

# SHIPWRECKS & UNDERWATER COMMUNITIES

Image courtesy of John McCord, UNC Coastal Studies Institute

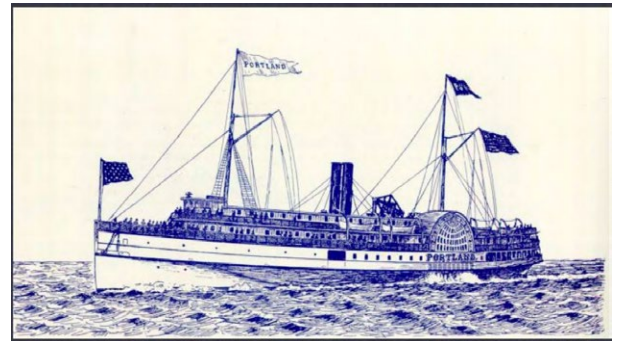
## Oasis on the Seafloor

Anne Smrcina Education and Outreach Coordinator  
NOAA Stellwagen Bank National Marine Sanctuary

Shipwrecks grab our attention. The lure of lost treasures and dramatic stories of vessels and their passengers and crew enthrall audiences. Massachusetts, with more than 400 years of seafaring history, has seen its fair share of accidents, although the final resting places of many of these ships have yet to be found. Even more obscure are the losses from coastal transit by early native peoples.

Each of these shipwrecks is more than just a potential dive site or a historical footnote. Shipwrecks serve as time capsules on the seafloor and windows into our past, holding the technology, culture, and commerce common to that particular moment in history. In addition, shipwrecks can serve as biological laboratories. A shipwreck provides a sturdy oasis of metal or wood in an otherwise hostile environment of mud and sand, and supports communities of invertebrates and fishes that find their way to this newly created seafloor feature.

During the summer of 2019 (July-September), a team of researchers from Woods Hole Oceanographic Institution (WHOI), Marine Imaging Technologies, and Stellwagen Bank National Marine Sanctuary visited several shipwrecks in New England's only national marine sanctuary. This was the first year of a three-year project to explore known shipwrecks and discover new ones, document changes in the condition of the wrecks over time, study the ships



Historic Portland image. Source Wikipedia

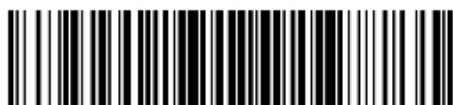
as archaeological sites, and understand the living communities that now make the wrecks their homes.

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**2020 MME Winter Calendar**

Check website and F&J for details.

**MARCH 5**

**High School Marine Science Seminar**

Northeastern University  
 Northeastern University Boston Campus  
 Contact Emily Duwan for information  
[eduwan@northeastern.edu](mailto:eduwan@northeastern.edu)

**MARCH 11**

**MME Board Meeting**

The Academy at Penguin Hall  
 Wenham, MA  
 Emily Hewitt, Hostess  
[ebhewitt@gmail.com](mailto:ebhewitt@gmail.com)

**APRIL 2 - 5**

**68th NSTA National Conference on Science Education – Boston Convention & Exhibition Center Boston, MA**

**MAY 2**

**MME Annual Meeting and Conference**

Woods Hole, MA  
 Grace Simpkins, Conference Chairperson  
[gsimpkins@whoi.edu](mailto:gsimpkins@whoi.edu)

**MAY 13**

**MME Board Meeting**

This meeting will be a virtual meeting held by ZOOM conference call

All MME Members are invited to Board Meetings.  
 Let the host know if you are coming.

# Inspired by Environmental Success at the 2019 BHEC

By Lexi Siino and Val Perini

It was a beautiful sunny morning on October 5th as educators, students, and other MME colleagues waited to enter the Deer Island Wastewater Treatment Plant. Once participants made it past the plant's strict security, they were welcomed to the historic restored pumping station building where the annual Boston Harbor Educators Conference was taking place.

Participants enjoyed breakfast and networking as they settled into their seats for a day of workshops, lectures, and tours on the theme of "A Working Harbor: Past, Present, and Future." As the events of the day kicked off, attendees were greeted by MME President Don Pinkerton and BHEC Chair Corrine Steever, who shared their excitement to be partnering with the Massachusetts Water Resource Authority (MWRA) to host the annual event at this exciting new location, after many great years hosting the event at UMass Boston. Don and Corrine offered a remembrance of treasured colleague the late Peg Collins, who devoted many years of service to MME.

Participants then enjoyed a lecture by keynote speaker Kathy Abbott of Boston Harbor Now, whose talk focused on the various ways that she and her colleagues are working to make the Harbor a sustainable and accessible resource to the community, and increase the resilience of our treasured coastline.

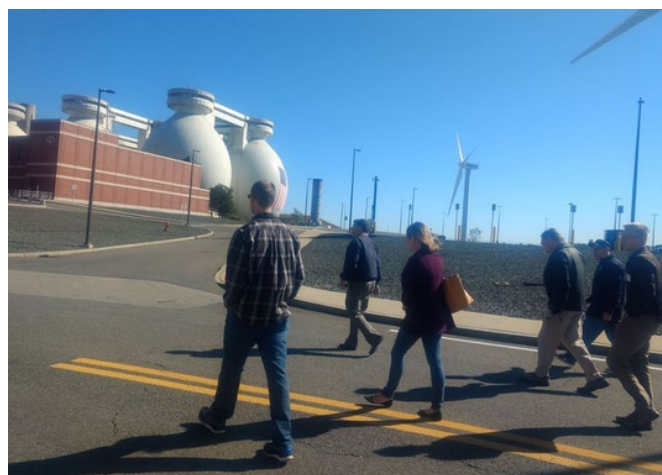
Following the keynote speaker, participants were invited to peruse exhibit tables and make their way to their choice of workshops and tours during two sessions before lunch. In a workshop led by Laura Lilly from Boston Harbor Cruises, participants learned about Salt Water Scribes program and worked as a team to complete a whale tales ID challenge.

In another workshop, led by Aimee Bonnanno of NEOSEC and Colleen Hitchcock of Brandeis University, participants learned how to join the City Nature Challenge, and worked through an iNaturalist challenge involving oysters, building excitement for the opportunity to involve learners in community or citizen science using iNaturalist.

