



DEPARTMENT OF  
ENVIRONMENT  
CAYMAN ISLANDS GOVERNMENT

REEF ENVIRONMENTAL EDUCATION FOUNDATION

# Grouper Moon Project Curriculum

Year 4



## Human Food Web Activity

# CREDITS

Human Food Web Activity – Year 4 Cayman Islands

Content written and created by Todd Bohannon. Special thanks to REEF Education and Scientific staff, Cayman Islands Ministry of Education Staff, and Cayman Islands Department of Environment Staff.

## CREATION AND REVISION HISTORY:

v 1.0 First Creation, 2011

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# Human Food Web Activity

## OVERVIEW REFERENCE SHEET YEAR 4

<b>DURATION:</b> 20 Minutes	<b>METHOD:</b> Group Activity, Classroom
<b>MATERIALS:</b> <ul style="list-style-type: none"><li>• Species Cards</li><li>• Yarn</li><li>• Students</li></ul>	<b>SUBJECT(S):</b> <ul style="list-style-type: none"><li>• Science</li></ul>

<b>MAIN VOCABULARY USED:</b> <ul style="list-style-type: none"><li>• Food Webs</li><li>• Trophic Levels</li></ul>	<b>SKILLS :</b> <ul style="list-style-type: none"><li>• Organizing</li><li>• Interpreting</li><li>• Analyzing</li></ul>
<b>ADDITIONAL RESOURCES:</b> <ul style="list-style-type: none"><li>• Bagheera is an educational website and resource about endangered species, <a href="http://www.bagheera.com">www.bagheera.com</a></li><li>• Bahamas Reef Environmental Education Foundation, <a href="http://BREEF.org">BREEF.org</a></li></ul>	

<b>EXTENSIONS:</b> <p>National Geographic article and slide show that explains marine food webs. <a href="https://education.nationalgeographic.org/resource/food-web/">https://education.nationalgeographic.org/resource/food-web/</a></p> <p>National Geographic's "Exploring Sustainable Seafood" game teaches students about sustainable fishing practices that dovetails nicely with the food web activity. The activity is appropriate for grades 3-5. <a href="https://www.nationalgeographic.org/activity/exploring-sustainable-seafood/">https://www.nationalgeographic.org/activity/exploring-sustainable-seafood/</a></p>
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## Description:

The Human Food Web activity is an engaging, kinesthetic, whole-class activity where students learn about the food web. To create a human food web, we have created a set of marine life cards representing a variety of coral reef organisms. Each card has a picture of the organism on one side and important facts, their trophic level, or the role they play in the food web, on the other side. Students will create a food web using species cards, a bolt of yarn, and their bodies.

## Learning Objectives:

- Students will work together to recreate a coral reef food web.
- Students will learn about the many ways these organisms are interconnected.
- Students will be able to describe and understand the difference between a food web and a food chain.
- Students will understand that living organisms can be categorized into different groups based on specific characteristics.

## National Science Curriculum Alignment: Year 4

- Recognize that living things can be grouped in a number of ways.
- Explore and use classification keys to help group, identify and name various living things in their local and wider environment.
- Observe similarities and differences between animals and plants.
- Find out about other animals, including how they grow, feed, move, and use their senses.
- Investigate a local habitat, including the relationship between the animals and plants found there, and develop skills in classifying animals and plants by observing external features.

## Background Information for Educators:

A keystone is the stone at the top of an arch that supports the other stones and keeps the whole arch from falling. A keystone species is a species on which the persistence of a large number of other species in the ecosystem depends. The Nassau Grouper is a keystone species of the Caribbean coral reef ecosystem.

If a keystone species is extirpated (The complete removal of a particular type of organism from an area, usually a specified geographic area.) from a system, the species it supported also will disappear, as will the other dependent species.

Keystone species may be top carnivores that keep prey in check, large herbivores that shape the habitat in which other species live, important plants that support particular insect species that are prey for birds, bats that disperse the seeds of plants, and many other types of organisms.

An example of a keystone predator is the sea otter, which is a keystone in the kelp forest ecosystem. Kelp forests are marine forests of seaweed that provide food and shelter for large numbers of species of fish and shellfish. They also protect coastlines from damaging wave action. Sea otters prey on sea urchins and keep their numbers in check.



