

*The Barataria-Terrebonne National Estuary is a very special place. In fact, it is one of America's natural treasures. The wetlands of the estuary give many different creatures a place to live. In the estuary there are lots of things to eat and many places to find shelter. People like the estuary for the same reasons! Here they catch fish, crabs, shrimp, oysters, crawfish, turtles, alligators, and ducks, and "pass a good time" while eating and being with their families.*

*The wetlands of Barataria-Terrebonne also help protect the homes of the people who live there. The wetlands do that by being between the homes and waves that come the Gulf of Mexico during storms.*



*There are also oilfields in the Barataria-Terrebonne estuary. These provide fuel for cars and electricity. Many other useful things are made from oil. People work in the oilfields to make money to support their families.*

*Sadly, this wonderful estuary is in trouble. Land is being lost through natural processes and man's activities. The salt marsh is changing quickly because it is next to the ocean. Many people are working to save the estuary, and you can too. Learning about the salt marsh and sharing what you know with your friends will help. This is because people will only save what they love, and once they know about the salt marsh and the rest of the estuary, they will love it!*

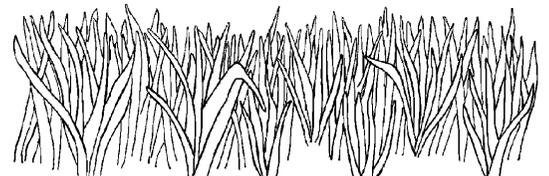
*I hope you enjoy this activity book!*

*Sincerely,*

*Clawdette*

**Note to teachers:** You can find additional information, including the state benchmarks & answers at:

[www.btne.org/pages/educational.html](http://www.btne.org/pages/educational.html)



# Table of Contents

Preface: Letter from Clawdette .....	i
Introduction .....	1
<b><u>Activities:</u></b>	
What is an Estuary?.....	2
Clawdette, Where is the Barataria-Terrebonne Estuary?....	3
The Story of My Life.....	4
Birds of a Different Feather.....	8
Bill Bits .....	9
# Fish Apart, Fish Together .....	13
Fish Pieces .....	29
The Spongy Marsh .....	20
* From Marsh to Marina .....	21
Water Pieces .....	33
Why Are We Losing Salt Marsh? .....	24
<b><u>Coloring Pages:</u></b>	
Blue Crabs .....	6
Brown Pelicans .....	7
Gulf Fritillary Butterfly .....	10
Diamondback Terrapin .....	11
Let's Go Fishing .....	14
Black Mangroves .....	12
Plants and Phytoplankton .....	16
Zooplankton .....	17
Food Pyramid of the Salt Marsh .....	18
How the Salt Marsh Stays Healthy .....	19
<b>Glossary .....</b>	<b>26</b>

# Activity was adapted from the *Take-Apart Fish Puzzle* developed at the Helen Shedd Keith Aquatic Science Center of the John G. Shedd Aquarium, Chicago, Illinois.

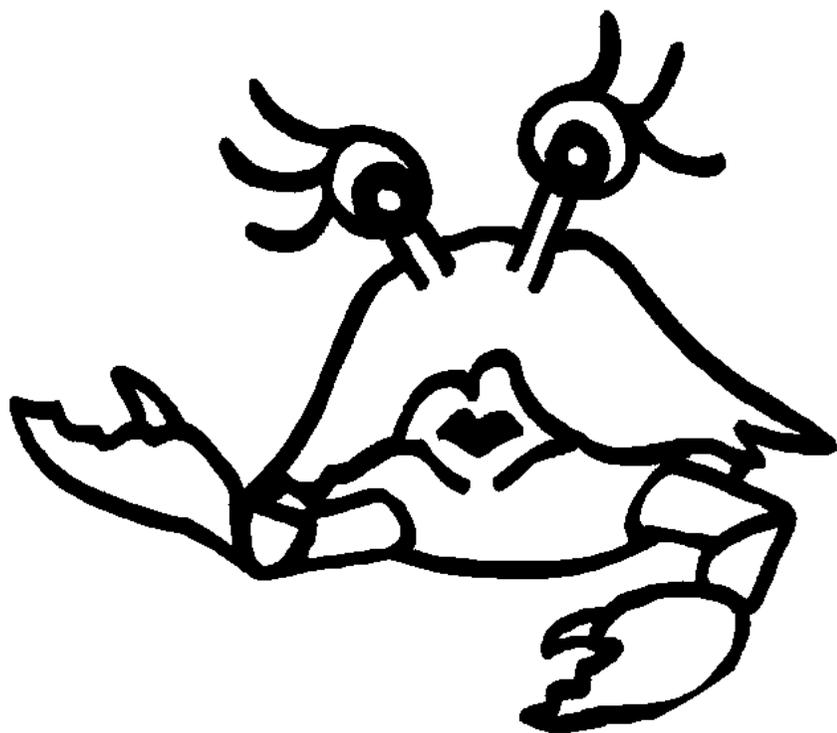
\* Activity from *Wading into Wetlands Issue of Nature Scope* by National Wildlife Federation reprinted with permission from McGraw-Hill Co.

My name is Clawdette.

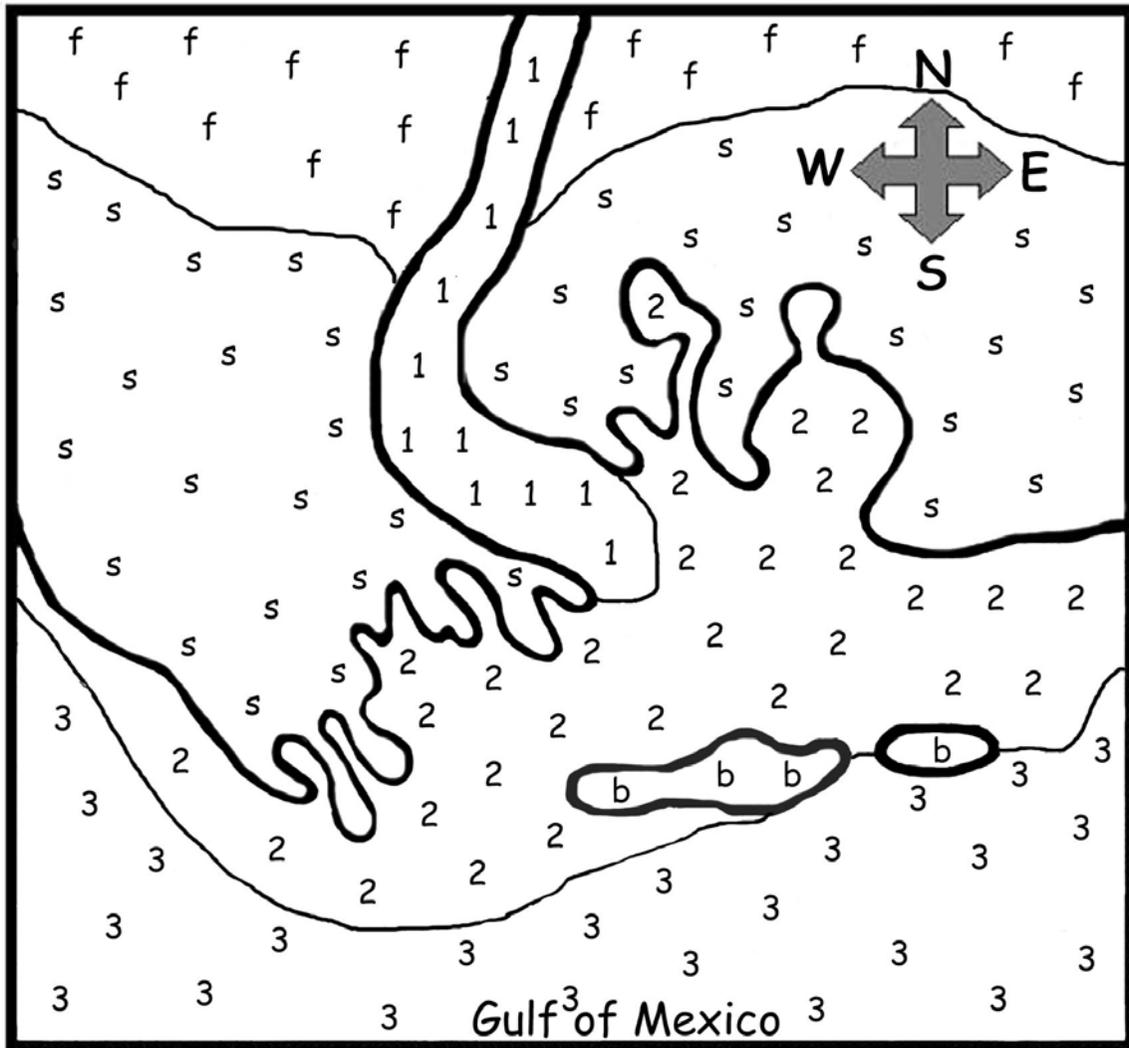
I live in the salt marsh of the  
Barataria-Terrebonne National Estuary.

Come see!

I would like to introduce you to  
my home and some friends who  
live there with me.



# What is an Estuary?

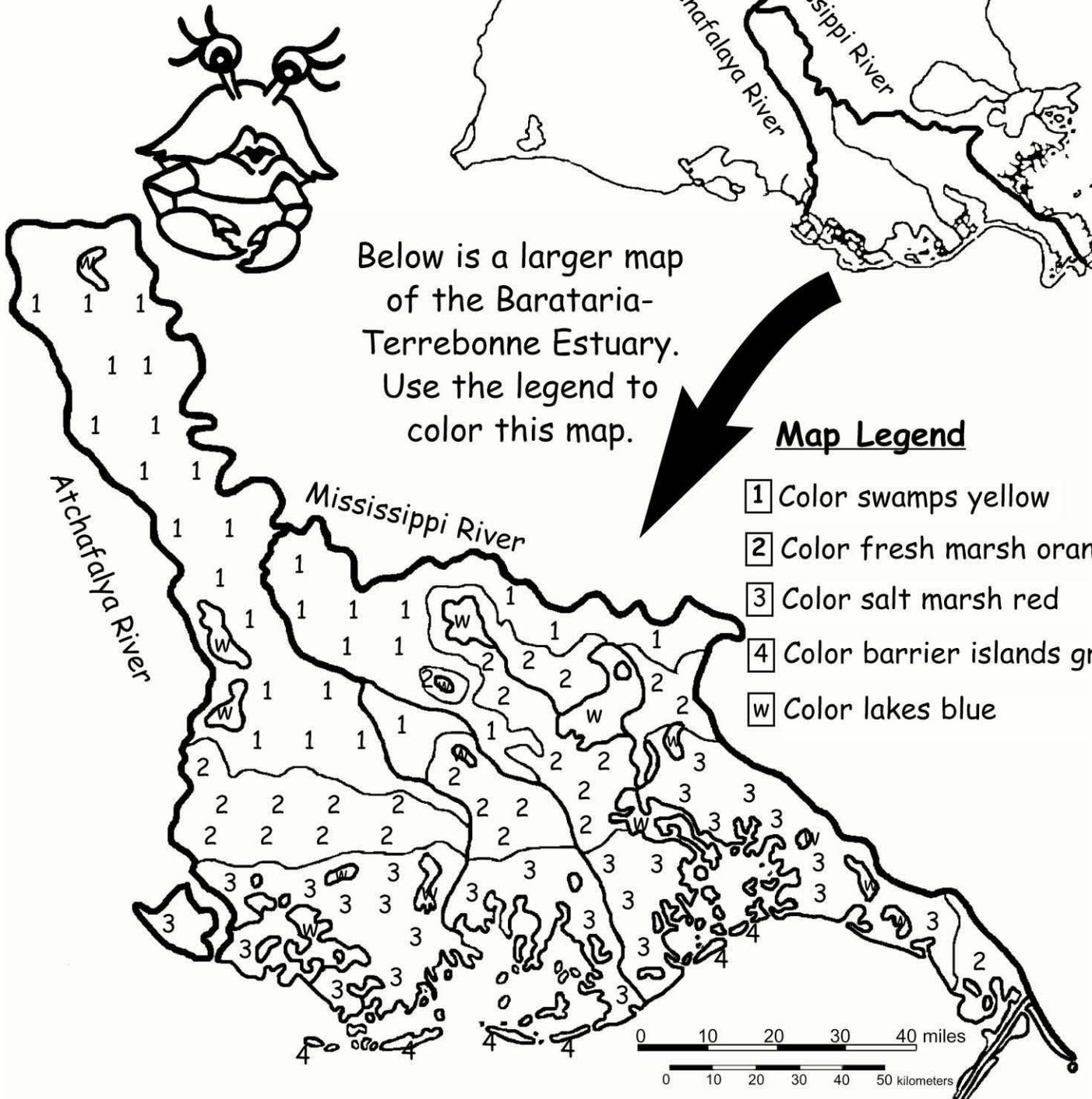
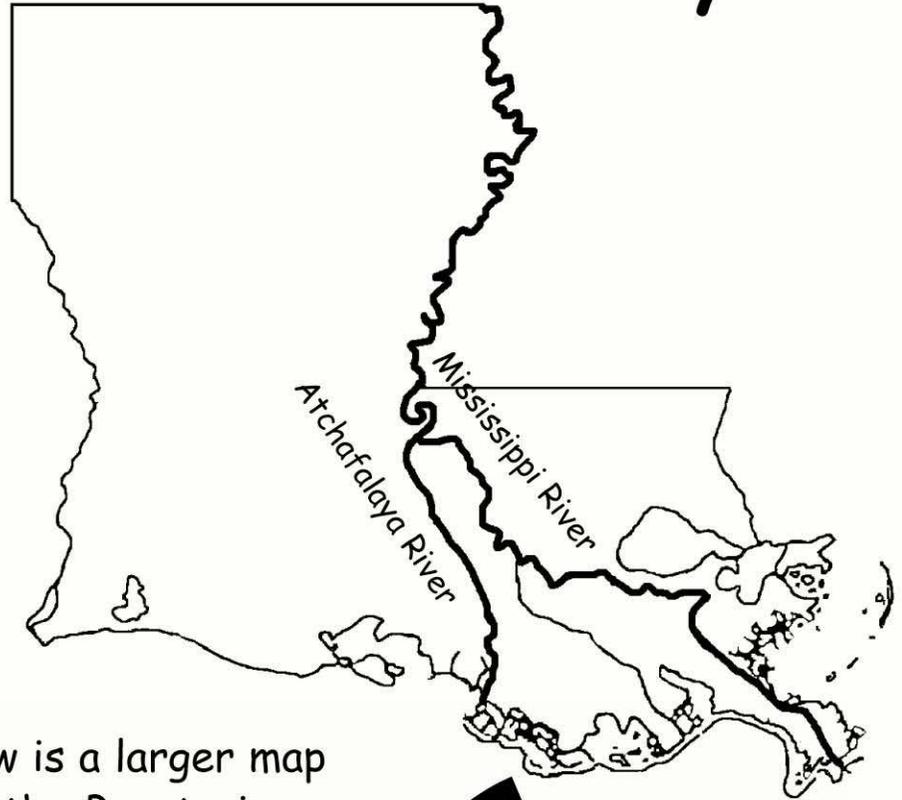


An estuary is a place where freshwater and saltwater mix. The freshwater comes from rivers, bayous, and lakes. Saltwater comes from the ocean. The ocean near the Barataria-Terrebonne National Estuary is called the Gulf of Mexico.

