

MAST ACADEMY OUTREACH

ELEMENTARY SCHOOL PROGRAM

Adventures Aboard The Land SHARC (Science Hands-On And Related Careers)

On-Site Packet



**MAST Academy
Maritime and Science Technology High School
Miami-Dade County Public Schools
Miami, Florida**

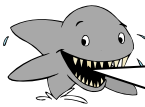
MAST ACADEMY OUTREACH
LAND SHARC ELEMENTARY SCHOOL
ON-SITE PACKAGE
TABLE OF CONTENTS

Wet Lab Docks

<i>Physical Oceanographer: Under Pressure</i>	1
<i>Marine Biologist: Buoyancy: Sink or Swim</i>	2
<i>Marine Biologist: Who's Who in the Ocean</i>	3
<i>Marine Biologist: Sharks and Their Relatives</i>	4
<i>Chemical Oceanographer: Sands of Time</i>	5
<i>Communications Specialist: Every Picture Tells a Story</i>	6

Computer Docks

<i>Marine Biologist: Coral Reefs: Living Communities</i>	7
<i>Marine Biologist: The Everglades Story</i>	8
<i>Marine Biologist: Sink the Reef</i>	9
<i>Marine Mammal Scientist: Ask the Experts About Whales</i>	10



The “shark” symbol appears beside all directions, which are always enclosed within a callout. **READ ALL DIRECTIONS CAREFULLY.**

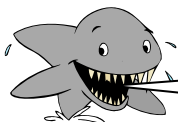


The “thinking” symbol appears beside all critical thinking questions. Teamwork will be required to answer these questions.

“UNDER PRESSURE”

**WET LAB DOCK
MARINE BIOLOGIST**

Pressure affects creatures that live in the deepest parts of the ocean by pressing against their bodies. The pressure of water changes with depth.



To observe the effect of depth on water pressure, follow the directions on the table and answer the questions.

1. From which hole does the water come out the farthest? a. top hole b. bottom hole
2. Is the water pressure greater at the top of the pitcher or the bottom of the pitcher?
Explain your answer. _____



3. What do fish that live in the deep ocean have to be adapted to in order to survive? _____

Read the following information and then answer the questions that follow.

Fish in the deepest parts of the ocean live in total darkness ; many glow in the dark (are bioluminescent). Bioluminescence helps them attract prey. However, these fish may also attract predators. Therefore, bioluminescence is an advantage when attracting prey and a disadvantage when attracting predators.

4. What two things can be attracted to a fish that is bioluminescent? _____

Marine biologists must make careful observations of animals when they study them in the ocean. They have found that deep water animals have unusual body parts that help them survive. Pretend you are a marine biologist. Look at the plastic models of deep-water fish in the aquarium. They are labeled A – F. Read the following descriptions and write the letter of the fish that matches each description.

Description Letter	
The Dragonfish has a long scaleless body, strong jaws and needle-like teeth. The female has a long, slender, sensory barbel under her chin.	
The Gulper Eel is a distant relative of the river eel. It has tiny eyes and teeth and a large umbrella shaped mouth.	
The Hatchetfish has light gray, luminescent (glowing) skin on the bottom and darker gray skin on top. It has large, bulging eyes and an upward-slanting mouth.	
The Viperfish has a long body and extremely large teeth, especially the front two on the bottom of its mouth. It has a long, slender lure in front of the dorsal fin.	
The Anglerfish lures prey with a long, slender lure between its eyes. It has needle-like teeth.	
The Loosejaw lives in the murky depths of all oceans. There are three rows of green, luminescent (glowing) spots running along its body. It has large eyes and needle-like teeth.	



5. What unusual body parts do you see on the fish that would help them to adapt to deep water? _____

(When finished, turn to page 2, the “Buoyancy: Sink or Swim” Dock.)

