

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

**Using a Dichotomous Classification Key to Identify
Common Freshwater Fish of New York State**

New York State Learning Standards Annotation: MST 1, 1.1 a-b, 1.2a, 1.3a-b, 1.4a, 2.2a, 3.1a; MST 4 1.1a, 1.2a, 2.2a, 3.1a, 3.1h, 5.1a-b, 6.1a-b, 6.2a-b, Appendix A

Special Thanks to Rick Marshall, Massena High School, Massena NY for his contributions to the re-creation of this lab experience.

Background: A dichotomous key is a tool that allows the user to determine the identity of items in the natural world, such as trees, wildflowers, mammals, reptiles, rocks, and fish. Keys consist of a series of "either or" choices that lead the user to the correct name of a given item. "Dichotomous" means "divided into two parts". Therefore, dichotomous keys always give two choices in each step.

Dichotomous keys are extremely important tools in science and even in fields like auto repair and crime investigation. This lab uses the identification of some common types of North American fish as an example of how to use a dichotomous key.

Laboratory Safety Precautions: The following symbols represent the precautions that are required for this lab:

There are no specific safety precautions for this activity.

Purpose: The purpose of this laboratory experience is:

- to correctly use a dichotomous key for identifying common freshwater fish found in New York State,
- to understand how scientists in a variety of fields use classification keys to identify specimens.
- to further understand the necessity of the Linnaean classification system
- to correctly identify unknown specimens

Materials: The following materials are needed to complete this laboratory experience:

- Lab papers
- Pen and pencil
- Specimen cards and diagrams

Procedure: The following procedure is utilized to perform this experience:

Study the terms listed below. All of these refer to structures of a fish.

Barbel – a fleshy projection from the lip or head.

FINS

Adipose- a small fin on the top mid-line of the body near the tail fin.

Anal– a fin along the lower mid-line of the body near the tail fin.

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

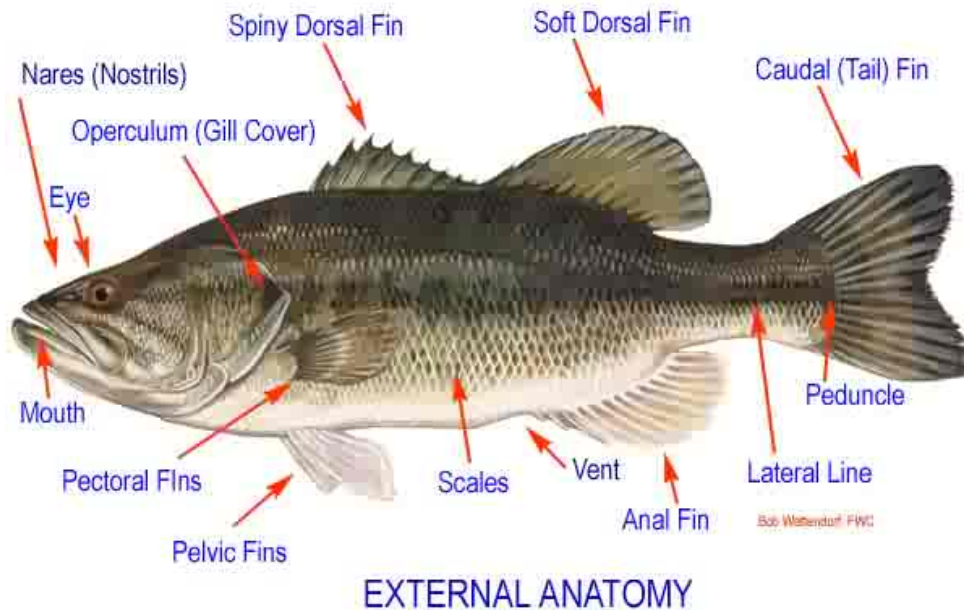
Caudal- tail fin.

Dorsal – the fin or fins along the top mid-line of the body.

Pectoral- the paired fins nearest the head, corresponding to front legs or arms.

Pelvic- the paired fins nearest the tail, corresponding to hind legs.

Scales- overlapping outgrowths of the skin.