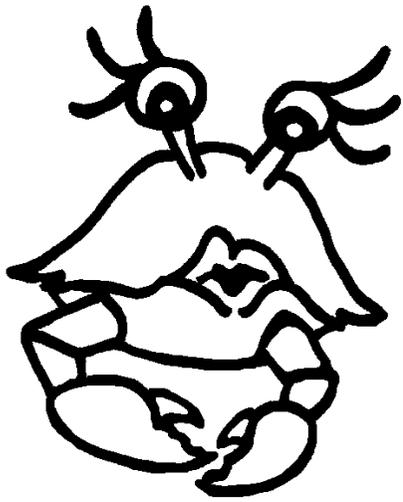
- |                            |                           |                            |                             |
|----------------------------|---------------------------|----------------------------|-----------------------------|
| <input type="checkbox"/> 1 | Color freshwater yellow   | <input type="checkbox"/> f | Color fresh marsh orange    |
| <input type="checkbox"/> 2 | Color estuary water green | <input type="checkbox"/> s | Color salt marsh red        |
| <input type="checkbox"/> 3 | Color saltwater blue      | <input type="checkbox"/> b | Color barrier islands brown |

# Clawdette, Where Is The Barataria-Terrebonne Estuary?

My home is located in South Louisiana between the Mississippi River and Atchafalaya River. On the right is a map of Louisiana. Find my home and color it purple.



Below is a larger map of the Barataria-Terrebonne Estuary. Use the legend to color this map.



# The Story of My Life

by Clawdette

My name is Clawdette, and I am a female blue crab. I began life as a tiny egg attached to my mother along with



thousands of siblings in the Gulf of



Mexico. Then I hatched as a zoea larva. In the deep water, there was plenty of food to eat, so I grew even bigger. As I continued to grow and became a megalops larva, I was strong enough to start to swim inland towards the salt marsh. During my next stage, I became an immature blue crab. As an



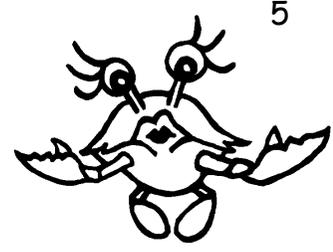
immature crab, I swam to the salt marsh edge and to shelter me



I swam to the salt found marsh grasses from animals that

wanted to eat me. Now I am a mature blue crab and live in the salt marsh. In the summer, I will travel to the deep offshore waters to lay my own eggs. Then the cycle will begin again.

Draw a line to show where I lived in each life stage.



Clawdette's life stages



Egg



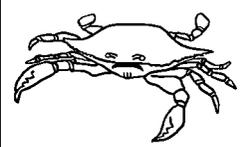
Zoea Larva



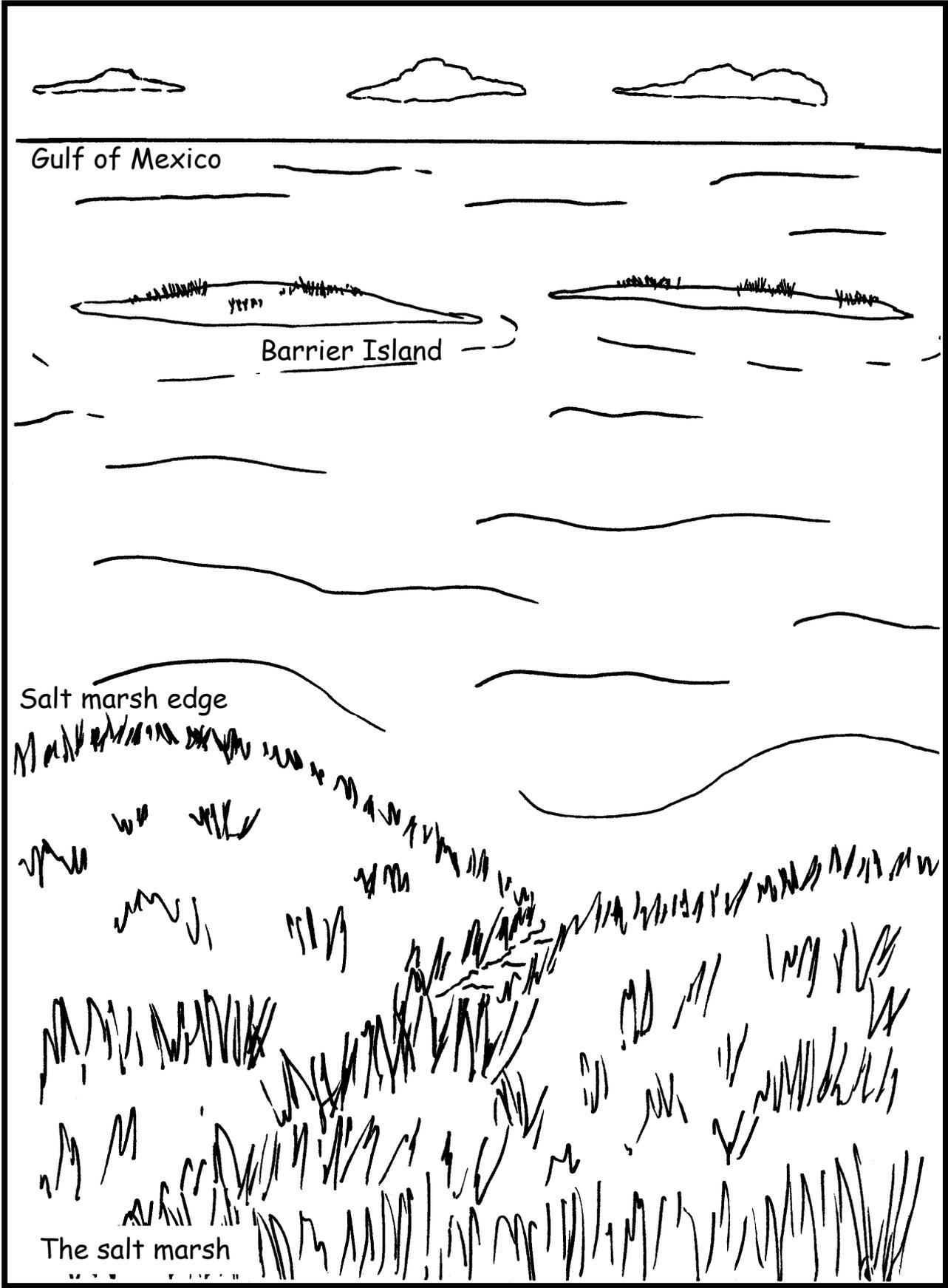
Megalops Larva

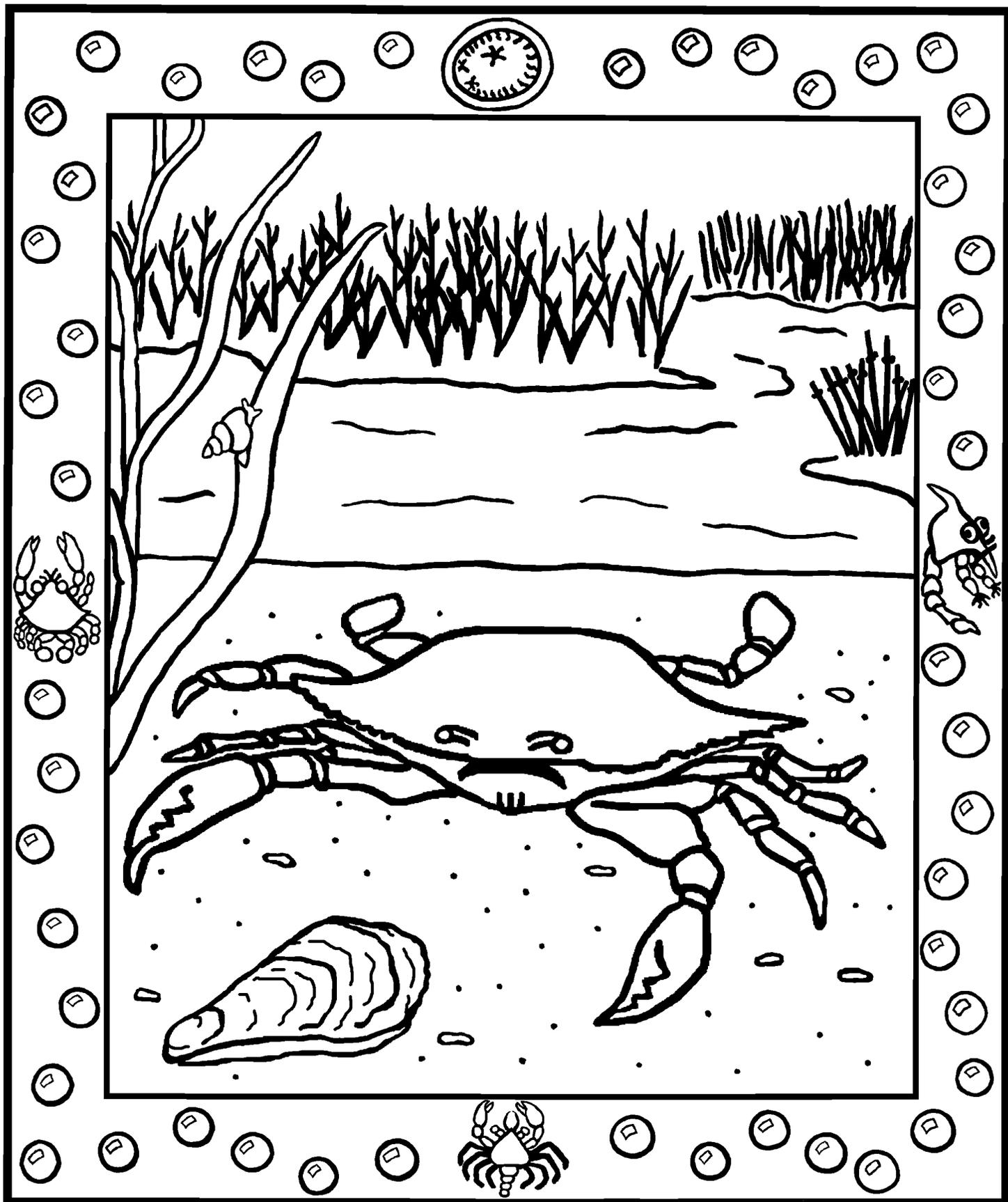


Immature Blue Crab



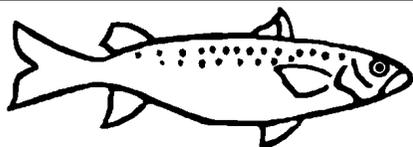
Adult Blue Crab





This is my sister, Shelby. Female blue crabs like Shelby and me have red claws. Male blue crabs have blue claws. This is a way to tell the difference between females and males.

C H O V I E

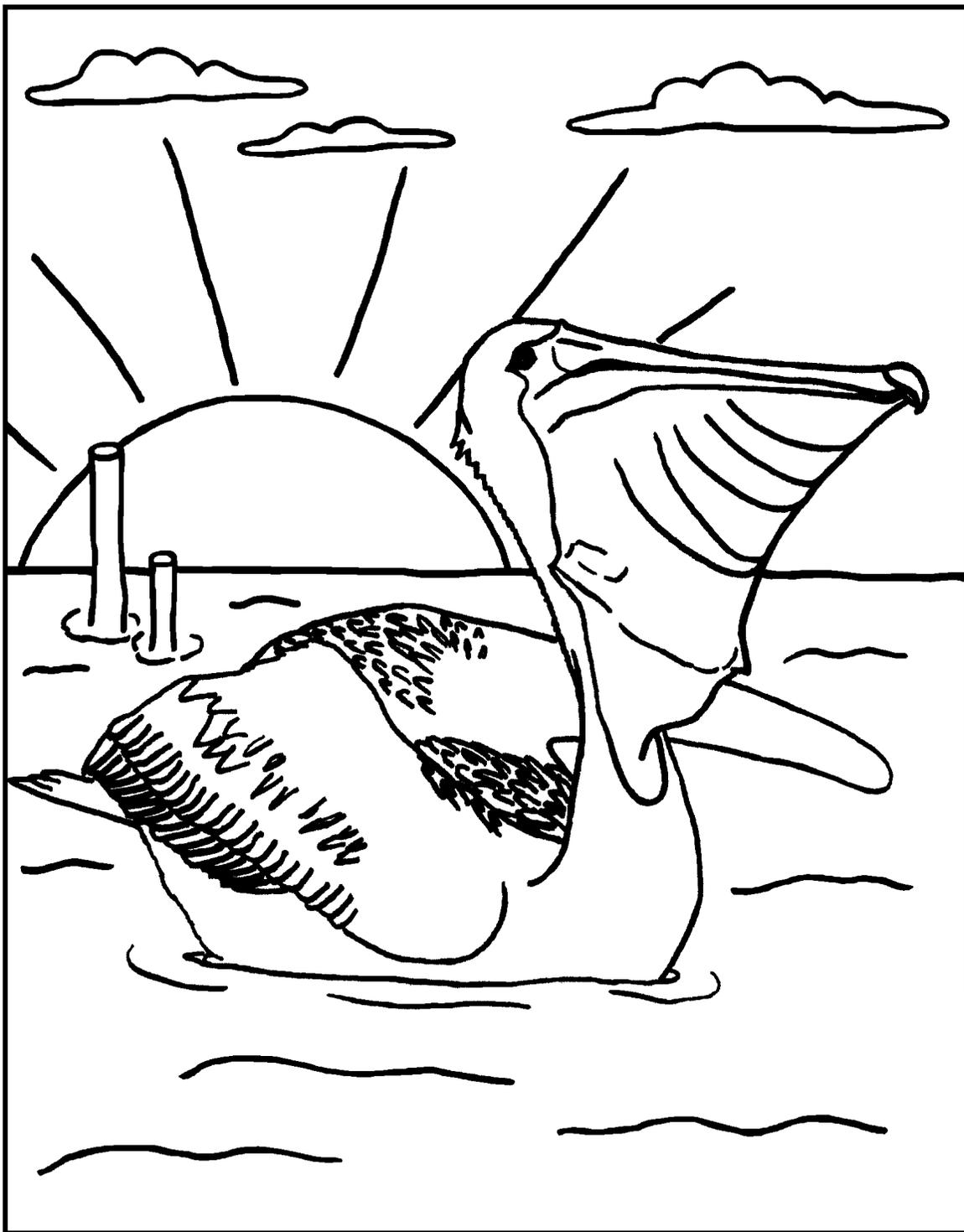


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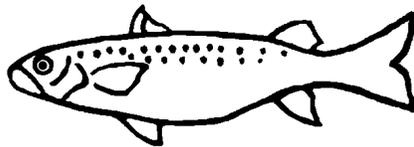