“BUOYANCY: SINK OR SWIM”

WET LAB DOCK OCEAN ENGINEER

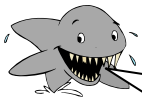
Introduction

An object will float as long as it weighs less than the water it pushes out of its way, or displaces. When an object floats, it is said to have positive buoyancy. An object can be made of materials that are heavier than water, but there must be air or space inside the object for it to float. The amount of air or space inside the object is also called volume. When the air inside an object is replaced by weight, the object will sink and is said to have negative buoyancy.

You will now do an experiment to find out how the amount of air or space (volume) in an object affects its buoyancy. On the table are four boats. Each boat weighs 10 grams. The experiment will involve finding out how much weight each boat will hold before it sinks. First, make two educated guesses or hypotheses about what you think will happen.

HYPOTHESIS 1: The (circle one) **A B C D** boat will hold the greatest amount of weight before sinking.

HYPOTHESIS 2: The (circle one) **A B C D** boat will hold the least amount of weight before sinking.



2. Carefully place the white boat in the container of water so that no water gets into the boat.
3. Carefully place washers (weights) one at a time in the center of the boat until it sinks.
4. In the data table below, record the number of washers it takes to make the boat sink.
5. Take the white boat and washers out of the water and place them back on the poster.
6. Repeat steps 1- 4 for the green, red, and blue boats.
7. Use information from the Introduction to answer the questions below.

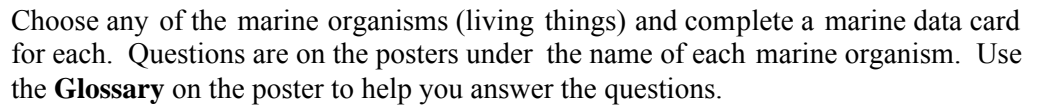
DATA TABLE

Boats	Number of washers needed for boat to sink
A	
B	
C	
D	

1. The boats had negative buoyancy when they (circle one) **floated** or **sank**.
2. Which boat held the greatest number of washers before sinking? (circle one) **A B C D**
3. Why did this boat hold the greatest number of washers? _____
4. Which boat held the fewest number of washers before sinking (circle one)? **A B C D**
5. Why did this boat hold the least number of washers? _____
6. The inside of the boats are not really empty. They have air inside of them. Which boat has the greatest amount of air inside of it? (circle one) **A B C D**
7. As the amount of air or space (volume) inside a floating object increases, the amount of weight the floating object can hold (circle one) **increases** or **decreases**?
8. Was your first hypothesis (circle one) **supported** or **not supported**? Why was your hypothesis supported or not supported? _____
9. Was your second hypothesis (circle one) **supported** or **not supported**? Why was your hypothesis supported or not supported? _____
10. If all the boats weigh the same, why do they hold different amounts of washers? _____
11. Cruise ships can float because they have large ballasts. What do you think is inside the ballasts? _____

(When finished, turn to page 3, the “Who’s Who in the Ocean” Dock.)

WET LAB DOCK MARINE BIOLOGIST

A cartoon illustration of a man with a wide-eyed, excited expression, pointing his right index finger upwards. Above his head is a thought bubble containing a glowing lightbulb, symbolizing an idea or realization.

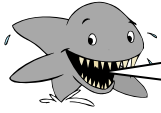
1. Marine biologists like to study interesting things about marine organisms. Pretend you are a marine biologist. Choose one of the organisms above. What would you like to find out about this organism? _____

(When finished, turn to page 4, the “Sharks and their Relatives” Dock.)

“SHARKS AND THEIR RELATIVES”

**WET LAB DOCK
MARINE BIOLOGIST**

Shark teeth can be triangular in shape with serrated (rough) edges or pointed in shape with smooth edges. The function of the tooth is determined by its shape.



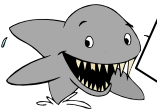
Look through one of the plastic magnifiers on the table by holding it away from you and looking through the top until the teeth are in focus. Draw each one in the data table below and answer the questions.

Triangular serrated tooth

Pointed smooth tooth

The function of this tooth is to (circle one)
a) cut prey b) puncture and hold prey.

