



# 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 5**  
**CNMI DFW, 2003**

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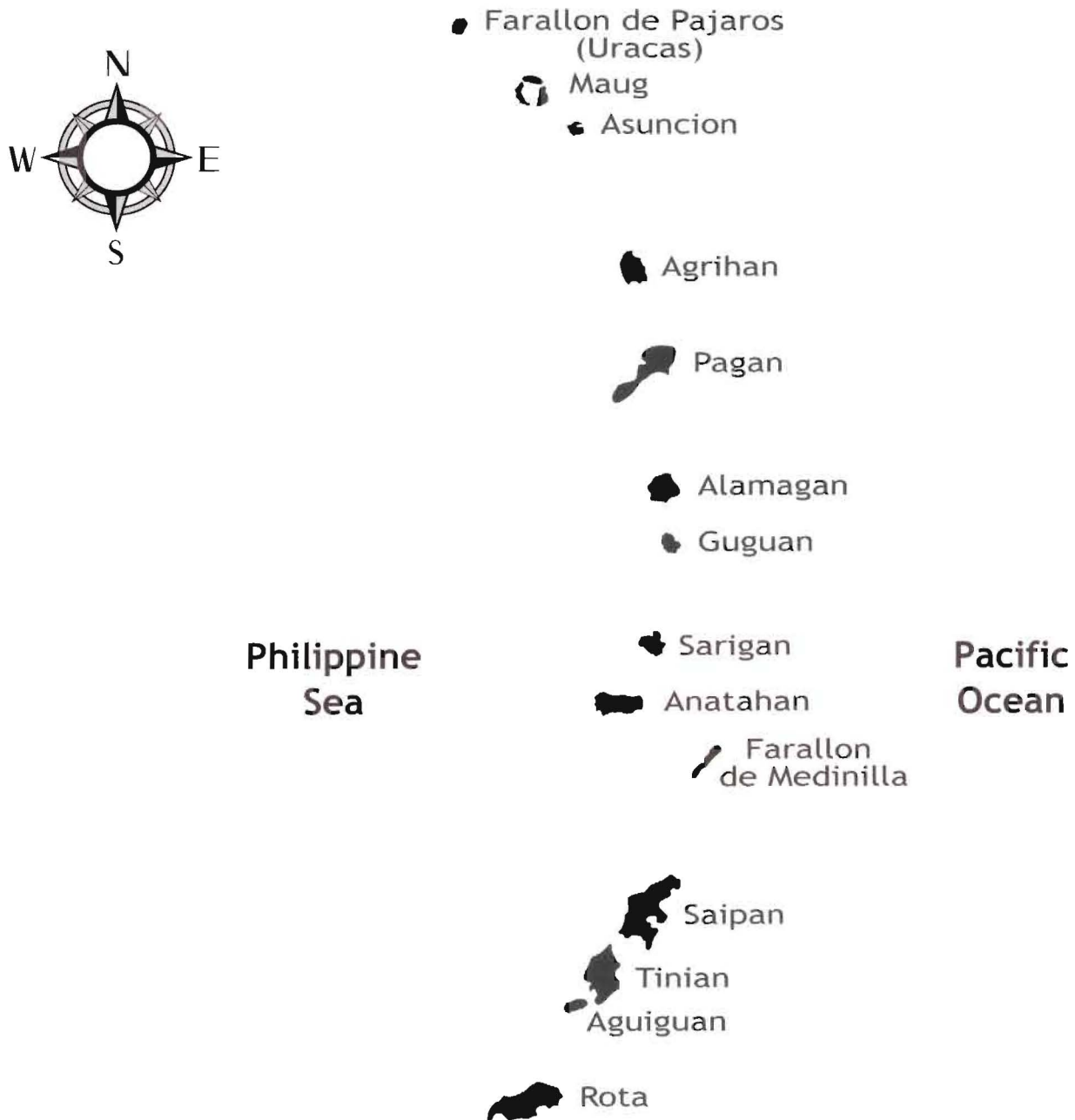
## Standards and Benchmarks (Grade 5)

Content and activities are aligned with the following CNMI Science Standards and Benchmarks (Grade 5)

Standard	Benchmark
Science as Inquiry	<ul style="list-style-type: none"><li>• Identify questions that can be answered through scientific investigations</li></ul>
Habits of Mind	<ul style="list-style-type: none"><li>• Seek information from reliable sources, including knowledge, observation, and trying things out</li></ul>
Science Connection	<ul style="list-style-type: none"><li>• Seek connection between science, culture, and Pacific societies</li></ul>
Science, Technology, and Society	<ul style="list-style-type: none"><li>• Explain relationships between and among things, including interactions, dependencies, and cause-and-effect events</li></ul>
Living Environment	<ul style="list-style-type: none"><li>• Describe the interactions of organisms in food chains and food webs</li></ul>

## The CNMI

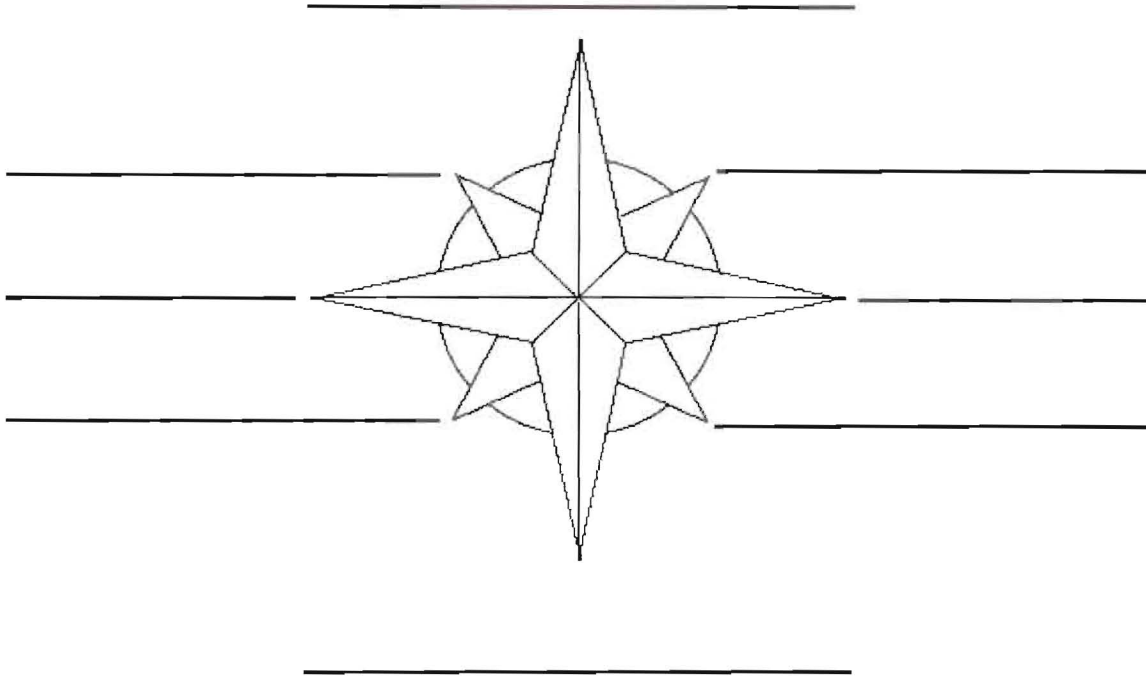
We live on an island. Our island is part of a group of islands called the Commonwealth of the Northern Mariana Islands or CNMI. The island chain is made up of 14 islands that were formed from volcanoes thousands of years ago.



### 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**

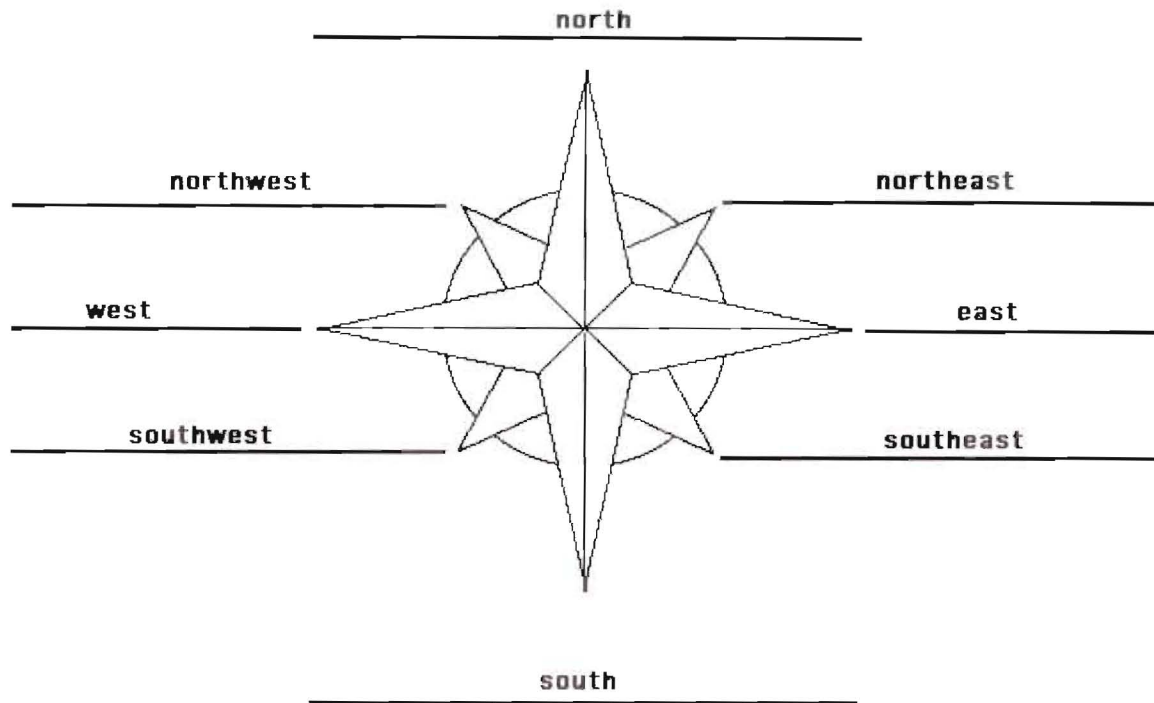


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*Fill in the correct direction for each statement.*

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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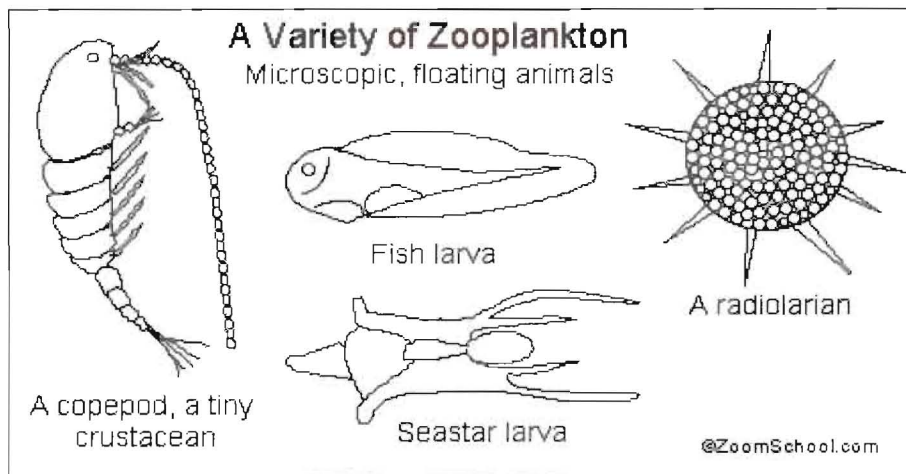
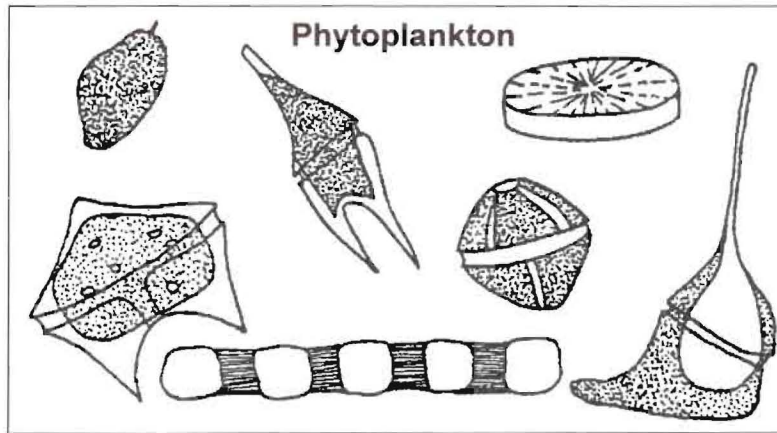
1. Guguan is **southeast** of Asuncion.
2. Rota is **southwest** of Farallon de Medinilla.
3. Saipan is **northeast** of Rota.
4. Alamagan is **south** of Pagan.
5. Maug is **southeast** of Farallon de Pajaros (Uracas).
6. The Philippine Sea is **west** of the CNMI.
7. Tinian is **southwest** of Saipan.
8. Sarigan is **northwest** of Farallon de Medinilla.
9. The Pacific Ocean is **east** of the CNMI.



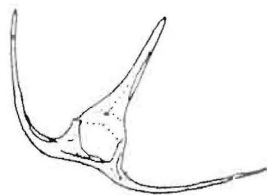
## Plankton

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.

