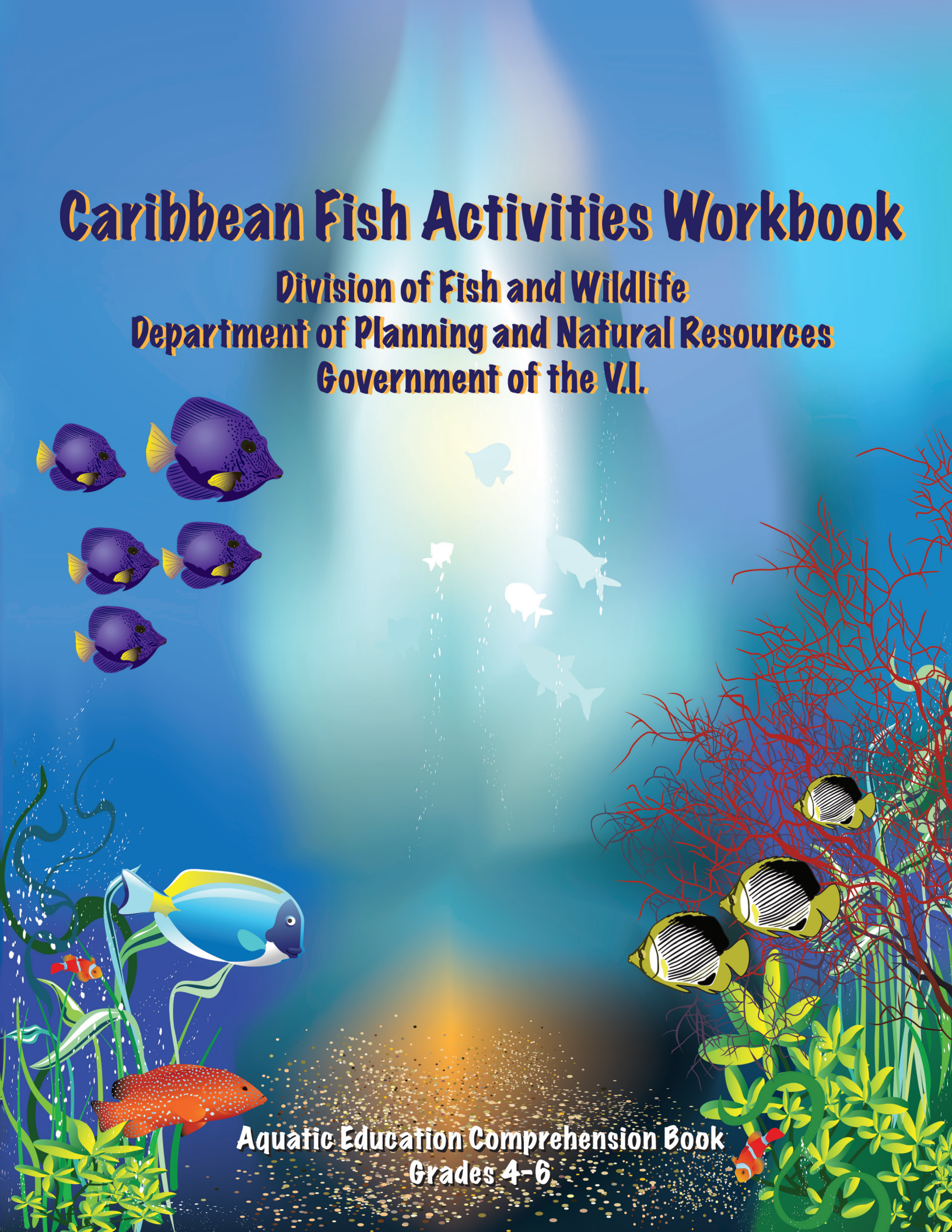
Caribbean Fish Activities Workbook

Division of Fish and Wildlife
Department of Planning and Natural Resources
Government of the V.I.

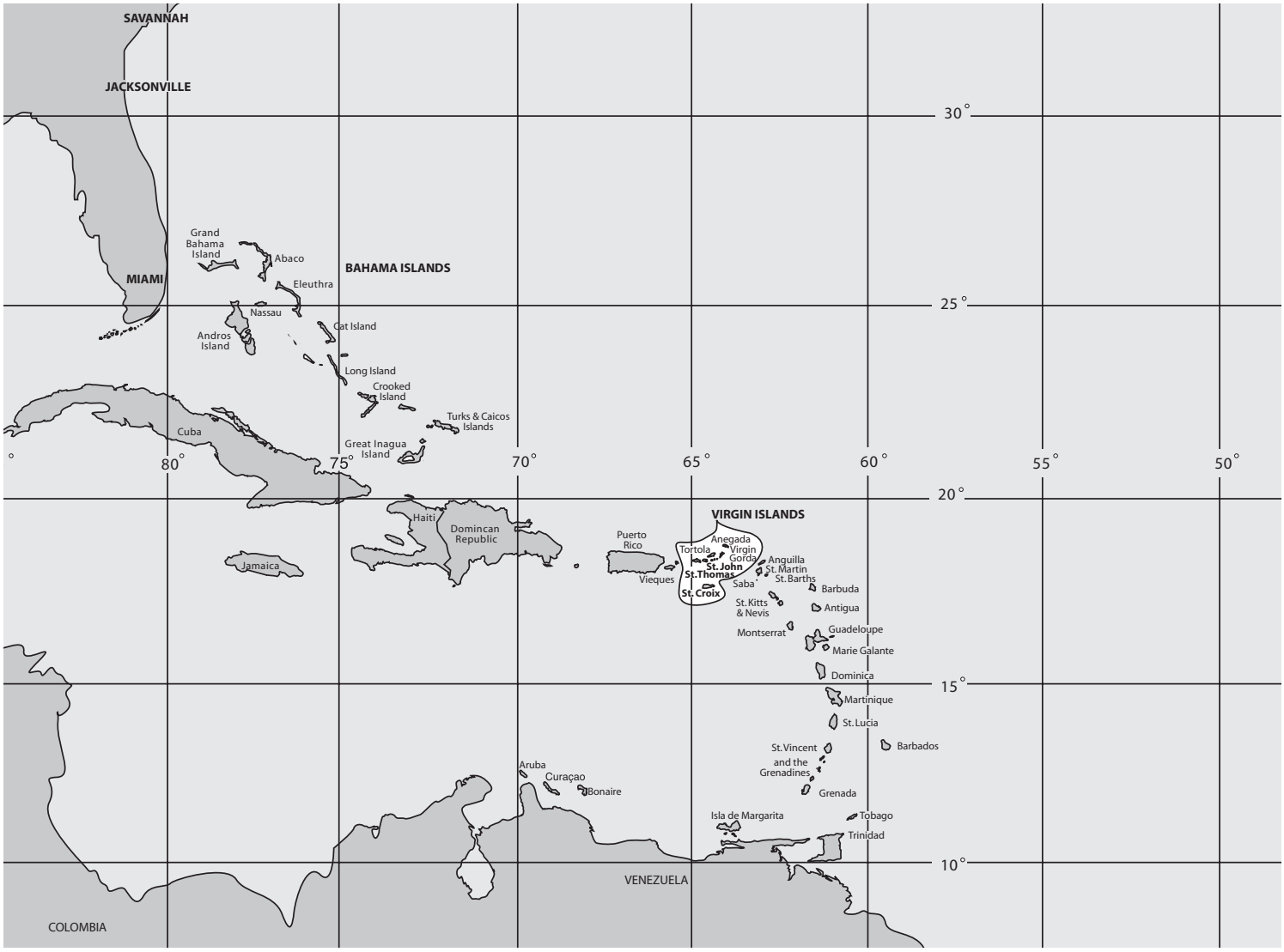


Aquatic Education Comprehension Book
Grades 4-6

AQUATIC EDUCATION COMPREHENSION BOOK

Name: _____

Grade: _____ Date: _____



DIVISION OF FISH AND WILDLIFE D.P.N.R. - U.S.V.I.

