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FINS & SCALES

An Introduction to Bony Fish

A MARINE SCIENCE PROJECT BOOK FOR 4-H INTERMEDIATE MEMBERS

Florida 4-H Youth Development Program

UF/IFAS Extension

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UF IFAS Extension UNIVERSITY of FLORIDA

Sea Grant Florida

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What Is a 4-H Project?

A project is a subject or topic that you learn about in 4-H. A project can provide you with new knowledge and skills. You can learn about the project by attending club meetings, being involved in educational programs, going on field trips, attending camps, and participating in shows and competitions, as well as through your family and self-study.

Why Complete a Project Book?

Completing a project book helps you learn more about a topic, in this case, bony fish! A project book helps you set goals and be more organized about achieving these goals. It also helps you to realize what you have done and have learned as a result of the project! If costs are involved, it helps you keep track of that too. It can provide information that might be needed to apply for awards and scholarships in 4-H and maybe even resumes for jobs and college! During your project, it is important to share what you are doing with your club leader and parents. Your club leader may need to review your project book and initial certain tasks and goals as you accomplish them.

The **Fins and Scales Project** helps you learn about fish and how they are adapted for living in water. If you like marine science and want to do other projects on this topic, visit the 4-H website at: http://florida4h.org/. You can also enter the 4-H State Marine Ecology Event held in the fall of every year. This event helps you learn even more about fish and other forms of marine life. Check it out at: http://florida4h.org/mee.

Acknowledgements

This publication was written and designed by Karen Blyler, State 4-H Science Coordinator in 2013. The original Fins and Scales Project was written by Neil Crenshaw, 4-H Marine Education Specialist in the 1980s.

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The 4-H Youth Development Program gratefully acknowledges artists Diane Rome Peebles and Duane Raver for permission to use their fish images in this publication. Photographs used in this publication were taken by Karen Blyler and many wonderful 4-H members. Thank you for contributing to this publication

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Before beginning the Fins and Scales project, fill in the following information.

My Fins and Scales Project Book

Member name: _____ Age: _____

Address: _____

Home Phone/Cell phone: _____

4-H County: _____Years in 4-H _____

Name of Club: _____Leader's Name: _____

Why did you choose this project?

_____

_____

_____

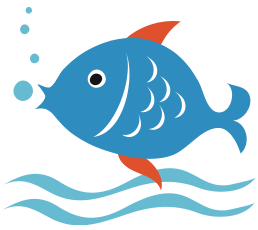
_____

What do you hope to learn about fish?

_____

_____

_____



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Overview of the Project

What will you learn?

In this project you will learn about fish and their adaptations for living in water.

Your Project Goals

Goal 1. Complete each of the following sections of your Project Book.

A. What is a fish?
B. How do fins help a fish?
C. How does body shape help a fish?
D. How does body color help a fish?
E. Why do fish have different mouths?
F. Why do fish have scales?
G. How can we determine a fish's age?

Goal 2. Participate in a fish-related learning experience, such as a trip to an aquarium for an education program, a club program on fish, a fishing trip, the 4-H Marine Ecology Event, or visiting a marine lab where fish research takes place!

Goal 3. Help another person through a fish-related activity by teaching or demonstrating the activity.

Goal 4. Share and/or demonstrate what you learned in the project to another group.

What will you need to complete the project?

1. Access to the Internet so you can conduct some research! There are resources and websites listed at the end of your Project book.

2. A real fish to observe and gather information on! You can obtain a real fish by going fishing, catching a fish in a net along a shoreline, buying a fish at a seafood market (mullet, tilapia, grunts are OK), going to an aquarium store or public aquarium and selecting a fish to observe. If you cannot obtain a real fish, select a specific fish from a book or research the Internet for a fish to use in your project.

3. A microscope (or strong magnifier) for looking at fish scales and fish ear bones more closely. There is a **"Fins and Scales"** support kit available that contains a small magnifier you can use. Ask your leader about this. If not, check with your science teacher and see if your school has a microscope that you can use.

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How I will reach my project goals

Goals	What I will do	Date completed
Complete the required sections of the project guide.		
Help or mentor another person through one of the activities.		
Participate in a learning experience related to fish.		
Share with others what I learned in the project.		

When do you hope to complete this project? _____

End of Project Signatures - The signatures below indicate that you have completed this project on your own and that the information is correct, to the best of your knowledge.

Title	Signature	Date
4-H Member		
Parent		
4-H Leader		

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A. What Is a Fish?

How would you describe a fish?

_____

_____

_____

_____

A fish, as most people think, is an animal that has fins and lives in the water. Fish can breathe, smell, hear, and move around but not as we do. There are many different kinds of fish and all have special adaptations that help them survive in water. Most fish fall into one of two groups or classes based on the type of skeleton they have. **Can you name these groups and describe how their skeletons are different?**

1._____

2._____

What features do both groups have in common?

_____

_____

This project will focus on the bony fish. There are about 23,000 different kinds of bony fish and they can live in fresh or saltwater, sometimes both! Some examples of bony fish include: bass, snapper, tarpon, catfish, herring, flounder, and swordfish.

What is the "study of fish" called? _____

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Table 1 - Name That Fish!

Can you identify the bony fish below? Use the resources listed on the last page of your Project Book to help you. Write the name of the fish under its image. Indicate if the fish lives in FW (freshwater) or SW (saltwater). Then answer the questions on the next page. Answers to these questions are in the **Leaders Guide** for the **Fins and Scales Project.** Ask your leader to go over the names and questions to see how well you did. *(SW images © Diane Rome Peebles; FW fish images by Duane Raver.)*

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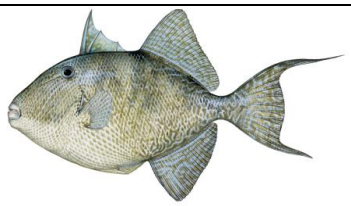
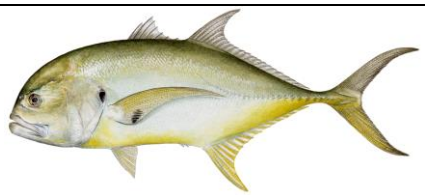
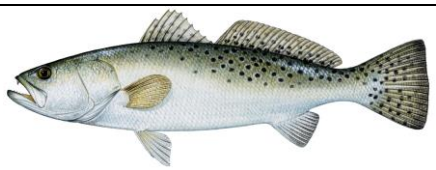
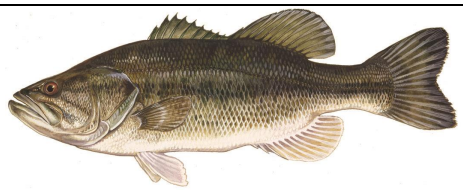
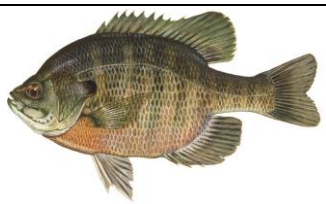
2. 	6. 
3. 	7. 
4. 	8. 