1. Closely examine one of the drawings of a fish shown on the next pages.
2. Read both statements listed under number 1 in the classification key. One of these statements should describe the fish you have chosen; the other should not.
3. Refer to the number after the statement that fits your fish and look for that number in the key.
4. Again select the statement that describes the fish you picked. Continue through the key until you come to a name after one statement. This should be the name of the fish you picked.
5. Practice using the key to identify several of the fish shown

Example:

Suppose you want to find the name of fish 2. Look at the classification key. Note that each numbered item presents two possibilities. We see that our fish has no scales, or at least we cannot see any. So we choose item 1b. This refers us to number 12. So we go down the page to number 12. Our fish is not elongated or snakelike (item 12b), so we go to number 13 of the key. The fish we are classifying has barbels growing from its lips and the top of its head (item 3a), so we go to number 14 of the key. Since our fish has a caudal fin that is rounded, and a blunt head, we see that it is the Bullhead catfish.

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Classification Key for Common Freshwater Fish of New York State

Questions	Identify/Go To
1a. Body noticeably covered with scales	2
1b. Scales not covering body or too small to be seen	12
2a. Dorsal fin single	3
2b. Dorsal fins two or more, joined or separated	6
3a. Body more than four times as long as broad (top to bottom): front edge of dorsal fin far back on body; mouth large, hinge back of eye	4
3b. Body less than four times as long as broad: front edge of dorsal fin about midway between head and tail; mouth not large, hinge in front of eye	5
4a. Dark lines forming netted design on body: fins not spotted	Pickerel
4b. Body covered with yellow spots; fins spotted	Northern Pike
5a. Mouth turned downward: barbels absent; dorsal fin not elongated	White Sucker
5b. Mouth not turned downward: barbels present; dorsal fin elongated	Carp
6a. Two dorsal fins separated, the anterior spiny and the posterior soft	7
6b. Two dorsal fins united, forming an anterior spiny portion and a posterior soft portion	8
7a. Top of head concave, forming a hump in front of dorsal fin; dark vertical bars on body	Yellow Perch
7b. Top of head not concave, body sloping to dorsal fin and not forming a hump; dark blotches on body	Walleye
8a. Body more than three times as long as broad	9
8b. Body less than three times as long as broad	10
9a. Hinge of jaws behind the eye: notch between spiny and soft dorsal fin deep and nearly separating into two fins	Large Mouthed bass
9b. Hinge of jaws below the eye; notch between spiny and soft dorsal fin not nearly separating into two fins	Small Mouthed Bass
10a. Mouth large, hinge below or behind eye	11
10b. Mouth small, hinge in front of eye	Bluegill
11a. Five to seven spines in dorsal fin; dark spots forming broad vertical bars on sides, Red/orange earspot on gill covering	Pumpkinseed
11b. Ten or more spines in dorsal fin: sides flecked with dark spots	Rock Bass
12a. Body much elongated and snakelike: dorsal, caudal, and anal fins continuous	American Eel
12b. Body not elongated and snakelike: dorsal, caudal, and anal fins separate; adipose fin present	13
13a. Barbels growing from lips and top of head; head large and broad	14
13b. Barbels lacking; head not large and broad	16
14a. Caudal fin deeply forked; head tapering	15
14b. Caudal fin rounded or slightly indented but not forked: head blunt	Bullhead
15a. Dorsal fin rounded at top: body silvery, speckled with black markings	Channel Catfish
15b. Dorsal fin long and pointed at top: body bluish-gray without speckles	Blue Catfish
16a. Caudal fin deeply forked: back not mottled and with few spots	Atlantic Salmon
16b. Caudal fin square or slightly indented; back mottled or spotted	17
17a. Back and caudal fin spotted: broad horizontal band along sides	Rainbow Trout
17b. Back mottled with dark lines: caudal fin not spotted; fins edged with White	Brook Trout

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Data: The following data was collected during this experience:

Fish #	Identified as	Identification pathway
1		
2		
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17		
18		

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Conclusion: The following can be concluded from performing this lab experience:

1. What did you learn to do?

2. What type of career would you expect to use this activity in? What would you be doing in this career and what sort of benefit would making a key have?