The function of this tooth is to (circle one)
a) cut prey b) puncture and hold prey.



You are going to **estimate** the number of teeth on the shark jaw by following the three steps below. (Remember, your answer will be an estimation, not the exact number of teeth on the jaw so do not count all the teeth one by one.) Use the diagrams on the poster to help you.

1. Count the teeth in the front row of the upper jaw from left to right. Do the same for the lower jaw. Write these numbers in the first row of the data table below.
2. Put your finger on one tooth in the front row of the upper jaw. How many teeth are lined up behind that front tooth? Do the same for the lower jaw and write these numbers in the second row.
3. Multiply the number of teeth in Row 1 by the number of teeth in Row 2 to calculate an estimate of the total on the upper and lower jaw. Write these numbers in Row 3.

	Upper jaw answers are approximations	Lower jaw answers are approximations
Row 1- Number of teeth in front row from left to right		
Row 2 - Number of teeth from front to back	X (multiply)	X (multiply)
Row 3 - Total number of teeth on each jaw		

1. To calculate an estimate of the total number of teeth on both jaws, what math computation do you have to use? _____

2. What is the estimated total number of teeth on the jaw? _____

The skate and the stingray are related to sharks because they have skeletons made of cartilage but their body shapes are different from a shark's body shape.



Marine biologists study how organisms are related to each other. Look at the models of a stingray and skate and answer the questions to find out how they are related to each other and to sharks.



3. Name two ways the ray and the skate are similar. _____

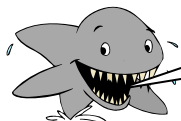
4. In what two ways are the ray and the skate different from sharks. _____

(When finished, turn to page 5, the “Sands of Time” Dock.)

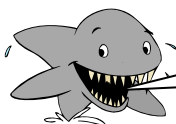
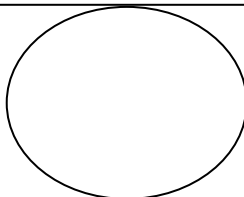
WET LAB DOCK

“SANDS OF TIME” PHYSICAL OCEANOGRAPHER

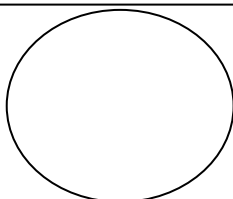
Not all sand is created equal! Sand from South Florida has shell pieces and sand grains in it while sand from other places may have only sand grains in it.



1. Look at the sand in Dish A under the stereoscope and draw what you see in the space below.



2. Look at the sand in Dish B under the stereoscope and draw what you see in the space below.

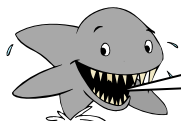


3. Which sand do you think is from South Florida? _____

4. Give a reason for your answer to question 3. _____

Hydrochloric Acid Test: Read the information about calcium carbonate before doing the next activity.

Calcium carbonate is found in many living things or parts of once living things such as shells from snails, clams, etc. It has the chemical formula CaCO_3 . **Hydrochloric acid is used as a test for CaCO_3 .** The chemical formula for hydrochloric acid is HCl . **If hydrochloric acid is added to a substance containing calcium carbonate, a chemical reaction occurs releasing the gas carbon dioxide (CO_2) and you will see bubbling.** You are going to test two samples of sand to see if calcium carbonate is present. One sample is from South Florida which has many shell pieces in it. The other sample is quartz sand and has no shell pieces in it.



Follow the directions on the table for the hydrochloric acid test and answer the questions. **PUT ON GOGGLES FOR SAFETY!**

5. Which test tube do you see bubbling? (Circle your answer)

(A) quartz sand

OR

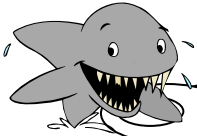
(B) South Florida sand

6. Which sand has CaCO_3 in it? _____

7. Where does the CaCO_3 in South Florida come from? _____

(When finished, turn to page 6, the “Every Picture Tells a Story” Dock.)

