

South Water Caye Marine Reserve

# Reef Keeper Workbook

For Belize Standard 4-6



Created by Lisa Mulcahy, MarEPOsa, Dec 2012

# Reef Keeper



## WELCOME

Welcome to South Water Caye Marine Reserve (SWCMR) and World Heritage Site! People from all over the world come to enjoy the natural beauty of its coral reefs and cayes or islands. SWCMR is one of Belize's natural treasures since it has a large variety of habitats, animals, plants, and marine life. The reserve area includes 117,878 acres and is the largest marine reserve area in Belize. The area includes 32 cayes including Man-of-War Caye, Tobacco Caye, Coco Plum Caye, Twin Caye, Carrie Bow Caye, South Water Caye, Wee Wee Caye, and others. The reserve is roughly 15 miles southeast from Dangriga offshore and spans from Dangriga to east of Placencia in Belize.

## South Water Caye Marine Reserve Is Part of a Network

The South Water Caye Marine Reserve is part of a network of barrier reefs. The Government of Belize created South Water Caye Marine Reserve in 1996 to give special protection to the aquatic plants and animals, and to protect and preserve the natural breeding grounds and habitats of aquatic life. SWCMR contains remarkable **biodiversity** and beauty. It is an important area for many animals such as sea turtles, grouper, and manatees. It also protects important nursery habitat of the queen conch and spiny lobster.

### Did you know?

*The Belize Barrier Reef is the second largest reef in the world after the Great Barrier Reef.*

*Coral reefs are limestone (calcium carbonate) formations, found mostly in warm and tropical seas. A barrier reef is a type of reef generally found many miles offshore, separated from land by a deep-water channel or a lagoon.*

## Respect and Protect

*It is very important that we do all we can to protect the marine reserves and ourselves. Marine reserves help to make sure we can enjoy beautiful reefs, plentiful seafood, and ensure future generations of visitors can enjoy it, too!*

### Belizean families depend on the reef.

Many people depend on the health of South Water Caye Marine Reserve for fishing, tourism, diving, and scientific research. Many people that live on the cayes fish to feed themselves and their families. People who do this are called **subsistence fishers**. For them, the reef is a very special place.



Fill in the blanks with these words: **place**      **cans**      **quiet**      **stay**

Put trash in garbage \_ \_ \_ \_.

Children and adults should \_ \_ \_ \_ together.

Leave sand, rocks, plants, animals, and anything else that belongs here in its \_ \_ \_ \_ \_.

Respect the ranger by listening \_ \_ \_ \_ \_ly.

# It Makes Sense

Adapted from Carlsbad Caverns Junior Ranger Workbook, 2011



**Using our five senses is how we explore our world and get information. Label the pictures above with name of the sense it represents. Walk the island and fill in these questions.**

Write something you smell at SWCMR. Is that a natural smell?

Name two sounds you hear at SWCMR.

When it comes to marine life like corals, touching them in the water can harm them. Describe how coral might feel based on the coral skeletons you see on land.

Draw a picture of two things you see at SWCMR.



## Did you know?

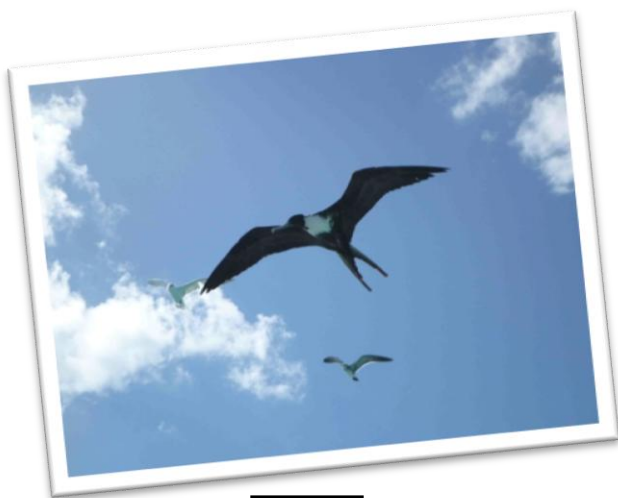
*Corals grow by making a substance called calcium carbonate, the same ingredient in chalk. This hard “shell” protects the soft coral animal inside. Corals grow very slowly and take hundreds to thousands of years to grow. This is why it is very important to not touch or damage the coral.*

# Scavenger Hunt

*Put a check by each thing once you find it.*

## Queen Conch

A queen conch is a marine snail. The queen conch eats algae, a water plant that grows on the turtle grass. Queen conchs are an important part of the fisheries at SWCMR. Notice the large, flaring pink lip on this shell? This indicates the conch is mature.