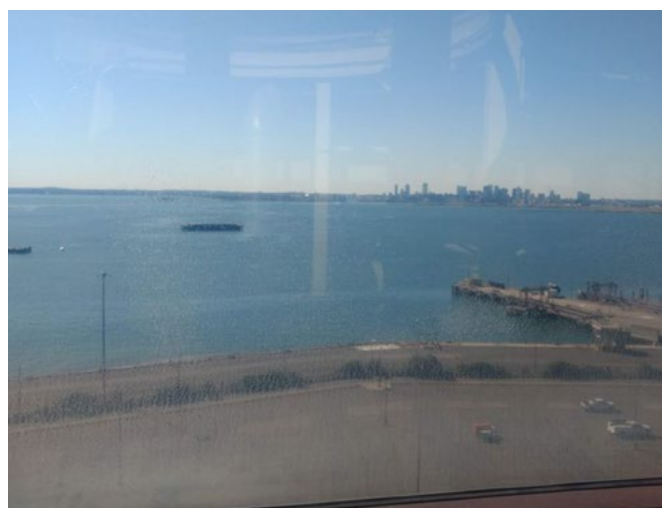
Longtime MME member Pat Harcourt's workshop explored the many uses of maps and data in the classroom and led participants through several examples of how to have a meaningful discussion around a map and access simple environmental data online for student exploration and analysis. Another workshop led by Katie Castagno of the Northeastern University Marine Science Center explored coastal erosion, and participants were challenged to engineer sustainable shorelines resilient to sea level rise.



Participants tour the control room from which employees can monitor and control plant operations.



12 giant digester "eggs" use microorganisms to digest waste, producing methane that provides energy for the plant.



A special treat – tour participants got to travel to the top of the digester eggs, enjoying a spectacular view of Boston.

*continued on page 10*



# President's Message



Greetings all,

Winter is upon us! It is only January and already we have had three snowstorms. I don't spend as much time outdoors in winter as I used to, but I do enjoy the quiet time indoors with a fire and a book. Last week, I joined a group of students from our high school for a hike at Mass Audubon's Ipswich River Wildlife Sanctuary. Before we arrived, I'm sure the woods were still and quiet. Our presence really brought out the chickadees, titmice and nuthatches, who were very curious to come see the intruders, and see if they had any food. The highlight of the trip was a group of about ten deer leaping through the trees... several yearlings and some females. For many of our students, it was their first time seeing a deer.

It was great to see so many MME members and new folks at the Boston Harbor Educators Conference on October 5. I think everyone really enjoyed the new venue at the Deer Island Wastewater Treatment Facility in Winthrop. Maybe only a group of scientists and science educators could really appreciate visiting such a place. Our hosts were gracious, the meeting facilities were excellent, and our tour of the plant, including a spectacular view of Boston Harbor from atop "egg" digesters, was a real treat. Certainly not something one experiences every day, unless of course you work there. I look forward to returning next year.

Planning is underway for the High School Marine Science Symposium, which will be held on Thursday, March 5 at Northeastern University. We hope to bring back the Salem event next year. This event brings hundreds of high school students together for a day of marine science exploration

and learning. We are still seeking scholarship donations which will allow us to accommodate students from high needs schools. If you are interested, please email me at the address below and I will forward instructions.

Planning is also underway for the MME Annual Meeting and Conference, which will be held May 2 at the Woods Hole Oceanographic Institution. This year's theme is ocean sustainability. Keep a lookout in your email for our monthly e-news for more information.

Finally, we hope to be launching our new website soon! Board member Jeffrey Morgan put together an excellent proposal and is working on it as I write this. I am also pleased to announce that former board member Elaine Brewer has agreed to help us out with social media and communications, so look for improvements in that area as well. It was made clear to us at our retreat last summer that improvements in communications and outreach need to be a priority for MME, and I thank the Board for diligently working to make that happen.

As always, if you have any questions, ideas, comments or concerns please feel free to contact me directly at [dpinkerton@rpsk12.org](mailto:dpinkerton@rpsk12.org), or call/text me at (781) 718-5770. I am on Instagram and Twitter @pinkerteach.

Best regards,

*Don*

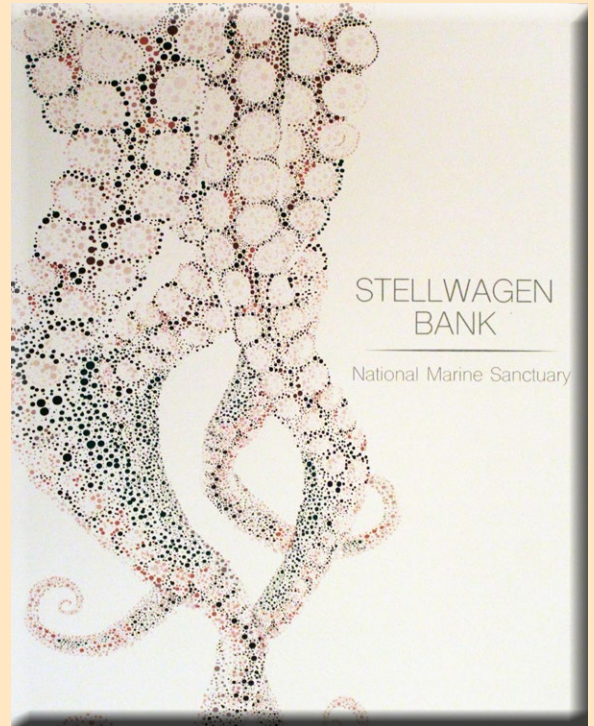
Don Pinkerton, President

# 2019 Marine Art Contest 1st Place Winners



## SCIENTIFIC ILLUSTRATION

Jessica Dai, Lexington Diamond Middle School  
*Red-Gilled Nudibranch*



## COMPUTER GRAPHICS

Sabrina Stone  
Old Colony Regional Vocational Technical HS  
*Octopus*



## HIGH SCHOOL

Jayana McGuire, Bourne HS  
*Green Sea Turtle and Moon Jelly*



## ELEMENTARY

Dylan, Thoreau School Concord  
*Atlantic Whitefish*



## MIDDLE SCHOOL

Hantong, Luckie Art Studio Lexington  
*American Lobster*



## From the Editor's Desk

Another year has come and gone. MME lost a faithful member – Peg Collins. We had a successful High School Marine Science Symposium, and an annual meeting at Woods Hole. This fall, our Boston Harbor Educators Conference moved to a new location at the Deer Island Treatment Plant. Many of you saw this facility for the first time.

