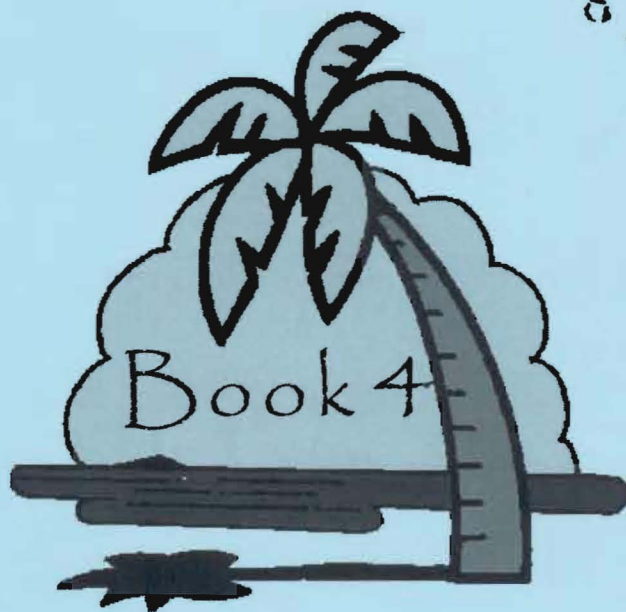




Our Island Environment

Commonwealth of the Northern Mariana Islands



Wildlife Conservation & Restoration Program, U.S. Fish & Wildlife Service
CNMI Division of Fish & Wildlife, Department of Lands & Natural Resources

Our Island Environment, Book 4
CNMI DFW, 2003

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Table of Contents

Standards and Benchmarks (Grade 4).....	4
The CNMI	5
Activity – Learning Directions	6
Answers to Learning Directions.....	7
Volcanoes.....	8
Volcano Review	9
Answers to Volcano Review.....	10
Volcano Craft – Making a Volcano.....	11
The Oceans	13
The Continents	14
Oceans and Continents Review	15
Environmental Story	16
Environmental Story – Review Questions	20
Shoreline Conservation	21
Plankton	22
Zooplankton Activity	23
Food Webs.....	24
The Marine Food Web	25
Review Questions - Food Webs	26
Introduction to Fish.....	27
Shark Anatomy	28
Bony Fish Anatomy	29
Answers - Shark & Bony Fish Labeling.....	30
Fish Report.....	31
Creature Feature – Goatfish.....	32

Creature Feature - Surgeonfish	33
Creature Feature – Reef Sharks.....	34
Review Questions – Goatfish, Surgeonfish, and Sharks	35
Coral Reefs of the World	36
Activity - Locating the Coral Reefs	37
Habitat Activity – Coral Reef Zones	38
Activity – Competing for Food	40
Activities – Scavenging and Filter Feeding.....	43
Creeks and Streams: Fresh Water from the Forest	45
Breathe In, Breathe Out.....	46
Reduce, Reuse, Recycle	47
Activity – Recycling Paper	48
Brainstorming Ideas – Recycling Paper	49
It’s Not My Fault! The Story of the Brown Treesnake.....	50
References	52

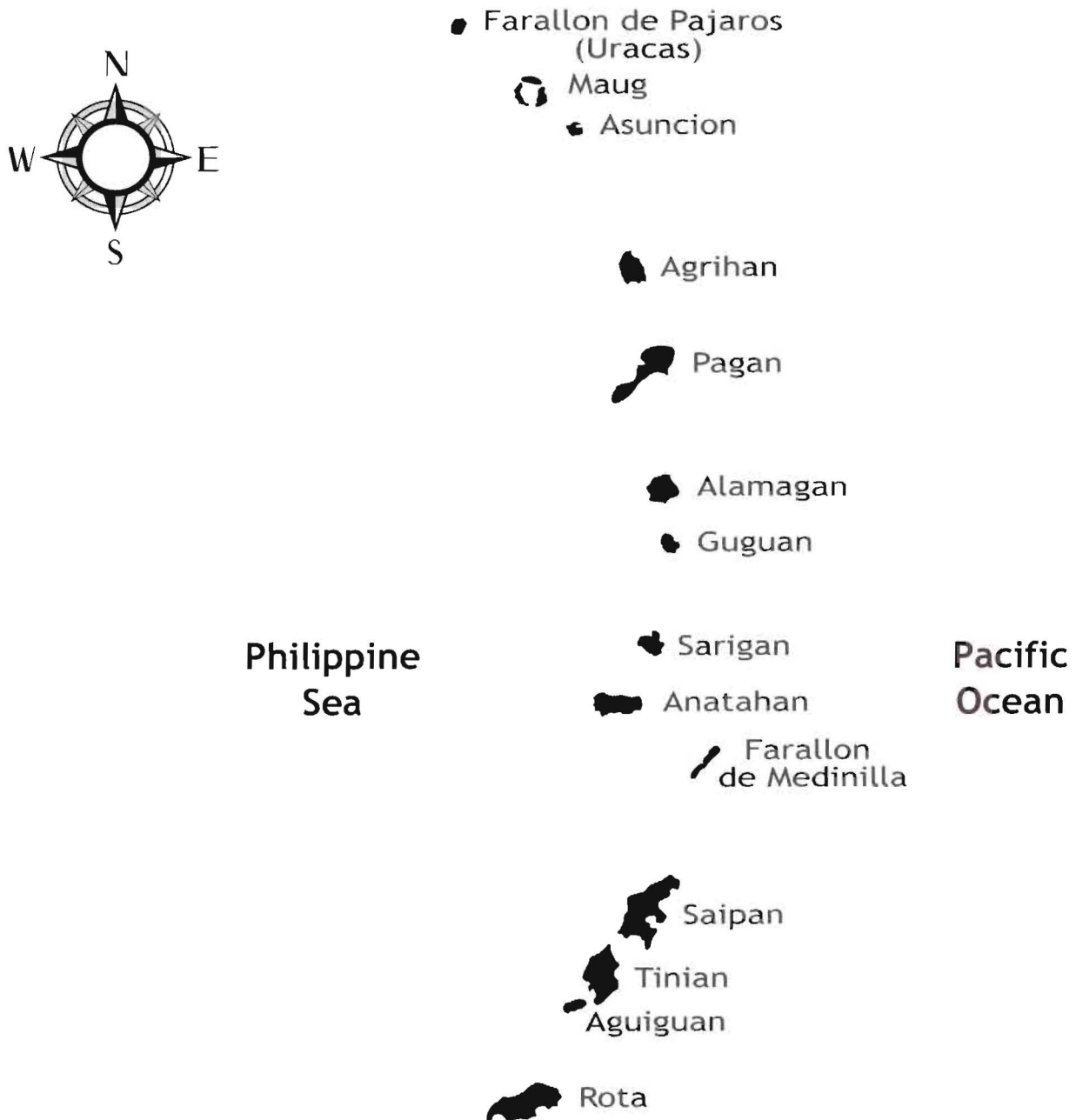
Standards and Benchmarks (Grade 4)

Content and activities are aligned with the following CNMI Science Standards and Benchmarks (Grade 4)

Standard	Benchmark
Science as Inquiry	<ul style="list-style-type: none">• Understand observation and investigation skills as a way to learn more• Ask questions about objects, organisms, and events in the environment/world around him/her• Work individually and in teams to collect/share information and ideas
Habits of Mind	<ul style="list-style-type: none">• Know that learning can come from careful observations and simple experiments• Plan and conduct a simple investigation• Complete a data study/research
Science Connection	<ul style="list-style-type: none">• Sort out the cause-effect relationship in interactions
Energy	<ul style="list-style-type: none">• Recognize that the sun is the primary source of energy for plant growth and plants are the primary energy source for living things
Planet Earth – Oceans and Land	<ul style="list-style-type: none">• Record observations about the environment and how things change• Understand that some of the land is covered by land and some by oceans• Know the difference between water from the ocean and water from the land or fresh water
Living Environment	<ul style="list-style-type: none">• Explain how organisms belong to groups based on similarities and differences• Diagram how plants and animals obtain energy from food• Explain how plants and animals interact with one another in several ways• Explain how plants and animals adapt to live in certain habitats

The CNMI

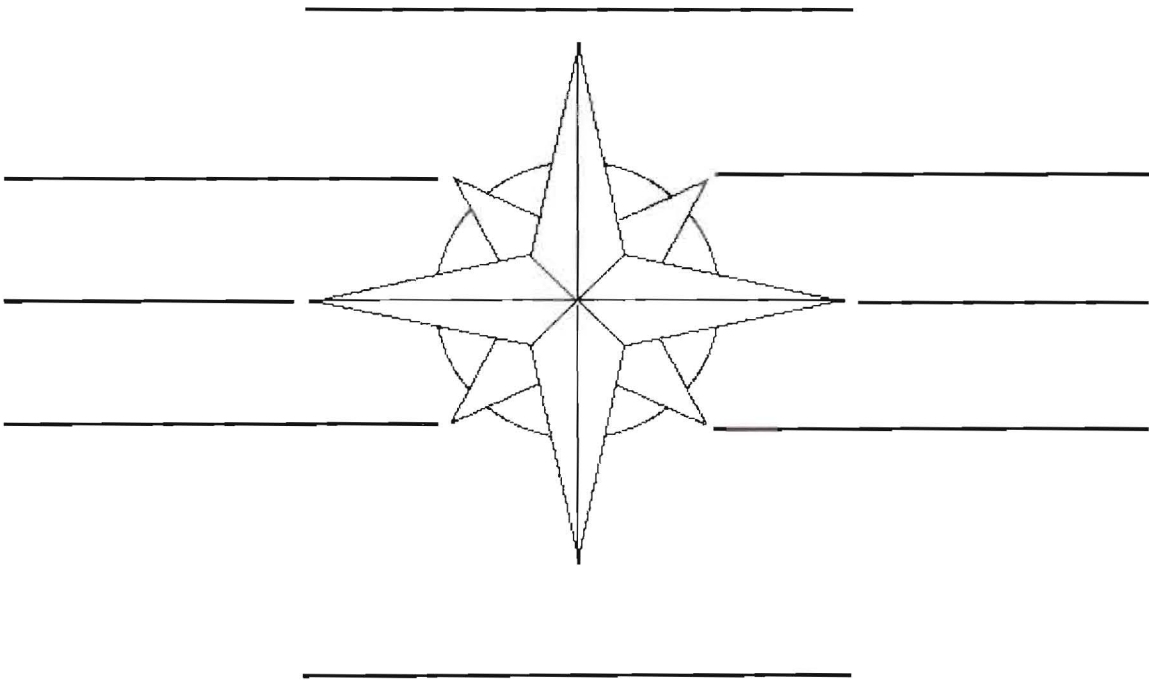
We live on an island. Our island is part of a group of islands called the Commonwealth of the Northern Mariana Islands or CNMI. The island chain is made up of 14 islands that were formed from volcanoes thousands of years ago.



Activity – Learning Directions

On the compass below, label each of the following directions on the correct line:

South, Northwest, Southeast, North, Southwest, East, Northeast, West

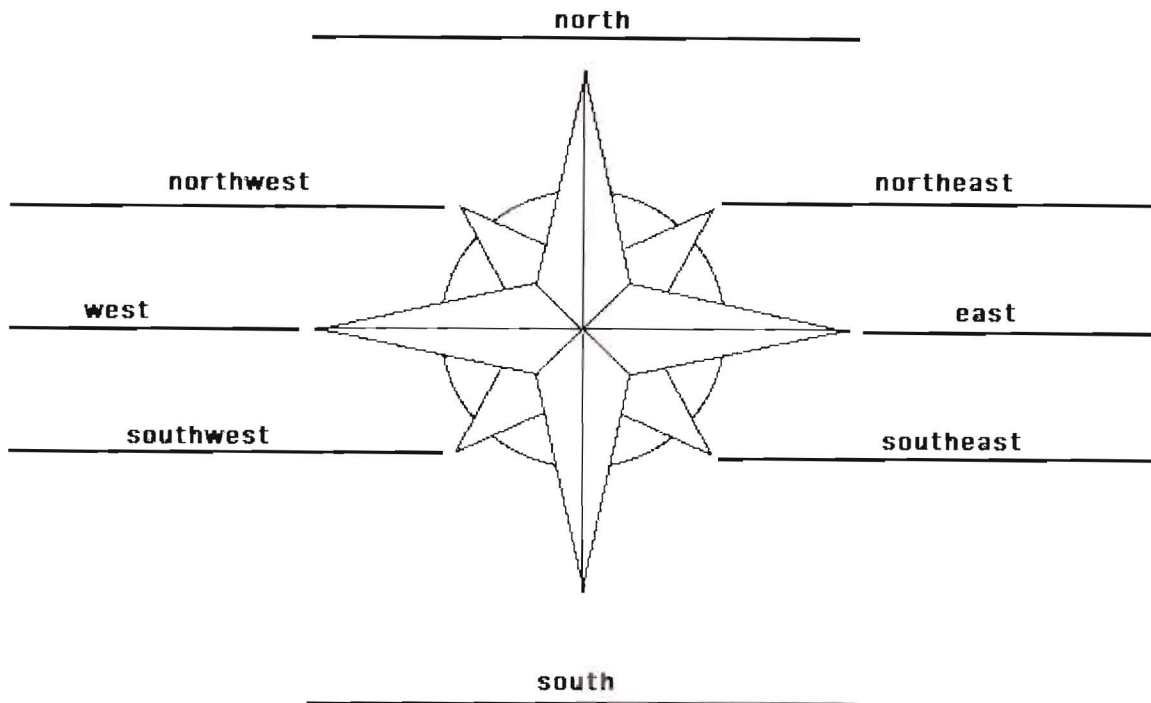


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Fill in the correct direction for each statement.

1. Guguan is _____ of Asuncion.
2. Rota is _____ of Farallon de Medinilla.
3. Saipan is _____ of Rota.
4. Alamagan is _____ of Pagan.
5. Maug is _____ of Farallon de Pajaros (Uracas).
6. The Philippine Sea is _____ of the CNMI.
7. Tinian is _____ of Saipan.
8. Sarigan is _____ of Farallon de Medinilla.
9. The Pacific Ocean is _____ of the CNMI.

