Fins, Tails and Scales: Identifying Great Lakes Fish

4-H SCIENCE BLAST! IN THE CLASS

Key Concepts:

Learners will identify distinguishing characteristics of fish and use a dichotomous key to identify 10 common fish families. By observing and comparing these features, learners will discover that fish, like other living organisms, can be organized and classified into meaningful groups for identification and further study.

Grade Level: 3-7

Education Subject: Science

Success Indicator:

After completing this lesson, learners will be able to:

▸ Describe the physical characteristics (traits) of fish that help them survive in their environment.
▸ Name several distinguishing characteristics of Great Lakes fish.
▸ Describe how these characteristics help fish survive in their environment.
▸ Organize Great Lakes fish cards on the basis of the similarities and differences among fish species.
▸ Use a dichotomous key to identify 10 Great Lakes fish families.

Materials and Methods

Preparation Time: 30 minutes

Lesson Time: 30-60 minutes (may be spread over multiple days)

Space: Anywhere

Materials:

▸ Pencils or pens

Download and print the following handouts at (*http://4h.msue.msu.edu/4h/science_blast*). To access the most current materials, including assessment tools, see the FLOW website: *www.projectflow.us http://www.projectflow.us* .

▸ Great Lakes Fish Family Cards and Generic Fish Graphic
▸ Dichotomous Key: Great Lakes Fish Families
▸ Distinguishing Characteristics of Fish (one to two per group for each of two activities)

Background Information:

The Great Lakes region is home to more than 160 species of fish. A species consists of individuals that share the same gene pool.

These species belong to 28 major fish families. A family or group of different but closely related fish species can be identified using a taxonomic or classification system that helps to define fish species on the basis of common characteristics.

Learners may be most familiar with fish in the sunfish and bass family, cold-water species in the salmon and trout family, or some of the 62 species that make up the minnow family. Ancient or prehistoric fish species such as lake sturgeon and long-nose gar also inhabit waters of the Great Lakes region and possess distinctive attributes that have allowed them to survive for millions of years.

With the exception of some primitive species, most fish have common characteristics that include gills, scales, fins and bony skeletons. Some characteristics that differentiate fish include head shape and mouth orientation, fin type and location, and body shape and average adult size.

Color markings, such as vertical stripes or fin spots, may also help differentiate fish when used in combination with other factors, including geographic range.

Distinguishing characteristics can provide clues about where a species typically lives and what it eats. For example, fish in the sturgeon and sucker families have downward-oriented mouths (sometimes called

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This lesson is based on content from Fins, Tails and Scales: Identifying Great Lakes Fishes, a free online lesson from Fisheries Learning on the Web (FLOW), developed by Michigan Sea Grant College Program, see: www.miseagrant.umich.edu *http://www.miseagrant.umich.edu* .

Vocabulary:

Adipose fin: Small, fleshy fin. When present, the adipose fin is located between a fish's dorsal and caudal fins.

Anal fin: Fin located on a fish's underside behind the pelvic fins.

Barbels: "Whiskers" used by bottom-feeding fish to sense food.

Caudal fin: Tail fin.

Dichotomous key: Classification tool used to sort, organize and identify a collection of objects or living organisms. (Dichotomous: divided into two parts. Key: A systematic classification of the significant characteristics of the members of a group of organisms to facilitate identification and comparison.)

Dorsal fin: Large fin or fins on a fish's back that vary in shape and size and may be connected or separate.

Family: A taxonomic category ranking below an order and above a genus.

Fry: Newly hatched young after the yolk sac has been fully absorbed and the fish shifts from the bottom to swim freely and search for food.

Genus: Major subdivision of a family or subfamily in the classification of organisms, usually consisting of more than one species.

Ichthyologist: Scientist who studies fish.

Larval fish: The stage in a fish's life cycle just after hatching from an egg. A larval fish lives off a yolk sac attached to its body.

Pectoral fins: Side fins mainly used for direction or steering.

Pelvic fins: Paired fins located on the belly of a fish or under the pectoral fins.

Snout: Front part of a fish that includes the mouth.

Spawn: To deposit eggs; to produce offspring in large numbers.

Species: A fundamental category of taxonomic classification ranking after a genus and consisting of organisms capable of interbreeding.

Superior: Directed upward.

Terminal: Directed forward.

Ventral: Directed downward.

Yolk sac: A membranous sac attached to an embryo, providing early nourishment in the form of yolk. In many fish, the yolk sac is retained for a period after hatching.

ventral) that enable them to find food along a lake or stream bottom. Other traits such as fin shape and location can provide clues about whether a fish species is maybe a more maneuverable swimmer (e.g. sunfish and bass), powerful swimmer (e.g. pike), or even long distance swimmer (e.g. trout and salmon). (See the Distinguishing Characteristics of Fish handout.)

Dichotomous Keys

To correctly identify fish and classify newly discovered species, fisheries scientists use something called a *dichotomous key*, which is a classification tool used to sort, organize and identify a collection of objects or living organisms.