In the spring a very successful Marine Art Contest was again held. Over 500 entries came in from across the country and around the world. This has become an exciting way to see the artistic skills of students and their interpretation of the flora and fauna of Stellwagen Bank National Marine Sanctuary.

Now as we enter a new decade, the Board is hard at work planning for another successful year. First up will be the High School Marine Science Symposium in March and our annual conference and meeting in Woods Hole in May. Some details will be found in this issue, with more coming on the website, and the newsletters you receive monthly. Work is progressing on an update of the website which will be coming later this year.

With our winter journal we are looking at Underwater Communities. Many are natural – coral reefs, and outcrops of rock and lava flows near volcanoes. Shipwrecks from years ago also turn up as “reefs”. Under the ocean are the skeletons of many dozens of ships, from ancient whalers, to military ships, victims of many past conflicts, to the skeleton of ships like the *Titanic*. Long forgotten, many have simply suffered the ravages of storms and the sea, slowly disintegrating under the pounding of waves as well as deterioration from the salt and other chemicals found in the seas.

Even off our New England coast lie many shipwrecks, such as the *Portland* and over 150 ships lost in the gale of 1898-1899

alone. Certainly, many others lie off our shores. Gone but not forgotten, they rest on the sea floor. As they waste away, they have become the home of algae, fish, corals, lobsters and barnacles. Safe havens from the larger residents of the sea, as well as areas where the young grow to adulthood.

Long used as dive sites, they are relics of the past. They serve as historic locales, and a study of the long-term effects of sea water on the wood and metal parts of these sunken artifacts. Many of the sites of ancient sunken ships hold the remains of their cargo, including ancient coins and sea chests.

Now in addition to sunken ships, man-made artificial underwater structures built for promoting marine life in areas of featureless bottoms are being established. Some serve as methods of controlling erosion. These reefs are often constructed from decommissioned ships like the USS Oriskany a post WWII carrier sunk 22 miles off the Coast of Pensacola, FL in 200 feet of water in 2005. It has become a diving site and a place to study how sea creatures have made it their home.

Other reefs have been built from sinking oil rigs, rubber tires linked together, and the retired shells of once high-flying aircraft. This past summer research began as a three-year project in the Gulf of Maine by a team from woods Hole, Stellwagen Bank NMS and private companies to study shipwrecks in the Gulf of Maine. This is our first report of early findings during the expedition.

*Howard*

Howard Dimmick, Editor



# What is an artificial reef?

An artificial reef is a manmade structure that may mimic some of the characteristics of a natural reef.



## Can you spot the sunken ship?

In June 2002, the retired USS *Spiegel Grove* was sunk in waters off Key Largo. At 510 feet (155.45 meters) long, the ship was, at the time, the largest vessel ever intentionally scuttled for the purpose of creating an artificial reef.

Submerged shipwrecks are the most common form of artificial reef. Oil and gas platforms, bridges, lighthouses, and other offshore structures often function as artificial reefs. Marine resource managers also create artificial reefs in underwater areas that require a structure to enhance the habitat for reef organisms, including soft and [stony corals](#) and the [fishes and invertebrates that live among them](#).

Materials used to construct artificial reefs have included rocks, cinder blocks, and even wood and old tires. Nowadays, several companies specialize in the design, manufacture, and

deployment of long-lasting artificial reefs that are typically constructed of limestone, steel, and concrete.

## A good view from inside the *Thunderbolt*

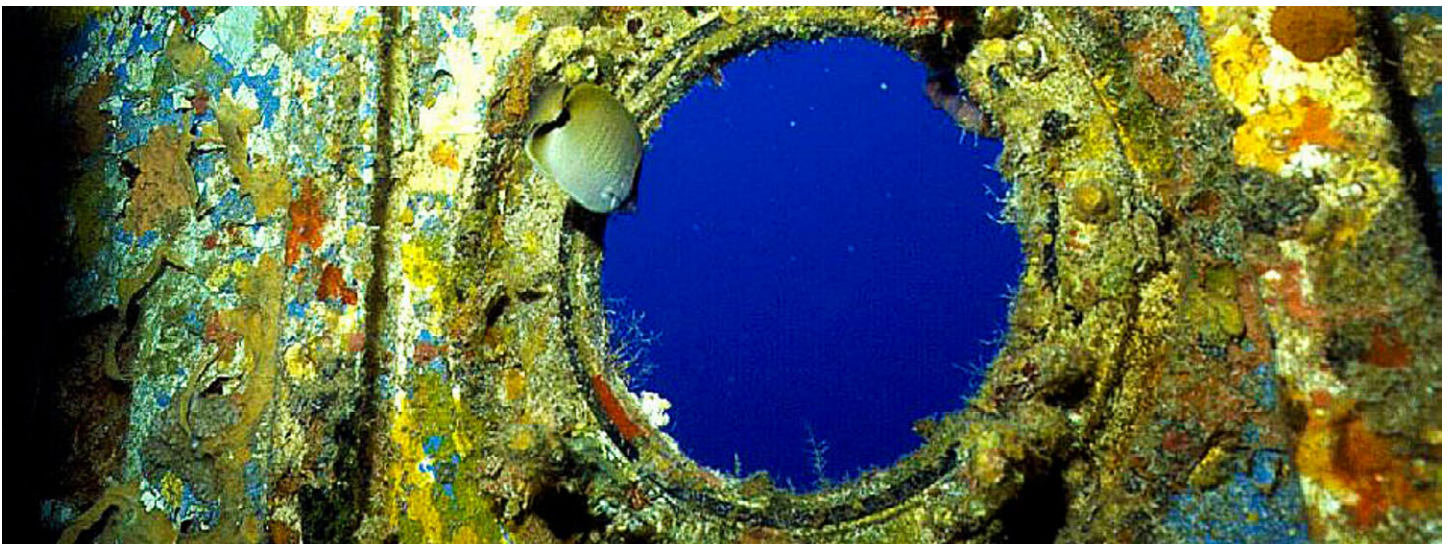
In 1986, the *Thunderbolt* was intentionally sunk in 120 feet (36.6 meters) of water four miles south of Marathon and Key Colony Beach in Florida. The ship's superstructure is now home to colorful sponges, corals, and hydroids, providing food and habitat for a variety of sea creatures.