Answers to Learning Directions



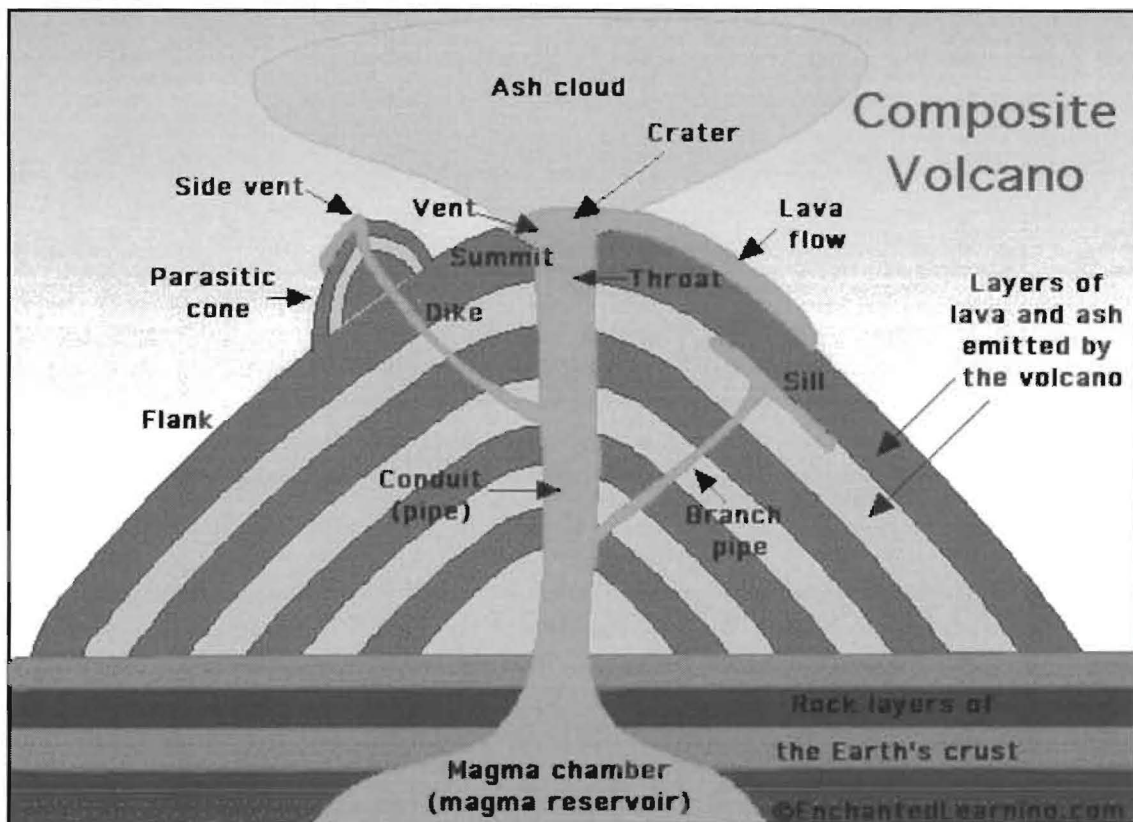
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1. Guguan is **Southeast** of Asuncion.
2. Rota is **Southwest** of Farallon de Medinilla.
3. Saipan is **Northeast** of Rota.
4. Alamagan is **South** of Pagan.
5. Maug is **Southeast** of Farallon de Pajaros (Uracas).
6. The Philippine Sea is **West** of the CNMI.
7. Tinian is **Southwest** of Saipan.
8. Sarigan is **Northwest** of Farallon de Medinilla.
9. The Pacific Ocean is **East** of the CNMI.

Volcanoes

A **volcano** is a place on the Earth's surface where molten rock, gases and pyroclastic (fire-formed) debris erupt through the Earth's crust. Volcanoes vary quite a bit in their structure - some are cracks in the Earth's crust where lava erupts, and some are domes, shields, or mountain-like structures with a crater at the summit. **Magma** is molten rock in the Earth's crust. When magma erupts through the Earth's surface it is called **lava**.

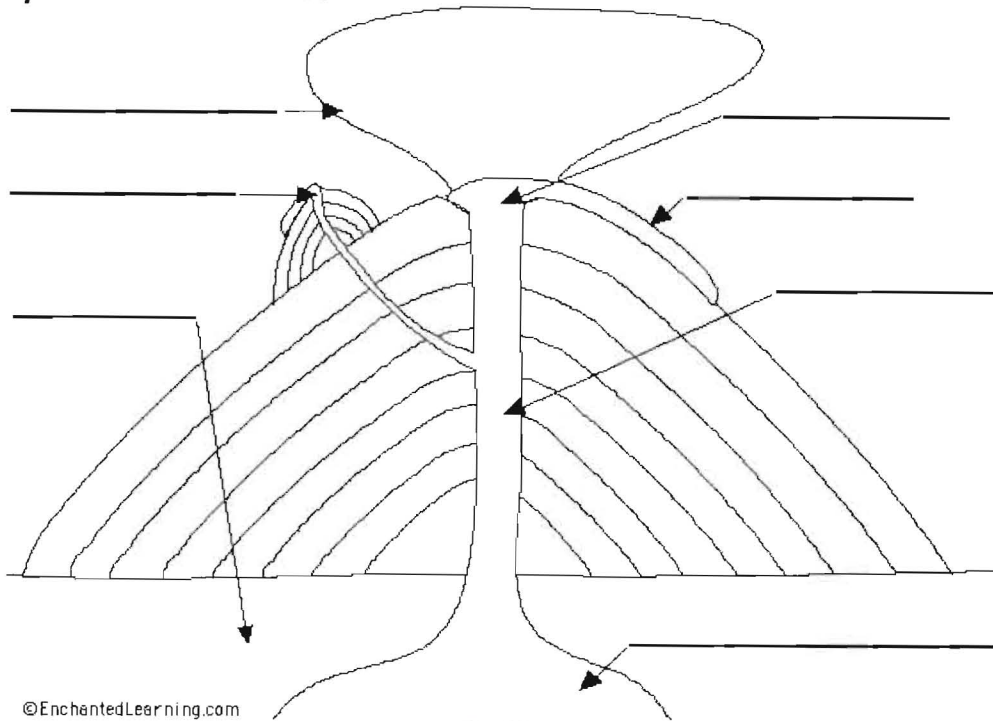
Some of the northern islands of the CNMI are active volcanoes. They are the youngest of the CNMI islands. In fact, the northern islands are still forming. The southern islands of the CNMI are the oldest. They were formed about 45 million years ago.



- **ash cloud** - an ash cloud is the cloud that forms in the air after some volcanic eruptions.
- **conduit** - a conduit is a passage through which magma (molten rock) flows in a volcano.
- **crust** - the crust is Earth's outermost, rocky layer.
- **lava** - lava is molten rock; it usually comes out of erupting volcanoes.
- **magma chamber** - a magma chamber contains magma (molten rock) deep within the Earth's crust.
- **vent** - a vent is an opening in the Earth's surface through which volcanic materials erupt.
- **side vent** - a side vent is a vent in the side of a volcano.

Volcano Review

Label the parts of the volcano.

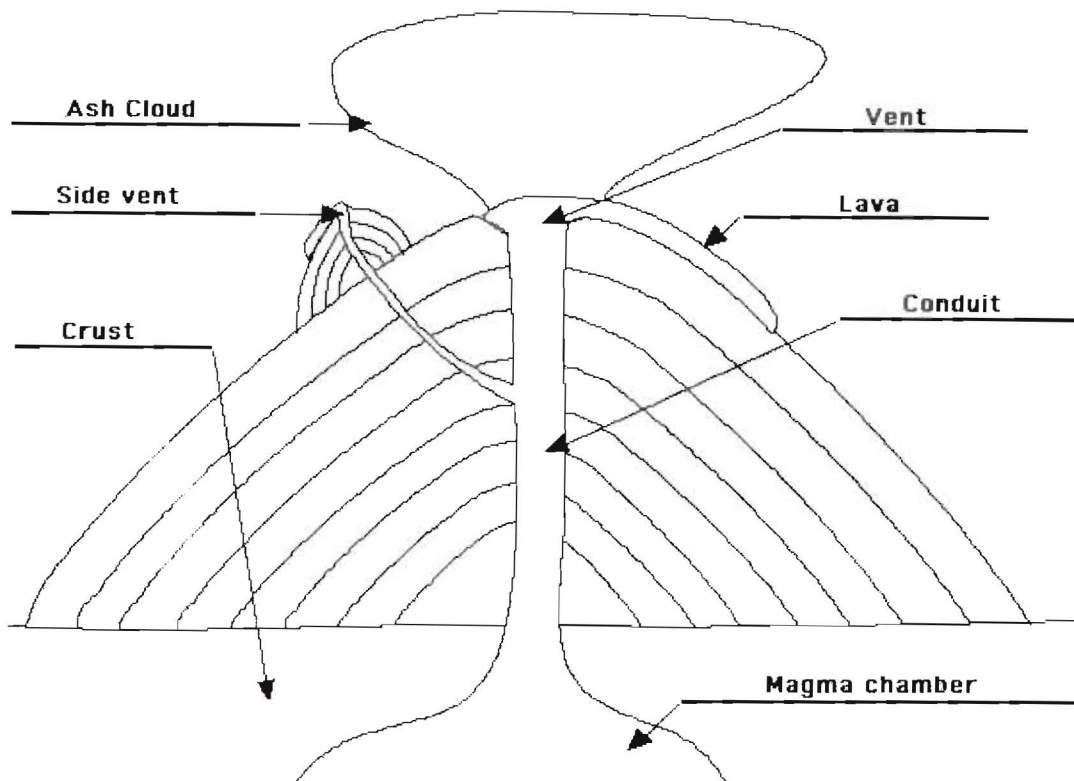


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Circle the correct answer to each question.

1. What is the name of molten rock that erupts from volcanoes? **MAGMA - LAVA - VENT**
2. What is the name of molten rock within the Earth's crust? **MAGMA - LAVA - VENT**
3. What is the name of the tube through which molten rock flows? **PARASITIC - CONDUIT - BASE**
4. In which part of the Earth would you find a magma reservoir? **CRUST - PARASITIC - CONDUIT**
5. Composite volcanoes are made up of layers of lava and _____. **CONDUIT - ASH - MAGMA**
6. What is the name of a smaller vent-structure on the side of some volcanoes? **SUMMIT - MAGMA RESERVOIR - PARASITIC CONE**
7. What is the name of the bowl-like opening of a volcano? **SILL - CRATER - ASH**
8. Are ash clouds emitted from sills? **YES - NO**
9. What is the name of an opening through which molten rock and gases escape from a volcano? **CONDUIT - VENT - FLANK**
10. The sides of a volcano are called its flanks. **YES - NO**

Answers to Volcano Review



1. What is the name of molten rock that erupts from volcanoes? **LAVA**
2. What is the name of molten rock within the Earth's crust? **MAGMA**
3. What is the name of the tube through which molten rock flows? **CONDUIT**
4. In which part of the Earth would you find a magma reservoir? **CRUST**
5. Composite volcanoes are made up of layers of lava and _____. **ASH**
6. What is the name of a smaller vent-structure on the side of some volcanoes?
PARASITIC CONE
7. What is the name of the bowl-like opening of a volcano? **CRATER**
8. Are ash clouds emitted from sills? **NO**
9. What is the name of an opening through which molten rock and gases escape from a volcano? **VENT**
10. The sides of a volcano are called its flanks. **YES**

Volcano Craft – Making a Volcano

Introduction:

In this activity, you will make a mock volcano that erupts when you mix baking soda and vinegar. This is a very messy project - especially at the end when the volcano erupts. Wear old clothes and work on a pile of newspapers (or even better, outdoors).

In a real volcano, molten rock from deep within the Earth erupts through a volcano (the molten rock is called magma when it is within the Earth and is called lava when it comes out of a volcano). In this project, a mock volcano will erupt with a bubbly, fizzy liquid that is created by a simple chemical reaction.

This project shows what happens when an acid (vinegar) and a base (baking soda) interact. Chemically, the acid and base neutralize each other, producing carbon dioxide gas as a byproduct.

The exact reaction is:

$\text{HC}_2\text{H}_3\text{O}_2$ (vinegar = acetic acid) + NaHCO_3 (baking soda = sodium bicarbonate) = CO_2 (carbon dioxide gas) + $\text{NaC}_2\text{H}_3\text{O}_2$ (sodium acetate) + H_2O (water)

Supplies:

- Old aluminum pie tin (or baking pan or paper plate)
- Lots of old newspaper
- Baking soda (about 3-4 tablespoons)
- Vinegar (about 1/2 cup)
- A few drops of liquid dishwashing detergent
- Small plastic bottle (like a small pop bottle)
- Modeling clay
- Funnel
- Measuring spoon and measuring cup
- Red food coloring

Procedure:

1. Put the clean, empty bottle on the aluminum pie plate (or baking pan or paper plate).
2. Using the modeling clay, make a volcano around the bottle. Leave the area around the top of the bottle open and don't get any clay inside the bottle.



3. You can decorate the volcano with little twigs, lichens (that look like tiny trees), etc.
4. Using the funnel (make sure it's dry), put 3 to 4 tablespoons of baking soda into the bottle. Then add a few drops of liquid dishwashing detergent and about a half cup of water. Optional: add a little bit of glitter (about half a teaspoon).



5. Put a few drops of red food coloring into about one-half of a cup of vinegar.

The Eruption:

Using the funnel, pour the vinegar mixture into the bottle (then quickly remove the funnel).



Your volcano will erupt immediately! When the vinegar reacts with the baking soda, carbon dioxide gas is formed and the bubbles push the "lava" out the "volcano."