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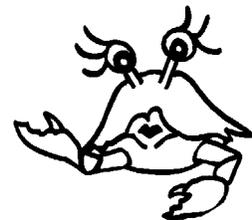
L L E T



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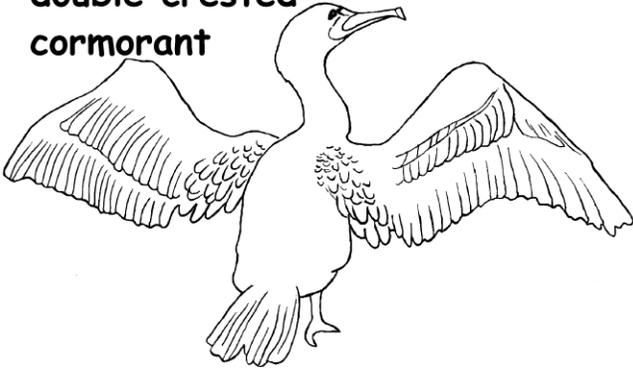
Here is a brown pelican, Louisiana's state bird. Pelicans can hold 2 1/2 gallons of water in their pouch! This one just caught a fish. Can you find the fish in its pouch? Brown pelicans like to eat fish such as mullet, menhaden, and anchovies.



# Birds of a Different Feather

In the circles below, describe how the two birds are alike and how they are different.

double crested  
cormorant



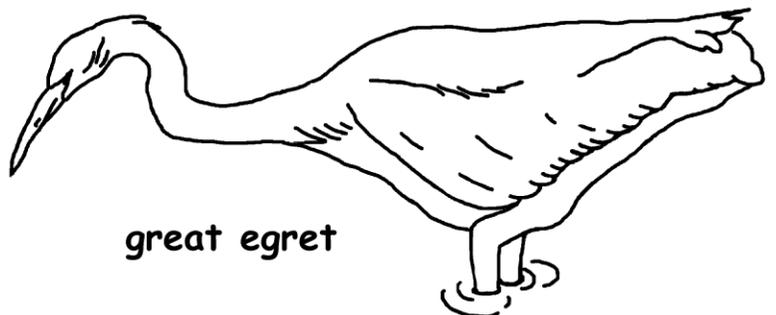
Double crested cormorants have black feathers and a yellow bill. They fly over the water looking for food. Once they spot their meal, the bird dives under the water to get it. Double crested cormorants like to eat fish. They have to spread their wings to dry in the sun, like the one pictured.

How is the double crested cormorant different from the great egret?

How are the birds alike?

How is the great egret different from the double crested cormorant?

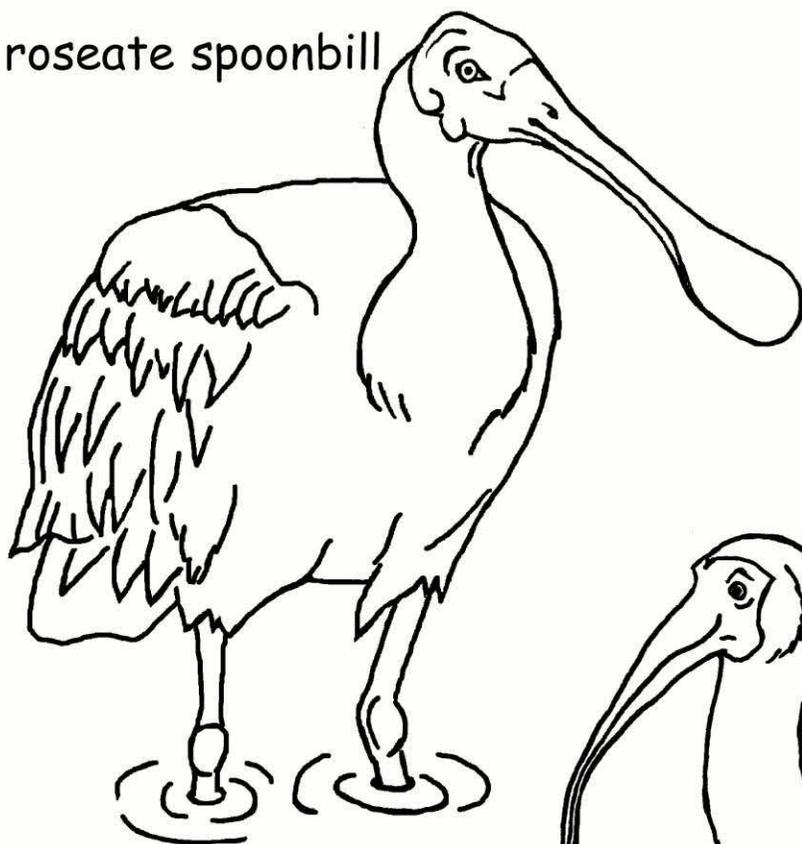
Great egrets have white feathers and a yellow bill. They have long legs used to wade in the water in search of a meal. They use their bill as a spear to catch prey. Great egrets like to eat fish, frogs, and snakes.



great egret

# Bill Bits

roseate spoonbill



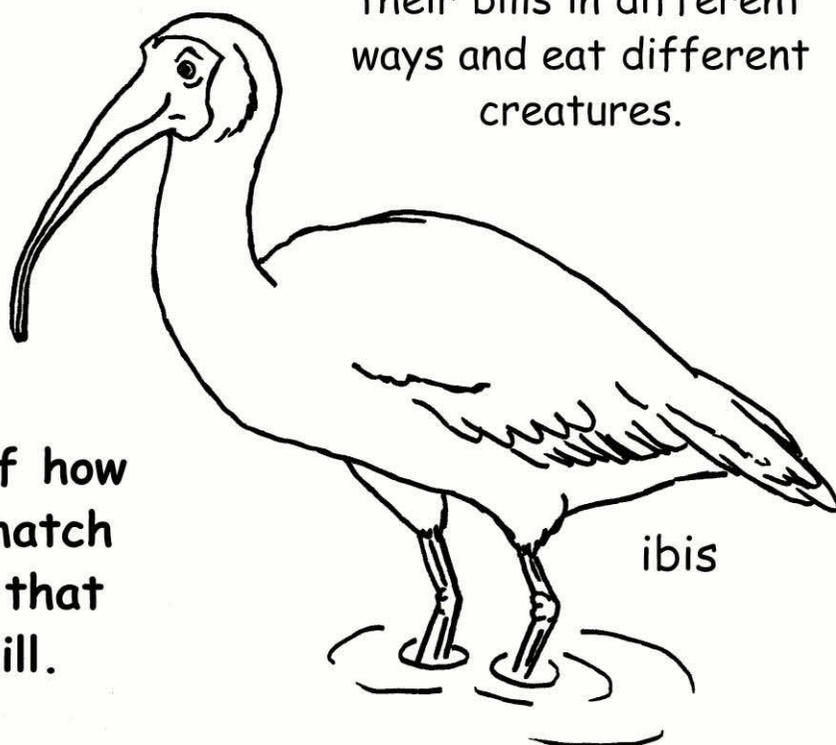
Both the roseate spoonbill and ibis are wading birds of the salt marsh.

These birds have similar body shapes but have very different bills. Their bills have different shapes because they use their bills in different ways and eat different creatures.

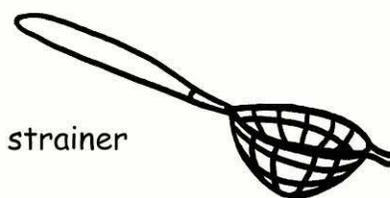
Read the description of how each bird eats. Then match the bird with the tool that works most like its bill.

The roseate spoonbill feeds by moving its open bill back and forth in the water filtering out small fish and insects.

The ibis feeds by sticking its bill into the muddy bottom in search of crabs.