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What did you learn about bony fish? _____

What resources did you have to use to find the answers? _____

_____

What features do all these fish have in common? _____

_____

What are some differences in their appearance? _____

_____

_____

Why are there different types of fish? _____

_____

_____

Why is it important to study fish? _____

_____

If you have seen any of these fish, describe which one and where you saw it.

_____

_____

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Let's Dive Deeper!

- Make a list of the names of all the fish you currently know. Separate them into the different classes or groups. Pick a fish to research and then share what you learned about the fish you chose with other club members.

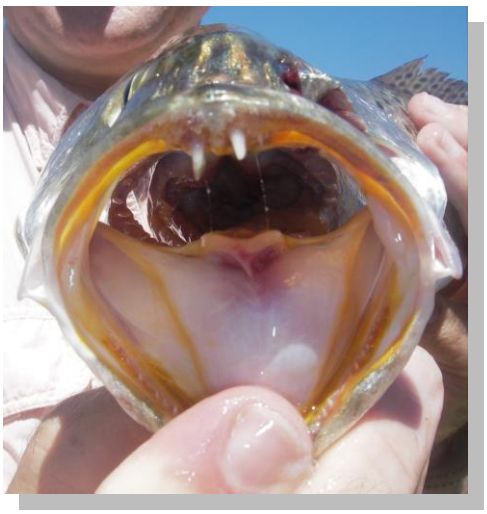
- Help your club plan a field trip to a place where you can learn about fish.

- Contact local experts on fish and ask them to come in and give a talk to the club!

Think Like a Scientist!

- What kinds of fish make it to our dinner table? Are some types more popular than others? Are they all bony fish? Investigate the types of fish local seafood markets sell. Interview their customers (get permission first!) and find out what fish they prefer to eat. Analyze your results and share them at a club meeting, county or state event.

- Do all bony fish have teeth? If not, then how do they hold or eat their food? Investigate the jaws of at least 6 different fish. Research how they use their jaws and/or teeth for getting food/holding their food. Share your observations and what you learned with others.



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B. How Do Fins Help a Fish?

Bony fishes have different kinds of fins for different purposes. Each fin plays an important role in the survival of the animal. The body structures of an animal, such as the fins of a fish, are part of the animal's **anatomy**. The anatomy of a fish can give us lots of "clues" about how it lives!
The diagram below shows the different types of fins a fish can have.

Why are fins important to fish? _____

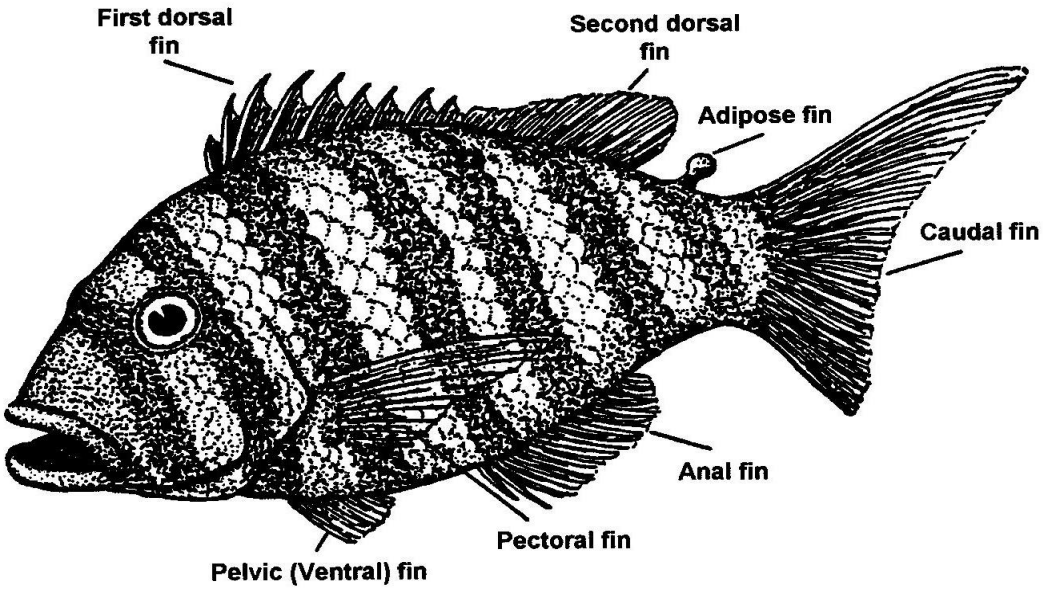
_____

Can you describe the purpose of each fin in the picture below? _____

_____

_____

_____



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Dorsal Fin

This is a single (not paired) fin located on the fish's back. Some fish may have only one dorsal fin while others may have two or even three. In many bony fishes the dorsal fin has stiff spines in the front to help give the fin support.

The dorsal fin helps the fish in swimming as well as in protecting itself. The fish can protect itself against predators by raising its dorsal fin. This makes it difficult for other animals to eat the fish, especially if the dorsal fin(s) is supported by sharp spines! The triggerfish and filefish are good examples of fish that have well developed dorsal spines which help to protect them from predators. The dorsal fin also acts as a stabilizer and helps to keep the fish upright.

Table 2 - Compare the Dorsal Fins of Fish

Look at the fish in the table on the next page. How are the dorsal fins different in each fish?

_____

_____

Why do fish have different types of fins? _____

_____

_____

The pinfish has spines in its dorsal fin. How do you think these spines help the fish?

