



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 6
CNMI DFW, 2003

This project was funded by a grant under the Wildlife Conservation and Restoration Program from the U.S. Fish and Wildlife Service, administered by the CNMI Division of Fish and Wildlife, Department of Lands and Natural Resources. The *Our Island Environment* series was revised and compiled by Kimberly Smith, Wildlife Education Specialist, CNMI DFW.

The original *Our Island Environment* series was produced in 1991 in Saipan, CNMI. Funding for that project was provided by a grant from the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce through the CNMI Coastal Resource Management Office. The CNMI DFW would like to acknowledge the work of Michael Quinn (text and art), Larry Lee (text and art), and David Aldan (art). Some of their work was reproduced in this series.

For further information contact CNMI Division of Fish and Wildlife, DLNR, Lower Base, P.O. Box 10007, Saipan, MP 96950; 670-664-6000.

Table of Contents

Standards and Benchmarks (Grade 6).....	4
The CNMI.....	5
Taxonomy.....	6
Activity: Classifying Objects.....	8
Classifying Objects – Student Worksheet.....	9
Classifying Objects – Handout 1.....	10
Classifying Objects – Handout 2.....	11
The Five Kingdoms.....	12
Examples of CNMI Plants (Kingdom Plantae).....	14
Kingdom Animalia.....	15
Phylum Porifera.....	16
Phylum Porifera – Review Questions.....	16
Phylum Cnidaria.....	17
Coral Life Cycle.....	18
Coral Reefs: Threats and Conservation.....	20
Phylum Cnidaria – Review Questions.....	21
Phylum Mollusca.....	22
Phylum Mollusca – Review Questions.....	24
Shells of the Northern Marianas Islands.....	25
Review Questions - Shells of the Northern Mariana Islands.....	28
Shell Matching Game.....	29
Shell Crossword Puzzle.....	30
Activity - Squid Dissection.....	31
Squid Labeling.....	32
Answers to Squid Labeling.....	33

Phylum Arthropoda.....	34
Arthropod Matching.....	38
Phylum Echinodermata.....	39
Echinoderm Review Questions	41
Life Cycle of the Crown of Thorns Starfish	42
Review Questions – Life Cycle	43
A Variety of Worms	44
Phylum Chordata	45
Animal Phyla – Matching	48
Activity – Using a Key to Classify Animals	49
Classification Review.....	55
Classification Review: Clues	56
Threatened and Endangered Species	57
Threatened and Endangered Species in the CNMI	58
Activity - Wild Verses Captivity	59
Comparison Chart	60
Activity - Endangered Species Recovery Plan	61
Recovery Plan for Endangered Species.....	62
What is Extinction and Why Should You Care If Sea Turtles Go Extinct?.....	63
Sea Turtle Survival Game	64
Scenario Cards.....	65
Turtle Trivia Cards.....	69
References	70

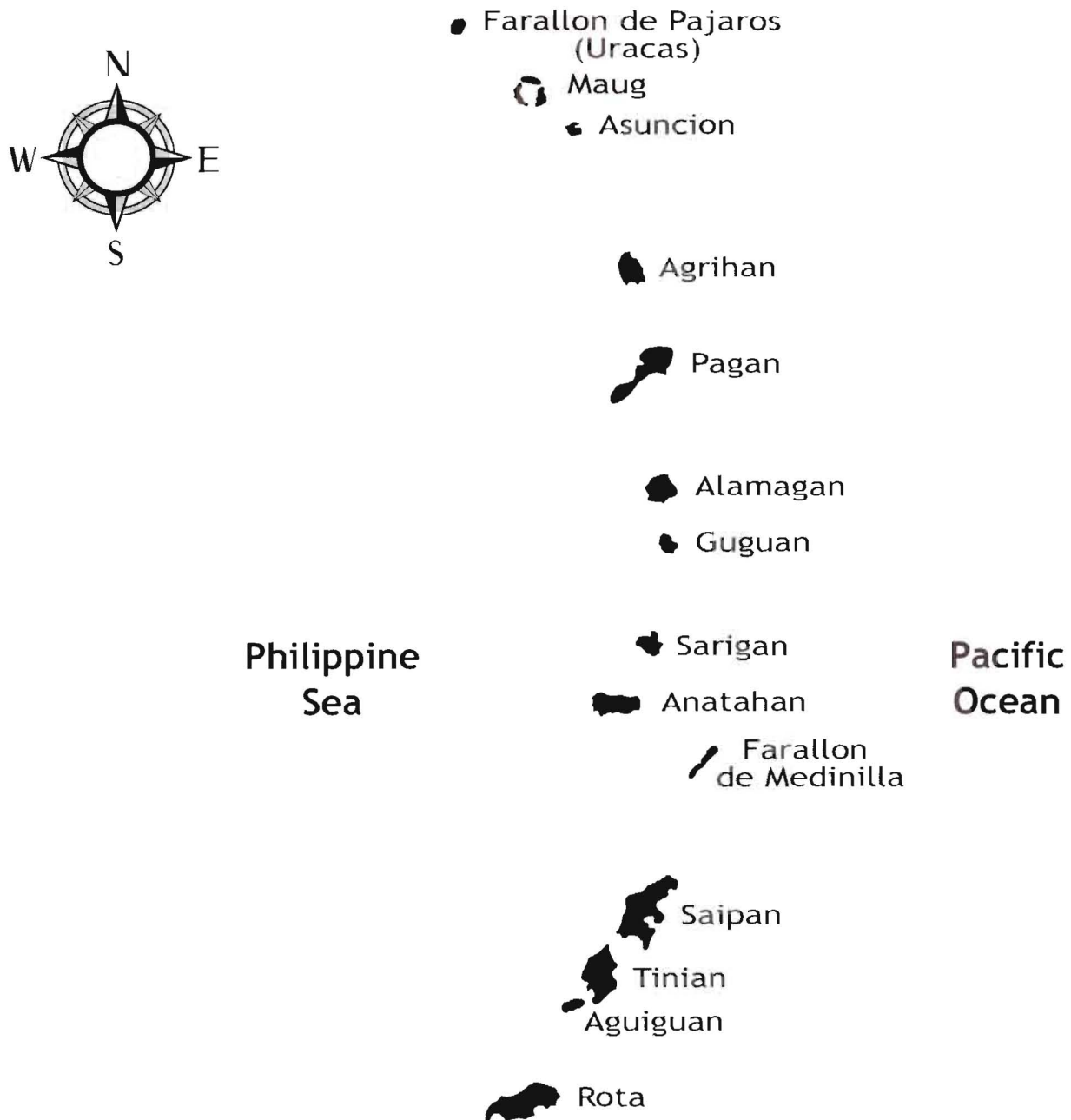
Standards and Benchmarks (Grade 6)

Content and activities are aligned with the following CNMI Science Standards and Benchmarks (Grade 6)

Standard	Benchmark
Science as Inquiry	<ul style="list-style-type: none">• Communicate results/data accurately, orally, and visually in charts, graphs, and drawings• Work individually and in teams to collect/share information and ideas
Habits of Mind	<ul style="list-style-type: none">• Respect people, their cultures, and all living things and take responsibility for the environment
Science Connection	<ul style="list-style-type: none">• Seek connection between science, culture, and Pacific societies
Science, Technology, and Society	<ul style="list-style-type: none">• Use the computer for word processing to produce written reports
Universe	<ul style="list-style-type: none">• Identify how the ancestors of the CNMI used technology and the objects in the sky to help them in their daily lives
Living Environment	<ul style="list-style-type: none">• Diagram the classification of plants and animals based on their similarities and differences• Outline the different levels of organisms• Describe the interactions of organisms in food chains and food webs• Differentiate asexual and sexual reproduction

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.



Taxonomy

Take a look at your friends around you. You know each one by name, and each person looks different from the others. Ask yourself, "What is different, and what is the same about all of my friends?" Sometimes you have to look very closely to tell people apart, such as twins, but sometimes it is very easy. This is the way some scientists look at every living thing, or organism. **Taxonomists** are scientists who identify organisms (What is this thing?) and then classify them into different categories (How is this thing different from, or the same as, other organisms?). **Taxonomy** is the study of grouping or classifying all living things.

You share similar characteristics with other members of your family. You probably look more like your brother or your sister than your distant cousin. That's because the more closely related you are, the more you look alike, usually. Taxonomists use this type of thinking when they group organisms together.

Taxonomists group all living organisms into five large groups, called kingdoms. Each kingdom is then divided into smaller groups called phyla. Each phylum is divided into classes. Each class is divided into groups called orders. Each order is divided into families. Each family is divided into groups called genera. Each genera is called a genus. Each genus is divided into species. Believe it or not, there are even more groups and sub-groups that scientist use. The ones mentioned here are the 7 major levels or groups of classification.

Kingdom

Phylum

Class

Order

Family

Genus

Species

It is important to remember that many phyla (more than one phylum) may be in a kingdom. Many classes may be in a phylum, and so on. When scientists refer to an organism, they use its genus and species name. The genus and species name is usually based on a language called Latin. The genus and species name of human beings is *Homo sapiens*. *Homo* is the genus and *sapiens* is the species. The genus and species names together make up the scientific name.

A species is all of the living things of the same type. Species are able to breed and produce young (offspring) of the same kind. For example, all humans (*Homo sapiens*) are the same species and can breed with each other and produce babies (offspring).

The following are the 7 levels of classification for humans.

Kingdom: Animalia

Phylum: Chordata (has backbone)

Class: Mammalia (nurses its young)

Order: Primates

Family: Hominidae

Genus: *Homo*

Species: *sapiens*

Remember that all living things share the same Earth. Each organism plays an important role in keeping all of the other organisms alive. All living things are connected in some way. We must remember that humans cannot live without the other organisms of nature, but they could live without us.

Activity: Classifying Objects

Objective

In this activity, you will learn to classify objects in a similar way to how scientists classify living things.

Materials

Student Worksheet
Glue
Handout 1 OR Handout 2
Scissors (to cut out objects)

Vocabulary

Classification
Taxonomist
Characteristics

Procedure

Cut out the 10 objects on the handout.

Separate the objects into two groups, based on their characteristics.

Examples:

Handout 1

Objects with Curves and Objects without Curves

Handout 2

Objects with Lines and Objects without Curves

Extension

Before the activity, have the students decorate the shapes on Handout 1. They can color them, fill them in with patterns, etc. Then, start the activity. Each student will be able to come up with different reasons for classifying the objects the way that he/she did.

Classifying Objects – Student Worksheet

Your job is to make two major groups for all of the objects. The groups do not have to be equal. You may have 8 objects in one group and two in the other group. The important thing to remember is that you need to describe how/why you classified the objects into the two groups that you choose.

Name of Group 1

Objects in Group 1

Name of Group 2

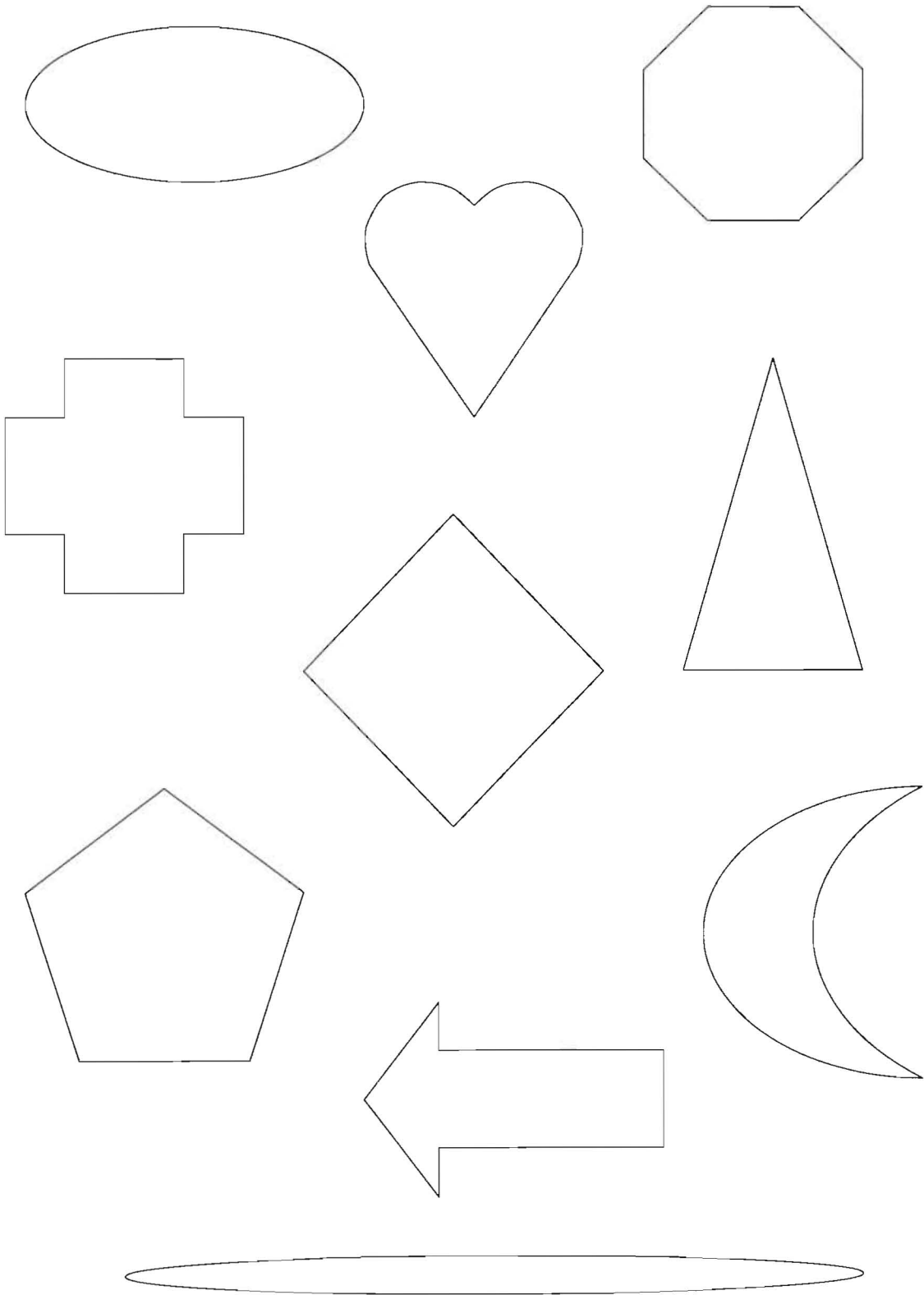
Objects in Group 2

Why did you choose the two groups that you did?

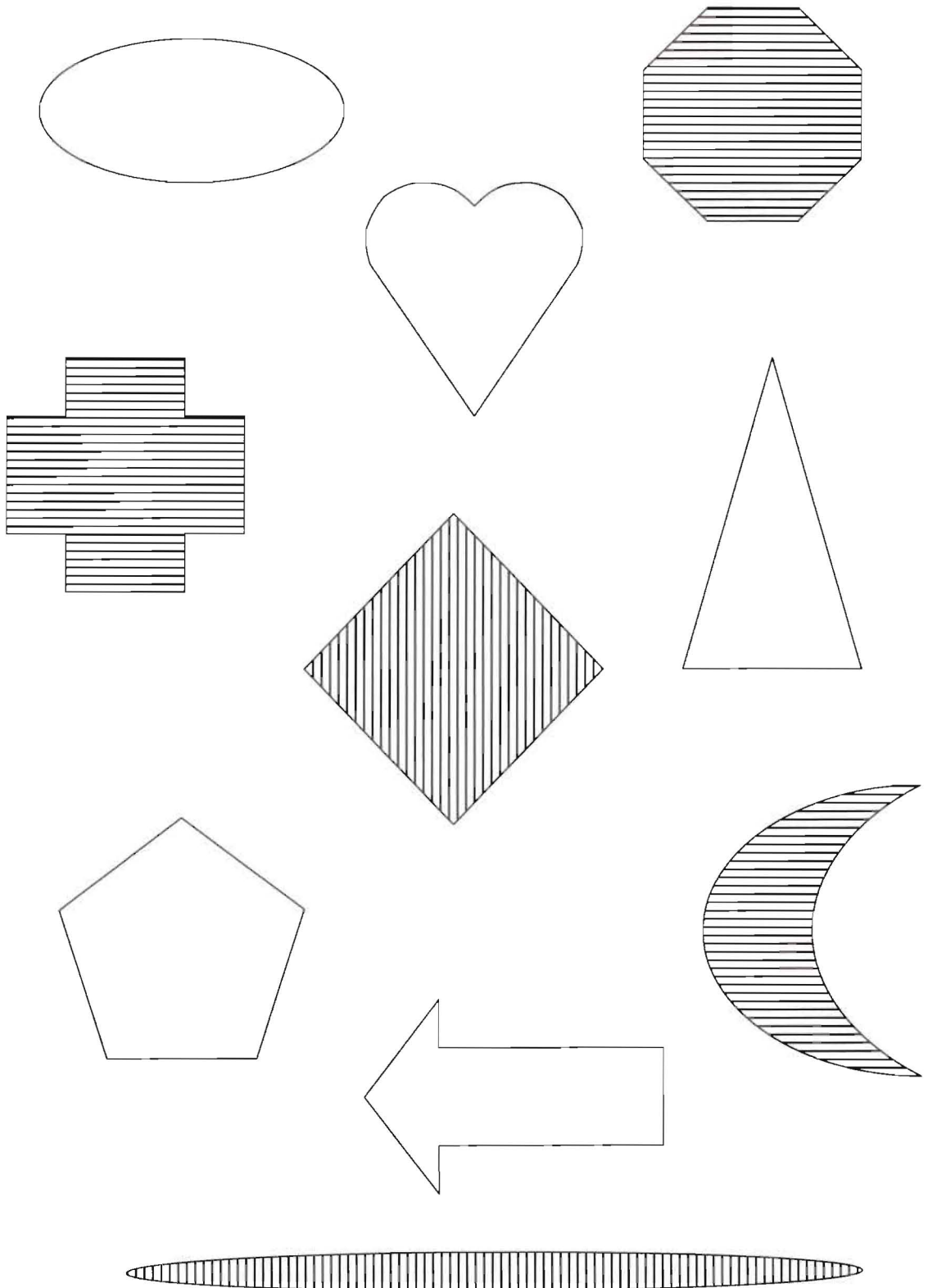
What characteristics did you use to separate the objects?

