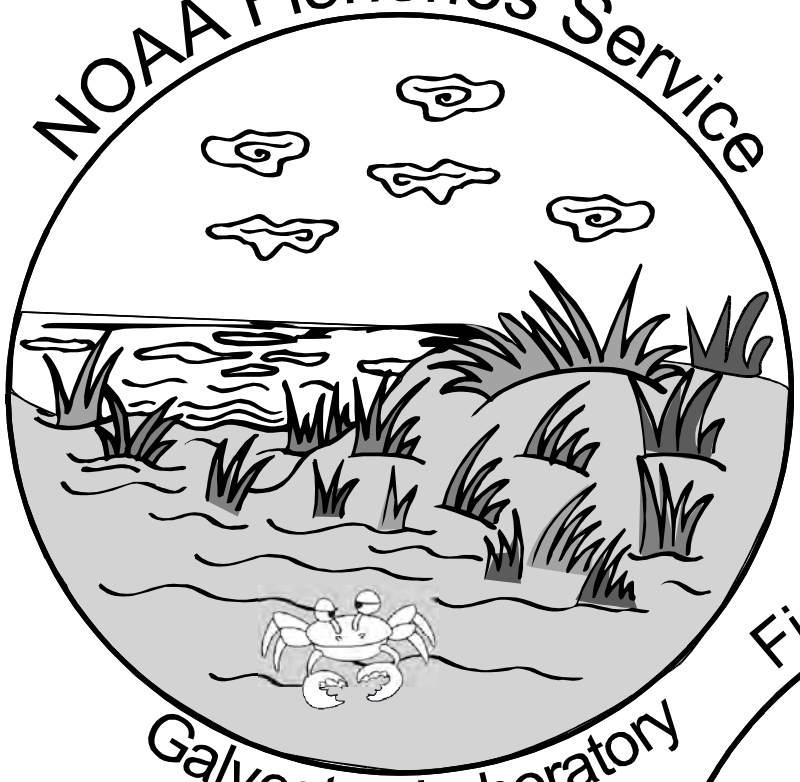
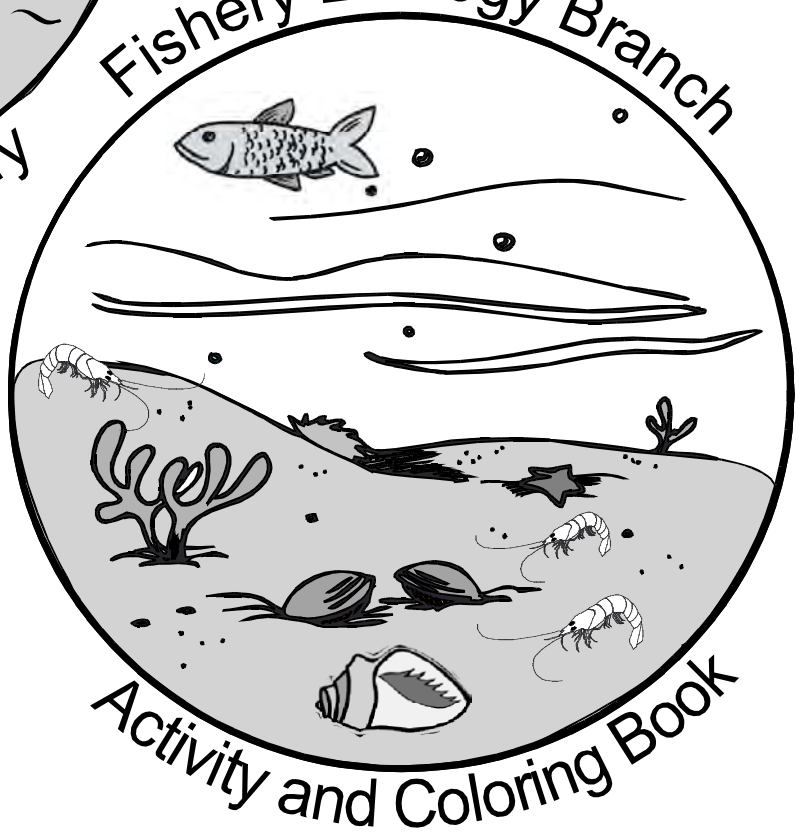


HABITAT!



It's Where It's At!

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
Southeast Fisheries Science Center
Galveston Laboratory
4700 Avenue U
Galveston, TX 77551-5997

Copies of this coloring book can be downloaded at:
http://galveston.ssp.nmfs.gov/kidstuff/index.html

HABITAT!

It's Where It's At!

Research in the NOAA Fisheries Service
Galveston Laboratory
Fishery Ecology Branch

Activity and Coloring Book

by

Jo A. Williams and Elizabeth Wilson

U.S. DEPARTMENT OF COMMERCE
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Note From the Authors

This coloring and activity book is meant for children of all ages. Some puzzles may be too difficult for younger children, but they can still enjoy coloring the pictures. Older children (and adults) who may think that they have outgrown coloring can still learn a lot about NOAA Fisheries Service Galveston Laboratory's Fishery Ecology Branch.

We would like to extend special thanks to the following people who assisted in the preparation and review of this booklet: Spencer Wilson, Kip Wilson, Jennifer Doerr, Ron Hill, Phil Caldwell, Lawrence Rozas, Becky Smith, Liz Scott-Denton, Jim Nance, and Tom Minello.

Fishery Ecology Branch

Our Mission (it's not impossible!)
(Definitions of words in **BOLD** print can be found in the Glossary.)

The mission of the NOAA Fisheries Service Galveston Laboratory Fishery Ecology Branch is to identify and describe relationships between fishery productivity and the coastal environment.

Yearly fishery production in the Southeastern United States is worth over a billion dollars. Most of the fish, crabs, shrimp, and other animals caught depend on coastal **habitats** such as **marshes**, seagrass beds, mangroves, **coral reefs**, and oyster reefs.

Research by the Fishery Ecology Branch is conducted on the relationships between these habitats and the animals that live there. We also study the food web in the coastal ecosystem and the relationship between habitats and **biodiversity**. This is important because it will help us identify which habitats are the most important and need protection to make sure many fishery **species** have a place to live and grow.

The Fishery Ecology Branch also conducts research on habitat **restoration,** because losses of **wetlands** and coral reefs in the region are a major concern. The goal of restoration projects often is to build habitats for fishery species. We are actively involved in habitat restoration projects in Texas, Louisiana, Georgia, and Puerto Rico.

The branch's research is important because it helps us determine if our habitat restoration programs are working. It also helps us develop new designs for recreated habitats that will function like natural habitats for fishery species.

In addition to the Galveston Laboratory, members of the Fishery Ecology Branch also work out of two field offices. Our office in Lafayette, Louisiana at the NOAA Estuarine Habitats and Coastal Fisheries Center participates in the planning, design, construction, and monitoring of projects developed through the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA). This Act authorizes an extensive wetland restoration effort in coastal Louisiana.

Our second field office is at Savannah State University (Georgia) through a Cooperative Marine Education and Research Program. This program is designed to increase awareness of fisheries **ecology** and habitat restoration in minority communities and promote cultural diversity among NOAA fishery biologists and ecologists.

Glossary

BIODIVERSITY	The variety of life on earth.
COMMUNITY	A natural group of different species living together.
CONCH	Marine snail having a heavy, spiral shell.
CORAL REEF	A ridge or mound found in the ocean made up of many corals grouped in colonies. Each individual coral is an animal called a polyp. They have a hard skeleton made out of limestone, which makes them look like rocks.
ECOLOGY	The study of relationships between living things and their surroundings (environment).
ECOSYSTEM	A community of organisms together with the physical environment where they live.
ESTUARY	A site where fresh water and salt water meet; usually where rivers meet the sea.
FISHERY	The business of catching, processing or selling fish, shellfish or other aquatic products.
GIS (Geographic Information System)	A computer system for capturing, storing, checking, combining, manipulating, studying and displaying data related to positions on the Earth's surface. Typically, a GIS is used for handling maps of one kind or another.
HABITAT	The place or type of place where a plant or animal naturally or normally lives or grows including everything it needs to survive (food, water, shelter, and space).
LARVA	An early form of any animal that at birth or hatching is very different from its parents. (Plural is larvae; adjective is larval.)
MARSH	Low wet land, often treeless and periodically covered by water, generally characterized by a growth of grasses, sedges, cattails, and rushes.
RESTORATION	A return of something to a former, original, normal, or unimpaired condition.

