

OCEARCH STEM Holiday Packet

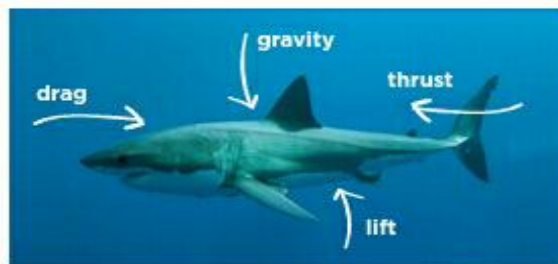
Grades K-12

You can track sharks like Hilton, Finn, and Canyon as they ping in over the holidays! Replace fear with facts as you learn more about what OCEARCH sharks will eat during the holidays, see how sharks adapt or behave during the changing seasons, participate in shark research projects, and explore the ocean as you track the pings of your favorite sharks. You will also build your “Sharkabulary” and discover how to use the OCEARCH Global Shark Tracker to gather near real-time data to complete the S.T.E.M. activities!

Here are several ways that you can be a part of the OCEARCH Education global community during the holidays, and beyond.

You can:

- Download the free OCEARCH S.T.E.M. Learning Curriculum for grades K-8
- Host a Change 4 FINS fundraising event at your school.
- Follow and engage with us on our social media platforms (Twitter, Facebook, Instagram)
- Sign up to receive the OCEARCH Education Newsletter at education@oceanarch.org for updates and upcoming events.
- Register for an OCEARCH Education Google Hangout lesson or Teacher Workshop with one of our OCEARCH Education Ambassadors.
- Schedule a Skype Session with an OCEARCH team member and get your questions answered.
- Kick Plastic by reducing the use of single use plastic bottles and bags in your classroom and home.
- Together we can educate, inspire, and enable the next generation of scientists, explorers, and stewards of the ocean.



Change 4 FINS is a 2-week program that combines fundraising and education to support and expand the OCEARCH STEM curriculum. Students will collect change to make a change. 50% of proceeds will go to your school's science programs!

The OCEARCH STEM Curriculum enables students to learn STEM skills while following the real-time data on the movements of their favorite sharks, via the OCEARCH Global Shark Tracker.

HOW IT WORKS

1. Choose a 2-week period to host the Change 4 FINS fundraiser
2. Email us at education@oceanarch.org to receive your Change 4 FINS Digital package
3. Designate a group to be in charge of the event during the 2-week period
4. **#Kickplastic** and help keep our oceans clean and healthy!
Use recycled containers to collect your donations.
5. Complete the Donation Tracker Sheet.
6. Make the donation directly to OCEARCH through [rally.org](https://rally.org/oceanarch) at <https://rally.org/oceanarch>.
7. Email the completed Donation tracker sheet and share your success with OCEARCH at education@oceanarch.org
8. Schedule a Skype session with our team by e-mailing education@oceanarch.org

Download Our Free Shark Tracker App!
Download Our Free OCEARCH STEM K-12 Curriculum

Join the movement **#WeAreOCEARCH**
www.OCEARCH.org



OCEARCH STEM Holiday Packet

Featured Scientist

OCEARCH collaborates with many scientists across several institutions when they're on Expedition. Scientists on board for Expedition are also collecting samples for those who are unable to come and require samples to continue their research. Here is our featured scientists) and their research that is featured in this packet.

Our first featured scientist is Dr. Lisa Hoopes!



