Coral Reefs

Concepts
Fish come in all shapes, sizes, and colors. However, they share many of the same body parts since they are all adapted to live in the water.

HCPS III Benchmarks
SC 4.3.2
SC 4.5.2
SC 4.5.3

Duration
1 hour

Source Material
MARE
PRISM

Vocabulary
Streamlined
Barbels
Receptors
Lateral Line
Gill raker
Gill cover/Operculum
Scales
Counter-shading
Mucus
Caudal fin
Dorsal fin
Pelvic fin
Anal fin
Pectoral fin
Swim/Air Bladder

Fish Fashion 101

Summary

This lesson builds on the concepts of fish adaptations and general anatomy. This activity will provide the students with the opportunity to recall what they know about fish and their anatomy. There knowledge will be utilized to construct a human-sized fish model right before their very eyes!

Objectives

- Students will identify the anatomy (body parts) of a fish.
- Student will understand why different fish must have many of the same parts for basic survival.

Materials

Fish anatomy patterns (see page 9)
Fish Formation dress up script (see procedure)
Balloon
Butcher paper (about 8 ft.)
Permanent color markers
Elastic (2 ft. of ½'' width; 2 ft. of 1'' width)
Plastic wrap (3 ft.)
Red felt or red construction paper
2 ft sq. of camouflage-colored construction or butcher paper *(see explanation below)*
3 ft x 1 ft ocean blue construction or butcher paper for counter-shading coloration pattern *(see explanation below)*
White poster board
Overhead projector
Transparency of pattern sheet (see page 9)
Scissors
1 roll of clear plastic tape or masking tape
Posters of various fish or pictures
Camera
Fish Anatomy Worksheet

Making Connections

Students will recall what they have observed thus far about fish and their anatomy. They will use this previous information to construct their own class model of a life-sized fish.

Teacher Prep for Activity

Making the human-sized fish costume *(see template and patterns on pages 8 & 9)*:

1. Make a transparency of the patterns. Using an overhead projector, adjust the patterns so that they are the right size. (arms should fit through the holes on the costume's sides; feet should be visible just below the tail) Then, using a colored marker, trace the projected pattern onto butcher paper or some other large white (preferably) heavy paper on a roll.
2. Make two each of the following parts: eyes, gills, gill covers, jaws, lateral lines, and tails so that there is one for each side of the costume.
3. Now, use your own creativity and finish the fish costume with various types of materials. For example, scale patches can be drawn out of white paper; red construction paper, felt, or poster board can used to make gills; and small cloth or paper dots can used to make the lateral line.
4. Make a camouflage square to add to the costume. This square can be made of anything and in anyway you want, although it works best to pick a color that matches the carpet, chalk/white/bulletin board, etc. that can be found around the room. This allows you to relate the fishes camouflage pattern to its habitat, in this case - the classroom around it, and show how it can blend in and escape predators.
5. Make the ocean blue strip for the counter-shading coloration pattern to add to the fish costume by laying out one side of the fish skin pattern on ocean blue paper and cutting out just the dorsal fin or upper half of the pattern.
6. After the costume parts are cut out and made, laminating *(helps make costume last for future use)* or taping the edges is necessary to prevent rips. All parts can be affixed with adhesive tape during the dress-up/fashion session.
7. Attach elastic/rubber bands to the pectoral fins so that the fins can be slipped on like sleeves.

Specific instructions for the dress-up/fashion session:

1. Hide the costume parts in a box/bag until it is time to use them. Stack the pieces in the correct order in anticipation of the students' speed and excitement during the activity. The order should be based on your assumption of the parts they will name first and last.
2. Pre-cut pieces of tape and place them within reach of the area where you will conduct this activity so they will be ready when the time comes.
3. This is a great opportunity to take photos so have a camera handy!
4. Write the key concept on chart paper or on the board in front of the class. *Different kinds of fish have many similarities since all are adapted to be survivors in marine or aquatic habitat.*

Background

See introduction and supplemental materials.

