (10 min)

Goal: To generate interest in fish morphologies through observations and by drawing upon students' previous knowledge on fishes and their habitats.

1. Divide students into small groups (groups of 3-6) and show them pictures of fish that live in one of the four assigned habitats, namely: coral reef, sandy bottom, rocky intertidal and the open ocean.
2. Students will study the images and individually make a —quick sketch of one of the fishes they have observed. Students should come up with three descriptive words for the fish.
3. As a group, students discuss each of their descriptors and list the most common. The instructor interacts with each group by asking them questions to focus their attention on fish morphologies and functions. Some questions that can be used include:
 - Have you noticed that fishes come in different size and shapes?
 - Have you noticed that fish from different habitats do not look the same?
 - Did you notice similarities among the fish that live in the same habitat?

Exploration: (10 min)

Goal: To explore the different morphological adaptations of fishes and make suggestions on the functional role of these adaptations.

1. Each group will share their assigned habitat and the descriptors they came up with. During their presentation, slides are projected so the entire class has an opportunity to see the diversity of fish among the habitats.
2. Lead a discussion on similarities and differences in morphological traits among fishes and make predictions/speculations on the functions they serve with regards to their habitat.
3. Some questions that can be used to guide the discussion include:
 - What are the similarities between the fishes that live in the same habitat?
 - Why might fishes from the same habitat share similar features?
 - Why do you think fishes that live in different habitats look different from each other?
 - Have you ever seen a salmon living in coral reef? Why not?
 - Do you think that a flat fish could survive in the open ocean?
4. Note students' suggestions on chart paper.

Concept introduction: (10 min)

Goal: To introduce the concepts that all habitats pose challenges to the organisms that live there and that those organism have developed special morphologies to survive.

1. Introduce and define key vocabularies: morphology and adaption.

2. Present the learning objectives using lead in questions such as:

- How does a flat body help a fish to survive in a sandy bottom?
- Why do you think that being brightly colored might help a coral reef fish to survive?

Application (30min):

Goal: To encourage students to apply the new concepts on morphological adaptations.

1. After learning about the challenges of different habitats and how organisms have developed special morphologies to cope with them, students are then invited to create/design their own fish that can survive in one of four new habitats introduced. Giant posters of the habitats, including: hydrothermal vents, wetlands, Arctic waters, and the kelp forest will be posted in the front of the classroom. For each habitat, some challenges will be listed on the board to guide students' thinking. (See panel below)

2. Each Student will make their own fish using the materials provided. Student should pay close attention to morphologies that will help their fish survive the habitat of their choice. The students will post their fish on the habitat posters and explain the unique characteristics.

3. To wrap up, show a few examples of some real-life fish that live in these habitats for comparison.

Habitats and challenges therein:



Hydrothermal vents: very high temperature near vent, high pressure, very cold further away from vents, total darkness, limited food



Arctic: cold, little light, little refuge (hiding places), lots of ice cover



Wetlands: muddy, constantly changing environment (temperature and salinity), high predation risk (bird), strong tidal influence (waters rush in and out)



Kelp forest: high light, a lot of competition, many predators, cold (temperate) waters

Assessment

Students' understanding can be assessed in both casually (oral presentation) and formally (worksheet).

The worksheet provided can be graded using the following rubric.

Score	Criteria
0	Neither morphological / behavioral characteristics nor adaptations were described (e.g. This fish lives in salt water.)
1	Student mentioned morphological/ behavioral characteristics without mentioning their adaptive values.
2	Student was able to describe morphological/ behavioral characteristics and liaise that to adaptation in some of the statements.
3	Clear explanation of the adaptive value of all morphological/ behavioral characteristics

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Fishy tales: a story of morphology and adaptation

Different habitats pose different challenges to their residents. Using the information below, design ONE fish that lives in ONE of the following habitats. Pay attention to its morphology (color, size, shape etc) and make sure it is well adapted to the environment.

Kelp Forest	Deep sea hydrothermal vents	Salt marsh	Arctic Ocean
<ul style="list-style-type: none">• High light• A lot of competition• Many predators• Cold (temperate) waters	<ul style="list-style-type: none">• very high temperature near vent• very cold further away from vents• high pressure• total darkness• limited food supply	<ul style="list-style-type: none">• Muddy• Constantly changing environment (temperature and salinity)• High predation (e.g. birds)• Strong tidal influence (waters rush in and out)	<ul style="list-style-type: none">• Cold• Little light during fall and winter• Little refuge (hiding places)• Lots of ice cover

Habitat chosen (Circle the habitat you have chosen for your fish):

1. Kelp forest
2. Deep sea hydrothermal vents
3. Salt marsh
4. Arctic ocean

Write three statements to explain why your fish is well adapted to the chosen habitat.