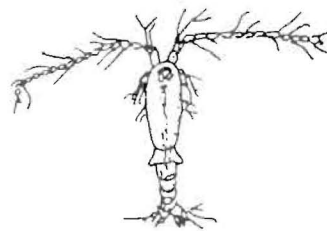
Scientists divide plankton into two large groups. The plants are called **phytoplankton** and the animals are called **zooplankton**.



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**



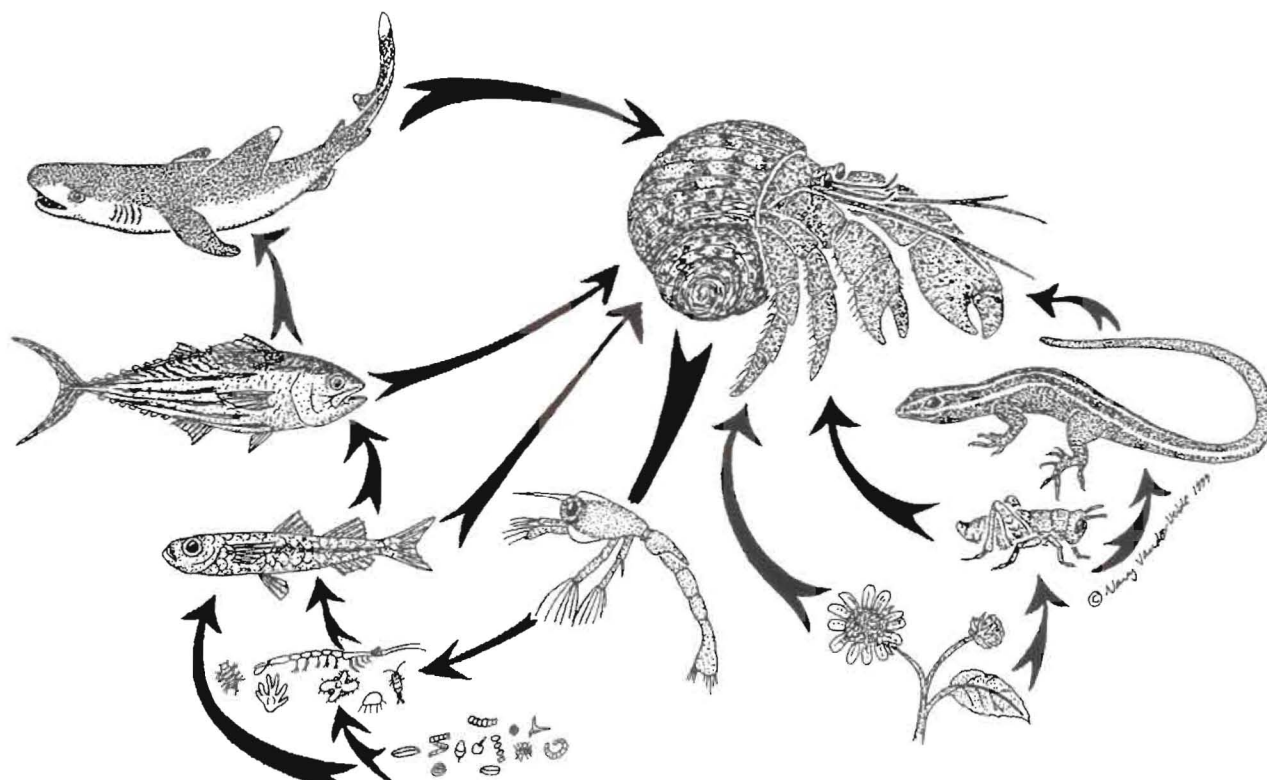
**A Consumer**

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

## 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 they 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 plants 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**.

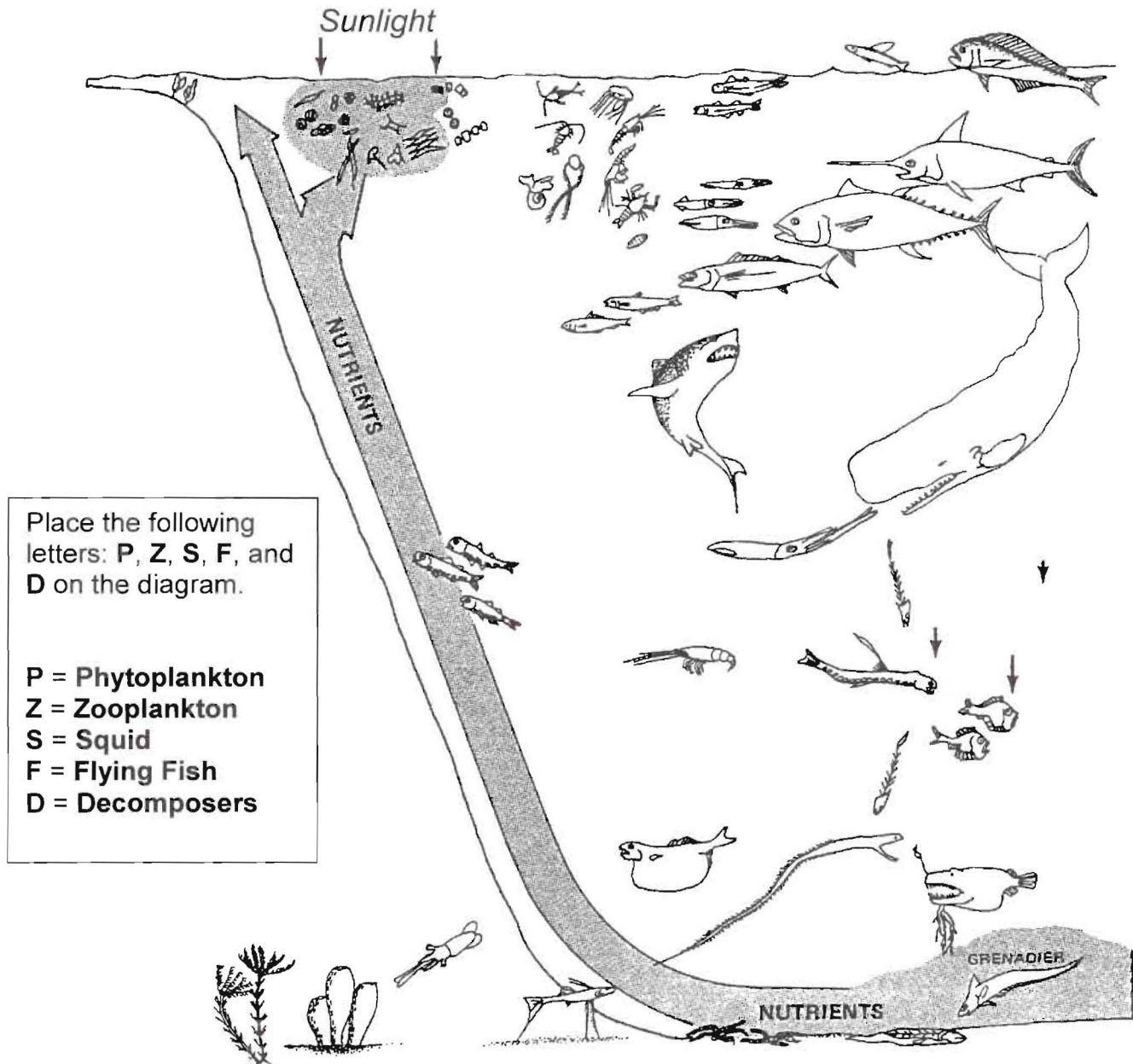
### Predators, Prey

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).



**Phytoplankton** are producers; **Zooplankton** are consumers; **Squid** are consumers, they are also predators of zooplankton and prey of large Jacks/Trevallies; a **Flying Fish** is a predator of zooplankton and a prey item of larger fish; many **Decomposers** live on the bottom where they break down the remains of dead organisms.

*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?  
\_\_\_\_\_

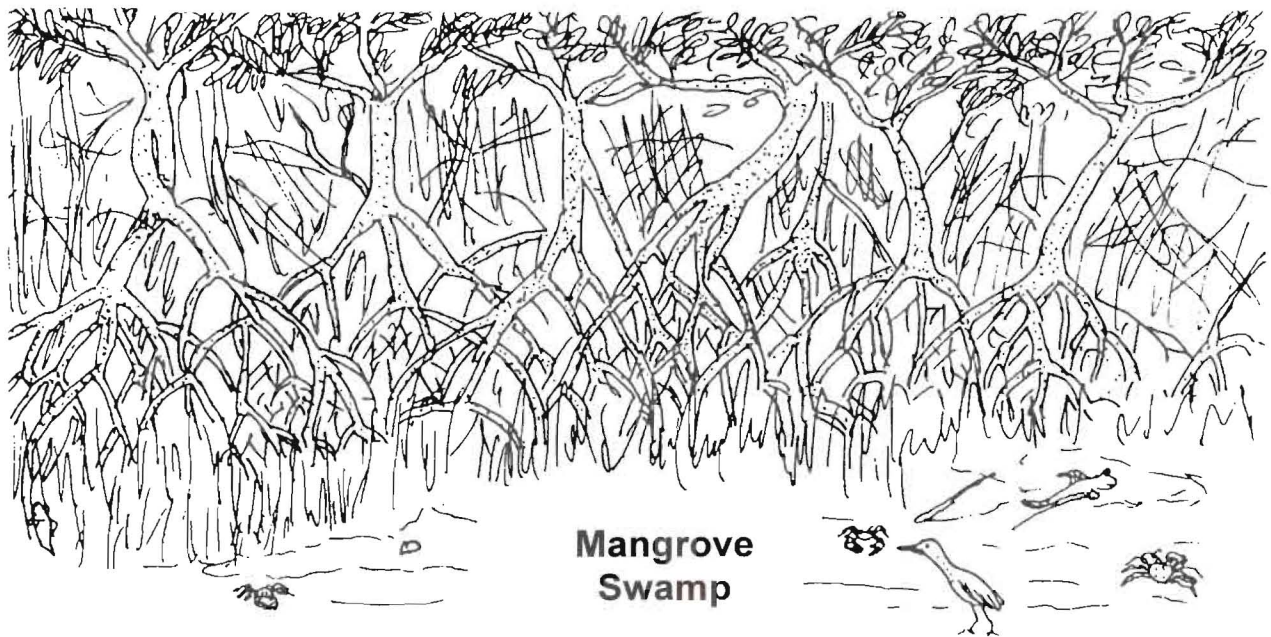


## Wetlands

Wetlands are environments that are wet most of the time. This may sound silly, but it is true. The ground of a wetland is usually **saturated**. This means that there is so much water in the soil that it cannot hold any more.







The water in a wetland may come from rain that soaks into the ground and becomes groundwater. This source of water produces freshwater wetlands. Some wetlands are located near the ocean or lagoon. The water supplied to these wetlands comes from freshwater and saltwater sources. **Brackish** water occurs when salt and fresh water are mixed. Wetlands supplied by brackish water are called marine wetlands.

Mangrove forests grow in the marine wetland environment. Mangrove trees have special features (adaptations) that allow them to live in salty water. The mangrove ecosystem is very important. It supplies many nutrients, keeps mud from killing our corals, and gives many animals and fishes a place to hatch their young. Some people may think that mangrove areas are just swamps, but they play a very important role in our island's ecology. We must preserve all of our wetland areas.



## Wetland Birds

Many different species of birds depend on the wetland habitat. Some birds, such as the endangered Mariana Common Moorhen, are only able to survive naturally in wetlands. Below are just a few of the species of birds that you may find in our island wetlands. Look carefully at each bird, and you will notice something that is different from the other birds.

	
<p><b>Nightingale Reed Warbler</b> Ga'ga karisu / Ga'kaliso (<i>Chamorro</i>) Litchoghoi bwel (<i>Carolinian</i>)</p>	<p><b>Cattle Egret</b> Chuchuko a'paka (<i>Chamorro</i>) Ghe're'bwesch (<i>Carolinian</i>)</p>
	
<p><b>Mariana Common Moorhen</b> Pulattat (<i>Chamorro</i>) Gherel Bweel (<i>Carolinian</i>)</p>	<p><b>Common Sandpiper</b> Dulili (<i>Chamorro</i>) Ghuliing (<i>Carolinian</i>)</p>
	
<p><b>Collared Kingfisher</b> Sihek (<i>Chamorro</i>) Waaw (<i>Carolinian</i>)</p>	<p><b>Yellow Bittern</b> Kakkak (<i>Chamorro</i>) Kakkaak (<i>Carolinian</i>)</p>

Artwork by Douglas Pratt

## Review Questions - Wetlands

1. What are wetlands?
2. Describe the ground of a wetland.
3. What is the difference between freshwater wetlands and marine wetlands?
4. What is brackish water?
5. List at least two reasons why a mangrove ecosystem is important.

***Wetland Bird Matching*** – Match the name of each bird with its picture on the right.

**Cattle Egret**



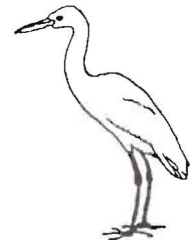
**Sandpiper**



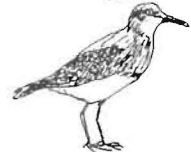
**Collared Kingfisher**



**Mariana Moorhen**



**Yellow Bittern**





## **Mari the Moorhen**

*By Michael Smith*

Mari, the Mariana Common Moorhen, looks a lot like a duck. She has black feathers and a red beak and shield on her forehead. Mari lives in Lake Susupe in Saipan with her mate, Manny. Mari and Manny met while searching for food at the edge of the lake. They like to eat plants, insects and snails from in and around Lake Susupe.