The [Florida Keys National Marine Sanctuary](#) contains several decommissioned vessels that were sunk in specific areas for diving or fishing opportunities prior to the area's designation as a national marine sanctuary. One of the most famous is the U.S. Coast Guard Cutter [Duane](#), which served on the seas for half a century before its final assignment as an underwater haven for sea life.

Planned manmade reefs may provide local economic benefits because they attract fish to a known location and are therefore popular attractions for commercial and recreational fishermen, divers, and snorkelers. However, the increase in illegal dumping for the purpose of creating habitat has led to significant poaching in the Florida Keys and subsequent high-profile arrests by [NOAA's Office of Law Enforcement](#). [Marine debris](#) continues to be an ongoing problem in these sensitive environmental areas, and [NOAA's Marine Debris Program](#) has helped provide funding to remove debris in the Florida Keys. ☆

## SOURCE

NOAA National Ocean Service



View from inside the *Thunderbolt*.

# Oasis on the Seafloor

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In this first year, the focus was on the passenger steamship *Portland*, which sank in 1898 and has become known as “New England’s *Titanic*,” and the coal schooners *Frank A. Palmer* and *Louise B. Crary*, which collided and sank in 1902. For more information on these wrecks, visit the Stellwagen Bank National Marine Sanctuary’s website at [stellwagen.noaa.gov](http://stellwagen.noaa.gov) and the interactive story map at the website [PortlandGale.blogspot.com](http://PortlandGale.blogspot.com).

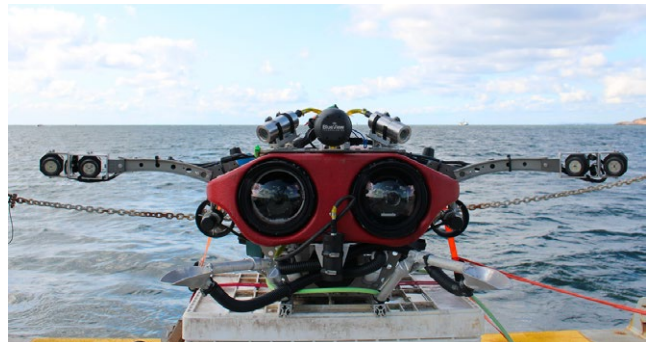
As part of the project, the WHOI team will build digital 3-D models of the Portland shipwreck to provide a baseline to assess future changes – and to which earlier video footage can be compared.

A major aspect of the September mission was to relay the excitement of underwater exploration, technology development, and scientific inquiry to students around the country. Working with the Inner Space Center at the University of Rhode Island, the expedition team was able to talk directly to about 1,400 students during nine morning broadcasts. Museum and aquarium sites displayed live broadcasts in the afternoon and evening, while thousands of individuals tuned in via their personal devices. Although dangerous sea conditions during the September broadcasts prevented the use of *Pixel*, Marine Imaging Technologies’ cinema-class remotely operated vehicle, video footage from earlier in the summer gave viewers a fish eye’s underwater view of the wreck.

For biology teachers, the work of WHOI scientist (and principal investigator for the project) Dr. Kirstin Meyer-Kaiser will be of particular interest. Dr. Meyer-Kaiser’s research focuses on invertebrate colonization. She conducted biological surveys to document the community structure on the wreck and is comparing these findings to what researchers have photographed since the 2002 confirmation of the wreck’s identity. As reported in a web story for the Office of National Marine Sanctuaries, Meyer-Kaiser noted, “Shipwrecks are interesting because they are unusually isolated and island-like, often sitting out in the middle of mud or sand. They are especially interesting because by definition they are not supposed to be there. That means anything that is living there got there by mistake or because of some variation in its dispersal that we don’t know about.”

[For more information about the archaeological and biological goals and technology plans for the three-year project, visit:

- the Office of National Marine Sanctuaries’ (ONMS) web story at [sanctuaries.noaa.gov/news/dec19/scientists-document-historic-shipwrecks-in-stellwagen-bank-national-marine-sanctuary.html](http://sanctuaries.noaa.gov/news/dec19/scientists-document-historic-shipwrecks-in-stellwagen-bank-national-marine-sanctuary.html);
- the ONMS mission page with links to the public broadcasts as [sanctuaries.noaa.gov/live/2019/whoi.html](http://sanctuaries.noaa.gov/live/2019/whoi.html),



*Pixel* ROV remotely operated vehicle on the stern of the RV Connecticut during the telepresence project. Built around two immense camera housings sized to accommodate modern cinema cameras, *Pixel* offers new possibilities to underwater cinematographers.

Photo: Anne Smrcina



Palmer-Crary Shipwreck Scan image.

Photo: SBNMS and Klein Sonar



A net drapes the bow of the *Portland*; invertebrates have attached to the lines. This still was taken from a video shot by the *Pixel* ROV during a dive to the wreck in July.

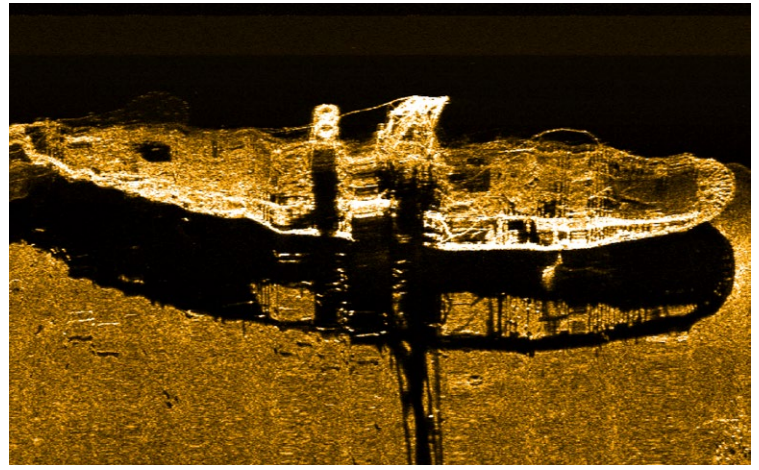
Photo: SBNMS/WHOI.





