



Habitat Balance



NOAA Office of Education

Oil Spill Workshop

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Habitat Balance

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Grade level: K- 12 (can be adapted for all ages)

Time Required: 50 min.

I. Course of Study Alabama Course of Study (ALCOS):

Kindergarten, Life Science, Content Standard 6

Compare size, shape, structure, and basic needs of living things.

1st Grade, Life Science, Content Standard 4

Describe survival traits of living things, including color, shape, size, texture, and covering.

2nd Grade, Life Science, Content Standard 6

Identify characteristics of animals, including behavior, size, and body covering.

3rd Grade, Life Science, Content Standard 10

Determine habitat conditions that support plant growth and survival.

3rd Grade, Life Science, Content Standard 13

Describe ways to sustain natural resources, including recycling, reusing, conserving, and protecting the environment.

4th Grade, Life Science, Content Standard 5

Describe the interdependence of plants and animals.

5th Grade, Life Science, Content Standard 9

Describe the relationship of populations within a habitat to various communities and ecosystems.

7th Grade, Life Science, Content Standard 1

Describe characteristics common to living things, including growth and development, reproduction, cellular organization, use of energy, exchange of gases, and response to the environment.

7th Grade, Life Science, Content Standard 7

Describe biotic and abiotic factors in the environment.

9th – 12th Grade, Biology Core, Content Standard 12

Describe protective adaptations of animals, including mimicry, camouflage, beak type, migration, and hibernation.

9th – 12th Grade, Biology Core, Content Standard 16

Identify density-dependent and density-independent limiting factors that affect populations in an ecosystem.

9th – 12th Grade, Aquascience, Content Standard 6

Describe adaptations that allow organisms to exist in specific aquatic environments.





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9th – 12th Grade, Aquascience, Content Standard 7

Describe processes and environmental characteristics that affect growth rates of aquatic animals.

9th – 12th Grade, Aquascience, Content Standard 8

Determine effects of the fishing industry on the aquatic environment.

9th – 12th Grade, Botany, Content Standard 12

Describe the ecological and economic importance of plants.

9th – 12th Grade, Environmental Science Elective Core, Content Standard 1

Identify the influence of human population, technology, and cultural and industrial changes on the environment

9th – 12th Grade, Environmental Science Elective Core, Content Standard 2

Evaluate various fossil fuels for their effectiveness as energy resources.

9th – 12th Grade, Environmental Science Elective Core, Content Standard 12

Identify positive and negative effects of human activities on biodiversity.

9th – 12th Grade, Marine Science Elective Core, Content Standard 7

Identify patterns and interrelationships among producers, consumers, scavengers, and decomposers in a marine ecosystem.

9th – 12th Grade, Marine Science Elective Core, Content Standard 11

Describe positive and negative effects of human influence on marine environments.

9th – 12th Grade, Zoology Elective Core, Content Standard 7

Explain how species adapt to changing environments to enhance survival and reproductive success, including changes in structure, behavior, or physiology.

National Science Education Standards:

Life Science E.C.1 Characteristics of Organisms

Life Science M.C.5 Diversity and adaptations of organisms

Life Science H.C.6 Behavior of organisms

Ocean Literacy Standards

Essential Principle 5 *The ocean supports a great diversity of life and ecosystems.*

Essential Principle 6 *The ocean and humans are inextricably interconnected.*

II. Concepts

Sargassum is a brown algae that floats on the ocean's surface with small air bladders. Sargassum was named for the Sargasso Sea in the Atlantic Ocean, which is the only borderless sea in the world. The list of animals that depend on this structure for their life cycle is numerous, from microscopic organisms to the ten foot dusky shark. Sargassum provides shelter in the middle of the open ocean, where habitat is scarce.





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Sargassum became oiled in the Gulf of Mexico during the 2010 *Deepwater Horizon* oil spill. The sargassum ecosystem became endangered because of this disaster. The habitat was unlivable due to floating oil mats and chemical dispersants. Clean up crews burned the oiled floating sargassum mats to prevent them from washing ashore. This destroyed the brown algae as well as its inhabitants.

Sea turtle hatchlings utilize the sargassum habitat for several years as both a refuge and resting area, as well as feeding grounds. Due to the 2010 oil spill, sea turtles hatchlings were shipped to the east coast and released into the Atlantic Ocean so they would have plenty of food and habitat. This is one example of many species that were affected by the loss of the sargassum habitats.