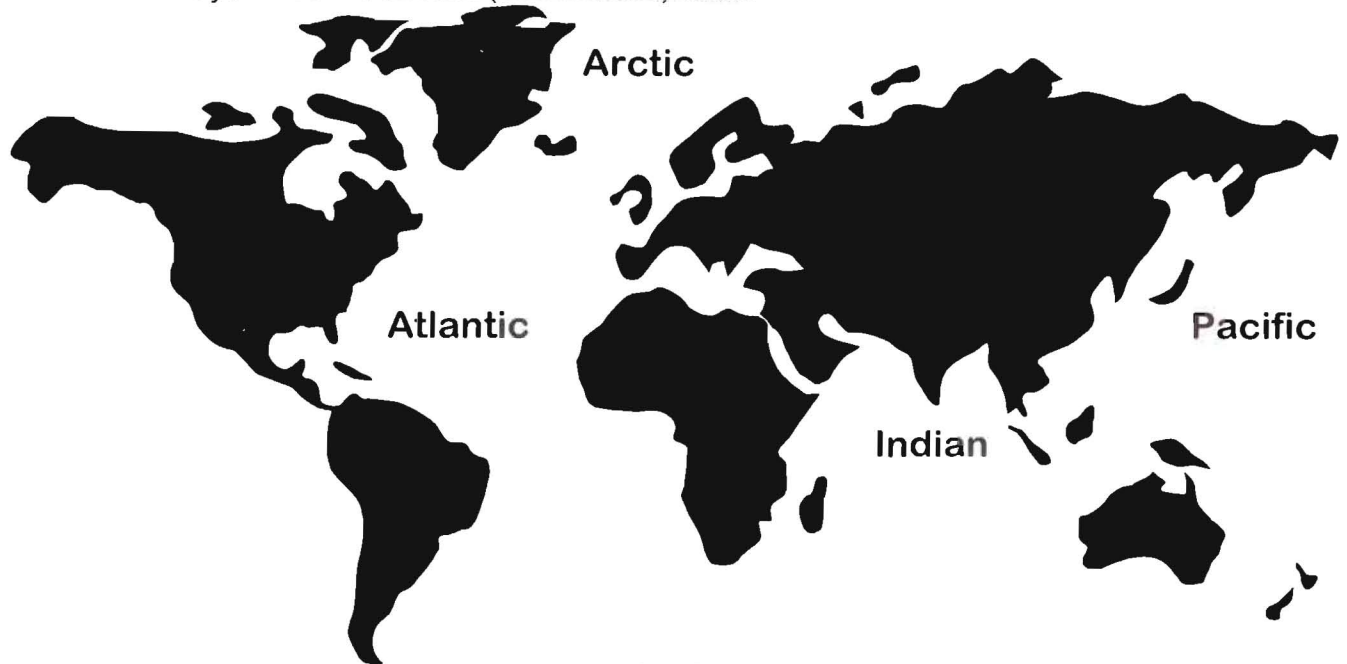
Be prepared for a mess!



Activity From Enchanted Learning

The Oceans

The four oceans on the Earth are: Atlantic, Pacific, Indian and Arctic Ocean. The Mariana Islands are located in the Pacific Ocean. The Pacific Ocean is the largest ocean. The Arctic Ocean is the smallest ocean. Sometimes the ocean is called the sea. The oceans are very salty. There is enough salt in the oceans to cover the land on the Earth with a layer that is 502 feet (153 meters) thick!



The study of the ocean is called oceanography. The oceans cover two thirds of the Earth's surface. The oceans are a precious resource for all life on Earth, and especially for human beings. They are a food source for us and they provide us with materials for medicine and for industry. The oceans enable us to receive items that are shipped from other countries. It also provides the people and the tourists of the CNMI with recreational activities. We must be careful not to put trash, chemicals, and other types of pollutants into our ocean.

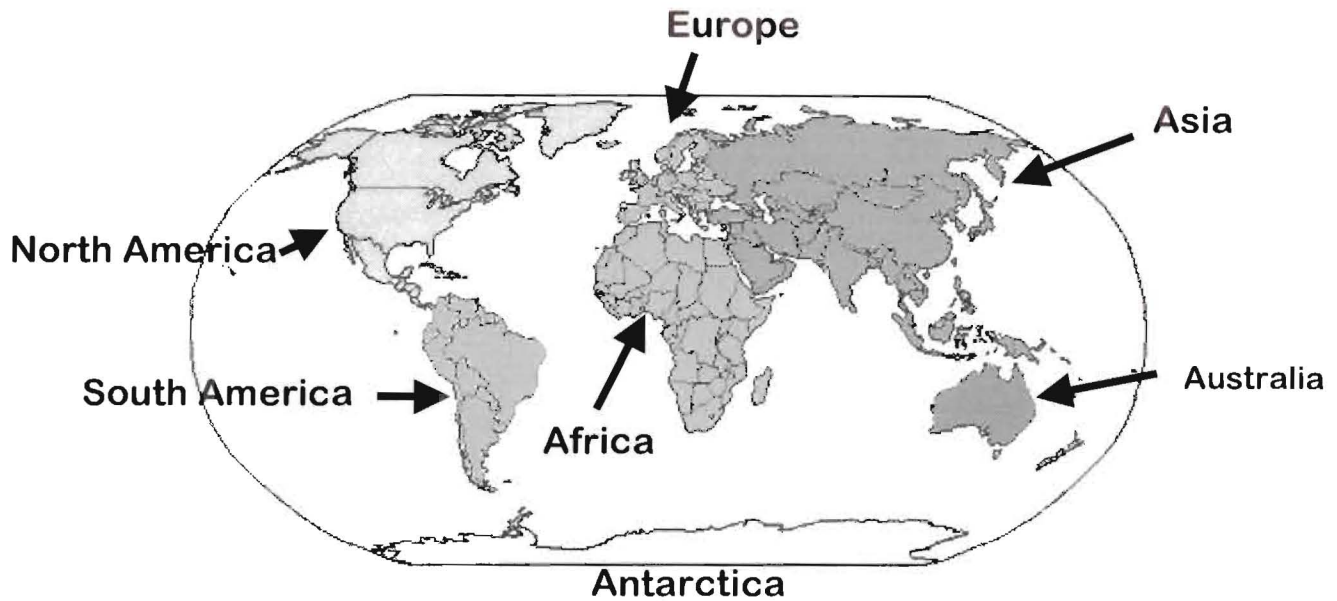
97% of all of the water on the Earth is in the oceans. That means that 97% of all of the water on the Earth is salty. We cannot drink water that is salty. The remaining 3% is in many places on the Earth such as in frozen glaciers, underground, and in the air. There is even a lot of water inside of plants and animals. Only 1% of the water on the Earth is fresh water that we can drink. That is why it is important to conserve water.

The oceans are very deep. The deepest part of the ocean is the Marianas Trench. It is located very close to the CNMI. The following table provides information on the average depth and deepest part of the oceans.

Oceans	Feet	Miles	Meters	Kilometers
Average Depth	13,124	2.49	4000	4
Deepest Part	35,838	6.79	10,923	10.92

The Continents

A continent is a large area of land. There are seven continents on the Earth. The largest continent is Asia. Mount Everest is the highest mountain on the Earth. It is found on the continent of Asia.



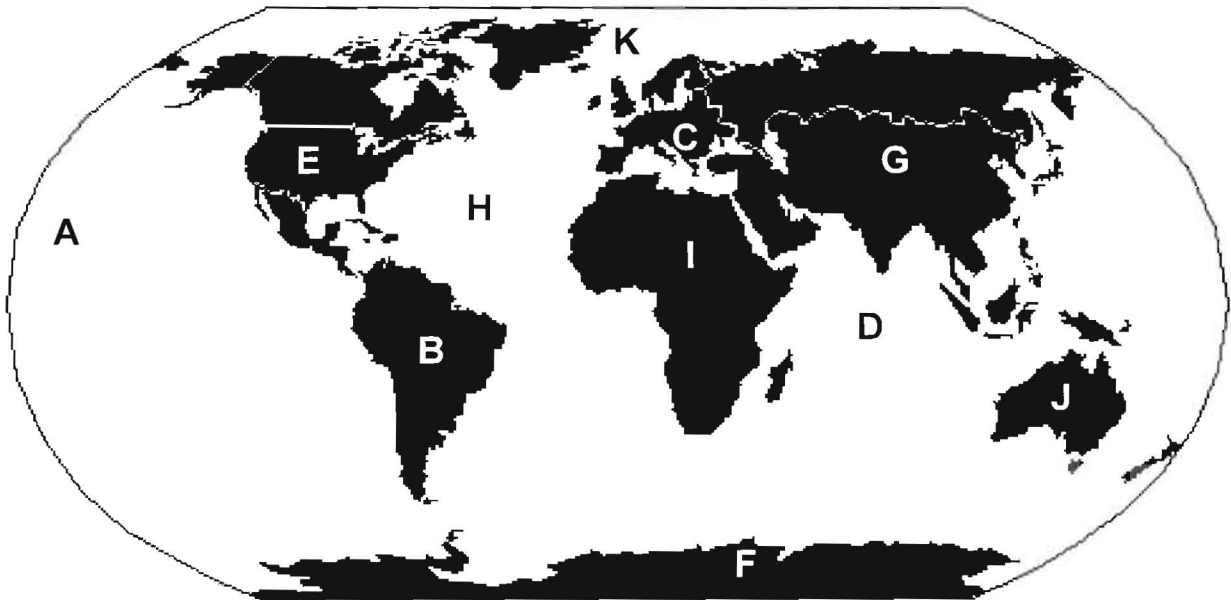
Review Questions – The Oceans and Continents

- Only _____ of all of the water on the Earth is water that we can drink.
1 % 2% 3% 4%
- The largest ocean is the _____ Ocean.
Arctic Pacific Atlantic
- The largest continent is _____.
North America Africa Asia
- Mount Everest is 29,208 feet (8848 meters). If Mount Everest was turned upside down and dropped into the Ocean, could it fit inside of the Marianas Trench?
Yes No
- What is the study of the oceans called? _____
- List at least three reasons why we should protect the ocean.

Oceans and Continents Review

On the map below, locate the following places. Place the letter of the correct label on the line next to each location.

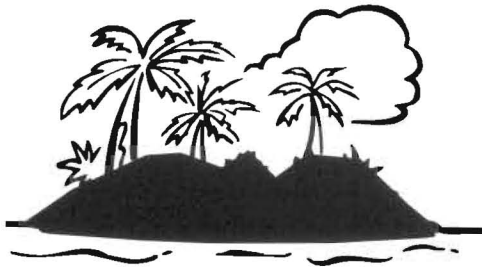
- _____ Pacific Ocean
- _____ Atlantic Ocean
- _____ Indian Ocean
- _____ Arctic Ocean
- _____ North America
- _____ South America
- _____ Australia
- _____ Antarctica
- _____ Africa
- _____ Europe
- _____ Asia



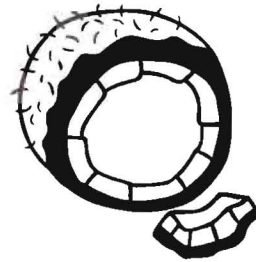
Find the CNMI, the place where you live. Put a star on the map where the CNMI is located. Hint: the Commonwealth of the Northern Mariana Islands (CNMI) is in the Pacific Ocean. It is to the East of Asia.

Environmental Story

Our island is our environment. Everything we need to live is provided by the land, sea, and sky. The things we use from our environment are our resources.



Years ago, there were not many people on the island. They lived simply by catching sea life, gathering wild fruits and vegetables, and by farming.



Over time, the number of people on the island increased. Many were born here and many came from different lands.



Now most people live very differently than their ancestors. Our island is changing in many ways.



Large areas of land are cleared for farming and to place buildings on. When the plants are scraped away, the rain washes much of the Earth into the ocean. This is erosion.



The muddy water caused by erosion harms the coral and other sea life.



By careful planning, we can control erosion.



Most people buy things that they use every day. We use what we need and throw the rest away.



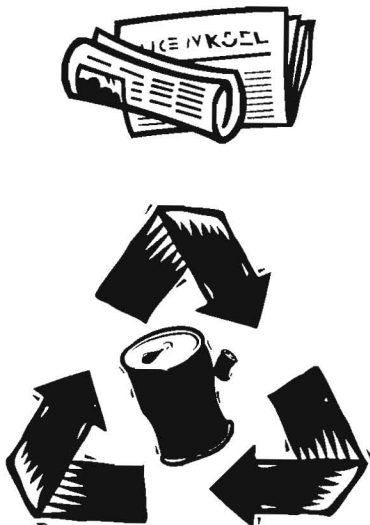
Some people throw cans, bottles, diapers, forks, plates, and other trash on the beach and along the road. This is litter. Litter is ugly and unhealthy for humans and other animals.



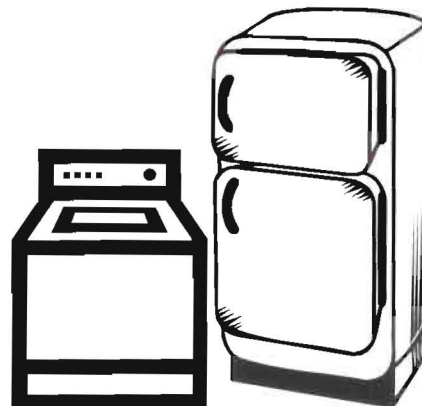
All items should be disposed of properly when they are used up. Many items can even be saved and used again. This is recycling.



Newspapers, bottles, cans, cardboard boxes, wood, and other items can be recycled.



Many things that are broken can be fixed and used instead of being thrown away.



Recycling takes careful planning and special effort, but it keeps our resources from being used up rapidly. The Earth can only provide us with a limited amount of resources.



We should use our resources wisely and replace them by recycling. We should also conserve water as much as possible. This means not wasting any of our resources.



For example, if we go fishing, we should only catch as much fish as we need. We should never use poisons or dynamite for fishing.



Setting aside special areas where plants and animals will be left alone is another way to conserve. This will help the plants and animals reproduce so that they will still be around for your children and grandchildren to enjoy.