U.S. VIRGIN ISLANDS DEPT. OF PLANNING AND NATURAL RESOURCES

GOVERNMENT OF THE UNITED STATES VIRGIN ISLANDS

SPORT FISH RESTORATION

An introduction to Caribbean Mangroves and Fish that live in them

When people living in the Caribbean are asked to describe the seashore, they often refer to a dense ring of forest hugging the coastline and reaching all the way to the water. The trees that make up these strange beach-front forests are collectively called mangroves. Mangrove forests make up one of the most unique ecosystems on earth in that they thrive where no other trees can survive, the transition zone between the ocean and land. The mangroves, in turn, provide shelter for an incredible variety of terrestrial and aquatic organisms.

What exactly is a mangrove? Mangroves are salt tolerant (halophytic) trees that live in areas saturated with salt water at least part of the time. There are many different kinds of mangroves. The Caribbean has only four species—Red Mangrove, White Mangrove, Black Mangrove and Buttonwood. All true mangroves display a unique reproductive mechanism known as viviparity. Instead of releasing seeds, which would soon get soaked with salt and die, the seeds of mangroves germinate while still attached to the tree. The fully developed seedlings are then dropped from the trees. These baby mangroves float root side down in the water until they reach the shallows near shore and take root.

Mangrove forests provide both shelter and a food source for an incredible diversity of life. The organisms living in association with mangroves can be divided into two basic groups, air dwellers and water dwellers. Let us consider the underwater dwellers living among the prop roots of the red mangrove. The organisms that live in association with mangroves include members of several different taxonomic groups ranging from bacteria to algae and animals. Some of these organisms settle on and attach to the mangrove roots. Once attached, these animals cannot move about and are called sessile. Examples of these are algae, encrusting sponges, feather duster worms, anemones, oysters, barnacles, and tunicates. Mobile organisms living among the mangroves include worms, jellyfish, periwinkles, crabs and shrimp, sea cucumbers, and many juvenile fish species.

Snorkel in a mangrove, and you will be struck by the variety of fishes, especially juvenile fishes. Mangroves are clearly a preferred habitat for adult fishes such as mangrove snapper, mangrove jack, gobies, blennies, cardinalfishes, pipefishes, and butterflyfishes. More abundant are juveniles of species whose adults occur in other, often coral-dominated habitats (including squirrelfishes, groupers, snappers, grunts, angelfishes, butterflyfishes, parrotfishes, surgeonfishes, jacks and barracuda). An important question is whether the juveniles are mangrove dependent: How many of the juveniles that occupy the inshore mangroves wind up out on the reef, or using ecological jargon, are mangroves sources of reef fish adults or merely sinks for reef fish larvae? If mangroves are critical nursery areas, protecting reef species requires protecting mangroves.

Unfortunately, these important ecosystems are threatened by various activities of man. The two major threats to the mangrove ecosystem are deforestation and pollution.

Luckily, there are many initiatives aimed at maintaining the mangroves we have. Many countries have initiated management plans that make it illegal or very difficult to cut down mangroves. Perhaps the most important way to protect mangroves is through education. Hopefully this article has helped to dispel the notion that mangrove forests are bug infested, useless swamps. They are instead a fascinating and very important resource for us to study, appreciate, and preserve. They are an important nursery for fish and other organisms, process nutrients, and protect islands from wave and storm action. We need to make the effort to find ways to live alongside this natural resource.

Mangrove Habitats and Fish that live in them
Reading Comprehension

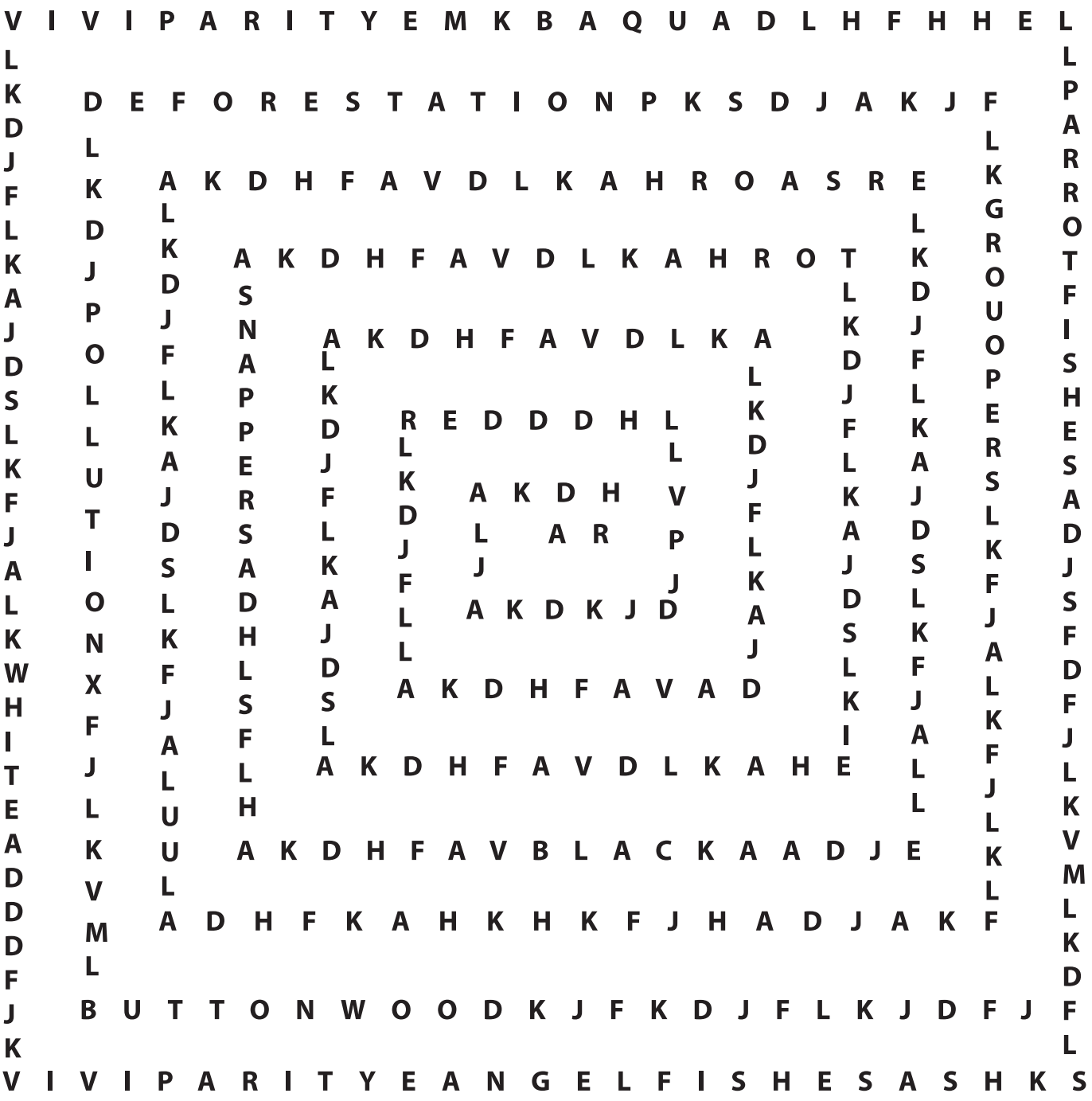
Circle the words to answer these questions

What are the 4 kinds of Mangroves?