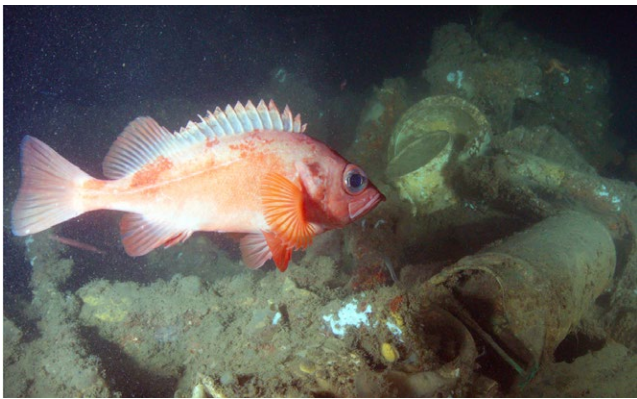
Dr. Kirstin Meyer-Kaiser speaks to a live audience of students. The on-board studio sent signals back to the Inner Space Center for the broadcast.

Photo: Anne Smrcina



Portland side scan image.

Photo: SBNMS and Klein Sonar



Portland wreck with Redfish 2019

Photo WHOI/NOAA

- WHOI's Stellwagen Bank expedition page at [whoi.edu](http://whoi.edu), and
- Marine Imaging Technologies' website at [marineimagingtech.com](http://marineimagingtech.com).]

Activity sheets, marine life ID cards, background information about the ship and larval dispersal, and other resource materials are available at the ONMS and WHOI websites. For further information about years 2 and 3, and how your school can get involved, contact [anne.Smrcina@noaa.gov](mailto:anne.Smrcina@noaa.gov), Stellwagen Bank National Marine Sanctuary's education coordinator. ★

## OCEAN LITERACY PRINCIPLE 3: The ocean is a major influence on weather and climate.

- The interaction of oceanic and atmospheric processes controls weather and climate by dominating the Earth's energy, water, and carbon systems.
- The ocean moderates global weather and climate by absorbing most of the solar radiation reaching Earth. Heat exchange between the ocean and atmosphere drives the water cycle and oceanic and atmospheric circulation.
- Changes in the ocean-atmosphere system can result in changes to the climate that in turn, cause further changes to the ocean and atmosphere. These interactions have dramatic physical, chemical, biological, economic, and social consequences.

## Inspired by Environmental Success at the 2019 BHEC

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Participants had the option to skip their second workshop for a tour of the plant's chemistry labs, where they got an in-depth look at the complex scientific equipment and expertise involved in processing waste from ~50 communities in the Greater Boston Area.

After a morning of learning, attendees enjoyed a delicious lunch and then careers-themed panel discussion, featuring staff from the Boston Harbor & Islands National Park, MWRA, and Deer Island Wastewater Treatment Plant. Many audience questions focused on how to create opportunities for young people, and what challenges face those pursuing careers in the field.


The conference ended with a fascinating tour of the Deer Island Wastewater Treatment Plant's facilities during which participants learned everything from the various kinds of self-sustained energy sources they employ, to what the inside of the "egg-like" structures looks like. Overall, the day offered a chance to see the plant from a new perspective and reminded participants of our ability to protect our environment and create a sustainable future. ★



*We even got the chance to touch the digester eggs. Whatever you do, don't turn that pipe valve!*



*Complex chemistry procedures, many reagents, and high-tech equipment are involved in water testing, which occurs at various stages throughout the treatment process.*



### OCEAN LITERACY PRINCIPLE 6: The ocean and humans are inextricably interconnected.

- The ocean provides food, medicines, and mineral and energy resources. It supports jobs and national economies, serves as a highway for transportation of goods and people, and plays a role in national security.
- Changes in ocean temperature and pH due to human activities can affect the survival of some organisms and impact biological diversity (coral bleaching due to increased temperature and inhibition of shell formation due to ocean acidification).
- Much of the world's population lives in coastal areas. Coastal regions are susceptible to natural hazards (tsunamis, hurricanes, cyclones, sea level change, and storm surges).

# TEACHERS SAVE THE DATE!



Mark your calendars for the **2020 High School Marine Science Symposium** hosted by the Massachusetts Marine Educators and the Northeastern University Marine Science Center, with additional support from many dedicated volunteers.

This year, we will be hosting one event:

**Thursday, March 5**

8 a.m. – 1 p.m.

**Northeastern University in Boston**

(Snow Date: Friday, March 6)

## 2020 High School Marine Science Symposium THURSDAY, MARCH 5

### About the Event

The High School Marine Science Symposium (HSMSS) provides the opportunity for high school students and their teachers to join dozens of local experts as they share their knowledge, skills, and passion for marine science-related research and practice.

The event will feature:

- Hands-on workshop sessions
- Ocean science education fair demonstrations
- Keynote presentation by Maris Wicks

Sessions and demonstrations will cover a variety of topics, including:

- Marine debris
- Technology used to track sharks
- Coastal protection from issues such as sea level rise
- Marine science art
- Climate change communication, and many more!

### How much does the event cost?

- \$15 per student
- Free admission for teachers and chaperones
- Lunch and morning snacks provided
- Schools are responsible for their own transportation

### Scholarships Available!

We are pleased to offer a limited number of scholarships to students in districts where greater than 40% of students are classified as economically disadvantaged ([click here](#) to check eligibility based on district profiles). Scholarships will be awarded on a first-come, first-served basis until all funds are allocated.

### When can I register?

Registration for schools launches on Tuesday, January 14 at 4 p.m. An email announcement will be sent. We encourage teachers to prepare to register now, because the event is popular and fills up quickly, usually within a few hours.

### How can I prepare for registration now?

- Obtain administrative approval
- Survey students to see who is interested in attending
- Please note that in order to accommodate more schools this year, each school will be limited to a max of 30 students*
- Sign up as soon as registration opens on Tuesday, January 14.