Mari and Manny decided to start a family. They both worked very hard, building a nest out of grasses and sedges. Mari was very excited because she laid six eggs. Last year, she only laid four eggs. Mari and Manny took turns keeping their eggs warm and watching out for lizards, cats, and dogs that like to steal eggs. Three and a half weeks after Mari laid her eggs, the chicks hatched. Mari was proud of her chicks. She had 4 females and 2 males with fluffy down feathers and white beaks. Two hours after the chicks hatched, the entire family was swimming and diving together in the lake. Three weeks later, Mari and Manny's chicks were ready to go out on their own and leave their parents.

Mari was very proud of her chicks. She watched her family grow and taught her chicks to watch out for humans and other predators. She taught them to be careful, because some of her relatives were taken by humans for food. She explained to her chicks that all moorhens are protected in the CNMI and that there is hope that they will get more help from people so that they can always call Lake Susupe their home.

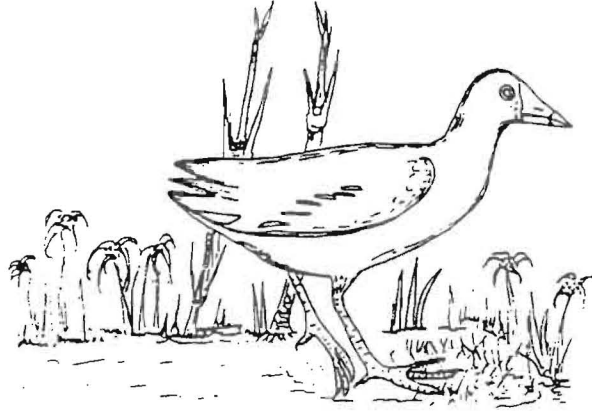


**Mariana Common Moorhen**

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



## Mari the Moorhen – Review Questions



1. Where did Mari live?
2. What was the name of Mari's mate?
3. What did Mari like to eat?
4. How many chicks did Mari have?
5. How long did it take before Mari's chicks were able to go out on their own?
6. What are four predators of Mari and her eggs and/or chicks?

## Threatened and Endangered Species

There are many reasons why plant and animal populations decline. Sometimes, the species are overharvested for food. Other times, their habitats may be destroyed by pollution, development, or introduced species. When a habitat is destroyed, the species no longer has a place to live.

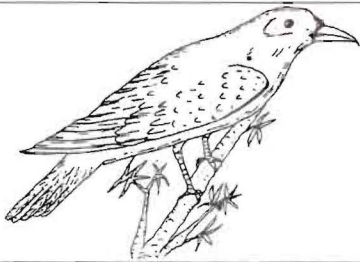
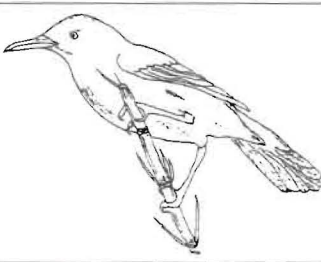
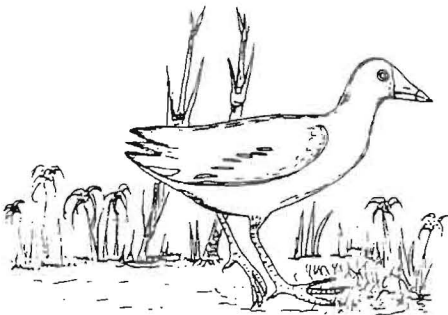

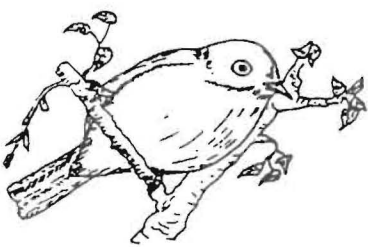
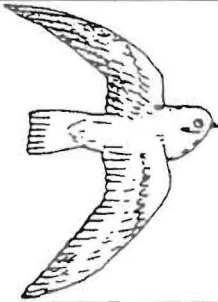
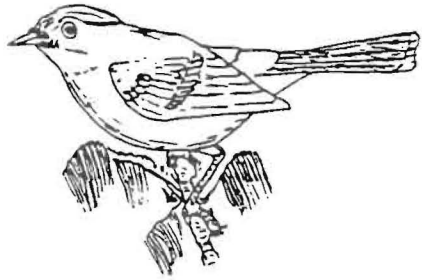
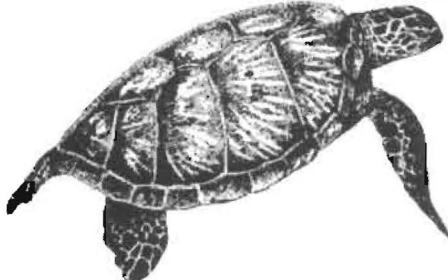
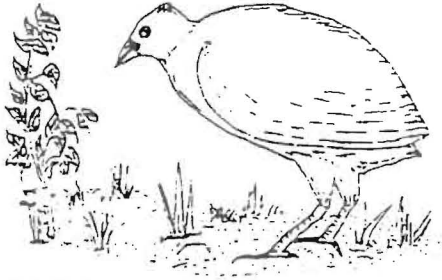
The term **threatened** is used when a plant or animal is likely to become endangered in the near future. The term **endangered** is used when a plant or animal is in danger of becoming extinct in the near future. The Mariana fruit bat is an endangered species. The term **extinct** is used when a plant or animal is no longer in existence. The term **extirpated** is used when a plant or animal is still in existence but not in all of its range. For example, the Nightingale reed-warbler used to live on the island of Pagan. Because it no longer lives there, it is extirpated there. Another term for extirpated is locally extinct. The Nightingale reed-warbler is still found on other islands.

A **recovery plan** is created to help conserve and protect species that are in trouble. **Endemic species** are species that live in only one part of the world. The CNMI has many endemic species. If those species are lost from the CNMI, they are gone forever.

There are many reasons why we should save endangered species from extinction. Here are five reasons. Can you think of other reasons why you would want to protect the local wildlife?

1. Every living thing has a role to play in the natural balance of our ecosystem.
2. When plants and animals become extinct, that is a sign to humans that the environment is not healthy. Endangered species are nature's "911." They are a warning that the environment is in trouble and could someday affect human health.
3. Endangered species may be sources of food, medicines, and cures for diseases that may not have been discovered yet.
4. One of the main sources of income in the CNMI is tourism. Tourists like to come here to experience a healthy environment, fish, bird watch and enjoy the beauty of nature.
5. Protecting endangered species saves a part of nature for our children and grandchildren to enjoy.

## Threatened and Endangered Species in the CNMI

		
<b>Mariana Crow</b> Aga (Chamorro) Mwii'lup (Carolinian)	<b>Nightingale Reed Warbler</b> Ga'ga karisu / Ga'kaliso (Chamorro) Litchoghoi bwel (Carolinian)	
		
<b>Mariana Common Moorhen</b> Pulattat (Chamorro) Gherel Bweel (Carolinian)	<b>Mariana Fruit Bat</b> Fanihi (Chamorro) Pai'Scheei (Carolinian)	
		
<b>Bridled White-Eye</b> Nosa' (Chamorro) Litchogh (Carolinian)	<b>Mariana Swiftlet</b> Chachaguak (Chamorro) Leghe'kiyank (Carolinian)	<b>Tinian Monarch</b> Chichurikan Tinian (Chamorro) Liteighi'par (Carolinian)
		
<b>Green Sea Turtle</b> Haggan (Chamorro) Wong Mool (Carolinian)	<b>Micronesia Megapode</b> Sasangat (Chamorro) Sasangal (Carolinian)	



## Micronesian Megapode



Chamorro Name: Sasangat  
Carolinian Name: Sasangal  
Scientific Name: *Megapodius laperouse*

Megapodes are slightly smaller than chickens and have long, yellow legs with black claws. They have dark feathers, yellow bills, and red areas around their eyes that are exposed areas of skin where their feathers are sparse. Their average weight is about twelve ounces (350 grams).

They have three loud calls that sound like combinations of high-pitched "kek" and "keek" sounds. One Megapode will begin with the call and others in the vicinity will answer. Their calls are usually at night.

Megapodes are endemic to the CNMI. That means that they are found nowhere else in the world. Megapodes live in native forests. Of the 14 CNMI islands, megapodes are found on 11 of them. However, they are rare except on the unpopulated northern islands.

Megapodes are omnivores, feeding on a variety of plant and animal material on the forest floor. Megapodes forage by scratching on the ground, exposing food items such as insects and seeds. They usually feed and move around in pairs.

One of the most interesting things about the megapodes is the way that they reproduce. Megapodes do not sit on their eggs like many other birds do. Instead of using their body heat to incubate their eggs, they rely on solar energy, volcanic thermal vents and decomposition of plants as heat sources for their eggs. That is why they are sometimes called "incubator birds." The female megapode lays one, large egg, often in a deep pit near a warm area such as a thermal vent from volcanic activity, or in dark volcanic sand warmed by the sun.

Artwork by Douglas Pratt



Sometimes many pairs of parents share nesting mounds. The parents may stay around and guard their nests for several days. The chick must kick its way out of the egg and dig itself out of the mound. It is able to search for food (forage) immediately upon emerging from the nest, with no care from the parents.

Threats to megapodes include habitat degradation (destruction) by feral mammals (pigs, goats), human consumption of their eggs, commercial and residential development, competition of introduced species and predation. Common predators of megapodes are monitor lizards, cats, rats, pigs and dogs. Megapodes may also be threatened by natural disasters.

The Micronesian megapode is listed as an endangered species both locally and federally and is protected under CNMI law. It is illegal to hunt, kill, or possess this bird or its eggs without a permit issued by the CNMI Division of Fish and Wildlife. Megapodes are protected from persecution by humans and feral animals on the northern islands of Asuncion, Guguan and Maug. Megapodes nest on the ground and are therefore vulnerable to attacks from the Brown treesnake (*Boiga irregularis*), so keeping this snake out of the CNMI is extremely important for the welfare of this bird.

### **Review Questions – Micronesian Megapode**

1. Describe the Micronesian megapode. What does it look like?
2. What do Micronesian megapodes eat?
3. How do Micronesian megapodes keep their eggs warm?
4. Name at least three predators of the Micronesian megapode.
5. How does the habitat of the Micronesian megapode get destroyed?

## Activity - Wild Verses Captivity

### Introduction

In this activity, you will research the requirements for an endangered species. Then, you will list the pros and cons of being raised in the wild or in captivity.

Many species are listed as endangered. That means that the population has decreased over time, and the animal may face extinction in the near future.

### Procedure

Choose a local endangered animal.

Research the following requirements for the animal. Make lists of all of the things that the animal needs in order to survive. Answer the following questions about the animal that you are researching.

**Habitat** – What type of habitat do they live in? How large does it need to be?

**Feeding** – What do they eat? When do they eat (day or night)?

**Reproduction** – How many young can they produce? How often?

**Predation** – What eats them?

### Other Needs

What are the advantages (pros) and disadvantages (cons) of living in the wild? The wild is an animal's natural habitat such as a forest.

List the pros and cons on the chart on the next page.

What are the advantages (pros) and disadvantages (cons) of living in a zoo or other area where animals are held captive areas?

List the pros and cons on the chart on the next page.

### Extension

Discuss other alternatives to being raised in captivity.

Could the animal be raised in captivity for just a part of its life and then be released into the wild? What are the pros and cons of doing this?

Could the animal be transferred to another island and placed into the wild? What are the pros and cons of doing this?

Comparison Chart

Wild or Natural Habitat	
Pros	Cons
Zoos or Captive Areas	
Pros	Cons

## Activity - Endangered Species Recovery Plan

### Introduction

After the U.S. Fish and Wildlife Service has listed a species as Endangered, its recovery plan is developed. The plan is made in an effort to protect the animal from facing extinction. In this activity, you will develop a recovery plan for a local endangered animal.

### Procedure

Choose a local endangered animal.

Research the following information:

**Ecological Importance** - Why did you choose this species? Is it worth saving? If so, explain why. You should explain how and why your animal is important to the ecology of the island. Do not give your opinion about why you want to save the animal.

**Historical Background** – What other islands has this animal lived on? Is it still in other locations? If not, why not? What factors led to the decline of this species?

**Current Threats** – What are factors that are currently threatening the species? Examples: habitat loss, predators, diseases, etc.

**Potential Threats** – What could happen in the future to threaten the animal? What types of predators could become a threat? What is happening to the animal's habitat that could become a threat to their population?

**Special Requirements** – Does the animal have any specific habitat, feeding and or reproductive requirements? If so, list them.

**Protection** – How can this species be protected from predators? How can the habitat of this species be protected?

**Budget** – Estimate the cost of protecting this species. Be sure to include the cost of paying for the salaries of people that are hired to manage your plan. List ways that you could find funding for your recovery plan.

**Public Support** – In order for your plan to work, you will need support from the public and from politicians. How will you inform the public about your plan?

### Extension

Compare your plan to a recovery plan developed by the U.S. Fish and Wildlife Service. How are the two plans similar? How are they different?

How could you improve upon your recovery plan for the endangered species?