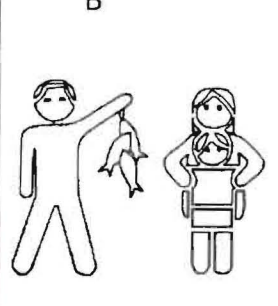
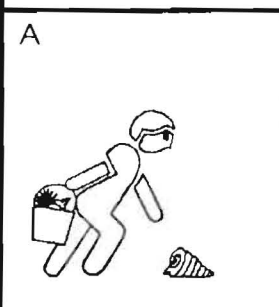
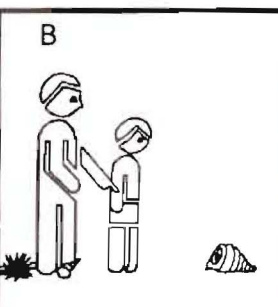
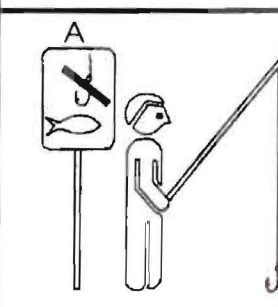
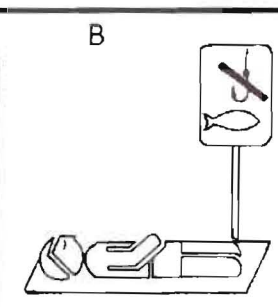
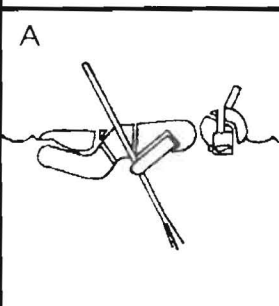
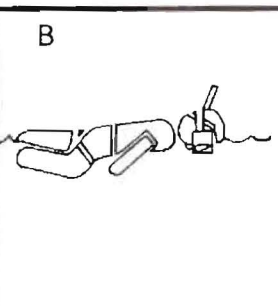
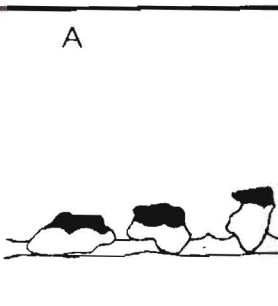
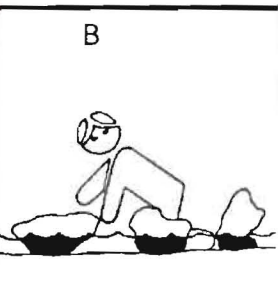
Environmental Story – Review Questions

1. Things that we use from our environment are called
 - a. nature
 - b. resources
 - c. evaporation
 - d. islands
2. The people that came to the island before us are our:
 - a. grandchildren
 - b. ancestors
 - c. sisters
 - d. brothers
3. People who came to the island before us did all of the following things EXCEPT:
 - a. caught food from the ocean
 - b. ate plants from the forest
 - c. shopped at the grocery store for soda
 - d. farmed the land
4. Rain washes mud into the ocean. This is called:
 - a. coral
 - b. urban planning
 - c. erosion
 - d. precipitation
5. Saving items and using them over again is called:
 - a. cardboard
 - b. recycling
 - c. protecting
 - d. copying
6. We should not waste our resources. We should:
 - a. go fishing as much as possible
 - b. hunt as much as possible
 - c. conserve our resources
 - d. collect as many native plants as we can

Shoreline Conservation

What does seashore conservation mean? It means the careful use of our shoreline resources. It means observing rules to help keep plants and animals alive. It means taking only what you need and not more.

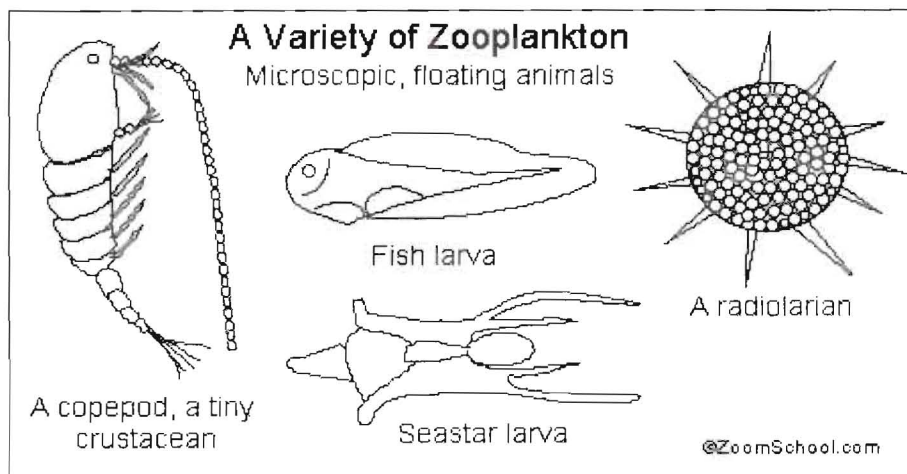
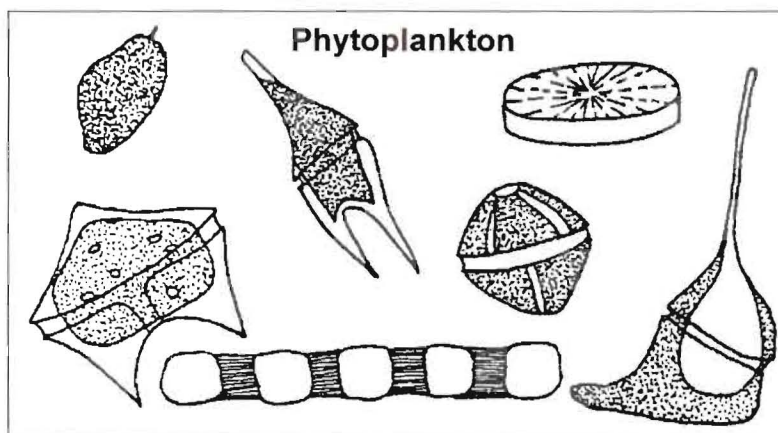
What can you do to help conserve? In the six sets of drawings below, choose the ones that show things that you can do to help conserve. Write **A** or **B** in the boxes below each set.

A 	B 	A 	B 
Put litter in its place. <input style="width: 50px; height: 20px;" type="checkbox"/>		Catch only what you need. <input style="width: 50px; height: 20px;" type="checkbox"/>	
A 	B 	A 	B 
Do not collect everything in sight. <input style="width: 50px; height: 20px;" type="checkbox"/>		Follow posted conservation signs. <input style="width: 50px; height: 20px;" type="checkbox"/>	
A 	B 	A 	B 
Do not spear lobsters out of season. <input style="width: 50px; height: 20px;" type="checkbox"/>		Replace overturned rocks. <input style="width: 50px; height: 20px;" type="checkbox"/>	

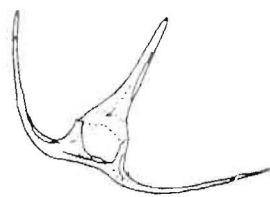
Plankton

There are tiny plants and animals that float around in the oceans, lakes, ponds, and streams. These tiny organisms are called **plankton**. Plankton are very important to all aquatic and marine life. They are the food of many animals. Some enormous whales eat only plankton.

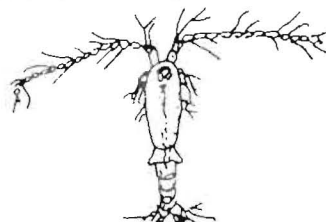
Scientists divide plankton into two large groups. The plants are called **phytoplankton** and the animals are called **zooplankton**.



Phytoplankton are **producers**. Zooplankton are the microscopic animals that eat plankton. They are **consumers**. You will learn more about producers and consumers in the next section.



A Producer

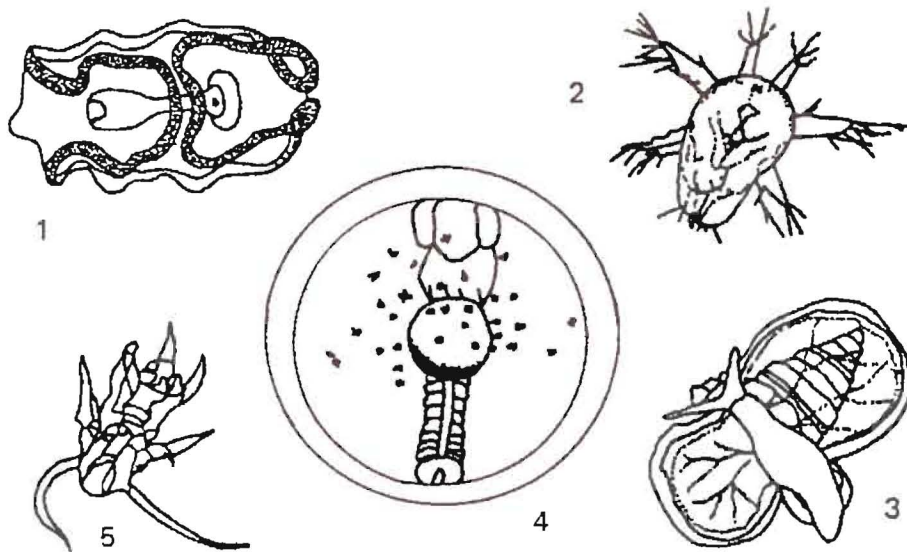


A Consumer

Phytoplankton drawing from Marine Activity Workbook, Zooplankton drawing from Enchanted Learning

Zooplankton Activity

Zooplankton are tiny animals that drift in the ocean currents like phytoplankton (tiny plants). Some zooplankton float for their entire life in the ocean. These permanent zooplankton do not change their body shapes as adults. Other zooplankton, called temporary zooplankton, spend only part of their lives as adults. These are the eggs and larvae of many kinds of marine animals. As babies, these animals float around. As they grow older, they change their shape and become starfish, sea urchins, crabs, fish, and many other animals.



Can you tell what these eggs and larvae will grow into?

In the boxes below, write the number of the larval form of each animal.

<input type="text"/>	fish
<input type="text"/>	crab
<input type="text"/>	sea cucumber
<input type="text"/>	snail
<input type="text"/>	sea urchin

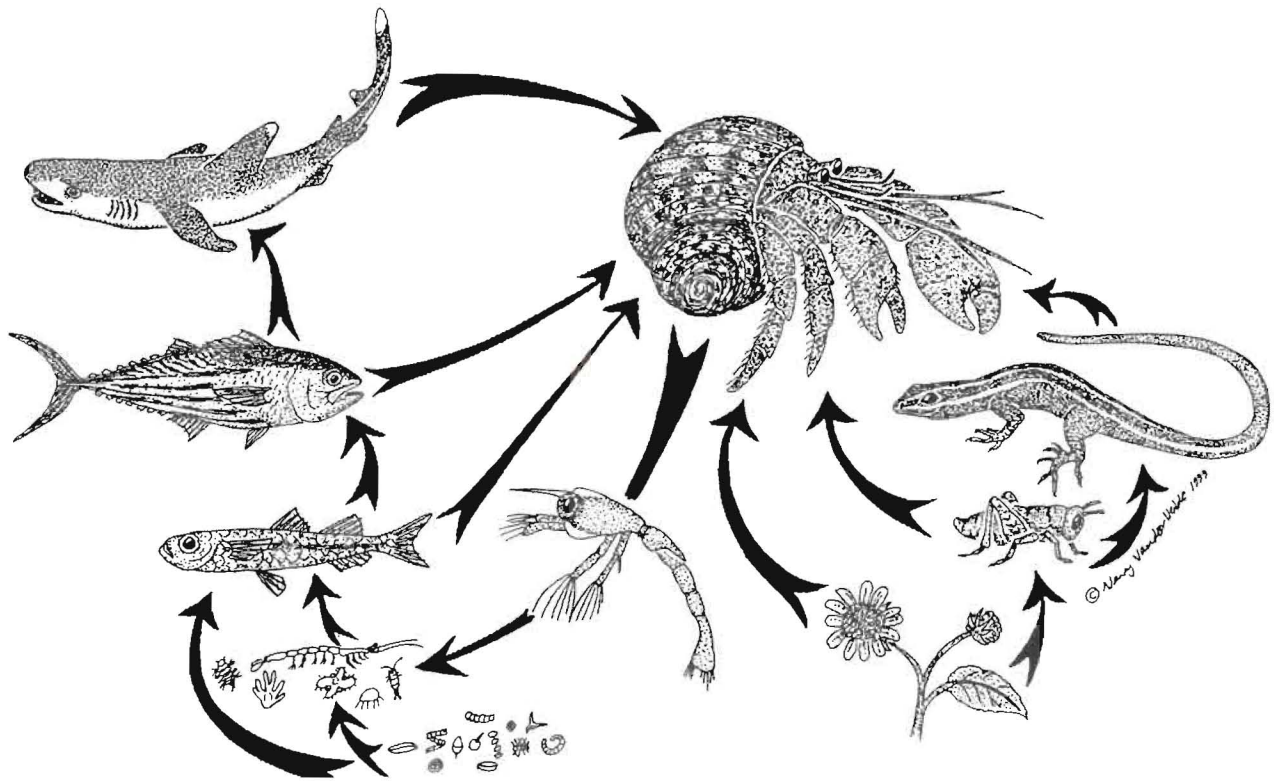
From Marine Activity Workbook, University of Hawaii Sea Grant College Program, MR-99-02, 2000

Answers: 4, 2, 1, 3, 5

Food Webs

All living things need energy. Nearly all plants get their energy from the sun. Plants are known as **producers**, since they produce food with sunlight, minerals, and water. Some animals eat plants, and then are eaten by other animals. They are called **consumers** because they must consume or eat other organisms to get their energy to live. When plants and animals die, their bodies provide energy for the **decomposers**. Decomposers are organisms that eat the dead bodies and turn them back into minerals or nutrients that the plants can use to produce again. Just like you, most animals eat more than one thing for their energy, so when we trace the energy produced by the plant all the way through the animals and to the decomposers, we go through a **food web**.

This is an example of an island food web.



Herbivores, Carnivores, Omnivores

Animals must eat in order to live. Some animals eat plants. They are called **herbivores**. Some animals eat other animals. They are called **carnivores**. Some animals eat both plants and animals. They are called **omnivores**.