Vocabulary

Streamlined – torpedo shaped, sleek for swimming fast
Barbel – whisker-like organ near the mouth
Receptors – sensors, like nerve ending in humans
Lateral line – a series of sensory pores (small openings) located along the side of the fish that sense vibrations in the water
Gill raker – the bony or cartilaginous projections that point forward and inward from the gill that aid in feeding

Gill cover OR Operculum – the bony cover over the gills
Scales – rigid plates on the skin of the fish
Counter-shading – protective coloration pattern, the dorsal (upper) side is darker than the ventral (lower) side
Mucus – protective coating
Caudal Fin – the tail fin
Dorsal Fin – the fin on the upper side of the body
Pelvic Fin – each of the paired in fins on the lower side of the body, near the head
Anal Fin – fin over the lower side of the body near the tail
Pectoral Fin – each of the paired fins on either side of the body, near the head
Swim or Air Bladder – air-filled organ for balance and to swim up and down in the water easily

Procedure

The following is only an example of the many ways "fish fashion 101" can go! This activity can and will be a little bit different every time, depending on how your students respond to the questions. Therefore, you should use this procedure to get started and when the students lead you down a different path, "Go with the flow" and ***adapt****. Enthusiasm and flexibility are the two keys to the success of this activity!*

NOTE:

1. Write the new terms or vocabulary on the board as they are introduced. You may want to make a vocabulary list on the board so you can add words to it as you go. Be sure to remind the students that they will be adding these words to their own fish drawings and "What it takes to be a survivor" worksheet later, so they need to listen carefully and pay attention.
2. Begin the activity: **(the procedure will read like a script from here to the end)**

Teacher: Today we are going to get to know fishes a little bit better. It may seem difficult since there are thousands of different kinds of fishes. This is especially true here in Hawaii where we have fish that cannot be found anywhere else in the world. Fortunately, since fishes are all adapted to life in water, they share a lot of the same characteristics. I am going to need an assistant to help us begin our study of fish adaptations. Would anyone like to help me?

Thank you, STUDENT NAME, for volunteering to be my helper. OK class, take your last look at STUDENT NAME, the student. During the next few minutes, we are going to turn him/her into a human-sized fish, before your very eyes! Like Magic! Hmmmm, where should we start? (*the dress-up is most fun when the student starts out looking like the fish right away, so get the fish body/skin and head on first thing)*

Let's put our thinking caps on and talk about some fish adaptations STUDENT NAME would need if he/she were going to start living life under the water, like a fish. Think about it for a minute. Let me see if I can help – have you ever stayed in a pool or the tub too long and gotten wrinkled skin? That's because human skin is not made for life in the water, so maybe the first thing we should do is give our fish some waterproof skin. What do you think? (*Get out the fish body tunic and put it on the student just as you would put on a jacket, then tape the front closed)*

Now, his/her skin won't wrinkle, and her body shape is smooth and **streamlined** (*write this word on the board and give the class the definition – be sure to repeat this for all new vocabulary words in bold print)* to move through the water with little resistance. But, while this is a very fine human head, it's not really streamlined for easy swimming. Maybe we should give him/her a fish head. (*Pull out the fish head and slip it over the students head)*

Let's see….How do we think fishes sense their environment? (*students will probably say "eyes", but fishes have all the other senses we do, plus one extra!)* STUDENT NAME, you've got very nice eyes, but I'm afraid bony fishes don't have much use for eyes with eyelashes and eyelids. Their eyes stay open all the time and they have much sharper focus underwater than we do. Let's give you some fish eyes! (*Pull out the fish eyes and tape them to the sides of the head)*

Class, did you know that a fish's eyes can tell us a lot about its habitat? STUDENT'S NAME eyes are quite big so he/she must be a visual predator or one that finds its prey by sight. Other fish depend mostly on their sense of smell and don't need large eyes. Fishes have pits with nerves that sense different smells. *(Point to nostrils on snout)* Other fishes have long whiskers or **barbels** with taste **receptors** to sense their prey – like the catfish or the goatfish (in Hawaii). Fishes can even feel nearby movements without actually being touched, so they have one sense that we don't called a sense of "distant touch." The organ that provides the distant touch is the lateral line. (*Take out the dotted ribbon and tape it just below the student's armpit so it hangs down the side)*

Have you ever seen the line running down the side of a fish? That's the **lateral line**! It's made of a series of tiny pits, each with a little hair-like sensor that detects nearby water movement. So, STUDENT NAME, now you can sense a predator's approach, even if the water is murky. Lateral lines also help schooling fish or fish that swim in large groups stay together and in touch.