Congratulations! You are a taxonomist. You separated objects into groups based on their characteristics. Take this activity one step further. Separate Group 1 objects into two smaller groups. Each group does not have to be the same size. In fact, one of the groups may only have 1 object in it. Repeat the activity by separating Group 2 objects into two smaller groups.

Classifying Objects – Handout 1



Classifying Objects – Handout 2



The Five Kingdoms

Kingdom Monera

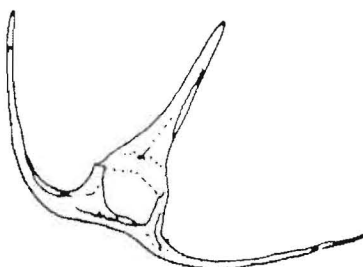
Bacteria and blue-green algae are the simplest life forms. They belong to the kingdom Monera. Organisms belonging to this kingdom are very small, but they are important to all living things. Monerans are food for other organisms and are decomposers. Decomposers help to break down the remains of dead things that were once living and turn them into nutrients for other living things to use again. If you look at bacteria and/or blue-green algae with a microscope, you will see simple shapes that look like circles, rods, spirals, and chains.



Kingdom Protista

Organisms that have single cells (one cell) that live alone or in colonies belong to the kingdom Protista. Some protists are plant-like and others are animal-like. Most protists are too tiny to see without a microscope.

There are thousands of different kinds of protists. Some look like blobs and others look like space ships. Some have flagella (whip-like tails) to help them move. Below is a picture of a dinoflagellate.



Some dinoflagellates are poisonous and are found on our coral reefs. The poison can be found on algae and on dead or dying coral. When fish eat the algae and larger fish eat the smaller fish, the poison accumulates in their tissues. If humans eat the affected fish, they can also become poisoned too. You may have heard that people that have eaten fish known as snapper have gotten sick. They may have ingested fish that contain the poison known as ciguatera. Ciguatera poisoning is caused by the dinoflagellate *Gambierdiscus toxicus*. The dinoflagellates grow on larger algae. Algae are eaten by fish that are herbivores. Herbivores are eaten by fish that are carnivores. The poison does not affect the fish that eat it, but it does affect humans who consume the fish.

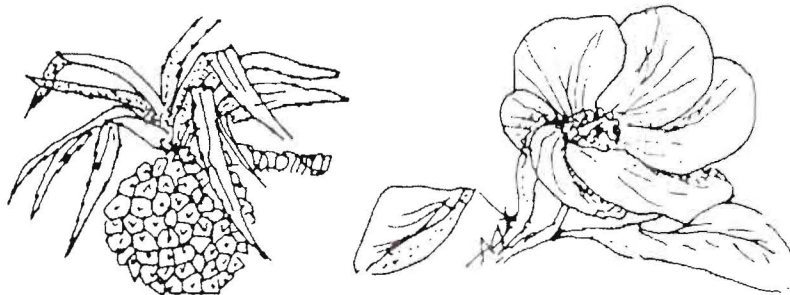
Kingdom Fungi

Fungi are very important organisms. Some are decomposers that help breakdown the remains of dead plants and animals. This helps to recycle nutrients back into the ecosystem. Other fungi are responsible for plant and animal diseases (as are some monerans and protists). Humans think that some fungi are pests (mold and mildew) and use chemicals to try to get rid of them. Other fungi, such as mushrooms are edible and are considered a delicacy.

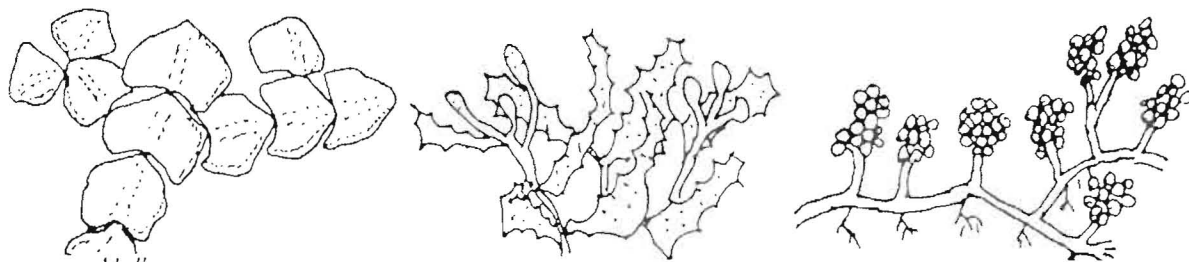


Kingdom Plantae

The plant kingdom is divided into two main groups: plants without internal tubing, and plants with internal tubing. These “internal tubes” are called vessels, and they are used to move substances throughout the plant. Plants with vessels are called vascular plants and most are found on the land. Sea grasses and mangrove trees are examples of vascular plants that can live in or near the salt water.



Most of the plants without vessels are found near the water. These plants are called algae. There are three types of algae: red (Rhodophyta), brown (Phaeophyta), and green (Chlorophyta). Algae are extremely important to the marine environment, especially to the coral reef areas. Some algae deposit calcium carbonate (reef building material) into their cell walls and are important reef builders. Some algae are useful to humans in food products and for other purposes.



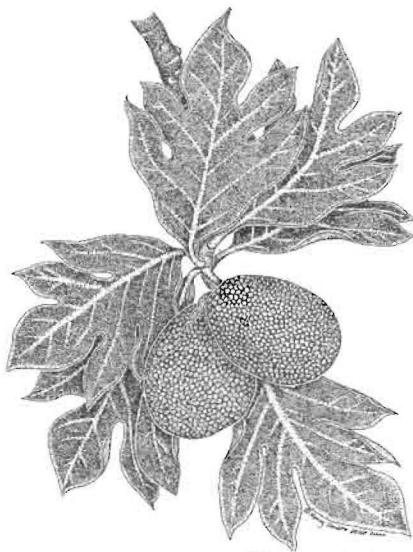
Examples of CNMI Plants (Kingdom Plantae)



Ipomoea
Beach Morning Glory
(Alahai tasi, Arabwal)



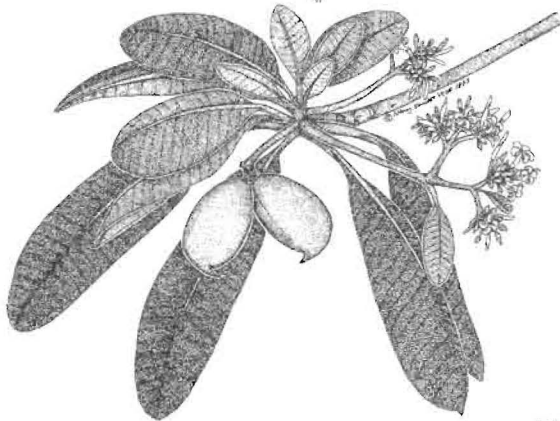
Casuarina equisetifolia
Australian Pine
(Gagu, Weighu)



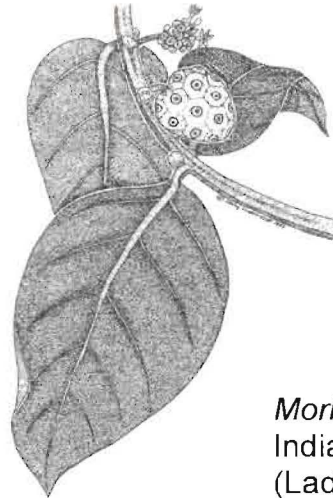
Artocarpus
Breadfruit (seedless)
(Lemai)



Leucaena leucocephala
Tangantangan
(Tóngantóngan)



Neisosperma oppositifolia
(Fagot)



Morinda citrifolia
Indian Mulberry
(Lada, Leel)

Artwork by Nancy Vander Velde

Kingdom Animalia

Almost all animals can be classified into **two** groups. They are invertebrates (without backbones) and vertebrates (with backbones). There are many different groups of invertebrates. There are many, many more invertebrates than vertebrates. Vertebrates however, are usually larger and more noticeable than invertebrates.

The animal kingdom is divided into many phyla (phyla means more than one phylum). Many phyla are not discussed in this book. Not every animal in the CNMI is discussed in each phyla, but the common animals in each group are mentioned.

We are fortunate to live near a great variety of life that abounds within our tropical island environment. You can investigate many other sources of information on the life forms that surround us and discover the great variety of organisms that exist.

Classification – Review Questions

The word Phyla is plural for the word _____.

_____ is the language used for genus and species names.

There are _____ kingdoms of living things on the Earth.

An example of an organism from the Kingdom Monera is _____.

A/An _____ is an organism from the Kingdom Protista.

Molds and mushrooms are examples of organisms from the Kingdom _____.

The tubes inside of some plants are called _____.

Three types of algae are _____, green and _____.

Decomposers are organisms that belong to the Kingdom _____ and the Kingdom Fungi.

Each kingdom is divided into groups called _____.

Each phylum is divided into groups called _____.

Each class is divided into groups called _____.

Each order is divided into groups called _____.

Each family is divided into groups called _____.

Each genus is divided into groups called _____.

Phylum Porifera

The animals of this phylum are commonly known as sponges. They may not look like animals, but they are. They are the most primitive (simple) animals. They all live in the water, and they cannot move from place to place.

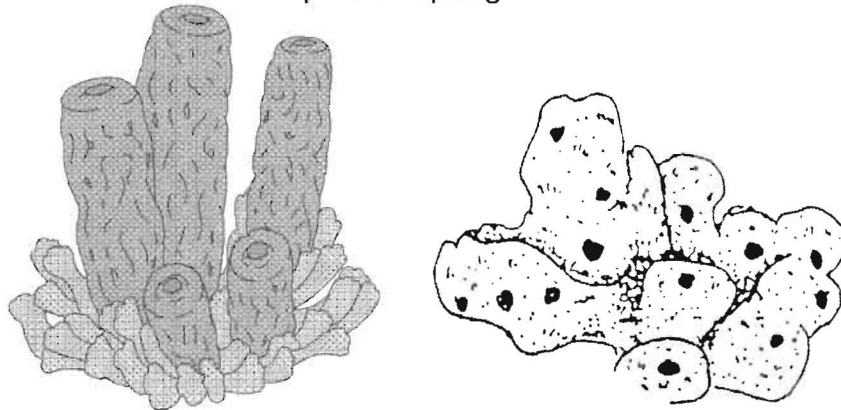
Sponges do not have tissues nor organs. Instead, they have specialized cells that carry out all of their basic life functions.

Sponges have many holes (pores) and canals in their bodies, and that is where they get their name. Some cells help circulate water through the body of the sponge, and other cells filter out food particles. Sponges are filter feeders. They filter tiny organisms out of the water for food.

Some sponges look like soft balls on the floor of the lagoon, and some exist as the brilliant colored coating on the underside of rocks.

Most sponge skeletons are made of spicules and spongin fibers. Sponges are grouped according to the type of skeleton that they possess.

Examples of Sponges



Phylum Porifera – Review Questions

Sponges are actually animals, not plants. They have a few characteristics that resemble plants. Describe at least one way that sponges are similar to plants.

How do sponges get their food?

What are spicules?

Phylum Cnidaria

Cnidarians (Coelenterates) are also very primitive. Organisms in the phylum Cnidaria possess stinging cells called nematocysts. They are located on tentacles that surround their mouths. Their mouths not only take in food but also get rid of wastes.

Cnidarians have bodies with radial symmetry. That means that their parts are arranged around a center. Their bodies can be divided into several equal parts, similar to slices of a pizza.

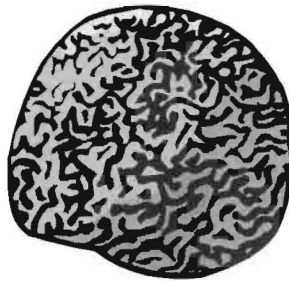
There are many types of cnidarians, but the most notable are the corals. Corals belong to the class Anthozoa. Corals are usually colonial, but they can also be solitary. The individual animals are called polyps. Polyps have tentacles that they use to sting and gather food.

Hard corals are cnidarians that secrete calcium carbonate to form their skeletons. These skeletons are major contributors to reef building. Corals may take years to build their skeletons. No one should ever remove living corals.

Hard Corals



Boulder Coral



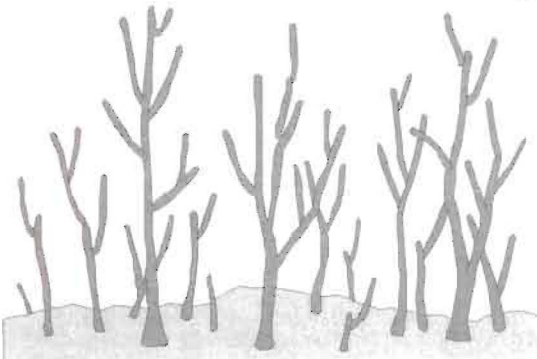
Brain Coral



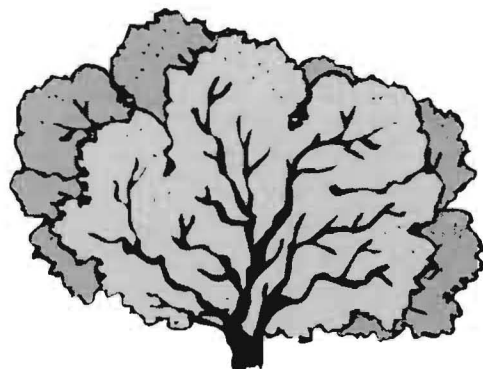
Staghorn Coral

Soft corals are also cnidarians (class Anthozoa). They are made up of colonies of polyps. Both hard coral and soft coral polyps feed on tiny animals that float in the plankton. These animals are called zooplankton.