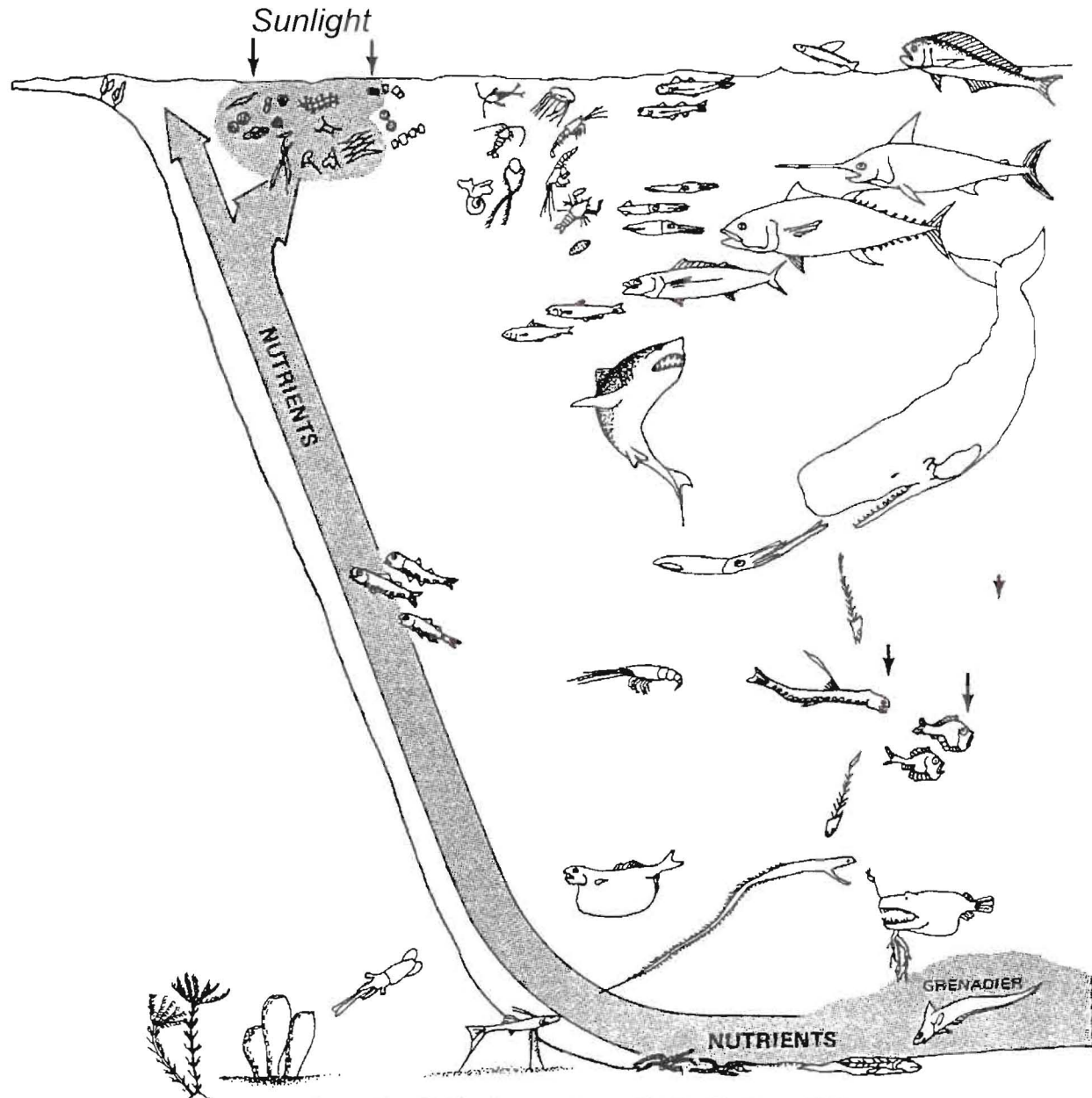
Predators, Prey

A **predator** is an animal that eats another animal, and the **prey** is the animal that is eaten. If something happens to the predators and they are no longer around, the number of prey will grow.

Island food web drawing by Nancy Vander Velde

The Marine Food Web

All life in the ocean is part of the **marine food web**. The beginning of the web is the sunlit zone of the ocean. Here, microscopic phytoplankton use energy from the sun to grow. The phytoplankton then serves as food for other microscopic animals which in turn become food for larger animals. Far beneath the ocean, what is not eaten is decomposed, or broken down by bacteria into minerals (nutrients).



On the diagram above, place the following letters: P, Z, S, F, and D

P = Phytoplankton, Producer; **Z = Zooplankton**, Consumer; **S = Squid**, Consumer, Predator of Zooplankton, Prey item of large Jacks/Trevallies; **F = Flying Fish**, Predator of Zooplankton, Prey item of larger fish; **D = bottom** where many **decomposers** live.

From Marine Activity Workbook, University of Hawaii Sea Grant College Program, MR-99-02, 2000

Review Questions - Food Webs

1. What do producers need in order to make their own food?
2. Give at least two examples of producers.
3. What are consumers?
4. Give at least two examples of consumers.
5. What are decomposers?
6. Give at least one example of a decomposer.
7. What is an herbivore?
8. Give at least two examples of island animals that are herbivores.
9. What is an omnivore?
10. Give at least two examples of island animals that are omnivores.
11. What is a carnivore?
12. Give at least two examples of island animals that are carnivores.
13. A shark eats smaller fish. In this example, is a shark a predator or prey?

14. Geckos eat insects. In this example, are insects predators or prey?

Introduction to Fish

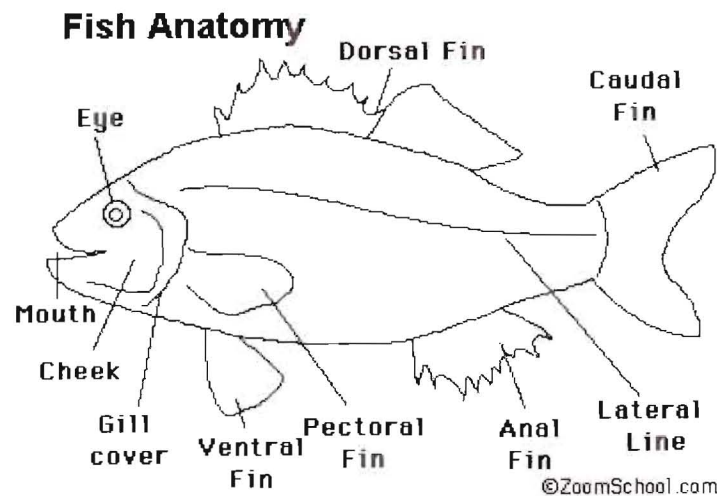
Fish are animals that live in water and breathe using gills. Water goes in through the mouth and out through the gills, which take oxygen from the water. Most fish swim by moving their tail (also called the caudal fin) left and right.

It is estimated that there are over 22,000 different species of fish in the world. Some fish have bones but others, like sharks and rays have no bones, only cartilage.

The biggest fish in the world is the Whale Shark; it is a shark but not a whale. The whale shark is up to 46 feet (14 m) long and weighs up to 15 tons.

The following table compares sharks (cartilaginous fish) to bony fish.

ATTRIBUTE	SHARKS	BONY FISH
Skeleton	Cartilage only	Bones and cartilage
Swimming	Can only swim forward	Can swim forwards and backwards
Buoyancy (floating)	Large oily liver	Gas-filled swim bladder
Gills	Gill slits but no gill cover	Covered gill slits
Reproduction	Eggs fertilized in female's body	Eggs usually fertilized in the water
Skin	Rough, sandpaper-like placoid scales	Slippery, overlapping scales



Shark Anatomy

anal fin - the fin on the lower side of the body near the tail (not on all sharks)

caudal fin - the tail fin

eye - sight organs located on the head

fin spine - a protective spine located at the base of the first

dorsal fin (not all sharks have fin spines)

first dorsal fin - the fin on the upper side of the body nearest the head

gills - fleshy organs that are used for breathing - they are located on the side of the head

mouth - the part of the body which the fish uses to catch food - it is located at the front of the body

nostril - paired slits on the underside of the snout. Water continually flows through the nostrils, giving the shark olfactory (sense of smell) information. Unlike humans, shark nostrils have nothing to do with breathing - they are not even connected to the mouth.

pectoral fin - each of the paired fins on either side of the body, near the head

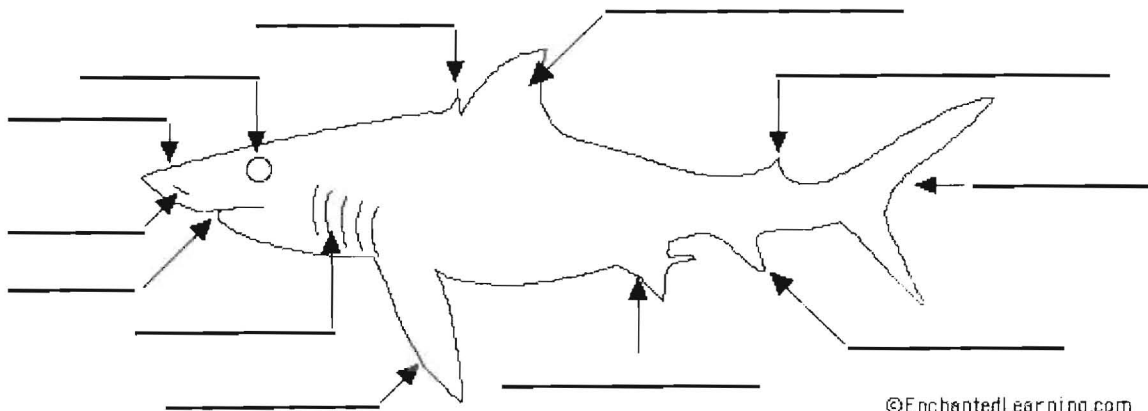
pelvic fin - each of the small, paired fins on the lower rear side of the body

second dorsal fin - the fin on the upper side of the body nearest the tail

snout - the front part of the shark's head

ventral fin - each of the paired fins on the lower side of the body, near the head

Label the parts of the shark using the terms above.



Bony Fish Anatomy

anal fin - the fin on the lower side of the body near the tail

caudal fin - the tail fin

dorsal fin - the fin on the upper side of the body

eye - sight organs located on the head

gills - fleshy organs that are used for breathing - they are located on the side of the head. Fish have a gill cover or operculum to protect their gills.

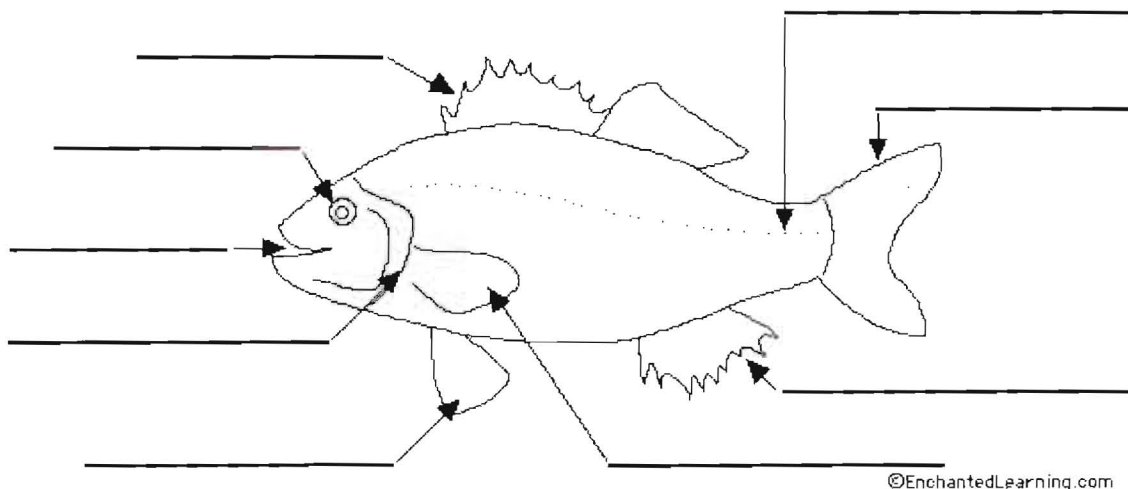
lateral line - a series of sensory pores (small openings) that are located along the sides of fish - they sense vibrations in the water

mouth - the part of the body which the fish uses to catch food - it is located at the front of the body

pectoral fin - each of the paired fins on either side of the body, near the head

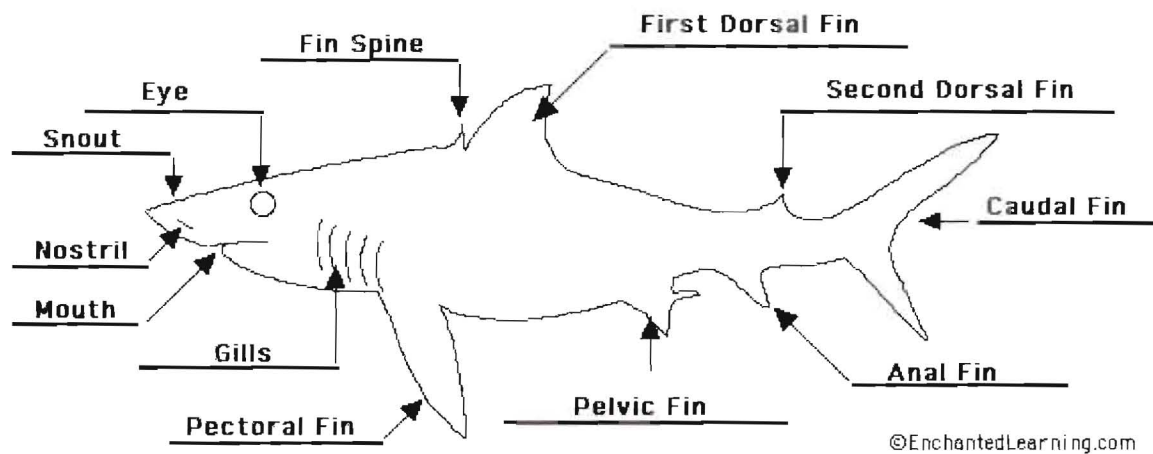
ventral fin - each of the paired fins on the lower side of the body, near the head. These fins are also called pelvic fins.

Label the parts of the bony fish using the terms above.

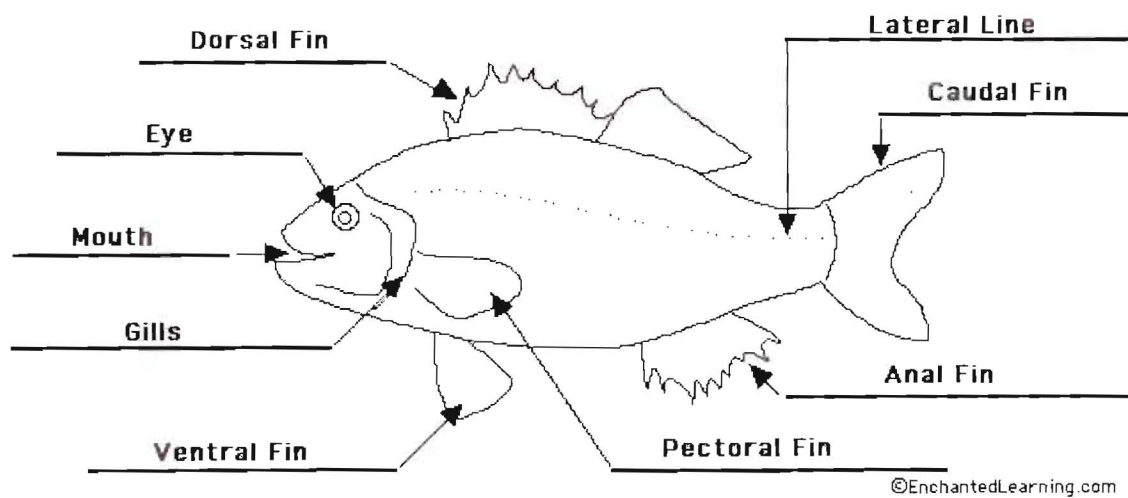


Answers - Shark & Bony Fish Labeling

Shark



Bony Fish



Fish Report

Choose a CNMI fish to do a research report on. You can find out information about your fish by observing it, reading books, using the Internet, and interviewing fishermen and wildlife managers. Fill in the following information about your fish.