OK, our class fish has nostrils that he/she uses them for smell in his/her environment. What else do we use our nostrils for?

Class: BREATHING!

Teacher: That's right! We can bring in air containing oxygen through out nostrils or even through our mouth and then the air enters our lungs where the oxygen is removed and sent out to the rest of our body. But wait! There is much less oxygen in the water than in the air, so most fishes have gills instead of lungs like us. We better give our fish some gills! (*Pull out the gills and show how one side of the gill is long and delicate and the other side is shorter and stouter)* The shorter, stouter side of the gill is called the **gill raker** and this acts as a sieve to keep food in the fish's mouth from swimming out through the delicate gills. (*Tape gill on each side of the fish body between the fish eye and the student's shoulder)* BUT, if these gills are so delicate, shouldn't we give them some protection? Fish have a protection shield for their gills called a **gill cover or operculum**. (*Tape a gill cover over each one of the gills)*

Now, our fish has a streamlined body, smooth fish skin, a way to sense the environment, and a way to breathe, but what will happen if another fish decides to take a bite of this nice unprotected skin? Don't fish have some kind of armor?

Class: He/She needs scales!

Teacher: Of course, of course! Most (but not all) fishes have overlapping **scales** that protect them from bites and scrapes. (*Pull out a patch of scales and tape them to the fish skin)*

Hey, I am just wondering, what color should our fish be? *Accept all possibilities and acknowledge that fishes come in all colors.* The color and pattern of a fish depends on where and how it lives. For example, fish are often camouflaged to match their surroundings. (*Pull out a patch of camouflage pattern and tape it to one side of the fish, preferably the side that is visible to the class*)

But, what if our fish was an open ocean fish, like a big tuna or ahi? How do fishes in the open water hide? *Acknowledge some various responses.* Did you ever notice that some fish are dark blue on the back and light on the belly? That's common in open water fishes. (*Pull out the blue back strip and tape it on the other side of the fish body*) When these fish are seen from other fish above, they blend in with the dark water below, and when they are seen from below, they blend in with the light from above. This is called **counter-shading** and it is a type of camouflage used by many organisms in their natural environment. Should our fish be a bottom-dwelling fish or an open ocean fish? *Turn the student so the appropriate side is facing the class.*

Guess what! Fishes have even another protective coating that helps them avoid bacterial infections. If you have ever been fishing or held a fresh fish, what's that slippery stuff that gets all over your hands?

Class: Slime!

Teacher: Wow, you really know your stuff! That's right, the fish's protective mucus coating has slimed you. *Take out come saran wrap to represent slime and drape it around the student fish's shoulder like a cape or shawl.* In addition to helping a fish avoid infection, the mucus helps the fish swim faster by reducing the drag and making them glide through the water. In some fish, the mucus is even poisonous so predators will avoid them.

Ok boys and girls, now our fish has a well protected body, but how is he/she going to swim? Human legs will certainly not work underwater. Any ideas?

Class: He/She needs fins!

Teacher: Right! Fins would sure help him/her move more efficiently. Hmmm, fish have several fins, which one do you think most fishes use as their main power source?