Soft Corals

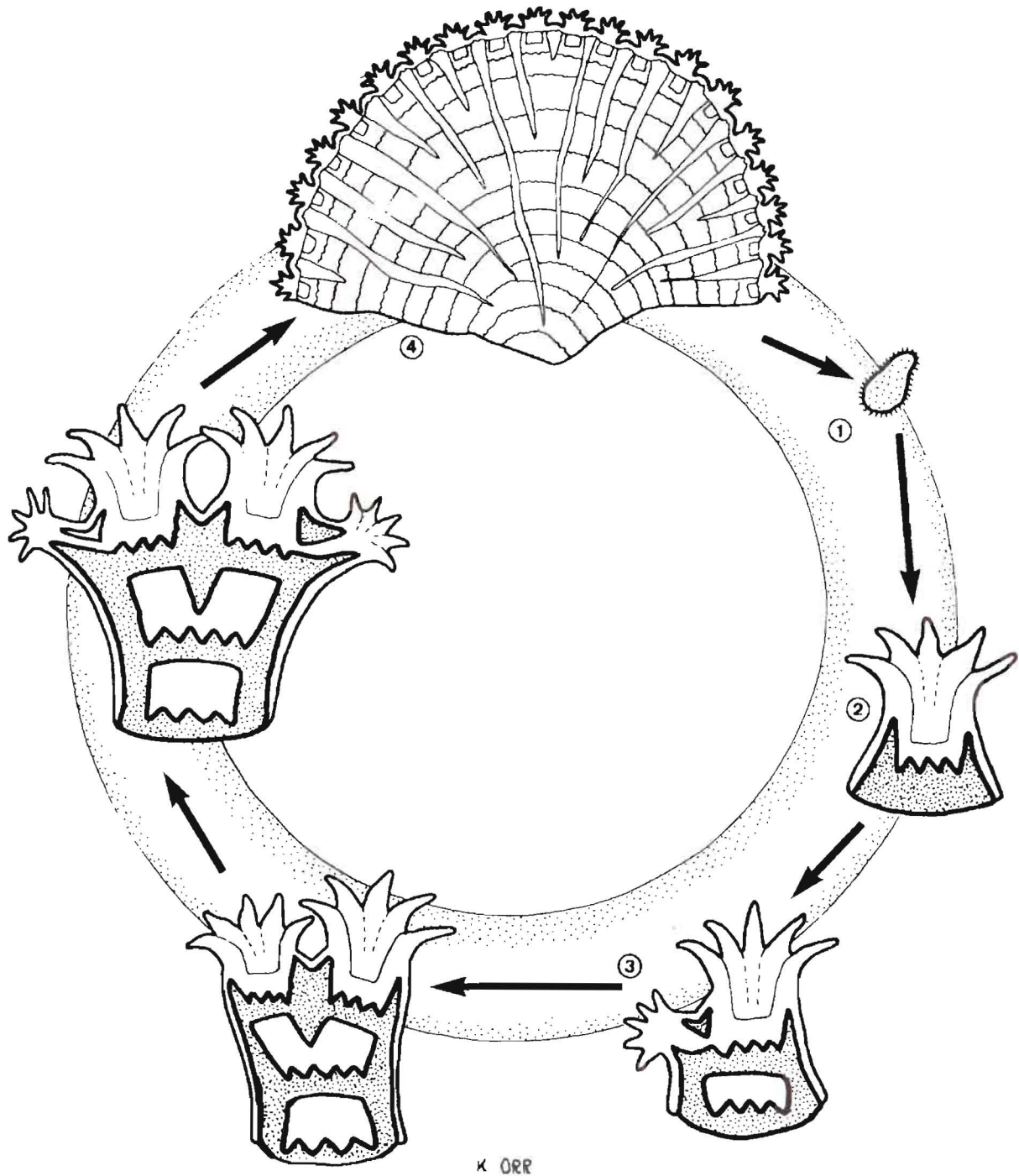


Sea Rods



Sea Fan

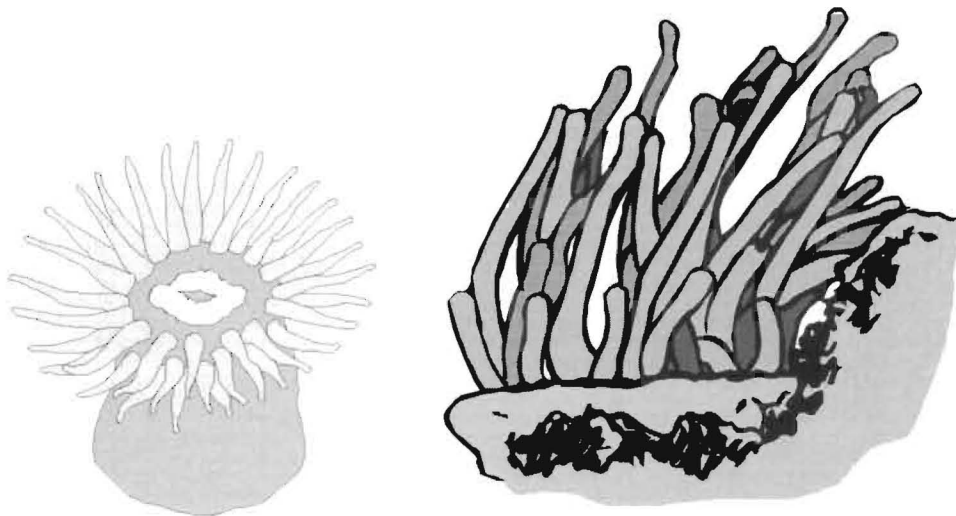
Coral Life Cycle



Corals start out as larvae that float in the plankton (1). Once larvae settle onto the bottom, they grow into polyps (2). Each polyp can divide to form more polyps (3-4).

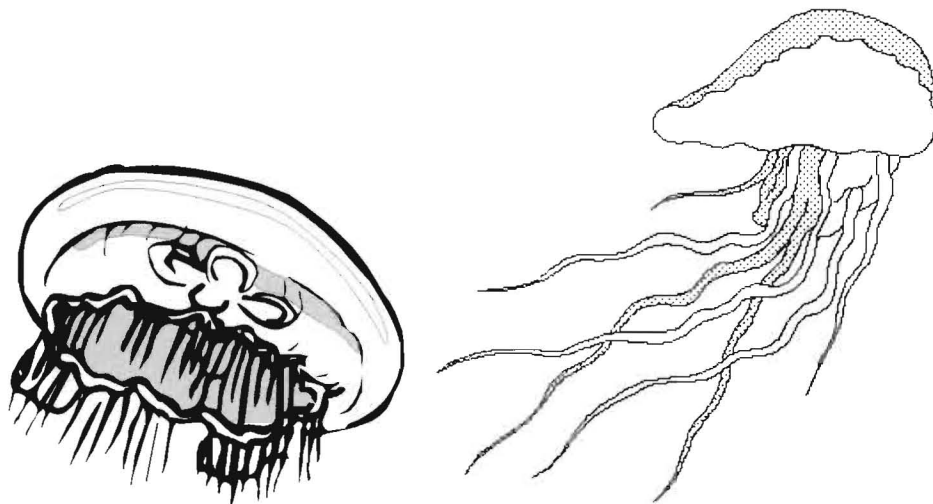
Illustration from Marine Activity Workbook, University of Hawaii Sea Grant College Program

Other cnidarians include sea anemones and jellyfish. Sea anemones are anthozoans without solid skeletons. Some crabs, shrimp and fish (clown fish/anemone fish) live with sea anemones for protection. A type of relationship in which two different species live together is called symbiosis.



Sea Anemones

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). Some jellyfish, such as the Portuguese Man o' War, have stinging cells so powerful that they can kill a human.



Jellyfishes

Coral Reefs: Threats and Conservation

Corals are important ecosystems for food and for recreation. They also protect our coastlines from erosion. Erosion is the wearing away of land by water.

One of the greatest threats to coral reefs is pollution. Coral polyps have algae living inside of them that help them eat. The algae are called zooxanthellae. Zooxanthellae must have clear water to be able to get the sunlight that they need. When erosion causes sediment to run off of the land and into the ocean, it can smother the coral reefs. This dark blanket causes the zooxanthellae to eject out of the coral tissue. This is known as coral bleaching. It causes many corals to die.

Other types of pollution are nutrients from fertilizers that are used on the land. The nutrients may cause a different kind of algae to grow over the top of the coral, killing it. More dangerous types of pollution include oil, pesticides, and heavy metals. These can cause corals to grow more slowly or kill them immediately.

Thermal pollution is when water is heated and then returned to the coral reef. This occurs at power plants where the plants must cool their machinery. Hot water discharge can be as lethal as other types of pollution because corals depend upon the temperature being stable. Coral bleaching can occur where there is thermal pollution. Another problem is that microorganisms such as plankton get killed as the water that they live in gets heated. The life cycle of many marine organisms starts in the plankton, therefore, the heat kills them before they ever get the chance to grow up. Many of the planktonic organisms are also food for corals and other creatures that live on the reef.

What happens on land can have an impact on what happens in the sea. When trees are cut down, erosion can occur. Erosion is the loss of soil. Soil can be washed away down the streams and into the sea. Trees help to cool the atmosphere by taking in carbon dioxide gas. Carbon dioxide gas traps heat in the atmosphere. One effect of the loss of trees on the Earth is a gradual rise in temperature. This is referred to as global warming. Global warming is the rise in global temperature due to an increase of carbon dioxide in the atmosphere. Corals are threatened by global warming in several ways. First, the temperatures may be too hot for them to grow. Second, the sea level may rise and they may not be able to grow fast enough to keep up with the rise in sea level. In other words, the water may get too deep for them.

Some fishing methods that humans use to catch fish to eat or sell can be very destructive. These include using dynamite to blast out areas of reef, poisons that kill fish and corals, and traps that catch species other than the ones that are going to be used. Simple hook and line fishing is not usually harmful to coral reefs. However, sometimes, the fishing lines and hooks get tangled in the reef and may injure animals.

One of the ways that coral reefs are being protected is by creating areas that are protected by humans. In areas where fishing is prohibited or regulated, fish have a chance to grow to full maturity and reproduce more.

Phylum Cnidaria – Review Questions

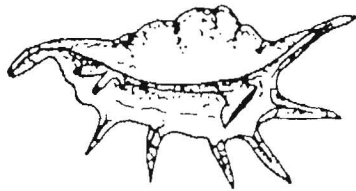
1. What do all cnidarians have in common?
2. What are three different types of cnidarians?
3. How are hard corals made?
4. Why do people around the world need coral reefs?
5. What are zooxanthellae, and where do they live?
6. When do corals feed? What do they eat?
7. Describe the two ways that corals reproduce.
8. What is coral bleaching? What causes it to occur?
9. List at least two types of fishing methods that are destructive to coral reefs.
10. List at least two kinds of pollution that affect coral reefs.
11. What are two negative impacts that deforestation can have on coral reefs?
12. What is one thing that you can do to help protect the coral reefs around our islands?

Phylum Mollusca

Mollusks are one of the most popular groups of marine animals. Mollusca is the second largest group of invertebrates (Arthropoda is the largest group). There are over 50,000 different species of mollusks in the world.

They are soft-bodied animals that scrape up their food with a radula. Mollusks have a layer of tissue called the mantle. Many mollusks have shells for protection. The mollusk animal creates its shell of calcium carbonate. It is secreted from the mantle. Many of these shells are quite beautiful and prized by collectors.

The class Gastropoda contains snails, limpets, abalones, conchs, and whelks. Gastropod means stomach-foot, and comes from the fact that its large foot seems to extend from its belly. It usually carries a shell into which it can withdraw when bothered.

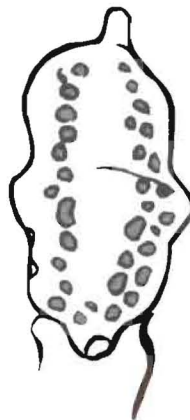
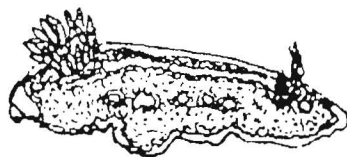


*The Spider Conch
is an example of a
Gastropod*

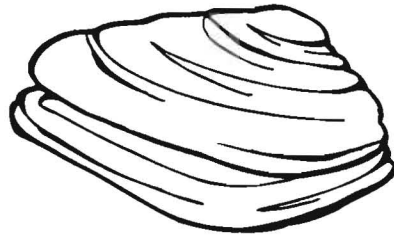
Cone shells belong to the class Gastropoda. Some cone snails produce a painful or deadly sting. They have a long, muscular proboscis with a sharp tooth (radula) on the end. The radula is where the spear is located. The harpoon-like spear has a lethal poison. They use it to catch food items such as small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



The nudibranchs (naked-gills) are also called sea slugs. They belong to the class Gastropoda, but they do not have shells. Many nudibranchs are ornate and intensely colored. Some are beautiful swimmers.



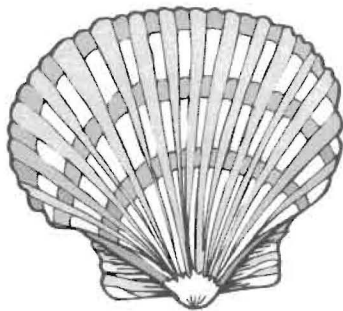
The class Bivalvia contains the clams, oysters, scallops, and mussels. Bivalvia means two-shells. The animals that live inside of the shells are very good to eat. They are called bivalves.



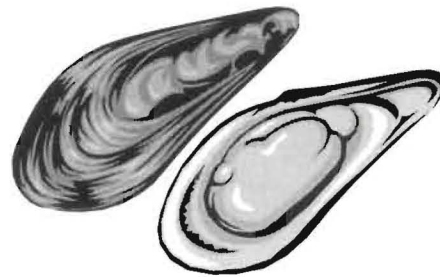
Clam



Oyster

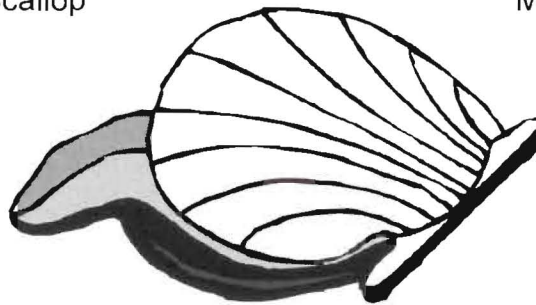


Scallop

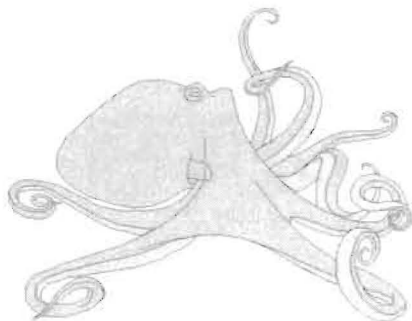


Mussel

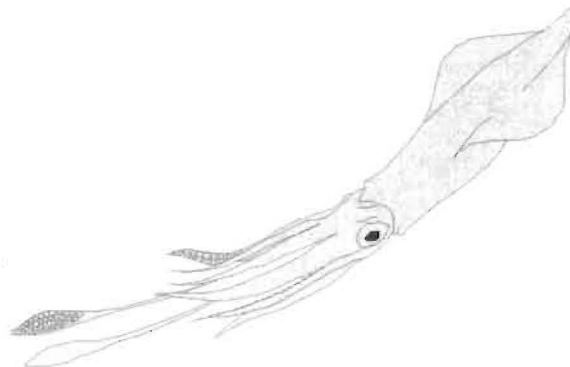
Bivalves have a muscular foot for movement.



The class Cephalopoda contains the octopus, squid, cuttlefish, and nautilus. Cephalopoda means head-footed.

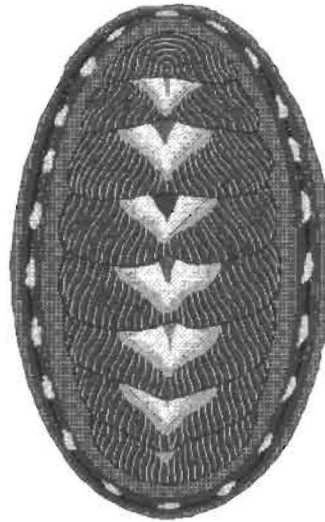


Octopus



Squid

Chitons belong to a class of mollusks that have eight hard, overlapping plates on their dorsal (back) surface. The name of the class that chitons belong to is called Polyplacophora, which means “many-plates.” They attach to rocks near the breaking waves of the shoreline.



Many mollusks are valuable to humans for food and other products, and care should be taken to avoid depleting them.

Phylum Mollusca – Review Questions

Snails belong to a group of mollusks called _____.

Mollusks with 8 overlapping plates are called _____.

Squid belong to a group of mollusks called _____.

Mollusks with 2 shells are called _____.

The name Gastropoda means _____.

The name Cephalopoda means _____.

The name Bivalvia means _____.

The name Polyplacophora means _____.

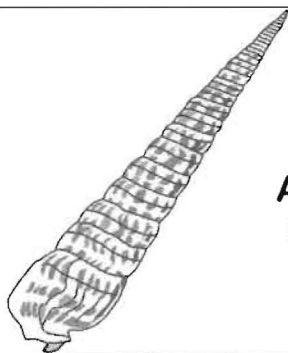
Shells of the Northern Marianas Islands

Seashells come from living things called **mollusks**. They are a very important source of food in the Mariana Islands. The Chamorro name for most seashells is *Karakot*.

A seashell is the hard outer covering that protects the soft body of the mollusk inside. Many of the animals inside of the seashells are called **snails**. A snail grows a bigger shell by getting calcium carbonate and other ingredients from the seawater and the food it eats, then it uses its fleshy **mantle** to add the new materials to the shell. This is the same way that other seashells grow.

The shells of many mollusks have been used throughout history for art, jewelry, money, scientific study, buttons, ink, road gravel and chicken feed (for stronger egg shells). Seashells are very popular to collect. Sometimes seashells are collected while the animal inside is still alive. If people collect too many living snails, then there will not be any around for generations to come.

Mollusks can be herbivores, carnivores, or omnivores. **Herbivores** eat only plants such as algae. **Carnivores** eat other animals such as invertebrates or fish. **Omnivores** eat both plants and animals.



Auger Shell

Auger shells live in the intertidal zone where they burrow in the sand or hide under the coral. Augers are carnivores and feed on worms.

The shell of the auger snail is long, slender and glossy.



Cone Shell

Cone snails are carnivores that feed on small invertebrates and fish. There are 70 kinds of cone snails in the Northern Mariana Islands.

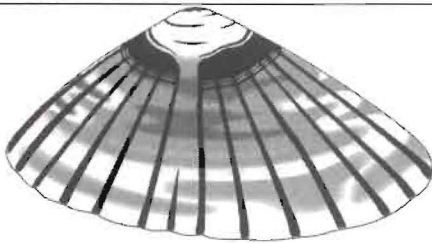
All cone snails are venomous, but only a few are considered dangerous to humans. BE CAREFUL when you see one of these shells. You should not pick it up.



Cowrie

Cowries are herbivores and live on the coral reef. They are rarely seen during the day because they are active at night. The shells of cowries are very smooth and shiny.

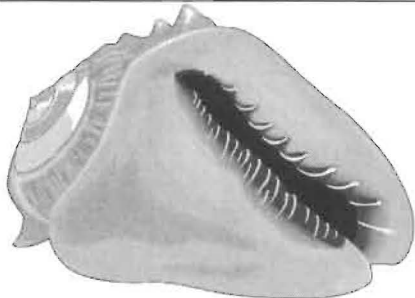
Female cowries sit on top of their eggs to protect them from enemies.



Limpet

Limpets are snails that have a cap-shaped shell. This shape helps them withstand the wave action. They live attached to rocks near the coast.