WET LAB DOCK
COMMUNICATIONS SPECIALIST
“EVERY PICTURE TELLS A STORY”



1. You will document your experience aboard the Land SHARC by using the digital camera to take two photos of any of the Land SHARC docks and then writing about your photographs.
2. Look around and find something you want to photograph. If you are waiting to use the camera, you can look around, decide on what you want to photograph and start writing your story (see #3 below) before you take your photographs.
3. Write a story about each photograph. Use complete sentences. Think about who or what is in your picture. If a person is in your photograph, what is he or she doing? If a computer is in your photograph, what is on the screen? If an instrument is in your photograph, what is it used for?

FIRST PHOTOGRAPH

This is a photograph of _____

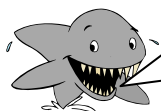
SECOND PHOTOGRAPH


This is a photograph of _____

(When finished, turn to page 7, the “Coral Reefs: Living Communities” Dock.)

“CORAL REEFS: LIVING COMMUNITIES”

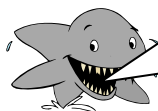
Before you is the command deck of your coral reef exploring submarine.



1. Turn on and put on headphones before you begin.
2. Click on the 5th orange lab icon from the left in the middle of the screen, called “Adaptations.” 
3. Click on the seahorse in the aquarium on the left to see the video “Camouflage,” then answer the following question.

Question 1 – Marine organisms use camouflage in order to (Circle the correct answer.)

- | | |
|-----------------------------------|------------------------------------|
| a. become energy efficient | c. produce more offspring |
| b. avoid becoming dinner | d. all of the above answers |






4. In the lower right corner of the screen, click on the black arrow to go to “Becoming Invisible: Find the Creature.”
5. Starting with the photo at the upper left, click on each photo.
6. Follow the directions on the screen and complete the matching questions for each photo.

Question 2 – Match each sea creature in the first column with its way of camouflaging by placing the appropriate number next to its name.

- | | |
|--------------------------------|---|
| _____ A. scorpion fish | 1. Looks like a sea whip |
| _____ B. lionfish | 2. Looks like a piece of debris |
| _____ C. trumpetfish | 3. Attaches other creatures to its shell |
| _____ D. seahorse | 4. Looks like a sunlight striped reef |
| _____ E. octopus | 5. Burrows in the sand |
| _____ F. decorator crab | 6. Looks like algae-covered coral |
| _____ G. crab | 7. Changes skin texture, color and shape |



7. In the lower left corner of the screen, click on the icon called “Adaptations.” 
8. In the lower left corner of the screen, click on the submarine icon. 
9. Click on the 3rd orange icon from the left called “Living Communities.” 
10. Click on the top right aquarium called “Underwater Wonderland.”
11. **Do not watch the video.** At the bottom right side, click on the black arrow.
12. Move the mouse around the picture (do not click) to see names of each marine creature shown.
13. Find 3 marine creatures you learned about in question 2. Write their names below.



Question 3

Creature 1 _____

Creature 2 _____

Creature 3 _____



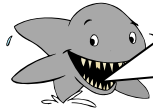
14. Click on the icon at the bottom left of the screen, called “Living Communities.” 
15. At the lower left of the screen, click on the sub icon. 
16. Turn off the headphones. Return them to the pegs on the wall.



(When finished, turn to page 8, the “The Everglades Story” Dock.)