## Recovery Plan for Endangered Species

<b>Common Name</b>	
<b>Scientific Name</b>	
<b>Local Names</b>	
<b>Ecological Importance</b>	
<b>Historical Background</b>	
<b>Current Threats</b>	
<b>Potential Threats</b>	
<b>Special Requirements</b>	
<b>Protection</b>	
<b>Budget</b>	
<b>Public Support</b>	

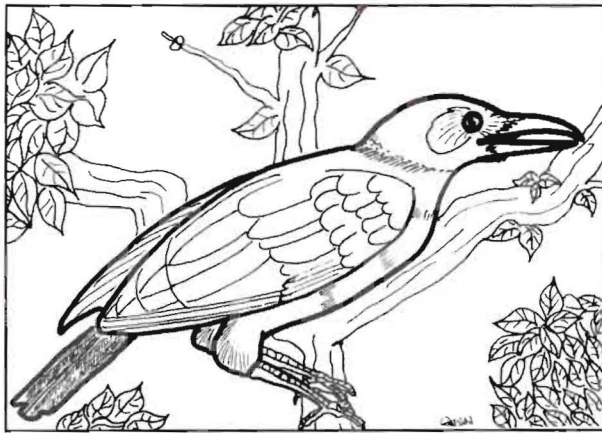
## Endangered Species

### *Locally Endangered Species*

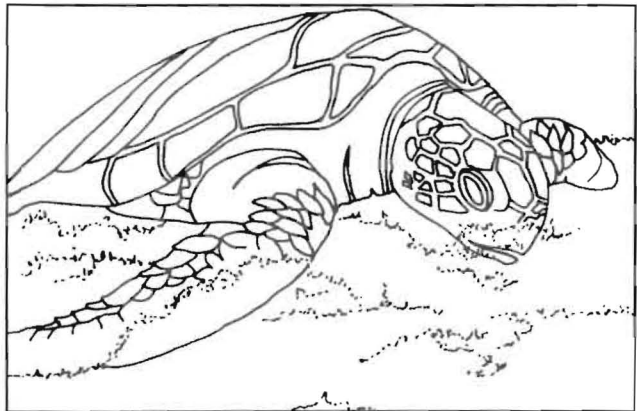


**Mariana Fruit Bat (Fanihi)**

### *Federally Endangered Species*



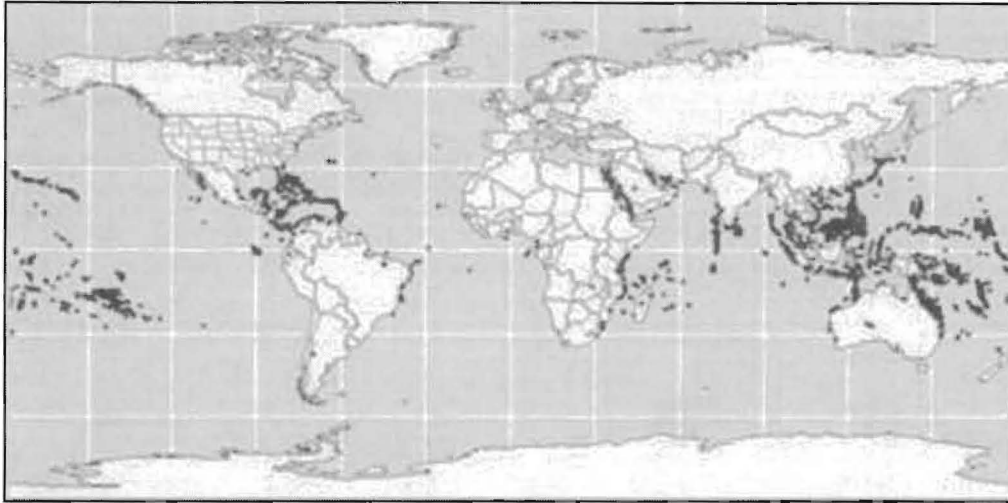
**Mariana Crow (Aga)**



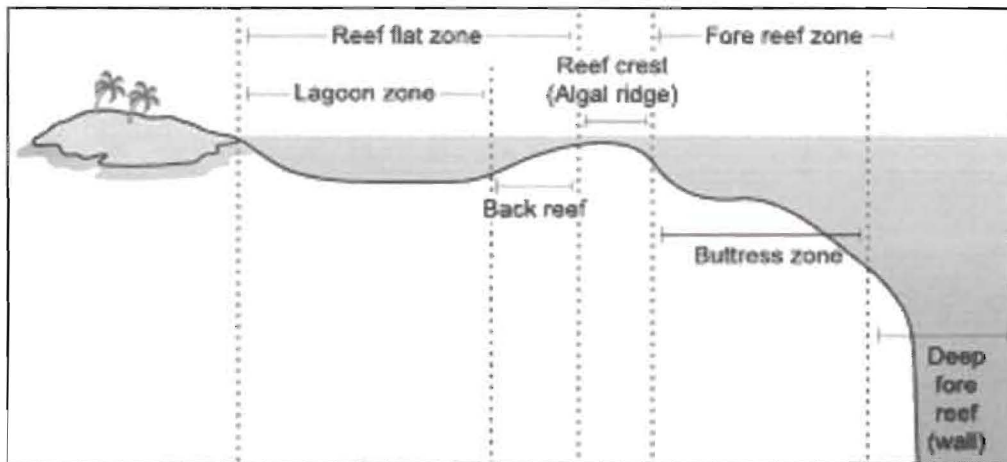
**Green Sea Turtle (Haggan)**

## 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 (near Australia). 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.*

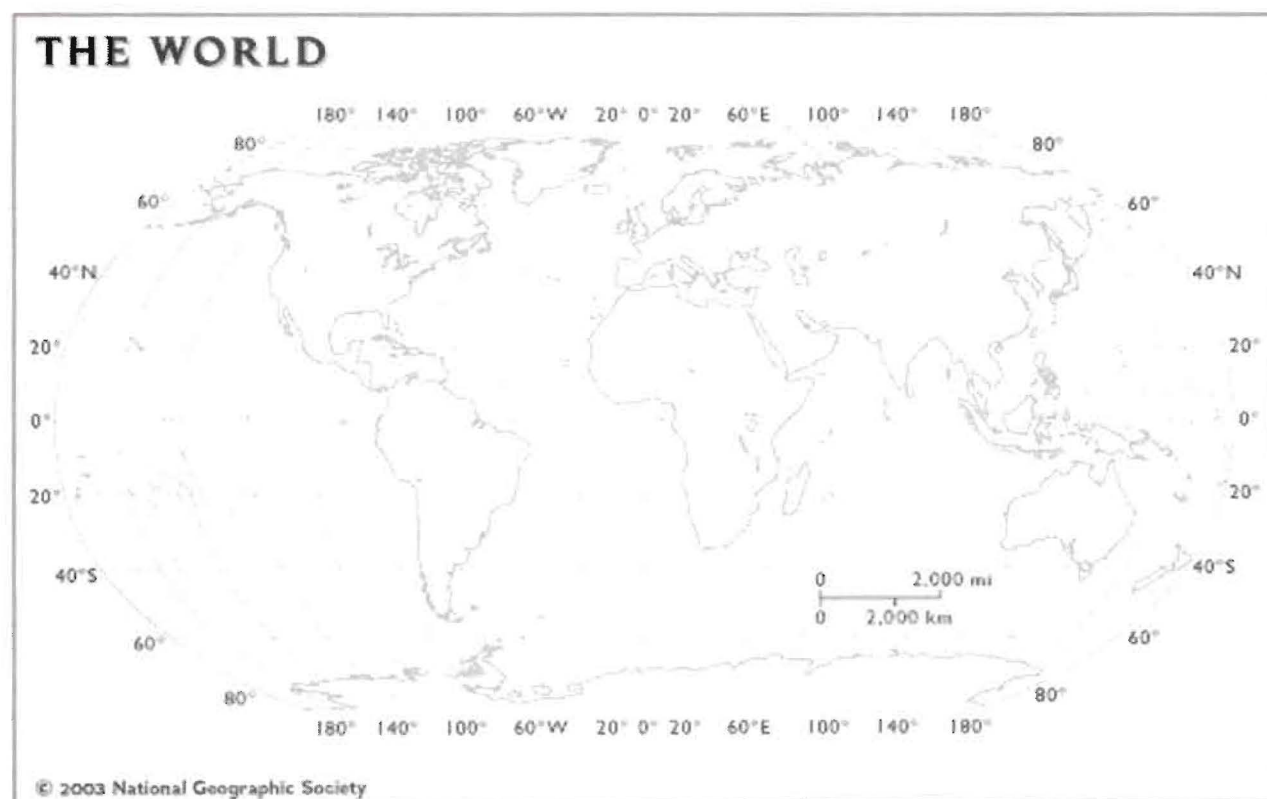
Each island is surrounded by a shallow **reef flat** or a **lagoon**. If you look out to where the waves are breaking, you will see the **reef crest**. It is a slightly raised area that has a lot of wave action. At low tide, the reef crest may be exposed. That is one reason why it is made up of mostly algae. Algae can produce a slime that protects 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.



NATIONAL GEOGRAPHIC marcopolo  
**XPEDITIONS**  
[www.nationalgeographic.com/xpeditions](http://www.nationalgeographic.com/xpeditions)

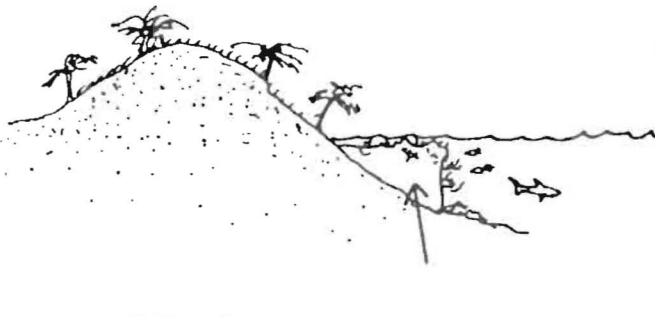
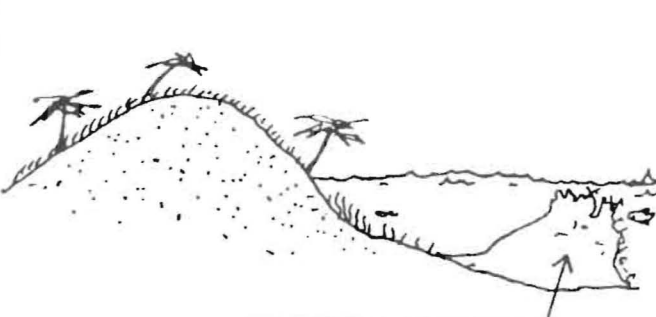
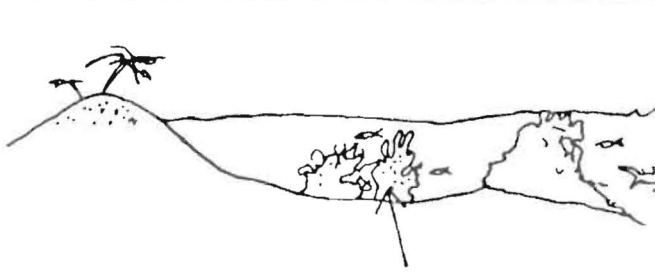
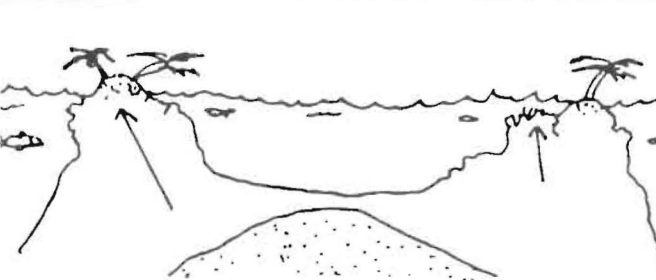


## Types of Coral Reefs

Coral Reefs formed over many, many years. They are only found in bodies of warm, clear, salty water. Many marine organisms contribute to the formation of coral reefs, but there are mainly two types: corals and calcareous algae. Corals are animals, and calcareous algae are plants. Both use the calcium from the seawater to create hard structures. Over time, these organisms die, but their calcium remains. Other organisms attach to these structures, sediments collect around the framework or the reef, and the reef builds.

Our islands were formed by coral reefs being created on and around volcanic mountains. These mountains slowly rise and sink, the sea level slowly rises and sinks, the mountains are eroded away, the reef grows, and different types of reefs are formed.

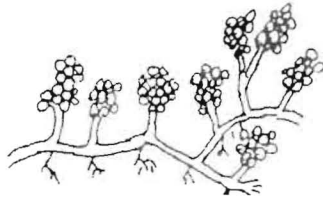
*Below are four types of reefs.*

	
<b>Fringing reefs</b> are directly connected to the land with no lagoon area between.	<b>Barrier reefs</b> are separated from the land by a calmer, open water area called a lagoon.
	
<b>Patch reefs</b> are usually found within lagoons, and are small, isolated reef formations.	<b>Atolls</b> are circular reefs surrounding a lagoon, with little or no land mass in the middle.

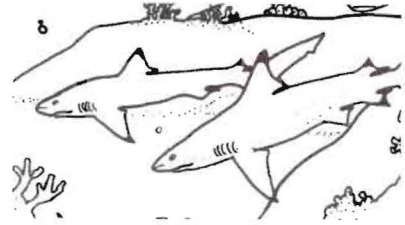
## Habitat Activity – Coral Reef Zones

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.

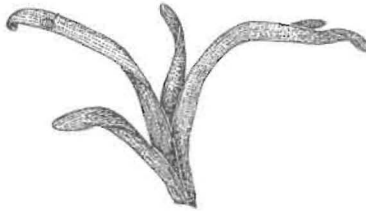
We are sea grapes, a type of green algae. We live in the shallow water near the beach and in lagoons.