If the sea otters are extirpated, large numbers of sea urchins feed heavily on the kelp forests, causing severe declines in the kelp forests and their associated species. Wherever otters have been reintroduced, kelp communities have returned. Ironically, many fishers resent sea otters because they view them as competitors for valuable commercial fish and shellfish, such as abalone. They do not realize that without the otters, the abalone would not have a kelp forest habitat.

Keystone species may occur at any level of the ecosystem, from plants and herbivores (plant eaters) to carnivores (meat eaters) and detritivores (waste eaters). From [www.bagheera.com](http://www.bagheera.com)

Now, let's take a look at the Nassau Grouper and its role as a keystone species in the Caribbean coral reefs.

### **Nassau Grouper (*Ephinephelus striatus*)**

The Nassau Grouper can be classified as follows:

Kingdom Animal - all multicellular organisms that ingest their food

Phylum Chordata (Vertebrates) - animals with backbones

Class Actinopterygii - fish with fins that consist of a web of skin supported by bony spines

Order Perciformes - dorsal fins divided into two parts - they are spiny in the front and soft in the back

Family Serranidae - all groupers and seabasses

Genus *Epinephelus* - large-sized groupers

Species *striatus* - striped body coloration

*How does the Nassau Grouper function as a keystone species?*

It is ecologically important as a predator on the reef, helping to keep the reef fish population in check. The health of the reef is dependent on the delicate balance between herbivores that feed on algae, organisms that feed on coral, and carnivorous predators.

### **Diet**

Juvenile Nassau Grouper:

Amphipods, isopods, small fish

Adult Nassau Grouper:

shrimp, crabs, octopus, a variety of reef fish

From: BREEF.org



## Keystone Species in the Food Web:

According to Wikipedia: A food web (or food cycle) depicts feeding connections (what eats what) in an ecological community. Scientists can organize these different living things into categories called “trophic levels.” Trophic levels are the feeding position in a food chain, such as primary producers, herbivores, primary carnivores, etc. Green plants form the first trophic level, the producers. Herbivores form the second trophic level, while carnivores form the third and even the fourth trophic levels.

Tertiary Consumer: Top-level carnivores, eaters of other carnivores

Secondary Consumers: Carnivores—eaters of herbivores

Primary Consumers: Herbivores, eaters of primary producers

Primary Producers: Photosynthesizers, plankton, algae, etc.

## Building Background Knowledge

Teacher’s Note: You may want to adapt this language to be appropriate for your students. You can avoid using the “trophic level” terminology if you feel it overcomplicates the idea for your students. For example, you can simply use “herbivores” and “carnivores.” It is important that they understand there are levels of the food chain that contain different marine life, and they all connect together, making a food web.

Watch the short film “The Food Web: Jessica Harvey Expedition Notebook” on YouTube:  
<https://youtu.be/PLQMKNKZv8v8>

After watching the video, review the following vocabulary terms with your students:

Food Web: “is how living organisms interact and depend on each other to survive”

Food Chain: “the order in which living organisms are consumed”

Primary Producers: “the foundation of the food web,” “the base of the trophic level pyramid,” “produce their own food from the sun”

Primary Consumers/Herbivores: “microscopic animals such as corals and zooplankton that feed on all the primary producers” “herbivores, animals that eat only plants”

Secondary Consumers/Carnivores: “mostly carnivores feeding on primary consumers or the herbivores. A carnivore eats other animals”

Tertiary Consumer: “Medium reef predators such as groupers and barracuda feeding on smaller fish”

Apex Predators: “such as sharks, hunt and consume the medium reef predators”

Decomposers: “exist on every trophic level and are mainly bacteria. These organisms help to break down waste and keep the cycle of life going”



# **Human Food Web Directions**

Now that your students have a better understanding of what a food web is and how it works, you are ready to begin the Human Food Web activity:

Before the activity, download, print, and cut out Marine Species Cards:

## **Step 1:**

Pass out a marine species card to each student. Have them read it to understand where they are in the food web. \*\*Prompt students to be paying attention to: “Who eats you?” and “Who do you eat?”

## **Step 2:**

Have all your students stand in a circle facing each other. The teacher will stand in the middle with a bolt of yarn. Give one end of the yarn to whoever is holding the card at the bottom of the food web. This usually leads to a class conversation about who is actually at the bottom. Macroalgae is where I start. Next, ask students to raise their hands if they are holding the card of an animal that eats macroalgae. Toss the ball of yarn to one of them; they hold onto the line of yarn and pass the ball on to another person who eats the algae. Then move your way up the food web.