ibis



strainer

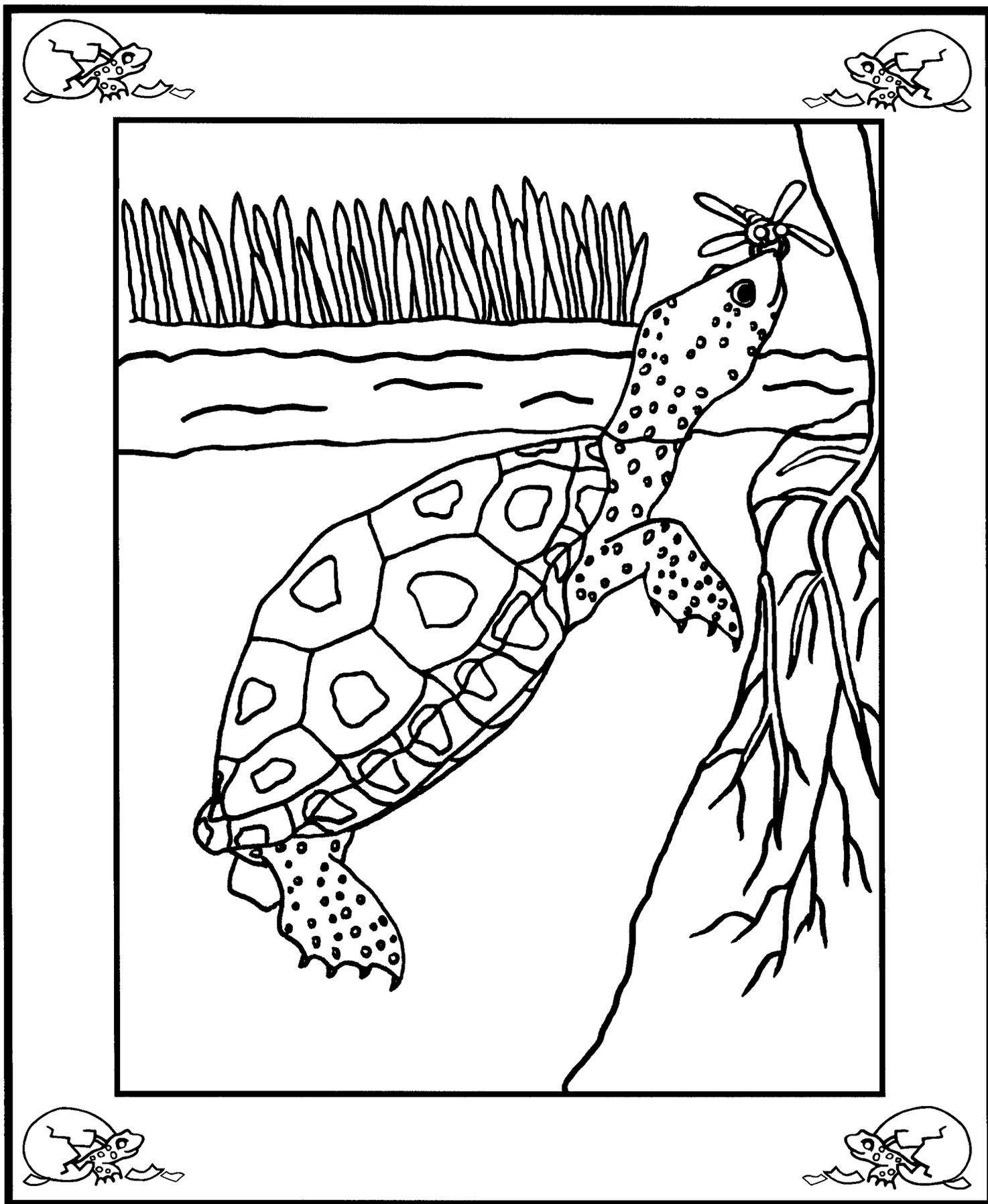


tweezers

## passion flowers

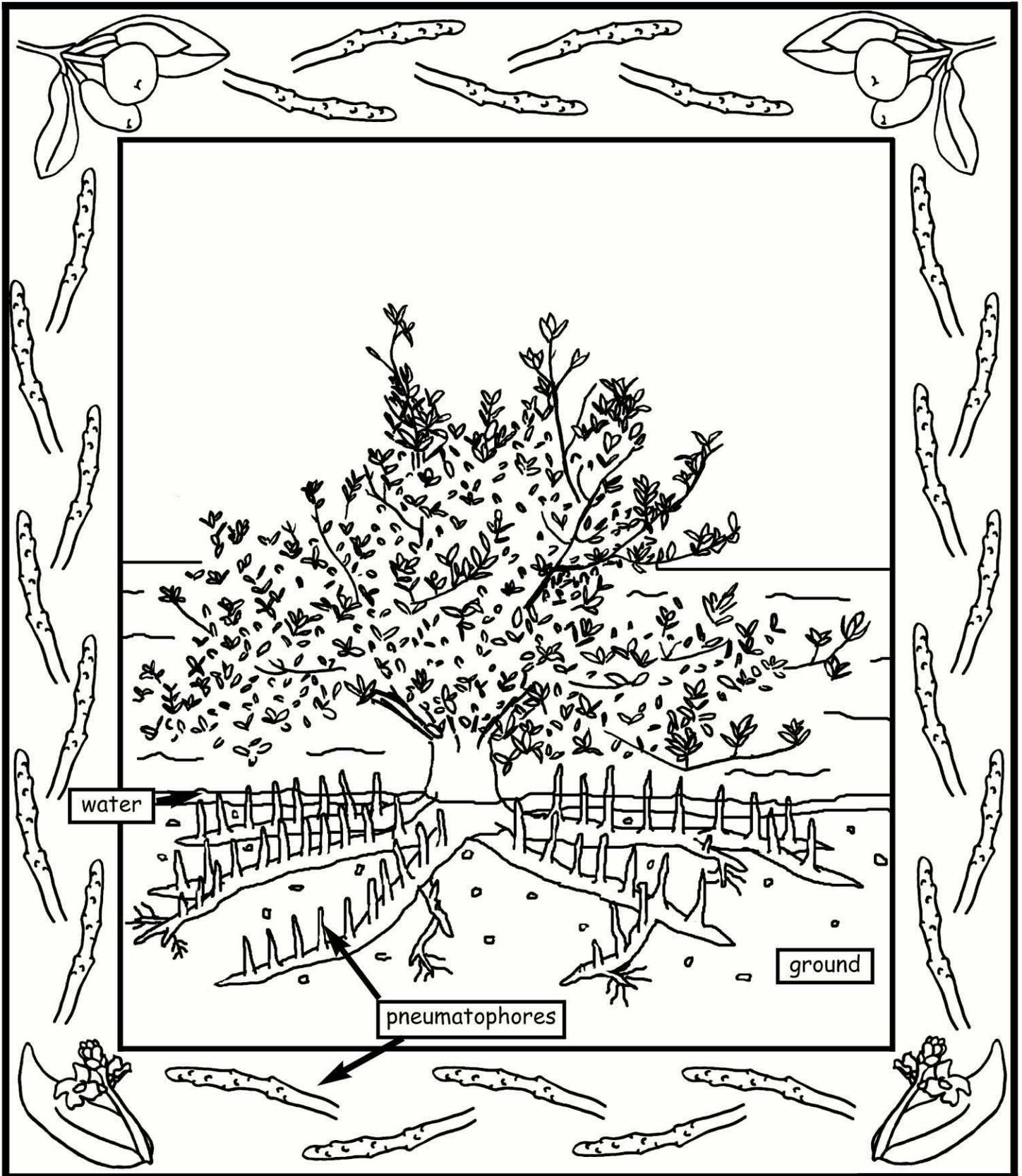


Here is a gulf fritillary butterfly sitting on a plant called a salt marsh aster. Gulf fritillaries eat salt marsh asters. They lay their eggs on passion flower leaves (maypops). The eggs hatch into caterpillars. Caterpillars eat and eat passion flower leaves until they become fat. In the fall they make a chrysalis which hangs from the plant. They stay in the chrysalis over the winter to rest and change into adults. In the spring they hatch into adult butterflies.



This is Freckles, a diamondback terrapin turtle. She lays her eggs in the salt marsh. She swims around looking for food to eat. She is happy because she likes to eat dragonflies. A dragonfly just landed on her nose.

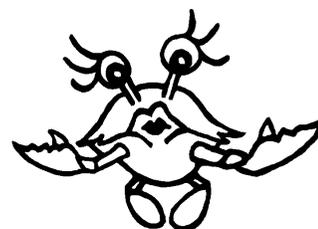
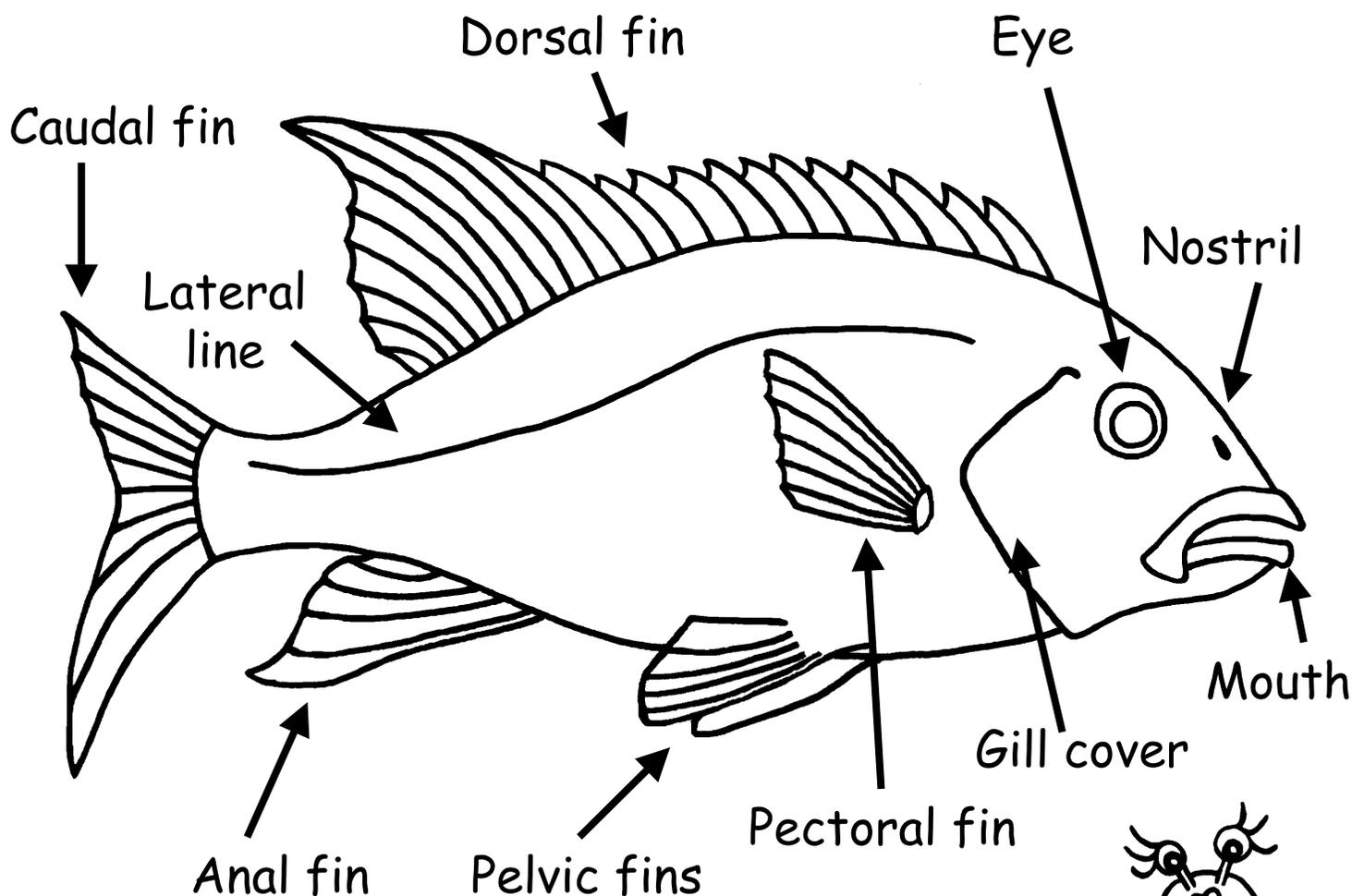




This is a black mangrove tree. Mangroves are found along the edge of salt marshes. Black mangrove trees in Louisiana rarely grow more than 4 feet tall, but in warmer places, like south Florida, they can grow to be 53 feet tall! Pneumatophores are part of a black mangrove tree's roots that stick out of the ground. Pneumatophores help the tree "breathe" by taking in carbon dioxide and giving off oxygen. The roots hold the ground together to help prevent erosion.



# Fish Apart, Fish Together

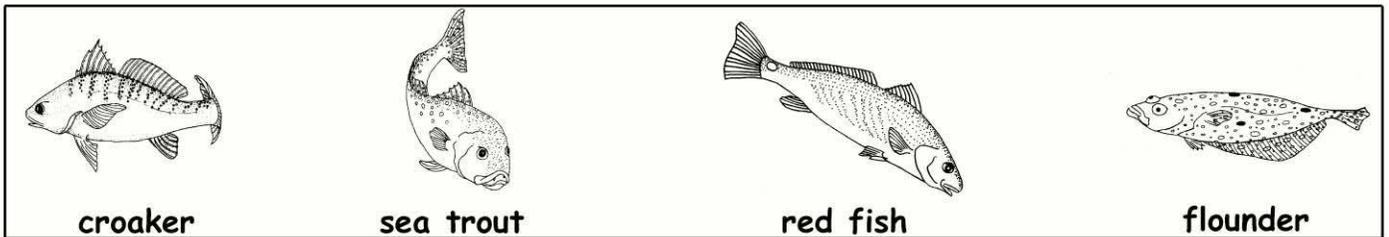
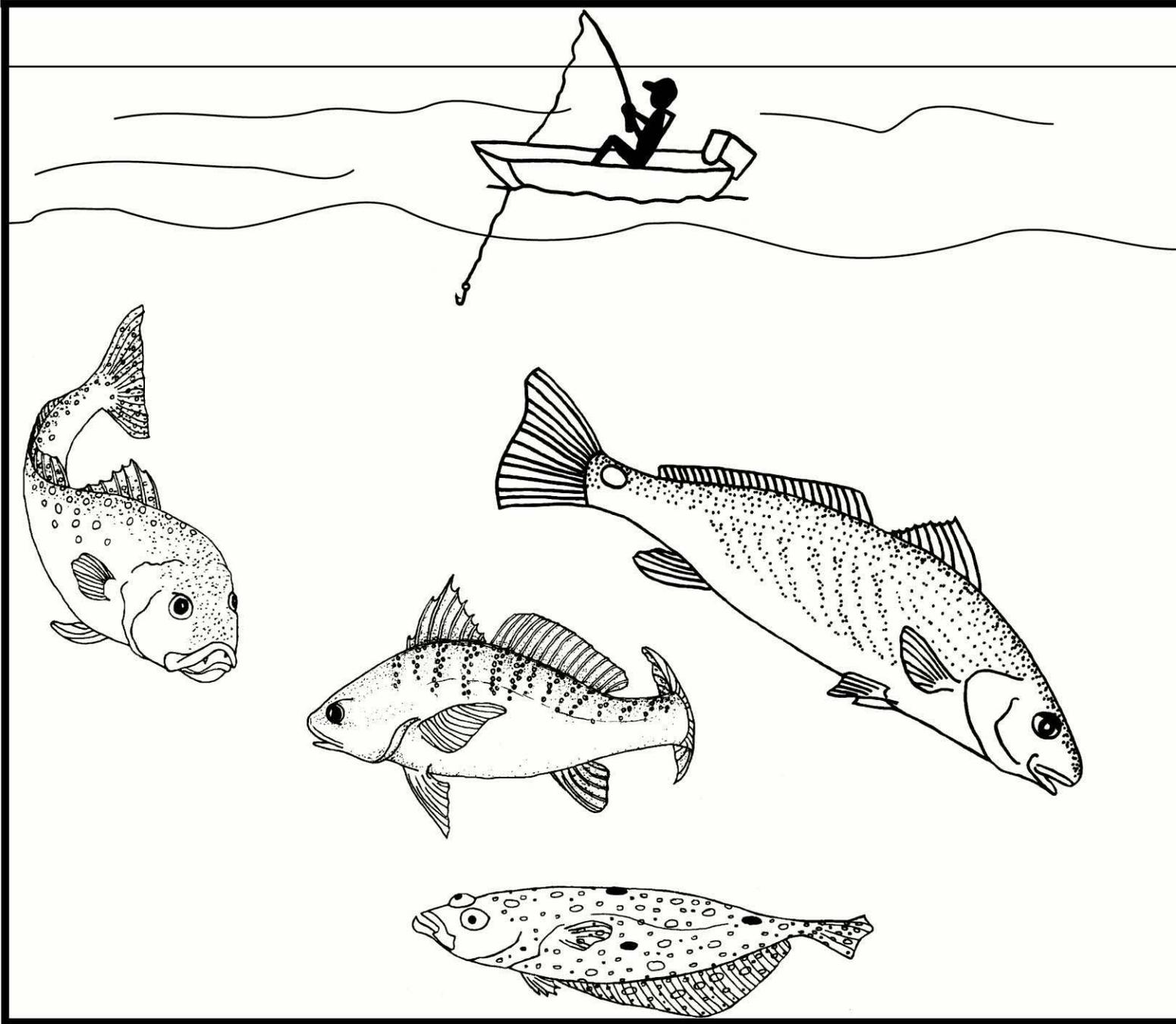


There are many different kinds of fish you can see in the salt marsh. All of them look different. Fish eat a variety of foods from tiny plants to other fish. Some fish live on the bottom while other fish live near the surface. For all their differences, all fish have the same parts. To find out the function of the parts of a fish, go to the fish glossary on page 27.

The parts of a fish are separated on pages 29 & 31. Cut them out and put the fish back together. Use the information on this page to help you out.