**Please direct any questions to  
Emily Duwan**

**[e.duwan@northeastern.edu](mailto:e.duwan@northeastern.edu)  
781-581-7370 x373**

*This event has been continuously offered by MME for over 30 years. Don't miss it!*

# Massachusetts Marine Educators **20** **Marine Art Contest** **20**

Grades K-12

Deadline: May 1, 2020

THEME:

**2020 PERFECT VISION:**  
*Illustrating the Biodiversity of  
Stellwagen Bank National  
Marine Sanctuary*



## Sponsors

Massachusetts Marine Educators,  
Stellwagen Bank National Marine Sanctuary,  
New England Aquarium, Ocean Genome Legacy Center-Northeastern University,  
Center for Coastal Studies, Whale and Dolphin Conservation, Woods Hole Sea Grant

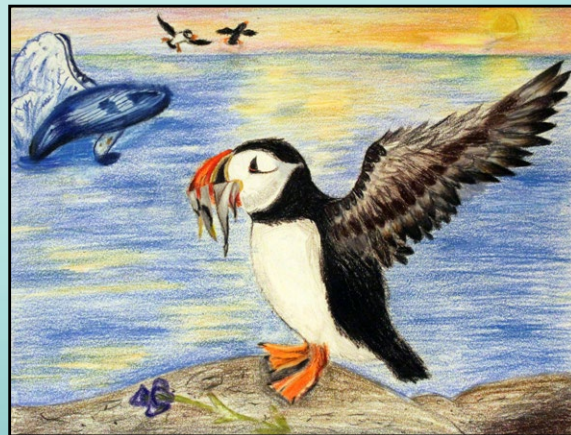
Stellwagen Bank National Marine Sanctuary, a marine protected area located between Cape Ann and Cape Cod at the mouth of Massachusetts Bay, is an ocean wilderness near an urban world filled with amazing marine life. A diversity of sea creatures reside in the sanctuary and the greater Gulf of Maine, ranging from tiny one-celled diatoms to enormous humpback whales. Students are encouraged to create artistic interpretations of these local species.

There are 5 divisions in the contest with a winner, second and third place selected from each division. Winning entries will be posted on the [Stellwagen Bank National Marine Sanctuary](#) website, as well as used by the Sanctuary and MME in their outreach programs. Notification and certificates will be sent to the participating teachers or individual students at their schools. For full contest details, download the [Rules & Entry Form](#) PDF. ★



*Middle School Third Place  
Elizabeth Jo, gr. 10  
The Bromfield School  
Harvard Loggerhead Turtles*

*Elementary School Second Place  
Christina Q., gr. 4  
Peter Noyes ES, Sudbury.  
Atlantic Puffins*



## WHO IS ELIGIBLE

K-12 Students

## ENTRY DEADLINE

April 26, 2019

## RULES AND ENTRY FORM

[PDF download](#)

## SUBMISSION

Deliver in person or postmark (first class mail) by deadline to:

MME Marine Art Contest  
c/o Stellwagen Bank  
National Marine Sanctuary  
175 Edward Foster Road  
Scituate, MA 02066

## THEME

2020 Perfect Vision:  
Illustrating the Biodiversity  
of Stellwagen Bank National  
Marine Sanctuary

## DIVISIONS

- Elementary School (K-4)
- Middle School (5-8)
- High School (9-12)
- Scientific Illustration (all grades)
- Computer Graphics & Photography (all grades)

## WEBSITE

[Stellwagen Bank National  
Marine Sanctuary](#)

# SAVE THE DATE!

## MME Annual Conference and Meeting at WHOI



*Mark your calendars!*

**44<sup>th</sup> Annual  
MME Conference and Meeting  
Saturday, May 2  
8:30 a.m. – 4:15 p.m.**

Quissett Campus  
Woods Hole Oceanographic Institution  
with a reception at  
Sea Education Association  
to follow

Save the date and get ready to dive into a day of marine science talks, workshops, and field trips focused on ***Sustainability***.

## Call for Presenters!

We are looking for **presenters** (45 minute hands-on sessions) and **exhibitors** at the Annual Meeting.

Interested presenters, please register at: [forms.gle/CKt3nfxbAighp84V7](https://forms.gle/CKt3nfxbAighp84V7)

# CLASSROOM ACTIVITY

This activity is reprinted with permission of NOAA

## Be A Shipwreck Detective!

*“Great acts of courage,  
senseless tragedy,  
the heroism of a captain,  
the greed of a stingy shipowner,  
the stupidity of a watchman  
all find their ways into the history of shipwrecks.”*

*~ from the Channel Islands National Marine Sanctuary  
Shipwreck Database Web site*

**S**hipwrecks are an important part of our nautical heritage. Some of our nation’s most interesting shipwrecks are found in NOAA’s National Marine Sanctuaries, including the remains of the Civil War ironclad, U.S.S. Monitor. Some shipwrecks are hazardous to other vessels. Nautical charts produced by NOAA’s Office of Coast Survey show the location of known shipwrecks and other hazards to navigation.

In September 2003, NOAA’s Ocean Exploration Program visited a newly discovered shipwreck in the Stellwagen Bank National Marine Sanctuary on the coast of Massachusetts. Underwater archaeologists studied the wreck to learn more about what happened to cause the ship to sink. Now it’s your turn to be a Wreck Detective!



Storm, shipwreck, and sea monster. Archival Photograph by Mr. Sean Linehan, NOS, NGS



### What You Will Do

Examine information about items found in and around the Stellwagen Bank shipwreck, and draw conclusions about the ship, who was aboard, and why the ship sank

# CLASSROOM ACTIVITY

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## What You Will Need

- "Grid Reference System for Unidentified Shipwreck Q11WRK5" and "List of Artifacts Retrieved from Unidentified Shipwreck Q11WRK5"
- Imagination

## How to Do It

1. Your first task is to organize information about where the artifacts were found on the shipwreck. The "List of Artifacts" gives a grid location for each item and how deeply artifacts were buried (so "22 inches from surface" means the object was buried 22 inches into the sea bottom). Archaeologists often use a grid system to precisely record the exact location of artifacts and their relationship to each other. You have already

used grids to express location if you have ever played Battleship, or even Bingo.

2. As you look at the description of each artifact, think about how deep the artifact was below the surface, and what other artifacts were found nearby. Then consider what the artifacts may suggest about
  - the specific identity of the ship that sank;
  - age of the vessel;
  - the vessel's purpose;
  - who was aboard; and
  - why the vessel sank.