Name of Fish _____

Game Species (Yes/No)	
Scientific Name	
Local Name(s) <i>Chamorro/Carolinian</i>	
Related Species	
General Facts and Description	
Habitat	
Sources of Food (<i>Prey</i>)	
Predators (<i>in the wild</i>)	
Threats to the Species and Conservation Efforts	
Other Interesting Facts (<i>Reproduction, Special Adaptations, Coloration Patterns, Behavior</i>)	

Terms to Know

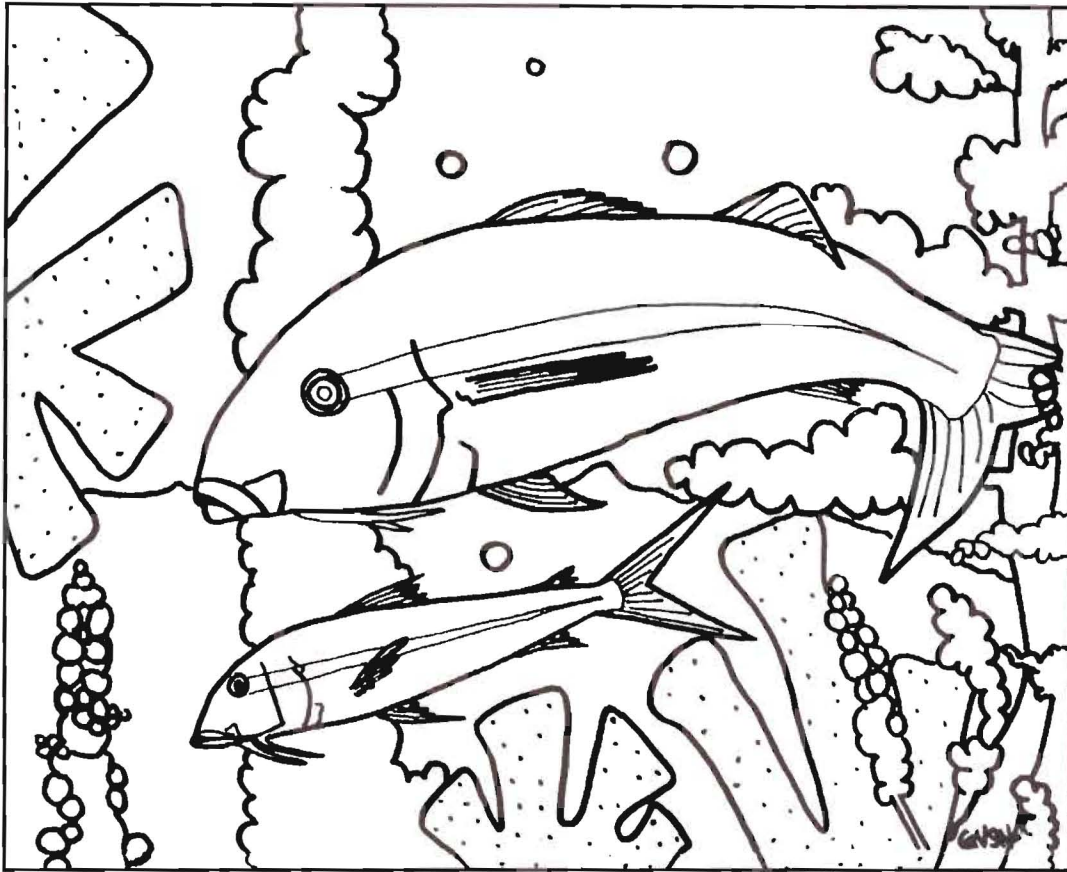
A **game species** is one that is hunted by humans for food.

The **scientific name** for an animal is its genus and species. For example, the scientific name for humans is *Homo sapiens*. The genus is always capitalized.

A **habitat** is the place where an organism lives. Fish live in a variety of habitats such as sand flats, sea grass beds, and coral reefs. Remember that the coral reef has many different habitats or zones. Fish may live in more than one habitat.

Threats to the species may be natural or caused by humans. Many fish are threatened by over harvesting, pollution, etc.

Creature Feature – Goatfish



Goatfish have a pair of barbels under their chin. The long, whisker-like barbels are used for searching for food in the sand. Most goatfish feed on small crabs, shrimp, and other animals that live in the sand.

Adult goatfish are known as Salmoniti in Chamorro. All goatfish are good to eat. Local fishermen catch them using a variety of methods.

The most common goatfish in the CNMI is the yellowstripe goatfish. During the day, they are seen in large groups, sometimes with other reef fish such as snappers. During the night, they leave their groups and disperse over the sand to feed.



Label the parts of the goatfish:

- A. _____
- B. _____
- C. _____

Goatfish drawing from Let's Talk Fish and Wildlife, DAWR, used with permission

Creature Feature - Surgeonfish



Blue-banded Surgeonfish

Surgeonfish have sharp spines at the base of their tails. The blade-like spines are how they got their name. That is also how they defend themselves from larger fish.

Surgeonfish are herbivores, or plant eating fish. They feed on the algae that grow on rocks and coral. Surgeonfish are found in many zones of the coral reef, in shallow and in deep water. They feed during the day and sleep at night. Other coral reef fish that are herbivores are the parrotfish, rabbitfish (Hiteng, Sesyon), and some damselfish.

There are many different kinds of surgeonfish in the CNMI. Most are blue, brown or black. Some have stripes or bands. Surgeonfish are known as Tataga, Hugupão, and Hiyok in Chamorro. Surgeonfish are good to eat and are a common catch of fishermen.

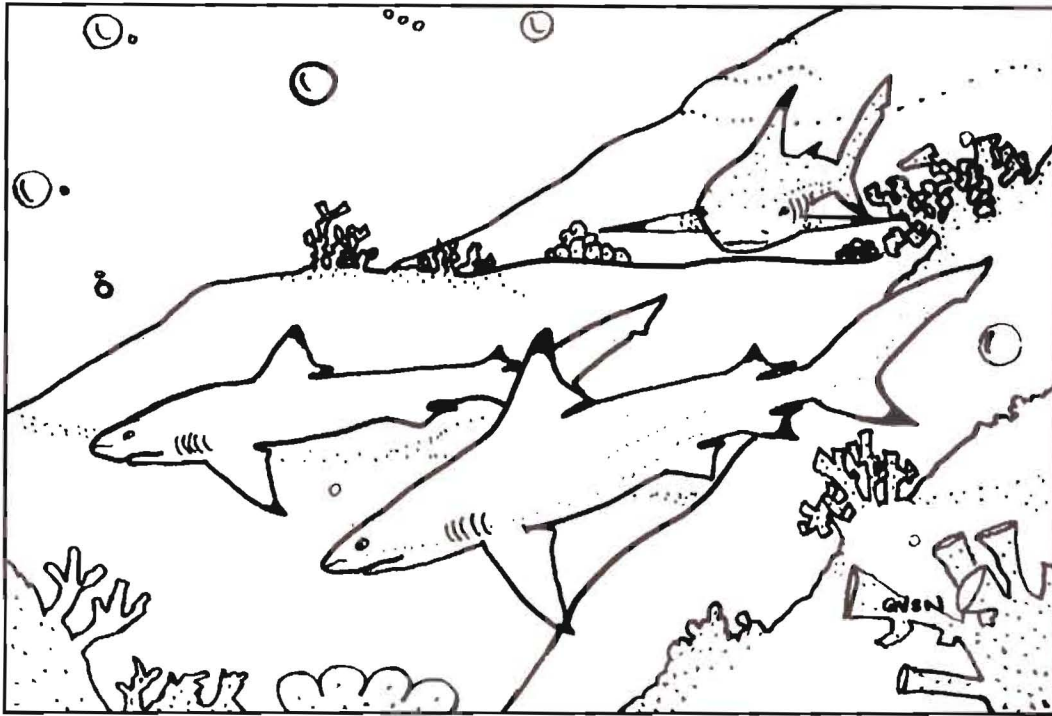


Label the parts of the surgeonfish:

- A. _____
B. _____

Surgeonfish drawing from Let's Talk Fish and Wildlife, DAWR, used with permission

Creature Feature – Reef Sharks



Over 20 different kinds of sharks can be found in the CNMI waters. Of those, only 12 are likely to come near the shore. Sharks are known as Halu'u in Chamorro.

The Blacktip reef shark and the Whitetip reef shark are the most common types of sharks that live near shallow coral reefs. Both sharks are harmless to humans unless they are provoked. Another common shark, the Gray reef shark is more aggressive and territorial. The Blacktip, Whitetip, and Gray reef sharks grow to about 6 feet (1.8 m). They feed on small fish and invertebrates.

The Tiger shark is the most dangerous shark in the CNMI waters. It grows to about 18 feet (5.5 m). Luckily for us, it is mostly found in water that is over 200 feet (60 m) deep. Occasionally, it may come into shallow water at night, during breeding time, or when it is attracted to food.

Review Questions – Goatfish, Surgeonfish, and Sharks

Goatfish

Goatfish search the sand for small invertebrates to eat. They are examples of:

Herbivores

Carnivores

Omnivores

The Chamorro name for goatfish is _____.

The most common goatfish in the CNMI is the _____ goatfish.

Goatfish feed mostly during the _____.

Name two kinds of food that goatfish like to eat.

1. _____

2. _____

Surgeonfish

Surgeonfish eat algae on the coral reef. They are examples of:

Herbivores

Carnivores

Omnivores

Surgeonfish have _____ to defend themselves.

Surgeonfish are active during the _____.

Sharks

Sharks feed on invertebrates and fish. They are examples of:

Herbivores

Carnivores

Omnivores

The Chamorro name for sharks is _____.

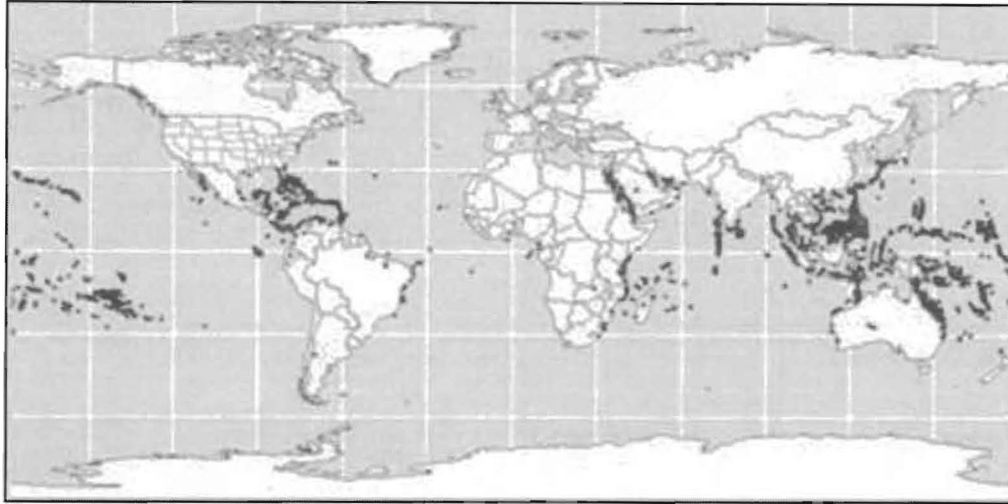
Two kinds of sharks that are found in the CNMI waters are:

1. _____

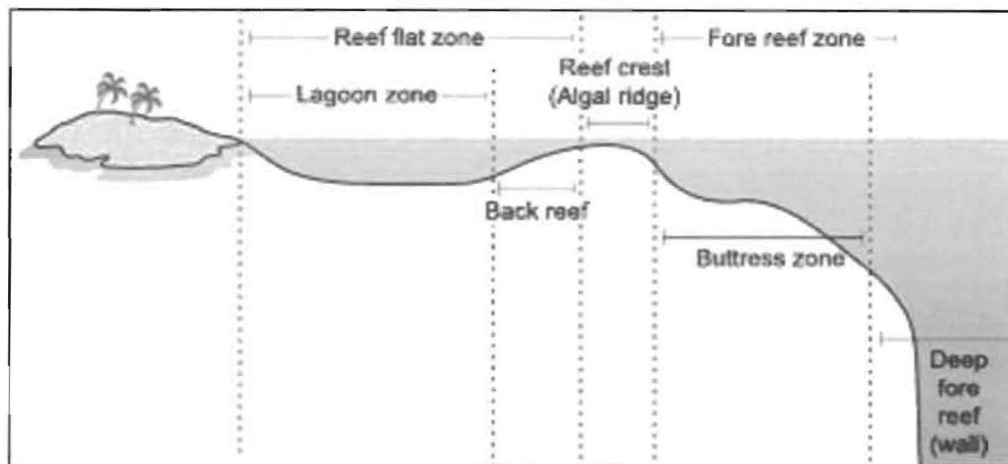
2. _____

Coral Reefs of the World

Coral reefs occur in warm tropical water (64-86° F). They are located around the world between 30°N latitude and 30°S latitude. Coral reefs are one of the most diverse ecosystems on the Earth. Coral reefs cover only 1% of the entire ocean but 25% of all of the species in the ocean live on coral reefs. The largest coral reef is the Great Barrier Reef. It is 1,250 miles long (*reference: Earle, 2001*).



The dark areas indicate the locations of coral reefs around the world.



Zones of a coral reef.