_____

_____

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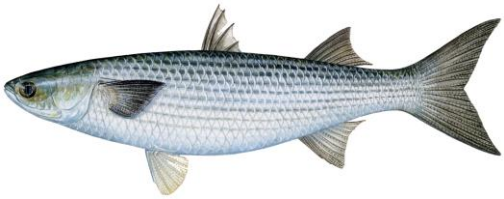
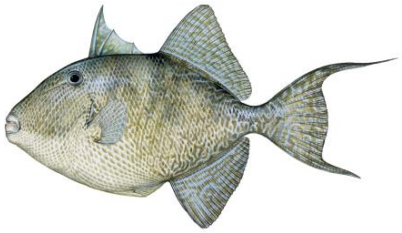
A. mullet 	**C. triggerfish** 
B. tarpon 	**D, pinfish** 

(Saltwater fish images © Diane Rome Peebles)

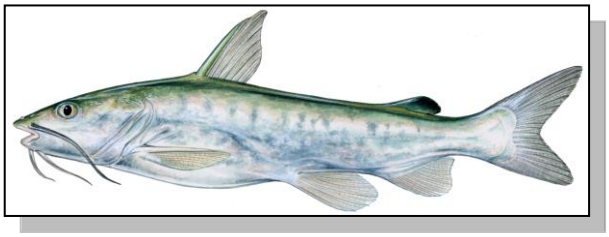
Adipose Fin

This fin lies behind the dorsal fin on some fish**. What is its purpose?**

_____

What is the name of the fish in the picture?

Label its adipose fin.



_____

Let's Dive Deeper!

- How does the dorsal fin of a triggerfish help it from being eaten? If you find the answer, share it with your club.

Think Like a Scientist!

- Conduct some research on the adipose fin and find out more about its origin. Share what you find with the group.

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Tail Fin

This fin is also called the caudal (kaw-del) fin. Without a caudal fin, a fish such as the tuna would not be able to swim at great speeds over long distances. Why? It helps propel the fish through the water! The blunt tail of a grouper helps it move swiftly from one hole in a reef to another. There are several types of caudal fins and each helps the fish to swim a certain way.

Look at the two fish below. Based on their tails, do you think they live in the same habitat? Explain your reasons. *(Fish images © Diane Rome Peebles)*

_____

_____

_____

_____

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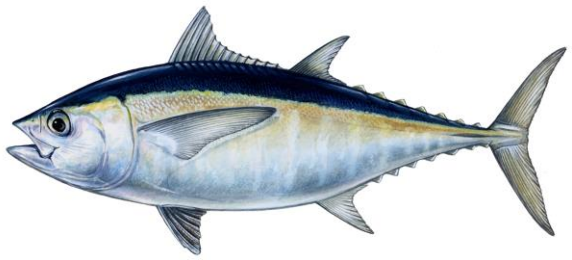

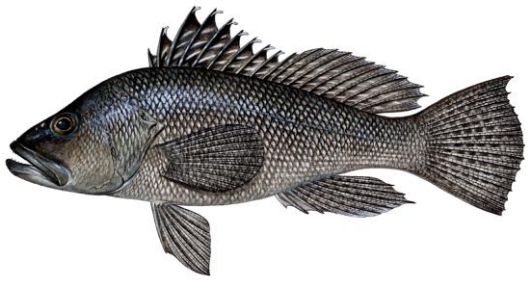

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Table 3 – How Does Tail Shape Help a Fish?

In the table below and on the next page are the names of the different types of tails fish can have. **Use the resources listed in the back of your Project Book to help you complete the table.** You may also search for the shapes on the web. Make a sketch of the tail shape the term refers to. Then describe how the shape affects the way the fish swims. *(Fish tail images © Diane Rome Peebles and Duane Raver)*

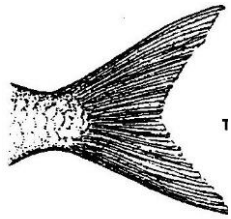
Tail Shape Drawing	How does this shape affect the way the fish swims?
Homocercal tail 	**Homocercal tail** *Example:* The upper and lower parts of the fin are symmetrical (the same). This helps the fish swim at moderate speeds over long distances.
Heterocercal tail	**Heterocercal tail**
Protocercal	**Protocercal**

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Table 3 - How Does Tail Shape Help a Fish?

Tail Shape Drawing	How does it affect the way the fish swims?
Rounded tail	**Rounded tail**
Truncated tail	**Truncated tail**
Forked tail	**Forked tail**
Lunate tail	**Lunate tail**

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Table 4: Name a fish that has each of these types of fins. To answer this, you may use the web or the resources listed in the back of your project book.

Type of tail	Name a fish with this type of tail
Homocercal tail	
Heterocercal tail	
Protocercal	
Rounded tail	
Truncated	
Forked	
Lunate	

Let's Dive Deeper! - Select one of the fish you identified above. Describe how its tail shape helps the fish survive in its habitat.

Think Like a Scientist! - What types of fish swim the fastest? Find out then make a list of their names. What tail shape do most have in common?

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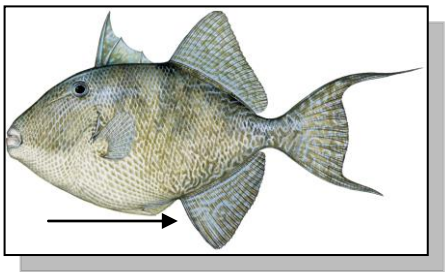
Anal Fin

The anal fin is a single, unpaired fin. This fin may not be present in some fish while on others it may be very long. The anal fin is on the underside of the fish and usually right behind the anus.

What is the role of the anal fin? _____

How do triggerfish use their anal fin?

(Triggerfish image © Diane Rome Peebles)



_____

_____

In some live-bearing fish (fish whose young are born alive and not hatched from an egg) the anal fin of the male is modified into a **gonopodium. What is it used for?** (Yes, you may find it on youtube.com!)

_____

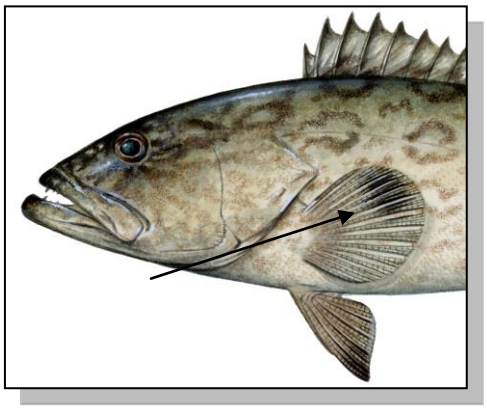
Using your resources, name a fish that has its anal fin modified into a gonopodium.