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



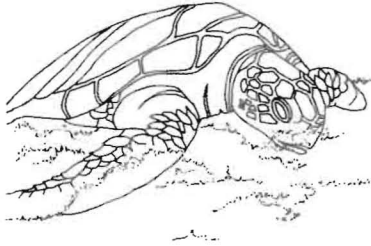
I am sea grass. I live in shallow water near the beach and in the lagoon. I need a lot of sunlight in order to grow.



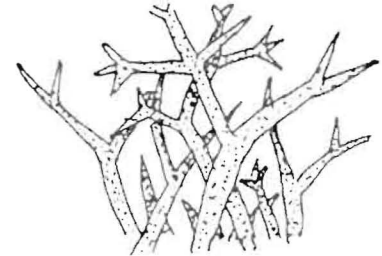
I am a sea cucumber. I crawl around on the sandy bottom area of the lagoon.



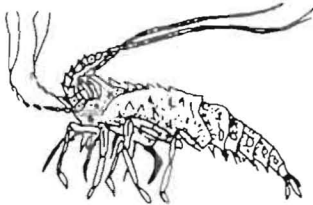
I am a green sea turtle. I feed on sea grass and algae. I live all over the reef. I lay my eggs up on the beach.



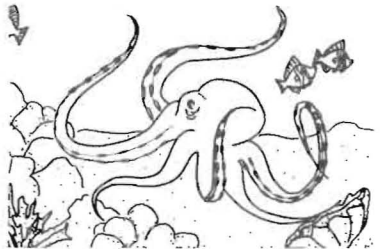
I am staghorn coral. I grow on the deep side of the reef crest near the reef slope.



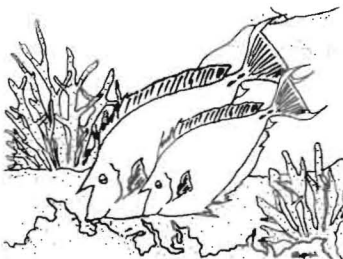
I am a lobster. I live on the bottom in the lagoon and on the deep reef.



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.

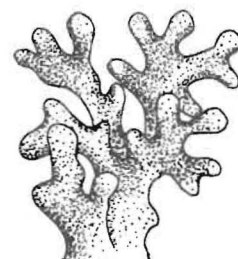
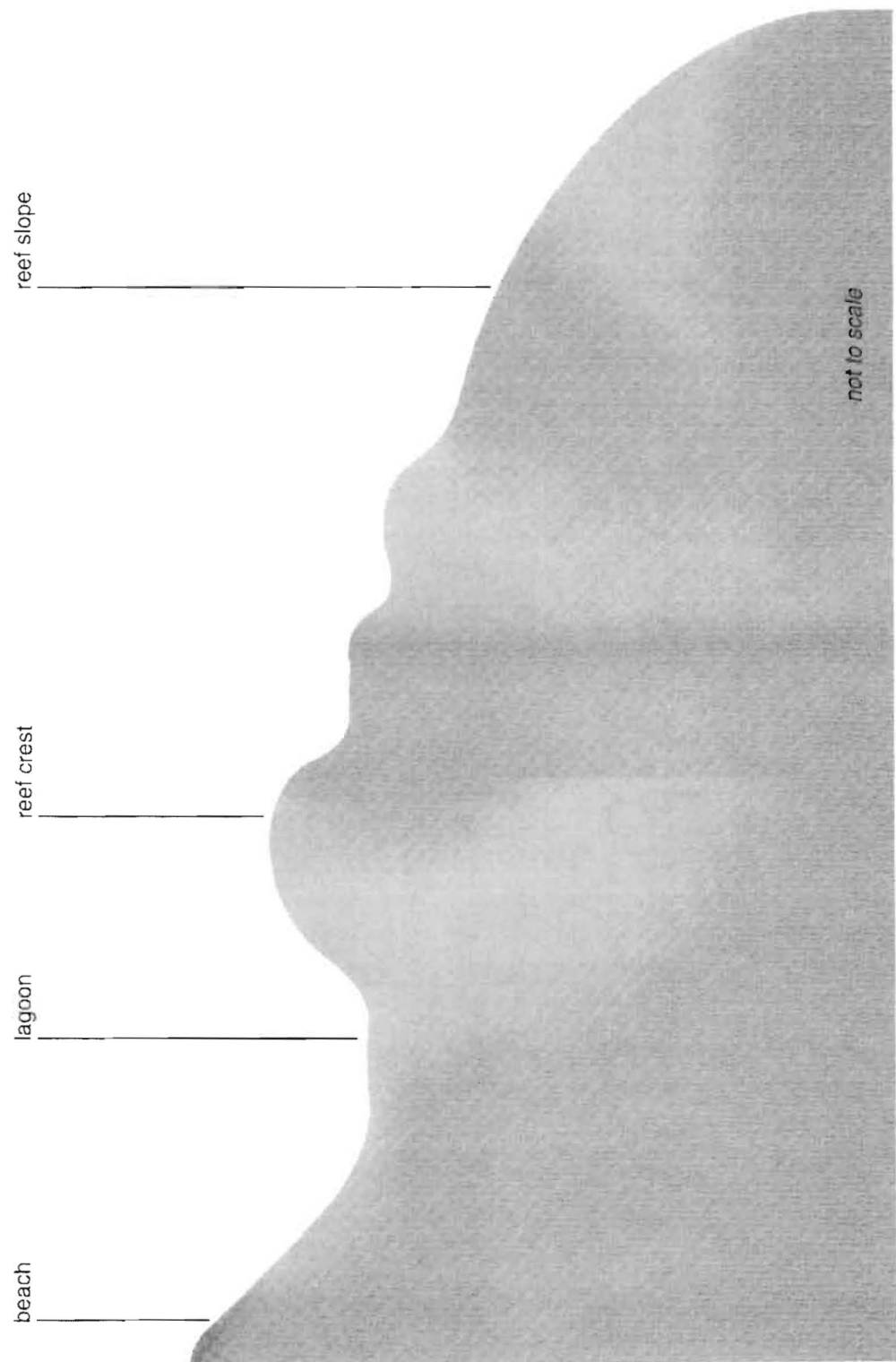


Image credits: sea grapes, staghorn coral, lobster, *Our Island Environment*, 1<sup>st</sup> edition, Book 6; sea grass © Nancy Vander Velde; sea cucumber, Stephen Francis, © Queensland Museum, Australia; reef shark, sea turtle, octopus, unicorn fish, *Let's Talk Fish and Wildlife*, DAWR; finger coral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

## Coral Reef Zones



*From National Geographic Atlas of the Ocean*

## 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 and list two animals that are scavengers.

**Objective 3:** Students will list at least two reasons why humans are not considered filter feeders and 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 (slowly) through their straw until their plate is clean.

*Caution:* Avoid the seeds so they don't clog the straw. Older children should not use their hands to move the straw across the plate. Be careful not to inhale crumbs.

**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 popcorn, 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 popcorn 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.)

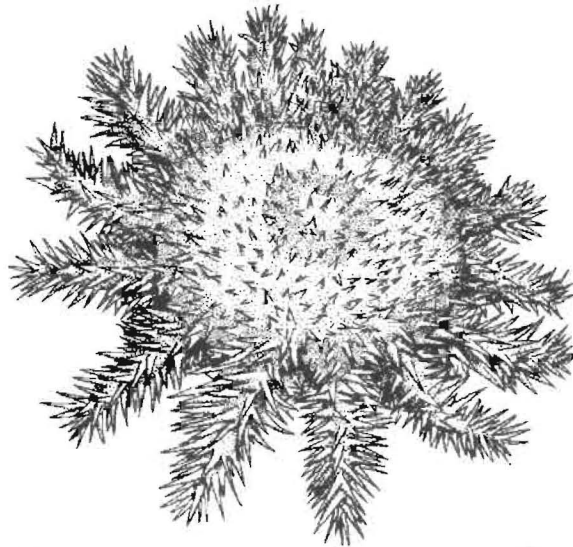
Students can move their arms (but cannot move their body) up and down /back and forth, but cannot grab popcorn that is beyond their grasp. They can either eat any popcorn they catch or hold and count it (i.e. on a paper plate) in order to see who caught the most food. To prevent choking, discourage students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

## The Battle on the Bottom of the Sea

by Jenna McDugald



The war was on. On one side, the sharp and prickly Crown of Thorns Starfish could be seen polishing their spikes for the battle. On the other side, the firm and determined hard coral colonies were busy preparing themselves for war.

The hard coral elders silenced all the younger coral polyps when they saw the size of the Crown of Thorns starfish army. There were thousands of those monstrous things. What could they do to protect themselves?

"We have stinging cells called nematocysts (nem-a-to-cysts)," said the elder corals, "we will easily protect ourselves from those starving starfish. They won't eat us! You wait and see how powerful we are," bragged the elders.

The younger coral children didn't look so sure.

"But, there are so many starfish," said a young coral child. "How will we sting them all with our ne-mat-o-tists or what ever you call our stinging cells?"

"Nem-a-to-cysts is what our stinging cells are called," replied an elder. "Now don't you worry. We have always survived our battle with the starfish in the past. That is why we are still here today."

Before the corals could finish their discussion, the starving starfish began to move slowly but steadily toward them.

The fastest Crown of Thorns Starfish was a starfish named Frenzy. Frenzy reached the coral colonies first. He decided to attach himself to a Brain Coral named Smarty. Frenzy crawled up on Smarty. All the other corals laughed at him. They thought Frenzy would be stung to death by Smarty's stinging cells.

To Smarty and his other coral friends' surprise, Frenzy was not affected by his stinging cells. Frenzy did not get sick, and he did not die. The other Crown of Thorns Starfish cheered and cheered. They decided to move their army forward and attack all of the hard coral colonies for as far as they could see. The Finger Corals were attacked. The other Brain Corals like Smarty were attacked. Even the Plate Corals were attacked!



"What will we do?" cried the young corals to their parents and elders. "The Crown of Thorns Starfish are spitting out their stomachs on us. The yucky acid in their stomachs is melting off layers of our bodies. Then they slurp us up!"

"Don't worry," said Smarty. "The Crown of Thorns starfish are our predators. They are supposed to try and eat us. We are their prey."

"What?" cried the young corals. "Is this all you have to tell us? Have you gone mad? Have you lost your mind? You're telling us they are our predators and we are their prey! So, are we supposed to just sit here and get slurped up by these prickly monsters?"

"Now, now," said Smarty, "calm down. With all of this screaming and yelling, I have not had a chance to tell you about our helpers. Calm yourselves, my coral children, and listen to the good news."

All was quiet on the sea floor as the corals waited to hear Smarty's good news.

"The Crown of Thorns Starfish have enemies too," Smarty told the other corals. "In fact, the starfish have three enemies: one big enemy, one medium-sized enemy, and one small enemy. These enemies are the Crown of Thorns' predators. Predators eat their prey!"

"Tell us, tell us," cried the young corals. "What is their big enemy?"

"The Crown of Thorns' big enemy," explained Smarty, "is the Humphead Wrasse (Tanguisson). When this fish grows up, it can weigh as much as four hundred pounds. Good ol' Humphead Wrasses love to eat Crown of Thorns Starfish like Frenzy and his army."

"Wow," said the young corals. "We understand. This means that Frenzy and his friends are the Humphead Wrasses' prey!"

The young coral polyps were so excited at having such a big friend to protect them, they could barely keep themselves rooted to the sea bottom.

"What other predators do the Crown of Thorns Starfish have?" demanded the young corals in unison. "What about the medium-sized predator? Tell us about the small predator, too."

"Yes, yes," sighed Smarty, "quiet down so I can continue my explanation."

The young corals quickly quieted down as they saw that Smarty was growing weak from Frenzy being on his back.

"Their medium sized enemy is a Triton's Trumpet sea snail. This soft-bodied creature also eats the Crown of Thorns Starfish. This creature, like the Humphead Wrasse, is immune to the Crown of Thorns' poison."

"What does immune mean?" asked a teenage coral who had been quite busy talking to her friends until now.

"Immune," gasped Brainy, "means that the poison in the Crown of Thorns Starfish will not hurt them."

Again, the young corals felt relieved. Now they could count on the Humphead Wrasse and the Triton's Trumpet sea snail to save them from Frenzy and his army. Now the Crown of Thorns Starfish had two kinds of predators trying to eat them!

"Okay Brainy," the young corals chimed. "There's still one more predator that will help eat the Crown of Thorns starfish. Tell us about the small predator. What can he do to help us?"

"He and she," corrected Smarty. "There are male and female Harlequin Shrimp on our side as well. These shrimp are tiny, but they still can help us. They bite off the Crown of Thorn's spikes to make them weak. We help the Harlequin Shrimp as well."

We offer them our colonies as their homes. They live and crawl around on us and eat some of our leftover food."

"So, you mean we help each other?" asked the young corals.

"Yes, that's what I mean," replied Brainy. "The Harlequin Shrimp do their best to make the Crown of Thorns Starfish go away, and the hard coral provide the Harlequin Shrimp with a cozy home and plenty of good food. This type of relationship between two kinds of living things is called symbiosis."

"Sym-bi-o-sis, sym-bi-o-sis," chanted the young corals in excitement. "We help them and they help us!"