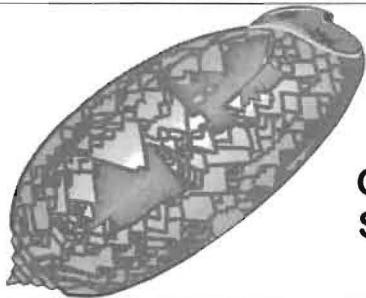
Limpets are herbivores. They are active at night when they leave their carved out area of the rock to feed on algae.



Helmet Shell

Helmet snails are carnivores that feed on sea urchins and other invertebrates. They live in the sand near the coral reef.

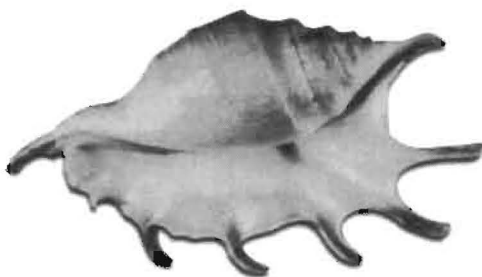
The shells of the helmet snail can be very large (8 3/4 inches or 22 cm long) and have been heavily harvested for the tourist trade.



Olive Shell

Olive snails live in tropical seas all over the world. They are carnivores that live in the sand near coral reefs.

Olive shells are smooth and polished. Many small shells are often strung together for necklaces.



Spider Conch

Spider conchs can be found in the sandy areas near the shore. They are herbivores and feed on algae.

Spider conchs may have algae growing on their shell, but their undersides are very smooth and shiny. The projections are longer on females than on male shells.



Top Shell

Top shells get their name because they resemble the spinning toy called a top. Top shells live on or near coral reefs. They are herbivores and feed on filamentous algae.

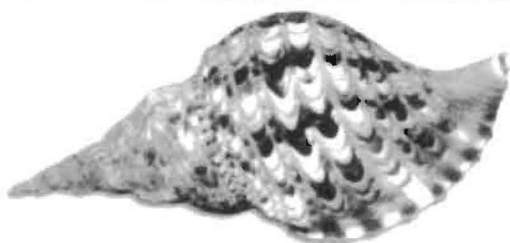
Many top shells are commercially harvested for decorative purposes, to make buttons, and for food. A large top shell, *Trochus niloticus* (called Alileng in Chamorro) can no longer be harvested in the Mariana Islands. Because it was overharvested, the *Trochus* is now protected until its population recovers.



Triton Shell

Triton snails are carnivores and feed on sea urchins, sea stars and other mollusks.

They are mostly found in tropical seas. They live on coral reefs and in deep water. Very large shells from this family have been used to make trumpets that can be heard for miles.



Triton's Trumpet

The triton's trumpet or trumpet triton is one of the few organisms that eat the crown-of-thorns starfish. The triton's trumpet also eats sea urchins and the cushion starfish.

Selling these shells commercially may lead to a further decrease in their numbers.

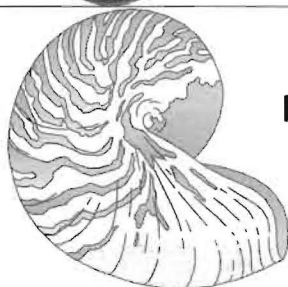
These seashells are made by Mollusks that are NOT snails



Chiton

Chitons have 8 plates on their shell. They are herbivores that scrape algae from rocks with their radula (teeth).

Chitons are very hard to remove from the rocks. They live in the same area where you will find limpets. Chitons can be found attached to rocks near the coast.



Nautilus

The nautilus belongs to a group of mollusks called cephalopods. They are closely related to squid and octopus.

Nautiluses have lightweight shells with chambers filled with gas. This helps them control their buoyancy. They live in the deep ocean. Nautiluses are carnivores that are active at night. They feed on shrimp, crabs and fish that they catch with their tentacles



Giant Clam

Giant clams are known as *Hima* in Chamorro. They have been collected for their meat and to make tools. Giant clams need sunlight in order to grow because they have algae living inside them that they feed on.

There are four types of giant clams (*Tridacna*) that live in the Northern Mariana Islands. The largest known clam is a giant clam that weighed 734 pounds and was nearly four feet in length!

Review Questions - Shells of the Northern Mariana Islands

Circle the correct answer(s) to each question

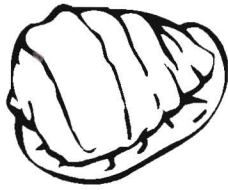
1. Which two are carnivores?
 - A. Spider Conch
 - B. Cone snail
 - C. Cowrie
 - D. Chiton
 - E. Nautilus
2. Which two are herbivores that feed on algae?
 - A. Giant clam
 - B. Helmet snail
 - C. Olive snail
 - D. Limpet
 - E. Auger
3. This looks like a snail but it is more closely related to squid and octopus.
 - A. Triton's trumpet
 - B. Helmet snail
 - C. Limpet
 - D. Nautilus
 - E. Cone snail
4. This shell looks like a small toy that spins.
 - A. Triton snail
 - B. Top shell
 - C. Olive snail
 - D. Spider conch
 - E. Giant clam
5. This is the part of the mollusk's body that makes the seashell.
 - A. Foot
 - B. Mantle
 - C. Buoyancy chamber
 - D. Plate
 - E. Head

Short Answer Questions

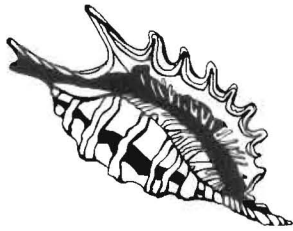
1. What do you think are the two most important uses of seashells?
2. What would happen if too many seashells were harvested?
3. What is your favorite seashell? Explain. Draw a picture of the shell on a separate sheet of paper.

Shell Matching Game

Draw a line from the shell to its name.



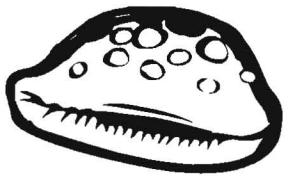
Cowrie



Cone Shell



Top Shell



Nautilus



Helmet Shell

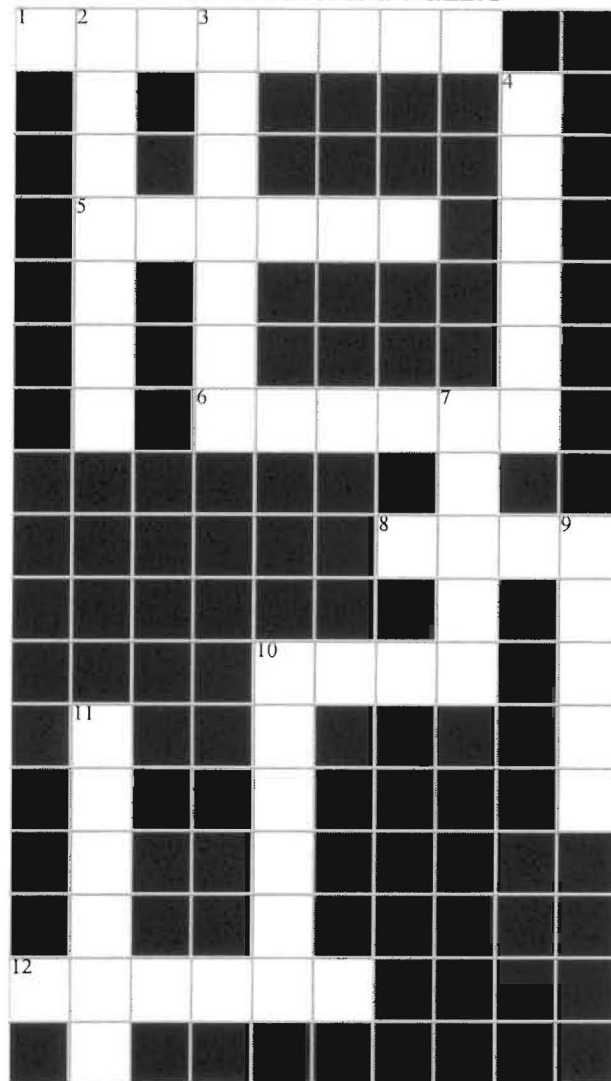


Spider Conch



Triton Shell

Shell Crossword Puzzle



Across:

- 1 It has chambers that fill with gas to help control its buoyancy.
- 5 A cap-shaped shell that lives attached to rocks.
- 6 Carnivorous snails that live on coral reefs and in deep water. Very large ones are used as trumpets.
- 8 The Chamorro name for the giant clam.
- 10 These snails are venomous and can even be dangerous to humans.
- 12 Very large snails that live in the sand near the coral reef.

Down:

- 2 The Chamorro name for the top shell that can no longer be harvested.
- 3 We should not harvest this because it is a predator of the crown of thorns, a coral eating starfish.
- 4 It has 8 plates on its shell.
- 7 It is a polished shell that is used for making necklaces.
- 9 The snail that lives in this long, slender shell feeds on worms.
- 10 A female will protect her eggs by sitting on them.
- 11 This large conch has projections on its shell.


Activity - Squid Dissection

Materials: squid*, dissection tools (tweezers, scalpel), newspaper, tray or paper plate

*A box of 24 squid (calamari) can be found in the frozen food section of the grocery store.

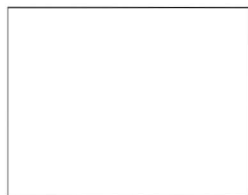
Procedure:

Draw a diagram of your squid and **label the following parts:** mantle, 8 arms, 2 tentacles, clubs (suction cups), fins, siphon, eyes, color cells (chromatophores).



Use a pair of tweezers to remove the beak. It will come out in two sections. **Make a sketch** of the beak in the box below.

Beak



Cut a small slit on the back tip of the squid (the side near the fins). Then **remove the pen** (quill) from the squid. It is a flexible piece that extends the entire length of the mantle. It provides support for the squid.

Use tweezers to **remove the thin outer layer of skin**. You can see the color cells on the skin. Color cells are also called chromatophores. After removing the skin, **cut open the mantle**.

On the inside of the squid look for: egg sac (clear, lumpy, jelly-like) or sperm sac (white, creamy), visceral mass – contains major organs (stomach, etc.), ink sac (dark blue), 2 gills (light, long, thin), and eye lenses.

If your squid contains an egg sac, it is a female. If it contains a sperm sac, it is a male.

Remove the ink sac and break it. Use the pen (quill) from your squid and the ink from the ink sac to write your name in the box below. Let dry.

Your Name in Squid Ink



Squid Labeling

arms (8) - eight short limbs, each of which has two rows of suction cups on the lower side; the arms hold the food while the squid bites it into swallowable pieces.

beak and mouth - the parrot-like beak on the mouth is used for biting food into small pieces. The beak and mouth are surrounded by the bases of the arms and tentacles.

clubs (2) - the ends of the tentacles, which have toothed suckers.

eye - an organ used to see; squid have two, very large eyes (they are large in proportion to the size of the body).

feeding tentacles (2) - the two, long tentacles are used for obtaining prey; they have toothed suckers only near the tip.

fins - two flaps on the mantle that are used to stabilize the squid during swimming.

head - the small part of the body between the mantle and the arms; the head contains the eyes, the brain, and the muscular buccal mass (which crushes the food).

mantle - the large part of the squid in front of the head; inside the mantle are the stomach, gills, ink sac, pen, reproductive organs, and many digestive organs.

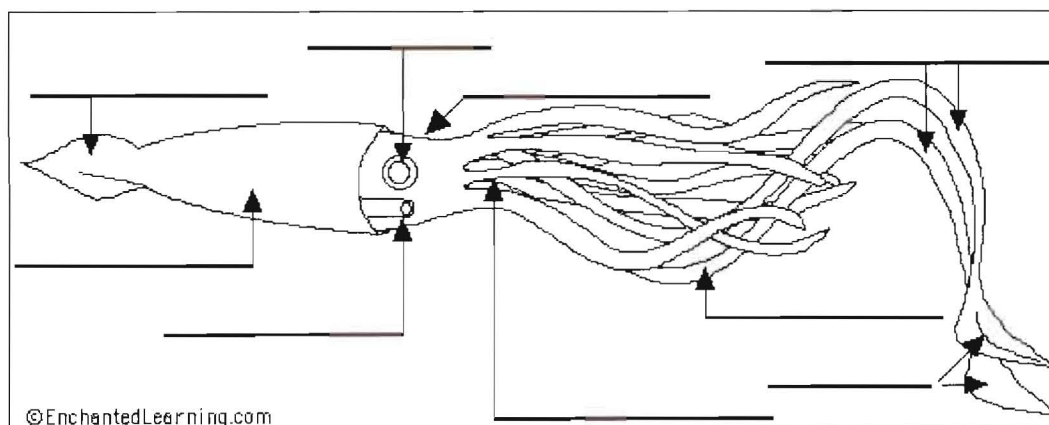
siphon - a tube-like organ on the lower side of the head; it expels water forcefully, enabling the squid to propel itself through the sea.

Labeling the following parts in the diagram below:

arms
beak & mouth
clubs

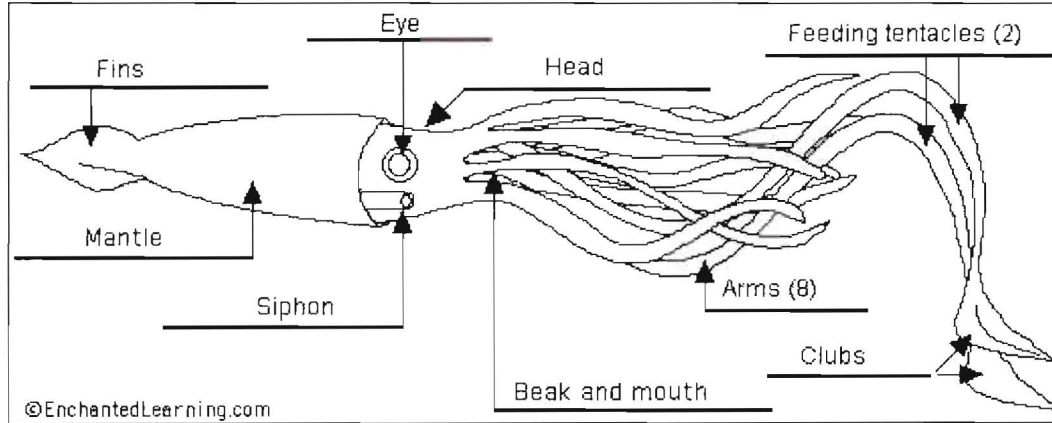
eye
feeding tentacles
fins

head
mantle
siphon



Labeling activity from Enchanted Learning

Answers to Squid Labeling



Phylum Arthropoda

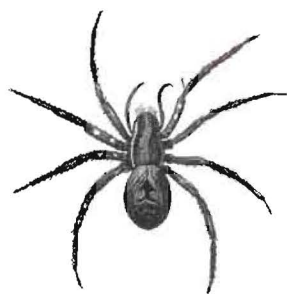
There are more arthropods than any other kind of animal. Arthropods have hard bodies made of chitin and protein. The hard outer covering is called the exoskeleton. The legs and other appendages are jointed, and that is where they get their name (arthro=jointed, poda=foot). Arthropods include insects, arachnids (spiders and their relatives), centipedes, millipedes, and crustaceans (crabs, lobsters, and shrimp).

The phylum Arthropoda is divided into four subphyla.

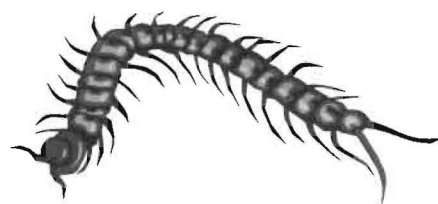
Subphylum Trilobitomorpha consists of extinct organisms called trilobites. We never had trilobites on our islands. The trilobites all died before our islands were formed.

Subphylum Chelicerata contains scorpions, spiders, ticks, and mites.

Subphylum Uniramia includes centipedes (one pair of legs per segment), millipedes (two pairs of legs per segment), and the insects (Class insecta).

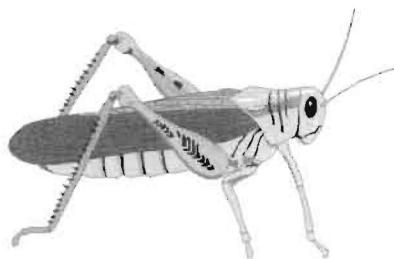


Spider



Centipede

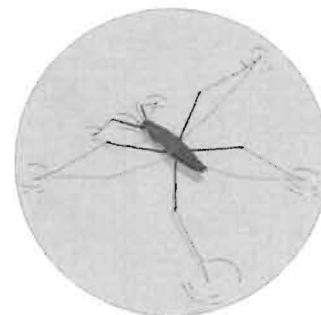
3 Examples of Insects



Grasshopper



Dragonfly

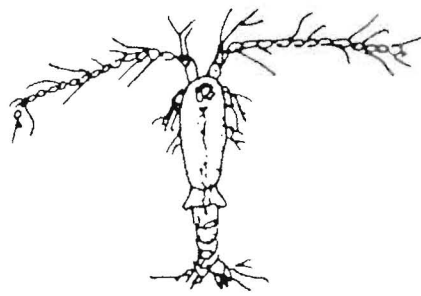


Water Strider

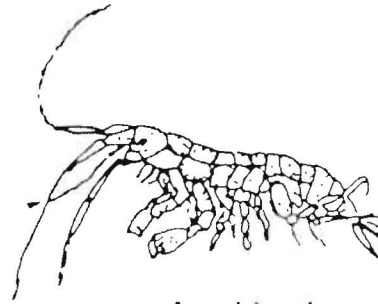
The Subphylum Crustacea has many marine members. Crustaceans are the “insects” of the sea. There are many different kinds of crustaceans that inhabit the marine ecosystem. Like all arthropods, crustaceans must molt in order to grow. This means that they shed their old exoskeleton when they outgrow it. Their new exoskeleton is soft at first, but soon it hardens.