SEAGRASS	Flowering plants (angiosperms) more closely related to terrestrial lilies and gingers than to true grasses. They grow in sediment on the sea floor with erect, elongate leaves and a buried root-like structure (rhizomes).
SPECIES	A population of individuals that are alike and able to breed and produce offspring.
WETLAND	Land or areas (as marshes or swamps) that tend to be regularly wet or flooded.

Word Search

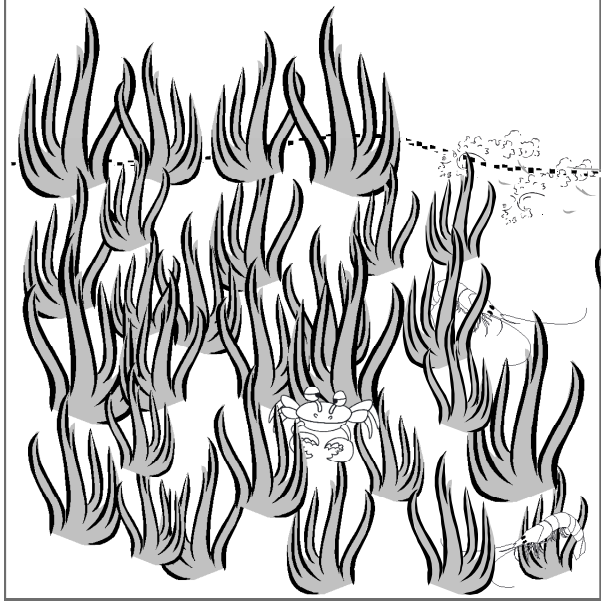
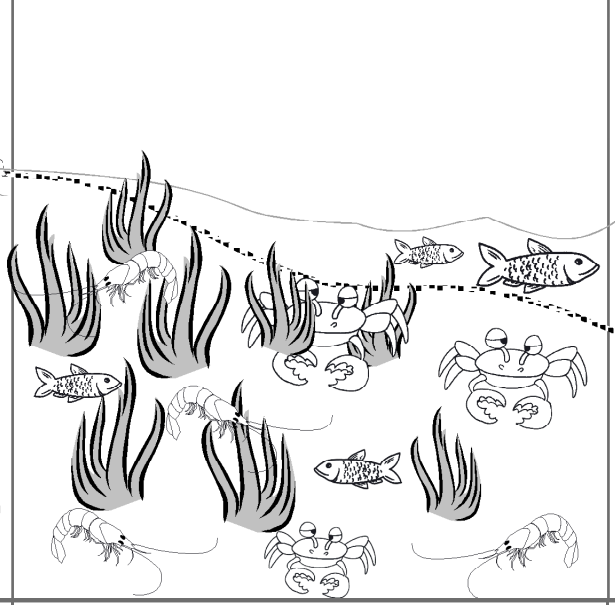
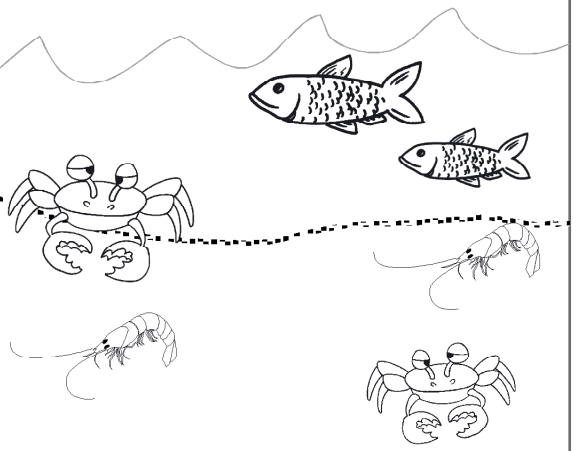
Can you find all the words in the list below? They can be found in straight lines running forward, backward, up, down or diagonally.

E C O L O G Y E Y R A U T S E Q
U Y R U I K T R F O A T U Y O Y
N M H S R A M C G R U T E E L T
O J W K M T E D E F M R D S H I
I K G G E C U Y C E T O Y K A S
T L A R V A L X S E P E B T C R
A G I S D T E L G R J N L A K E
R R D V U E F F A L A E H T E V
O E N M L N E S T A W P S I M I
T A A T O G T E T R M U I B B D
S C R L G A R H I O S A R A A O
E U T S S M I K P C O N C H W I
R X W E T L A N D P L M N U O B
S P E C I E S J O Y R E H S I F
T Y U Y T I N U M M O C I M G H
M E T S Y S O C E A Y E C V B N

BIODIVERSITY
COMMUNITY
CONCH
CORAL REEF
ECOLOGY
ECOSYSTEM
ESTUARY
FISHERY
GIS (Geographic Information System)
HABITAT
LARVAL
MARSH
RESTORATION
SPECIES
WETLAND

Habitat Counts!

The Fishery Ecology Branch conducts sampling in different types of estuarine habitats to count the numbers of young fish, shrimp and crabs living there. The higher the number of animals found, the more important it is to protect that habitat. Count the number of fish, crabs and shrimp in each of the different habitats found in a saltwater marsh. Which one is the most productive (the most important habitat that is needed by young fish, shrimp and crabs)?

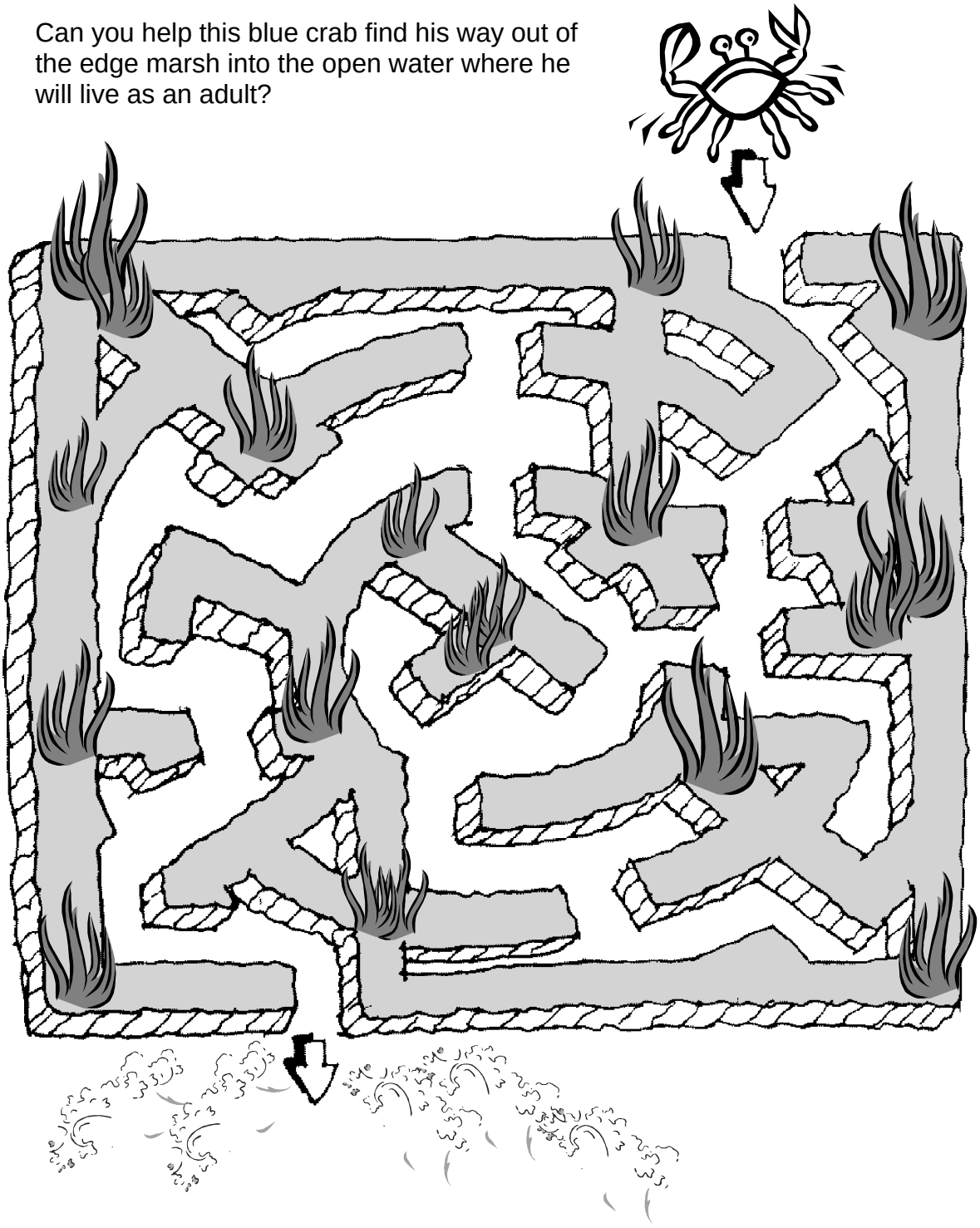
High Marsh (Vegetated Bottom)	Edge Marsh (Emergent Vegetation)	Open Water (Non-vegetated bottom)
		