Suddenly, all of the excitement was interrupted by the sounds of the warning bells echoing through the waters. By this time, Frenzy and his army had made their way straight down the middle of the coral colonies' homeland. You could see the clear, white path they left behind.

"They have bleached us by melting away all our color with their yucky stomachs!" the middle-aged corals exclaimed. "Now the ugly green algae will grow on us. We will no longer have our beautiful colors, and soon we will die."

The corals on the left and on the right side of the path Frenzy and his army had made were completely stunned.

"But, where are our friends?" inquired a coral head sitting near the path where his bleached and dying friends lay. "The Humphead Wrasse, the Triton's Trumpet sea snail, and the Harlequin Shrimp were supposed to help us."

"Why haven't they helped us?" pleaded all the corals that still had the strength to speak? They were supposed to eat the Crown of Thorns Starfish. After all, those starfish are their prey!"

Brainy, the smartest of the coral elders, had already been too damaged by Frenzy to speak, so his cousin Stacy Staghorn took over for him.

"The people have taken too many Humphead Wrasses while they were fishing, said Stacy. Sadly, there are not enough to protect us any more. Also, the Triton's Trumpet snail has been over-harvested by humans. They like to sell them as souvenirs. The Triton's Trumpet sea snail and the Harlequin Shrimp do their best, but there are too many Crown of Thorns starfish in Frenzy's army."

"So, you mean that there are not enough predators to eat enough of the starfish?" squeaked a kindergarten coral.

"That's what I mean," admitted Stacy Staghorn. "The Crown of Thorns Starfish's army has grown far too large and now the balance of the sea has been jeopardized."

"What can we do?" begged the young corals. "We don't want to be bleached. We don't want green algae to grow on us, and we don't want to die!"

"The only thing we can do is to have hope," explained Stacy Staghorn in a soothing voice. "We must hope the divers see us down here and miss our beautiful colors. Then maybe they will help us battle the Crown of Thorns Starfish. We must hope the fishermen leave some of the Humphead Wrasses behind to protect us from the Crown of Thorns Starfish. Finally, we must hope that the message of our destruction is spread throughout the dry part of the earth so that people will help restore the natural balance of the sea."



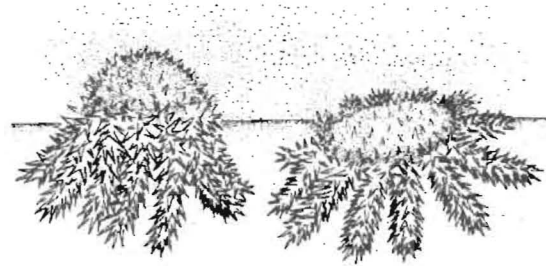
Battle on the Bottom of the Sea  
**Review Questions**

1. In this story, what kind of animal was Smarty?
2. In this story, what kind of animal was Frenzy?
3. What is the prey of the Crown of Thorns starfish?
4. Name the three predators of the Crown of Thorns starfish.
5. What are nematocysts?
6. The Crown of Thorns starfish has predators. Corals have nematocysts to help protect themselves. Why isn't the coral totally protected from the Crown of Thorns starfish?
7. Stacy Staghorn said to the younger corals "The only thing we can do is to have hope." State at least one reason why the corals should have hope.

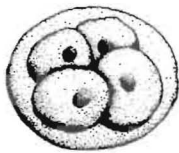
## Life Cycle of the Crown of Thorns Starfish

Male and female starfish spawn by getting into arching positions and releasing their eggs and sperm into the water from the surface of their skin. Females can release up to 100 million eggs in one year.

### Adults Spawning



Eggs and sperm meet in the water and form embryos. Embryos become larvae. The tiny larvae are washed away by ocean currents. They drift in the ocean as part of the zooplankton (animal plankton). They feed on phytoplankton (plant plankton) for 14 to 28 days.

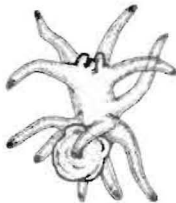


Embryo

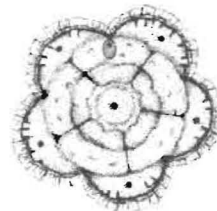


Larvae

Between 14 and 28 days, the larvae become settlers on the coral reef. The settlers feed on coralline algae (hard algae). The settlers soon change into small starfish with five arms. These young juvenile starfish are food for crabs, shrimp, worms, and fish.

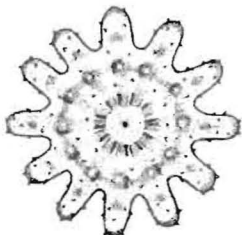


Settler

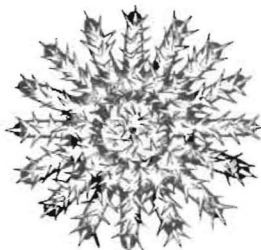


Young Juvenile

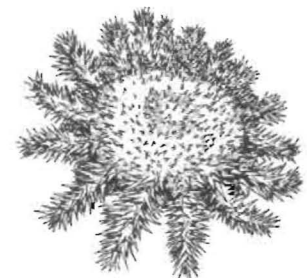
As the young juvenile grows into a juvenile, it gradually adds more arms. At about 4 to 6 months, the juveniles stop eating algae and start to feed on coral. Before the starfish starts to eat coral, it is only the size of a nickel. In just about 2 years, it will grow to the size of a dinner plate, (25 to 35cm in diameter)!



Young Juvenile



Older Juvenile



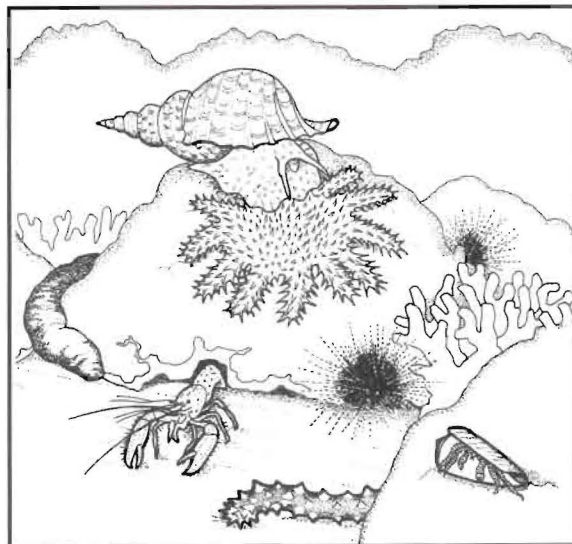
Adult

Adults have many spines and contain poison. They have very few predators. However, the predators are no match for their numbers.

*Drawings by Stephen Francis, © Queensland Museum, Australia; Information from Tropical Topics*

### Review Questions – Life Cycle

1. Female Crown of Thorns starfish begin to spawn at age 3. They can live and reproduce until they are about 10 years old. How many eggs can a female produce in her lifetime?
2. List the stages in the life cycle of the Crown of Thorns starfish.
3. What are the predators of the juvenile Crown of Thorns starfish?
4. Sometimes humans dump fertilizers and sewage into the ocean. These contain nutrients and help algae to grow. What effect can this have on the Crown of Thorns starfish population? *Hint: What do the juveniles eat?*
5. Why should you be concerned if there are too many Crown of Thorns starfish on the coral reefs in the CNMI? *Hint: What do the adult Crown of Thorns starfish eat?*
6. Two of the predators of the Crown of Thorns starfish are the Triton's Trumpet snail and the Humphead Wrasse (Tanguisson). Many snails have been collected and many wrasses have been caught by fishermen. What effect can this have on the Crown of Thorns starfish population?



*Coral Reef Drawing from Marine Activity Workbook, used with permission*



## Seabirds of the CNMI

Seabirds feed by diving into the water or by skimming the surface of the ocean for food. They feed on fish, squid, and crustaceans. Some seabirds fly above schools of tuna because tuna force the smaller fish to the surface. Some seabirds, like the Great frigatebirds steal fish from other birds. Seabirds spend much of their time out at sea, but they all need to come to shore to breed.

Seabirds may actually look like they have runny noses but that is actually salt water dripping. Seabirds have a special gland that gets rid of excess salt. It is located at the base of their eyes.

**Terns** - White terns have completely white bodies except for the black rings around their eyes. Another name that is sometimes used for this bird is the fairy tern. They live on beaches and in forests near the coasts. Sooty terns are white underneath and black on top of their bodies. They live along the coasts.

**Boobies** - There are three different species of boobies in the CNMI. The Brown booby is brown and has a white breast. The Red-footed booby is mostly white with brown wings and red feet. The Masked booby is the largest of all of the boobies. It is white with brown or black edges on its wings.

**Tropicbirds** - White-tailed tropicbirds are white with black markings and yellow bills. They have two, long white tail feathers. Red-tailed tropicbirds are all white with red beaks. They have two, long red tail feathers.

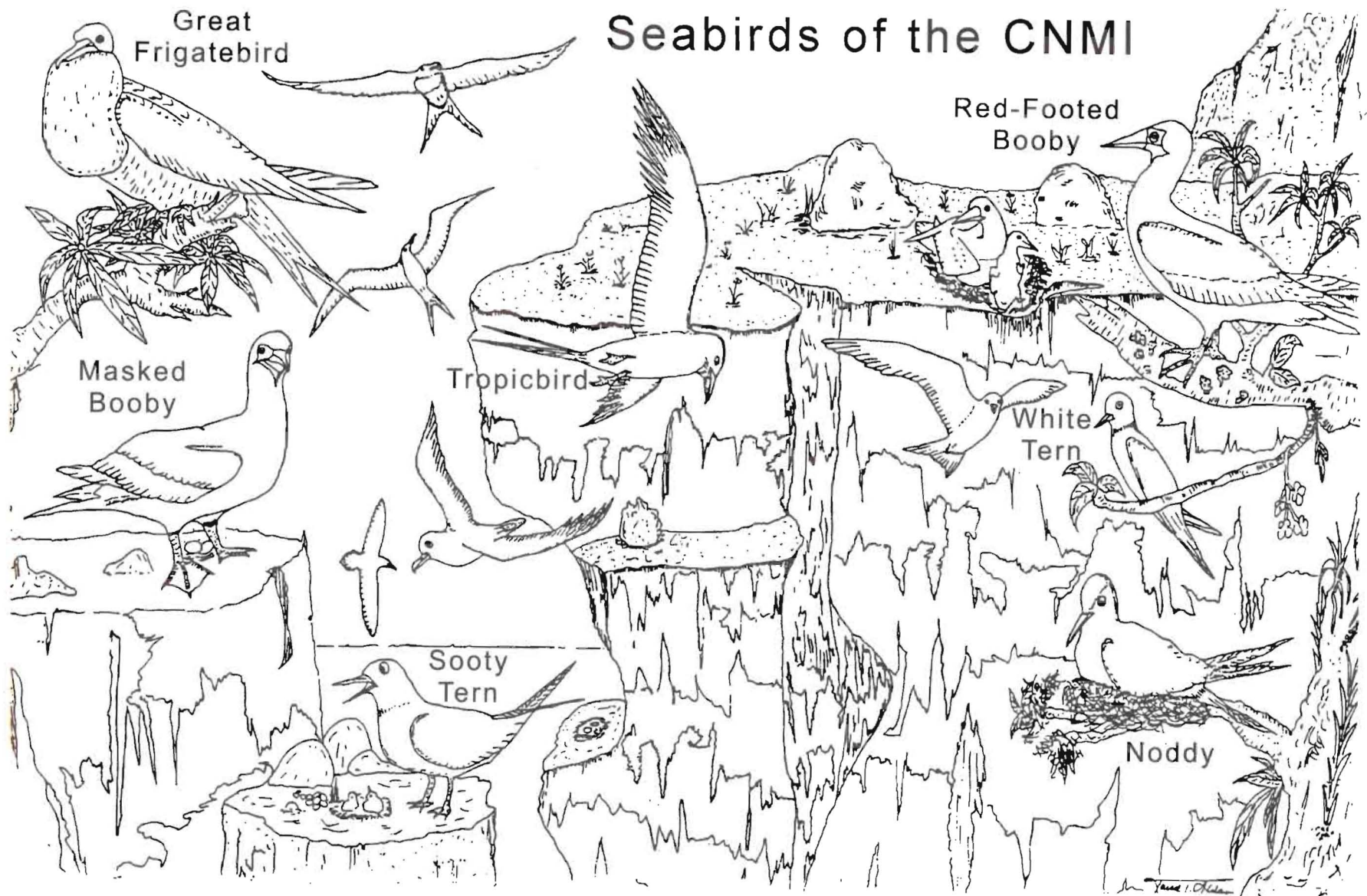
**Noddies** - Noddies are dark seabirds with light foreheads and crowns. The black noddy and the brown noddy look very much alike. The black noddy is slightly smaller. The black noddy also has a longer, thinner bill.

**Frigatebirds** – The Great frigatebird is a beautiful bird in flight. You may see it soaring in the air for long periods. The male is black with an inflatable red throat pouch. The female is black with a white breast. Frigatebirds are also called man-o-war birds.

