



NOAA Teacher at Sea Lesson Plan



A “Key” to Alaskan Fish ID

Subject (Focus/Topic):	Scientific Classification
Grade Level:	Grades 5-7
Average Learning Time:	Two 50-minute class periods
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Creation Date:	September 1, 2015

LESSON PLAN DESCRIPTION

Lesson Summary (Overview/Purpose)

Students will observe pictures of ten different Alaskan fish species and design a taxonomic (dichotomous) key that can be used to identify them.

Overall Concept (Big Idea/Essential Question)

Taxonomic keys are tools that scientists use in the field to identify organisms based on physical characteristics. By designing one, students will understand how to properly use a taxonomic key. This activity also requires students to make observations and apply knowledge of external fish anatomy.

Specific Concepts (Key Concepts)

- Scientists must closely observe an organism in order to accurately identify it by physical characteristics. It must be noted that internal features and/or genetic information is sometimes needed to identify a species.
- Two different tools scientists might use in the field to make a species identification are field guides and taxonomic keys.
- Field guides are portable books used to identify things in nature by illustrations or photographs.
- Taxonomic (or dichotomous) keys are a series of paired statements used to identify things in nature in which each step presents descriptions of two distinguishing characteristics, with a direction to another step in the key or a species identification.

Focus Questions (Specific Questions)

1. What are observable characteristics of fish that can be used for identification?
2. How can I use a taxonomic key as a classification tool?
3. How are taxonomic keys designed so that they can be used to identify organisms?

Objectives/Learning Goals

- Students will be able to design a taxonomic key using proper anatomic terms that can be used to identify ten specific Alaskan fish with 100% accuracy.
- Students will be able to use a taxonomic key to identify organisms with 100% accuracy.

Background Information

Before this lesson, students should review the external anatomy of fish, so that they use proper terminology in their taxonomic keys (dorsal fin, pectoral fin, caudal fin, etc.). Teacher may provide each group with an external anatomy diagram, if necessary. Teacher may need to provide or display materials describing the common anatomical features of fish and how they are located in slightly different areas depending on the fish. i.e.- dorsal fin is on the top or upper side of a roundfish but is on the side edge of flatfish. Pelvic fins are on the sides of roundfish but on the upper and lower sides of flatfish.

Common Misconceptions/Preconceptions

Most students have seen or used a field guide, but they are unfamiliar with taxonomic keys. When introduced to the keys, they often misuse them without instruction. Common mistakes include not beginning at the first step of the key or thinking they have to go to every step. A common misconception is that any fish that look similar at first glance are the same species.

Teaching Materials

Appended Resources (AR's)

Non-interactive, printed materials inserted into this document after the Lesson Plan Description.

- Activity Instructions (1 page)
- Taxonomic Key Template (1 page) – table to calculate classifications
- Selected Fish of Alaska Field Guide (3 pages) – photos of fish to be classified

Digital Resources (DR's)

Interactive, electronic files created by the Teacher-At-Sea to support this lesson.

- none

Physical Items

Items used in the classroom to facilitate learning, especially during activities:

- Pencil
- Notebook Paper
- Activity Instructions, Taxonomic Key Templates, and Selected Fish of Alaska Field Guides

Technical Requirements

Any connectivity, software, hardware, or A/V equipment needed to teach this lesson:

- computer and projector to project fish images in order to test student keys
- computers with internet access

Teacher Preparation

Make photocopies (one set per group) of the Activity Instructions, Taxonomic Key Templates, and Selected Fish of Alaska Field Guides; prepare a slideshow of the ten fish to display during the tests of student keys; bring in field guides/taxonomic keys to show as examples; review external anatomy of bony fishes

Keywords

- Classification
- External Anatomy
- Field Guide
- Taxonomic/Dichotomous Key

Pre-assessment Strategy/Anticipatory Set (Optional)

Teacher may choose to begin the lesson by displaying a photo of an Alaskan fish not used in the activity. Challenge students to describe the physical characteristics of the fish using proper anatomical terms. Ask students what tools they could use to help them determine the species of the fish. Introduce the field guide and the taxonomic key (also called dichotomous key) as tools used to identify organisms. Distinguish between a field guide and a taxonomic key and show examples.

Lesson Procedure

1. Arrange students into groups of two (or three, if necessary).
2. Share the Selected Fish of Alaska handout with illustrations of ten different fish species. Reinforce to students that it is a field guide and they will be creating a taxonomic key.
3. Have students read the Activity Instructions handout, including the Helpful Hints, and work together with their partner to create their own taxonomic key. On the Activity Instruction handout, the process to create the key is detailed.
4. After each group has finished their key, have student groups exchange keys. Each group will then test the accuracy of their classmate’s key. This can be done with a slideshow of the ten fish species represented by the key (but different photographs and in random order).
5. De-brief the activity with students. Discuss elements of successful keys, any design challenges, and any potential improvements that could be made to the keys. If necessary, give groups time to re-design their keys based on teacher/classmate feedback.