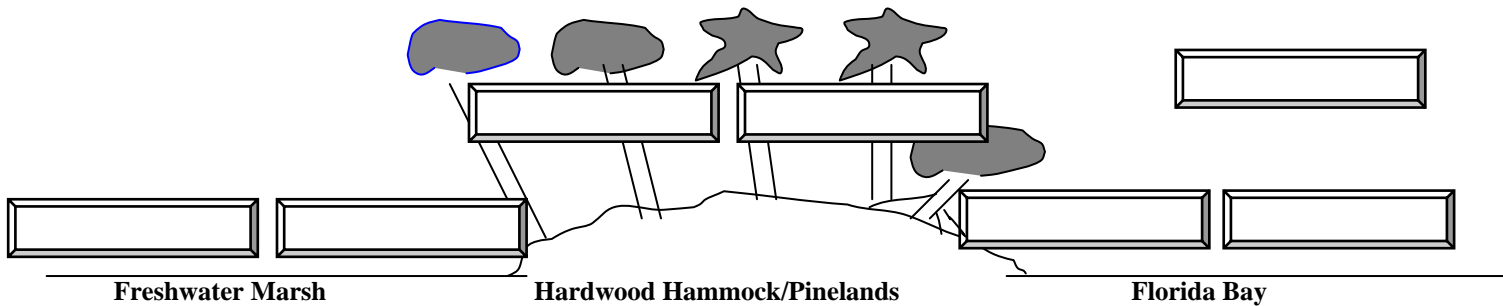
“THE EVERGLADES STORY”


COMPUTER DOCK MARINE BIOLOGIST

In this lesson you will learn about Everglades habitats and food chains. First, you will play two environmental games.

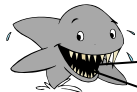



1. On the left side of the screen, click on the top icon that looks like this. ()
2. Follow the directions on the screen.
3. **Do not watch the video until you have tried to complete the game.**
4. Remember to click on Report Card to check your answers.
5. If you cannot get the correct answers, click on the video icon () to watch the video.
6. Try the game again. When your answers are correct, write the names of the creatures in the boxes below.



7. Click on the middle icon that looks like this:  Follow the directions on the screen.
8. When the food chain is correct, write the names of the creatures in the spaces below.

The alligator _____ which _____ which _____ which _____ which _____
eats the eats the eats the eats the eats the



9. If you have already watched the video, then answer the questions below.
10. If you have not watched the video yet, click on the video icon (). Answer the questions.

1. Interdependence, the major idea of this video, means that
 - a) the life of one organism depends on all the other organisms
 - b) all life is related
 - c) food webs connect all organisms
 - d) all of these answers
2. The pig frog and periphyton are related because they both live in the
 - a) hardwood hammock
 - b) pinelands
 - c) freshwater marsh
 - d) Florida Bay
3. Without periphyton, there would be no fish available to be eaten by the
 - a) egret
 - b) mosquito larva
 - c) deer
 - d) tree snail
4. The deer and the tree snail are related because they both live in the
 - a) hardwood hammock
 - b) air
 - c) freshwater marsh
 - d) Florida Bay
5. The mosquito fish is food for largemouth bass and the Florida gar. These fish are food for
 - a) raccoons
 - b) otters
 - c) alligators
 - d) a, b and c



Click on the “Happy Face” at the bottom of the screen to return to the beginning of the lesson.

(When finished, turn to page 9, the “Sink the Reef” Dock.)

“SINK THE REEF”

WET LAB DOCK MARINE BIOLOGIST

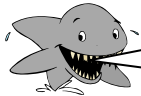
Artificial or man-made reefs are made by placing materials on the ocean bottom. In this lesson you will experiment with different artificial reef designs using concrete blocks. Their rough surface encourages the growth of corals, algae and barnacles which are food for many kinds of fish. Your objective is to see which design is the most effective for attracting fish.



1. Click on the word “Height” and choose 1 meter.
2. Click on the word “holes” and choose none.
3. Click on “spacing” and choose 5 meters.
4. Click on “done” to determine the fish catch for this reef design.
5. Record the height and the fish catch in the table below.
6. Click on the word “height” and choose 2 meters.
7. Click on “done” to find out how this changed the fish catch. Record the height and the fish catch below.
8. Change the height and choose 3 meters.
9. Click on “done” and record the height and the fish catch below.

Height	Holes	Spacing	Depth	Fish Catch
	None	5 Meters	12 Meters	
	None	5 Meters	12 Meters	
	None	5 Meters	12 Meters	

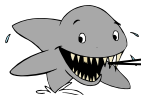
1. How did increasing the height affect the fish catch? _____



10. Click on “holes” and choose small.
11. Click on “done” and record the catch.
12. Do the same for “large” holes and for “combination.”