Common Name	Chamorro	Carolinian
White Tern	Chunge'	Geeghi, Ghiyeghi
Sooty Tern	Giree'girak	Meshe'gua
Brown Booby	Lu'ao	O'mwo'o'bwesch
Red-footed booby	Lu'ao talisai	Amwo
Masked booby	Lu'ao	
White-tailed tropicbird	Fagpi-apa'ka	Su'ghu'bwesch
Red-tailed tropicbird	Fagpi	
Brown Noddy	Fahang dankolo	Sche'e'lap
Black Noddy	Fahang dikike'	Rees
Frigatebird	Paya'ya	Asaf



# Seabirds of the CNMI



## Label the Seabirds

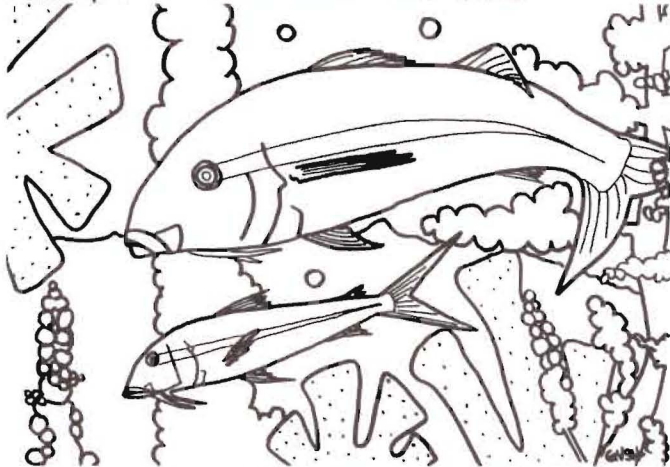




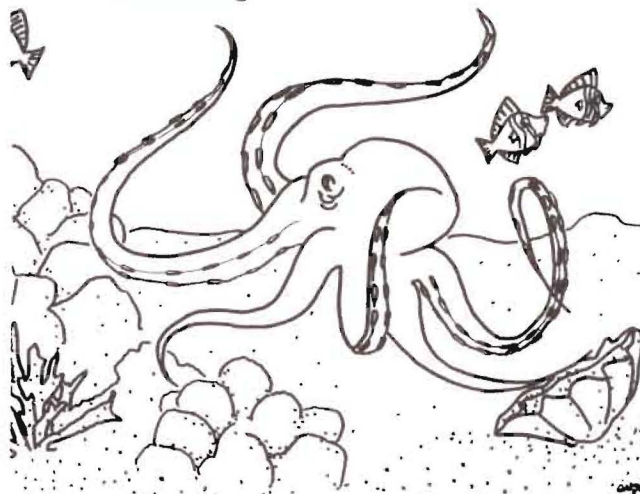
## Adaptations

An adaptation is a special feature of an organism that helps it to live. Adaptations are different, depending on the environment that the animal lives in.

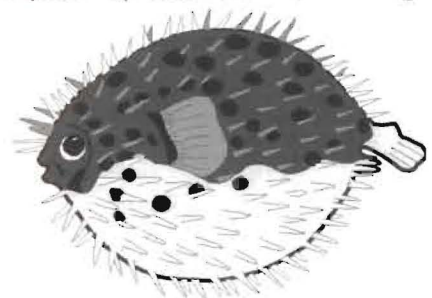
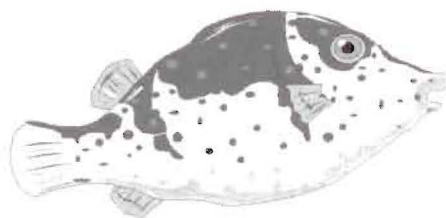
Goatfishes (Salmoniti) have a pair of long “chin whiskers”, called barbels. They use these barbels to find shrimp and small crabs in the sand.



An octopus (Gamson) has long arms with suckers to help it find and catch its food. An octopus can also change the color and texture of its skin to blend in with its surroundings. This is called camouflage.

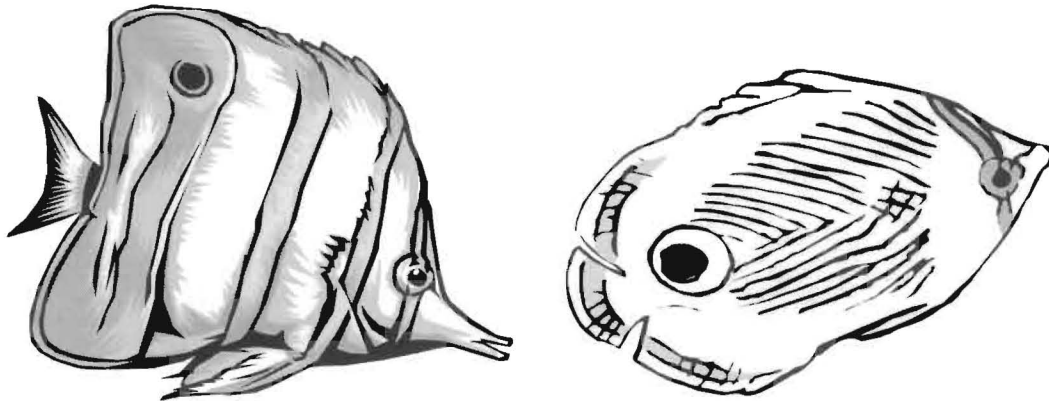


The pufferfish (Botati) can blow up like a balloon. They suck water into a special sac near their stomach. If a predator tries to eat them, they can “puff” up with water, making themselves too large to swallow. Some pufferfishes have sharp spines on their skin while others have poison skin or poison in their meat.



Some butterfly fishes (Ababang) have long, pointed snouts that allow them to feed on the tube feet of sea urchins and other food that is hard to reach.

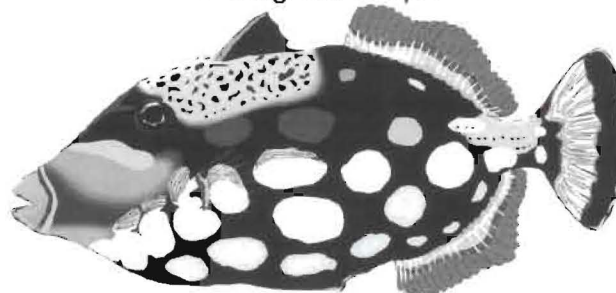
A band may disguise their true eye or they may have false eyespots. That is a spot on their backside that may confuse predators. Instead of attacking the real eye, the predator may attack the false eye, allowing the butterfly fish to escape in the opposite direction.



Spots and stripes help break up the body shape of some fishes. This type of adaptation is called disruptive coloration. Disruptive coloration may help conceal fish against certain backgrounds on a coral reef. This helps the fish hide from predators.



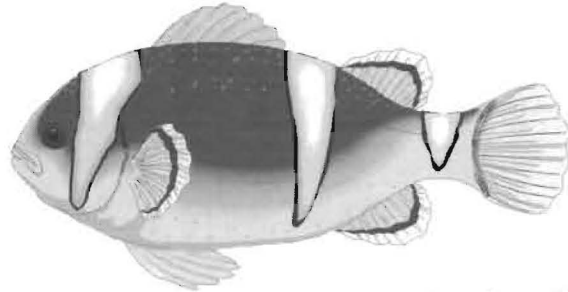
*Young Sweetlips*



*Clown Triggerfish*



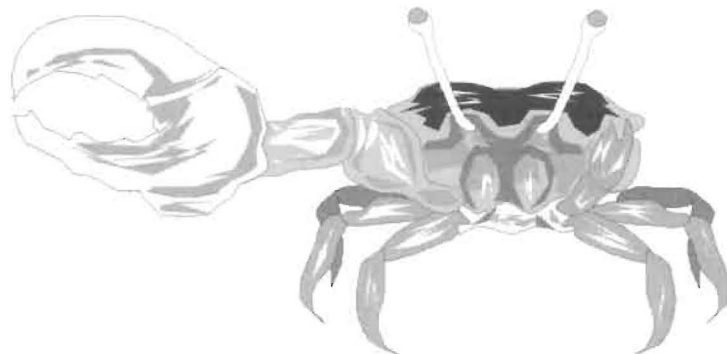
Many coral reef fishes are brightly colored. Different patterns help fish recognize each other. Some clown fish are bright orange with white or blue stripes. This bright color may also serve as a warning. Clownfish live with sea anemones that can sting other fish.



Some cone snails produce a painful or deadly sting. They have a long, muscular proboscis with a sharp tooth (radula) on the end. The radula is where the spear is located. The harpoon-like spear has a lethal poison. They use it to catch food items such as small fishes. Never pick up a cone shell with your bare hands.

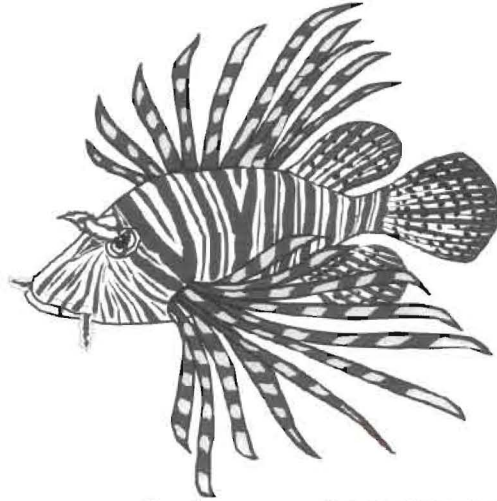


Male fiddler crabs have one claw that is larger than the other. Male fiddler crabs use their large claw to fight other males while protecting their territory.



Animals that are **nocturnal** are more active at night than in the day. Examples of nocturnal coral reef fish are the lionfish, the moray eel, and the squirrelfish.

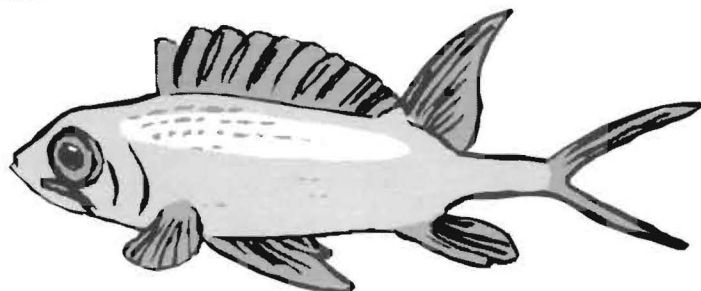
The lionfish is well protected. It has spines that can inject poison into predators. It is brightly colored like the clown fish. The red/orange color may also serve as a warning to potential predators.



Moray eels (Hakmang) have an excellent sense of smell to help them find and catch their prey. They have sharp teeth that they use to catch smaller fish.



Squirrelfish have very large eyes to help them see better at night when there is very little light in the ocean.

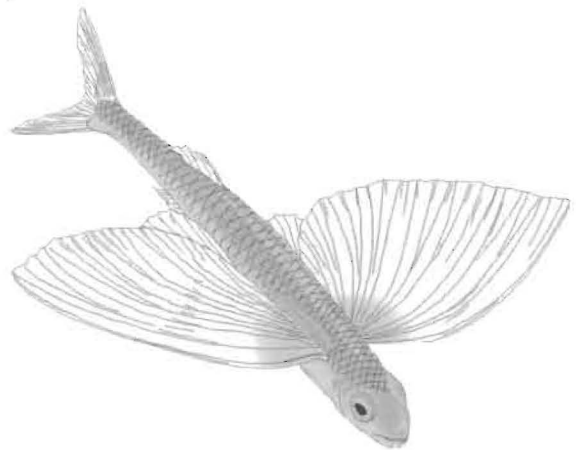


Open ocean animals are called **pelagic**. Many pelagic animals have dark backs and light bellies for protection from predators. This adaptation is called countershading. If they are viewed from above, their dark backs blend in with the darkness of the ocean. If viewed from below, their light bellies blend in with the light coming from the surface.



**Marlin (Batto)**

Flying fish can actually glide over the surface of the water for several seconds at a time to avoid predators.

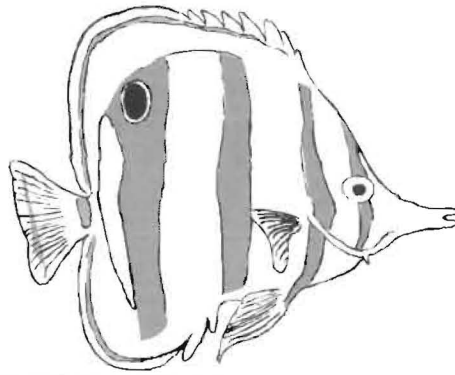


Jellyfishes are animals that float around in the ocean. They have stinging cells on their tentacles to help them catch smaller zooplankton (tiny floating animals).



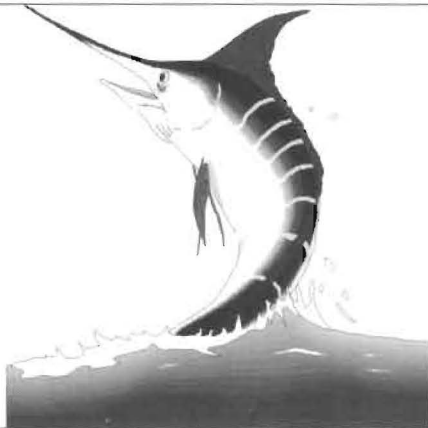
## Animal Adaptations

Name each animal. Then, make a list of the adaptations that the animal has.