III. Behavioral Objectives:

TSWBAT:

Discuss ecosystem interactions.

Predict food web connections.

Describe camouflage, diversity and adaptations of animals particular to the sargassum ecosystem.

IV. Materials

“Jenga” blocks (or generic version)

Playing cards (included)

Information cards (included)

Markers or paint (for marking blocks)

Cardstock (or heavy duty paper)

“Diving Deeper” worksheet (included)

V. Teaching/Learning Procedures/Instructional Procedures

The teacher will:

~purchase “Jenga” game (generic version) (multiple ones for large class sizes)

~print playing cards and information sheets on heavy duty paper (cardstock) (1 set per game)

~cut out playing cards, but leave information sheet intact

~color ends of blocks as follows:

15 **BROWN** pieces (represents Sargassum)

12 **ORANGE** pieces (represents Sargassum fish, Sargassum crabs, Sargassum shrimp, amphipods, planehead filefish, nudibranchs, seahorse, pipefish)

12 **GREEN** pieces (represents sea turtle hatchlings, juvenile tripletail, juvenile bermuda chub, juvenile mahi mahi, sergeant major)

9 **BLUE** pieces (represents mahi mahi, dusky shark, albatross, pelican, jack crevalle, bluefin tuna)



When playing the game, stack blocks in directionally alternating sets of 3 (pictured). Stack in order from bottom to top: brown, orange, green, blue. Directions for the game: Split large class into small groups. Each group should have one set of blocks, one set of playing cards and information sheets. Stack blocks in order of colors listed above. Shuffle playing cards and turn face down. Students take turns drawing playing cards and without revealing what is to be removed and/or replaced discuss the scenarios written. Predict what layer of animals will be affected (a.k.a. which pieces might be removed and/or replaced). Then follow the directions on the card. When block tower tumbles, discuss actions that led to the collapse of the habitat. Come up with options of how to prevent this from happening in real life. For evaluation of the activity, use the “Diving Deeper”





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worksheet.

VI. Resource Materials:

Cabrillo Marine Aquarium

<http://www.defendersblog.org/2010/07/oases-in-the-gulf-part-1-sea-life-thrives-at-sargassum-%e2%80%98islands%e2%80%99/>

<http://www.defendersblog.org/2010/07/oases-in-the-gulf-part-2-sea-life-threatened-by-oil-at-sargassum-%e2%80%98islands%e2%80%99/>

<http://oceanexplorer.noaa.gov/explorations/03edge/background/sargassum/sargassum.html>

<http://www.aoml.noaa.gov/general/lib/seagrass.html>

<http://www.scientificamerican.com/blog/post.cfm?id=deepwater-doom-extinction-threat-fo-2010-09-08>

<http://www.defendersblog.org/2010/09/future-uncertain-for-seahorses-in-the-gulf/>

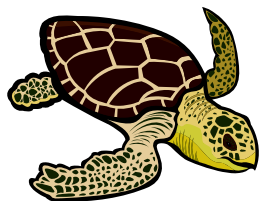
http://www.defenders.org/resources/publications/programs_and_policy/wildlife_conservation/threats/wildlife_and_offshore_drilling_sargassum.pdf

<http://www.defendersblog.org/2011/04/bp-oil-disaster-one-year-later-defenders-continues-to-fight-for-gulf-wildlife/>





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Diving Deeper!



1. How many of each color block did you remove before the block tower tumbled?

_____ Green

_____ Blue

_____ Brown

_____ Orange

2. How many scenario cards did you complete before the tower tumbled? _____

3. (a) Which block color was the most important to the structure of the tower? _____

(b) Which organism(s) did this block color represent? _____

(c) Why was this organism so important to the structure and habitat? Explain.

4. Which scenario caused the block tower to tumble? Would this scenario alone have tumbled the tower? Explain your answer.

5. Describe how you would prevent a 'tower tumble' or habitat collapse from happening in real life.





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INFORMATION SHEETS: PRINT OFF AND KEEP INTACT, DO NOT CUT APART



Scientific name: Sargassum spp.