## **Tips:**

- Explain to them to keep a hold of their part of the string with one hand or a couple of fingers, but not with both hands, or they will dampen the effects of the tugging later on in the game.
- Don't go around in a circle with the string. Let anyone yell out an answer, and the more times you go across the middle with the string, the better!
- You will probably need to explain that if a participant is already holding onto the string, they don't need to call out an animal/plant since they are already one. Ask them to remember which one they were!

## **Step 3–Giving the Message:**

Once you have the web completed and everyone is connected to one another, climb your way out of the middle. Ask everyone to make sure there is no slack in their sections of yarn. Pick one animal that was mentioned [hopefully they will remember which one they were] and pose a question like: “What would happen if we decided that this animal was hurting our crops and tried to get rid of it completely? Well, let's see!” Ask the example animal participant to tug on their piece of string [sometimes a hard tug is necessary, but not too hard!]. Then ask that whoever felt the tug to raise their hands. Ask those with raised hands what animals they were.

# Human Food Web Directions, Continued

Ask them if they ever imagined if Animal A and Animal B were so closely linked. You can go around the circle, pick some other animals/plants, and ask them to tug, too. Pick one final animal and say it went extinct! Ask that person to drop the string and ask someone to describe what happened to the food web (It collapsed!)

## **To Conclude:**

Ask everyone to drop their piece of string and take one step back. As you are balling up and untangling the web, start a brief discussion on why food webs are important and how each species has its own place in the web.

## **Step 4–Written Reflection:**

On a piece of writing paper, have students write 3–4 sentences about the activity they have just done. Here are some prompts you can give if they need them:

- What did this activity teach you about food webs?
- Describe your Species Card: what were you and how did you fit into the food web?
- When you were holding onto the yarn, describe what happened when someone became extinct. What does this mean?



# What is Reef Environmental Education Foundation (REEF) and the Grouper Moon Project?

- Reef Environmental Education Foundation is an international marine conservation organization implementing hands-on programs involving local communities in conservation-focused activities. Its mission is to protect biodiversity and ocean life by actively engaging and inspiring the public through citizen science, education, and partnerships with the scientific community.
- Historically, Nassau Grouper represented one of the Caribbean's most economically important fisheries. Unfortunately, due to intense harvest on spawning aggregations, populations have dwindled to a fraction of their historic numbers. The species became one of the first Caribbean reef fish to be listed as endangered by the International Union for the Conservation of Nature (IUCN). The species is listed under the US Endangered Species Act.
- The Grouper Moon Project is a conservation science partnership between Reef Environmental Education Foundation (REEF) and the Cayman Islands Department of Environment (DoE) with scientists from Scripps Institution of Oceanography at UC San Diego and Oregon State University, aimed at studying Nassau Grouper (*Epinephelus striatus*) - a social and ecological cornerstone of the Caribbean's coral reefs.
- The Project's initial objectives were to observe the Nassau Grouper spawning aggregation off the western tip of Little Cayman and to develop a protocol for monitoring their numbers and activity at the site. The project has expanded to include an ambitious acoustic tagging project, juvenile habitat research, genetic studies, and a current drifter project to understand how currents and other oceanographic conditions affect grouper larvae recruitment.

## Healthy Ocean Ecosystems and the Dangers of Overfishing

- The Nassau Grouper is an important commercial, recreational, and ecological fish species in the Caribbean. They are a significant food source for many places throughout the region and help keep a healthy ocean ecosystem. Groupers are essential coral reef predators, and Nassau Groupers are keystone species or species on which other species in an ecosystem largely depend - they help control populations of lower-level reef organisms, maintaining the balance of the ecosystem.
- The Nassau Grouper, however, has been overfished and is considered an endangered species throughout its range. Nassau Grouper forms large groups or schools called spawning aggregations during winter to reproduce. The aggregations will form at predictable times and places every year, making them quite vulnerable to overfishing due to the ease of finding and removing them. Not only are fishermen able to remove large numbers of fish at once during these aggregations, but they also have the chance to remove fish that have not yet gotten the chance to release their gametes (sperm and eggs) to reproduce successfully.