A dichotomous key is made up of a series of questions with two choices. Each choice leads to another question. The key can appear in narrative form (as numbered questions), graphically (resembling a flow chart), or as a combination of graphics and narrative. By making choices and progressing logically through the key, users follow a path that ends with the correct identification of the organism.

Dichotomous keys vary in their degree of specificity. In this lesson, a simplified key has been created that distinguishes 10 Great Lakes fish families. By using their knowledge of distinguishing characteristics, Learners use illustrations of fish to work through the key and make identifications. (See Dichotomous Key)

Instructions:

1. Discuss the importance of observing distinguishing characteristics of living organisms to classify and identify them.

2. Hold up the generic fish illustration. Explain that this is not a real fish but rather a composite showing a variety of physical traits. Point out the locations and names of the various fins and other special features such as barbels (a scientific term for the "whiskers" used by bottom-feeding fish to sense food) and adipose fin (a fleshy fin located behind the dorsal fin).

3. Arrange the learners in small working groups. Provide each group with the generic fish illustration and a set of Great Lakes Fish Family Cards. Explain that the species on the 12 cards belong to 10 Great Lakes fish families.

4. Ask the groups to sort the fish cards on the basis of any set of physical characteristics they choose or about which they have some prior knowledge. (This is an important step in drawing out learners' previous knowledge and creates motivation for them to learn more.)

5. Discuss the results. Ask: How did you sort the fish? What features did you look at? Was it easy or hard? As the discussion progresses, ask: Did anyone sort by tail shape, by presence of a barbel, by mouth shape or by fin shape or location? This way, the discussion becomes informative to learners about what features scientists consider important and informative to the teacher about learners' current knowledge. Collect the cards and the generic fish illustration from each group.

6. Explain that next the students will use a dichotomous key to sort and identify fish on the basis of the characteristics that ichthyologists, or fish scientists, view as important.

7. Divide the class into new small groups. Explain the need to use classification systems to organize living organisms. Introduce the concept of a dichotomous key. Emphasize that this system uses a set of logical steps based on distinguishing characteristics and results in the correct classification or identification of an organism.

8. Pass out a set of Great Lakes Fish Family Cards and a dichotomous key to each group. (The Distinguishing Characteristics of Fish sheet may be helpful for reference.) Remind learners that the species on the 12 cards belong to 10 Great Lakes fish families. Explain that each group will use the dichotomous key to identify the correct families of the fish on the cards. (The families are trout and salmon, pike, sturgeon, lamprey, sunfish and bass, perch, sucker, goby (invasive), catfish and freshwater cod.)

9. Using the set of fish family cards, have learners begin by selecting one fish and "keying it out" by answering the questions and following the arrows as indicated on the key. They should identify the correct fish family for each fish. As they identify each illustration, have them write the name of the family on a sticky note and label each card.

10. Review the results with the learners. Hold up the enlarged fish illustrations (labeled Teacher Master) and tell about each species, pointing out distinguishing characteristics and family. Did everyone correctly identify all fish families? Was it difficult to distinguish some of the characteristics? How else might some of the characteristics be described? Remind learners that these variations, or adaptations, help fish survive in their environment.

11. Explain that one limitation of a dichotomous key is that, like humans in a family, all fish of a given family or species do not look exactly alike. There will always be individual differences. Fisheries scientists often use many additional physical characteristics, such as scale counts, fin location and body depth — in combination with factors such as geographic distribution — to correctly identify fish.

Check for Understanding:

▸ Were the characteristics you first noticed on the fish the ones used to categorize them?

▸ Did categorizing these fish help you learn about Great Lakes fish? How many could you identify and name without using a key? Why might this be important?

▸ How would you teach someone about using a dichotomous key?

▸ How would you teach someone about identifying Great Lakes fish?

▸ What did you learn about making decisions?

▸ How could the things you learned today be used to help you in other situations?

▸ Give an example of a challenge you had and what you did to solve it.

Learn More:

Have learners develop a dichotomous key to categorize candy, shoes or any other group of objects.

Michigan Grade Level Content Expectations:

Grades 3-7: Communicate and present/defend findings of observations and investigations (S.IA.03.13, S.IA.04.13, S.IA.05.13, S.IA.06.13, S.IA.07.13).
Grade 3: Classify animals on the basis of observable physical characteristics (L.OL.03.42).
Grade 4: Identify individual differences (for example: color, leg length, size, wing size) in organisms of the same kind (L.EV.04.21); identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction (L.EV.04.22).
Grade 5: Explain that the traits of an individual are influenced by both the environment and the genetics of the individual (L.HE.05.11); describe the physical characteristics (traits) of organisms that help them survive in their environment (L.EV.05.12); relate degree of similarity in anatomical features to the classification of contemporary organisms L.EV.05.21).
Grade 6: List examples of populations, communities and ecosystems including the Great Lakes region (L.EC.06.11).

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