_____

Pectoral Fin

Pectoral fins are paired fins. They are usually located on the side of the body near the fish's head.

How are the pectoral fins used? _____



_____

_____

_____

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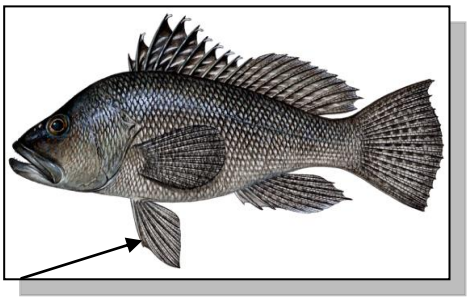
If possible, observe how a live fish uses their pectoral fins. (You may look at youtube.com.) Describe the movement of the fins. How do these fins help the fish?

_____

_____

Pelvic Fin

There are two pelvic fins, a right one and a left one. On some fish the pelvic fins may be way up front and very close to the fish's throat while on other fish they may be further back and very close to the anal fin.



What are pelvic fins used for?

_____

_____

Using the pictures on page 6, complete the following questions.

Name a fish that has its pelvic fins directly under its pectoral fins?

_____

Name a fish has its pelvic fins further back on their body?

_____

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Let's Dive Deeper! - Some fish use their pelvic fins for clinging to rocks. Find out more about these fish and how they live!

Think Like a Scientist! - Do fish that live in the same underwater habitat (like a coral reef) have similar looking fins? How would you investigate this?

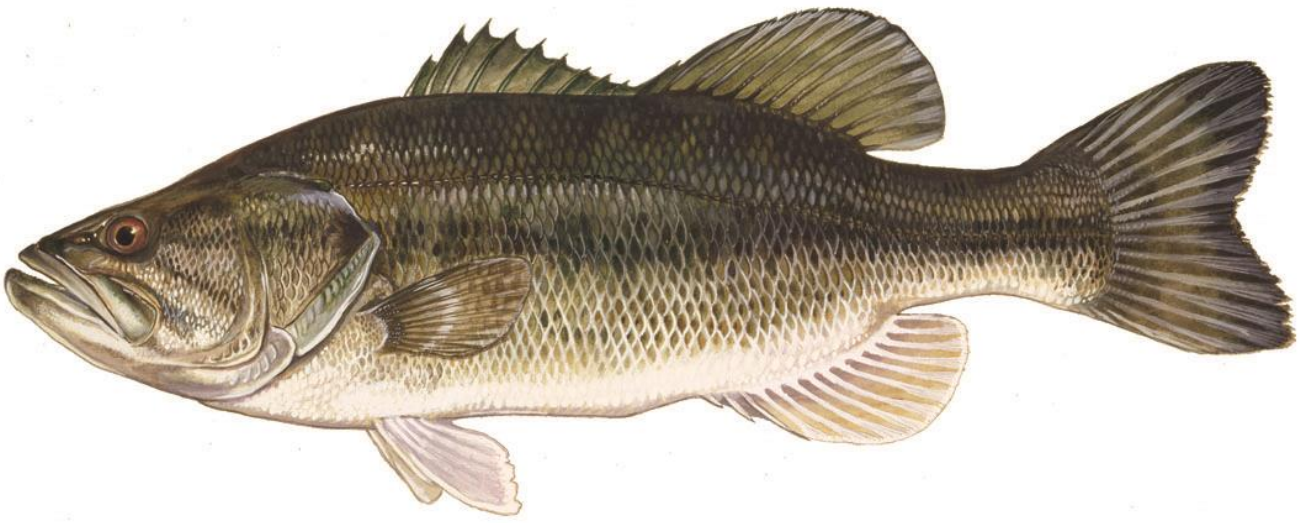
Let's Review!

_____ **Look at the fish diagram below. Using arrows, label each of the fins.**

_____ **Using the diagram below, explain and/or demonstrate to others how each fin helps the fish. You may use another fish example if you want to.**

After completing this, have your club leader or parents initial it.

(Image courtesy of Duane Raver and Florida Fish and Wildlife Conservation Commission)



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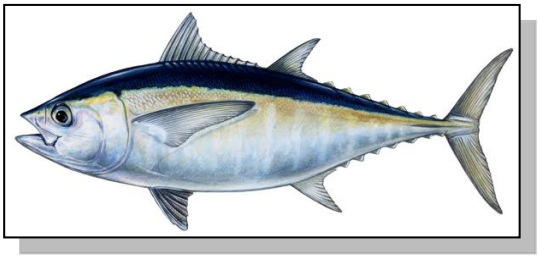
C. How Does Body Shape Help a Fish?

Although fins are a great adaptation for living in water, the type of body shape a fish has also helps it survive. Look at the fish to the right. **How would you describe its body shape?**

(Tuna fish image © Diane Rome Peebles)



_____

_____

Based on its shape, where in the ocean do you think this fish lives?

_____

Based on its shape, how do you think it would obtain its food? _____

_____

What is another name for this "torpedo-like" shape? _____

Using the web or other resources, name two other fish that have this type of body shape.

_____ _____

The fish in the picture to the right is called a batfish. It has a flat or wide belly. **Where do you think it lives?**

_____

_____

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How does its body shape help it survive? _____

_____

_____

How would you describe the shape of the fish to the right?

_____

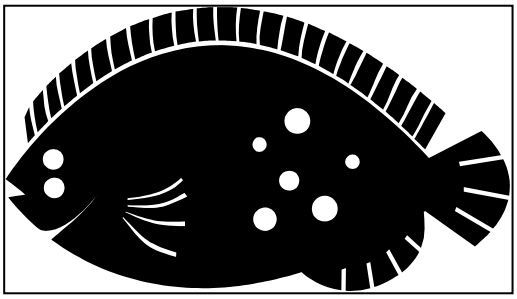
_____

_____

_____

Where in the ocean do you think it lives? _____

_____



A flounder lies on the bottom of the ocean. How would you describe its body shape?

_____

_____

_____

_____

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Let's Review!

What kind of body shape would a fish most likely have if it lived under a rock? Why?