Shrimp _____	Shrimp _____	Shrimp _____
Crabs + _____	Crabs + _____	Crabs + _____
Fish + _____	Fish + _____	Fish + _____
TOTAL = _____	**TOTAL** = _____	**TOTAL** = _____

Answer: High Marsh: 2 shrimp, 1 crab, 0 fish, 3 total; Edge Marsh: 4 shrimp, 3 crabs, 4 fish, 11 total; Open Water: 2 shrimp, 2 crabs, 2 fish, 6 total. The edge marsh is the most productive.

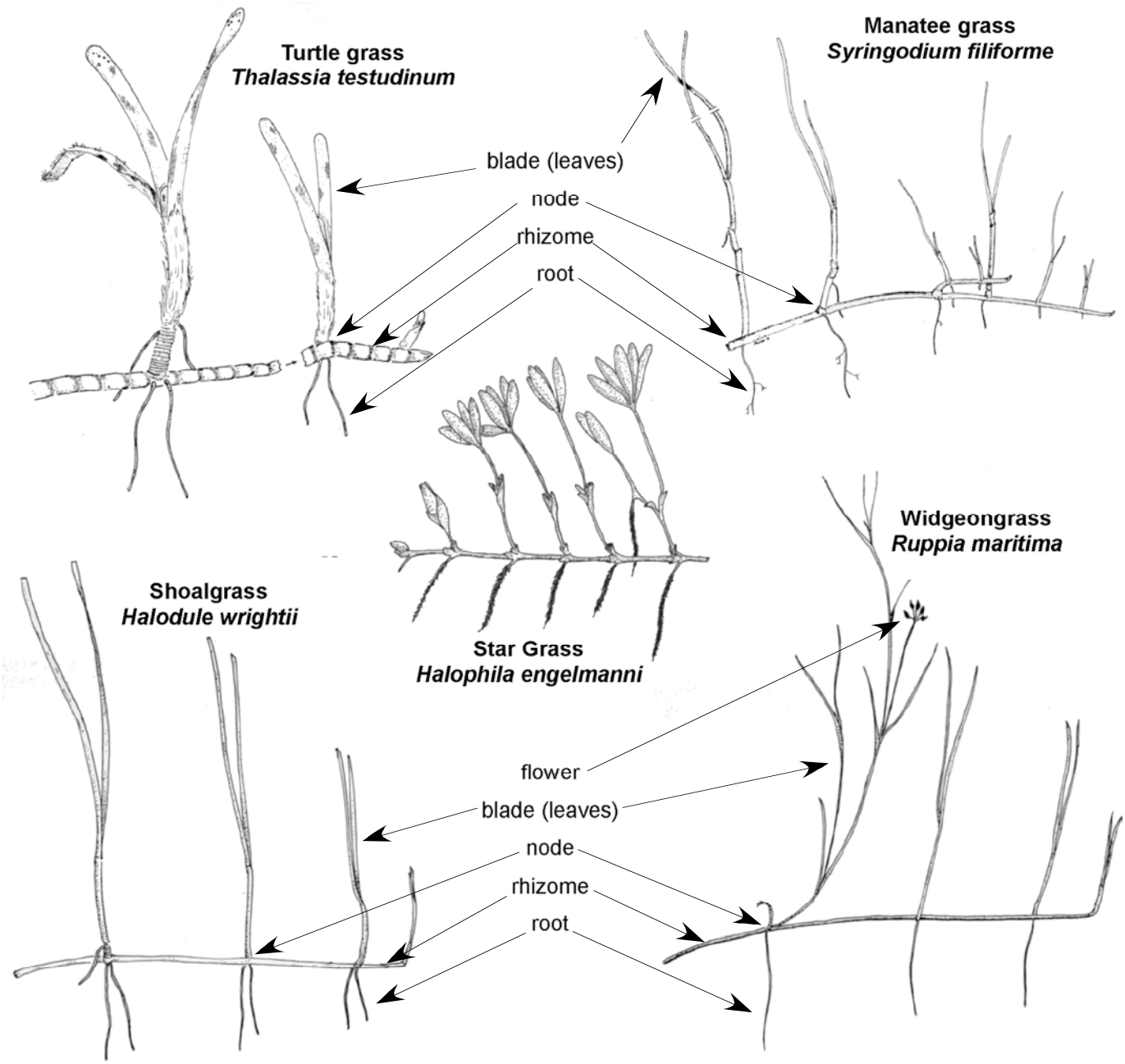
Marsh Edge Maze

Coastal wetlands are very important nursery habitats for many marine animals. The young animals spend part of their lives there, but leave before they are adults. The areas favored by many animals are in the marsh vegetation (plants) found next to open water, ponds, or creeks. The amount of marsh-water edge in nurseries is positively related to the abundance and productivity of juvenile brown shrimp, white shrimp, blue crabs, spotted seatrout, and red drum. Marshes without open water, ponds, and creeks are less productive.

Can you help this blue crab find his way out of the edge marsh into the open water where he will live as an adult?



Seagrass beds are one of the most productive plant communities on the planet. They provide food for microscopic animals at the base of the food web and they provide shelter and nursery grounds for larger animals like shrimp, fish, and crabs. Many seagrass beds have been lost because of human activities and developments along the coast. The Fishery Ecology Branch has participated in many projects to replant and restore seagrass beds on the Gulf of Mexico coast.



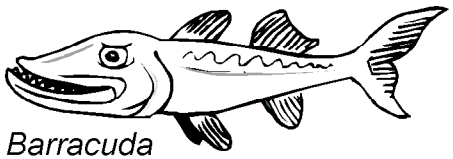
Below are some descriptions of the seagrass species found in the Gulf of Mexcio. See if you can match them with the pictures above.

A. Has 5-7 leaves at the tip that look like flowers
B. Has cylindrical (round - like a tube) leaves with pointed tips
C. Has wide (1/4 - 1/2 inch) flat leaves and heavy, thick rhizomes
D. Has narrow leaves with pointed tips and one root per node. Often has long stalks with yellow flowers.
E. Has narrow leaves with square tips. Has two roots per node.

Answers: A. Star grass; B.Manatee grass; C. Turtle grass; D.Widgeongrass; E. Shoalgrass

Eat or be Eaten?

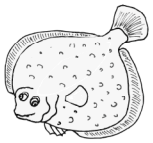
You can often tell where an animal lives or what role it plays in the food chain by how it looks. That's because over many generations, marine animals have adapted to the habitat where they live. The shape of their bodies (and the colors and patterns too) can either help the prey (the animals that get eaten) hide from the animals that eat them (the predators!) - or help the predators hide so they can make a sneak attack on their prey! Look at the animals below and see if you can figure out where they would live and why they are best suited to live there.