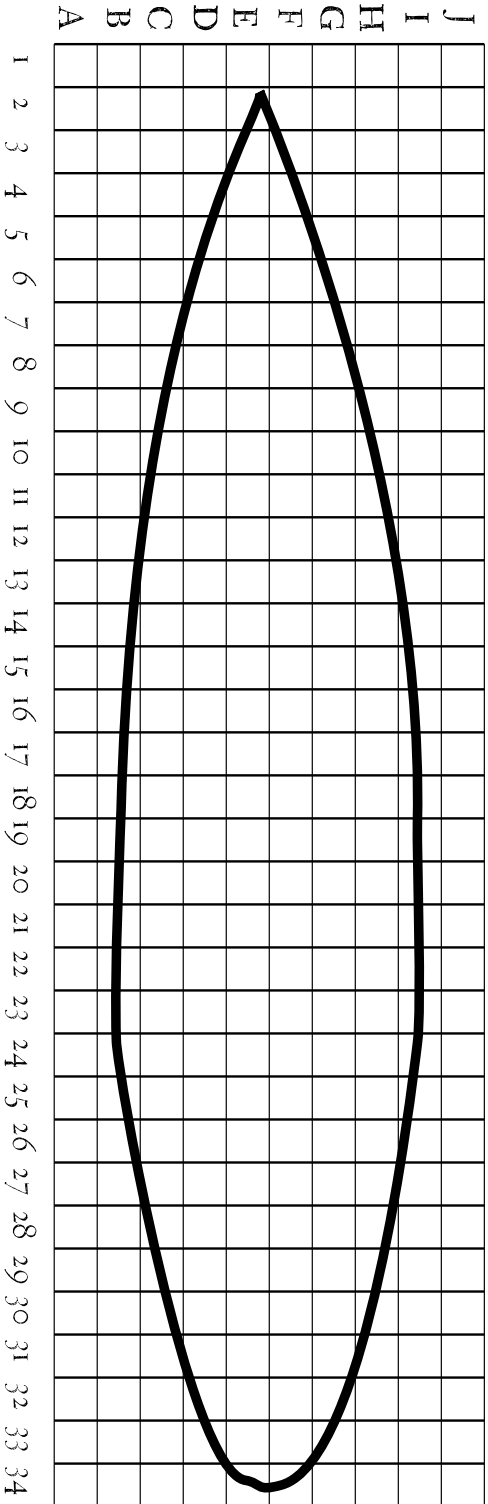
3. Write your conclusions on a piece of paper. Then read "The Story of the Steamship Portland" on Page 50.

## Want to Do More?

1. Visit <http://oceanexplorer.noaa.gov/explorations/03portland/welcome.html> the Web site for the Steamship Portland expedition.
2. For another shipwreck activity see "Lost at Sea: Sunken Slave Ship" activity from Newton's Apple episode 1502. You can access this activity from <http://www.ktca.org/newtons/15/sunken.html>
3. Read "The Portland Gale" from <http://www.hazegray.org> for more information on the Portland and the monster storm of 1898.

This activity is adapted from "Wreck Detectives," a lesson from the Ocean Explorer Steamship Portland Expedition (<http://oceanexplorer.noaa.gov/explorations/03portland/background/edu/media/portlandwreckdetec.pdf>); by Mel Goodwin, The Harmony Project, Charleston, SC.

Grid Reference System for Unidentified Shipwreck Q11WRK5





# CLASSROOM ACTIVITY

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## List of Artifacts Retrieved from Unidentified Shipwreck 211 MARKS

Grid Reference	Description	Grid Reference	Description
Fig-E23 & Fig-F23	Heavy metal structure, diamond shaped, partially buried	D13	China chamber pot, 24 inches from surface
D10	Gentleman's gold ring, 22 inches from surface	En	Carving knife, 92 inches from surface
E14	Heavy mahogany chair, velvet upholstery, 40 inches from surface	D10	Man's leather dress shoe, 24 inches from surface
D10	China plate, 100 inches from surface	B13	Carved wooden plank, letters "RTLAND;" left side broken
G10	China chamber pot, 20 inches from surface	En	Silver serving platter, 92 inches from surface
D13	Silver flatware, engraved letter "P," 100 inches from surface	E5	Rusted iron mass, possibly chain
F14	China cup, 100 inches from surface	F21	Heavily rusted iron mass, possibly tools, 100 inches from surface
D10	Brandy flask, 20 inches from surface	En	Ship's wheel, 12 inches from surface
F14	Domed skylight, 16 inches from surface	D10	Small mahogany chest of drawers, 28 inches from surface
D13	Carved mahogany headboard, 28 inches from surface	E33	Rudder, partially buried
F13	Ebony piano keyboard, 22 inches from surface	G19-G24 E17 & F17	Massive paddlewheel, partially buried Smokestacks
C19-C24 G10	Massive paddlewheel, partially buried Child's rocking chair, mahogany, 24 inches from surface		
D13	Lady's dress shoe, 26 inches from surface		
G10	Shaving straight razor, 22 inches from surface		
H17	Silver buckle, 28 inches from surface		

**NOTE:** Extensive debris around main wreck, mostly large timbers and pieces of heavy equipment; several lifeboat remnants outside main wreck. Less obvious structural debris in quadrats numbered 25 and higher; these quadrats contain mostly silt down to the apparent hull of the vessel at approximately 140 inches.

# CLASSROOM ACTIVITY

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## The Story of the Steamship *Portland*

On Thanksgiving Saturday, November 26, 1898, the passenger steamship *Portland* left Boston Harbor with more than 190 passengers and crew bound for Portland, Maine. The *Portland* was a state-of-the-art, luxury ship with velvet carpets, mahogany furniture, and airy staterooms. By 1898, paddlewheel steamboats had revolutionized transportation in the United States. Faster and more reliable than sailing ships, paddlewheelers could also maneuver in waters that were too shallow for sailing ships. By the 1870's, many people routinely boarded steamboats to travel between port cities. But the paddle-wheelers had a serious flaw: they were built long and narrow (the *Portland* was 28 feet long and 62 feet wide), and this shape combined with a shallow draft (the *Portland's* keel was only 11 feet below the water line) made these ships extremely unstable in high seas.

When the *Portland* steamed out of Boston Harbor, she ran straight into a monster storm moving up the Atlantic coast with northeasterly winds gusting to 90 mph, dense snow, and temperatures well below freezing. Facing a roaring northeasterly wind, the captain could not turn back; to have done so would have placed the ship broadside to wind and waves that would surely have capsized her. The only choice was to continue to head northeast into the waves, and hope to ride out the storm. Four hours after her departure, a vessel believed to have been the *Portland* was seen near Thacher Island, about 30 miles northeast of Boston. But the *Portland* was apparently unable to make much more progress against the storm.