Assessment and Evaluation

Students will be assessed on the taxonomic key they created, and they should re-design their key until it can be used with 100% accuracy. All keys that utilize correct terminology and allow for correct identification should be accepted. Students may also be assessed on their engagement in the de-brief discussion about key design.

Standards

National Science Education Standards Addressed

- 8CLS5.1 *Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry*

Ocean Literacy Principles Addressed

- 5. *The Ocean supports a great diversity of life and ecosystems*

Hawaii State Standards Addressed

- SC.7.4.4 *Classify organisms according to their degree of relatedness*

Additional Resources

- NOAA FishWatch: <https://www.fishwatch.gov>
- External Fish Anatomy Review: <https://www.dnr.sc.gov/fish/anatomy.html>
- Fish external anatomy –Structure and Function:
<https://manoa.hawaii.edu/exploringourfluidearth/biological/fish/structure-and-function-fish>

Acknowledgements

Special thanks to Alaska Fisheries Science Center’s Midwater Assessment and Conservation Engineering Program (MACE) scientists Darin Jones and Denise McKelvey for providing lesson feedback. It was a privilege sailing with you aboard the NOAA ship Oscar Dyson.

ACTIVITY INSTRUCTIONS

In this activity, you will work collaboratively with a partner or small group to create a taxonomic key for ten fish found in Alaskan waters. To create your key:



1. Review the field guide "Selected Fish of Alaska." For each fish, carefully observe the physical characteristics. Use internet resources to look for additional images and research any additional notes on the physical anatomy of each fish.
2. Decide upon a way to divide all the fish into two general groups. Think of an identifying characteristic such as shape, size, color, etc. On notebook paper, record the characteristic used and the members of each general group.
3. Continue to divide each group until each fish species is by itself. On your notebook paper, keep careful records of the identifying characteristics and members of the groups created.
4. Looking at your records and the divisions you made, create a taxonomic key that would lead someone else to make the same choices you did. Begin your key by recalling the first characteristic you used to divide into two groups (Step 1) and then keep going (Steps 2-9).
5. Once your taxonomic key is ready to be finalized, print it neatly on the template. We will be testing out all the keys in class!

Helpful Hints:

- ✓ *Remember, the choices created for each statement pair must be about the **same characteristic** but be **opposite** of one another. Make sure the user can choose only one!*
- ✓ *While you are constructing your key, you must be as **specific** as possible so that the user does not become confused. If the two choices are not specific, a user can easily choose the wrong one and then get the wrong classification.*
- ✓ *Before you finalize the key, **try to use it!** If you are not able to correctly identify the fish using only the key, then re-work your key until you get it right.*
- ✓ *All taxonomic keys should have one fewer steps than the number of organisms being classified. So your key should have **9 steps** with two choices for each one.*

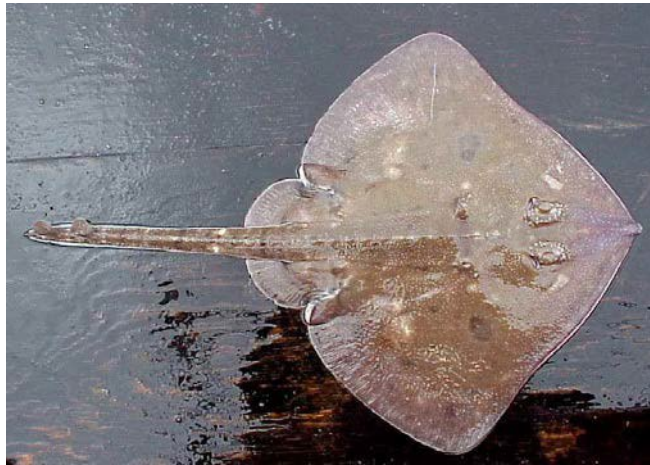
TAXONOMIC KEY TEMPLATE

Created By:		
		<i>"Go To Step..." or Species Name</i>
Step 1	1a.	
	1b.	
Step 2	2a.	
	2b.	
Step 3	3a.	
	3b.	
Step 4	4a.	
	4b.	
Step 5	5a.	
	5b.	
Step 6	6a.	
	6b.	
Step 7	7a.	
	7b.	
Step 8	8a.	
	8b.	
Step 9	9a.	
	9b.	

SELECTED FISH OF ALASKA FIELD GUIDE

All images courtesy of the NOAA Alaska Fisheries Science Center's Multimedia Gallery and FishWatch

NOTE: Images are not to scale



Alaska skate (*Bathyraja parmifera*)



Pacific Ocean Perch (*Sebastes alutus*)



Pacific Cod (*Gadus macrocephalus*)



Pacific Herring (*Clupea pallasii*)



Dark Dusky Rockfish (*Sebastes cilatus*)



Arctic Flounder (*Liopsetta glacialis*)



Big skate (*Raja binoculata*)



Tiger rockfish (*Sebastes nigrocinctus*)



Walleye Pollock (*Gadus chalcogrammus*)



Smooth lumpsucker (*Aptocyclus ventricosus*)