Barracuda

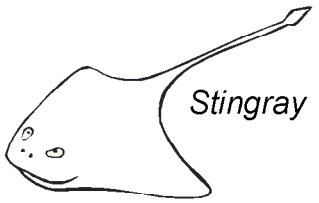
Blue crab

Pipefish

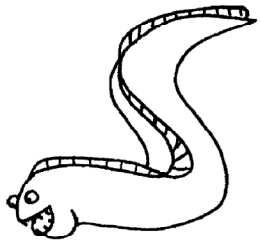


Flounder

Seahorse



Stingray

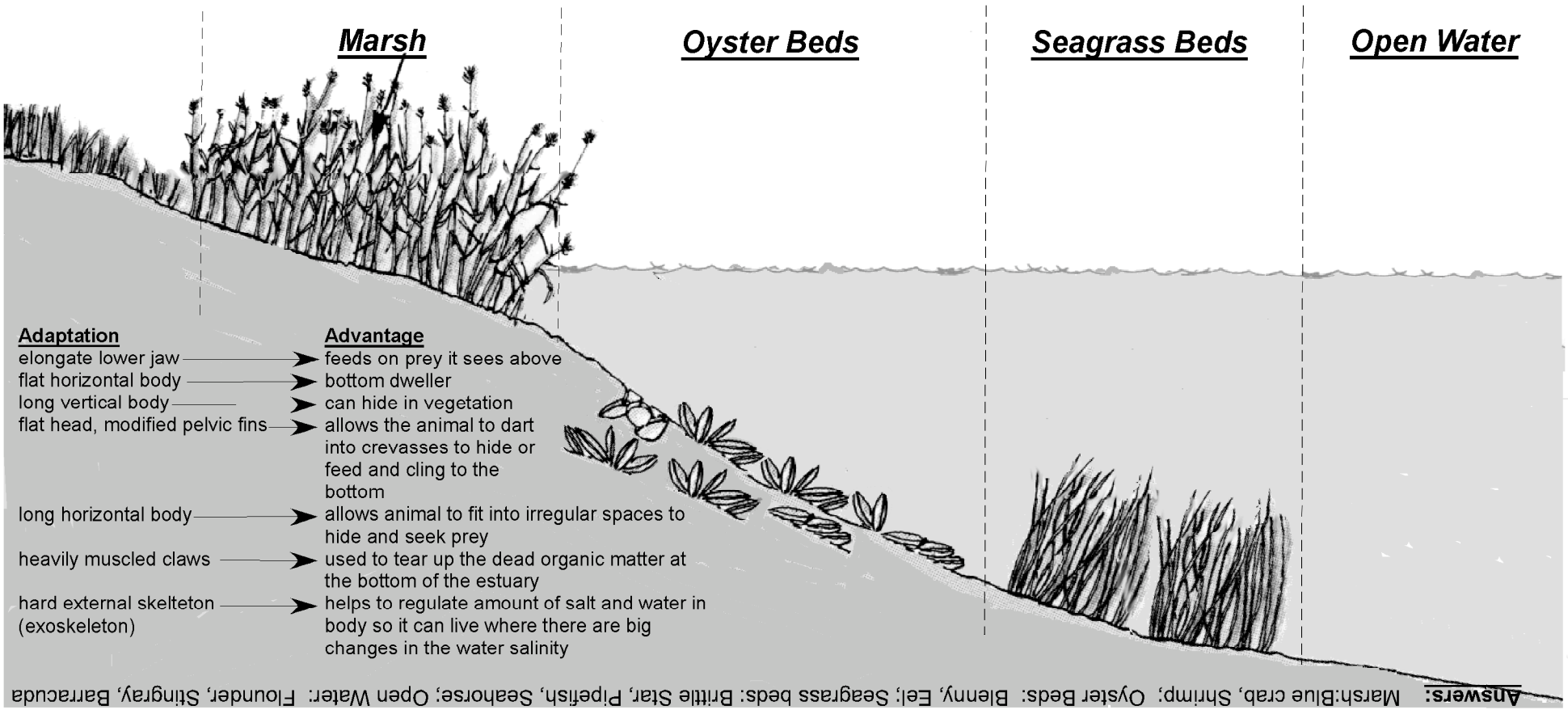


Eel

Blenny

Brittle star

Shrimp



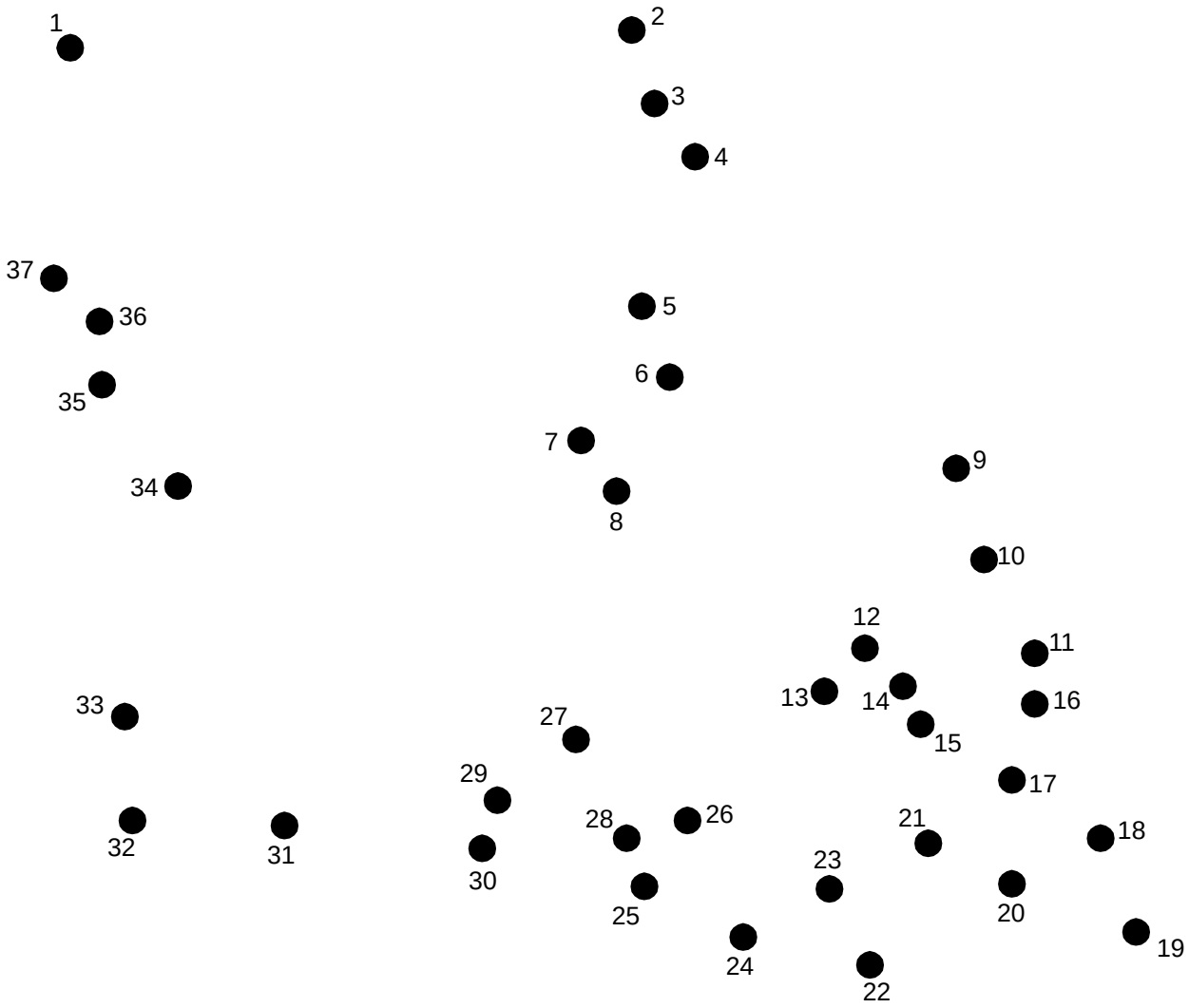
Answers: Marsh:Blue crab, Shrimp; Oyster Beds: Blenny, Eel; Seagrass beds: Brittle Star, Pipefish, Seahorse; Open Water: Flounder, Stingray, Barracuda

Going, Going, Gone?

Not yet, but this coastal state is disappearing at the rate of 25 square miles annually. Studies show about one third of land loss is caused by shoreline erosion, one third by oil and gas impacts, and one third by the effects of levees, impoundments, nutria and other factors.

CWPPRA (the Coastal Wetlands Planning, Protection and Restoration Act) is helping to rebuild the coastline of this state by funding projects that will preserve and restore its coastal wetlands.

Can you connect the dots to rebuild this state and then name which state it is?



Ecological Economics

You have learned that programs like CWPPRA help provide money to rebuild marsh habitats that have been lost. How do we know how to rebuild a marsh? We know that animals like to live in marshes that have lots of EDGES!.....but there are lots of ways to create edges (see all the drawings below). How do we know which one is best? One way is to count the number of animals (shrimp and crabs) living there. We also must consider how much money it cost to rebuild the marsh. Decide which of the marsh designs is best (produced the most animals for the least amount of money) by dividing the number of animals there by the cost of construction (the numbers are for one square meter of marsh). The marsh with the highest number would be the best design to use to build a recreated marsh.