At 5:45 a.m. on the morning of November 27, four short blasts on a ship's steam whistle told the keeper of the Race Point Life-Saving Station on Cape Cod that a vessel was in trouble. Seventeen hours later, life jackets, debris, and human bodies washed ashore

near the the Race Point station, confirming that the *Portland* and everyone aboard had been lost in one of New England's worst maritime disasters. The loss of the *Portland* underscored the inherent instability of sidewheel paddleboats. Sidewheelers were gradually replaced by propeller-driven boats, which have a lower center of gravity.

For 90 years, the location of the *Portland* wreck was unknown, despite intense and continuing public interest. In April 1989, members of the Historical Maritime Group of New England found wreckage in water more than 300 feet deep that they were certain had been the *Portland*. Because of the depth, however, the discoverers were unable to obtain photographs or other evidence that could confirm their find. Thirteen years later, on August 29, 2002, the U.S. Commerce Department's National Oceanic and Atmospheric Administration (NOAA) confirmed that the wreck of the *Portland* had been found within NOAA's Stellwagen Bank National Marine Sanctuary. Using side-scan sonar and a remotely operated vehicle (ROV), scientists obtained high-quality video and side-scan images in a joint research mission of the Stellwagen Bank National Marine Sanctuary and the National Undersea Research Center at the University of Connecticut.

Massive storms during late October and November are not particularly unusual in the New England states. At this time of the year, large cold air masses from Canada cross the midwestern states on a regular basis. At the same time, the Atlantic Ocean retains its summer heat and these warm waters sometimes spawn hurricanes. When the east-moving cold air masses encounter the warm, humid oceanic air, the result is what New Englanders call "Nor'easters." storms that are often severe, and are often the cause of maritime disasters. 🌪️

### Clues from the "List of Artifacts Retrieved from Unidentified Shipwreck Q1WRK5:"

The large paddlewheels near the middle of the ship clearly suggest a sidewheel paddleboat. This was a large vessel for a paddlewheeler; over 280 feet. The diamond shaped metal structure is probably the remains of a walking beam engine, a common design in ships of this type. The fact that this was a large paddlewheeler narrows its probable vintage to between 1890 and 1910. Artifacts in quadrats D10, D13, and G10 suggest that men, women, and children may have been aboard, and these areas may have been staterooms. The fact that artifacts in these areas were close to the surface suggests that these staterooms were on or near the deck of the vessel. Eating utensils recovered from more than 80 inches below the surface suggest a dining area, located on a lower deck. Engraved silver flatware and the carved wooden plank are valuable clues, suggesting that the name of the vessel may have begun with the letter "P" and ended with the letters "rland." Many of the artifacts suggest wealth and luxury. This vessel almost certainly carried some wealthy passengers.

Think about the size of the debris field. Ships that sink suddenly (such as those sunk in battle) often have a rather small debris field. Ships that sink with lots of movement, on the other hand (such as ships sunk in storms) are likely to have larger debris fields. This ship has an extensive debris field, suggesting that a lot of motion, possibly due to a storm, was involved in her sinking.

This activity can also be found at [seagrant.psu.edu/sites/default/files/Shipwreck%20Lessons%201%2019%2016.pdf](http://seagrant.psu.edu/sites/default/files/Shipwreck%20Lessons%201%2019%2016.pdf)

## How humpback whales sneak up on thousands of unsuspecting fish

By Eva Frederick *SCIENCE* 12/23/2019 A publication of AAAS



Photo: Jennifer Tackaberry

For many ocean creatures, there's safety in numbers. A school of small, fast-moving fish can confuse and distract larger, lumbering predators such as sea lions, which are generally out for a single snack. But that strategy doesn't work as well when the fish are faced with a heftier threat such as a humpback whale that can engulf nearly two-thirds of a school in one gulp.

To find out how these whales are able to catch speedy fish by surprise, researchers snuck up on individual anchovies in the lab with animations of fake “predators” (really just appropriately sized dots) to see what would send the fish fleeing. As it turns out, [humpback whale-size predators are so enormous that the fish don't even register them as threats](#) as they approached from afar, the team reports today in the *Proceedings of the National Academy of Sciences*.

The researchers also observed real schools of anchovies in Monterey Bay and off the coast of Southern California as whales approached the fish at different speeds. In the wild, the fish only started to flee when the whales opened their mouths—at which point it was too late.

The fish likely don't have a good defense response to the whales because they primarily evolved to respond to smaller predators, which are more common. The whales have another advantage as well: If some fish around the edges of the group try to make a break for it, the humpbacks raise their huge, white-bottomed flippers around the school in a hug of death, as seen in the above photo, shepherding wayward anchovies into their gaping mouths. ★

**Eva Frederick** is a science journalist who currently writes for *Science Magazine* (AAAS)

**Jennifer Tackaberry** graduated from Colby College with a degree in Biology back in 2004. She soon discovered a passion for large whale research and by 2006 was working full-time in the field. Most of her research focuses on humpback whales, but also includes all large baleen whales found in the same study area (right, blue, fin, sei, and minke whales). She joined the Center for Coastal Studies' (CCS) Humpback Whale Studies Program and Marine Animal Entanglement Response (MAER) team in 2010. While working at CCS, Jennifer became one of only five women in the US permitted to lead disentanglement responses on baleen whale, except for right whales, and responded to over 50 cases of large whales and sea turtles entangled in fishing gear. Although she loved her job, she knew she needed to return to school to gain the analytical and writing skills required to pursue her research interests.

While looking for a graduate program, she moved to the West Coast in 2017 and began working with Cascadia Research Collective (CRC). Here she was able to continue her research on baleen whales to West Coast populations. Since joining CRC, she has covered almost the entire coastline of Washington, Oregon, and California while collecting data about baleen whale populations and participating in many disentanglement responses. She continues working with CRC while beginning graduate work at Moss Landing Marine Laboratories on the California coast.

Jennifer joined the Vertebrate Ecology Lab in the fall of 2018 under the guidance of Dr. Alison Stimpert and Dr. Gitte McDonald. Her thesis is focused on the feeding ecology of humpback whales in the Gulf of Maine and is funded by the Volgenau Foundation. She will be using data from archival digital tags from Stellwagen Bank National Marine Sanctuary tagging project and CCS's long-term humpback whale population dataset to determine the effect of demography on the feeding ecology and cooperative behavior of humpback whales in the Gulf of Maine. She looks forward to gaining the skills needed to progress in this field and continuing to participate in research projects with colleagues on both coasts.

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