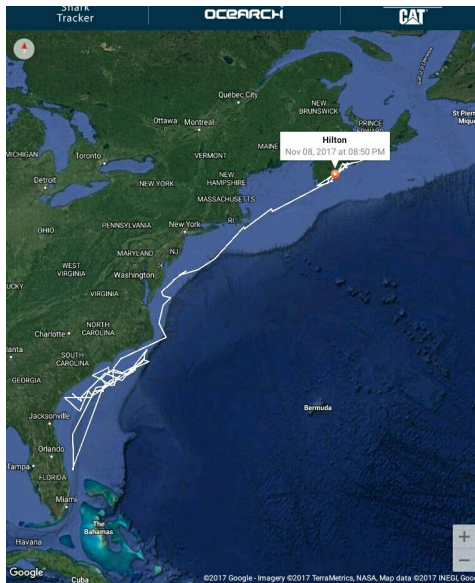
Dr. Lisa Hoopes is the Nutritionist at the Georgia Aquarium in Atlanta, GA where she directs all aspects of clinical nutrition for the animal collection, from the smallest of urchins to the largest of whale sharks. Lisa is one of the few nutritionists managing the nutrition of a primarily aquatic animal collection and she has been invited to speak at numerous domestic and international conferences on her expertise in the field of animal nutrition. Lisa has always had an interest in marine animals and focused her Masters of Science research on physiological and hematological changes in Kemp's ridley sea turtles. She received her Ph.D. from Texas A&M University in 2007 and focused her research on Steller sea lion metabolism and energetics to address

questions related to nutritional stress and resulting changes in body composition. Following this, Lisa completed a two-year post-doctoral fellowship in animal nutrition through the University of Florida and with Disney's Animal Kingdom, where she had the opportunity to work with a number of terrestrial and aquatic species. In addition to managing the nutrition and feeding of such a unique collection of animals at the Georgia Aquarium, Lisa maintains an active research program exploring questions surrounding comparative and applied nutrition, energetics, contaminants, and feeding ecology; particularly in elasmobranchs. She is currently working on research projects with white sharks, spotted eagle rays, manta rays, and sand tiger sharks.

OCEARCH STEM Holiday Packet

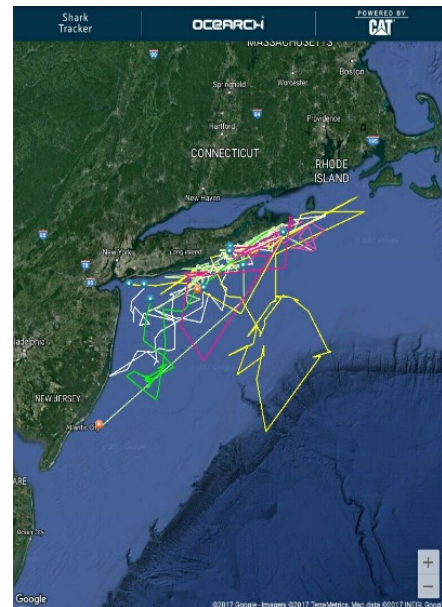
Expedition Updates

In 2017 OCEARCH completed 3 successful expeditions: Lowcountry, the Mid-Atlantic, and Long Island, NY. These expeditions furthered research of the apex predators in these regions. During Expedition Lowcountry, OCEARCH tagged and released 2 white sharks, a mature male named Hilton, and an immature female named Savannah. There were also 2 tiger sharks tagged and released, a juvenile named Beaufort, and a mature male named Weimar. These sharks are already giving insight to researchers about their ecology. Watching Hilton's pings have been exciting for researchers as they begin to see a well defined track for a mature male white shark in the North Atlantic.



The second expedition of the year was in the Mid Atlantic region. This is the first time that OCEARCH has conducted research in the region. While there, researchers and crew were able to complete workups on 2 sand tiger sharks.

The final expedition for 2017 was in New York, off Long Island, continuing research and tagging young of the year white sharks. The research team and crew collaborated with 13 different institutions, including Long Island Shark Collaboration were very successful. Working together, they were able to tag 11 young of the year white sharks, completing the sample size for the science team in this area. They also were able to do a work up on a juvenile mako, and tagged a blue shark, named Azul. Tobey Curtis was quoted as saying that without OCEARCH, it would have taken his team probably 6 years to do what they were able to in 2 years with OCEARCH.



OCEARCH STEM Holiday Packet

Build Your Sharkabulary!