Let's

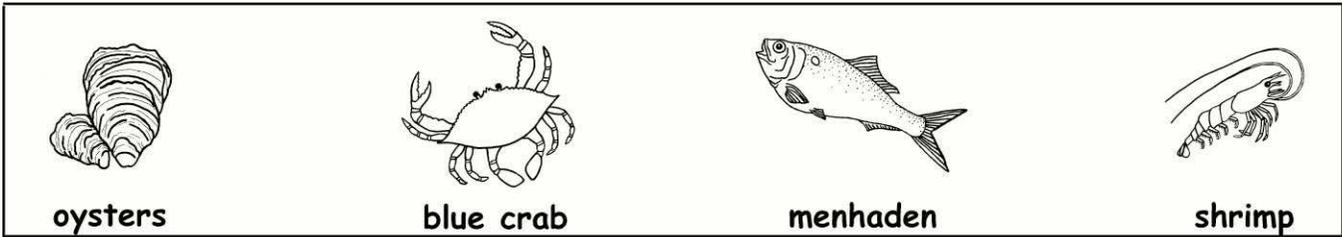
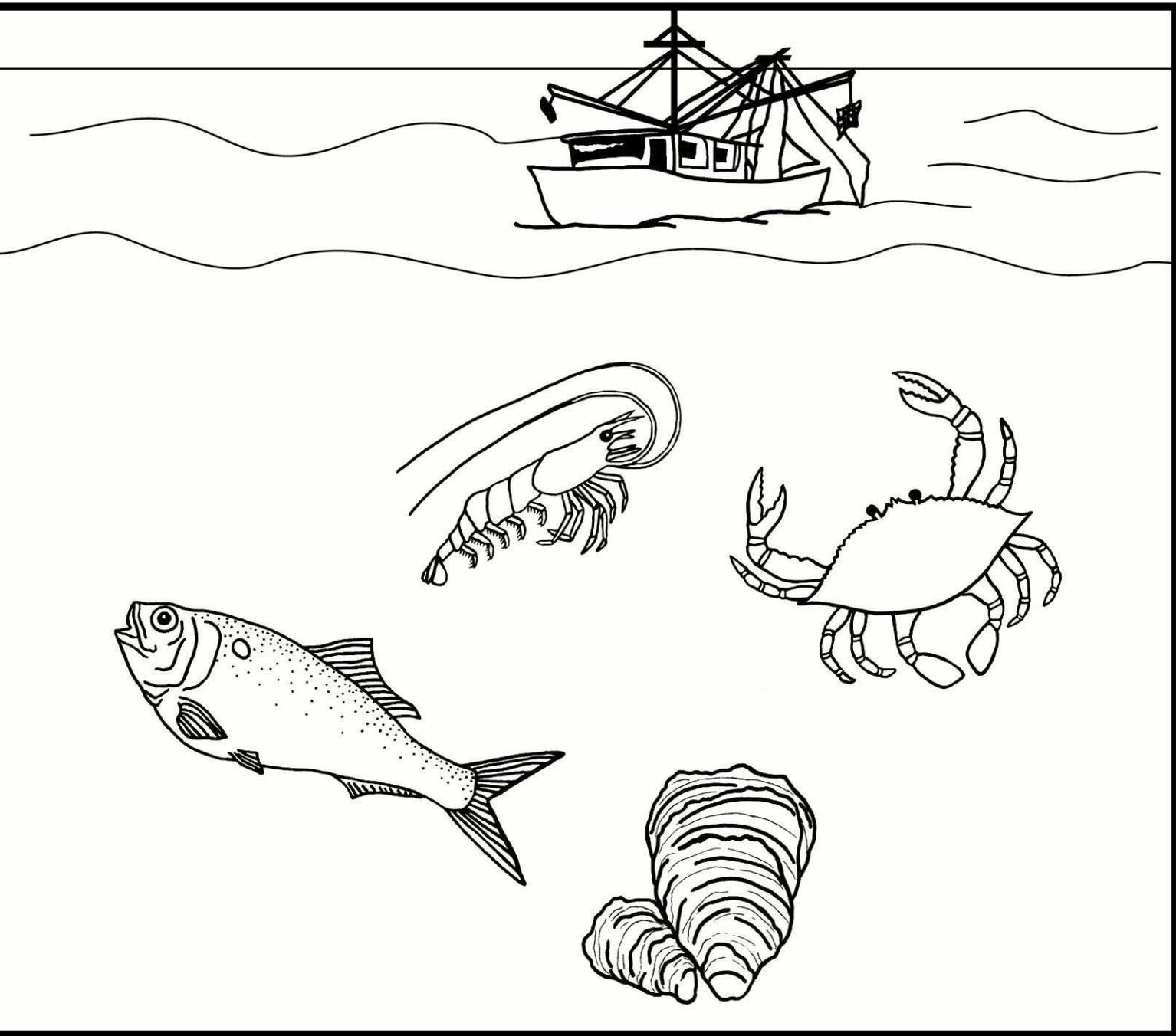
Go



### Major recreational finfish

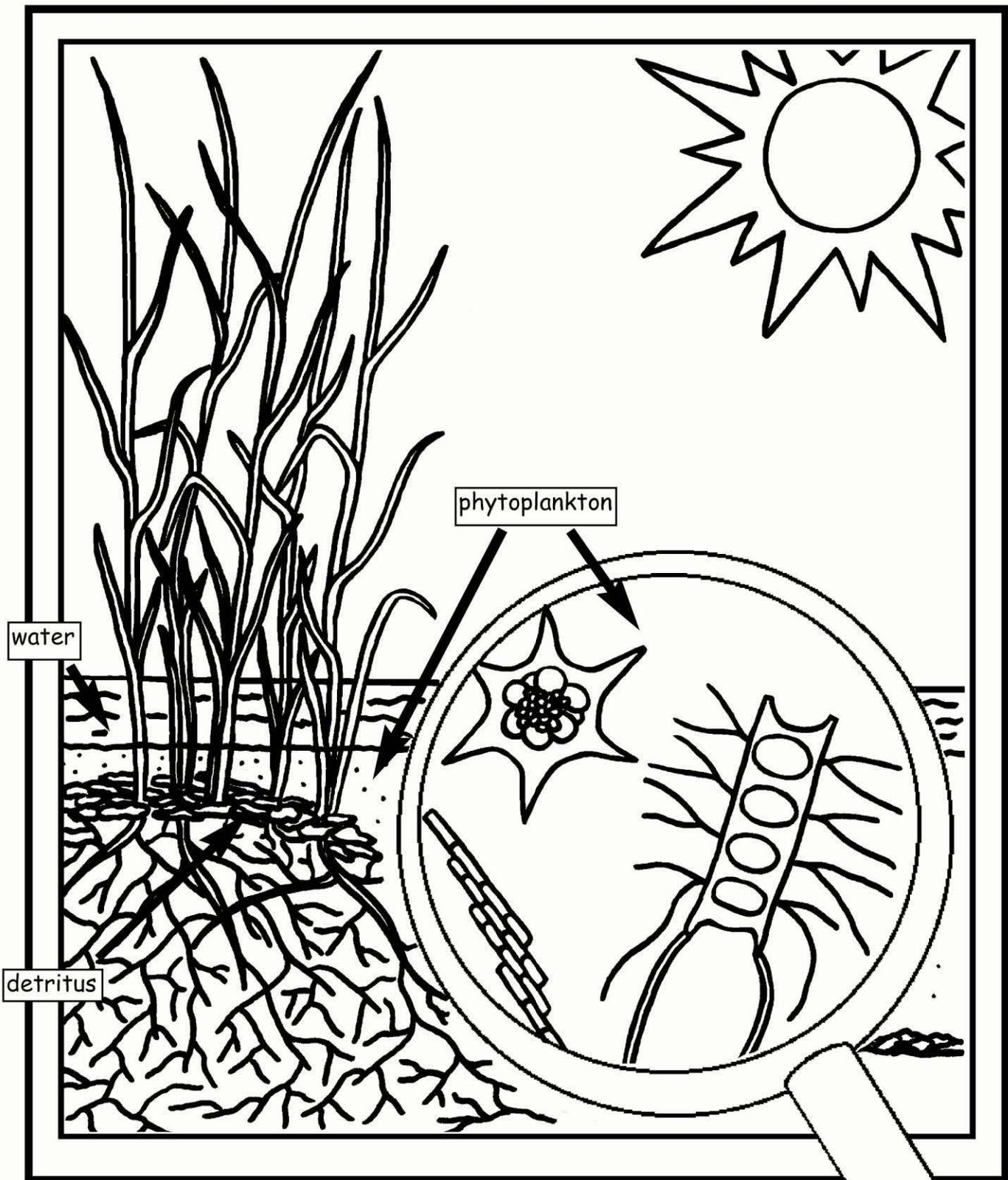
Fish and shellfish lay eggs near the salt marsh. The salt marsh provides young fish and shellfish with a place to hide. The salt marsh also has plenty of food for these youngsters to eat. Some young fish and shellfish are eaten by other creatures of the salt marsh. Many of the fish and shellfish grow up to be adults.

# Fishing

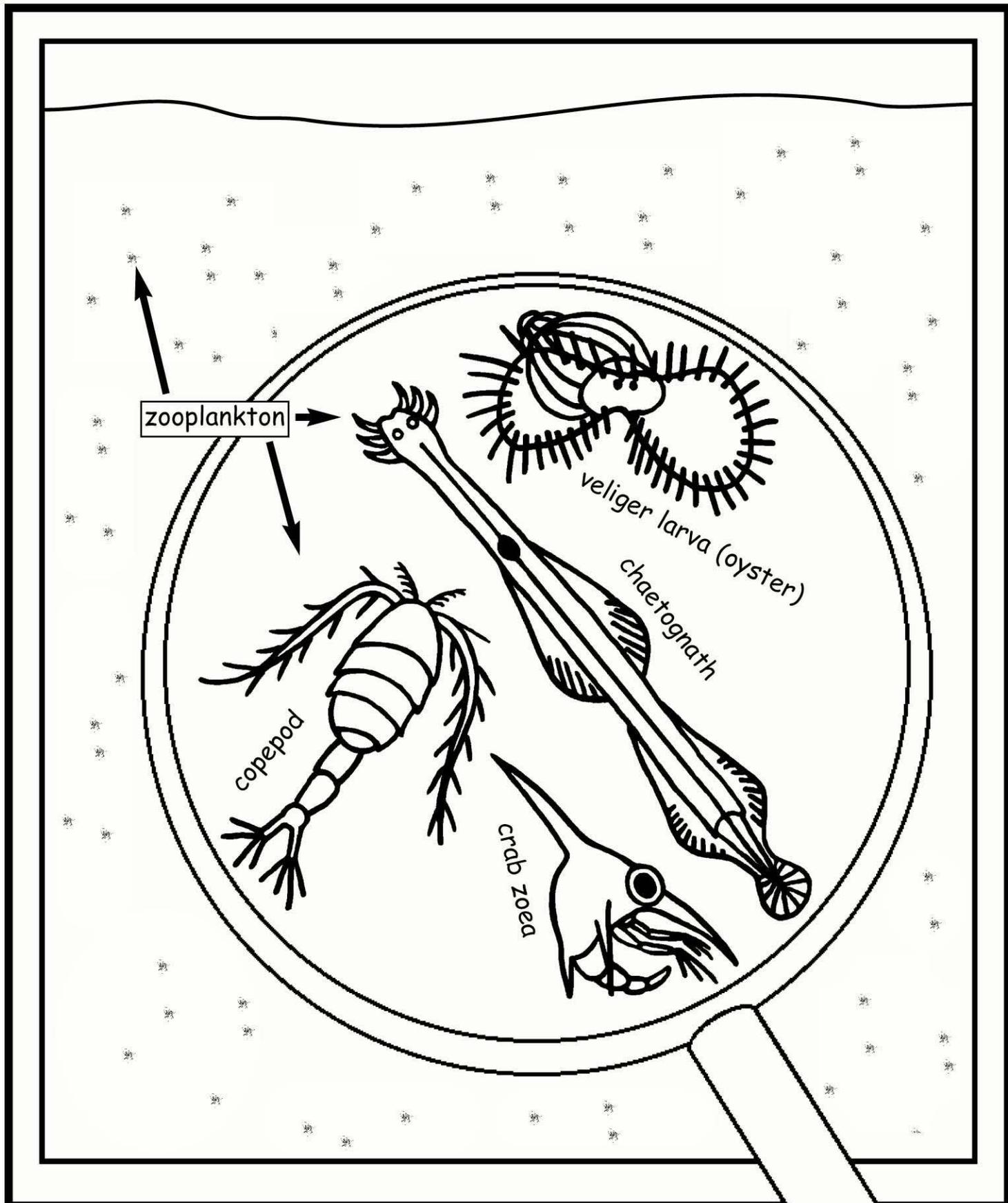


## Major commercial shellfish and finfish

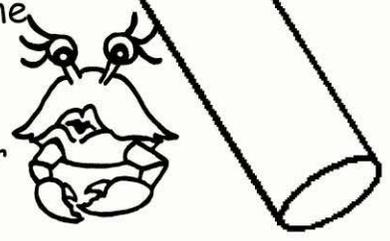
Humans love to go fishing in or near the salt marsh because there are many fish to catch. In **recreational fishing**, people catch fish for fun. In **commercial fishing**, people catch fish and shellfish which they sell to make a living.