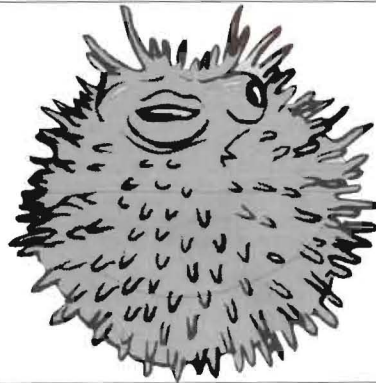
Name

Adaptations



Name

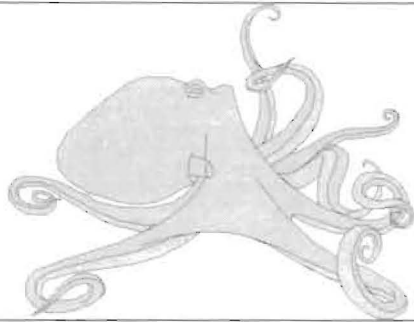
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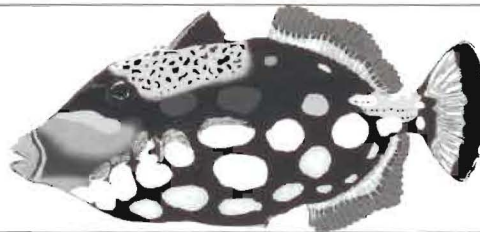
Adaptations





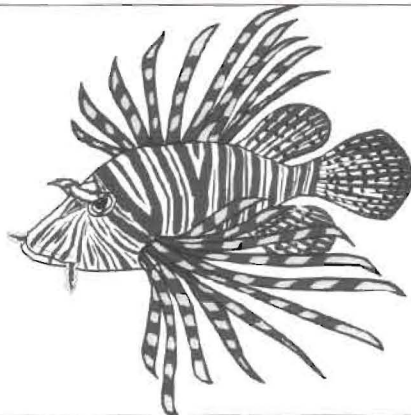
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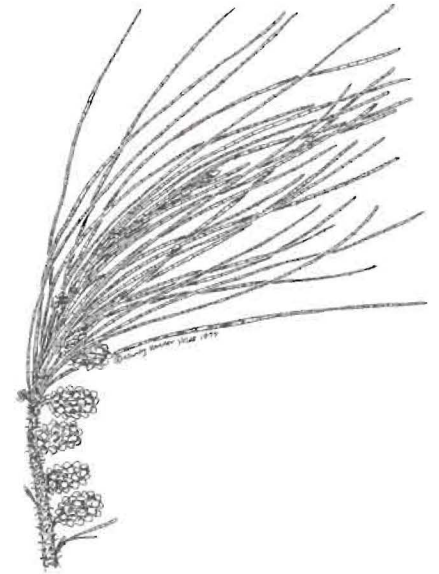
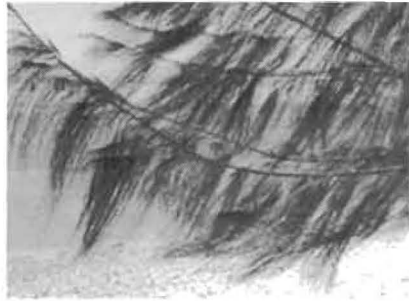


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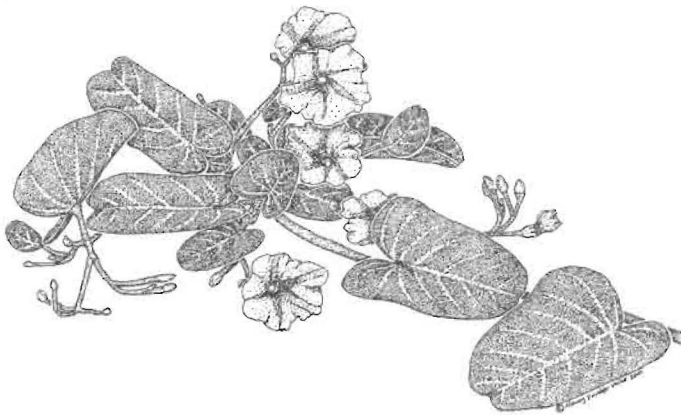
Adaptations

## Adaptations of Beach Plants

The Australian pine or ironwood tree (Gagu, Weighu) lives on the beach. It has a flexible trunk that can bend if there are strong winds. It is not really a pine tree. The parts that look like needles are actually thin branchlets with tiny leaves.



The Beach morning glory (Alahai tasi, Arabwal) is a vine that grows along the sandy beach and rocky shores. It sends out a deep taproot into the sand. If conditions are harsh and most of the plant on the surface dies, it will grow back again because the deep root keeps it alive. The leaves are used for medicinal purposes.



The Half-flower (Nanaso, Llat) is a plant that grows along the beach. It can also live in other areas where there is very strong sunlight. This plant has very strong roots and flexible branches. In very strong winds, the Half-flower may lose its branches but its strong roots keep the plant from being washed away. The fruits of the Half-flower are salt-tolerant and buoyant (they float). The fruits contain a juice that islanders sometimes use as an eyewash.



*Artwork by Nancy Vander Velde, photos by Kimberly Smith*

## **Adaptations – Short Answer Questions**

1. What is an adaptation?
2. One adaptation of the octopus is camouflage. What is camouflage? List at least two different animals that use camouflage. The animals can live on the land or in the ocean.
3. What special adaptations do nocturnal sea animals have?
4. Name at least one nocturnal land animal. Then, list at least two adaptations of that animal.
5. What special adaptations do pelagic sea animals have?
6. What adaptations do beach plants have that help them to survive in strong winds and storms?
7. What adaptations do you have that help you survive?
8. Draw a fish below. Then, color in the fish using a disruptive coloration pattern.

## Why Flounder Fish Are Flat



A lobster and a flounder fish have certain characteristics. A lobster has long feelers, and a flounder is a flat fish. At one time, the flounder was shaped like any other fish, but became flattened by an angry lobster.

The two sea creatures were at one time very good friends and would often play together. One day, the lobster suggested to the flounder that they play a game of hide-and-seek. The flounder agreed, and the lobster was the first in the game to try and hide. He crawled into a hole in the coral reef. His body was in the hole but his long feelers remained outside of the hole. When the flounder went to search for his friend, the lobster was very easy to find, and the flounder won the first game.

Then, it was the flounder's turn to hide. Rather than swim away and conceal himself, he stirred up a sand cloud on the ocean floor next to the lobster, and hid in the cloud while standing close to his friend. The lobster could see nothing because of the swirling sand, and when the flounder teased the lobster while standing very close to him, and the lobster could not see the flounder, it made the lobster very angry because he had been tricked.

When the sand settled, the lobster stomped on the flounder so hard that the fish was flattened out. He then poked out the eye of the flounder and stuck it back on the top of the flounder's head.

Now, flounders in the ocean are very hard to see because they lie flat on the sea floor's sand. And the lobsters are quite easy to find because they still have not learned how to conceal their feelers when hiding in the coral rocks.

*Reprinted from Never and Always – Micronesian Legends, Fables and Folklore through the courtesy of Gene Ashby and the students of the Community College of Micronesia.*



### **Review Questions - Why Flounder Fish Are Flat**

1. Who were the two friends in this story?
2. What game did they decide to play?
3. Where did the lobster hide?
4. Why was the lobster easy to find?
5. How did the flounder hide or conceal itself?
6. Why did the lobster become angry?
7. According to this legend, why are flounders hard to see today?
8. According to this legend, why are lobsters easy to find?
9. What part of this story can't be true? Explain.
10. Animals have adaptations, or characteristics that help them to survive. Explain why the flounder fish may be flat. In other words, how would being flat help the flounder fish survive? What other adaptations does a flounder fish have?

**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***

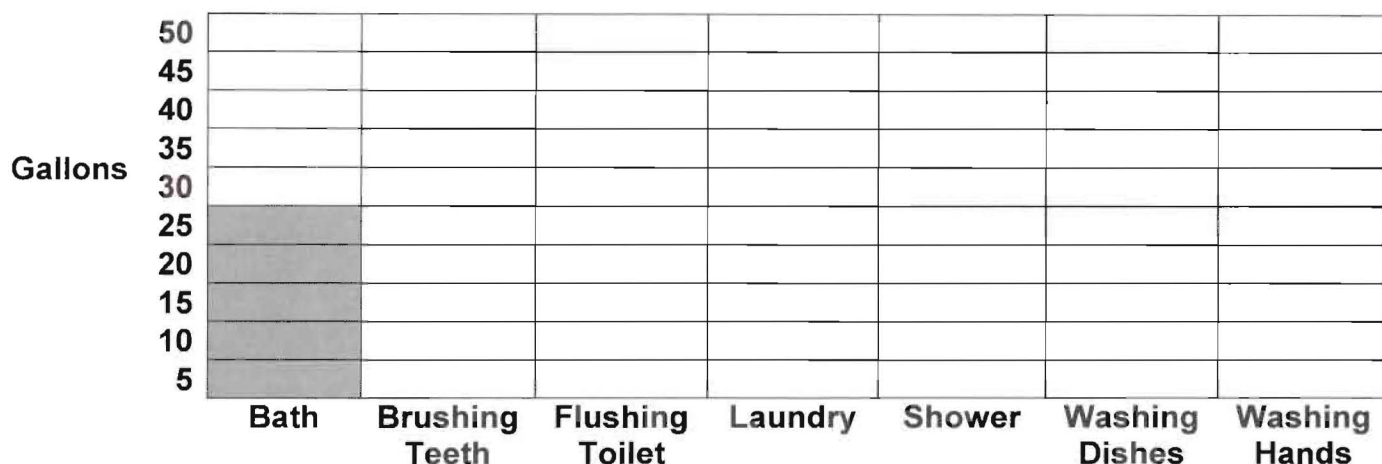
1. How did the brown treesnakes get to Guam?
2. What happen to the birds after the brown treesnakes got to Guam?
3. Is it possible that the same thing that happened on Guam could happen on Saipan, Tinian and Rota?
4. How can we prevent brown treesnakes from coming to the CNMI?

*Brown treesnake drawing used with permission from the USGS.*

## Activity - How Much Water?

Here is a list of ways that you and your family use water. Use the following information to complete the graph below. Fill in one block for every 5 gallons of water used. The first one is completed for you.

Bath	25 gallons
Brushing Teeth (2 times)	5 gallons
Flushing Toilet	5 gallons
Laundry (1 load)	40 gallons
Shower (5 minutes)	50 gallons
Washing Dishes	20 gallons
Washing Hands	5 gallons



### Questions

On average, you flush the toilet 5 times each day. How much water do you use to flush the toilet each day?

How many gallons of water would be used if you took a 10-minute shower?

If you turn off the water when you are brushing your teeth, you would use less than 1 gallon of water to brush your teeth two times. What other kinds of things could you do to conserve water?

How many cups of water do you drink per day?

There are 16 cups in one gallon. How long does it take you to drink a gallon of water?

If you do four loads of laundry on Saturday, how much water will you use (for laundry only)?



## Family Water Usage

Keep track of how much water you and your family uses in one day. You will have to do some calculations to estimate the amount of water that you and your family members use per day. For example, if you take a 10-minute shower instead of a 5 minute shower, you will use 100 gallons instead of 50 gallons. Do your best at estimating.

Number of Family Members in Household \_\_\_\_\_

Water Used For...	Number of Times per Day	Estimated Amount	Total Gallons
Bath		25 gallons	
Brushing Teeth (2 times)		5 gallons	
Flushing Toilet		5 gallons	
Laundry (1 load)		40 gallons	
Shower (5 minutes)		50 gallons	
Washing Dishes		20 gallons	
Washing Hands		5 gallons	
Other			
Total			

1. What are other uses of water that were not on the list above? For example, washing a car is not done every day, but it does use a lot of water.
2. How much water did you and your family use in one day?
3. Estimate how much you and your family would use in one week. Do this by multiplying your total by 7 (days/week).
4. Estimate how much water that you and your family use in one year.
5. What do you or any of your family members do to help conserve water? For example, not doing laundry until you have a full load to wash.
6. What other types of things could you and your family do to conserve water?

## References

- Carter, Ken. 2003. *Cone Snails*. [http://oceanography.asu.edu/project\\_ken.htm](http://oceanography.asu.edu/project_ken.htm)
- Col, Jeananda. 2003. *Enchanted Learning*. <http://www.EnchantedLearning.com>
- Commonwealth of the Northern Marianas Public School System. 2002. *K-12 Science Standards and Benchmarks*. CNMI.
- Department of Agriculture, Division of Aquatic and Natural Resources. 2001. *Let's Talk Fish and Wildlife*. Mangilao, GU. DAWR.
- Earle, Sylvia A. 2001. *National Geographic Atlas of the Ocean. Coral Reefs, Learning Activity: Cities in the Sea*. Washington D.C. National Geographic Society.
- Falls of the Ohio State Park, <http://www.fallsoftheohio.org/education/filter-feeders.html>
- Furey, John and Contributing Authors. 2003. *Island Ecology & Resource Management, Commonwealth of the Northern Mariana Islands*. CNMI. Coastal Resource Management Program, Public School System, and Northern Marianas College. *Note*: this book is awaiting publication.
- National Oceanic and Atmospheric Association (NOAA). 2002. *What are Corals and Coral Reefs?* [http://www.coris.noaa.gov/about/what\\_are/what\\_are.html](http://www.coris.noaa.gov/about/what_are/what_are.html)
- Quinn, Michael and Lee, Larry. *Our Island Environment*, 1991. CNMI Coastal Resources Office.
- University of Hawaii Sea Grant College Program. 2000. *Marine Activity Workbook*. UNIH-SEAGRANT-MR-99-02. NOAA.
- U.S. Fish and Wildlife Service. 2002. *Kid's Corner, Endangered Species - Hey, Teachers!* <http://endangered.fws.gov/kids/heyteach.htm>