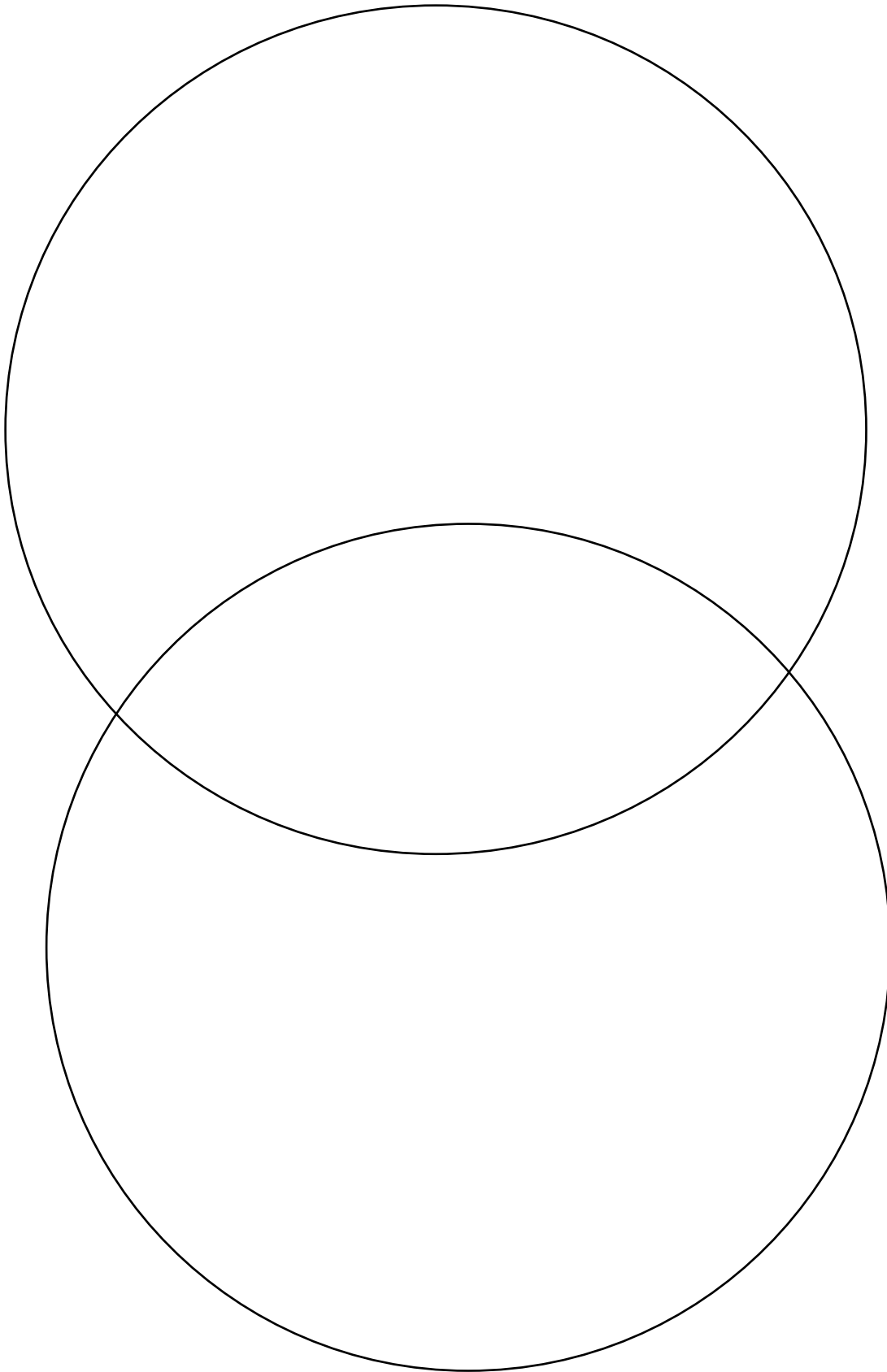
1. **Apex Predator** - an animal that is at the top of the food chain. It doesn't have a natural predator.
2. **Benthic** - the ecological area or region at the lowest level of a body of water, like a lake or ocean, that includes the surface or sub-surface layers.
3. **Coastal** – meaning near a coast
4. **Demersal Fish** - species of fish that live and feed on the bottom of a lake or sea.
5. **Dissolved Oxygen** - “the amount of gaseous oxygen dissolved in water as an indication of the degree of health of the water and its ability to support a balanced aquatic ecosystem.” (Dictionary.com)
6. **Endothermic** – animals that are able to generate and regulate their own internal heat.
7. **Ectothermic** - animals or organisms that depend on external sources to regulate their body heat.
8. **Growth rate** - the rate or unit of time at which an animal or organism grows.
9. **Immature shark** – the life stage of a shark when they are not able to reproduce.
10. **Keystone Species** - an animal or organism that if removed from a food chain, would affect the entire ecosystem.
11. **Mature** - The life stage of a shark when they are able to reproduce.
12. **Metabolism** - the sum of the physical and chemical processes in an organism by which material substance is produced maintained and destroyed, and which makes energy available.
13. **Nutrition** - Science or study of nutrition or diet of an animal.
14. **Pelagic** – the area of the Open Ocean or seas. It also means animals living or growing at or near the surface of the ocean, away from land.
15. **Young of the Year** - the life stage of a shark from birth to 1 year of age.