_____

_____

_____

What kind of body shape would a fish have if it lived out in the open ocean? Why?

_____

_____

_____

Let's Dive Deeper!

- Collect pictures of different fish and bring them into a club meeting to sort into the different body shapes.
- Do some fish undergo a change in their body shape as they grow up? Give examples and describe how these changes occur.

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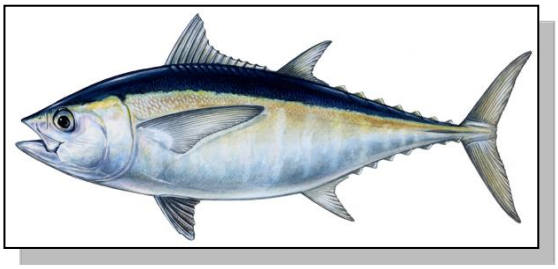
D. How Does Body Color Help a Fish?

Many fish that live in open waters of the coast or ocean have a coloration called **countershading**. Countershading is a way to blend in with the background. Tunas have countershading.
Look at the tuna fish to the right. **How would you describe its coloration?** *(Fish image © Diane Rome Peebles.)*

_____

_____

_____



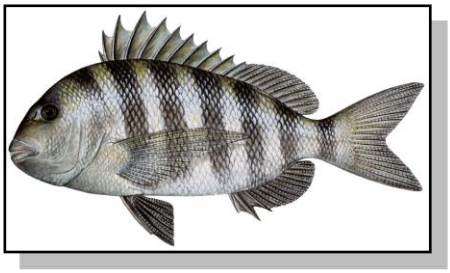
How does countershading help a fish? _____

_____

Can you name another fish that shows countershading? _____

_____

Some fish have **disruptive coloration** to confuse predators. This is any color pattern that helps break up a fish's body outline. An example of this is the fish to the right**. Describe what you see.**



_____

_____

_____

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How does this pattern help the fish "hide" from its predators? _____

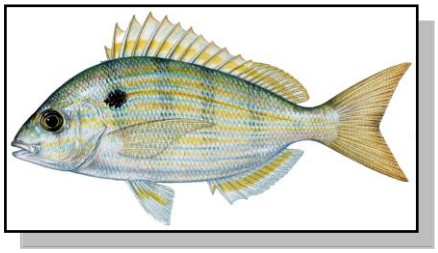
_____

Can you name two other fish that also have a "disruptive" coloration pattern?

1. _____

2. _____

Some fish, such as the pinfish on the right, have "**false eye"** on parts of their bodies. **How could a "false eye" help a fish survive?**



_____

_____

Can you name another fish that has a "false eye" somewhere on its body?

_____

Camouflage is a type of coloration that helps the animal blend into its surroundings. **Mottled** coloring (a type of camouflage) helps the fish blend into the rocks or the bottom.

What is the name of the fish in the photo?

_____

Based on its coloring, where do you think it lives? _____

_____

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Name another fish that has a mottled coloration and describe where it lives.

_____

_____

Let's Review!

Based on what you have learned, **tell a story** about a fish you have caught or seen somewhere. **What did it look like? How was it shaped? What was its color?** (If you do not have a story, listen to someone else's story and write about it!)

_____

_____

_____

_____

Let's Dive Deeper!

- Work together and collect pictures of fish from magazines. Sort them according to color. Make a collage. As a group discuss how the fish's color might help the fish survive.
- Are there other types of coloration patterns that fish can have? If so, how do they help the fish?

Think Like a Scientist!

- Do fish have the same color pattern throughout their life? Or do they change their coloring as they get older? Can you find examples?

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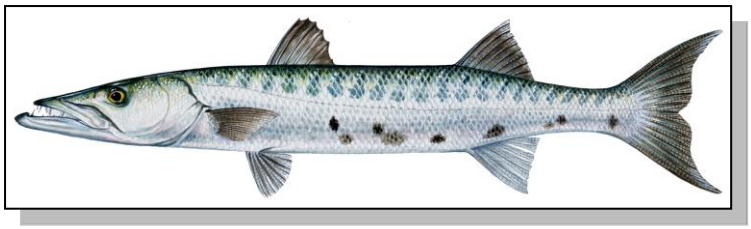
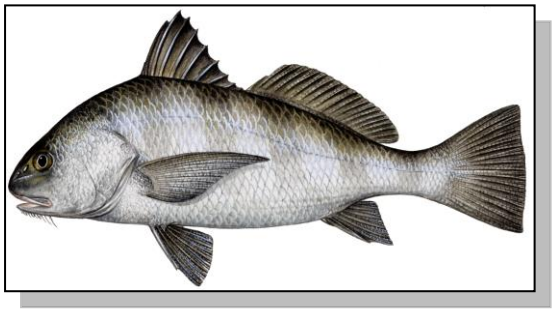
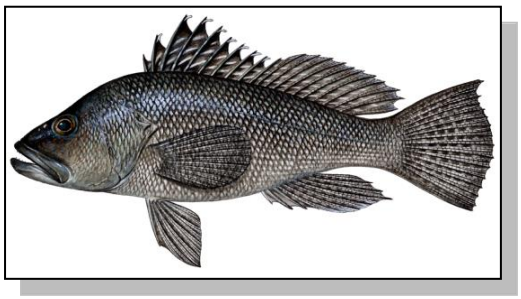
E. Why Do Fish Have Different Mouths?

The type of mouth a fish has can give you a clue as to what and where it eats in the water. A fish with a very **large mouth** surrounds its food and often swallows it whole. A fish with a **small mouth** may eat small bits of food or prey. Fish with a **sucker-shaped mouth** (or mouth on underside) feed near the bottom and search the sediment for food. Fish with long **duckbill-like jaws** (pickerel or gar) will use their jaws to grasp the prey before swallowing it. Fish with jaws that angle **upward** (like snook and tarpon) feed more on prey near the surface.

Look at the fish below and describe the types of mouths you see. Does any mouth look like it could swallow prey whole? Is one shaped for feeding off the bottom? Which one(s) might feed on prey near the surface? *(Barracuda, black drum, and black seabass images © Diane Rome Peebles.)*







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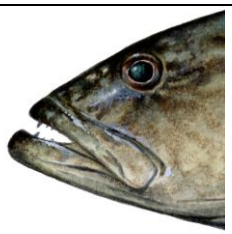
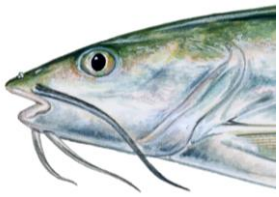
ACTIVITY: A Feeding Frenzy!