The classification of crustaceans is very complex, and different books classify them in different ways. This book will just mention several of the different types of crustaceans.

Copepods are tiny, usually with two very long antennae. Copepods may be found floating as plankton, crawling on the bottom of the oceans, or as parasites. Amphipods and isopods are small crustaceans that are found crawling among seaweed, rocks, and debris.



Copepod



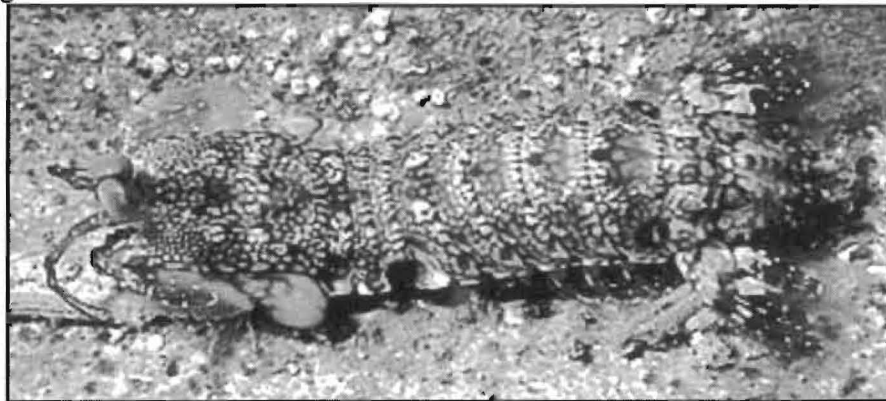
Amphipod

Barnacles live attached to things and are surrounded by a hard shell. They may be found on anything from rocks to floating zories.



Barnacle

Mantis shrimp are beautiful, long, and narrow. They have their claws curled under like a praying mantis. They can snap out these claws and quickly grab their prey or pop your finger. They feed on small fish and crustaceans. Mantis shrimp have colors and patterns for camouflage.

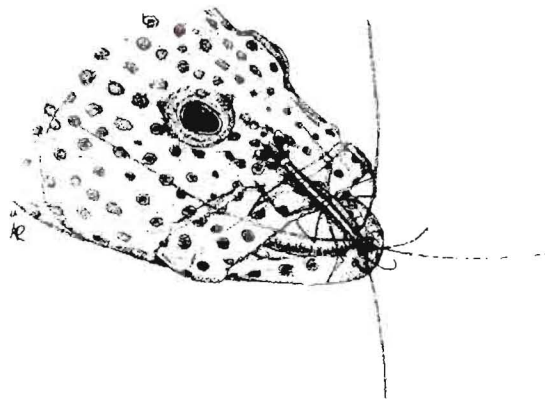


Mantis
Shrimp

Image from Coral Reefs of the Marina Islands CD ROM

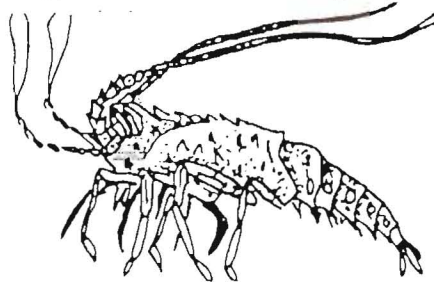
There are a wide variety of shrimp. The cleaner shrimp is fairly common. Cleaner shrimp are usually red and white, and they pick the parasites from fish and eat them. Many fish do not eat the cleaner shrimp because of the service that they provide. Most

other types of shrimp look similar, but some are very specialized and only live closely associated with another organism, such as a particular sea urchin.



Cleaner Shrimp
cleaning a Grouper

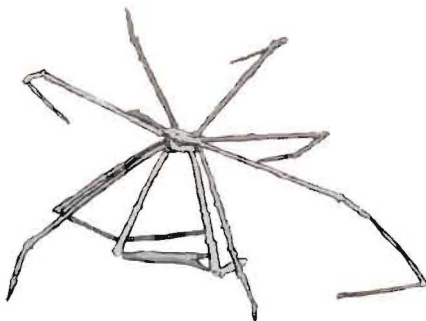
Lobsters are not only good to eat, but they are ornate. The spiny lobster (Langusta) and the slipper lobster (Papangpang) are both beautifully colored.



Spiny
Lobster

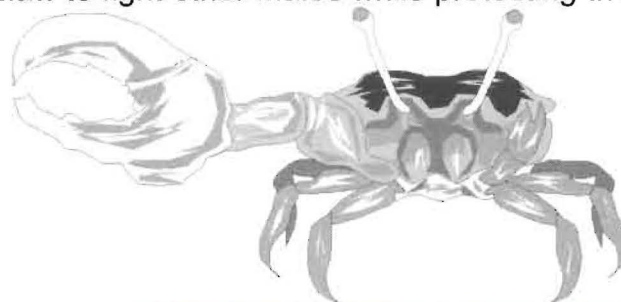
There are many different kinds of crabs around our islands. There are box crabs that hide behind the shield of their claws and scurry beneath the sand. Xanthid crabs are usually found scurrying along the rocks.

Many crabs get their names from how they look. Spider crabs have 8 long legs like a spider.



Arrow
Crab

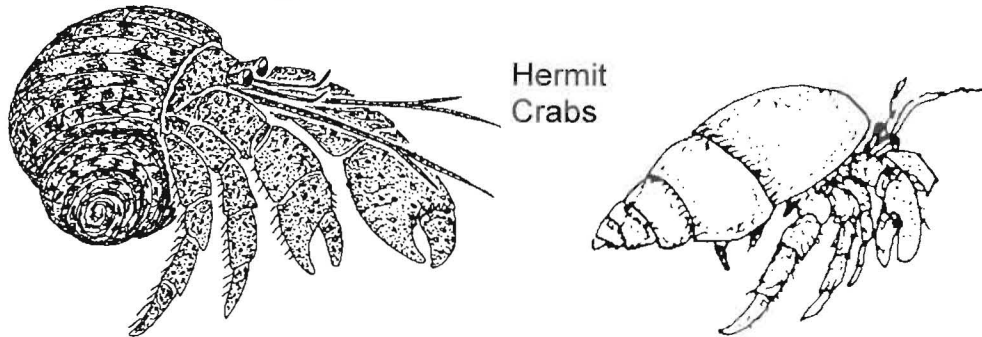
Fiddler crabs (males) have one claw that is larger than the other claws. Male fiddler crabs use their large claw to fight other males while protecting their territory.



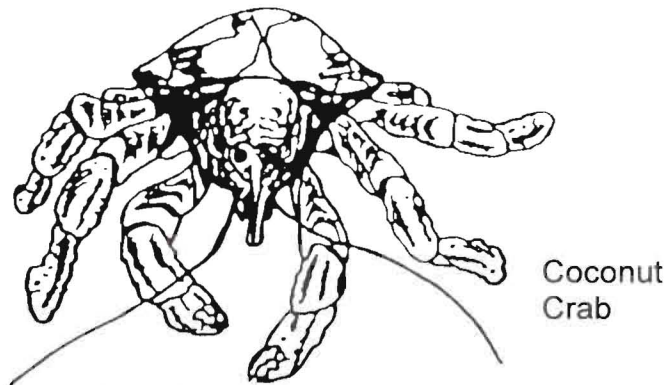
Fiddler
Crab

Cleaner shrimp and grouper image from Tropical Topics, Queensland Parks and Wildlife Service

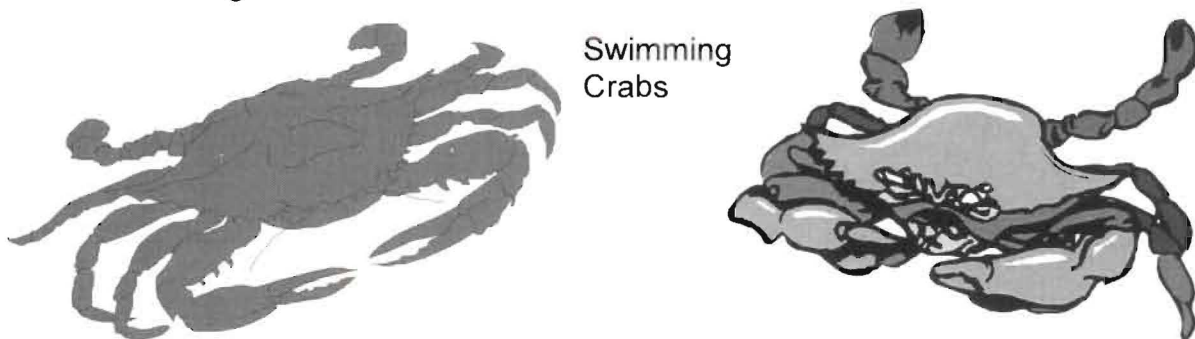
Hermit crabs occupy an abandon shell from a snail to protect their soft abdomen. Some hermit crabs may be found on the land.



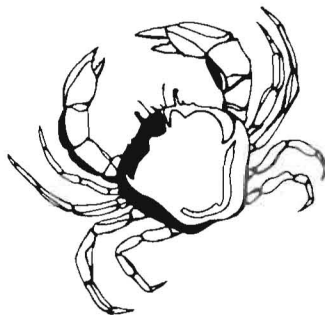
The popular coconut crab (ayuyu) is a hermit crab with a hard abdomen, so it does not need a shell. Overhunting is quickly depleting the ayuyu population.



Swimming crabs have flattened legs that they use for paddles. There are many different kinds of swimming crabs.

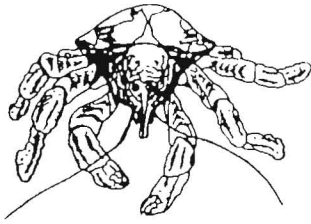


Ghost crabs are fast moving crabs that you can observe as they move from the water to their holes in the sand. Because they are the color of the sand, they are hard to see. They disappear quickly into their holes. That is how they got their name.



Arthropod Matching

Match the picture on the left with the name of each arthropod on the right.



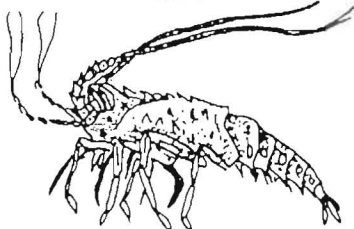
Spiny Lobster



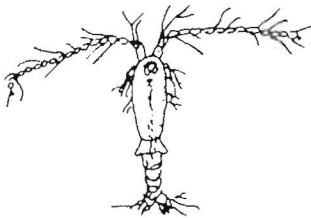
Fiddler Crab



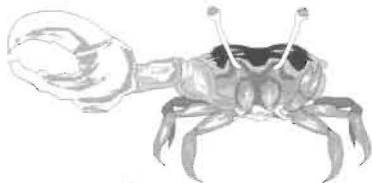
Copepod



Coconut Crab



Centipede



Spider



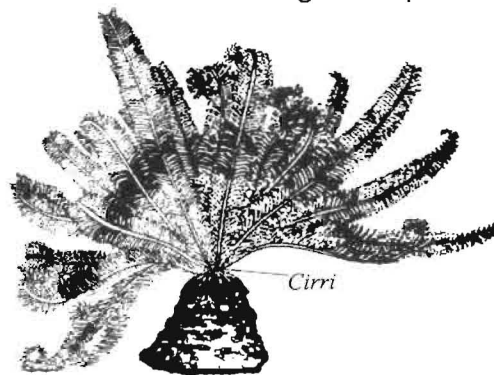
Barnacle

Phylum Echinodermata

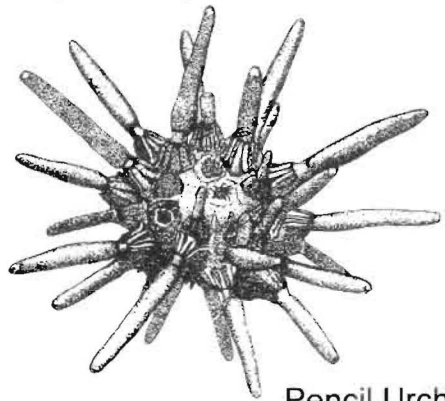
The echinoderms have spiny skin, and that is where they get their name (echin=spiny, derm=skin). Although the members of this phylum may look very different from each other, they all have body shapes that are radially symmetrical. This means that you can look at them a certain way, and they will look round or have parts that originate from a central point.

Echinoderms also have unique “plumbing” in the form of a water vascular system. This is a series of tubes in their body through which water flows. Many echinoderms have tube feet that act as suction cups. As the water squirts in and out of different tubes, it allows the animal to move, eat, and defend itself.

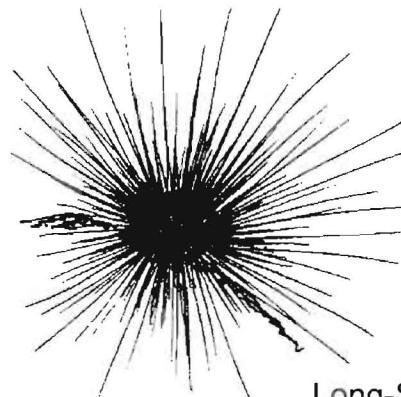
Class Crinoidea contains sea lilies. Sea lilies are also called feather stars. They usually live in deeper water, but some kinds may be found along the reef. They may look like flowers with their upturned mouths and radiating arms perched upon a stalk (cirri).



Class Echinoidea contains the sea urchins. Sea urchins are active at night (nocturnal). They feed on algae that grows on rocks and coral.

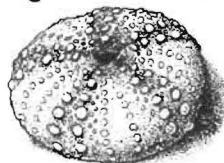


Pencil Urchin



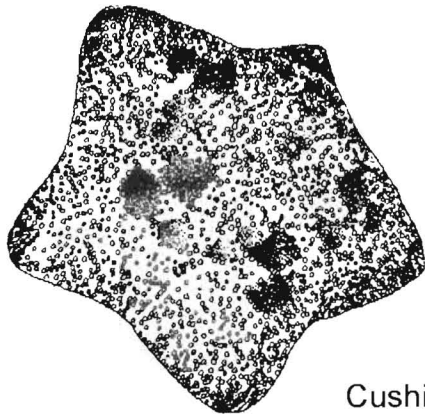
Long-Spined Sea Urchin

The skeleton of a sea urchin is made up of calcium-carbonate. It is called a test. Broken tests of sea urchins are common along the beach.

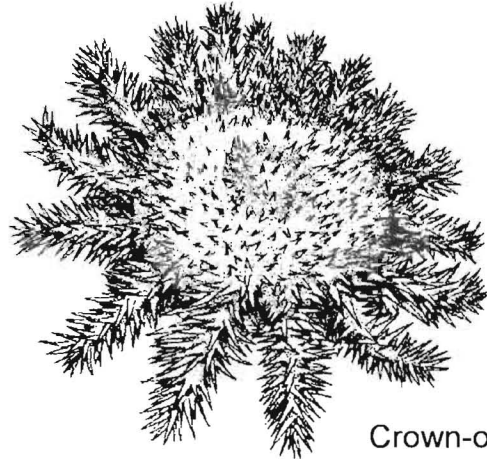


Test

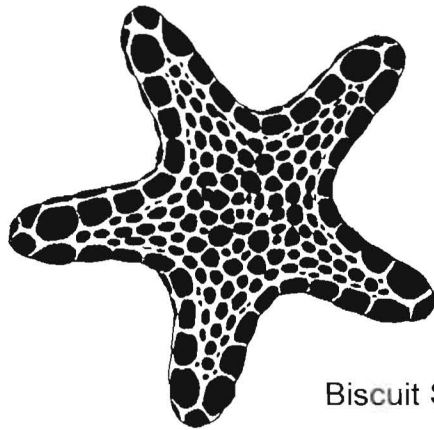
Class Asteroidea contains the starfish or seastars. These familiar organisms exhibit a wide variety of shapes. The crown-of-thorns starfish eats coral and destroys reefs. It sometimes undergoes mysterious population explosions.



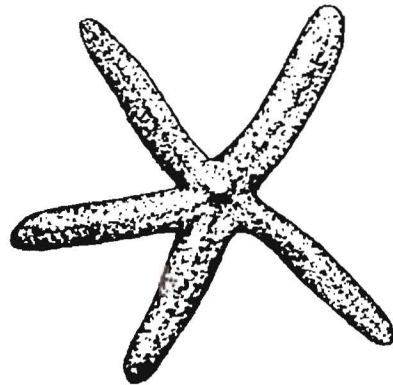
Cushion Star



Crown-of Thorns

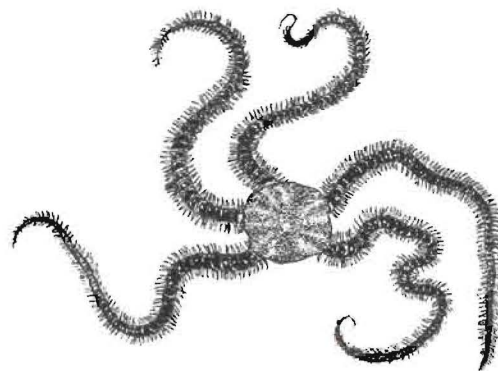


Biscuit Star



Blue Seastar

Class Ophiuroidea contains the brittle stars and basket stars. Their arms surround a central, rounded disk. Brittle stars are very common along the shallow coral reef. During the day, you may see their arms sticking out from under rocks. They are active at night (nocturnal). They feed on plankton and detritus (nutrients) suspended in the water. They catch their food with their long arms.