For example:

Marsh #1:
20 Crabs and shrimp Cost: $10

2 animals for every dollar spent
$10⟌ 20

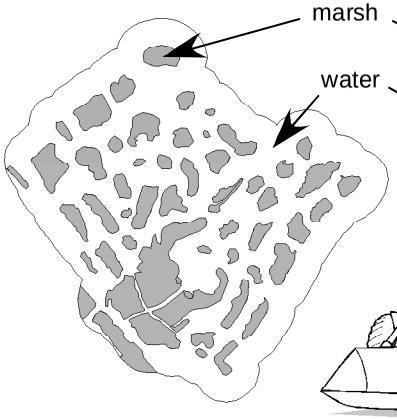
Marsh #2
40 Crabs and shrimp Cost: $40

1 animal for every dollar spent
$40⟌ 40

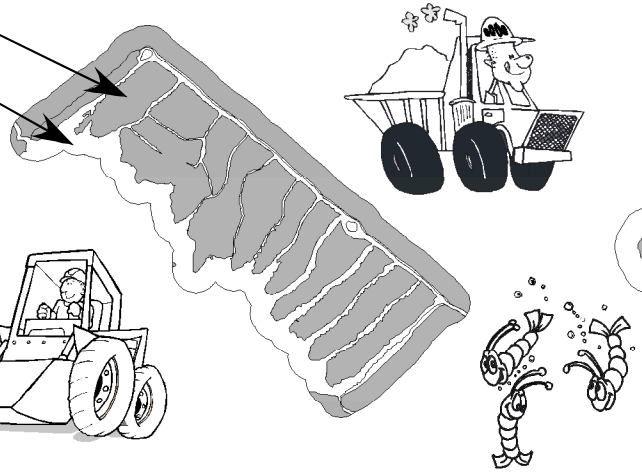
In this example, Marsh #1 is the best design because we got the higher number of animals for every dollar we spent to build the marsh.

Now you try it with some actual marsh designs:

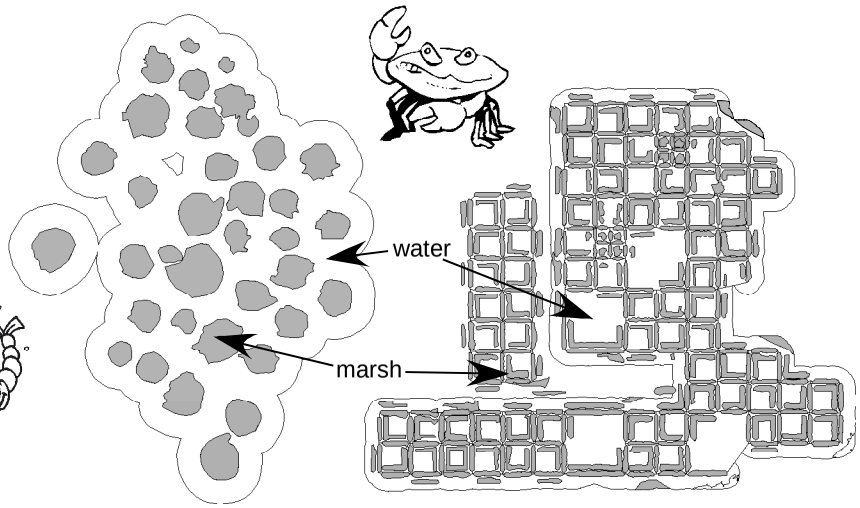
A. Number of animals: 60
Cost to build: $10



B. Number of animals: 80
Cost to build: $40



C. Number of animals: 44
Cost to build: $11



D. Number of animals: 50
Cost to build: $5

10⟌60 = ____ number of animals for every dollar spent

40⟌80 = ____ number of animals for every dollar spent

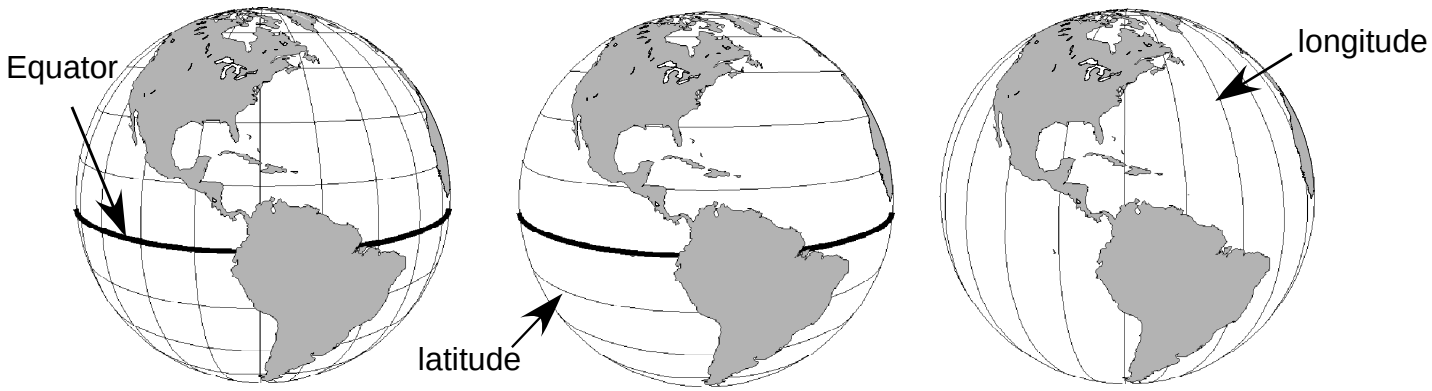
11⟌44 = ____ number of animals for every dollar spent

5⟌50 = ____ number of animals for every dollar spent

1. Which marsh has the **highest** number of shrimp and crabs living there?
2. Which marsh has the **lowest** number of shrimp and crabs living there?
3. Which marsh cost the **most** to build?
4. Which marsh cost the **least** to build?
5. Which marsh is the best (produced the highest number of animals for every dollar spent)?

Answers: 1)Marsh B; 2)Marsh C; 3)Marsh B; 4) Marsh D; 5)Marsh D

Where in the World Is...?



Imaginary lines of latitude and longitude help geographers pinpoint locations on the earth. Latitude is distance north or south of the Equator. Longitude measures distance east or west. Both are measured in terms of the 360 degrees (symbolized by °) of a circle. Imaginary lines of latitude and longitude intersect each other, forming a grid that covers the Earth and helps us locate points on it. For greater precision, degrees of latitude and longitude are divided into 60 minutes (symbolized by ’), and minutes are divided into 60 seconds (symbolized by ”).

Geography is important to biologists because most of the data we collect has a spatial component (that means it is located somewhere on earth and it is important to know where that is!) We use a **Geographic Information System (GIS)** to plot the location of our data. We use a GIS to track the locations of restored and created salt marshes in Galveston Bay. After several years of growth, they may be hard to distinguish from natural marshes, so we need a way to be able to locate them so we can return there and monitor how well they are doing. Use the grid to plot out the locations of these restored salt marshes. Put a dot on the map when you locate them.