Common Name: Sargassum

Sargassum is found offshore in mats. These mats of vegetation provide crucial habitat for a wide variety of marine animals in the open ocean, including economically important pelagic species such as tuna, dolphin fish, wahoo and billfish as well as

sea turtles and marine birds.



Scientific name:
Portunus sayi

Common Name:
Sargassum crab

Sargassum crabs mimic the colors of the sargassum and aren't easily spotted hiding among the branches.



Scientific name:
Latreutes parvulus

Common Name:
Sargassum shrimp

Sargassum shrimp find a safe hiding place among the branches of sargassum.



Scientific name: Caprellidae spp.

Common Name: Amphipods

Amphipods use sargassum as food and as a refuge.



Scientific name: *Scyllaea pelagica*

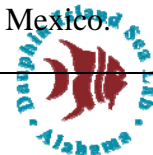
Common name:
Sargassum nudibranch

Some species of nudibranchs store stinging cells (nematocysts) from their prey and fire them in defense.



Scientific name:
Hippocampus spp.
Common name: Seahorse

Seahorses blend right in and find food, shelter—and a free ride—in the dense, floating mats that blanket the surface of the deep waters of the Gulf of Mexico.





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Scientific name:
Syngnathus pelagicus

Common name:
Sargassum pipefish

Male pipefish carry the eggs in a brood pouch below the tail and birth the babies, just as seahorses do!



Scientific name:
Stephanolepis hispidus

Common name: Planehead filefish

The Planehead Filefish is the most abundant species found in Sargassum collections. Its color and shape blend seamlessly into the seaweed.



Scientific name: Histrio spp.

Common Name:
Sargassum fish

Sargassum fish can escape underwater

predators by jumping out of the water onto floating mats of sargassum. They can survive out of water for extended periods of time.



Scientific name: *Carretta caretta*

Common Name:
Loggerhead sea turtle

Hatchling turtles are thought to actively seek out sargassum rafts, using them to find food and for protection during the "lost years."



Scientific name: *Lobotes surinamensis*

Common Name: Tripletail fish

They are well known for their unusual behavior of floating just beneath the surface with one side exposed, mimicking a leaf or floating debris.



Scientific name:
Kyphosus sectatrix

Common Name:
Bermuda Chub Fish

The Bermuda Chub mainly feeds on benthic algae and on small crabs and mollusks. Because of its small mouth, it nibbles food and is regarded by anglers as an accomplished bait stealer.





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Scientific name:
Abudefduf saxatilis

Common Name:
Sergeant Major
Damsel fish

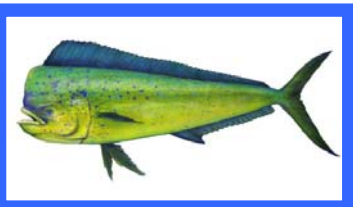
Sergeant Major fish feed upon the larvae of invertebrates, zooplankton, smaller fish, crustaceans and various species of algae.



Scientific name:
Thunnus thynnus

Common Name:
Bluefin Tuna

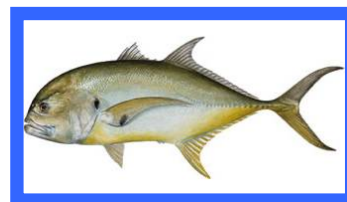
The Bluefin Tuna is listed by the Monterey Bay Aquarium on its *Seafood Watch* list and pocket guides as a fish to avoid due to overfishing.



Scientific name:
Coryphaena hippurus

Common Name: Mahi
Mahi, Dolphin Fish

Fisherman look for floating mats of sargassum to find Mahi Mahi. They know that if Frigatebirds are diving in the water, there will be a good catch.



Scientific name:
Caranx hippos

Common Name: Jack
Crevalle

The Jack Crevalle is a popular and highly regarded gamefish throughout its range, with the recreational catch of the species often exceeding commercial catches.



Scientific name:
*Carcharhinus
obscurus*

Common Name: Dusky Shark

Dusky Sharks are one of the slowest-growing and latest-maturing sharks, not reaching adulthood until around 20 years of age. Because of its slow reproductive rate, the dusky shark is vulnerable to human-caused population depletion.



Scientific name: *Thalassarche
chlororhynchos*

Common Name: Yellow Nosed
Albatross

The albatross is endangered with the biggest threat being commercial longline fishing. These birds spend a great majority of their life out at sea, and some species are among the largest birds in the world.