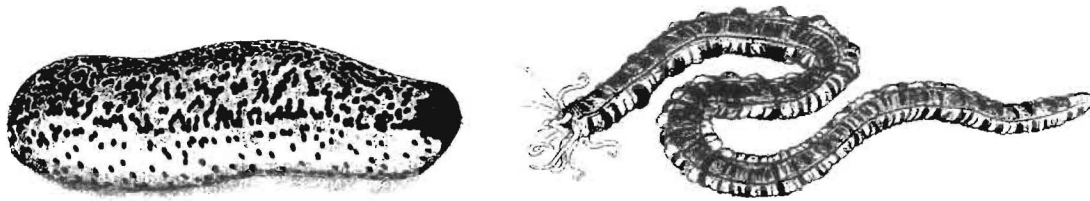


Brittle Star

Drawings by Stephen Francis, © Queensland Museum, Australia

Class Holothurioididea contains the sea cucumbers. These look the least like the other groups of echinoderms. Sea cucumbers can be found in the sand where they feed on detritus. Detritus is organic material such as bacteria and small organisms that live in the sand. Once the sand passes through the sea cucumber, it is cleaner. Sea cucumbers are important because they are like the “vacuum cleaners” of the sandy bottom, keeping it clean.

Sea Cucumbers



Echinoderm Review Questions

1. What does the name Echinoderm mean? _____
2. Name at least two kinds of starfish/seastars.

3. What is the name of the Class that starfish/seastars belong to?

4. What is the name of the starfish/seastar that eats coral and destroys coral reefs?
5. _____
6. What is another name for sea lilies? _____
7. When are sea urchins and brittle stars active? _____
8. What is the name of the Class that sea urchins belong to?

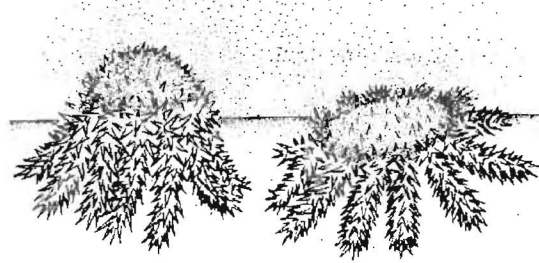
9. What is the skeleton of a sea urchin called? _____
10. Why are sea cucumbers important?

11. What is the name of the Class that sea cucumbers belong to?

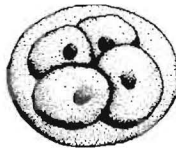
Life Cycle of the Crown of Thorns Starfish

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.

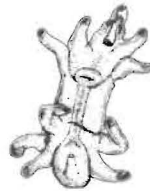
Adults Spawning



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.

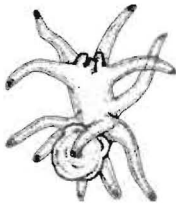


Embryo

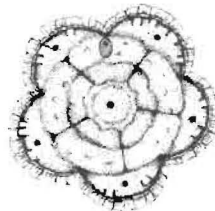


Larvae

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.

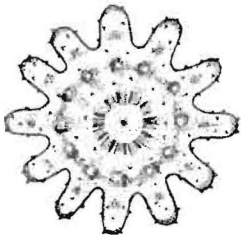


Settler

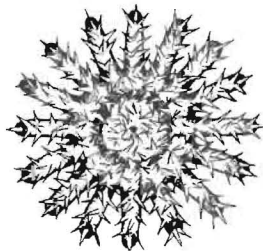


Young Juvenile

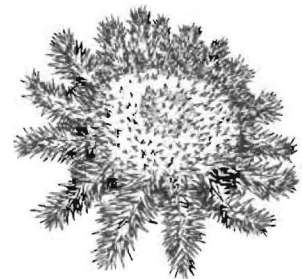
As the young juvenile grows into a juvenile, it gradually adds more arms. At about 4 to 6 months, the juveniles stop eating algae and start to feed on coral. Before the starfish starts to eat coral, it is only the size of a nickel. In just about 2 years, it will grow to the size of a dinner plate, (25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



Young Juvenile



Older Juvenile



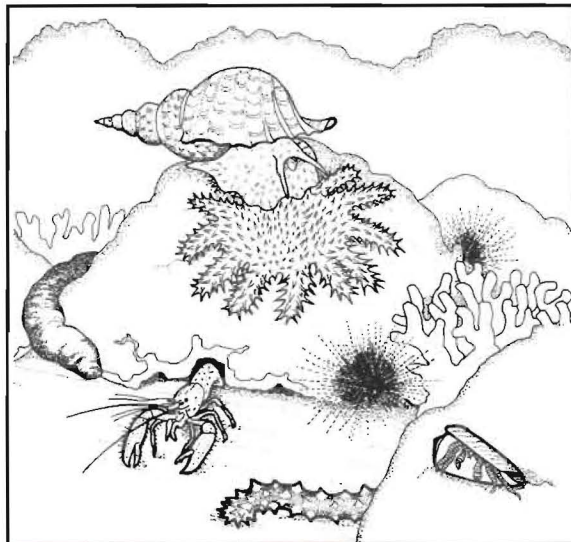
Adult

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

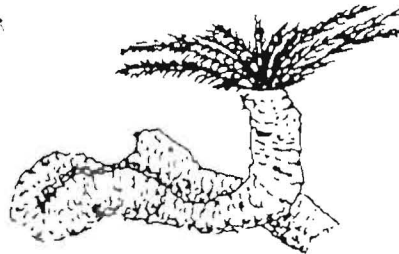
A Variety of Worms

Worms belong to many different Phyla of invertebrates. The three major phyla of worms are the Platyhelminthes (flatworms), Nematoda (roundworms), and Annelida (segmented worms).

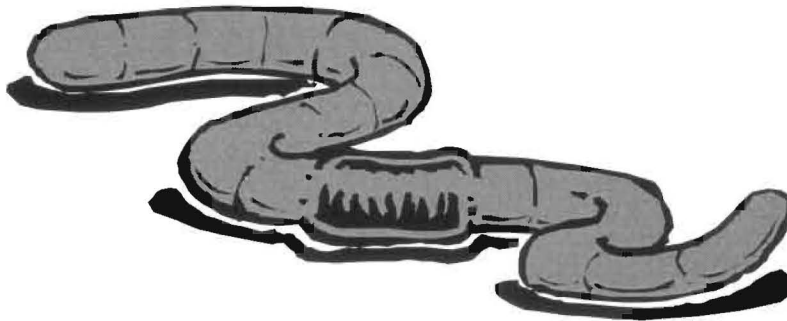
Worms come in many varieties and live in all sorts of habitats — from the bottom of the ocean to the inside of other animals. Flatworms blend in very well with their environment. The Christmas tree worm and the tubeworm are both segmented. The only part of the worm that you can see is the part that they feed with. Their segmented bodies are protected inside of a tube. The earthworm is another example of a segmented worm. They can be found living in the soil.



Christmas Tree Worms



Tube Worms

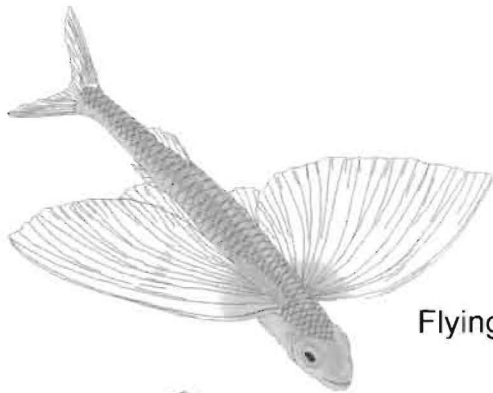


Earthworm

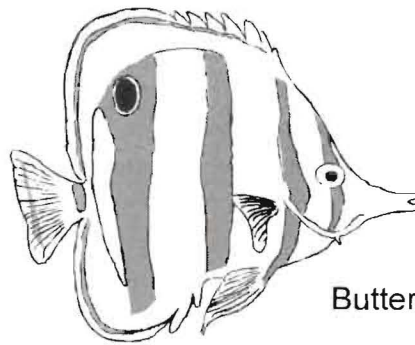
Phylum Chordata

Phylum Chordata consists of animals that have a backbone. Most of the animals in this phyla are vertebrates. Examples of vertebrates are fish, amphibians, reptiles, birds and mammals.

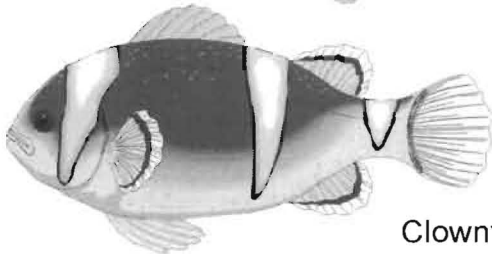
The most abundant group of animals with backbones are the fish. Fish breathe through gills, live in water, and are cold-blooded. That means that their bodies are the same temperature as the surrounding water. Most fish lay eggs. Some give birth to live young. Most fish have bones, but some have cartilage (sharks, skates, and rays). Below are several examples of bony fish that live in the CNMI waters.



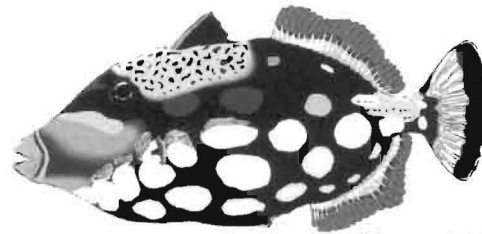
Flying Fish



Butterflyfish



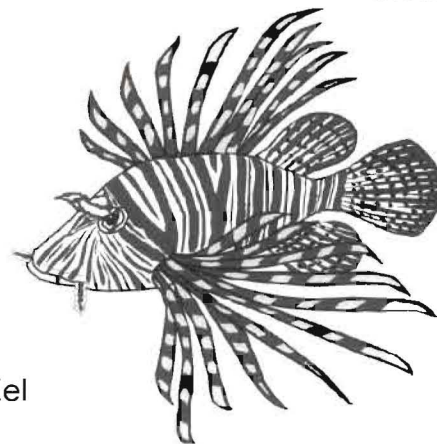
Clownfish or
Anemonefish



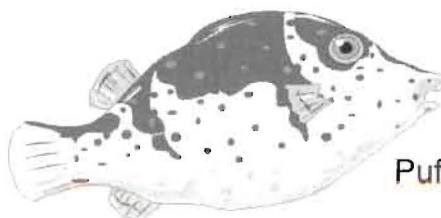
Clown Triggerfish



Moray Eel



Lionfish



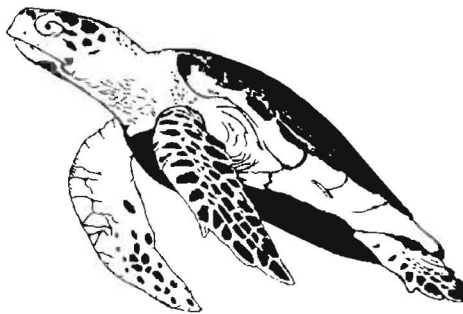
Pufferfish

Amphibians (Class Amphibia) are vertebrates that breathe air and depend on the water for at least one stage in their life cycle. They are cold blooded. Examples of amphibians are frogs, toads, and salamanders.



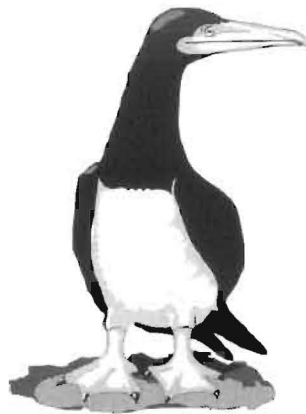
Frog

Reptiles (Class Reptilia) are vertebrates that live on the land or in the water. Most reptiles lay their eggs on the land. Some give birth to live young. Reptiles have scales and are cold blooded. Examples of reptiles in the CNMI are turtles, geckos, lizards, and snakes.



Sea Turtle

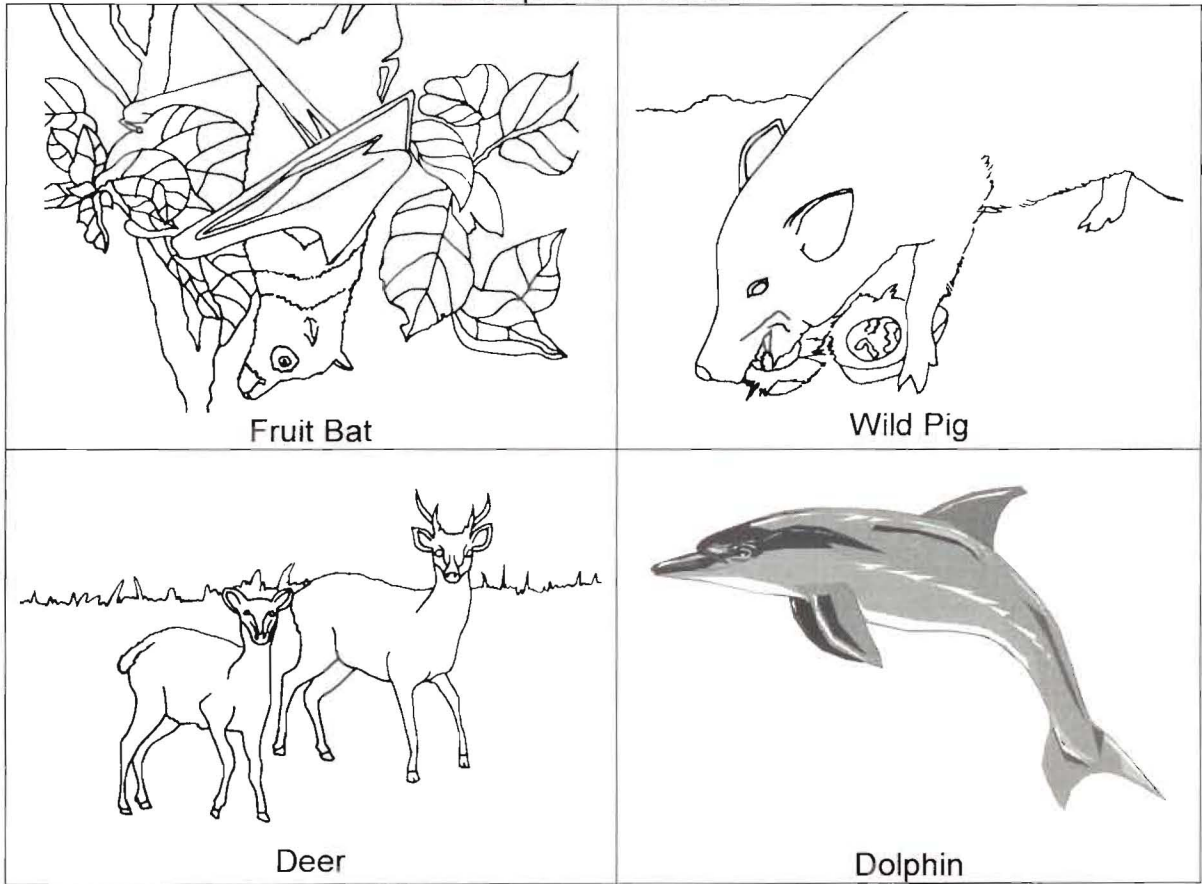
Birds (Class Aves) are vertebrates with feathers and wings. They lay eggs and are warm blooded. Most birds can fly, but some are ground birds that do not fly.



Brown Booby

Mammals (Class Mammalia) are vertebrates that are nourished by milk from their mothers. Mammals have hair and are warm blooded. Most mammals are born alive.