Class: The tail fin. *Other answers are ok, since some fish use other fins for their main swimming power.*

Teacher: Oh, yeah! The tail fin. It's called the caudal fin. Good job, boys and girls! (*Take out the rounded tail fin and show it to the class)* Will he/she move the tail up and down or side-to-

side to swim? *Fish move their tails side to side to swim, whales move their tails up and down. Demonstrate this as you hold the tail up in front of the class and then tape it to the bottom of the fish body so it hangs down by the students feet).* This round-shaped **caudal fin** is common in slow-swimming fishes that live on or near the seafloor. They often lay still and ambush their prey. Other slow-swimming fishes have squared off tails like this. (*Pull out the square tail to demonstrate)* The fastest swimmers, like the tuna, have crescent-shaped tails. (*Pull it out and show it to the class)* The slowest of all the fishes are the eels, like the moray eel, that are long and skinny with no tail or caudal fin. Which tail should we give our fish? (*Tape on the most popular tail*) Now, if our fish sees a tasty treat swim by he/she can beat his/her tail to chase it. But something is not quite right, when he/she beats the tail from side to side, the body will tend to move in the other direction. A sailboat has a board in the center of the hull, called a keel, to help keep it going straight. What can we give STUDENT'S NAME that would work like a boat's keel?

Class: More fins!

Teacher: Right, fishes have a fin right on the middle of their back called a **dorsal fin**. (*Take out the dorsal fin and show it to the class, then tape it to the back of the fish body)* And they have a similar fin on the middle of their underside, called the **anal fin**. (*Take out anal fin and tape it to the front of the costume just above the tail)* So, now our STUDENT NAME fish has 2 keels to keep him/her going straight. But what if the tasty treat he/she is chasing turns quickly and all he/she can do is swim in a straight line?

Class: Add more fins!

Teacher: Right again! What good little ichthyologists you are becoming! Fish have fins called **pectoral fins** on each side of their body that help them to turn and stop. (*Pull out the pectoral fins and attach one to each of the student's biceps with a rubber band*) Now, if a tasty treat swims by and turns left, then our fish can use its left fin to the turn that way too. Some fishes swim mainly with their pectoral fins, instead of their caudal fin. Now, let's make our fish even more agile and give her/him 2 other fins called **pelvic fins** that will help him/her turn and stop also. The pelvic fins are near the mid-line on the fish's belly. Some fishes use their pelvic fins like legs to walk along to the seafloor. (*Take out the pelvic fins and tape them on)*

Alright! We are getting close to the perfect fish model! Now our fish can find prey and detect predators with its eyes and lateral line. He/she can chase prey or escape predators with a caudal fin, turn and stop using the pectoral and pelvic fins. But even if he/she catches dinner, like a scrumptious squid, how is she going to eat it?

Class: Jaws! (or teeth, or a mouth)

Teacher: Let me see if we have some jaws for STUDENT NAME. (*Get the class to make the suspense-building sound effects from the movie "Jaws" – da na, da na, da na, da na, da da da da! As you pull out a set of jaws*). The jaws of a fish can tell us a lot about the food a fish eats. For example, a fish with a big mouth and very small teeth, like a grouper, probably swallows other fish whole. (*Pull out another set of jaws*) A fish with lots of big sharp teeth, like a

barracuda, may slash its prey before swallowing it. Which jaw should we give STUDENT NAME? (*Tape the desired set of jaws on the head of the fish)*

There is another body part we should add so that STUDENT NAME doesn't have to constantly work to keep from sinking to the bottom or floating to the surface. (*Pull out the balloon and have the student fish blow it up, then put it inside the costume)* Explain to the students that this balloon represents the **swim or air bladder** and that many fish have this to help them easily stay at one particular depth in the water rather than constantly working or swimming to stay where they want. It is sort of like having an inner tube. The less gas in the air bladder the deeper the will be, and the more gas the higher they will float.