3. What was the most difficult part of developing your classification key?

Bibliography of Images Used

Brook Trout Image: http://fish.dnr.cornell.edu/nyfish/Salmonidae/brook_trout.html
Pickerel Image: http://fish.dnr.cornell.edu/nyfish/Esocidae/chain_pickerel.html
Northern Pike Image: http://fish.dnr.cornell.edu/nyfish/Esocidae/northern_pike.html
Yellow Perch Image: http://fish.dnr.cornell.edu/nyfish/Percidae/yellow_perch.html
White Sucker Image: http://fish.dnr.cornell.edu/nyfish/Catostomidae/white_sucker.html
Smallmouth Bass Image: http://fish.dnr.cornell.edu/nyfish/Centrarchidae/smallmouth_bass.html
Largemouth Bass Image: http://fish.dnr.cornell.edu/nyfish/Centrarchidae/largemouth_bass.html
Bluegill Image: <http://fish.dnr.cornell.edu/nyfish/Centrarchidae/bluegill.html>
Pumpkinseed Sunfish Image: <http://fish.dnr.cornell.edu/nyfish/Centrarchidae/pumpkinseed.html>
Rock Bass Image: http://fish.dnr.cornell.edu/nyfish/Centrarchidae/rock_bass.html
American Eel Image: <http://fish.dnr.cornell.edu/nyfish/Anguillidae/americanelpic.html>
Bullhead Catfish Image: <http://fish.dnr.cornell.edu/nyfish/Ictaluridae/blackbullhead.html>
Channel Catfish Image: <http://fish.dnr.cornell.edu/nyfish/Ictaluridae/channelcatfish.html>
Rainbow Trout Image: <http://fish.dnr.cornell.edu/nyfish/Salmonidae/steelhead.html>
Atlantic Salmon Image: <http://www.dec.state.ny.us/website/dfwmr/fish/fishspecs/atlanticsal.gif>
Blue Catfish Image: http://www.nationalgeographic.com/lewisandclark/images/species/high_168.jpg
Carp Image: <http://www.dec.state.ny.us/website/dfwmr/fish/fishspecs/carpadult.gif>

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

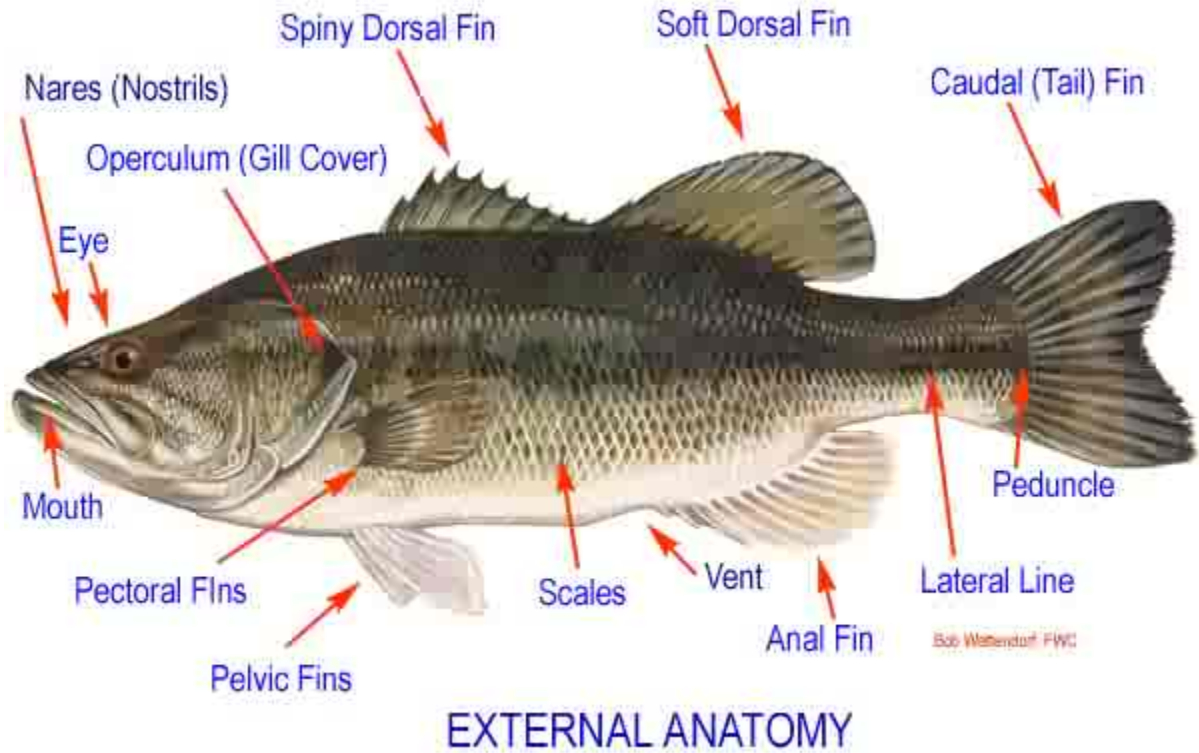
Analysis Questions: There are no specific analysis questions for this experience. You must identify each of the specimens by their Common and Scientific names in the table below. You will need to resource this using the internet or other resources.