How do Mangroves reproduce?

What are 3 juvenile fish species found in Mangroves?

What are 2 threats to the mangrove ecosystem?



Mangrove Habitats and Fish that live in them
Reading Comprehension

Use the words from the word bank to complete the sentences below.

juveniles	preferred	float	useless
bacteria	dense	snapper	jack
animals	germinate		

1. Mangroves are a _____forest that lives where no other trees can survive.

2. Mangroves are a _____ habitat for a variety of fishes.

3. Mangrove forests are not _____ swamps.

4. The seeds of Mangroves _____while still attached to the tree.

5. Baby Mangroves _____root side down in the water until they reach the shallows and take root.

6. The organisms that live in association with mangroves include _____ and _____.

7. Adult fishes that live in the mangroves include _____ and _____.

8. Young fishes are called _____.

What is the number of the question above that this picture shows an example of?

_____

FISH HABITATS

As a fish grows up it goes on a journey through habitat changes. Can you put these habitat words in the correct order as a fish grows from a juvenile, to a young fish to a fully mature adult.

Mangroves **Deep Water** **Coral Reefs** **Sea Grass**

1. _____

2. _____

3. _____

4. _____

Some fish species travel between different habitats as adults.

True or False?

Seagrasses—Underwater Meadows

Seagrasses are found throughout the Caribbean. They grow in the reef lagoons between the beaches and coral reefs or form extensive meadows in more protected bays and estuaries. There are 7 species of seagrass recognized in the Caribbean. Thalassia testudinum (turtle grass), is the most abundant seagrass in the region. Tropical seagrass communities, among the most productive in the world, are ideal for fish and other sea creatures. Seagrasses, like mangroves, are a major source of photosynthetic primary production, providing and energy base for an often complex ecosystem. The rhizomal root system stabilizes the sediment in the sea water and small invertebrates and fish are provided protections against waves, currents and predators.

The fish population of a seagrass meadow may be highly diverse. Some species are permanent residents, and others live in seagrasses only at certain times in their life cycle (for example, as juveniles) or are seasonal occupants; many commute in from adjacent habitats such as mangroves and coral reefs. Because of these movements in and out of seagrasses, fish are probably one of the main routes of energy flow linking seagrass meadows with other ecosystems.

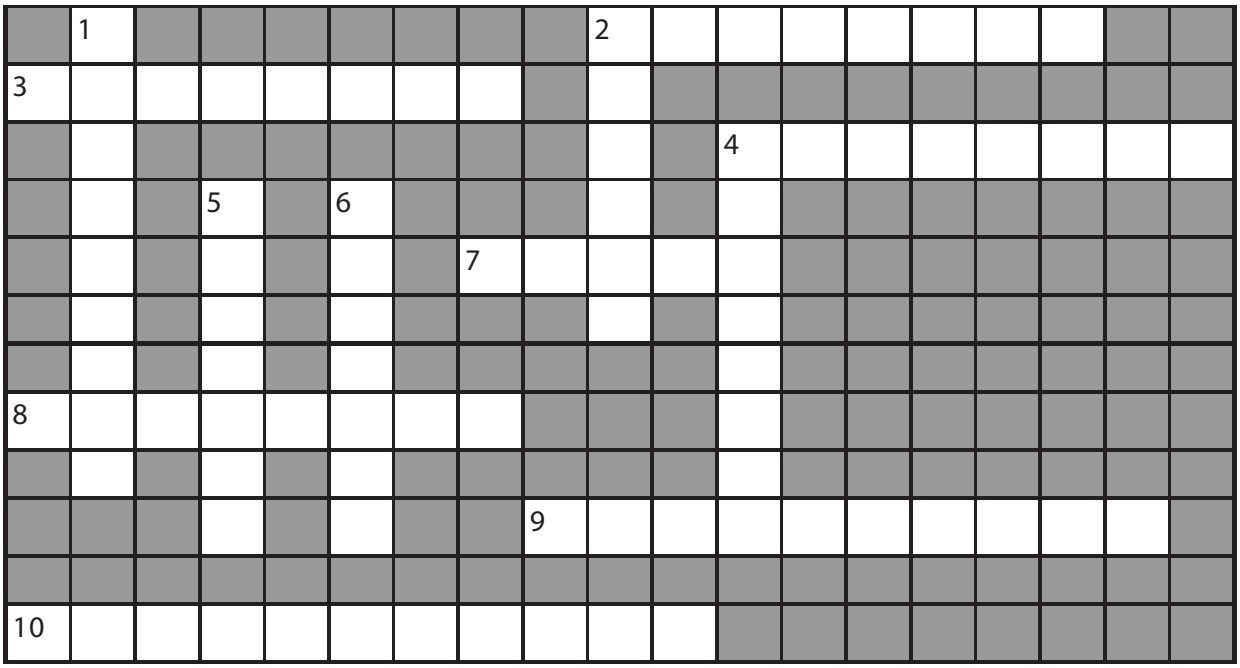
Fish are attracted to seagrasses for protection against predators, as well as the food resources offered. In some species, taking refuge in seagrass meadows means relinquishing a better food source elsewhere. Of those fish which depend on seagrass for food most are predators, exploiting the many invertebrates or smaller fish. Others are omnivores, detritivores, or herbivores. Most herbivores graze on epiphytic algae and many species mix them with seagrass material in their diet, among them parrot fish. In the Caribbean, parrotfish (Scarus and Sparisoma spp.) make sorties from coral reefs to graze on adjacent seagrass beds.

Predatory fish such as grouper, snapper, shark and barracuda, and algae-eating fish such as parrot fish, doctor fish and surgeon fish rely on the reefs and sea grass beds for food and shelter and as a breeding ground. Predator-prey interactions are complex. The complexity of the seagrass environment makes it more difficult to locate and pursue small active prey; this is one reason why seagrass beds are an important nursery area for many fish species. On the other hand, ambush predators use seagrass for concealment and wait for prey to come to them. One group of specialist sit-and-wait predators are the pipefish and seahorses (Syngnathidae). Pipefish, particularly with lying vertically, look very similar to surround seagrass blade and mores, and are very hard to spot. Seahorses can attach themselves to the seagrass by their prehensile tail and remain motionless until prey come within striking distance.

Threats to seagrass in the Caribbean include: destruction or removal by the construction of coastal developments associated with tourism or other coastal activities; anchor and propeller scarring due to increased traffic of ships and recreational vessels; shading by marinas and piers; removal to make way for salt production and mariculture; dynamite fishing; illegal sand mining from beaches; pollution from land-based sources including sewage, agricultural fertilizers, hydrocarbons, pesticides and other toxic wastes. As seagrasses actively form and maintain extensive subtidal flat structures in the Caribbean, there is concern about the effects of global warming and sea-level rise on seagrasses.

Models of global climate change predict considerable changes for the coastal environments in the Caribbean, including rising sea level, increasing water temperature and more frequent hurricanes. Seagrasses should be able to maintain vertical rates of habitat development in pace with predicated rises in sea level until at least the middle of this century, and a rise in sea level is not expected to seriously affect the predominant species unless a general deterioration of the habitat occurs.

Seagrasses—Underwater Meadows
Reading Comprehension Puzzle



ACROSS

2. has a prehensile tail
3. a major source of photosynthetic production
4. sit-and-wait predator
7. a food source for herbivores
8. predatory fish
9. algae-eating fish
10. most abundant seagrass in the Virgin Islands region

DOWN

1. eats on only plants
2. threat to seagrass in the Caribbean
4. eats other fishes
5. to move from one habitat to another
6. place to raise the young

What is the number and direction in the puzzle that names the two fishes below?