This activity is described in the Helper's Guide. If you did this activity as a group, please describe what you did below.

What did you learn from this activity?

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Table 5: Fish Mouths: Complete the table below and provide examples. *(Images used with permission © Diane Rome Peebles and Duane Raver)*

	Q. The fish on the left is a grouper. It has a large mouth. What do you think it eats?	Q. Give another example of a fish with a large mouth. What do you think it eats?
	Q. The fish on the left is a pinfish. It has a small mouth. What do you think it eats?	Q. Give another example of a fish with a small mouth. What do you think it eats?
	Q. The fish on the left is a catfish. It has a sucker-like mouth that is turned downward. What do you think it eats? What are those whiskers for?	Q. Give another example of a fish with a sucker-like mouth. What do you think it eats?
	Q. The fish on the left is a gar. It has duckbill-like jaws. What do you think it eats?	Q. Give another example of a fish with duckbill-like jaws. What do you think it eats?
	Q**.** The fish on the left is a tarpon. It has a large mouth that is turned upward. What do you think it eats?	Q. Give another example of a fish with a large mouth that is turned upward. What do you think it eats?

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Let's Dive Deeper!

- Select a fish and research how it gets its food based on the type of mouth it has. Share what you learned with the group.

Let's Review!

Look at the fish below. Based on its appearance, tell us what you know about the fish!

What kind of swimmer is it? _____

_____

What kind of body shape does it have? _____,

Where in the water does it most likely feed? _____

_____

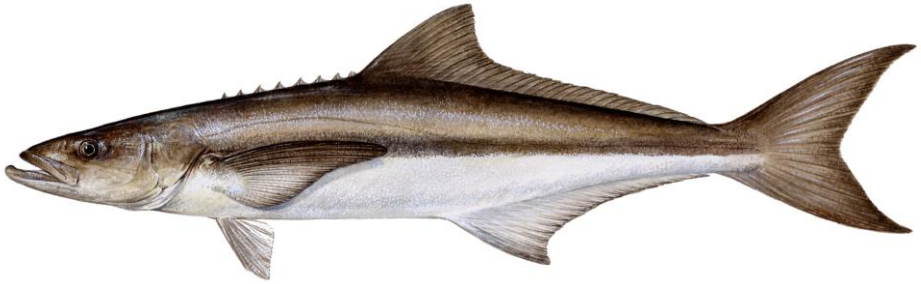
What types of food might it eat? _____

_____

Look at its color. How does the color help protect the fish? _____

_____

(Cobia image © Diane Rome Peebles)



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Activity: Imagine-A-Fish

Can you draw an imaginary fish and create a habitat for it to live in? Your leader can give you more information on how to do this! If you do this as a club, you may be using large pieces of paper. If so take a photo of your imaginary fish and place it in the box below.

Describe the type of fish you created and how it was adapted for living in water.

_____

_____

_____

What did you learn from this activity? _____

_____

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Let's Review - Observing a Real Fish!

To best complete this part of the project, you need to obtain and observe a real fish! You can get a fish by going fishing or buying a fish at a seafood market (mullet, tilapia, grunts are OK). You may also visit a local aquarium store or public aquarium and select a fish to observe. If you are unable to use a real fish, you may search the internet for fish videos.

What kind of fish do you have? Does it have any other common names?

_____

_____

How did you obtain your fish? _____

_____

_____

Describe the shape of your fish's dorsal fin(s). _____

_____

_____

If possible, feel its dorsal fin(s). Do you feel or see spines, rays or both? _____

_____

_____

Does your fish have an adipose fin? _____

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If your fish has pectoral fins, how are they used or what are they used for?

_____

Based on what you have learned about tail shapes, what kind of swimmer is it?

_____

_____

How would you describe its body shape? _____

_____

Based on the shape of your fish, what kind of swimmer do you think it is?

_____

_____

Based on your fish's body shape, where do you think it lives in the water?

_____ On the bottom _____ off the bottom/below surface _____ more open water

Now look at your fish! Describe its coloration pattern and how it helps your fish survive.

_____

_____

_____

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Based on your observations, predict what habitat your fish lives in and check your answer by using the Internet or the resources listed in the back of your project book!

NOTE: Keep your fish, or at least some scales from it, for the next two sections!

Draw <u>your</u> fish below. (You may also take a photo and paste it in.)

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

F. Why Do Fish Have Scales?

Most fish have hard outer coverings called scales**. How do scales help a fish?** *(Photograph credit: joysaphine.)*

_____

_____

Some fish such as catfish have no scales and are said to be “naked.” Other fish such as trout and freshwater eels have scales that are very small. The scales are so small on these fish that many people think that they are naked like the catfish. Some fish have very large scales. A tarpon fish, which can grow up to five feet or so, has scales that can be three inches around!

Look at your fish**. Does it have scales?** _____

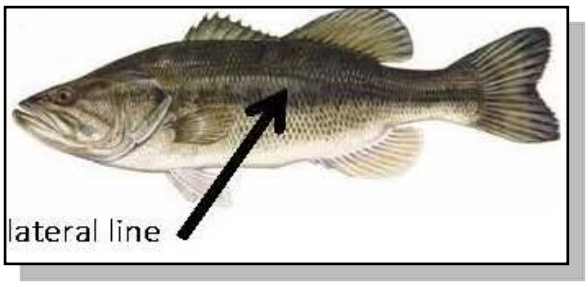
Are all the scales the same size? _____

Where do the scales seem to be the largest? _____

Fish scales are covered with a protective layer of slime. This slime helps to protect the fish from diseases and parasites. Gently touch your fish. **Does your fish have a layer of slime?**

_____

Scales also have color pigments which give the fish its coloration. There are special scales along the side of the fish that make up the lateral line. This line contains sensory receptors which enable the fish to detect wave vibrations in the water.