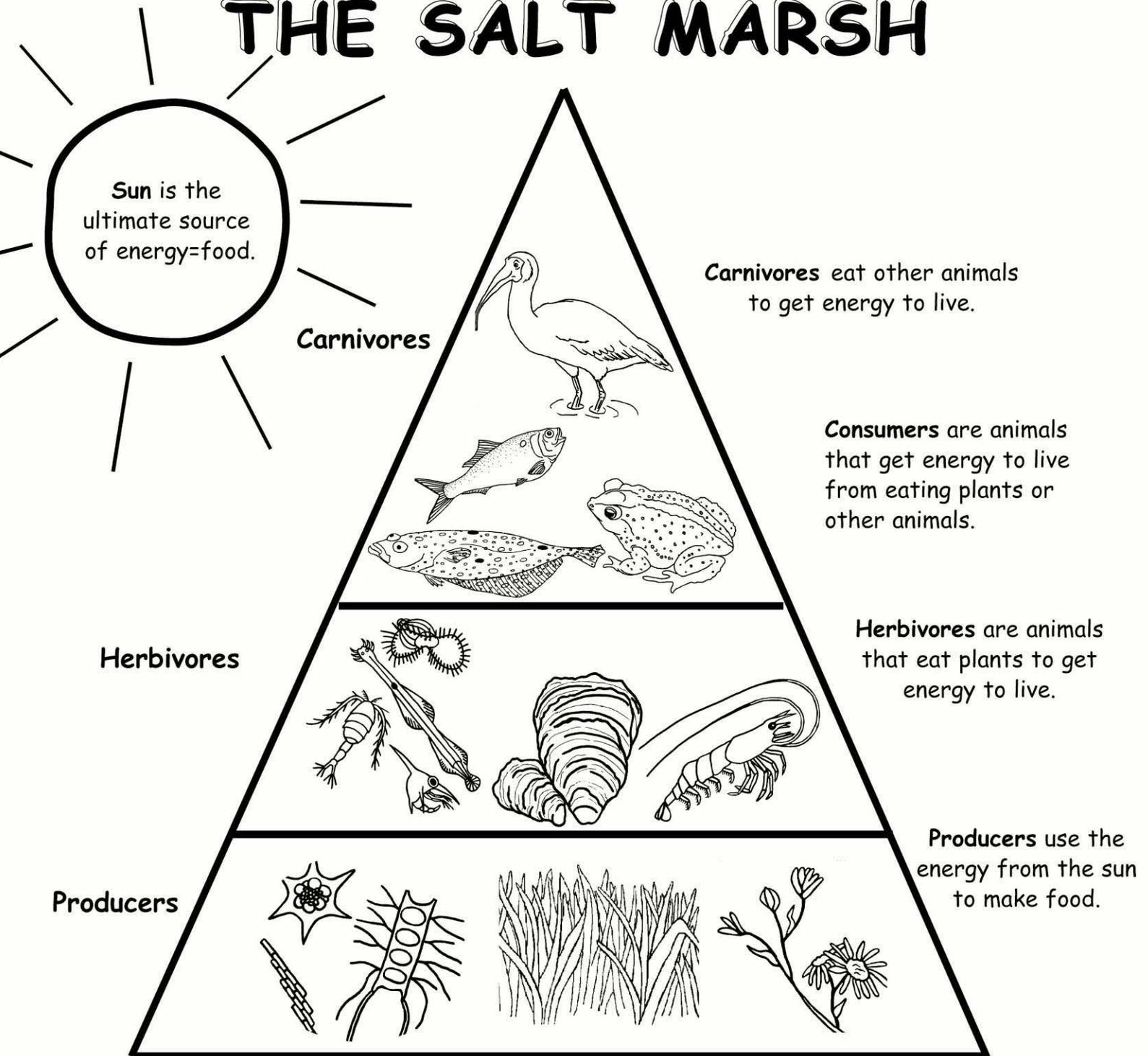
Did you know that the plants in the salt marsh are "wanted, dead or alive"? It is true that many animals including birds, crabs, snails, and even microscopic bacteria all eat plants to survive. Birds eat the seeds, snails eat the leaves, and bacteria feast on the detritus. If you look closely in the water you will find tiny creatures called phytoplankton. These creatures use the sunlight to store energy just like plants. Phytoplankton are an important part of the salt marsh food web.



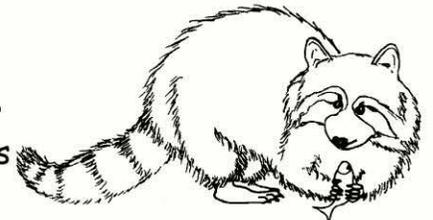
Zooplankton are tiny animals that float in the water. Some zooplankton grow into larger animals, like me. Other zooplankton spend their entire life floating freely in the water. Zooplankton are the main food source of all filter feeding salt water animals, like oysters and small fish.



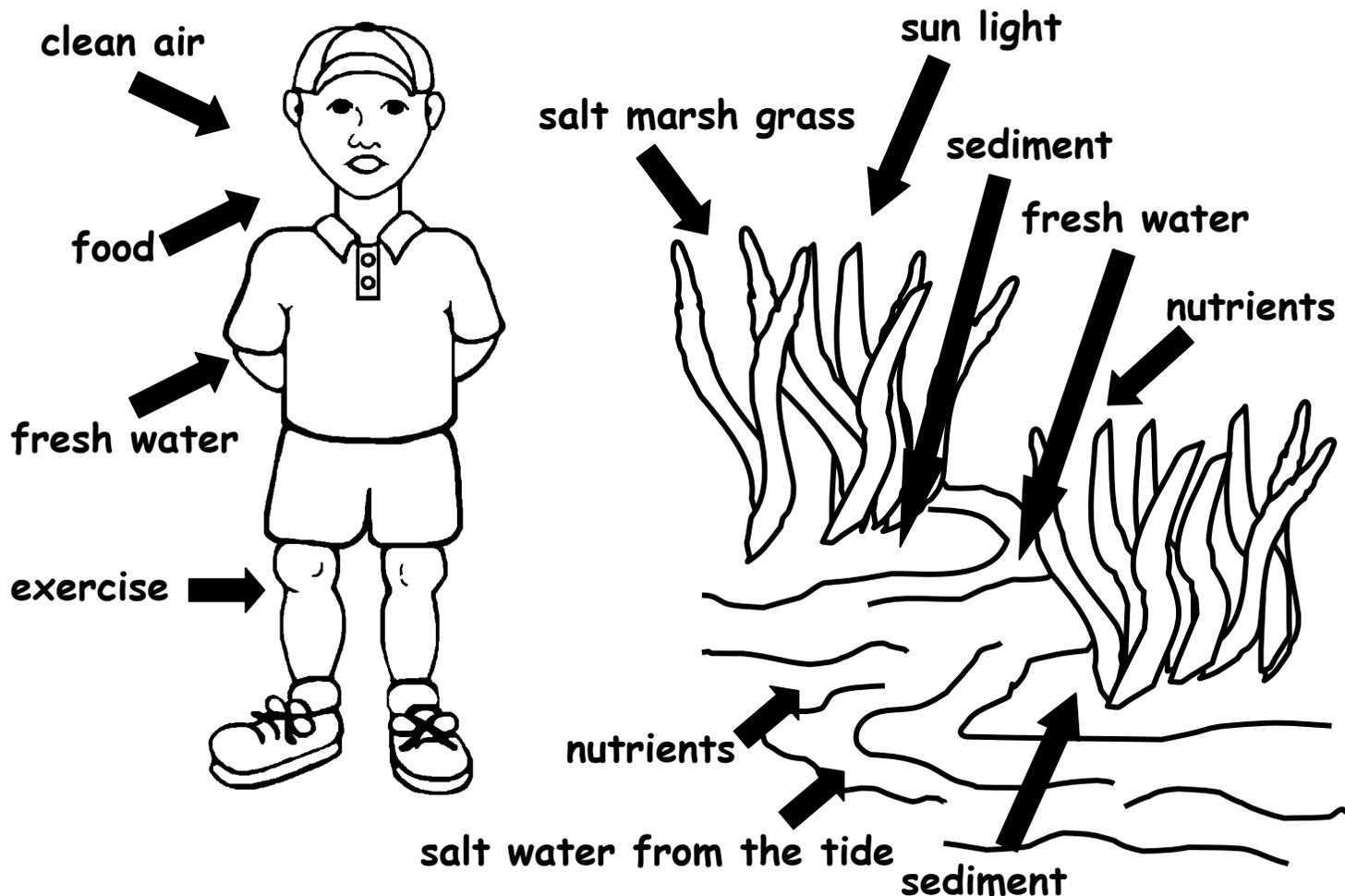
# FOOD PYRAMID OF THE SALT MARSH



**Omnivores** are a type of animal that eat both plants and animals for energy to live. Some examples of omnivores are blue crabs, raccoons and humans.



# How the Salt Marsh Stays Healthy



Just as you need clean air to breathe, food to eat, water to drink, and exercise to grow and stay healthy, the salt marsh also has needs.

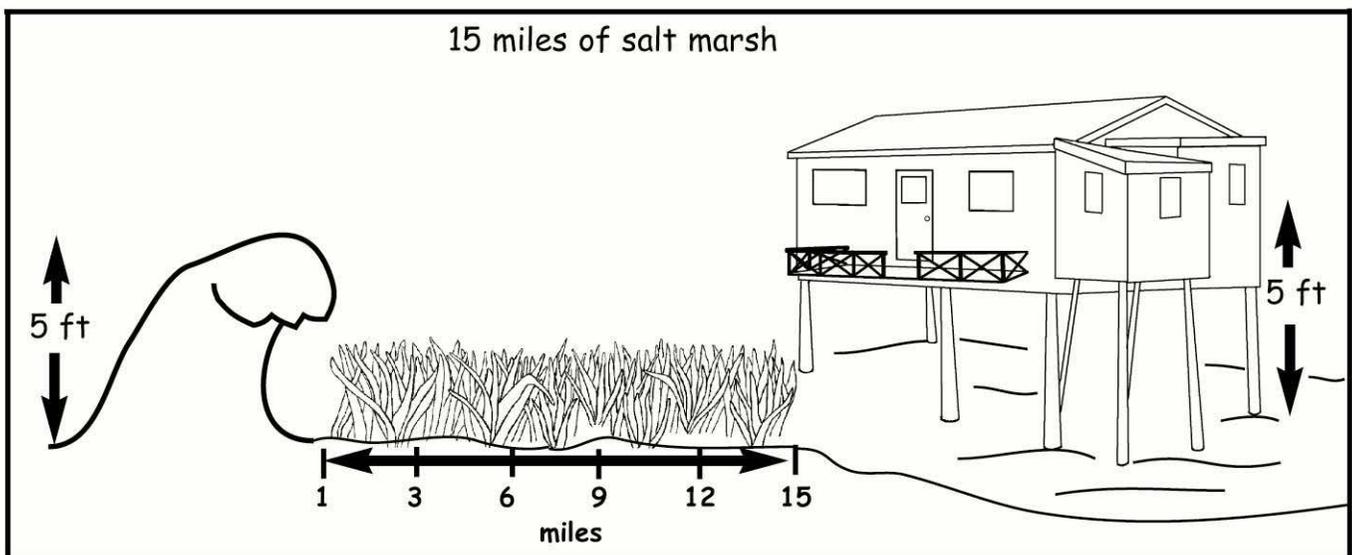
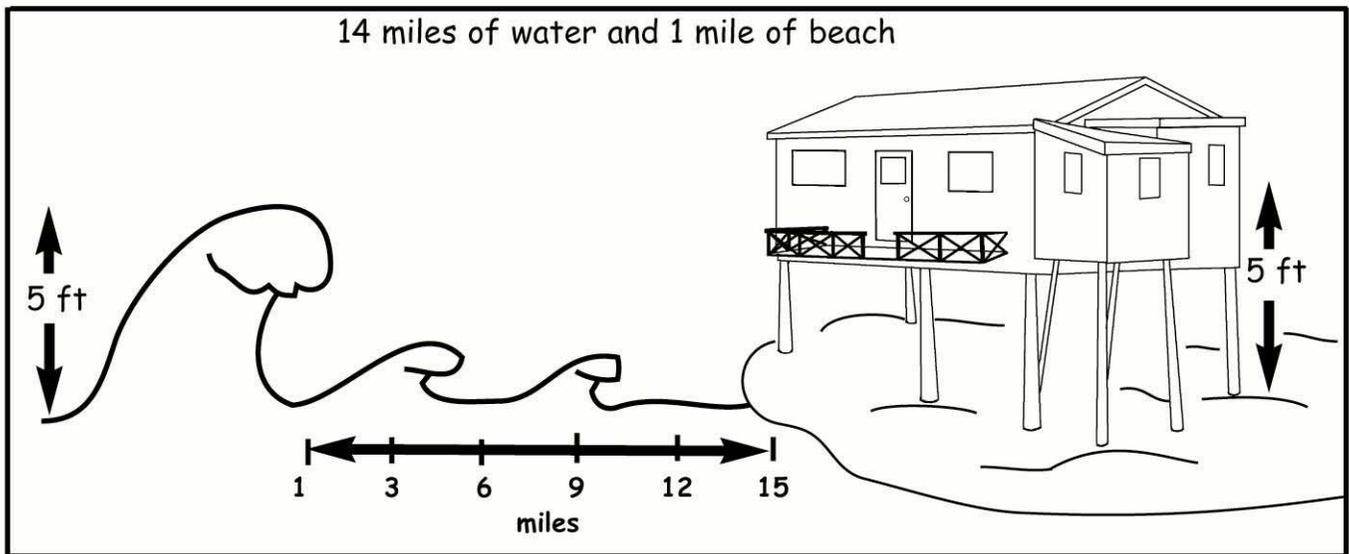
The salt marsh needs fresh water moving from land to the sea to bring it nutrients and sediment. Salt marsh plants need the nutrients to grow just as you need food. Salt marsh plants also need sediment to have a place for their roots to grow. The tide pushes salt water into the salt marsh. Salt water brings with it more nutrients and soil. When the tide goes out to the sea, the salt water drains from the salt marsh. This action allows the fresh water from the land to move into the salt marsh on its way to the sea.

# The Spongy Marsh

Salt marshes and other wetlands act like a sponge to absorb water. To prevent flooding, wetlands often absorb rain and waves of water brought in by storms.

**For every 3 miles of marsh, flooding from storms is reduced by 1 foot.**

There is a hurricane heading straight toward two camps below. The winds from the hurricane are pushing a wall of water 5 feet high. Below, draw where the water would hit each camp.



# From Marsh to Marina

The salt marsh can be a great place to make a living! Hundreds of years ago Native Americans and some of the earliest European settlers knew this. Today, many people still depend on the salt marsh to make a living. In this activity, you will see how humans have changed the marsh to meet their needs over time.

Follow the directions to figure out the order of how this salt marsh becomes a marina.

1. Go to this website:  
[www.btnep.org/pages/educational.html](http://www.btnep.org/pages/educational.html)
2. Print out the Marsh to Marina activity pages.
3. Color and cut out the pictures.
4. On the following pages, paste the pictures in order from the earliest to present day.