## Magnificent Frigate Bird

The frigate bird is a marine bird that eats fish from the surface or steals it from other birds. At Man-O-War Caye on SWCMR there is a protected nesting colony of these birds. The frigate bird does not have the oil that most diving birds have to protect its feathers so it cannot dive. The frigate birds often live with the brown booby, which it steals from to get food.

## Mangrove

Mangroves are an important part of the marine reserve. These amazing plants can grow in salt water! Some have special roots for gas exchange. Their roots provide a nursery ground for many of the creatures such as snapper, Caribbean spiny lobster, and habitat for birds like the frigate above. Mangroves also provide protection from storms and erosion.



## Seagrass

See the grass under the water in the picture? Seagrass is a marine grass. There are three kinds of seagrass in SWCMR: turtle grass, manatee grass, and shoal grass. It is an important food for conch, sea turtles, and manatees that eat plants. It also acts as a nursery ground for small fish that hide in the blades. Seagrass helps hold the sand together and protects the reef.



# The South Water Caye Marine Reserve Story



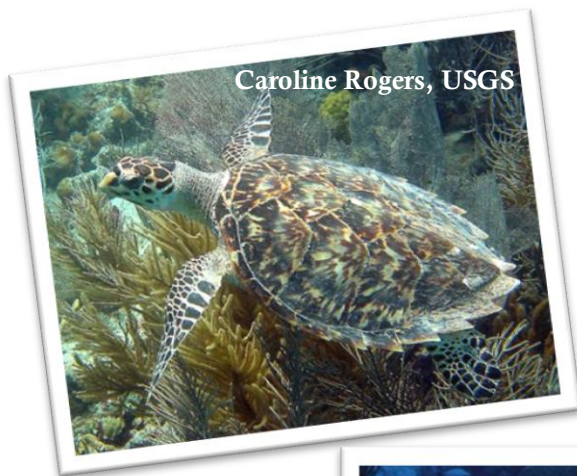
Fill in the blanks to learn the story of South Water Caye Marine Reserve using the letters below. The letters can be used more than once.

n e v y n s h t f u g o l a r i

Ancient people have used the cayes for a long time. Around 2,500 years ago the M\_\_\_\_\_s likely used the cayes for f\_\_\_\_s h\_\_\_\_g. After the Mayan civilization declined, the cayes probably went unused. In the 1600s, Spanish explorers used the cayes to collect fresh w\_\_\_\_t\_\_\_\_r and to repair their boats. Later, the cayes became a haven for plundering p\_\_\_\_r\_\_\_\_s who survived off the rich marine life. In the early 1800s the G\_\_\_\_f\_\_\_\_na, who came from Honduras to Belize, probably used the cayes for fishing, too. Within the past half-century, many of the c\_\_\_\_s came into private ownership. Belizeans from the nearby mainland town of D\_\_\_\_n\_\_\_\_i\_\_\_\_a now use the cayes as their weekend homes. Because of the natural beauty of the cayes, many Belizeans also built h\_\_\_\_t\_\_\_\_s for tourists. Residents of the cayes now include fisherman, r\_\_\_\_ng\_\_\_\_rs, people working with the tourists (hotel staff, dive and snorkel operators, fishing guides), and mainlanders. All of them come to enjoy the rich bounty and beauty that South Water Caye Marine Reserve offers. In 1993, the Belizean government decided to protect this precious natural resource by creating a system of marine reserves including South Water Caye M\_\_\_\_e R\_\_\_\_s\_\_\_\_e.