Height	Holes	Spacing	Depth	Fish Catch
3 Meter		5 Meters	12 Meters	
3 Meter		5 Meters	12 Meters	
3 Meter		5 Meters	12 Meters	

2. How did adding small holes affect the fish catch? _____
3. How did increasing the size of the holes affect the fish catch? _____
4. How did adding a combination of holes affect the fish catch? _____



13. Click on “spacing” and find the catch for 5, 10, and 20 meters.
14. Record the catch.

Height	Holes	Spacing	Depth	Fish Catch
3 Meter	Combination		12 Meters	
3 Meter	Combination		12 Meters	
3 Meter	Combination		12 Meters	

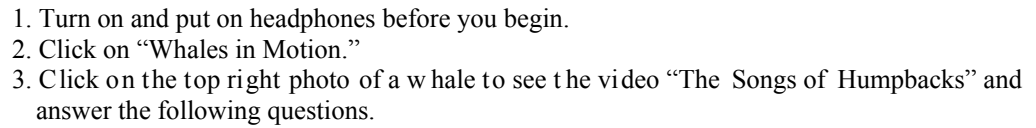
5. How did increasing the spacing affect the fish catch? _____



6. Now that you know how changing height, holes and spacing affects fish catch, how would you design an artificial reef so that it attracts the most fish?

(When finished, turn to page 10, the “Ask the Experts about Whales” Dock.)

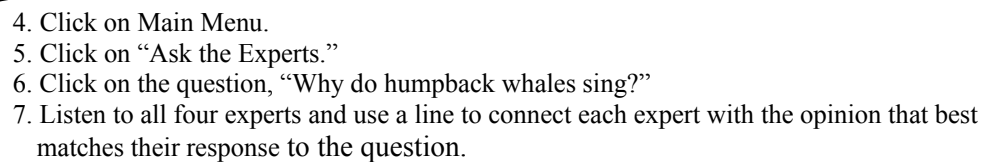
“ASK THE EXPERTS ABOUT WHALES”



a. to attract females b. to attract food c. to challenge rival males d. both a & c

True **False**

a. a poem b. a rock and roll song c. a rap song d. a story

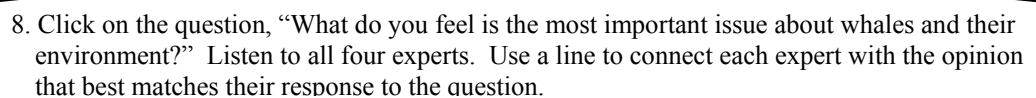


to communicate

males sing to attract females and deter other males

to drive males away and to attract females

to drive males away and to advertise their presence

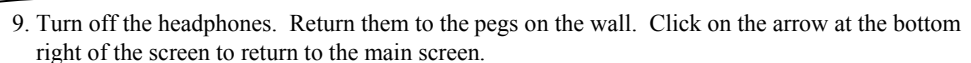
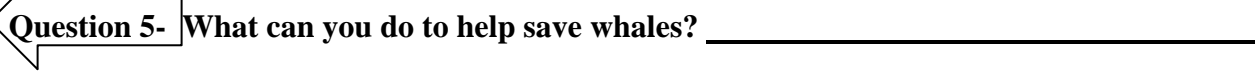


fishing nets and destruction of habitat

noise, pollutants, overfishing, overharvesting

mainly pollution

human beings damaging the environment



10

The School Board of Miami-Dade County, Florida, adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Education Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits sex discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations, and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to "eligible" employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

School Board Rules 6Gx13- 4A-1.01, 6Gx13- 4A-1.32, and 6Gx13- 5D-1.10 - prohibit harassment and/or discrimination against a student or employee on the basis of gender, race, color, religion, ethnic or national origin, political beliefs, marital status, age, sexual orientation, social and family background, linguistic preference, pregnancy, or disability.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulate categorical preferences for employment.

REVISED 8/1/01