Examples of Mammals



Drawings (Fruit Bat, Wild Pig, Deer) from Let's Talk Fish and Wildlife, DAWR, used with permission

Animal Phyla – Matching



Cnidaria/Soft Coral



Chordata/Mammalia



Arthropoda/Crustacea



Molluska/Cephalopoda



Porifera



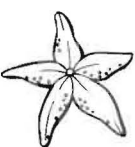
Arthropoda/Insecta



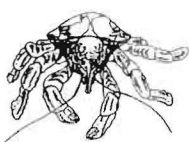
Echinodermata/Asteroidea



Molluska/Gastropoda



Cnidaria/Hard Coral



Chordata/Reptilia

Activity – Using a Key to Classify Animals

Objective

To learn the common characteristics of animals

To learn how to use a dichotomous key

Materials

Living Animals

Preserved Specimens

Photographs or drawings of Animals

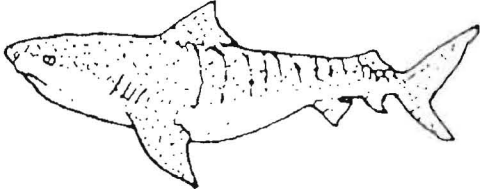
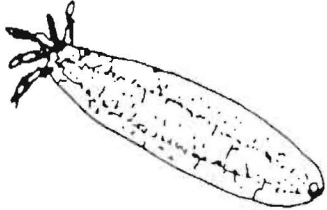
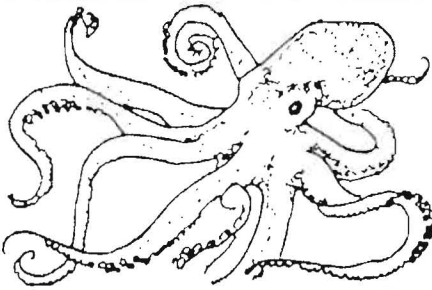
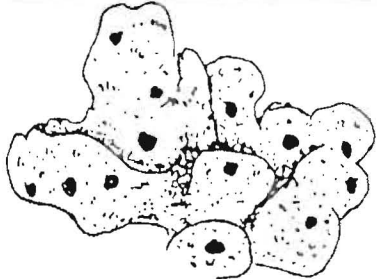
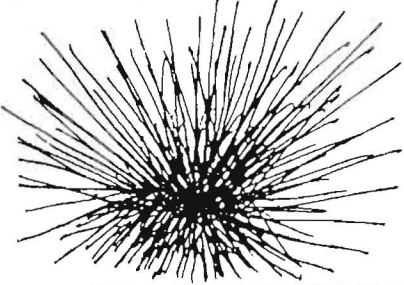

Procedure

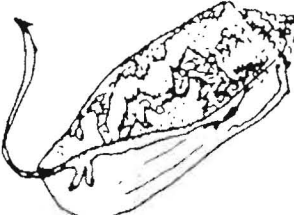
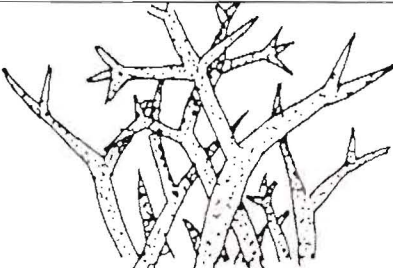
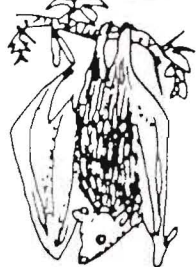
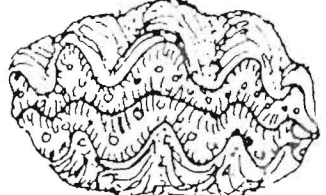
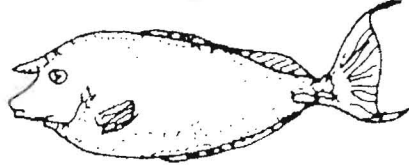
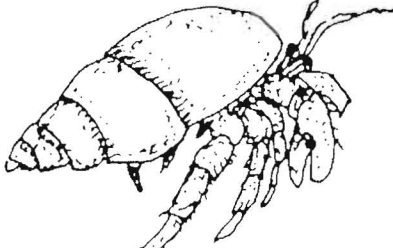
Begin at step 1. You will have only two choices. Look at your specimen carefully to determine the next step to go to be. Keep going to the next step until your animal has been classified.

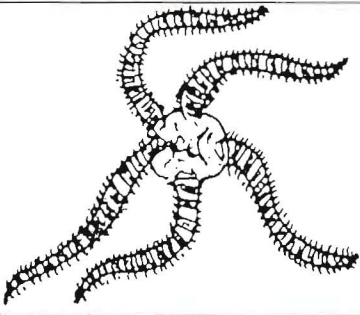
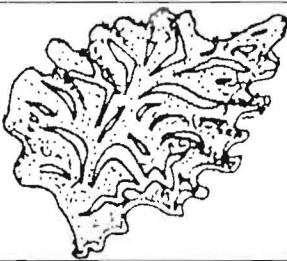
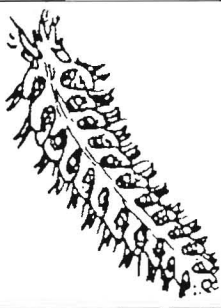
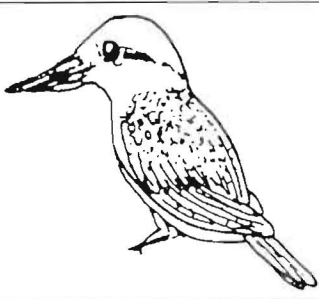
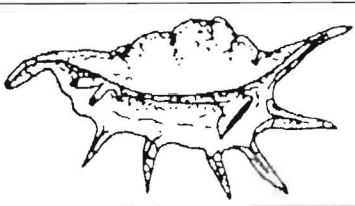
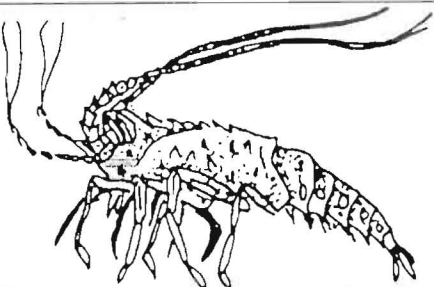
Step	Go To
1 A. Asymmetrical, irregular in shape, has pores. (Phylum Porifera)	2
1 B. Symmetrical, body has a definite shape.	3
2 A. Has a flexible body with many pores. (Class Demospongia)	
2 B. Is brittle. It is made of calcium (Class Calcarea)	
3 A. Radial symmetry, many equal parts	4
3 B. Bilateral symmetry, similar left and right sides	6
4 A. Soft body, polyp or medusa (Phylum Cnidaria)	5
4 B. Spines, arms, and/or tube feet (Phylum Echinodermata)	12
5 A. Medusa, transparent body (Class Scyphozoa)	
5 B. Polyp, tentacles on top of body surrounding mouth (Class Anthozoa)	
6 A. Body is wormlike or soft, may have a shell(s) for protection	7
6 B. Internal or external skeleton (exoskeleton)	15
7 A Body is wormlike	8
7 B Body is soft but not wormlike (Phylum Mollusca)	9
8 A. Flattened body (Phylum Platyhelminthes)	
8 B. Cylindrical, tube-like body with segments (Phylum Annelida)	
9 A Does not have tentacles	10
9 B Has tentacles (Class Cephalopoda)	

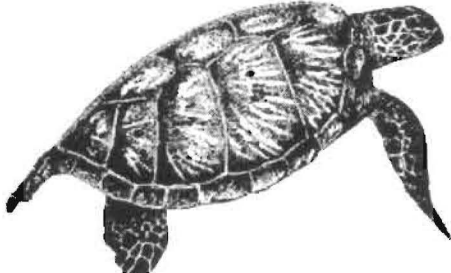

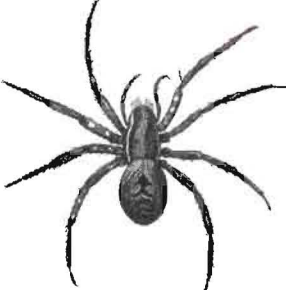

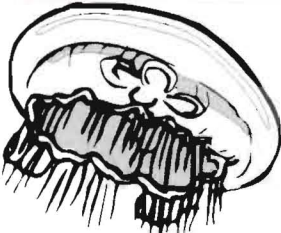

10A Has one shell (Class Gastropoda)	
10 B Has more than one shell	11
11 A Has two shells (Class Bivalvia)	
11 B Has 8 shells (Class Polyplacophora)	
12 A Has arms with tube feet and small spines	13
12 B Has a tube-like body or visible spines	14
13 A Arms are fused to the body. (Class Asteroidea)	
13 B Arms are connected to a central disk (Class Ophiuroidea)	
14 A Tube-like body with bumps (Class Holothuroidea)	
14 B Body spherical with radiating spines (Class Echinoidea)	
15 A External skeleton (Phylum Arthropoda)	16
15 B Internal skeleton (Phylum Chordata)	18
16 A Head, thorax and abdomen with 6 or 8 legs	17
16 B Head is fused to thorax, abdomen present (Class Crustacea)	
17 A Thorax has 6 legs attached (Class Insecta)	
17 B Thorax has 8 legs attached (Class Arachnida)	
18 A Fish	19
18 B Not a fish	20
19 A Skeleton made of flexible cartilage (Class Chondrichthyes)	
19 B Skeleton made of bone (Class Osteichthyes)	
20 A Does not have feathers or hair	21
20 B Has feathers or hair (at some stage)	22
21 A Begins life in the water (Class Amphibia)	
21 B Begins life in an egg. Has thick scales or plates. (Class Reptilia)	
22 A Body has feathers; front limbs are wings, lays eggs (Class Aves)	
22 B Live birth, nurses young with milk, warm blooded (Class Mammalia)	

These drawings may be cut out and used for classification activities if living or preserved specimens are not available.

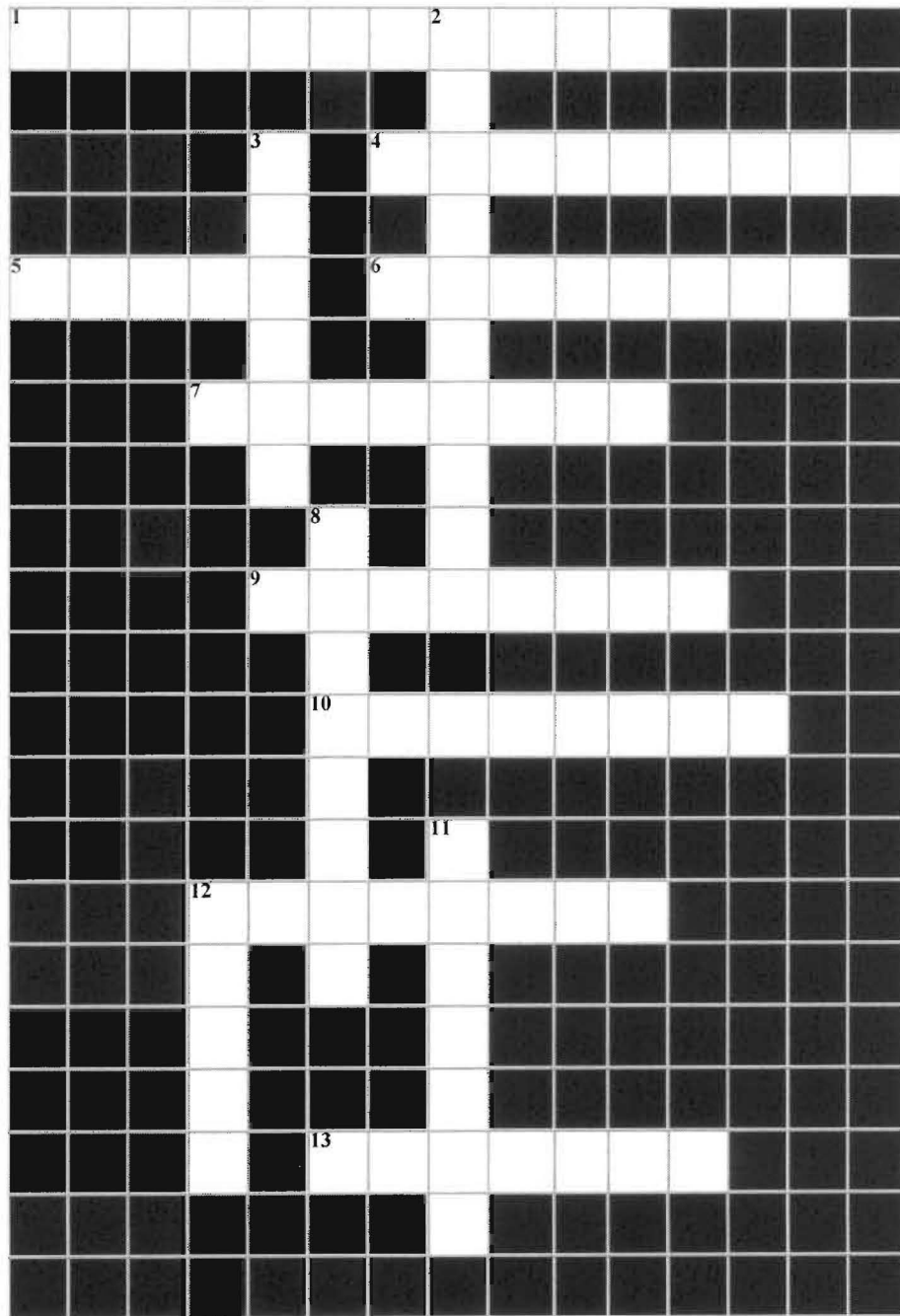
Animal	Common Name and Classification
	<p>Tiger Shark</p> <p>Phylum: Chordata Class: Chondrichthyes</p>
	<p>Sea Cucumber</p> <p>Phylum: Echinodermata Class: Holothuroidea</p>
	<p>Octopus</p> <p>Phylum: Mollusca Class: Cephalopoda</p>
	<p>Sponge</p> <p>Phylum: Porifera Class: Demospongia</p>
	<p>Sea Urchin</p> <p>Phylum: Echinodermata Class: Echinoidea</p>
	<p>Rat</p> <p>Phylum: Chordata Class: Mammalia</p>

Animal	Common Name and Classification
	<p>Cone Snail</p> <p>Phylum: Mollusca Class: Gastropoda</p>
	<p>Staghorn Coral</p> <p>Phylum: Cnidaria Class: Anthozoa</p>
	<p>Fruit Bat</p> <p>Phylum: Chordata Class: Mammalia</p>
	<p>Giant Clam</p> <p>Phylum: Mollusca Class: Bivalvia</p>
	<p>Unicorn Fish</p> <p>Phylum: Chordata Class: Osteichthyes</p>
	<p>Hermit Crab</p> <p>Phylum: Arthropoda Class: Crustacea</p>

Animal	Common Name and Classification
	<p>Brittle Star</p> <p>Phylum: Echinodermata Class: Ophiuroidea</p>
	<p>Flat Worm</p> <p>Phylum: Platyhelminthes</p>
	<p>Segmented Worm</p> <p>Phylum: Annelida</p>
	<p>Kingfisher</p> <p>Phylum: Chordata Class: Aves</p>
	<p>Spider Conch</p> <p>Phylum: Mollusca Class: Gastropoda</p>
	<p>Spiny Lobster</p> <p>Phylum: Arthropoda Class: Crustacea</p>

Animal	Common Name and Classification
	<p>Green Sea Turtle</p> <p>Phylum: Chordata Class: Reptilia</p>
	<p>Chiton</p> <p>Phylum: Mollusca Class: Polyplacophora</p>
	<p>Spider</p> <p>Phylum: Arthropoda Class: Arachnida</p>
	<p>Frog</p> <p>Phylum: Chordata Class: Amphibia</p>
	<p>Moon Jellyfish</p> <p>Phylum: Cnidaria Class: Scyphozoa</p>
	<p>Soft Coral</p> <p>Phylum: Cnidaria Class: Anthozoa</p>

Classification Review Crossword Puzzle



Classification Review: Clues

Across:

- 1 Some organisms from the Kingdoms Monera and Fungi break down the remains of living things. They are known as _____.
- 4 This type of food poisoning is caused by a protist called a dinoflagellate.
- 5 The genus and species names are usually based on this language.
- 6 Humans belong to this Kingdom.
- 7 Single-celled organisms that can be "plant-like" or "animal-like" belong to the Kingdom _____.
- 9 Plants that have vessels are called _____ plants.
- 10 Another name for a living thing.
- 12 Each Order is divided into groups called _____.
- 13 Each Phylum is divided into groups called _____.

Down:

- 2 A genus and a species make up a _____ name of an organism.
- 3 Bacteria and blue-green algae belong to the Kingdom _____.
- 8 The study of classification is called _____.
- 11 Mangroves, sea grasses and pandanus trees all belong to the Kingdom _____.
- 12 Mold, mildew, mushrooms, and yeast belong to the Kingdom _____.

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.