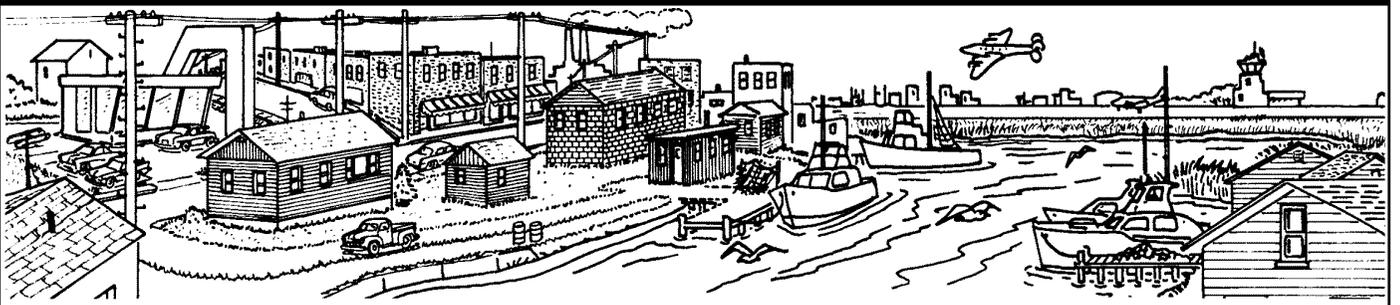
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B



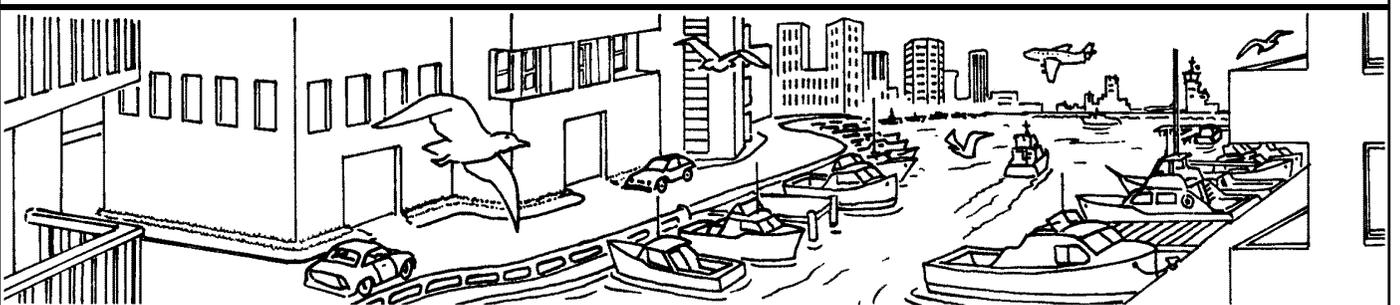
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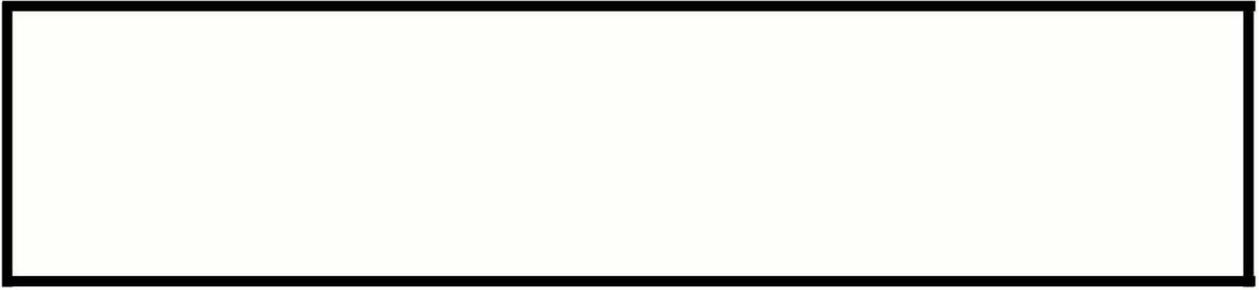
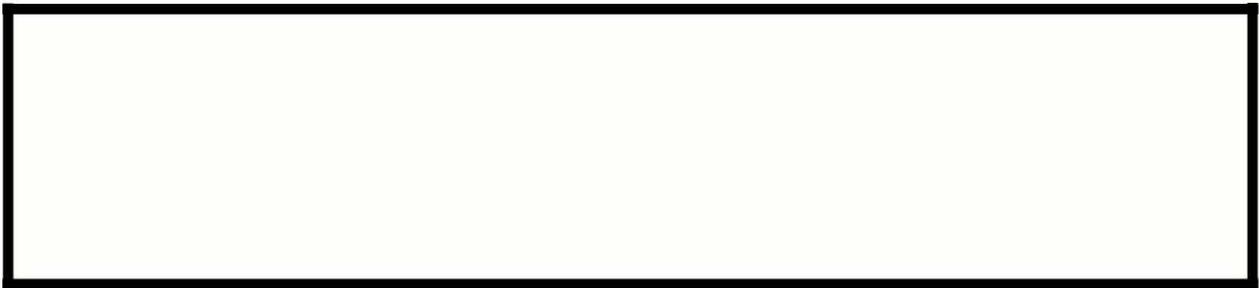
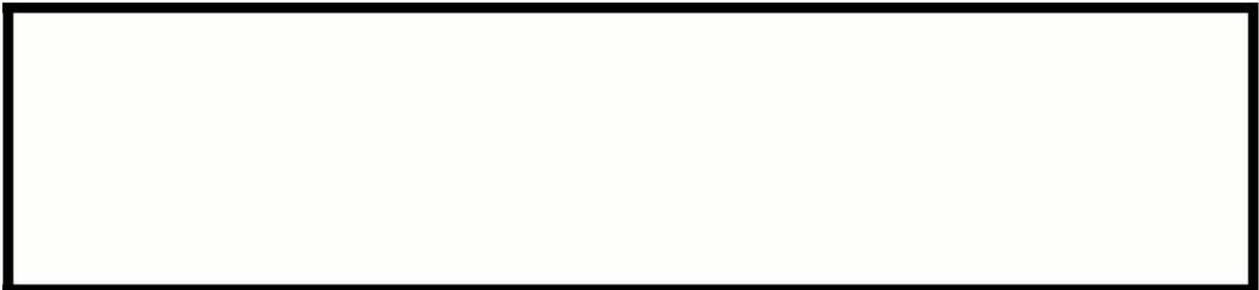


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**Answer the following questions about the salt marsh pictures.**

1) The pictures show these time periods. Can you label them?

\_\_\_ 1600s

\_\_\_ 1700s

\_\_\_ early 1800s

\_\_\_ late 1800s to early 1900s

\_\_\_ 1950s

\_\_\_ 1980s

2) How do the buildings change over time?

3) Look at the wildlife in the first picture and then in the last picture, how has the wildlife changed?

4) What do the people use the salt marsh for in the pictures?

# Why are We Losing Salt Marsh?

Land loss occurs through natural causes and man's activities.

1) Color the salt marsh on the following page. Go to page 33, and color the water pieces, then cut them out.

2) Read the following examples of causes for land loss in the salt marsh.

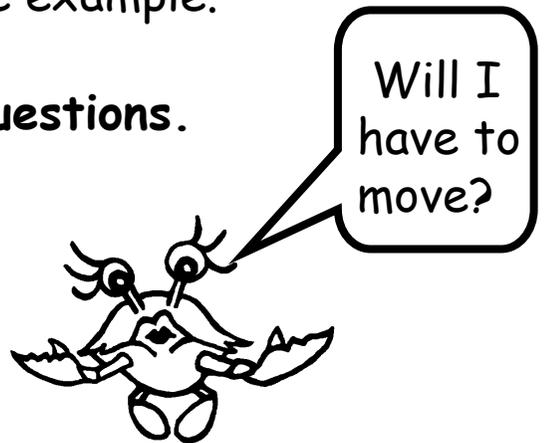
- A) An Oil and Gas company digs a canal through the marsh to look for oil to supply our nation with energy.
- B) A patch of salt marsh grass drowns from subsidence.
- C) Wake from boats traveling through the canal causes it to become wider.
- D) Tropical Storm Edgar pushes large waves towards the marsh causing erosion.

3) On the salt marsh page, place a water piece on the location that matches the letter of the example.

4) After the activity answer these questions.

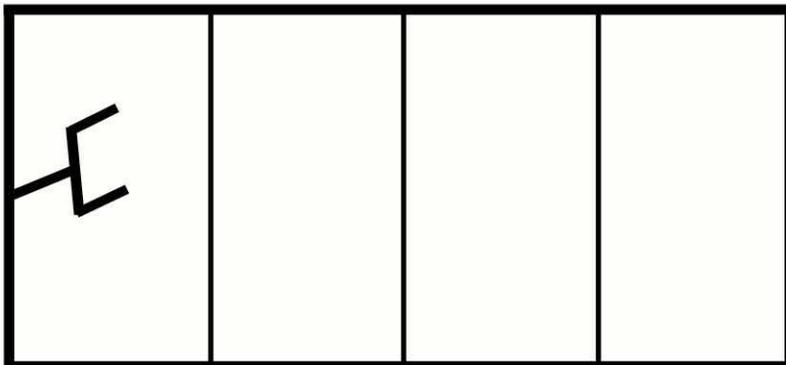
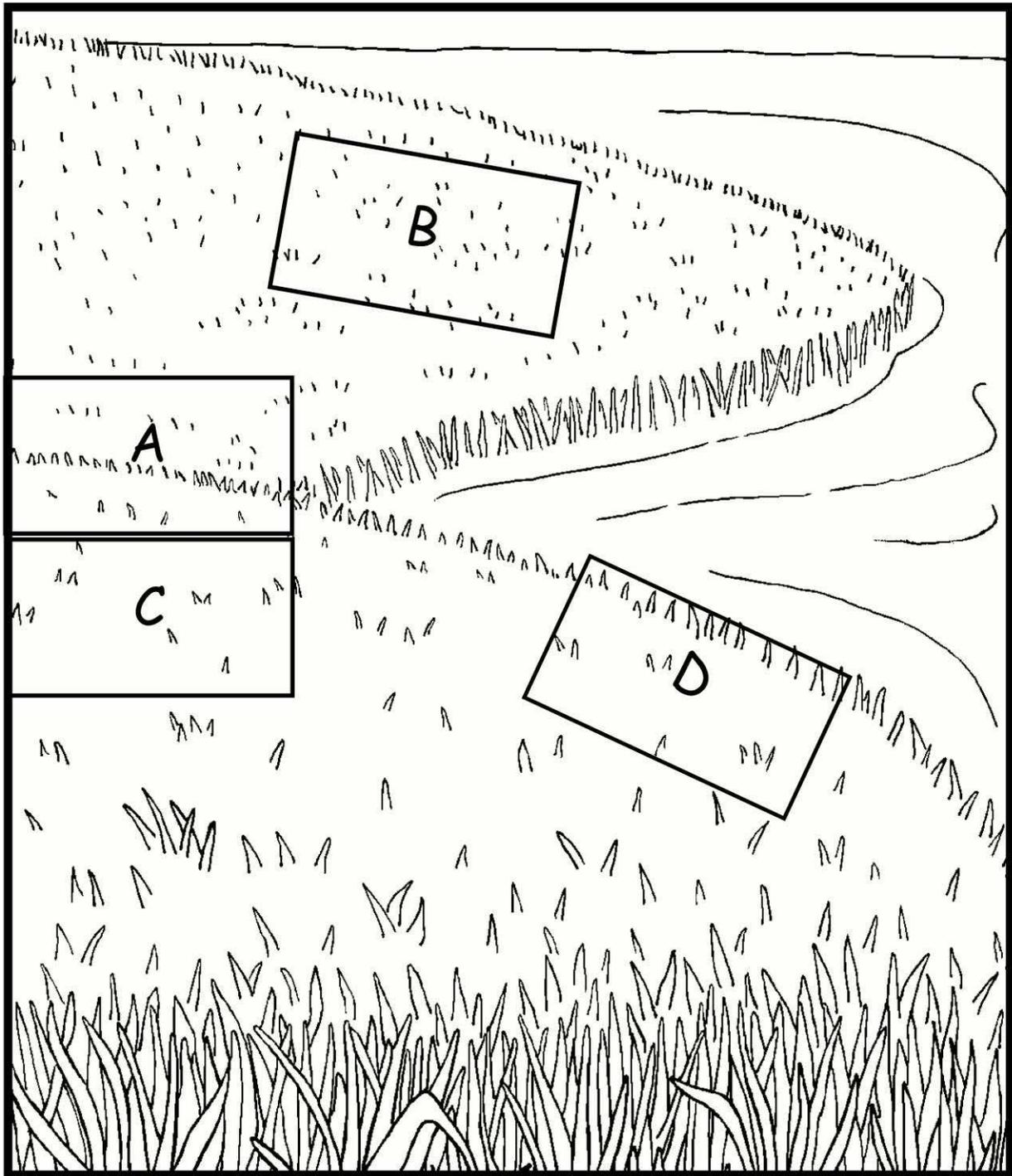
What does the marsh look like now?

How does this affect you?



If 4 acres of land are lost every 3 hours, how much salt marsh would be lost to open water in 24 hours (1 day)?

# Salt Marsh



If you take all the land that is lost to water in 45 minutes and put it together, it equals an area of land the size of a football field.

# Glossary

**Bacteria** (băk-tîr'ē-c): Tiny one-celled animals that can be seen under a microscope.

**Chrysalis** (krîs'c-lîs): The skin that covers a caterpillar while it changes into a butterfly.

**Detritus** (dî-trî'tcs): Decaying plant material.

**Erosion** (î-rō'zhcn): The removal of sediments often through the action of water and wind.

**Estuary** (ēs'chc, werē): The place where fresh and salt water mix.

**Habitat** (hăb'î-tăt'): An area where an animal has food, water, shelter, and space to live.

**Nutrient** (nū'trē, cnt): Something an animal needs for life and growth.

**Phytoplankton** (fî'tō-plăngk'tcn): Tiny creatures found in the water that use sunlight to store energy like plants.

**Pneumatophore** (nū-măt'c-fôr'): Part of the black mangrove tree roots that stick out of the ground.

**Salt marsh** (sôlt marsh): A kind of wetland covered by tall grasses and salt water.

**Sediment** (sedcm cnt): Material that is deposited by water or wind, such as sand, silt, or clay.

**Subsidence** (scb-sî' dēns): When the land becomes more packed together, it sinks.

**Zooplankton** (zō'c-plăngk'tcn): Tiny animals that float in the water.

# Fish Parts Glossary

**Mouth-** The mouth on a fish may be big or small, may face up or down, may be long like a straw or short, and may stretch out.

**Nostril-** Fish have noses, but not for breathing. Fish use their noses to smell chemicals and other fish in the water. Some fish can smell things that are miles away.

**Eyes-** Fish can have large eyes or small ones. There are many different eye colors. One thing is for sure- most fish have blurry vision.