Seagrasses—Underwater Meadows
Word Definitions

Match the words below with its definition

ecosystem	graze	subtidal
prehensile	mariculture	seagrass
omnivore	detritivore	rhizome

_____ noun Zoology • an animal that feeds on dead organic material, especially plant detritus.

_____ noun • a grasslike plant that lives in or close to the sea, esp. turtle grass.

_____ noun Botany • a continuously growing horizontal underground stem that puts out lateral shoots and random roots at intervals.

_____ noun • the cultivation of fish or other marine life for food.

_____ noun • an animal or person that eats food of both plant and animal origin.

_____ verb [intrans.] • (of animals) eat grass in a field or meadow.

_____ adjective • (chiefly of an animal's limb or tail) capable of grasping.

_____ noun Ecology • a biological community of interacting organisms and their physical environment.

_____ adjective • the flora and fauna environment below low tide that is always covered by water.

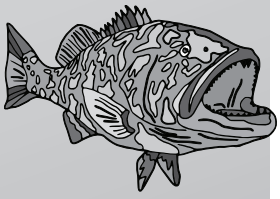
Circle the letter for which picture shows a predator fish hiding in the seagrass? A or B?

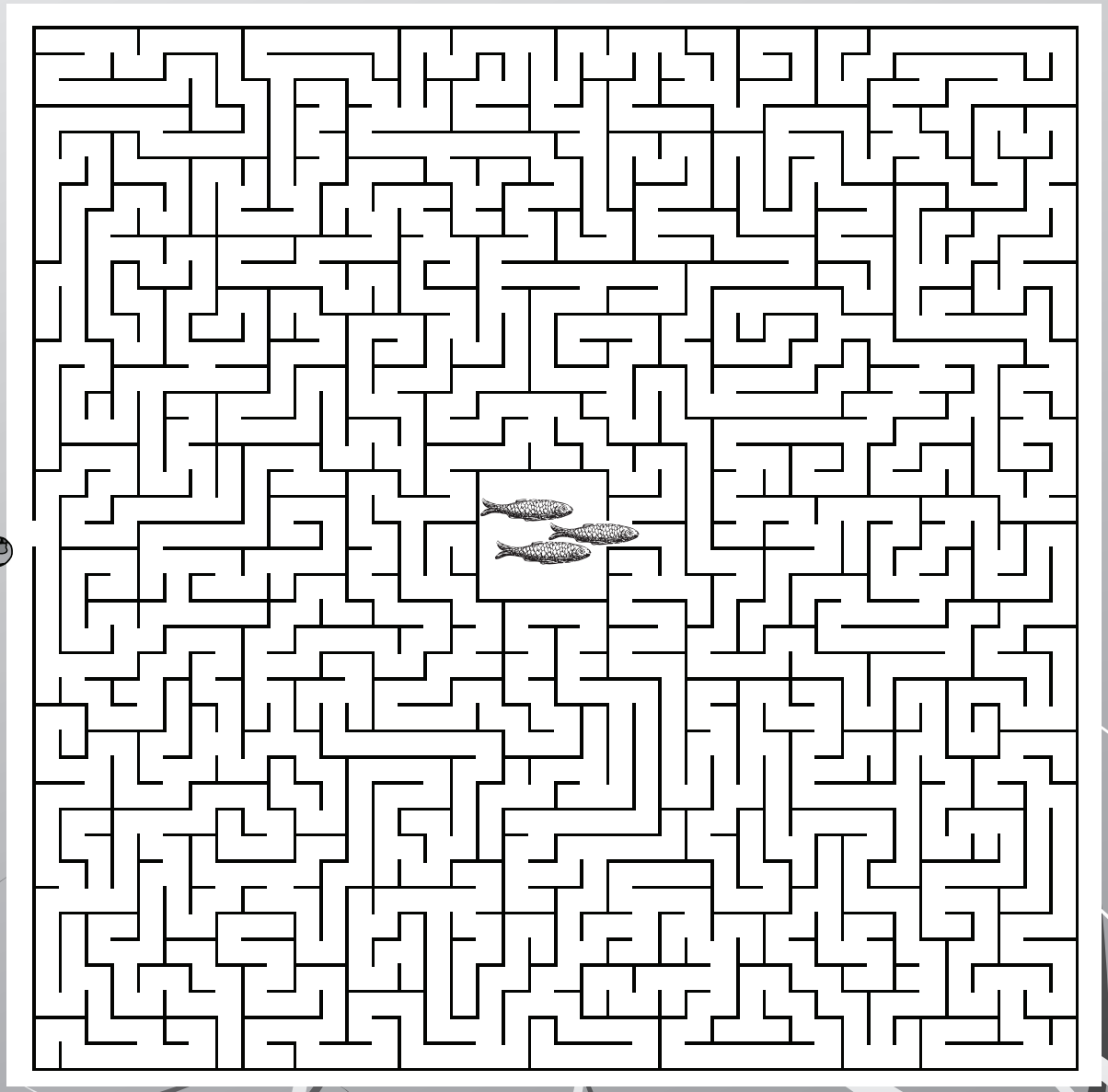
A

B

Seagrasses—Predator Fish Maze

Lead the grouper through the seagrass maze to find the smaller fish he likes to include in his diet.