# Sea Turtles of South Water Caye Marine Reserve

Sea Turtles are an important part of marine life at South Water Caye Marine Reserve. They are reptiles that breathe air like we do. Sea turtles eat jellyfish, sponges, crabs, conch, and seagrass, depending on the kind of sea turtle they are. Like other reptiles, sea turtles are cold-blooded. To lay their eggs, adult females come onto the beach, usually at night. Amazingly, the female sea turtle returns to the beach where she was hatched to lay eggs! She pulls herself forward with her strong front flippers (much like our arms). Once she finds a good spot, she makes a small pit for her body. Then the sea turtle uses her rear flippers to dig the nest for the eggs. A female turtle will then lay from 50 to 200 eggs in the nest. Once the female lays her eggs, she returns to the ocean. In 45 to 60 days the eggs will hatch and the hatchlings (baby turtles) crawl out, generally at night, when there are less predators to eat them. Using the moonlight, turtles head toward the ocean and the females will eventually return to the beach where they hatched to complete the cycle.



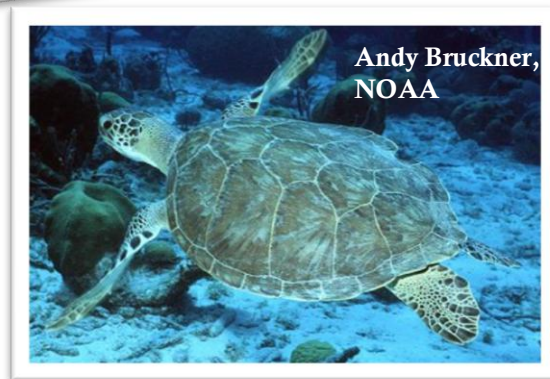
Caroline Rogers, USGS

**Hawksbill**



Strobilomyces, France

**Loggerhead**



Andy Bruckner, NOAA

**Green**

## Did you know?

*The temperature of the eggs in a sea turtle's nest determines whether the egg will become male or female. The eggs at the top of the nest that are closer to the sun and warmer become female. Those at the cooler bottom become male.*

# Turtle Nesting Game

Adapted from *Sun, Sand and Sea Turtles*, Marin 2010

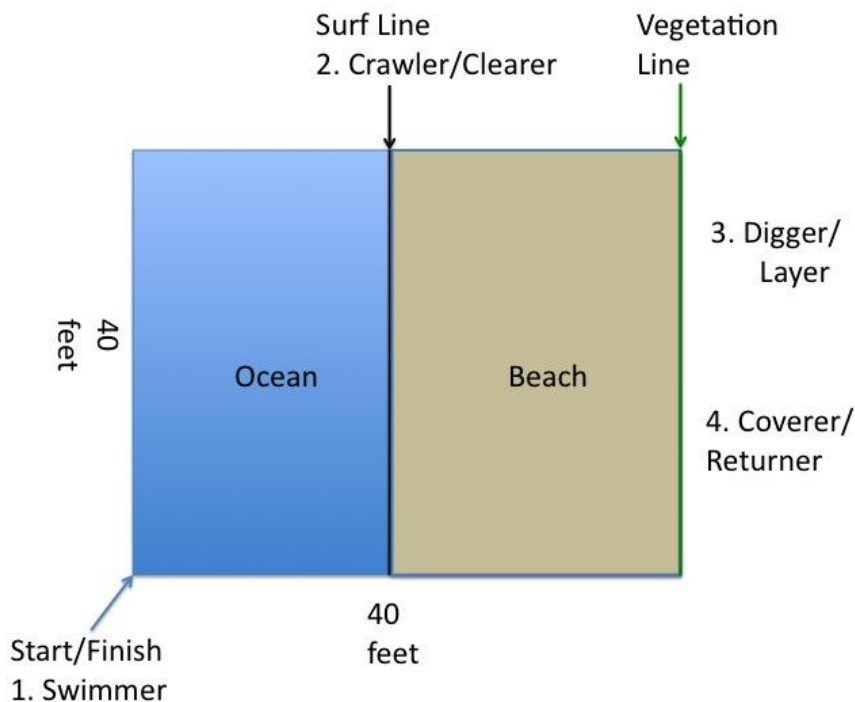
*Imagine what it would be like to be a sea turtle swimming around in the ocean?*

Today you will have a chance to pretend to be sea turtle. This nesting relay race will show the steps a female sea turtle goes through to lay her eggs. She:

1. swims to shore,
2. crawls across the beach and clears the nest area,
3. digs a nest and lays eggs,
4. covers them and returns to the sea.