**Gill cover-** This is a flap of skin and bone to protect the delicate gills found underneath. The gills of a fish are for breathing. The fish use the gills to take oxygen from the water.

**Caudal fin-** This is the fish's tail. Some fish move through the water by moving their caudal fin back and forth. Some fish use the caudal fin as a rudder to help guide them through the water and use their other fins for movement.

**Dorsal fin-** Fish can have one dorsal fin, two, or none at all. Dorsal fins come in a variety of shapes and have many different uses.

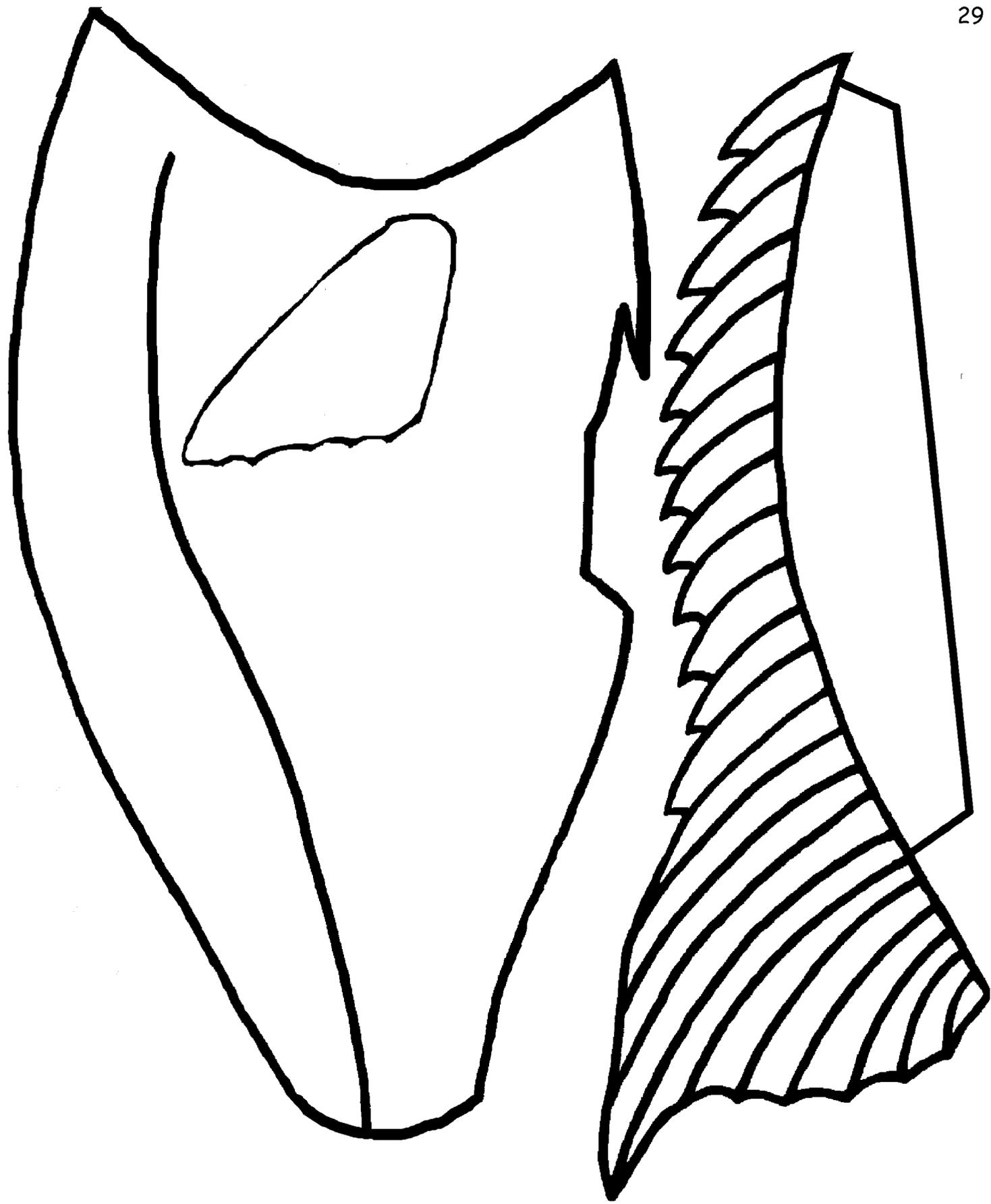
**Anal fins-** Sometimes anal fins have sharp projections on them to protect the fish from predators.

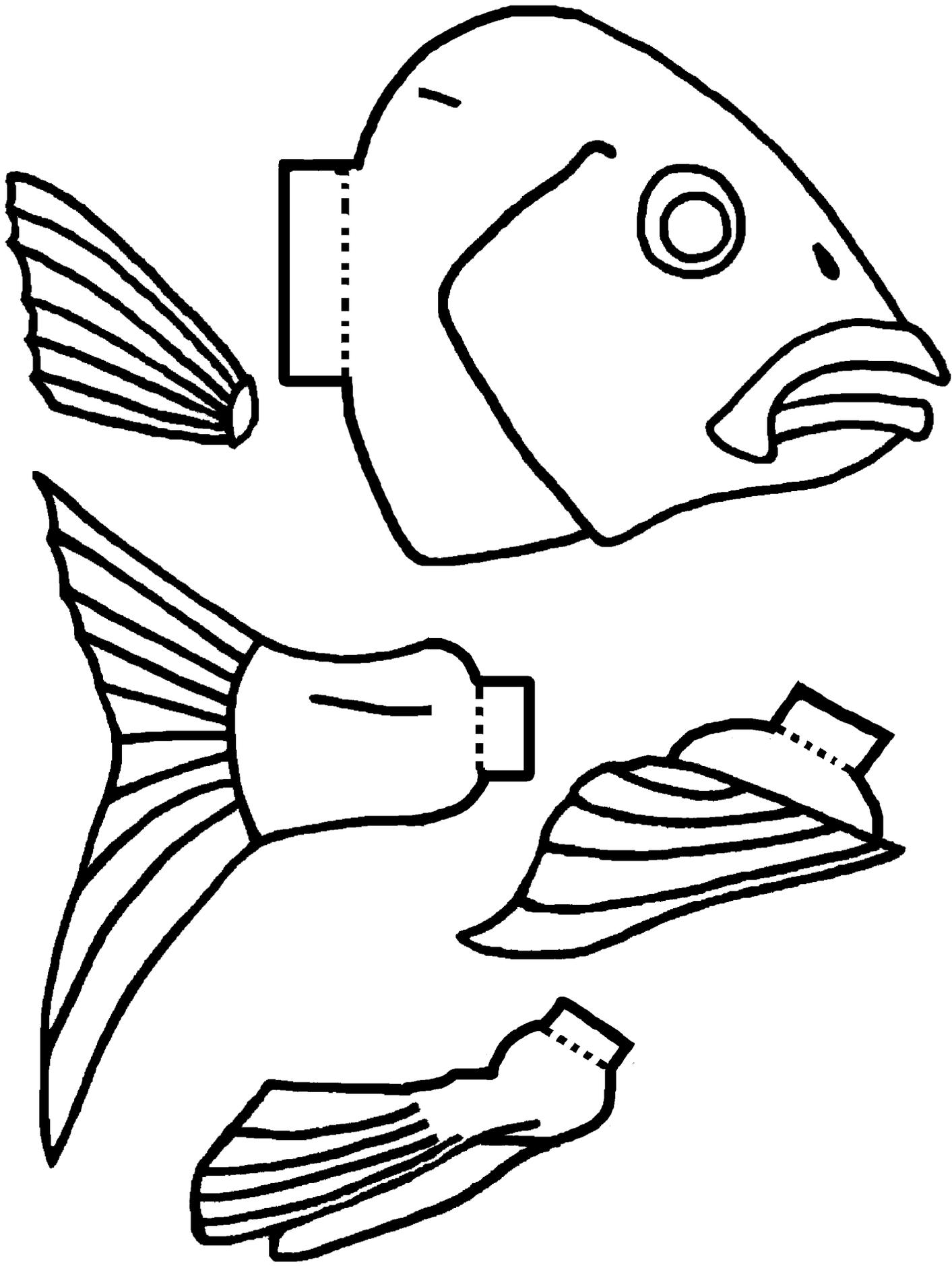
**Pelvic fins-** These fins are like the fish's legs. They are used to fine tune movement of a fish but can have a different function. In some fish pelvic fins are used to crawl along the bottom or to hold and grasp objects.

**Pectoral fins-** These are like the fish's arms. They are also used to fine tune movement of a fish but can be used for a different function. Some fish do not have pectoral fins.

**Lateral line-** This is a special sense organ on a fish. Fish use the lateral line to tell how deep it is in the water, what sounds are present, and to help it "see" in murky water. The lateral line is sensitive to chemicals in the water and can sometimes sense electrical fields to make it work like radar. A fish, therefore, does not always depend on sight.

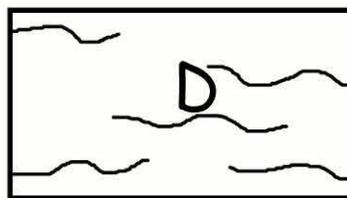
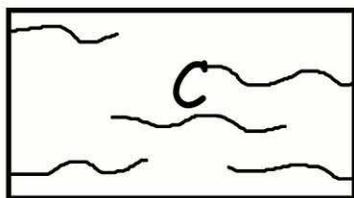
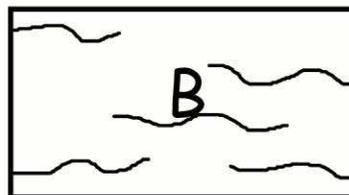
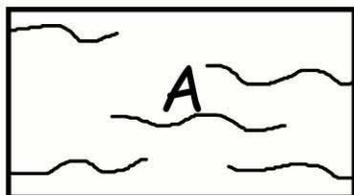
**Scales-** Most fish have some sort of scales, but a few do not. Scales often feel slimy. This "slime" protects a fish from infections due to cuts and scrapes.





# Why are We Losing Salt Marsh?

## Water Pieces



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# Louisiana State Benchmarks

## Life Science

### K-4

LS-E-B1 - Observing and describing the lifecycles of some plants and animals

**Pages: 4,5, and 10**

LS-E-C3 - Observing animals and plants and describing interactions or interdependences

**Pages: 10, 14, 15, 16, 18, 21, and 24**

### 5-8

LS-M-A3 - Observing and analyzing the growth and development of selected organisms, including a seed plant and insect with complete metamorphosis, and an amphibian

**Pages: 4 and 10**

LS-M-C3 - Investigating major ecosystems, recognizing physical properties and organisms within each

**Pages: 2, 3, and 19 physical, all animal pages**

## Science and the Environment

### K-4

SE-E-A1 - Understanding that an "ecosystem" is made of living and nonliving components

**Pages: The book as a whole describes the salt marsh ecosystem**

SE-E-A3 - Identifying ways in which humans have altered their environment, both in positive and negative ways either for themselves or for other living things

**Pages: 21-23, and 24**

### 5-8

SE-M-A1 - Demonstrating knowledge that an ecosystem includes living and nonliving factors and that humans are an integral part of that ecosystem

**Pages: The book as a whole, especially the preface**

SE-M-A10 - Identifying types of soil erosion and preventative measures

**Page: 24**

# Answers

Page 5. Draw a line from:

Egg and Zoea to Gulf of Mexico

Megalops to Barrier Island

Immature Blue Crab to Salt Marsh Edge

Adult Blue Crab to The Salt Marsh

Page 7. Fish located in bottom of pelican's pouch.

Page 8. The double crested cormorant is different from the great egret because it.....

- a) Has black feathers
- b) Flies to look for food
- c) Dives to get food
- d) Dries wings in the sun

The birds are alike because.....

- A) Both have yellow bills
- B) Both eat fish
- C) Both get their food from the water
- D) Both live in the salt marsh

The great egret is different from the double crested cormorant because it.....

- a) Has white feathers
- b) Has long legs to wade in the water
- c) Uses its bill as a spear
- d) Eats frogs and snakes

# Answers

Page 9. Match the roseate spoonbill to the strainer.  
Match the ibis to the tweezers.

Page 20. The top image of the camp on the beach:

The water should be drawn to reach the top of the 5 foot mark, flooding the camp, because the sand can not absorb the 5 foot wall of water.

The bottom image of the camp in the marsh:

The water should be drawn along the ground or drawn to the end of the marsh. A student could also draw the line on a diagonal, visually describing how each 3 mile section of marsh absorbs 1 foot of water therefore decreasing the height of the wall of water.

This is proven mathematically.....

15 miles of marsh \* (1 foot water absorbed/3 miles of marsh) =  
5 ft of water absorbed.

Since the wave is 5 ft high, the 15 miles section of marsh will absorb 5 ft of water and the wall of water will be absorbed before it reaches the camp.

# Answers

Page 23.

1) The pictures show these time periods. Can you label them?

1600s -D

1700s - B

early 1800s -F

late 1800s to early 1900s -A

1950s -C

1980s -E

2) How do the buildings change over time?

They go from no buildings, to log cabins, to wood houses, to brick, to cement skyscrapers, and the number of buildings increases as more people move in.

3) Look at the wildlife in the first picture and then the last picture. How has the wildlife changed?

In the first picture there are ducks, deer, shorebirds, seagulls, and a crane because there is plenty of marsh for them to find food and shelter. In the last picture there are only a few seagulls because they can live close to people.

4) What do the people use the salt marsh for in the pictures?

In the first picture the Native Americans use it as hunting and fishing ground. Later the settlers used it for harvesting marsh grass to be used as hay to feed livestock and to thatch roofs. As more people settle the area there are more boats and boat docks and the salt marsh becomes smaller. In the last picture the marina and city have completely replaced the salt marsh.

Page 24.

4) After the activity on land loss in the salt marsh answer the following questions.

a) There is less marsh and it is broken up

b) This affects me because there are less places for animals that I like to eat to live, and less places to go hunting and fishing. It is also more likely for flooding to occur.

c)  $24 \text{ hours} / 3 \text{ hours} = 8$

if there are 8, 3 hour segments of time, in 24 hours

and for every 3 hours 4 acres of land is lost

then  $8 * 4 \text{ acres} = 32 \text{ acres in 24 hours}$