1. Webb Marsh 1984
29° 25‘North 94° 45‘West

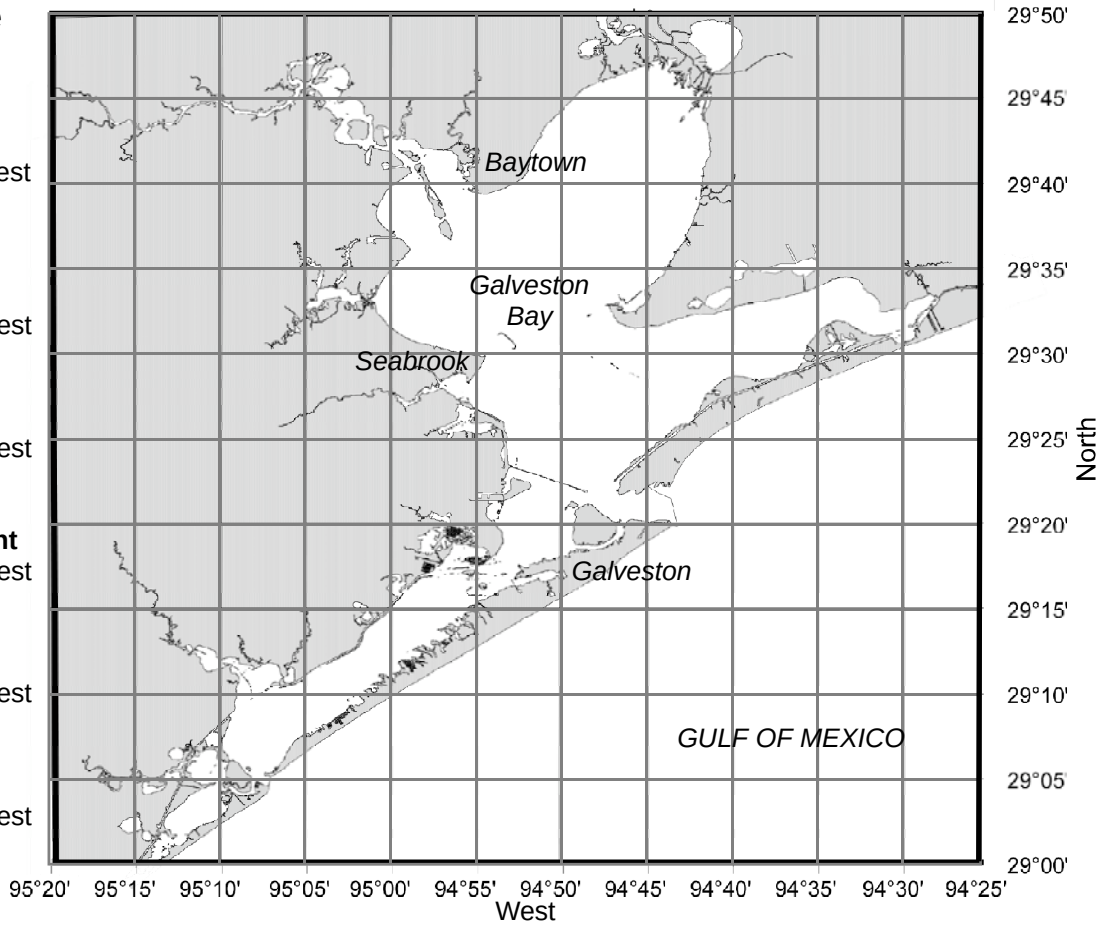
2. Galveston Bay Foundation
29° 40‘North 95° 00‘West

3. Armand Bayou #2
29° 35‘North 95° 05‘West

4. San Jacinto Monument
29° 45‘North 95° 05‘West

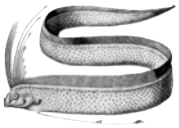
5. Robinson Park
29° 35‘North 95° 00‘West

6. Sweetwater
29° 15‘North 94° 55‘West

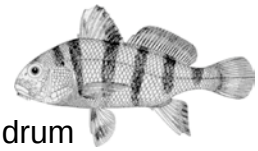


What Will I Be When I Grow Up?

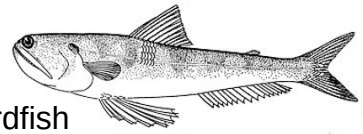
The early development of fish is a very complex period during which they undergo many changes and the larvae look very different from the adult fish. The ability to identify these early stages is of great importance when managing fisheries and their habitat. Can you match the adults (on the left) of these fishes of the Gulf of Mexico with their larva on the right? (Don't feel bad if you can't! It really is hard to do!)

A. Oarfish 

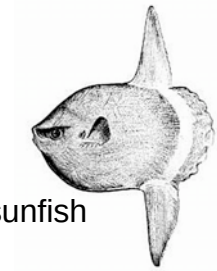
B. Cowfish 

C. Black drum 

D. Dolphinfish 

E. Lizardfish 

F. Cobia 

G. Ocean sunfish 

H. Tripletail 

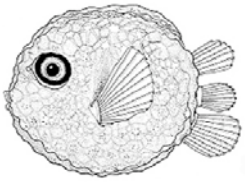
1. 

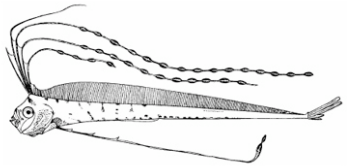
2. 

3. 

4. 

5. 

6. 

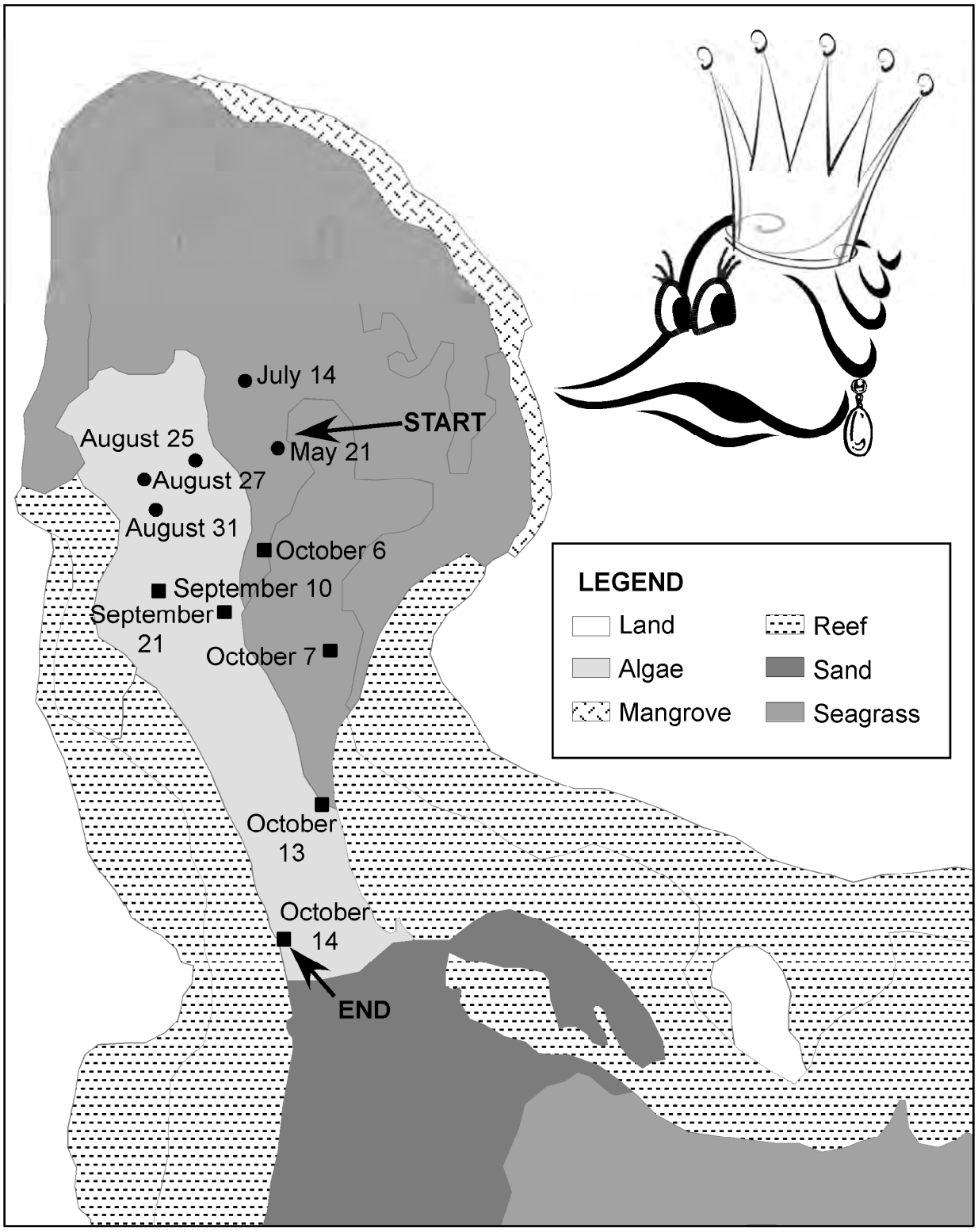
7. 

8. 