Happy Holidays!

What are YOU Thankful for? What do you think sharks are thankful for? Write your ideas in the diagram below. Are there any things that you BOTH could be thankful for?

You

Sharks



OCEARCH Holiday STEM Activity Packet

Grades K-5

Many of us hit the road or fly to see family and/ or friends for the holidays. Sharks are also on the move as they make migratory tracks in the ocean. Sometimes we go to the same places each year and other times we stay at home. Sharks also ping in as they move to a new area, like Savannah, and the young of the year sharks. Some stay in an area for a bit, like Hilton in Nova Scotia. Track Hilton and Savannah from the past year to see how their migrations are similar and different. Where will they ping in over the holidays (next 30 days)? Let's track them to find out!



Draw Savannah and/or Hilton's pings here!

| | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---------------|--|--|--|--|--|--|--|
| Week 1 | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ |
| Week 2 | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ |
| Week 3 | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ |
| Week 4 | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ | Ping(s)? _____ Time: _____ Location: _____ |

Where do you think Hilton and/ or Savannah will be for the holidays? _____

Where did they ping in? _____

Where did you go for the holidays? _____

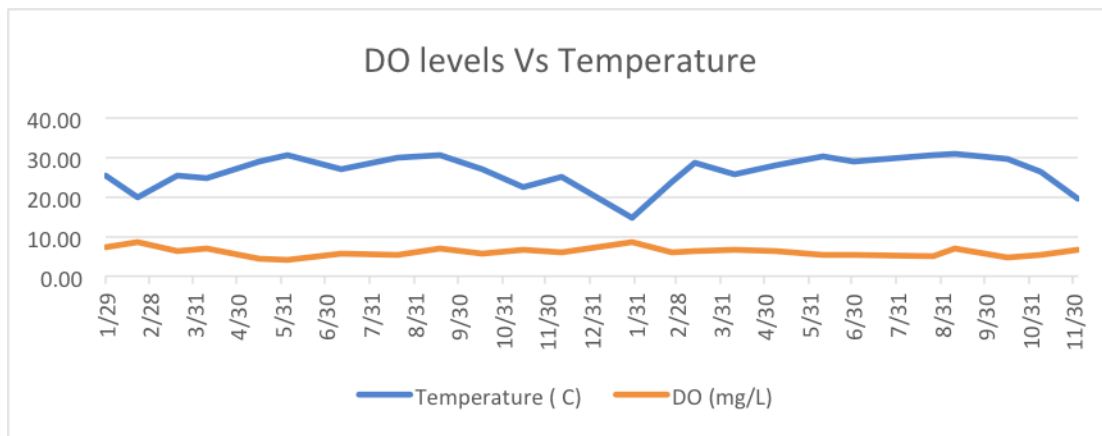
OCEARCH Holiday STEM Activity Packet

Dissolved Oxygen Lab: Grades 9-12

Oxygen is the key to life on this Earth. Oxygen allows our bodies to go through the simultaneous processes that allow life to thrive. Terrestrial organisms can walk through the air and are able to breathe with the use of lungs. How do organisms in the ocean achieve this same task?