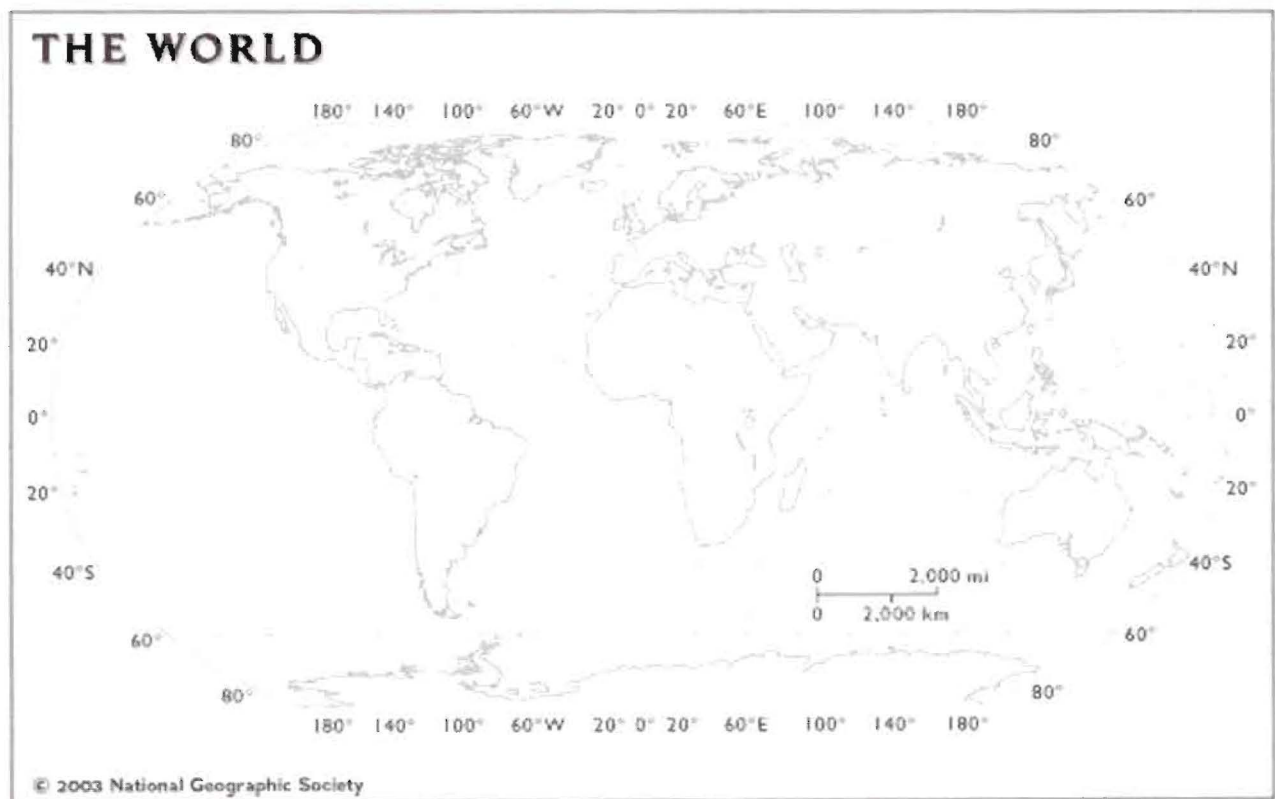
Each island is surrounded by a shallow **reef flat** or a **lagoon**. If you look out to where the waves are breaking, you will see the **reef crest**. It is a slightly raised area that has a lot of wave action. At low tide, the reef crest may be exposed. That is one reason why it is made up of mostly algae. Algae can produce a slime that protect it from drying out when it is exposed to air. The reef crest is also called the **algal ridge**. The **fore reef** is also called the **reef slope**. That is the area where the reef gets deeper. It continues to get deeper until it reaches a point where coral can no longer grow.

Activity - Locating the Coral Reefs

Use the map below. Draw a line across the map at 30°N latitude. Draw another line on the map at the 30°S latitude. Shade in that area. That is the only place in the world where coral reefs can grow.

Mini-Research Report

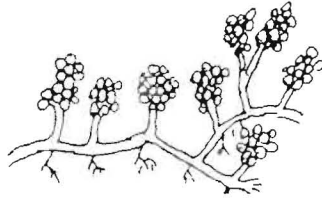
1. Choose one area of the world where coral reefs are found.
2. Circle the area on your map.
3. Research the threats to the coral reef in that area of the world. Humans may cause the threats or they may be from natural causes.



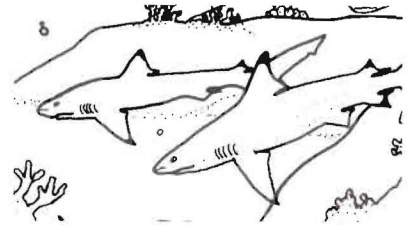
Habitat Activity – Coral Reef Zones

On the diagram on the next page, draw each of the coral reef organisms in at least one of the habitats that they live in.

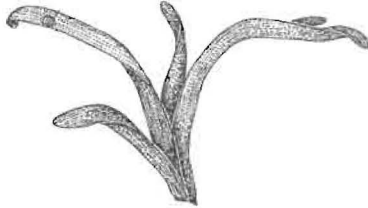
We are sea grapes, a type of green algae. We live in the shallow water near the beach and in lagoons.



I am a reef shark. I live in deep water. I come to the reef slope to feed on fish.



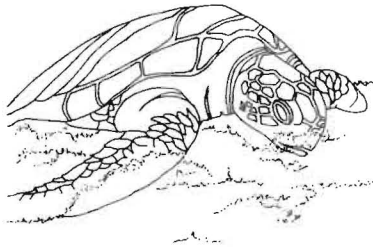
I am sea grass. I live in shallow water near the beach and in the lagoon. I need a lot of sunlight in order to grow.



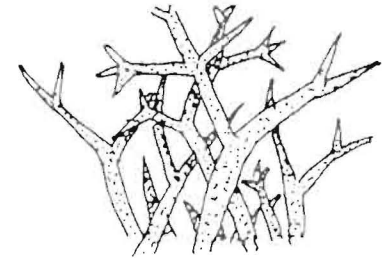
I am a sea cucumber. I crawl around on the sandy bottom area of the lagoon.



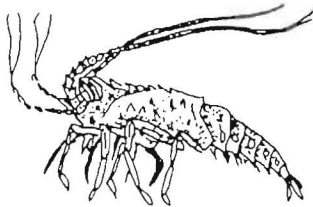
I am a green sea turtle. I feed on sea grass and algae. I live all over the reef. I lay my eggs up on the beach.



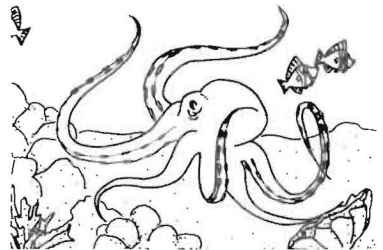
I am staghorn coral. I grow on the deep side of the reef crest near the reef slope.



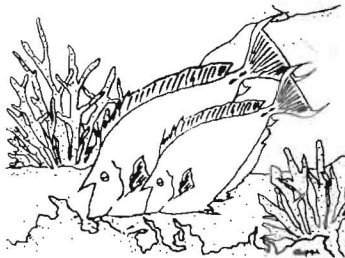
I am a lobster. I live on the bottom in the lagoon and on the deep reef.



I am an octopus. I am found all over the coral reef. I stay on the bottom.



We are unicorn fish. We live in deeper parts of lagoons and on the reef slope.



I am finger coral. I live on the reef slope.

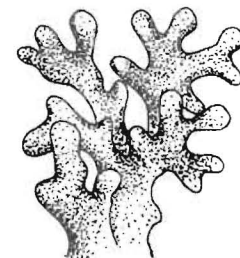
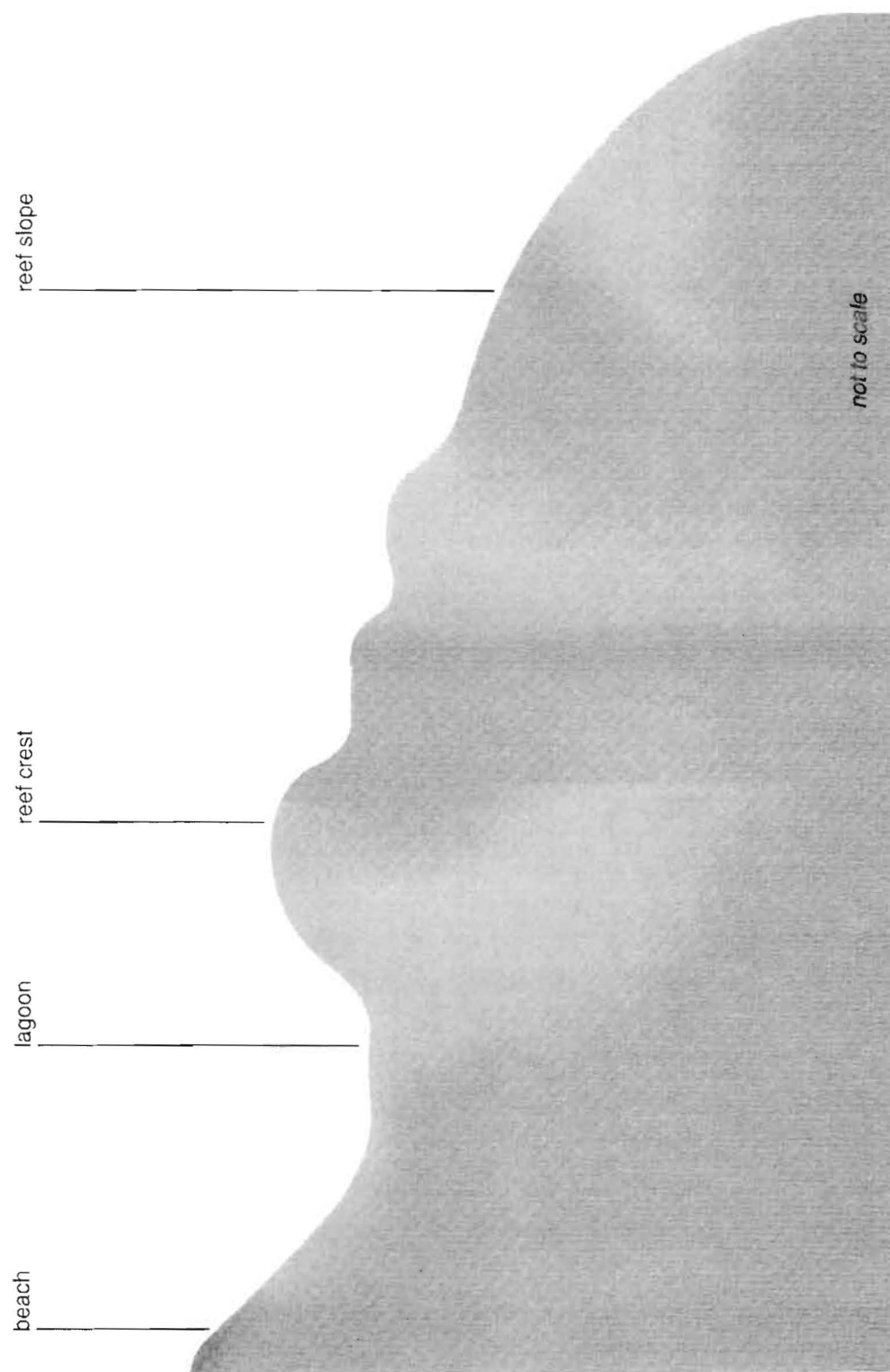


Image credits: sea grapes, staghorn coral, lobster, Our Island Environment, 1st edition, Book 6; sea grass © Nancy Vander Velde; sea cucumber, Stephen Francis, © Queensland Museum, Australia; reef shark, sea turtle, octopus, unicorn fish, Let's Talk Fish and Wildlife, DAWR; finger coral © Tropical Topics.

Coral Reef Zones



From National Geographic Atlas of the Ocean

Activity – Competing for Food

Objectives

Students will learn that different types of birds eat different types of foods due to the shape of their beak.

Students will learn how to gather and collect data.

Materials

Hard food items - peanuts and M&Ms

Soft food items – raisins or dried fruits, marshmallows or Styrofoam

Metal pieces – paper clips

Paper plates

Construction paper (for designing beaks)

Plastic spoons

Bamboo skewers

Straws

Magnets

Procedure

Each group of 4 will receive construction paper, one plastic spoon, one bamboo skewer, one straw, and one magnet.

You will each make a different type of bird beak out of construction paper.

At the end of your beak, attach one of the four materials: plastic spoon, bamboo skewer, straw, and magnet.

Name your bird and draw a picture of its beak.

Practice feeding with your beak. You can only pick up one food item at a time.

Place the following food items onto a paper plate.

10 peanuts

10 M & Ms

10 raisins

10 marshmallows

10 paper clips

Each member of the team:

Pick up one food item at a time with your beak.

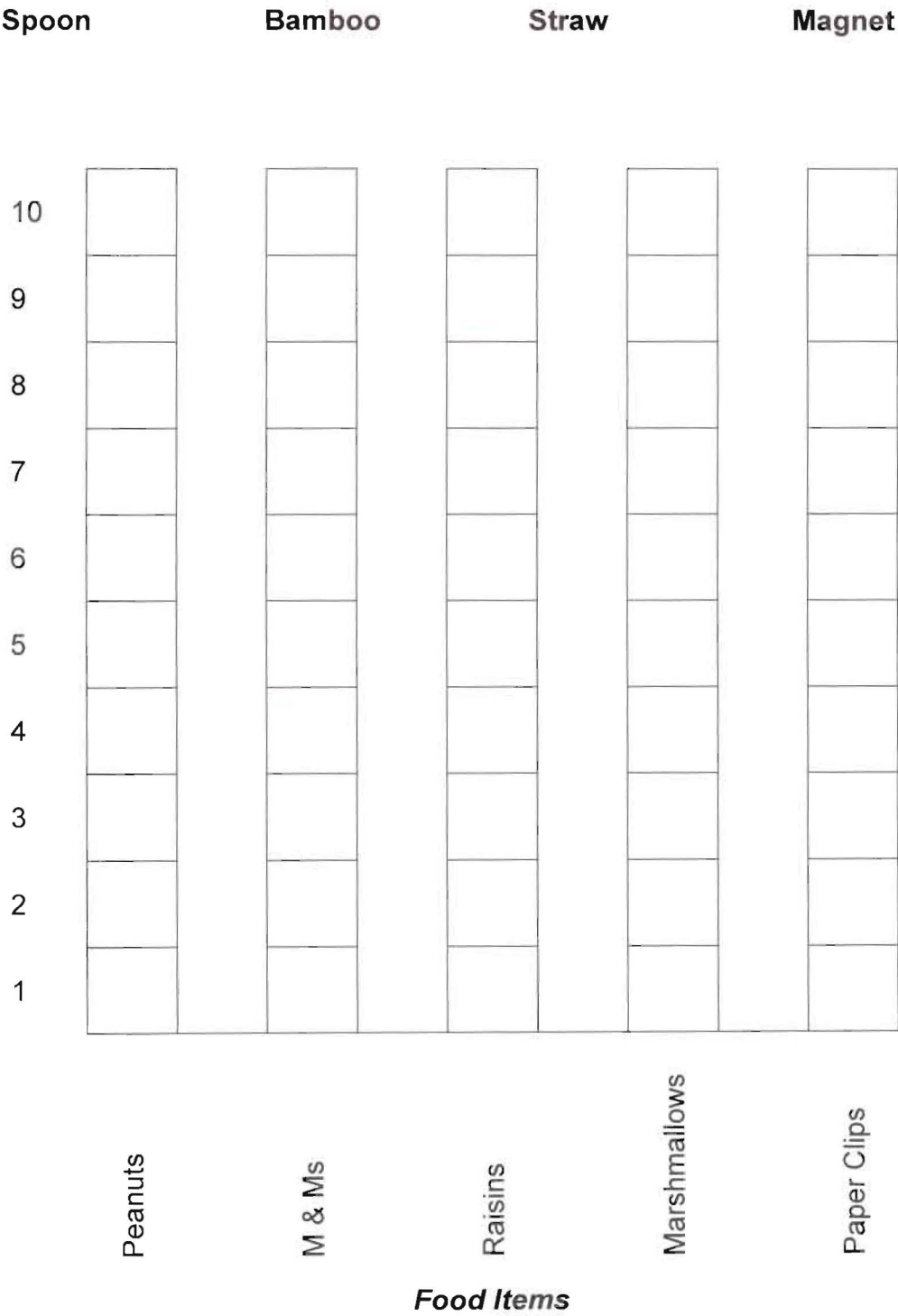


Continue feeding by catching one item at a time until all of the food is gone. DO NOT EAT THE FOOD. It must be counted and recorded first.