Use a section of beach that is free of debris and hazards or do a clean up before the turtle activity. Divide the group into teams of four to five. Each team will be one nesting female and each person in the team will represent a different step (1-4). (For a larger group you can break up the steps to fit more people in a team.) Each team puts each of their members at the correct place for each step.



The swimmer starts at the start line and “swims” to the crawler and tags him/her. The crawler crawls and clears the nest, and then tags the digger, who digs and lays eggs. Once finished, the egg layer tags the coverer/returner who returns to the swimmer who moves to the finish line in just enough water to cover the feet. The first turtle to return to the sea wins.

For each team, the swimmer pretends to swim on the beach using their arms (front flippers), the crawler crawls on their hands and knees to the digger; the digger uses their feet (hind flippers) to dig the nest and counts loudly by 10s to 100 for the egg laying. The coverer then covers the nest with their feet (hind flippers) and hides the nest by tossing sand over the nest with their hands (front flippers). Once the nest is buried, the coverer crawls to the surf line and tags the swimmer. Once the swimmer reaches the finish line, the relay is finished. All teams must complete the cycle.



# Caye-p It Clean

Adapted from Bahamas National Trust, *Treasures in the Sea*, 2007



At home and on the cayes you can help the reef by cleaning up trash. Trash and discarded items that end up in the ocean are called **marine debris**. Using the marine debris you find, you can draw some conclusions about the different types you find, where it comes from, and how it possibly reaches the water. **Look at the marine debris along the water's edge and answer the questions below.**

*What are some things that most marine debris has in common?*

*What is marine debris made of? Does it sink or float?*

*What happens to heavy items that sink?*

Marine debris comes from all over. Often items that float drift far from where they started. Are there any indications that the marine debris you found has been in the ocean for a while? Living things like gooseneck barnacles and algae (marine plants) attached to the item let you know it has been drifting at sea.



**Gooseneck Barnacle**

***Using gloves & trash bags, collect all the marine debris you can find within a given area. Follow these rules:***

- Do not pick up anything that looks heavy. (Take note of heavy items.)
- Be careful with sharp items such as broken glass and metal.
- Do not get into the water to collect items (unless instructed by an adult).
- Do not fill your bag too much, otherwise the bag will break.
- Arrange for disposal or plan to take your bag home with you to dispose of in the trash.
- Do not pick up any hazardous materials (oil, gas, cleansers, batteries, chemicals).
- Do not pick up anything rotten (food, dead animals, and plants).

# Caye-p It Clean

Adapted from Bahamas National Trust, *Treasures in the Sea*, 2007

**While you collect the marine debris in bags, have one person take note of each item. Use the table to make conclusions about the type of marine debris you found.**

Plastic	Styrofoam	Glass	Metal	Paper	Wood	Cloth
Bags	Bits	Bottle/jars	Bottle caps	Bags	Traps	Clothing
Bottles	Buoys	Pieces	Cans	Cartons	Crates	Pieces
Buckets	Cups	Other	Crab/fish Trap	Cardboard	Lumber pieces	
Caps, lids	Food containers		Pieces	Cups	Other	
Fishing line	Packing Material		Wire	Newspaper/Magazines		
Fishing gear	Cups		Other	Pieces		
Fishing nets	Other			Plates		
Flip-flops				Other		
Pieces						
Rope						
6-pack ring						
Strapping band						
Straw						
Toys						
Other						

*What item category makes up most of the marine debris you found?*

*Did any of the marine debris have barnacles or algae?*

*Did any of your items have writing that would identify where it originated? If so, where did most items come from?*

# The Sea, Me, and Marine Debris

You can do a lot to help the marine reserve. One of the biggest threats to the area is trash. Once trash ends up in the water it becomes marine debris. It is estimated that 80 % of marine debris comes from the land. Many people think this trash is not a problem because it breaks down. However, plastic items last for a long time. This floating debris creates problems for many animals. Sea turtles that eat jellyfish often mistake plastic bags for their favorite food and become choked or unable to eat. Fish mistake bits of plastic for food, too. Plastic fishing line also creates another danger. It can wrap around fish, sea turtles, and manatees. As they grow, the line begins to cut into their skin, keeping them from eating or causing them to lose a fin or flipper. Imagine how well you would eat without your arm! In some areas, there is so much plastic in the ocean that little bits of plastic make up a large part of the sand you find on beaches. Plastic also contains many chemicals that are not good for the ocean or people.