Dissolved oxygen (DO) is the amount of gaseous oxygen (O_2) that is dissolved in water. There are many different factors that can impact the levels of DO. Water temperature, amount of photosynthetic organisms, and volume of moving water can all influence the amount of available DO in an area. The higher the DO the more nutrients available. This allows for life to flourish. How do you think this might impact the way sharks migrate?

Let's have a look at the relationship between DO and water temperature. The below Graph shows how DO responds to temperature fluctuations.



What trends do you notice?

What time of year had the highest level of DO?

Predict how you think time of year and sea surface temperatures might impact where Great White sharks give birth.

How do you think DO levels impact the Young of the Year white sharks?

Visit:

<http://www.ocearch.org/profile/amagansett/>

<http://www.ocearch.org/profile/manhattan/>

<http://www.ocearch.org/profile/gurney/>

<http://www.ocearch.org/profile/hampton/>

OCEARCH STEM Holiday Packet

Shark Nutrition: Grades K-5

Dr. Lisa Hoopes studies nutrition in sharks and rays! One of the shark species she studies is the white shark. Dr. Hoopes says that you can tell what a shark has been eating by taking a blood, muscle tissue, or fecal sample and running tests on them. She says that as she studies a shark's nutrition, she sees that "they are what they eat. For instance, if you are what you eat, and I were to take a sample of your dry skin, what would I see that you ate for breakfast? A donut? Or cereal?" That is the kind of information that she can tell from the samples she gathers from white sharks. She can tell what they have eaten in the short term, from blood samples, and in the long term, from muscle and fecal samples.

Young of the Year white sharks do not eat the same things as mature white sharks. They have different physical and nutritional needs. Young of the Year white sharks are feeding on prey near the seafloor of coastal areas. They eat prey like: **searobins, skates, flounder, sea stars, smooth dogfish, crabs, snails, and menhaden**. They have even eaten **garbage**! Each of these prey has nutritional markers in its blood, tissues, and feces, and shows Dr. Hoopes what each shark has been eating. These samples are taken in a way that doesn't harm or stress the shark. You can use the OCEARCH Global Shark Tracker to see where these young sharks are pinging as they swim from the New York Bight to the North Carolina coastline and see how they stay close to the coast and see how they are using these areas to find food.