Results - Record the amount of food that your bird caught. Fill in the correct number of blocks for each food item that your bird caught.

What is the name of your bird? _____

Circle the Type of Beak that Your Bird Had



Follow-up Questions

1. What kind of food was the easiest to catch?
2. What kind of food did your bird catch the most of?
3. What kind of food was the most difficult to catch?
4. What kind of food did your bird catch the least of?
5. What would happen if only one type of food was available for all of the different types of birds to eat?

Extension Activities

Compare the results of the other teams to the results of your team. For example, did the other birds that used spoons on their beaks (spoonbills) capture the same kinds of food as the one from your team?

Each team can make a separate graph for each food item. Use a different color for each bird and compare which type of beak was the most successful at catching each type of food.

Build a better beak. Use materials from the classroom to build a beak that will be more successful at catching food.

Topics for Further Discussion

Adaptations – some birds are specialized and can only eat certain kinds of food. Adaptations are special traits that help species survive in their environment. A long, curved beak that can reach far inside of a flower is an example of an adaptation for eating nectar.

Competition - birds that can eat many different types of food may be very successful at competing for food.

Endangered species – species that are limited to a certain food item may become endangered if their food supply decreases.

Extinction – if a bird is adapted to eating only a certain kind of food and that food supply is no longer available, it may go extinct.

Activities – Scavenging and Filter Feeding

Why We Aren't Filter Feeders...

Learning statement: Organisms are designed for specific feeding methods. Why are we considered carnivores? Our body design, particularly limbs and teeth function effectively for most of the foods we eat.

Goal: Students will be able to describe three attributes that determine what type of food we are designed to eat.

Objective 1: Students will be able to describe three methods of obtaining food: scavenging, filter feeding, and hunting

Objective 2: Students will list at least two reasons why humans are not considered scavengers; list two animals that are scavengers.

Objective 3: Students will list at least two reasons why humans are not considered filter feeders; list two animals that are filter feeders.

Activity 1: Scavenging Food

Materials: Cookie baking sheet, waxed paper or aluminum foil, graham crackers or crumbs, mallet, drinking straws, paper plates, peas or other large seeds

Preparation: Place paper or foil on cookie sheet; place graham crackers on sheet and cover with paper/foil.

Pound crackers until they are finely ground.

Place graham cracker crumbs and sprinkle the seeds on individual plates, and give each student a straw.

Students suck crumbs through their straw until their plate is clean.

Caution: They should avoid the seeds so they don't clog the straw. Older children should not use their hands to move the straw across the plate.

Explanation: Scavengers in the ocean often get nourishment by sucking sediment in and processing organic material. Non-nourishing material is processed through and eliminated as waste. Sea cucumbers use this method and are one of the most widespread invertebrates in the ocean today. There are sediment particles and organisms that are too large to be consumed by the scavenger.

Discussion: Why are we not adapted to feed as scavengers? What characteristics do scavengers share?

Activity 2: Filter Feeding Food

Materials: Popped pop corn, circulating fan elevated on a table top, protective eyewear, baseball gloves (optional). This activity may be done outside if there is access to an electrical outlet.

Preparation: Students should be spread out so they are just beyond hand-to-hand with their arms outstretched (baseball gloves optional). Some students should sit on the floor, others should stand behind them.

Use a circulating fan set on its highest setting and gently pour pop corn directly in front of the fan so it sails through the air. (You may want to practice without students first, so you can place them at the proper distance.)

Students can move their arms (but cannot move their body) up and down /back and forth, but cannot grab pop corn that is beyond their grasp. They can either eat any pop corn they catch or hold and count it (i.e. on a paper plate) in order to see who caught the most food. To prevent choking, discourage students from catching pop corn with their mouth.

Explanation: In the ocean, filter feeders depend on ocean currents to bring food to them. Organisms have developed several methods to catch microscopic plankton. Corals have tentacles covered with stinging cells that harpoon and paralyze their prey. Crinoids (feather stars) have sticky arms with cilia that move food toward their mouth.

Discussion: There are no air borne filter feeders, but many plants and fungi are pollinated and disperse seeds or spores by the wind. Imagine trying to catch food floating through the air! What characteristics do filter feeders share?

Prepared by the Naturalists at the Falls of the Ohio State Park, Clarksville, IN

Creeks and Streams: Fresh Water from the Forest

Directions: Read the following paragraph. Then, answer the questions.

Most of our clean drinking water comes from the forest. Here is how it works. It rains in the forest. The rain water falls on the leaves and soil and roots of the forest floor. As the water travels deep down in the Earth, dirty particles are filtered out. The clean water flows underground and comes out into creeks and streams.



We get our fresh water from the ground, creeks, and streams. How does the rain water get cleaned?

Why is it important not to pollute the forest?

From: The Forest Fun Book, used with permission

Breathe In, Breathe Out

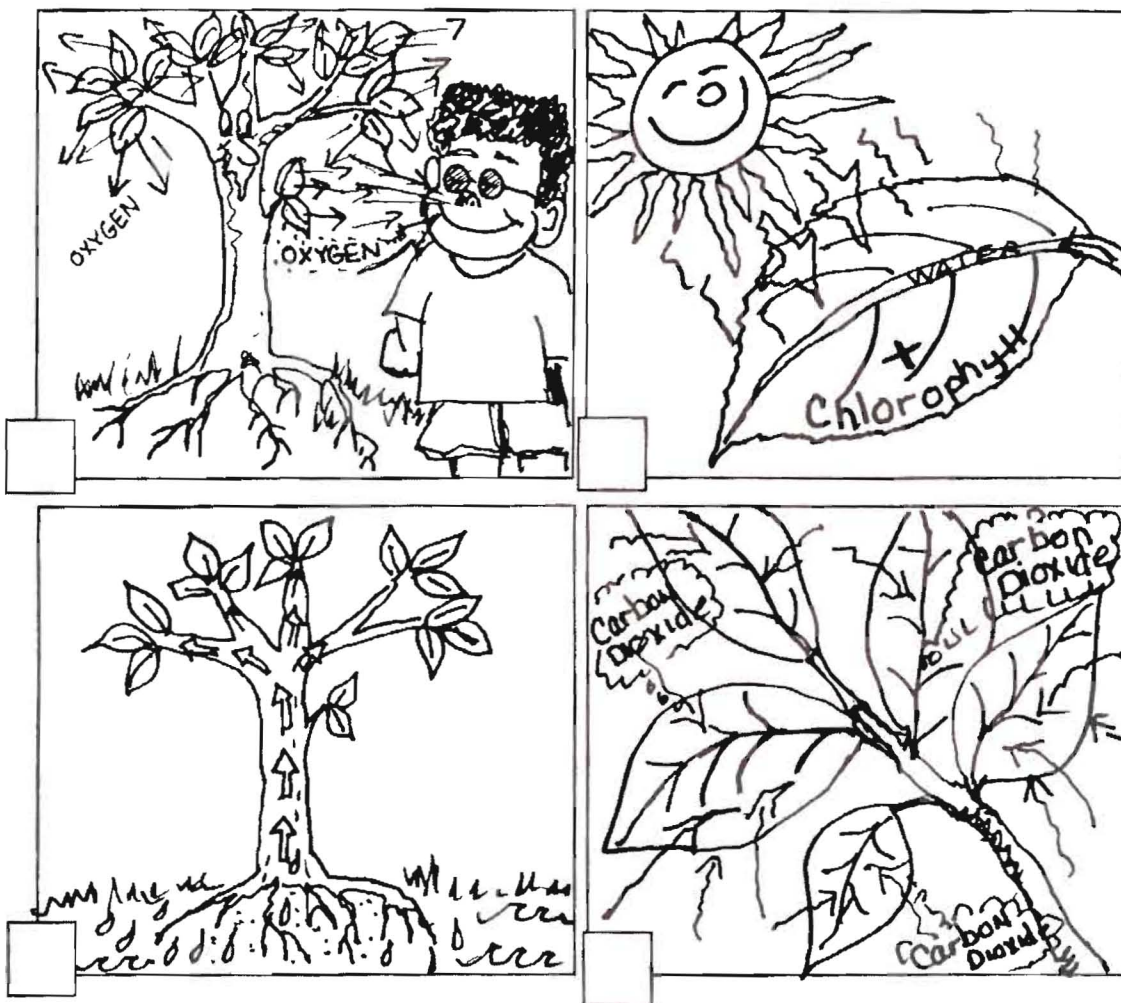
Oxygen from our healthy forest

Directions: Read the story.

Number the pictures below in the correct order according to the story.

You can't see it but healthy trees are producing oxygen for us to breathe. Here is how.

Green leaves are like little food factories. First, the leaves breathe in carbon dioxide. Second, carbon dioxide is mixed with water from the soil and a chemical called chlorophyll is made. Third, the leaves use the sun's light as the energy that mixes everything together. This makes food for the tree. Fourth, while the tree is making food, oxygen is released into the air. That is what we breathe.



From: The Forest Fun Book, used with permission

Reduce, Reuse, Recycle

Introduction: What is different about the way people live now and the way that they lived in the past? Discuss how our ancestors lived off of the land and did not produce trash that could not be used again. Now, humans produce so much trash. Where does it go? Most goes into landfills. A landfill is a large hole where the trash collectors bring the trash from your house. When the landfills become too full, more landfills need to be built. How can we help?

Reduce – do not use as much packaging, items that cannot be recycled, etc.

Reuse – use trash items over again for other purposes

Recycle – make other things out of the trash that we create.

Teacher: Questions for Discussion and Possible Answers

How can humans reduce the amount of trash that they make?

Buy larger containers.

Reduce buying foods that have a lot of packaging.

How can humans reuse their trash?

Use grocery bags over again for other things.

Use trash items to create art projects.

Make a piggy bank out of an old jar.

What kinds of items can be recycled?

Paper – newspaper and cardboard

Plastic – food containers, shampoo bottles, etc.

Metal – soda cans, cars, etc.

Glass – jars, bottles, etc.

Chemicals – oil, paint, etc.



Activity – Recycling Paper

Objectives

Students will learn how to make recycled paper
Students will discuss ways to use the recycled paper



Materials

Newspaper and used writing paper
Bowl
Water
Wire Screen (students should bring from home)
Blender
Food coloring
Rolling pin
Large spoon
Liquid Starch (optional)
Wax paper



Procedure

Tear paper into small scraps. Soak overnight in a bowl of water.

The next day, pour the soaked paper mixture into a blender with one ounce of liquid starch (optional) and 10 drops of food coloring (any color).

Blend until it is smooth and creamy.

Scoop a large spoonful of the mixture onto a screen. Roll the mixture flat with a rolling pin. Excess liquid may be soaked up with towels. Cover the paper with wax paper. Let dry for at least one day.

The next day, peel the paper off of the screen. The students can put their name on their paper. They may also cut it into shapes and/or use it for other arts and crafts projects.

Discuss several ways to use the recycled paper.



Brainstorming Ideas – Recycling Paper

Each year, the average American uses 500 pounds of paper. Paper is made from trees and other plants. Some of the paper that we use has been recycled.

Brainstorm: Uses of Paper

Examples

Food packages
Gift-wrap
Newspaper
Construction paper
Writing letters
Cards
Books and magazines
Bags for carrying things



Brainstorm: Uses of Recycled Paper

Examples

Newspapers are made from recycled paper.
Old newspapers are then used for:

- arts and crafts
- to wrap fish
- pet cages
- clean up spills
- packaging material

Used paper can be used for scratch paper.

Extra pieces of wrapping paper can be used to wrap smaller gifts.

Brainstorm: Reasons to Recycle Paper

Examples

Save trees
Save money
Save room in landfills
Less trash
Keep the islands beautiful



Brainstorm: Ways to Reduce amount of Paper Used

Examples

Buy larger quantities (less packaging materials).
Use scratch paper instead of new paper whenever possible.
Use shoeboxes to store things inside.
Buy paper that is made from recycled paper.
Use a lunch box instead of paper bags.
Electronic books instead of paper.

It's Not My Fault!
The Story of the Brown Treesnake
By Olympia Terrel

It's not really my fault. I didn't ask to come here: Nobody asked me if I wanted to leave my island and come to the CNMI. I was very happy living in the Solomon Islands with lots of jungle and birds and stuff to eat.

My great, great, great grandmother and grandfather came over on a ship. They weren't interested in going on vacation. Some military guys put the logs they were living in on a ship and they woke up in paradise. Guam was great! At that time there were lots of birds on Guam and nobody was eating them. It was fiesta everyday! The birds had never seen a snake before, so they didn't know that they should be afraid of us. My family kept getting bigger and bigger. Guam got quieter after so many of the birds died. It got more difficult to find food for our family, so some of us decided to take a trip.

We slithered down to the docks and up the lines of a ship and curled up under a forty-foot container for the voyage. We got off in Saipan and we are so happy to be here. There are a lot more birds here than in Guam. The big flame trees are great to climb up and play in. But we've got to be careful. Everyone in Saipan knows that brown treesnakes love to eat birds. So when people see us they try to kill us. But it's not my fault, my great, great, great grand parents were happy on their home island.



Review Questions

1. How did the brown treesnakes get to Guam?
2. What happen to the birds after the brown treesnakes got to Guam?
3. Is it possible that the same thing that happened on Guam could happen on Saipan, Tinian and Rota?
4. How can we prevent brown treesnakes from coming to the CNMI?

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