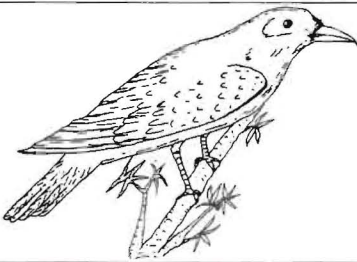
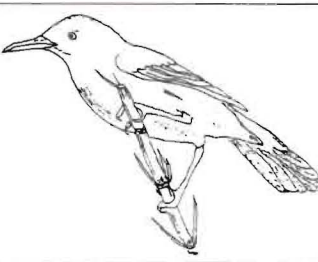
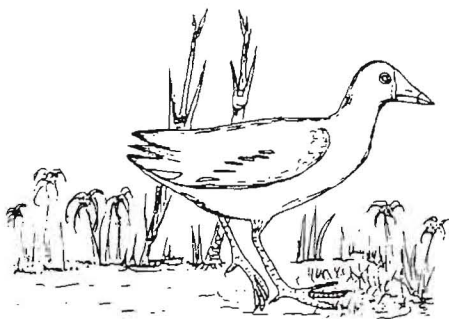
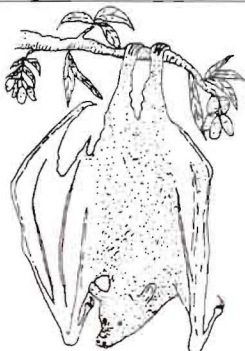
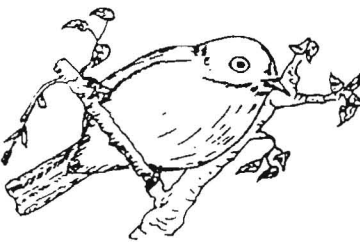
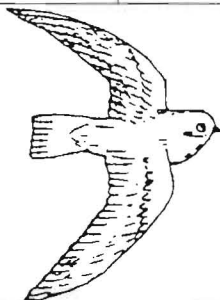
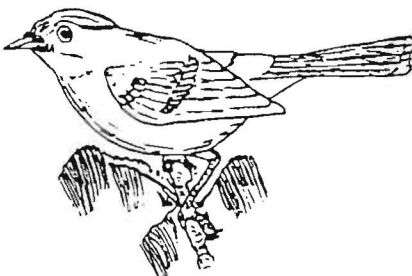
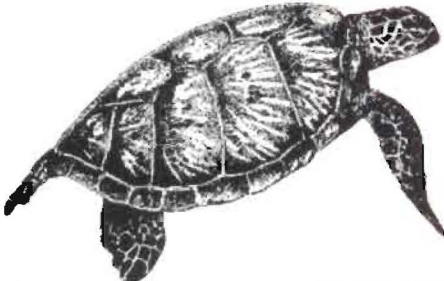
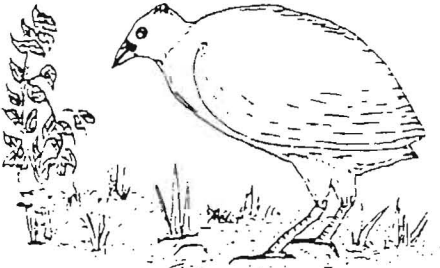
The term **threatened** is used when a plant or animal is likely to become endangered in the near future. The term **endangered** is used when a plant or animal is in danger of becoming extinct in the near future. The Mariana fruit bat is an endangered species. The term **extinct** is used when a plant 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

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

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

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

What is Extinction and Why Should You Care If Sea Turtles Go Extinct?

A plant or animal becomes extinct when the last living individual of its species dies, causing it to vanish from the earth forever. If there is ever a time when the last green turtle on earth dies, then never again will this magnificent creature grace our world.

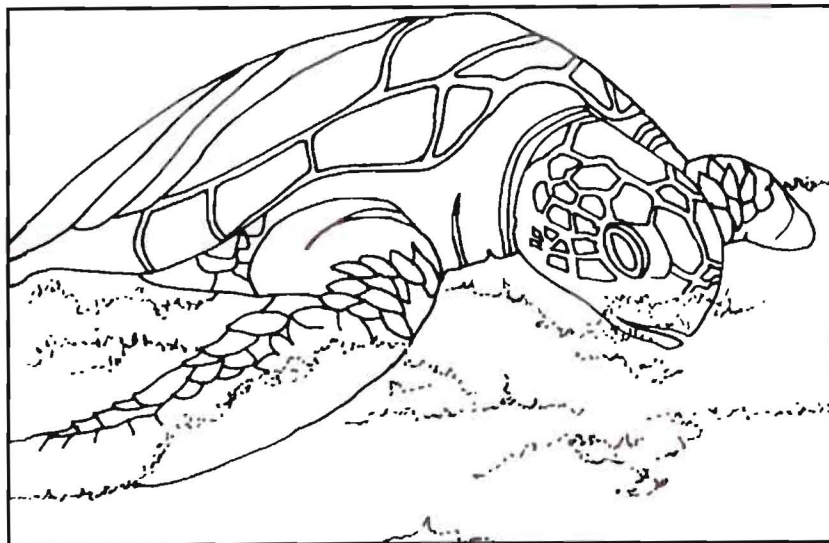
Species have been going extinct for millions of years; it is a natural part of the evolutionary process. For example, most of the species that existed during the time of dinosaurs have perished. Many probably went extinct because of sudden geological or climatic changes -- possibly because of a large volcanic eruption or because of a giant meteor hitting the earth.

Today, however, species are going extinct because of abrupt changes brought about by humans. Habitat destruction, pollution and overconsumption are causing species to decline at a rate never before seen in history. This loss of species is eroding the diversity of life on earth, and a loss of diversity can make all life vulnerable.

Much can be learned about the condition of the planet's environment by looking at sea turtles. They have existed for over 100 million years, and they travel throughout the world's oceans. Suddenly, however, they are struggling to survive -- largely because of things people are doing to the planet's oceans and beaches. But what does this mean for the human species?

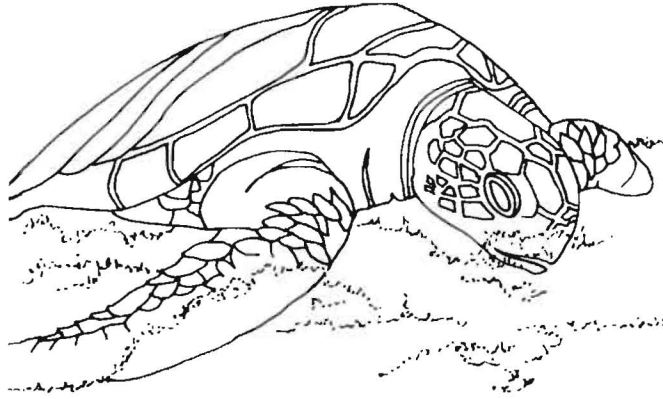
It is possible that a world in which sea turtles cannot survive may soon become a world in which humans struggle to survive. If, however, we learn from our mistakes and begin changing our behavior, there is still time to save sea turtles from extinction. In the process, we will be saving one of the earth's most mysterious and time-honored creatures. We might just be saving ourselves too.

from Sea Turtle Survival League, Educator's Guide, Caribbean Conservation Corp.



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

Sea Turtle Survival Game



Introduction

In this activity, students will be presented with different scenarios and turtle trivia questions. If answered correctly, turtle eggs will be earned. If answered incorrectly, turtle eggs will be lost and never get to hatch. This is a game of survival. The one with the most eggs at the end of the game will win.

Objectives

Students will be able to identify several threats to sea turtles.
Students will be able to understand ways to conserve sea turtles.

Materials

Chips (turtle eggs)
Scenario and Turtle Trivia Cards (cut out and mix them up)

Procedure

1. Create teams with three to five players.
2. Each player starts out with 25 turtle eggs. Distribute chips. Keep all of the extra chips (eggs) in the bank (nest),
3. The youngest player on the team will go first. Play in a clockwise direction and take turns.
4. Each player will have a scenario or trivia question read to him/her by another player. If they answer correctly, he/she will gain eggs. If not, he/she will lose eggs.
5. Only one scenario or trivia question will be given to each player during his or her turn. Continue to play the game until all of the questions are gone.

Extension

Students can create additional questions for this game.
Students can discuss conservation plans for sea turtles.

Adapted from Environmental Education Outreach Program, Northwestern Hawaiian Islands National Wildlife Refuge, Rebecca Himschoot and Valerie Sloan, USFWS

Scenario Cards

Questions	Answers
<p>A developer wants to dig up the vegetation along the beach. The vegetation is a known area for turtle nesting. What can you do?</p> <p>A. Nothing B. Ask them to build behind the vegetation line. C. Change the location of the vegetation.</p>	<p>The correct answer is B.</p> <p>Correct: Gain 3 eggs Incorrect: Loose 3 eggs</p>
<p>There was a typhoon and a nest has been uncovered. What can you do?</p> <p>A. Transplant the eggs to the trunk of your parent's car to keep them warm. B. Put the eggs into the ocean so that they can hatch. C. Place sand back over the nest so that the turtles may have a better chance at hatching.</p>	<p>The correct answer is C.</p> <p>Correct: Gain 5 eggs Incorrect: Loose 5 eggs</p>
<p>You are bringing your dogs to the beach. Dogs have been known to dig up turtle nests. What can you do?</p> <p>A. Keep your dog on a leash. B. Do not take your dog to the beach. C. Train your dog to chase other dogs away from turtle nests.</p>	<p>The correct answer is A.</p> <p>Correct: Gain 2 eggs Incorrect: Loose 2 eggs</p>
<p>You see a nest where most of the turtles have hatched out the night before. Five hatchlings are stuck inside of the nest. What do you do?</p> <p>A. Call DFW (Division of Fish and Wildlife) so that they can help rescue the turtle hatchlings? B. Dig out the nest and lift the turtles out. C. Keep on sunbathing.</p>	<p>The correct answer is A. Remember - it is illegal for you to touch threatened and endangered species in the CNMI.</p> <p>Correct: Gain 8 eggs Incorrect: Loose 8 eggs</p>

Scenario Cards

Questions	Answers
<p>Your family is going to a party on the beach during turtle nesting season. What can you do?</p> <ul style="list-style-type: none"> A. Ask them not to drive on the beach. B. Ask them to drive in the water and not on the sand. C. Ask them to drive only on the loose sand and not on the vegetation. 	<p>The correct answer is A. Driving on loose sand created tire tracks which may not allow turtles to make it safely out to sea.</p> <p>Correct: Gain 3 eggs</p> <p>Incorrect: Loose 3 eggs</p>
<p>You are having a huge bonfire on the beach. You notice that hatchlings are starting to emerge from a nest nearby. What do you do?</p> <ul style="list-style-type: none"> A. Dig up the nest and carry the hatchlings to the water. B. Put out the fire and quietly leave that area. C. Cover up the nest so that the fire does not burn the turtles. 	<p>The correct answer is B.</p> <p>Correct: Gain 5 eggs</p> <p>Incorrect: Loose 5 eggs</p>
<p>You are getting ready to go jet skiing in the lagoon. You notice that turtles are feeding in the sea grass beds nearby. What do you do?</p> <ul style="list-style-type: none"> A. Choose another area to jet ski or jet ski slowly out to a different area. B. Stand there all day telling everyone that they are not allowed to jet ski there. C. Go and pet the sea turtles. 	<p>The correct answer is A. Remember; it is illegal for you to touch threatened and endangered species in the CNMI.</p> <p>Correct: Gain 4 eggs</p> <p>Incorrect: Loose 4 eggs</p>
<p>You see a poacher digging up a nest of turtle eggs. What do you do?</p> <ul style="list-style-type: none"> A. Ask them to let you taste the eggs. B. Make a citizen's arrest. C. Leave the area and call 911 or the DFW (Division of Fish and Wildlife). 	<p>The correct answer is C.</p> <p>Correct: Gain 6 eggs</p> <p>Incorrect: Loose 6 eggs</p>

Scenario Cards

Questions	Answers
<p>Visitors to your island are petting a sea turtle in shallow water. What can you do?</p> <ul style="list-style-type: none"> A. Call 911 and ask the police to have the tourist arrested. B. Educate the tourist about sea turtles and politely ask him/her not to touch the turtle. C. Do nothing. Pretend you did not see that. 	<p>The correct answer is B.</p> <p>Correct: Gain 7 eggs</p> <p>Incorrect: Loose 7 eggs</p>
<p>There was an oil spill near a turtle nesting area. You know that the hatchlings will emerge soon. What can you do?</p> <ul style="list-style-type: none"> A. Dig up the nest and carry the hatchlings to another beach. B. Call the DFW (Division of Fish and Wildlife) and the Coast Guard to report the oil spill. C. Try to clean up as much of the oil as you can because your time is limited. 	<p>The correct answer is B.</p> <p>Correct: Gain 3 eggs</p> <p>Incorrect: Loose 3 eggs</p>
<p>You see a program on the Discovery Channel. It documents sea turtles entrapped in plastic soda rings. What should you do?</p> <ul style="list-style-type: none"> A. Nothing. That could never happen to turtles in the CNMI. B. Never drink soda again. C. Cut up soda rings from 6-packs before you throw them away. 	<p>The correct answer is C.</p> <p>Correct: Gain 5 eggs</p> <p>Incorrect: Loose 5 eggs</p>
<p>A shark has attacked a female sea turtle. One of her back flippers is completely gone. She is about to nest. What can you do?</p> <ul style="list-style-type: none"> A. Call the DFW (Division of Fish and Wildlife) to inform them that a turtle is struggling while trying to nest. B. Dig a large pit in the sand and show the turtle where to lay her eggs. C. Go home and check on the turtle the next day. 	<p>The correct answer is A.</p> <p>Correct: Gain 4 eggs</p> <p>Incorrect: Loose 4 eggs</p>

Scenario Cards

Questions	Answers
<p>Your parents want to release 100 balloons into the air at your birthday party on the beach. You know turtles and other animals sometimes swallow balloons by mistake. What can you do?</p> <ul style="list-style-type: none"> A. Ask your parents not to have any balloons at your birthday party. B. Only release 50 balloons into the air instead of 100. C. Ask them to have balloons but not to release them. Instead, dispose of them in a trashcan at the end of the party. 	<p>The best answer is C. However, A is also correct. Remember - you should never release balloons into the air.</p> <p>Correct: Gain 4 eggs</p> <p>Incorrect: Loose 4 eggs</p>
<p>A new beach restaurant is keeping its lights on all night. This is a turtle nesting area. What can you do?</p> <ul style="list-style-type: none"> A. Politely ask them to turn off their lights at closing time. Explain why. B. Have your classmates protest outside of the restaurant so that customers will not dine there. C. Do nothing. 	<p>The correct answer is A.</p> <p>Correct: Gain 5 eggs</p> <p>Incorrect: Loose 5 eggs</p>
<p>You notice that sharks are eating the turtle hatchlings as soon as they reach the water. What can you do?</p> <ul style="list-style-type: none"> A. Go in the water and fight off the sharks. B. Put the hatchlings in a box and carry them to another beach. C. Do not interfere with hatchlings entering the water. 	<p>The correct answer is C. Some hatchlings will survive and hopefully reach adulthood.</p> <p>Correct: Gain 2 eggs</p> <p>Incorrect: Loose 2 eggs</p>
<p>You are snorkeling on a boat trip. Your guide tells you it is OK to ride on the backs of sea turtles if you see them. What can you do?</p> <ul style="list-style-type: none"> A. Don't ride the sea turtle. Inform your guide that sea turtles are protected. B. Go for a ride. They can swim up to 25 miles per hour, and it will be fun. C. Don't ride the turtle but tell your friends that they should try it. 	<p>The correct answer is A.</p> <p>Correct: Gain 3 eggs</p> <p>Incorrect: Loose 3 eggs</p>

Turtle Trivia Cards

Questions	Answers
<p>The two types of sea turtles that are found in the CNMI islands are:</p> <p>A. Leatherback and Hawksbill B. Hawksbill and Green C. Green and Loggerhead</p>	<p>The correct answer is B.</p> <p>Correct: Gain 5 eggs Incorrect: Loose 5 eggs</p>
<p>Sea turtles are:</p> <p>A. Mammals B. Amphibians C. Reptiles</p>	<p>The correct answer is C.</p> <p>Correct: Gain 4 eggs Incorrect: Loose 4 eggs</p>
<p>Green sea turtles eat:</p> <p>A. Fish and squid B. Algae and sea grass C. Lobsters and jellyfish</p>	<p>The correct answer is B.</p> <p>Correct: Gain 6 eggs Incorrect: Loose 6 eggs</p>
<p>Hawksbill sea turtles eat:</p> <p>A. Squid B. Fish C. Sponges</p>	<p>The correct answer is C.</p> <p>Correct: Gain 2 eggs Incorrect: Loose 2 eggs</p>
<p>Adult Hawksbill sea turtles can weigh:</p> <p>A. Up to 40 pounds B. Over 100 pounds C. Over 300 pounds</p>	<p>The correct answer is B.</p> <p>Correct: Gain 2 eggs Incorrect: Loose 2 eggs</p>
<p>Adult Green sea turtles can weigh:</p> <p>A. Up to 50 pounds B. Over 300 pounds C. Over 1000 pounds</p>	<p>The correct answer is B.</p> <p>Correct: Gain 3 eggs Incorrect: Loose 3 eggs</p>

References

Bourquin, Avril and Mayhew, Ross. 1999. *Man and Mollusc - Uses of Shell-Bearing Molluscs - Past, Present & Future*.

http://www.manandmollusc.net/advanced_uses/advanced_uses-print.html

Carter, Ken. 2003. *Cone Snails*. http://oceanography.asu.edu/project_ken.htm

COA Conch-Net. 1998. *Things You Always Wanted to Know About Shells*. Philadelphia, PA. Academy of Natural Sciences. <http://coa.acnatsci.org/conchnet/facts.html>

Col, Jeananda. 2003. *Enchanted Learning*. <http://www.EnchantedLearning.com>

Coulombe, Deborah A. 1984. *The Seaside Naturalist*. NY, NY. Prentice Hall Press.

Commonwealth of the Northern Marianas Public School System. 2002. *K-12 Science Standards and Benchmarks*. CNMI.

Dance, Peter S. 1992. *Shells*. New York. Dorling Kindersley, Inc.

Department of Agriculture, Division of Aquatic and Natural Resources. 2001. *Let's Talk Fish and Wildlife*. Mangilao, GU. DAWR.

Fact Monster. 2003. *Animal Groups*. Family Education Network.

<http://www.factmonster.com>

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

Quinn, Michael and Lee, Larry. *Our Island Environment*, 1991. CNMI Coastal Resources Office.

Sea Turtle Survival League, 1999. *Sea Turtle Migration-Tracking & Coastal Habitat Education Program, An Educator's Guide*. Caribbean Conservation Corps. Gainesville, FL. <http://www.cccturtle.org>

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>