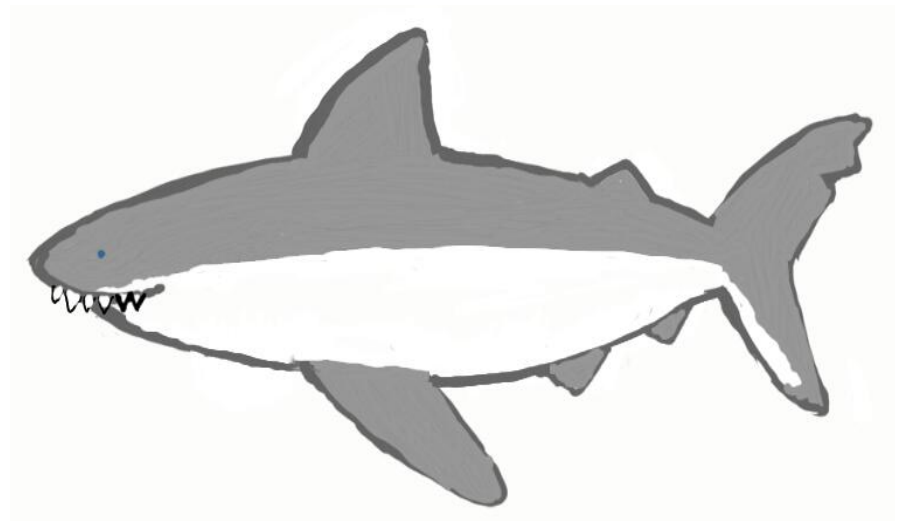
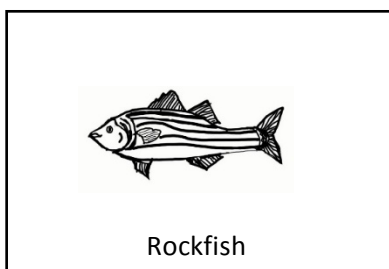
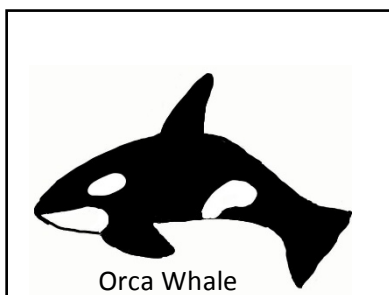
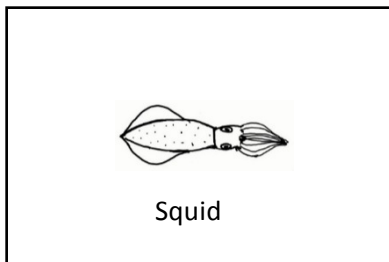
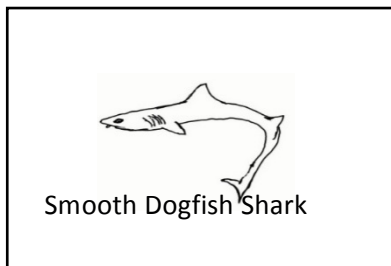
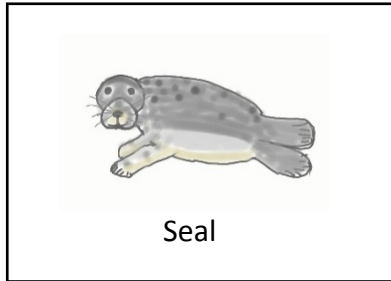
Mature white sharks in the North Atlantic, make longer migrations, are larger in size than young of the years, and mature female white sharks need food for feeding baby white sharks she carries when she's gestating. Therefore, mature White Sharks need to eat prey that will keep them full for longer periods of time, and help feed growing pups. Mature White Sharks will eat prey that is higher in fats, like: **whales, dolphins, seals, Rockfish, Tuna, squid, and smaller sharks**.

OCEARCH STEM Holiday Packet

White Sharks Nutrition: Grades K-2

Name _____

We are trying to find the prey that a mature white shark like Hilton might eat for a meal for Thanksgiving! Can you find what he might eat that would give him the nutrition and energy he needs to swim from Savannah, GA to Nova Scotia? Be careful! Not all of the marine animals are things he would like. Draw a line from the prey to his stomach.



OCEARCH STEM Holiday Packet

What's on the Pup's Menu? White Sharks Nutrition: Grades K-5

Name _____

Young of the year white sharks, like Mission, can eat 20 prey items per year as he pings in. The table below represents the prey items researchers have found that YOY white sharks are eating off Long Island, NY. Make a bar graph using the data below, and then write the fraction and/or percentage of how much of each prey item makes up a YOY white shark's diet.

Young of the Year White Shark Diet



Menhaden= 5

Flounder= 2

Bluefish= 2

Starfish= 1

Searobins = 4

Crabs= 1

Skates= 3

Garbage = 1

1. What fraction of Mission's diet were Menhaden? _____ What percentage is that? _____
2. What fraction of Mission's diet was starfish? _____ What percentage is that? _____
3. What fraction of Mission's diet was Bluefish? _____ What percentage is that? _____
4. What fraction of his Mission's diet were Searobins? _____ What percent is that? _____

What prey item surprised you regarding what young of the year white sharks ate?

Why do you think they are eating that? _____

****The percentages and number items that young of the year white sharks are hypothetical. More research is still being done on what these YOY white sharks are eating and what makes up their diet.**

OCEARCH STEM Holiday Packet

White Sharks Nutrition: Grades 6-12

Name _____

An adult white shark can weigh up to 4000 pounds and grow to be 20 feet long and swims an estimated 8,000 miles per year. It takes a lot of energy to swim that far. Let's take a look at what a white shark would need to eat to sustain them along their journey.