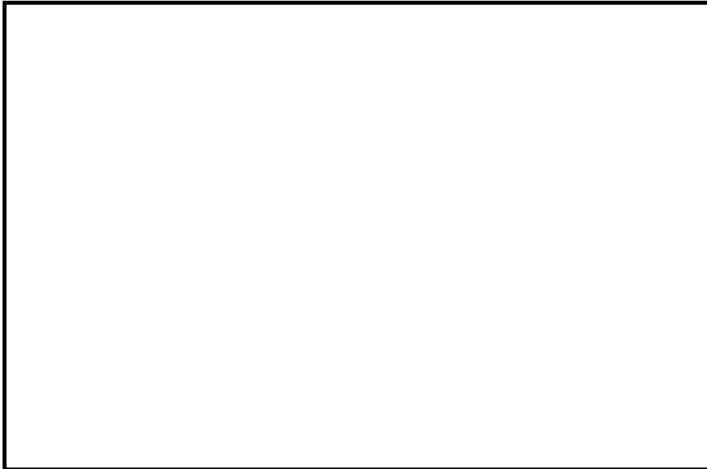
***Tip: Always put trash in trash bins. Bring your own cloth bags to go to the store instead of using plastic bags. Pick up litter. Recycle glass bottles. Discard used fishing line in the trash. Use environment-friendly products.***

## Did you know?

*Almost 90 percent of marine debris is plastic. Items like Styrofoam containers last for 50 years. A plastic milk jug can last for 450 years. In human terms, this would mean a milk jug would last in the ocean for nine generations!*

## What is sand made of?

Look closely at the sand. Use a magnifying glass if available. **Draw a picture of the different colored particles and shapes of the sand. Write down the colors you see.**



**The colors I see are:**

Sand comes from rocks and minerals that wear or break down into very small pieces. Is there anything that is hard nearby in the water that may break up into sand? Think about different hard things in the ocean: corals, shells, animal bones, and rocks.

Most of the sand on tropical beaches is made up of tiny pieces of coral. But how does the coral get broken up? Answer: the parrotfish does it! The parrotfish is a grazer who uses its strong, grinding teeth to nip at the coral. Once it digests the coral, coral sand comes out the other end. Parrotfish are the key to a healthy reef because they keep the coral clean by eating algae that can smother the coral.

*Do the reef and beach a favor and don't catch or eat parrotfish!*

Like the sand on the beach?  
Thank a parrotfish!





## What can I do?

The Reef Keeper Motto is “Learn, Protect, Respect”.  
Tell us some ways you can achieve these goals.

- 1. One place where I can go to learn more about the creatures in the marine reserve is:**
  
  
  
  
  
  
  
  
  
  
- 2. I can help protect plants, animals and the area near my home by:**
  
  
  
  
  
  
  
  
  
  
- 3. I can respect the ocean and coral reefs by:**

“I, \_\_\_\_\_ am proud to be a South Water Caye Marine Reserve Reef Keeper. I promise to learn about, protect, and respect the marine environment and the natural world around me. I will share my knowledge of these special places with my friends and family.”

# Certificate of Achievement



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Name of Student

Has successfully fulfilled the requirements of the Reef Keeper Program and is hereby proclaimed an official South Water Caye Marine Reserve

## Reef Keeper

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Ranger's Signature

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Date

# Vocabulary and Terms

**barrier reef:** Coral reefs are limestone (calcium carbonate) formations, found mostly in warm and tropical seas. A barrier reef is a type of reef generally found many miles offshore, separated from land by a deep-water channel or a lagoon.

**biodiversity:** The number and variety of different animals, plants, and other life within the area. Coral reefs have high biodiversity.

**coral:** An animal that lives generally in shallow tropical oceans, which is related to jellyfish. Coral contains algae, a marine plant, that helps it get some of its food needs while the coral animal protects the algae within it. Corals make a limestone skeleton that surrounds it.

**coral reef:** A group of corals and all of the associated animals that live on, within or near the coral.

**subsistence fisher:** A person who fishes to feed himself or herself and provide for their family's food needs.