Fish #	Common Name	Scientific Name
1		
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16		
17		
18		

Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

General Fish Anatomy

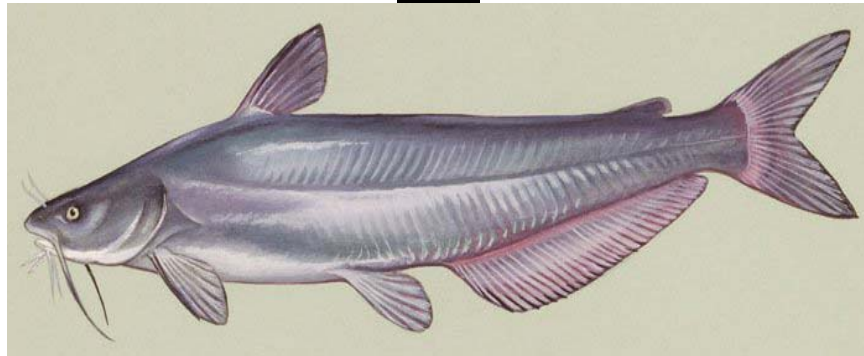


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Class Period _____ Lab Days/Period _____ Teacher _____

Fish 1



Fish 2



Fish 3



Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Fish 4



Fish 5



Fish 6



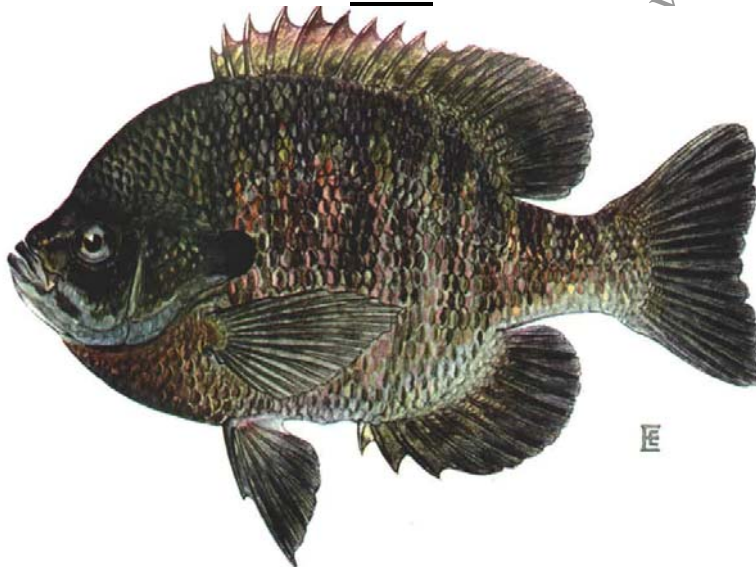
Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Fish 7



Fish 8



Fish 9



Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Fish 10



school

Fish 11



Lewis

Fish 12



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Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Fish 13