OK, This is a really great looking fish! You have done an excellent job! Of course, we could add even more really cool body parts if we wanted. How about a lure like a fishing pole extending off his/her head, glow-in-the-dark bioluminescence, whiskers on his/her chin or suckers on her belly? All of these structures help make fish more successful in their individual habitats. For instance, bioluminescence would be a great adaptation to life in the dark-as-night deep sea. What might suckers be an adaptation for? *Stay put in rough water* Or whiskers *to see in murky water*

Well, I think our STUDENT NAME-fish already looks very cool and well adapted just as he/she is! Let's just double-check if our transformation is complete. *Quickly recap the adaptations that have been added, having the class come up with either the name of the element or the function.*

To end the fashion show: Let's all give a big hand for STUDENT NAME-fish for helping us learn all about fish today! *Have the student take a bow and have another student(s) help to carefully remove the costume parts.*

Last, while the student fish is being disassembled, have one or two student helpers pass out a Fish Anatomy Worksheet to each student. Explain that they should work individually to complete the worksheet using the word bank at the top of the page.

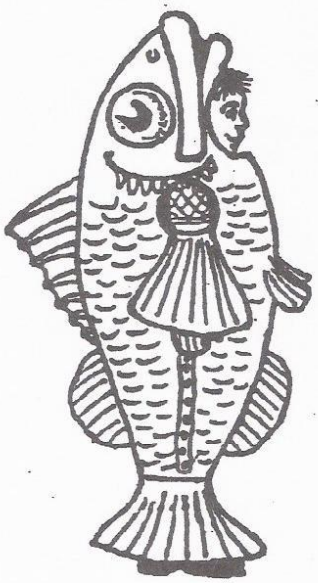
Assessments

Active participation throughout discussion and recap of structures and functions
Completion of fish anatomy worksheet