OCEARCH white shark, Hilton, eats 1 seal to stay full for 30 days. If a Harbor Seal weighs 300 pounds and 1 pound = 16 oz. How many pounds of food per day does he eat ?

What would you have to eat from the menu below, to eat as much as a white shark?

How many salads equal 1 pound (16 ounces)?

How many salads would you need to equal 1 Harbor Seal?

What about these items? How many _____ would it take to eat like a white shark?

Menu

A Chicken Nugget = 1 oz.

Filet of Fish = 6 oz.

Apple = 5 oz.

Burger = 8 oz.

And this is only 1 month! How much food is that Or per week? per day? (Based on a 30 day month).

OCEARCH STEM Holiday Packet

May your days be Green and Bright!

Kick Plastic Activities: Grades K-12

Holiday Recycling Tips: Going Green for the Holidays

With the holiday season approaching it is easy to forget to cut down on waste and recycle. We use more plastic during the holidays while we entertain and travel. Here are some ways you can kick plastic and stay eco-friendly during the holiday season! Join us and #KickPlastic this holiday season!

1. Use paper/eco-friendly gift wrap instead of traditional wax coated wrapping paper.
2. Use crayons/markers or stamps to decorate your paper instead of adding ribbon and bows.
3. Make holiday gift cards using recycled material.
4. When entertaining guests, try to use reusable plates, napkins, and silverware.
5. Store leftovers in glass storage containers.
6. Use glassware to serve your holiday beverages instead of plastic.
7. When traveling use a reusable water bottle or coffee mug.
8. Pack snacks in a reusable container.
9. When plastic is the only option, find a way to reuse or recycle it.
10. Try to purchase holiday gifts from companies that package and/or ship items using paper filler instead of inflated plastic bags or Styrofoam.
11. Check the sources of your seafood, to make sure that they are from sustainable fisheries.

OCEARCH STEM Holiday Packet

May your days be Green and Bright!

Kick Plastic Activities: Grades K-12

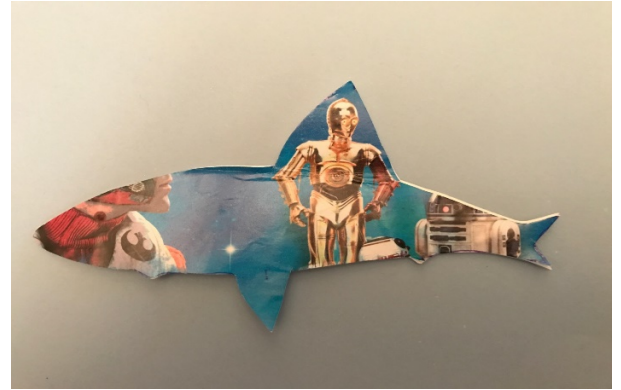
Shark Holiday Greeting/Thank You Cards

Supplies:

- Recycled holiday wrapping paper
- Card stock/construction paper
- Glue stick
- Crayons/markers/pens
- Scissors
- Pencil

Instructions:

1. Cover one side of the paper stock/construction paper with recycled wrapping paper using glue to secure.
2. Fold card stock/construction paper in half.
3. Trace your favorite shark onto the card and cut out.
4. Create a special holiday message or a thank you note then decorate!
5. Share your holiday spirit with family and friends!



Holiday Card Holder

Supplies:

- Recycled holiday wrapping paper
- Recycled tissue box
- Scissors
- Glue stick

Instructions:

1. Cut a hole in the top of the tissue box large enough to hold holiday greeting cards.
2. Wrap the tissue box in recycled wrapping paper using a glue stick to secure paper to box.
3. Store all of your holiday greeting cards in your new recycled box

OCEARCH STEM Holiday Packet

12 Days of Expedition! Merry Sharkmas!

On the 12th day of Expedition, OCEARCH gave to me...

12 Research Projects

On the 11th day of Expedition, OCEARCH gave to me...

11 YOY White Sharks

On the 10th day of Expedition, OCEARCH gave to me...