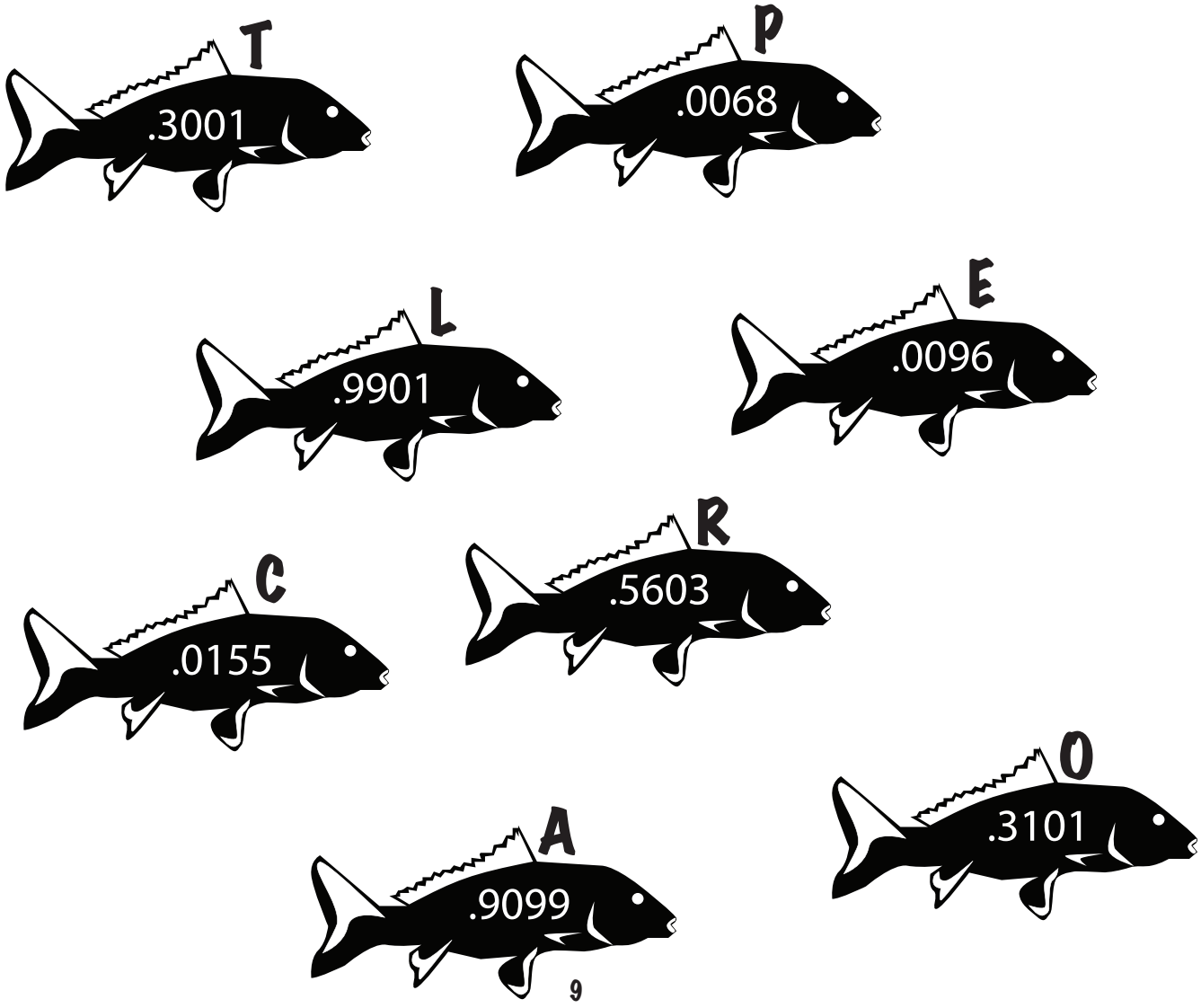
How Fish Swim

Fish swim by exerting force against the surrounding water. There are exceptions, but this is normally achieved by the fish contracting muscles on either side of its body in order to generate waves of flexion that travel the length of the body from nose to tail, generally getting larger as they go along. The vector forces exerted on the water by such motion cancel out laterally, but generate a net force backwards which in turn pushes the fish forward through the water.

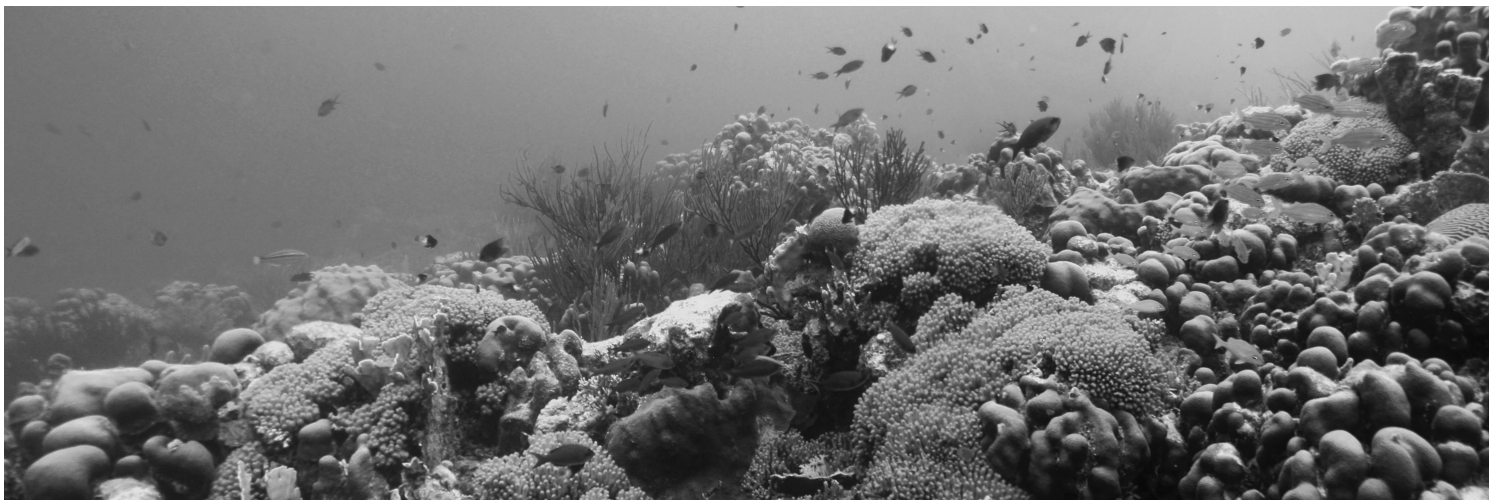
Most fishes generate thrust using lateral movements of their body & caudal fin. But there are also a huge number of species that move mainly using their median and paired fins. The latter group profits from the gained manoeuvrability that is needed when living in coral reefs for example. But they can't swim as fast as fish using their bodies & caudal fins. The two types of paired fins are pectoral and pelvic. The Pectoral Fins are predominately used for buoyancy and lift while pelvic fins are mostly used for stability and steering.

What are the main fins that a flying fish uses to "fly" over water?_____

To discover the answer to this riddle, put these fish in order from smallest to the largest decimal numbers.



CORAL REEFS



Small marine organisms, including algae and coral, create coral reefs. How do they do this? As these organisms die, their skeletons form a reef. New young corals then attach to the skeletons. The reef grows in this way from the sea floor to the surface of the water. Many specific conditions are necessary for coral reefs to survive sea currents, sunlight and water temperature are important for coral reefs. Some corals are very sensitive and can only live in certain conditions. As corals are attached to one place, they are dependent on the quality of the water around them and food available in that water. The water temperature must be between 72°F (22°C) and 82°F (28°C). It must have just the right amount of salt in the water. There also needs to be enough of the right kind of food. Corals must have a constant supply of zooplankton.

Reefs are a special environment for many fish and sea plants. These life forms are dependent on the conditions that the reef supplies. Reefs provide places for fish to hide and for plants to attach. Reefs make a protected area for small fish and other animals. A reef also helps keep large waves from breaking on the beach.

Most coral reefs are made from stony coral. There are many other types of coral, such as thorny coral, soft coral, horny coral, and organ-pipe coral. Corals can be found in many different colors, including black, red, and blue. Stony coral is usually brown, yellow, or green. Some corals live in deep water, while others thrive in shallow water. Stony coral grows best in water that is about 36 feet (11 meters) deep.

Reefs are formed in several different ways. Some reefs are created around the rims of old volcanoes in the ocean. Other reefs form on or near a continental shelf. These are called barrier reefs. Fringe reefs grow along the shore of an island or near a large piece of land.

Coral reefs are important to people. Reefs help to protect beaches. A reef can provide a safe harbor for boats. Reefs also are places where many fish and other marine animals live. Angelfish, Groupers, French Grunts, Squirrelfish, Flying Guernards, Blue Tangs and Trumpetfish are just few of the kinds of paired fin fish you see on a reef. People like to swim near reefs to see the beautiful colors of the coral and the sea animals. Some reefs have become national parks.

Changes in ocean temperatures and weather can destroy reefs. Pollution is also a serious threat to coral reefs. Some types of starfish and coral rock-borers also threaten reefs. When the natural balance of a reef is destroyed, it dies.