Answers: A.7; B.6; C.8; D.1; E.4; F.2; G.3; H.5

Queen Conch for a Day

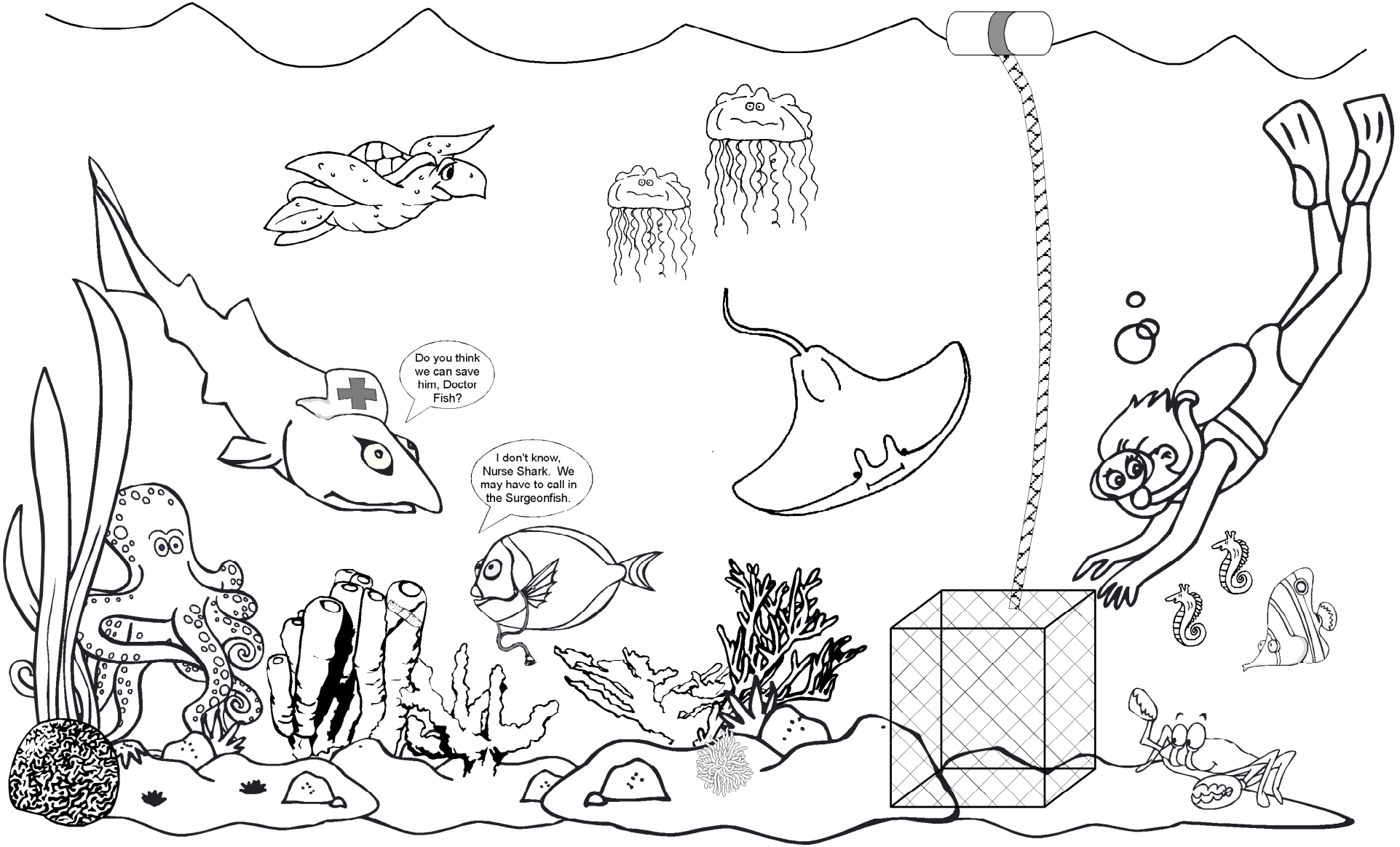
Can you connect the dots by the date to follow the movements of this Queen Conch in Fish Bay on St. John Island in the U.S. Virgin Islands? Use the Legend to count the number of dots (days) that she was found in areas covered by algae. How many dots are found in areas covered by seagrass? by reef? What kind of habitat do you think the Queen Conch liked best (where did she spend the most time?)



Answers:
Algae: 7 days, Seagrass: 4 days, Reef: 0 days. She seemed to prefer areas covered by algae.

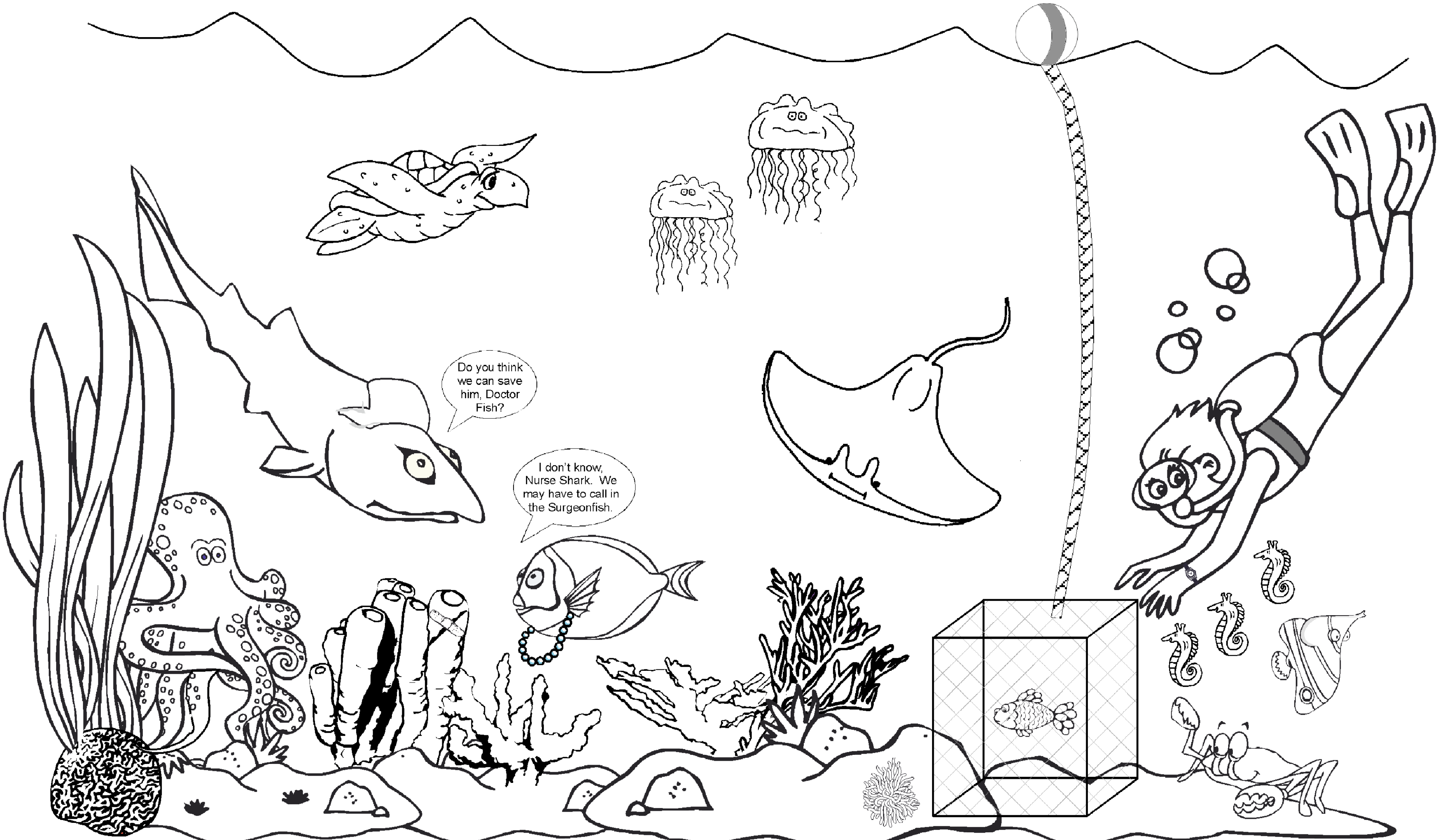
Color the Corals!

Fishery Biologists from the NOAA Fisheries Galveston Laboratory also travel to Florida, Puerto Rico and the U.S. Virgin Islands to study the effects of trap fishing on coral reefs. They want to see if the corals are damaged by the traps and find ways to prevent it. (Did you know that coral reefs are NOT rocks?! They are tiny animals called polyps with skeletons made out of limestone. They are grouped in colonies that form the coral reef.)