10 brilliant scientists

On the 9th day of Expedition, OCEARCH gave to me...

9 Periscopes of Tagging

On the 8th day of Expedition, OCEARCH gave to me...

8 beds for sleeping

On the 7th day of Expedition, OCEARCH gave to me...

7 mature White Sharks

On the 6th day of Expedition, OCEARCH gave to me...

6 sharks Z ping

On the 5th day of Expedition, OCEARCH gave to me...

5 expert fishermen

On the 4th day of Expedition, OCEARCH gave to me...

4 vials for samples

On the 3rd day of Expedition, OCEARCH gave to me...

3 tags for telemetry

On the 2nd day of Expedition, OCEARCH gave to me...

2 Tiger Sharks

On the 1st day of Expedition, OCEARCH gave to me...

1 mother ship to study shark species!

OCEARCH STEM Holiday Packet

12 Days of Expedition! Merry Sharkmas Trivia

Name _____

Use the OCEARCH holiday song above to answer the following trivia questions!

1. How many YOY white sharks were tagged during Expedition New York this year?

2. How many beds are there in the Ocho on the ship? _____

3. How many tags were put on the young of the Year white sharks for telemetry?

4. How many people are there on the fishing team that are part of the crew?

5. Can you name who they are? _____

6. How many tiger sharks were take during Expedition Low Country this year?

7. What are their names? _____

8. How many research projects are conducted in 15 minutes before a shark is released? _____

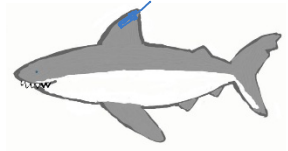
9. What is the name of the Mothership? _____

10. Bonus! What does the name "OCEARCH" stand for? _____

OCEARCH STEM Holiday Packet Activity Page

Ping in the New Year doing STEM with Savannah!

Grades K-2 : Addition



Name _____

Solve the division problem. Then look up the answer in the table, to find the matching letter and decode the OCEARCH Holiday message!

| | | | |
|-------|--------|--------|--------|
| 1 = Z | 2 = N | 3 = T | 4 = C |
| 5 = W | 6 = O | 7 = H | 8 = A |
| 9 = P | 10 = Y | 11 = E | 12 = R |

$5+2 = \underline{\quad}$ $7+1 = \underline{\quad}$ $3+6 = \underline{\quad}$ $8+1 = \underline{\quad}$ $5+5 = \underline{\quad}$

Letter: _____

$1+1 = \underline{\quad}$ $6+5 = \underline{\quad}$ $2+3 = \underline{\quad}$

Letter: _____

$3+7 = \underline{\quad}$ $9+2 = \underline{\quad}$ $4+4 = \underline{\quad}$ $6+6 = \underline{\quad}$

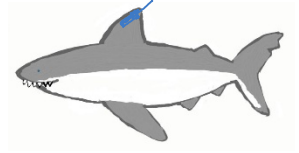
Letter: _____

OCEARCH STEM Holiday Packet Activity Page

Ping in the New Year doing S.T.E.M. with Savannah!

Grades 3-5: Division

Name _____



Solve the division problem. Then look up the answer in the table, to find the matching letter and decode the OCEARCH Holiday message!

| | | | |
|-------|-------|-------|-------|
| 1 = E | 2 = P | 3 = L | 4 = C |
| 5 = N | 6 = O | 7 = V | 8 = A |
| 9 = G | | | |

$4 \div 2 = \underline{\quad}$ $7 \div 7 = \underline{\quad}$ $16 \div 2 = \underline{\quad}$ $4 \div 1 = \underline{\quad}$ $6 \div 6 = \underline{\quad}$

Letter: _____

$9 \div 3 = \underline{\quad}$ $12 \div 2 = \underline{\quad}$ $21 \div 3 = \underline{\quad}$ $5 \div 5 = \underline{\quad}$

Letter: _____

$14 \div 7 = \underline{\quad}$ $27 \div 9 = \underline{\quad}$ $18 \div 6 = \underline{\quad}$ $18 \div 2 = \underline{\quad}$

Letter: _____