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Answer the questions about CORAL REEFS

1. How are reefs formed?
   a. From stones
   b. From volcanoes
   c. From coral skeletons
   d. By people

2. What threatens a coral reef?
   a. Pollution
   b. Coral rock-borers
   c. Changes in weather
   d. All of the above

3. What does *salinity* mean?
   a. The shape of the reef
   b. The distance between the reef and the beach
   c. The thickness of the reef
   d. The amount of salt in the water

4. Where are coral reefs found?
   a. In the Arctic Ocean
   b. In tropical seas
   c. In large lakes
   d. In rivers

5. What would you see in a living coral reef?
   a. Palm trees
   b. Birds
   c. Colorful fish
   d. Whales

6. Name 3 paired fin fish you would like to see in a coral reef?

   _____

   _____

   _____

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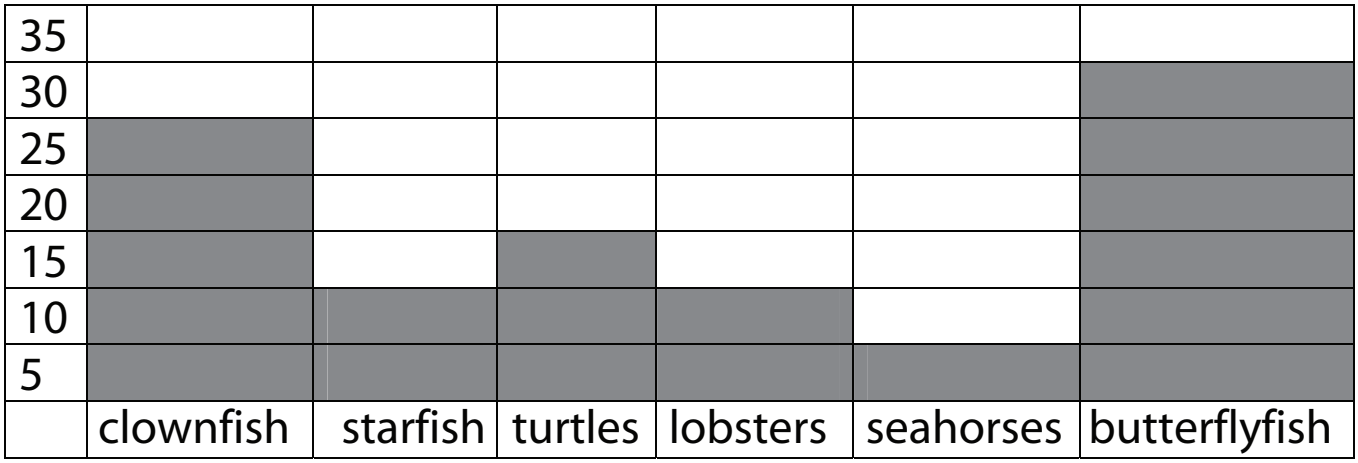
Coral Reef—Reading and understanding graphs.

Sea Animals Seen in the Coral Reef



Read the chart above and answer the questions.

1. What is the title of this graph?
   a. Types of Fish
   b. Read the Graph
   c. Rainforest Animals
   d. Sea Animals Seen in the Coral Reef

2. How many clownfish were seen in the coral reef?
   a. 30
   b. 25
   c. 10
   d. 5

3. Which animals were seen the least?
   a. seahorse
   b. lobsters
   c. turtles
   d. starfish

4. Which animals were seen the most?
   a. lobsters
   b. turtles
   c. clownfish
   d. butterflyfish

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CORAL REEFS AND POLLUTION

Coral reefs are important for animals and people all over the world. Reefs are an important source of food. They also bring tourists to tropical areas to see the interesting marine life near reefs. Many islands and coastal towns earn money from tourism business. Coral reefs also provide protection from storms for beaches and coastal areas.

Some coral reefs are thousands of years old. Their structure can endure many things in nature. Reefs can survive cyclones, waves, high winds and volcanic eruptions. Unfortunately, many coral reefs are threatened by the modern activities of people, such as building, deforestation, and waste products dumped into the oceans. Coral reefs need the right combination of temperature, sunlight and clean water. Pollution can disturb all three of these conditions.

Power plants and factories can increase water temperatures. Changes in the atmosphere because of too much carbon dioxide can also cause a rise in water temperature. When the temperature gets too warm, the coral begins to die. Most coral cannot live in water that is above 80'F (26.5'C). When the water is too warm, coral expels the algae that are essential for the coral's survival.

Coral also needs sunlight. If the water is polluted, it does not let enough sunlight to the coral. When coastal land is heavily logged or if the land is cleared, soil is washed into the ocean. The soil or sediment in the water blocks the sunlight. Other pollutants also create this turbidity. Sewage, industrial waste, and building construction on coastal land can cause water to become so turbid that coral reefs suffer.

Clean water is essential for coral reefs. The small animals that create the reefs rely on clean seawater that has the perfect balance of salt. The reef can be damaged when industrial wastes, agricultural run-off, or oil spills pollute the water near a coral reef.

Coral reefs are a special ecosystem that provides an environment for many living things. To protect the existence of reefs, people must limit the amount of pollution that goes into the oceans, along coastal areas, and into the air.

Answer the questions about CORAL REEFS AND POLLUTION

1. What conditions are necessary for a healthy coral reef?
   a. sunlight
   b. clean water
   c. the right temperature
   d. all of these

2. What is the worst threat to coral reefs?
   a. cyclones
   b. volcanoes
   c. people
   d. high winds

3. How does warm water damage coral?
   a. It causes fish to leave.
   b. The amount of salt increases.
   c. The coral expels algae.
   d. More people go swimming.

4. What does NOT cause pollution?
   a. agriculture
   b. fish
   c. industry
   d. deforestation

5. "Turbidity" means
   a. water that is cloudy from sediment
   b. water that moves slowly
   c. water that is too warm
   d. none of these

6. Who can help limit the pollution that damages coral reefs?
   a. everyone
   b. farmers
   c. people who fish
   d. factory owners

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Mangrove Habitats and Fish that live in them
Reading Comprehension

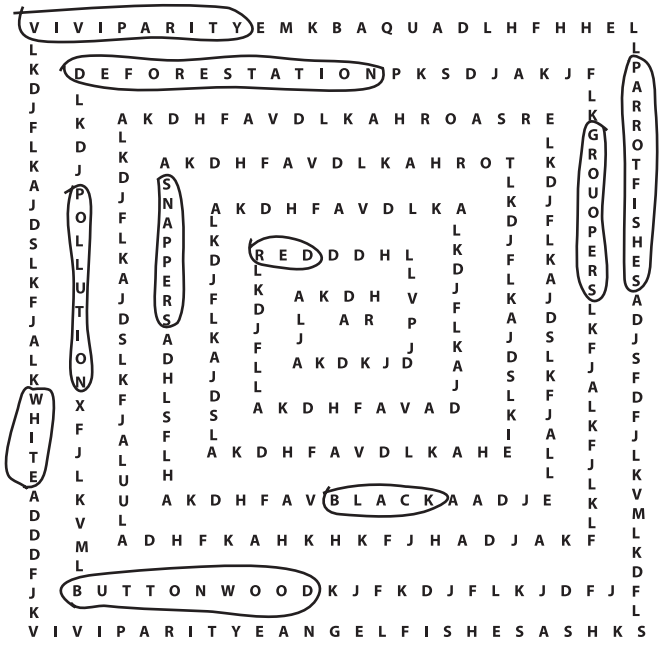
Circle the words to answer these questions

What are the 4 kinds of Mangroves?

How do Mangroves reproduce?

What are 3 juvenile fish species found in Mangroves?

What are 2 threats to the mangrove ecosystem?



Mangrove Habitats and Fish that live in them
Reading Comprehension

Use the words from the word bank to complete the sentences below.

juveniles	preferred	float	useless
bacteria	dense	snapper	jack
animals	germinate		

1. Mangroves are a dense forest that lives where no other trees can survive.
2. Mangroves are a preferred habitat for a variety of fishes.
3. Mangrove forests are not useless swamps.
4. The seeds of Mangroves germinate while still attached to the tree.
5. Baby Mangroves float root side down in the water until they reach the shallows and take root.
6. The organisms that live in association with mangroves include animals and bacteria.
7. Adult fishes that live in the mangroves include jack and snapper.
8. Young fishes are called juveniles.

What is the number of the question above that this picture shows an example of?