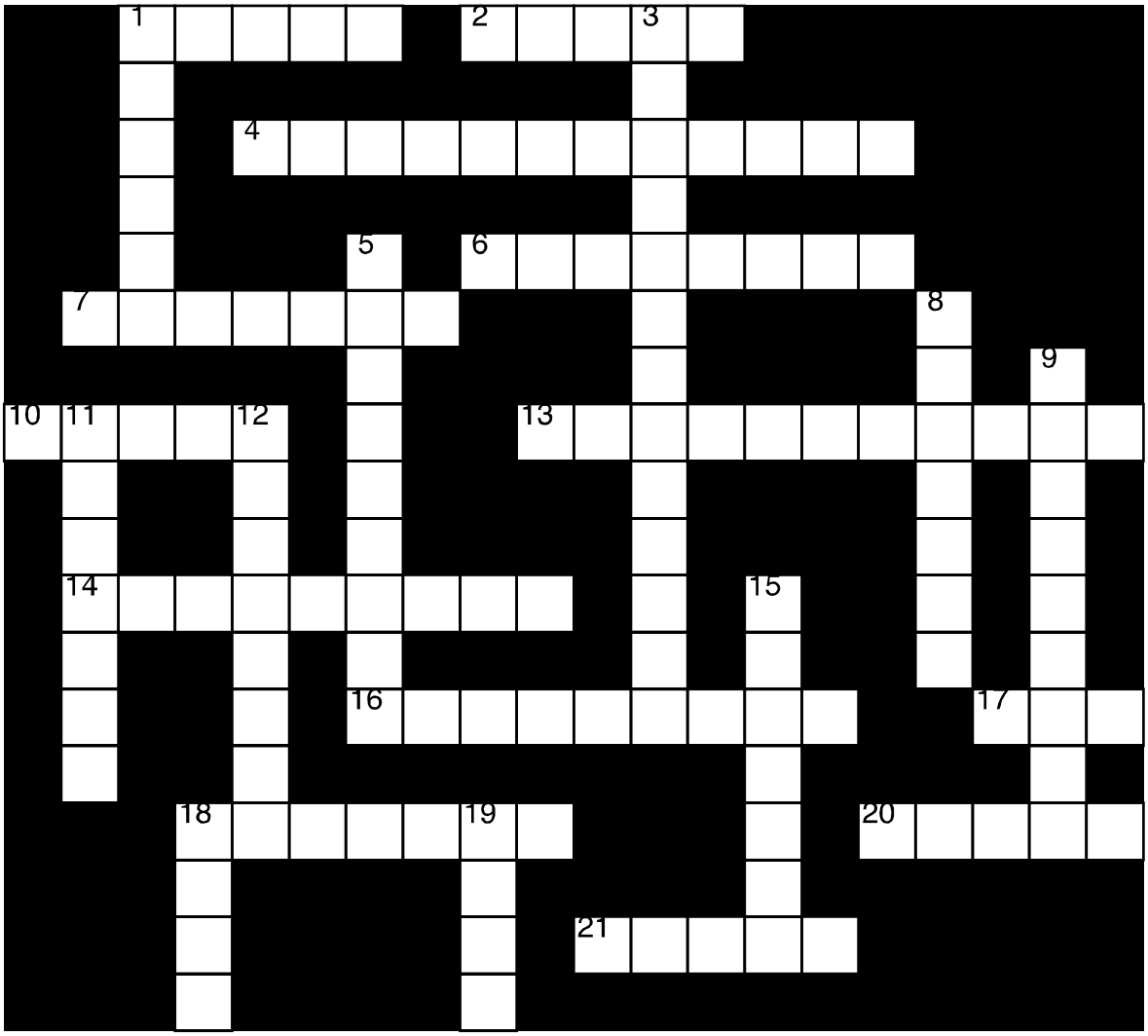


Color the Corals (part two)!

There are 15 things in this coral reef drawing that are different. Can you find them?



Answers: There are more plants by the octopus, octopus has an extra tentacle, there is no cross on the nurse shark's hat, doctor fish is wearing pearls instead of a stethoscope, the anemone has moved, stingray is flipped, jellyfish's tentacles are shorter, diver's belt is black, diver is wearing a watch, there is a fish in the trap, trap is a different color, three seahorses instead of two, more bubbles, fish is upside down, float is a different shape.



Across

1 Marine snail having a heavy, spiral shell.

2 An early form of any animal that at birth or hatching is very different from its parents.

4 The variety of life on earth.

6 Imaginary line around the earth used to locate points north and south.

7 The place or type of place where a plant or animal naturally or normally lives or grows including everything it needs to survive.

10 The state where the NOAA Fisheries Galveston Lab is located.

13 A return of something to a former, original, normal, or unimpaired condition.

14 Imaginary line around the earth used to locate points east and west.

16 A community of organisms together with the physical environment where they live.

17 A computer system for capturing, storing, checking, combining, manipulating, studying and displaying data related to positions on the Earth‘s surface.

18 A site where fresh water and salt water meet.

20 An individual coral animal.

21 Low wet land, often treeless and periodically covered by water, characterized by a growth of grasses, sedges, cattails, and rushes.

Down

1 Abbreviation for the Coastal Wetlands Planning Protection and Restoration Act.

3 St. John Island, where we study the Queen conch, is one of these.

5 City where our field office in Louisiana is located.

8 Land or areas (as marshes or swamps) that tend to be regularly wet or flooded.

9 A natural group of different species living together.

11 The study of relationships between living things and their surroundings.

12 Flowering plant that grows in sediment on the sea floor with erect, elongate leaves and a buried root-like structure.

15 A population of individuals that are alike and able to breed and produce offspring.

18 The part of the marsh where animals prefer to live.

19 A ridge or mound found in the ocean made up of many corals grouped in colonies.

How You Can Help Us Have Healthy Habitats!

- Join a local group for a shoreline cleanup or wetland restoration day to ensure that our wetlands are healthy.

- Conserve water. The less water you use, the less runoff and wastewater that eventually finds its way back into our oceans. Take shorter showers. Turn off the water while you're brushing your teeth, washing your hands, or doing dishes in the sink. To learn more about ways to conserve water, go to **http://www.epa.gov/ow/you/chap3.html**.

- Don't anchor your boat on seagrass beds or coral reefs.

- Know what the fishing regulations are. Don't catch more fish than you are allowed, or fish that are too big or too small. And definitely don't take any endangered or protected species!

- If you fish, remove all line and hooks and take it with you for proper disposal. Pick up any line left by other people. Improperly discarded fishing line cripples and kills and wildlife at an alarming rate.

- If you take a vacation at the beach, don't buy souvenirs made from coral or protected marine animals.

- Don't pollute! Make sure your own trash ends up in a trash can or recycling bin, and it never hurts to pick up a stray piece of litter or two! Thousands of marine creatures die each year after trying to eat a piece of plastic they mistook for food.

- Keep oil off the street! If you or a family member changes motor oil at home, prevent accidental spills and recycle used oil. For the motor-oil recycling facility nearest you, call (800)CLEANUP or visit **www.Earth911.org**.

- Drive less! Walk, ride a bike, use public transportation, or carpool to reduce the amount of grease, oil, exhaust, and tire and brake residue that ends up in the bay. Vehicle exhaust contributes more than one-third of all the nitrogen pollution entering the bay from the air. Make it a personal goal to combine errands and limit trips to reduce your contribution to auto emissions. And when the time comes to buy a new car or truck, choose the most fuel-efficient gasoline, gasoline-electric hybrid, or alternative-fuel model in its class.

- Avoid pouring toxic substances down storm drains. Don't dump hazardous materials like solvents, paints, and preservatives. They go directly into streams and waterways to pollute the bay. Use your county's hazardous waste collection program instead. Go to your local government's website for information on when and how to dispose of hazardous waste in your community.

- Use chemically enhanced pesticides and fertilizers responsibly. Lawn fertilizers and chemicals are a big source of nitrogen and phosphorus pollution and toxic runoff. Even if you live thousands of miles from the ocean, these products can end up in the watershed and may ultimately impact the coastal environment.

- Plant a tree. Besides providing oxygen to the atmosphere, trees hold soil in place with their roots, preventing erosion that runs into the bay. They soak up fertilizers and other chemicals before they seep into waterways.

PLEASE RECYCLE!