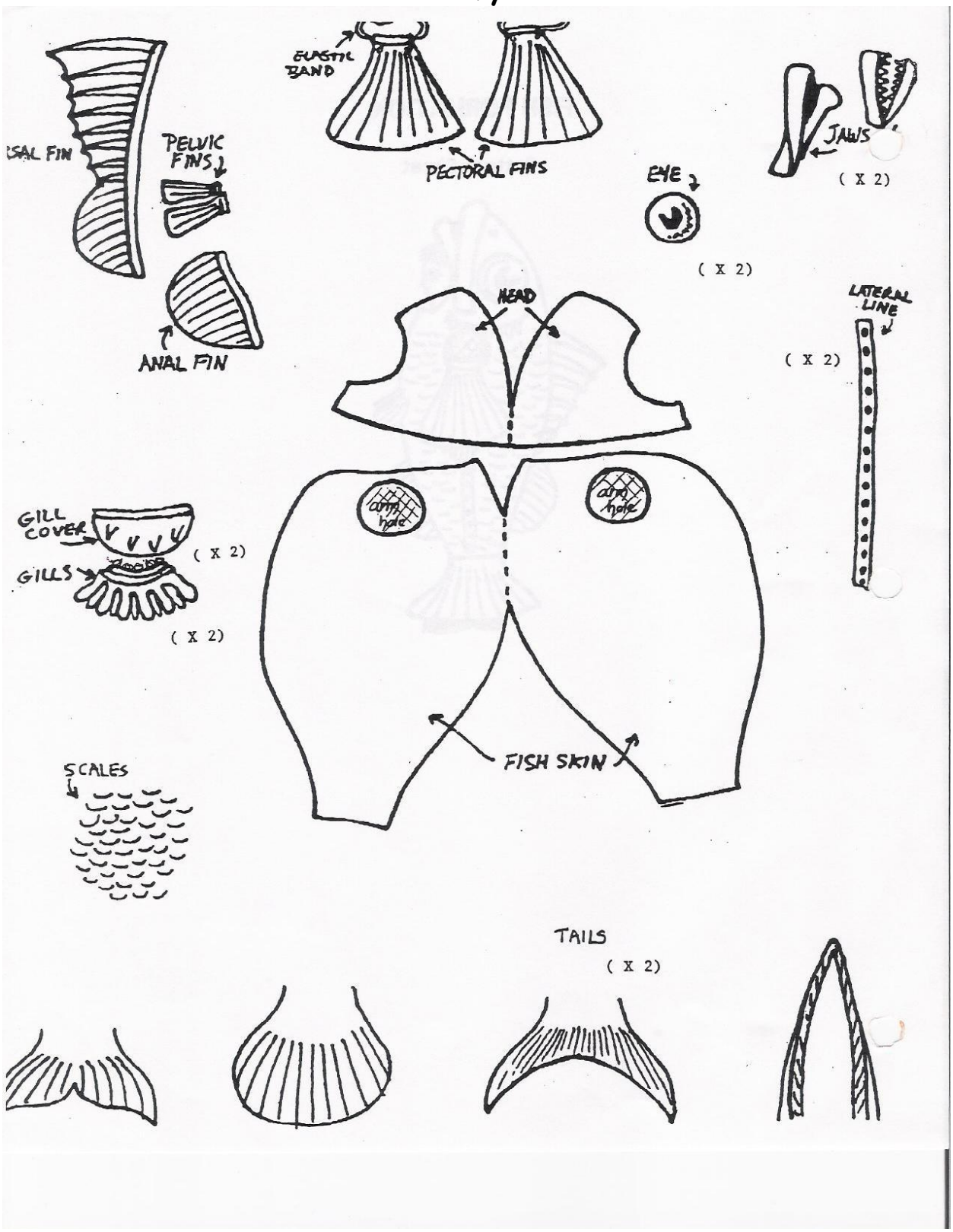
Resources

www.enchantedlearning.com

Fish Costume Pattern/Example



Fish Anatomy Patterns



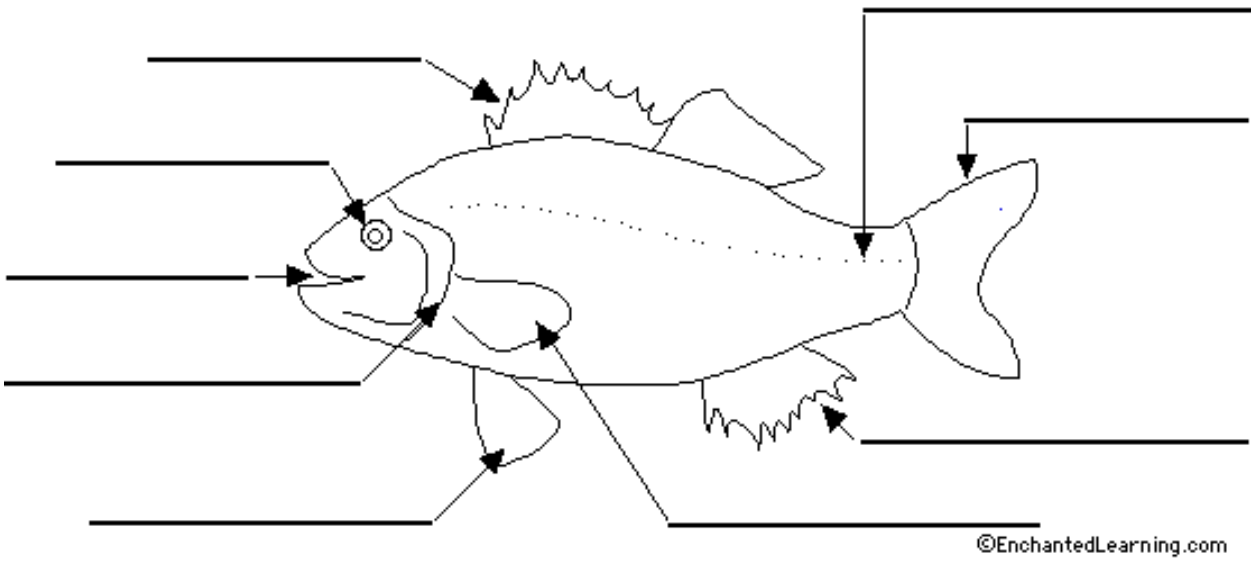
MARE Coral Reef Ecology

Student Name: _____

Fish Anatomy Worksheet

Using the words in the box below, label the fish diagram.

Anal fin	Dorsal fin	Gills	Mouth
Caudal fin	Eye	Lateral Line	Pectoral fin
	Pelvic fin		



Fish Anatomy Worksheet
Answer Key