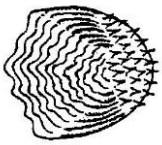
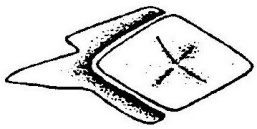


Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Find the lateral line on your fish and pull off a scale or two. Pull off another scale somewhere else on the fish and compare the two**. Is there anything different about the lateral line scale?**

Different fish have different scales. **Below are the <u>three kinds of scales</u> found on bony fish.** Find out what kind of scale your fish has! Remove a scale from your fish. **Using a magnifier, determine what kind of scale it is and circle which type it is in the choices below. Note:** If you are using a fish in a book, or the Internet, or in an aquarium, you may need to do some research to determine the type of scale it has.

Table 5 - What Are the Different Types of Fish Scales?

1. A ctenoid (teen-oid) scale has small sharp spines on one end	 CTENOID Perch Scale
2. A cycloid (syk-loid) scale is a smooth scale.	 CYCLOID Carp Scale
3. A ganoid (gan-oid) scale is a thick plate like scale found on sturgeons and gars.	 GANOID Gar Scale

Let's Dive Deeper! Find out more about the lateral line and what it is used for.

Think Like a Scientist! Are all scales on a fish the same size and/or shape? How can you determine this?

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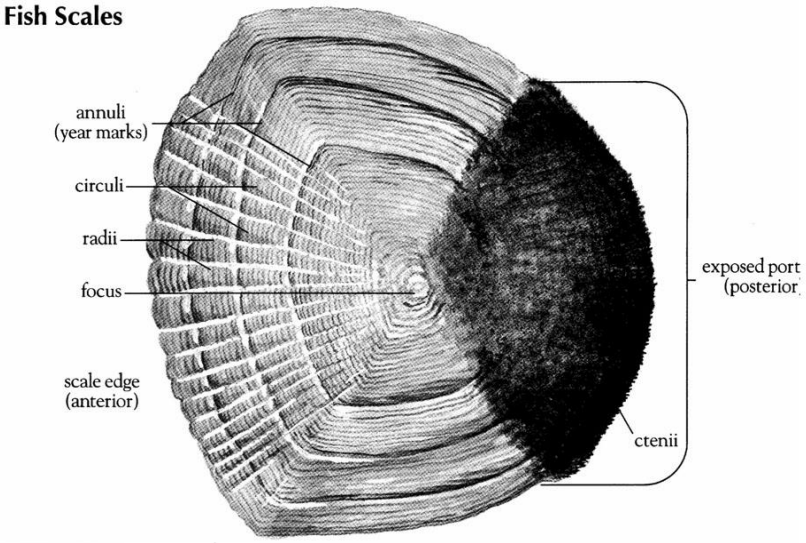
G. How Can We Determine a Fish's Age?

Parts of a Scale

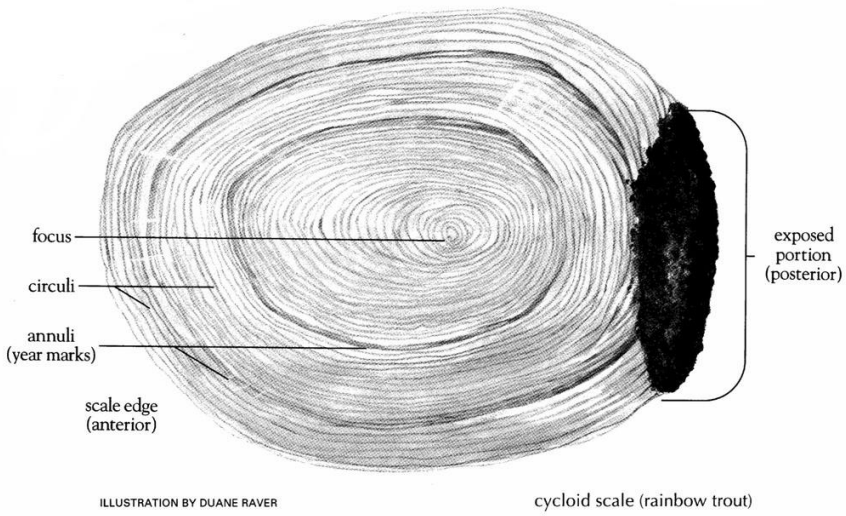
When a fish hatches, it has small scales covering its body. The center (focus) of an older fish's scale represents that scale when the fish was newly hatched. As the fish grows the scales get larger. Rather than growing smooth like our fingernails, scales produce small circular growth rings around themselves. These growth rings are called **circuli.** A fish grows faster in the summer and slower in the winter. Circuli formed during the summer are widely spaced. Circuli formed in the winter, however, are spaced very close together. A dark ring is formed where the circuli are spaced close together. The darker ring of circuli is called the **annulus**. The age of a fish can be determined by counting the number of annuli on its scales. *(Images courtesy of Duane Raver and North Carolina Fish and Wildlife.)*

Did you know?

The study of growth rings in aquatic organisms is called sclerochronology. It is an actual field of study in science!



ctenoid scale (bluegill)



cycloid scale (rainbow trout)

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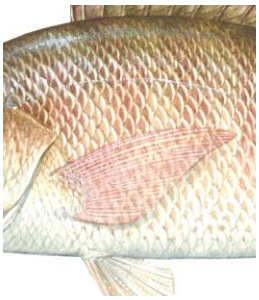
GROUP OR INDIVIDUAL ACTIVITY:

Determine the Age of a Fish



In this activity you will use the scales of your fish (or another fish) to determine how old it is. The directions for how to do this can be found in the Leaders Guide. If you would like to do this activity, ask your club leader for assistance! You will need the following materials. *(Image credit © Diane Rome Peebles.)*

Materials:

- If making a glass slide mount you will need: forceps, microscope slides, and silicon glue.
- If making a laminated scale mount, you will need: Pocket size laminating film, laminating machine. (County Extension offices may have a laminator.)
- You will also need a microscope or good glass magnifier.

If you did the activity, please describe below what you did!

_____

_____

_____

_____

_____

_____

_____

_____

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

You should remove three scales and make a sketch of each scale below. Try to label the general features of the scales: **focus, annuli,** and **circuli**. If they are ctenoid scales, indicate the cteni (small spines) Determine the age of each scale by counting the number of annuli. Write the age of each scale under your scale drawings.

1.	2.	3.
Age =	Age =	Age =

What can you conclude about the age of your fish? _____

_____

_____

Did you have any problems aging the fish using its scale? If so, what were they?

_____

_____

_____

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Let's Review!