_____

FISH HABITATS

As a fish grows up it goes on a journey through habitat changes. Can you put these habitat words in the correct order as a fish grows from a juvenile, to a young fish to a fully mature adult.

Mangroves Deep Water Coral Reefs Sea Grass

1. mangroves

2. sea grass

4. deep water

3. coral reefs

Some fish species travel between different habitats as adults.

True or False?

Seagrasses—Underwater Meadows
Reading Comprehension Puzzle

	h							s	e	a	h	o	r	s	e			
s	e	a	g	r	a	s	s		e									
	r							w		p	i	p	e	f	i	s	h	
	b		c		n			a		r								
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t	u	r	t	l	e	g	r	a	s	s								

ACROSS

2. has a prehensile tail
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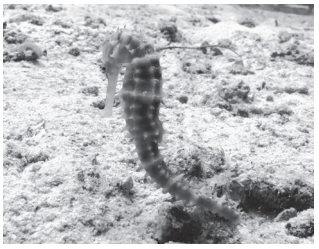
5. to move from one habitat to another
6. place to raise the young

What is the number and direction in the puzzle that names the two fishes below?

8 across



2 across

Seagrasses—Underwater Meadows
Word Definitions

Match the words below with its definition

ecosystem	graze	subtidal
prehensile	mariculture	seagrass
omnivore	detritivore	rhizome

detritivore — noun Zoology • an animal that feeds on dead organic material, especially plant detritus.

seagrass — noun • a grasslike plant that lives in or close to the sea, esp. turtle grass.

rhizome — noun Botany • a continuously growing horizontal underground stem that puts out lateral shoots and random roots at intervals.

mariculture — noun • the cultivation of fish or other marine life for food.

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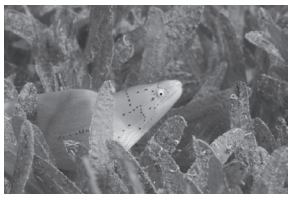
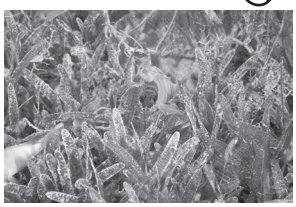
subtidal — adjective • the flora and fauna environment below low tide that is always covered by water.

Circle the letter for which picture shows a predator fish hiding in the seagrass? (A) or B?

A

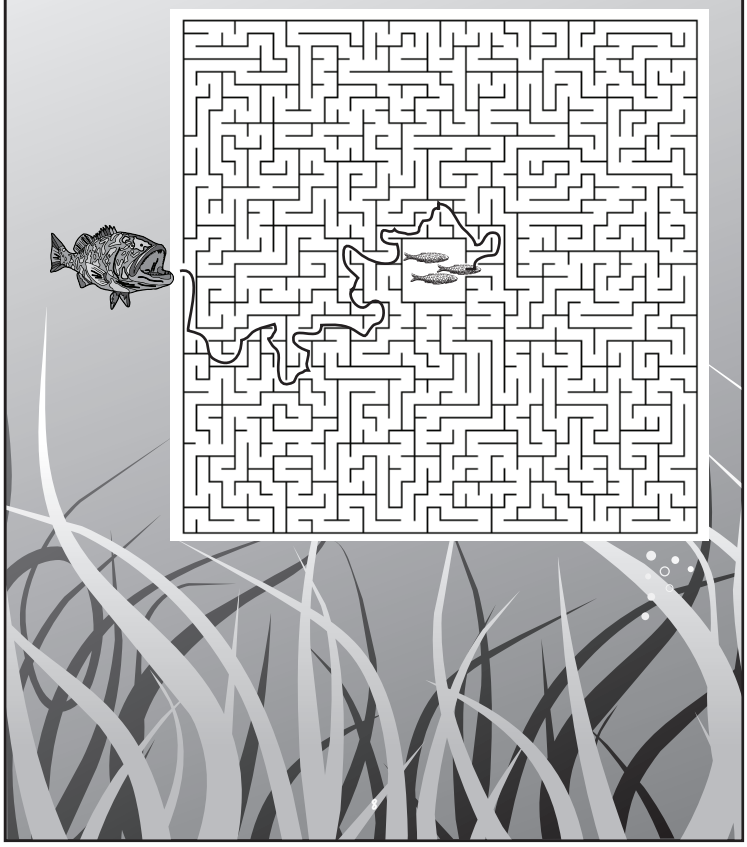


B



Seagrasses—Predator Fish Maze

Lead the grouper through the seagrass maze to find the smaller fish he likes to include in his diet.



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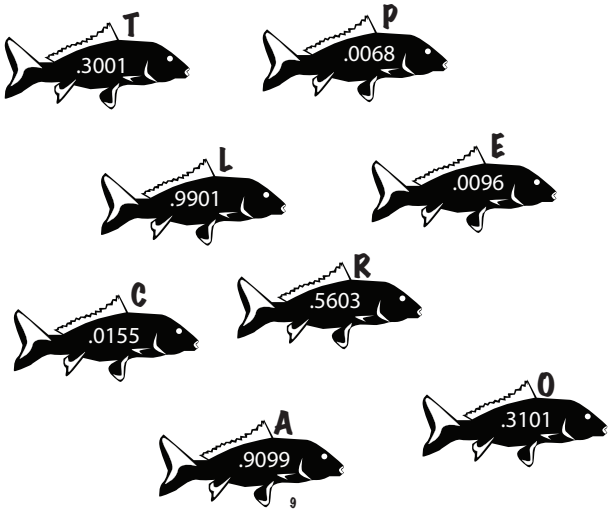
What are the main fins that a flying fish uses to "fly" over water? PECTORAL

To discover the answer to this riddle, put these fish in order from smallest to the largest decimal numbers.



Answer the questions about CORAL REEFS

1. How are reefs formed?
   a. From stones
   b. From volcanoes
   c. From coral skeletons
   d. By people

2. What threatens a coral reef?
   a. Pollution
   b. Coral rock-borers
   c. Changes in weather
   d. All of the above

3. What does *salinity* mean?
   a. The shape of the reef
   b. The distance between the reef and the beach
   c. The thickness of the reef
   d. The amount of salt in the water

4. Where are coral reefs found?
   a. In the Arctic Ocean
   b. In tropical seas
   c. In large lakes
   d. In rivers

5. What would you see in a living coral reef?
   a. Palm trees
   b. Birds
   c. Colorful fish
   d. Whales

6. Name 3 paired fin fish you would like to see in a coral reef?
   Groupers
   French Grunts
   Squirrelfish

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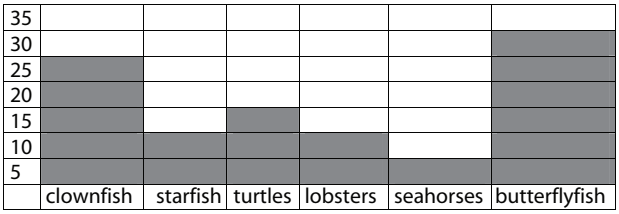
Coral Reef—Reading and understanding graphs.

Sea Animals Seen in the Coral Reef



Read the chart above and answer the questions.

1. What is the title of this graph?
   a. Types of Fish
   b. Read the Graph
   c. Rainforest Animals
   d. Sea Animals Seen in the Coral Reef
2. How many clownfish were seen in the coral reef?
   a. 30
   b. 25
   c. 10
   d. 5
3. Which animals were seen the least?
   a. seahorse
   b. lobsters
   c. turtles
   d. starfish
4. Which animals were seen the most?
   a. lobsters
   b. turtles
   c. clownfish
   d. butterflyfish

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CORAL REEFS AND POLLUTION

Coral reefs are important for animals and people all over the world. Reefs are an important source of food. They also bring tourists to tropical areas to see the interesting marine life near reefs. Many islands and coastal towns earn money from tourism business. Coral reefs also provide protection from storms for beaches and coastal areas.