Fish 14



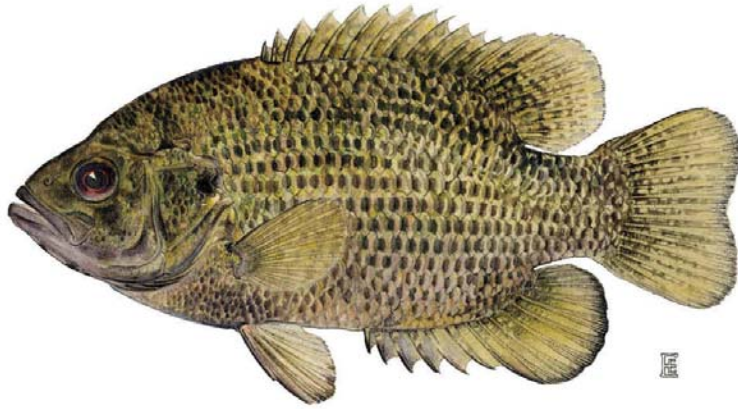
Fish 15



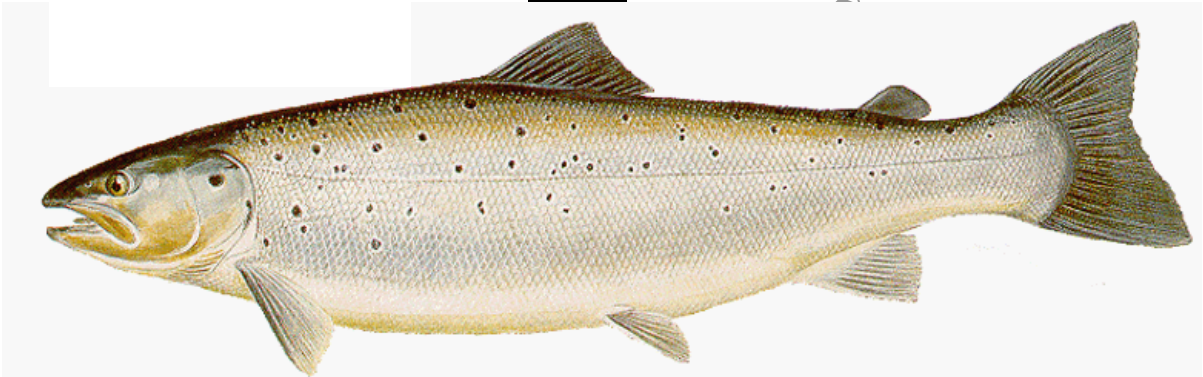
Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

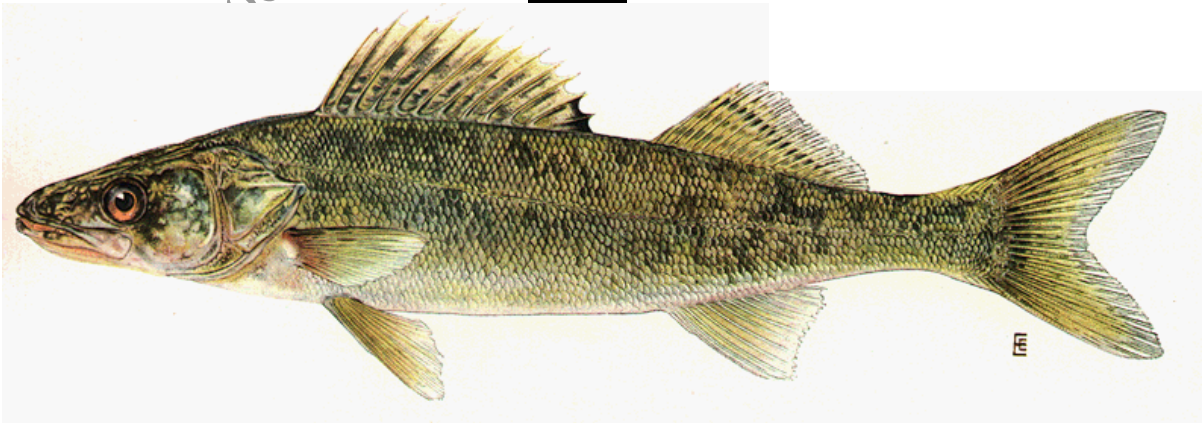
Fish 16



Fish 17



Fish 18



Name _____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Note to Teachers...

Teachers, please do not waste your ink printing these images for each students. I have printed them on several sheets of photo paper and laminated them for years of use. Once laminated, punch one corner and thread them onto a key ring and they will never get lost (or at least shouldn't).

As far as a "key", I provide the following:

1. Blue Catfish
2. Bullhead Catfish
3. Largemouth Bass
4. Pickerel (Also called chain pickerel due to netlike markings)
5. Carp
6. Smallmouth Bass (sometimes called Bronze bass)
7. American Eel (do not confuse with lamprey)
8. Bluegill
9. Brook Trout
10. Yellow Perch
11. Rainbow Trout (sometimes called steelhead)
12. Pumpkinseed (commonly called sunfish)
13. Channel Catfish
14. Northern Pike
15. White Sucker
16. Rock Bass (sometimes called Redeyed Bass)
17. Atlantic Salmon
18. Walleye (Walleyed Pike)

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