What are the three types of scales bony fish can have? _____

_____

How do scales help a fish? _____

_____

Why are the "original" scales most likely to be under the pectoral fin? _____

_____

_____

Let's Dive Deeper!

Using the resources listed in the back and/or Internet resources, find the answer to this question. **How could age determination of fishes be useful in fishery biology?**

_____

_____

_____

_____

_____

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OPTIONAL ACTIVITY: Using Earbones to Age Your Fish

Today, scientists often use the earbones, or otoliths, of fish to determine a fish's age. Otoliths are usually more accurate in ageing a fish than using its scales, but getting to the earbones inside a fish's head and preparing each one for observation takes more time and skill.

In the **Fins and Scales Leaders Guide** there are directions on how to remove the otolith and use it to age a fish. Another option is to contact local Fish and Wildlife scientists and see if they can demonstrate this to your club,

If you completed this activity, tell us what your club did and how it worked.

_____

_____

_____

_____

_____

Do all fish have the same type of otolith? Design an investigation to help you find the answer to this question. Describe the steps you would take.

_____

_____

_____

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

INDIVIDUAL OR GROUP ACTIVITY:

Fish Printing!

Directions for this activity are in the **Leader's Guide**. In this activity you will paint your fish or perhaps a rubber fish and make a print of it on paper or even on one of your t-shirts!

Please describe what you did. _____

_____

_____

_____

What did you learn that was new? _____

_____

If possible, paste a photo of your creation here!

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You are almost done! To complete this project, don't forget to fulfill the following goals!

Did you help or mentor another person through one of the activities?

Who did you help? _____

_____

What did you help them with? _____

_____

What did you learn from the experience? _____

_____

Did you participate in a learning experience related to fish?

What did you do? _____

_____

What was something you learned from the experience? _____

_____

Did you communicate to others what you learned in the project?

What did you do? _____

_____

What was something you learned from the experience? _____

_____

_____

_____

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Fins and Scales Project Summary

1. Why did you do this project?

_____

_____

_____

2. What were three things you feel you learned from this project?

_____

_____

_____

3. What problems did you encounter in this project and how did you solve them?

_____

_____

_____

_____

4. How did you share what you learned? _____

_____

_____

_____

5. What was your favorite learning experience related to this project?

_____

_____

_____

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6. What suggestions do you have for improving this project?

_____

_____

_____

7. Who were the people that helped you with this project?

_____

_____

8. How will you use what you learned in the future? _____

_____

_____

9. List below any additional books, references, magazines, etc., that you read on fish, scales, age determination in fishes, or any other aspect of fish biology.

_____

_____

_____

_____

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Helpful Vocabulary

Anal fin – The fin that is located under the fish and between the anal vent and the tail. The role of the anal fin is to help stabilize the fish while it is swimming.

Barbels – These are located under the mouth or the chin of the fish. They are slender whisker-like strands that have a sensory function.

Caudal fin – The tail of the fish. The tail can be shaped differently, depending on where the fish lives and how it moves in the water.

Camouflage – A coloration that helps a fish blend in to match its surroundings. This helps it to hide from predators.

Countershading – When a fish is dark on its upper side and light on its lowerside. This helps a fish "hide" in open water. The dark color helps the fish blend in with the bottom when viewed from above. The light color helps the fish to blend in with the sky when viewed from below.

Disruptive coloration – When a fish has bars, stripes, spots or patches of color to break up an animals outline in the water.

Dorsal fin – The fin on the back (or top) of the fish. This fish may be one long fin or divided into different fins. The fin may have spines and/or rays to support it.

Forked tail – This type of tail has longer top and bottom extensions than the center. Looks like a sideways "V". This tail helps a fish accelerate but provides less maneuverability.

Fusiform – A body shape that is tapered at each end and helps in streamlining the fish. A tuna is an example of a fish with a fusiform body shape.

Heterocercal tail – The upper and lower parts of the tail are NOT symmetrical (not the same). This type of tail helps propel the fish forward and provides some upward lift.

Homocercal tail – The upper and lower parts of the fin are symmetrical (the same). This helps the fish swim at moderate speeds over long distances.

Lateral line – The sensory organ that detects vibrations in the water. It looks like a line that runs along each side of the fish.

Lunate tail – This type of tail is curved or shaped like a crescent. Looks somewhat like a flat "C"! Not as good for maneuvering but great for speed over long distances.

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Otoliths – These are bony structures found in a fish's inner ear. They are located in the head. Otoliths can be used to determine the age and growth rate of fish.

Pectoral fins – The paired fins found on each side of the fish just behind the gill opening.

Pelvic fins – The paired fins located on the underside of the fish, just under or further back from the pectoral fins.

Rays – Soft supporting fin structures.

Rounded tail – This tail has a rounded edge. It allows for good acceleration and maneuvering but creates drag and will allow a fish to tire more easily.

Spines – Stiff supporting fin structures. Spines may make it difficult for predators to eat the fish. The spines on some fish may contain painful toxins.

Truncated tail – This tail has a flattened edge and is good for maneuverability and making shorts bursts of speed.

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Resources for the Fins and Scales Project

WEB RESOURCES

Florida 4-H Marine Ecology Event – This website has study materials for this state event including fish pictures and descriptions. *http://florida4h.org/programsandevents/marineevent.shtml*

Florida Museum of Natural History – The museum has a website on fish anatomy and adaptations. Visit *http://www.flmnh.ufl.edu/fish/Kids/kids.htm*

Florida Fish and Wildlife Conservation Commission – The FWCC has information on many Florida fish found in both freshwater and saltwater fish! *http://myfwc.com/wildlifehabitats/profiles/fish/* *http://myfwc.com/fishing/saltwater/publications/fishing-lines-magazine/*

Take Me Fishing – This website has information on a variety of fish, where they live, and the best ways to fish for them! *http://www.takemefishing.org/fishing/fishopedia/home*

BOOKS

Robins, C. Richard; Ray, G. Carlton; Douglas, J. *Atlantic Coast Fishes: Peterson Field Guides*, Houghton Mifflin Company, 1986.

Page, L. M. and Burr, B. M. *Freshwater Fishes: Peterson Field Guides*, Houghton Mifflin Company, 1991.

Kells, V. and Carpenter, K. *A Field Guide to Coastal Fishes from Maine to Texas*. John Hopkins University Press, 2011.

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