Some coral reefs are thousands of years old. Their structure can endure many things in nature. Reefs can survive cyclones, waves, high winds and volcanic eruptions. Unfortunately, many coral reefs are threatened by the modern activities of people, such as building, deforestation, and waste products dumped into the oceans. Coral reefs need the right combination of temperature, sunlight and clean water. Pollution can disturb all three of these conditions.

Power plants and factories can increase water temperatures. Changes in the atmosphere because of too much carbon dioxide can also cause a rise in water temperature. When the temperature gets too warm, the coral begins to die. Most coral cannot live in water that is above 80°F (26.5°C). When the water is too warm, coral expels the algae that are essential for the coral's survival.

Coral also needs sunlight. If the water is polluted, it does not let enough sunlight to the coral. When coastal land is heavily logged or if the land is cleared, soil is washed into the ocean. The soil or sediment in the water blocks the sunlight. Other pollutants also create this turbidity. Sewage, industrial waste, and building construction on coastal land can cause water to become so turbid that coral reefs suffer.

Clean water is essential for coral reefs. The small animals that create the reefs rely on clean seawater that has the perfect balance of salt. The reef can be damaged when industrial wastes, agricultural run-off, or oil spills pollute the water near a coral reef.

Coral reefs are a special ecosystem that provides an environment for many living things. To protect the existence of reefs, people must limit the amount of pollution that goes into the oceans, along coastal areas, and into the air.

Answer the questions about CORAL REEFS AND POLLUTION

1. What conditions are necessary for a healthy coral reef?
   a. sunlight
   b. clean water
   c. the right temperature
   d. all of these
2. What is the worst threat to coral reefs?
   a. cyclones
   b. volcanoes
   c. people
   d. high winds
3. How does warm water damage coral?
   a. It causes fish to leave.
   b. The amount of salt increases.
   c. The coral expels algae.
   d. More people go swimming.
4. What does NOT cause pollution?
   a. agriculture
   b. fish
   c. industry
   d. deforestation
5. "Turbidity" means
   a. water that is cloudy from sediment
   b. water that moves slowly
   c. water that is too warm
   d. none of these
6. Who can help limit the pollution that damages coral reefs?
   a. everyone
   b. farmers
   c. people who fish
   d. factory owners

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Credits and Acknowlegements

An introduction to the biology of Eastern North American and Caribbean mangroves
http://www.summer-camps-adventures.com/mangrovewa.html
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Hubbard's Fish Anatomy
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The Biology of Mangroves & Seagrasses
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Peter J. Hogarth
Oxford University Press, April 2007

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Caribbean Seagrass
http://www.seagrasswatch.org/Caribbean.html
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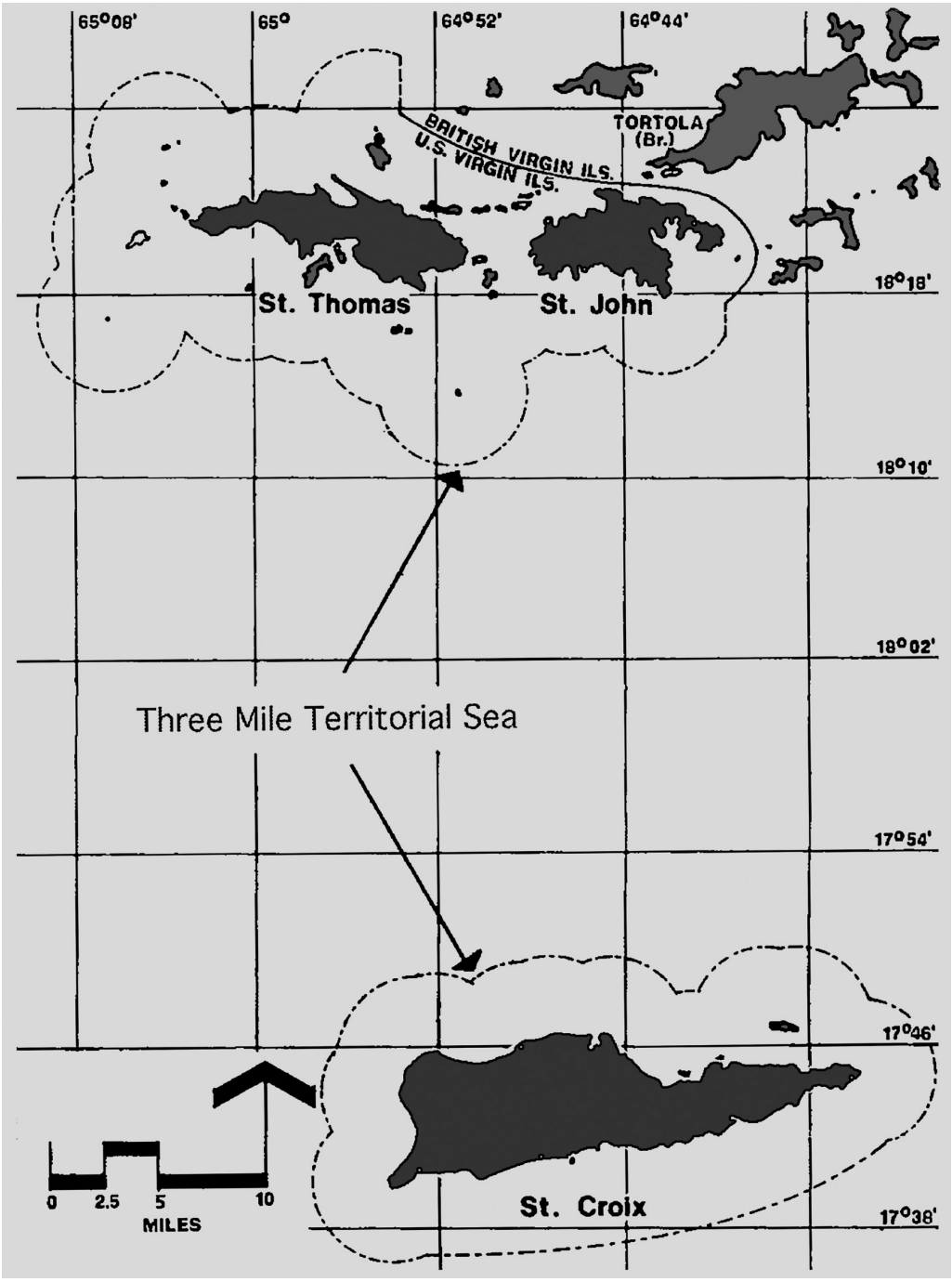
MISSION STATEMENT OF THE DEPARTMENT OF PLANNING & NATURAL RESOURCES DIVISION OF FISH & WILDLIFE

The Division of Fish and Wildlife (DFW) is charged with the assessment and monitoring of fish and wildlife resources within the U.S. Virgin Islands. The Division provides scientific advice to the Commissioner of the Department of Planning and Natural Resources on the condition of the marine resources and the best strategies to sustain these resources for all of the citizens of the U.S. Virgin Islands. The Division is composed of three bureaus: (1) Bureau of Fisheries, (2) Bureau of Wildlife, and (3) Bureau of Environmental Education. DFW has two offices. The main office is in Red Hook, St. Thomas. The St. Croix office is located in the Rainbow Plaza in Frederiksted.

The Division is 100% federally funded by the U.S. Department of Interior, U.S. Fish and Wildlife Service, Federal Assistance Service (USFWS/FA) and by the National Oceanic and Atmospheric Administration, National Marine Fisheries Services (NOAA/NMFS).

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