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Scientific name: *Pelicanus occidentalis*

Common Name: Brown Pelican

Brown pelicans dive for their food from a height of up to 60 feet. Just before they hit the water, the pelican opens its beak and scoops up to 3 gallons of water and fish into a large flexible pouch attached to its lower beak.



Scientific name: *Brevoortia pretronus*

Common Name: Gulf Menhaden

Menhaden is the most commercially harvested animal in the Gulf of Mexico. Products from this fish are used in some makeup.

Scientific name:

Common name:

Scientific name:

Common name:

Scientific name:

Common name:

Scientific name:











Common name:





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PLAYING CARDS: CUT APART

<p>Large ocean vessel passes through floating sargassum mat and divides the habitat into smaller pieces. Remove one <i>brown</i> piece.</p> 	<p>Drifting oil coats sargassum mat destroying the habitat by making the surrounding area inhospitable. Remove one <i>brown</i> piece, one <i>orange</i> piece, one <i>green</i> piece, and one <i>blue</i> piece.</p> 
<p>Oil found in animals' gills causes extreme breathing problems. Remove one <i>green</i> piece, one <i>orange</i> piece, and one <i>blue</i> piece.</p> 	<p>Large bluefin tuna enters the habitat feeding on smaller prey fish. Remove one <i>green</i> piece and replace one <i>orange</i> piece.</p> 
<p>Purse seine deployed to collect a large school of menhaden also pulls up a vast mat of sargassum. Remove one <i>brown</i> piece, one <i>orange</i> piece, one <i>green</i> piece, and one <i>blue</i> piece.</p> 	<p>Deep-sea fishing tournament begins with numerous fishing boats slicing apart the sargassum habitat. Remove one <i>brown</i> piece.</p> 
<p>With sargassum mat gone for protection, fish near the surface suffer extreme thermal stress during the hot summer. Remove one <i>brown</i> piece, one <i>orange</i> piece, one <i>green</i> piece, and one <i>blue</i> piece.</p> 	<p>Large predators are absent because of overfishing. Remove one <i>blue</i> piece and one <i>orange</i> piece. Replace one <i>green</i> piece.</p> 
<p>Due to the large amount of oil-eating bacteria present during the spill, the area within the sargassum has been left anoxic. Remove one <i>orange</i> piece, one <i>green</i> piece, and one <i>blue</i> piece.</p> 	<p>Convergent currents join the sargassum with floating marine debris (plastic). Sea turtles and birds will be affected the most. Remove one <i>brown</i> piece, one <i>green</i> piece and one <i>blue</i> piece.</p> 





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<p>Oil coats the eyes and limbs of juvenile sea turtles making it difficult to find sargassum. Remove one <i>green</i> piece.</p> 	<p>Foreign Longline fishermen remove tunas, marlins, and sharks from the open ocean creating a disruption in the food web. Remove one <i>blue</i> piece and one <i>orange</i> piece. Replace one <i>green</i> piece.</p> 
<p>Recreational fishermen targeting sargassum as a habitat reduce the population of tripletail, mahi mahi, and other large jacks. Remove one <i>blue</i> piece and one <i>orange</i> piece. Replace one <i>green</i> piece.</p> 	<p>Large flocks of albatross feed on small prey items such as sergeant majors, chub, and tripletail. Remove one <i>green</i> piece.</p> 
<p>Pelicans are severely oiled while diving into sargassum for food. Remove one <i>brown</i> piece and one <i>blue</i> piece.</p> 	<p>Dusky sharks eat the sargassum to gain nutrition from all the turtle hatchlings. Remove one <i>brown</i> piece, one <i>orange</i> piece, and one <i>green</i> piece.</p> 
<p>Shark conservation methods improving large predator populations. Replace one <i>blue</i> piece.</p> 	<p>Sargassum drifts onto shore and dies. Remove one <i>brown</i> piece and one <i>orange</i> piece.</p> 
<p>Sargassum drifts into shallow water and the larger predators stay behind in the deep water. Remove one <i>blue</i> piece and one <i>orange</i> piece. Replace one <i>green</i> piece.</p> 	<p>Record hurricane season destroys sargassum habitat all over the Gulf of Mexico. Remove one <i>brown</i> piece, one <i>orange</i> piece and one <i>green</i> piece.</p> 