

# COASTWATCH

Center for Coastal Studies • Provincetown, Massachusetts • 2018 • Vol. 40

## The Science of Collaboration

Program Updates and 2016-2017 Financial Reports







# Letter from the President & CEO

## The Science of Collaboration

**Collaboration (noun):** the act of working with other people or organizations to create or achieve something; the state of having shared interests or efforts; one of the keys to the success of the Center for Coastal Studies.

Throughout this review of Center for Coastal Studies activities you'll find numerous examples of successful partnerships among and between CCS programs, as well as with local, state and federal agencies, public and private foundations, and dozens of universities and research institutions. These collaborations allowed for many accomplishments including:

The recovery, conservation, re-articulation and installation of the skeleton of the humpback whale, Spinnaker.

Completion of an extensive environmental assessment of the Pleasant Bay region, to help resource managers address changes to this increasingly vulnerable habitat.

Successful cleanup of more than 17,000 pounds of lost and discarded fishing gear in a partnership with commercial fishermen, and local and state authorities.

Multiple cooperative water quality monitoring projects in Cape Cod Bay, Buzzards Bay, Nantucket Sound and the Cape Cod National Seashore.

Validation of a blubber hormone based pregnancy test for humpback whales.

Entanglement response training for teams and individuals in the U.S. and around the world.

As regulations to protect the climate and environment are decimated, and research funds are slashed, it's more important than ever that we pool our skills and resources to maximize productivity, outreach, and education. We are grateful to you—our members, volunteers, business partners, and supporters—for your investment in CCS and your commitment to the current and future protection of our coasts and ocean. If we join together to fight for change, we can and will make a difference.

*Richard Delaney*

*R/V Shearwater steaming towards home port.*

**Help us steam ahead into the new year.**

Please donate generously to our Annual Appeal. *Thank you!*





## Highlights from Humpback Whale Studies

CCS has studied humpback whales since the 1970s and we are the only institution to study humpback whales across the Gulf of Maine feeding range in U.S. and Canadian waters. We have also maintained an annual research program at American Samoa, in the South Pacific, since 2003. Achievements over the past two years include a new series of estimates of humpback whale population abundance and trends in the Gulf of Maine, in collaboration with the NMFS Northeast Fisheries Science Center. Former staffer Jennifer Tackaberry started graduate research focusing on our long-term collaboration with the Stellwagen Bank National Marine Sanctuary to better understand humpback whale behavior. An Unusual Mortality Event has been underway since 2016, and CCS has worked to identify each victim in the U.S. and Canada. We also continue to work with colleagues to better understand the humpback whales using U.S. coastal waters south of the Gulf of Maine. In 2017, this resulted in the first scientific publication on increasing humpback whale sightings off New York.

Every year, we work to use our extensive life history data and tissue archives to facilitate the development of new techniques for studying large whales. One major recent achievement was the success of a blubber hormone based pregnancy test, the first of its kind for free-ranging baleen whales. This, along with our epigenetic aging technique, has already been used to study less well-understood populations in the Southern Hemisphere. We continue to collaborate on studies of hormones in feces, breath and baleen, and to better understand the humpback whale microbiome. A skin sample from one of the most well-known humpback whales, Salt, is allowing us to study the humpback whale genome and to identify possible cancer prevention mechanisms. Finally, thanks to a formal study of satellite tagging impacts in the Gulf of Maine, tags are now more robust and cause less harm to whales than in the past.

Two recent studies have provided new information about the effects of climate change on whale populations. One genetic study revealed long-term ecological effects to humpbacks and other cetaceans after a period of global climate change more than 9 thousand years ago. In modern times, American Samoa sits near

the upper limit of water temperatures known to be suitable for humpback whale breeding grounds. Any temperature increases there may affect continued humpback whale use of that area and cause other habitat use shifts in the South Pacific.

**Other Species.** CCS curates a catalog of over 600 individual fin whales in the Gulf of Maine, with sightings dating back to 1979. In the past two years, we have contributed to genetic research providing new information on hybridization between blue and fin whales and challenging recent evidence that there may be two subspecies of fin whale in the Northern Hemisphere.

Our work has recently led to new information on ocean-scale genetic population structure of both sei and minke whales in the North Atlantic. We are also currently sharing our sei whale photo-identification data with the Northeast Fisheries Science Center for a new, large-scale collaborative cataloging effort. Finally, our decades of observations of toothed whale species (dolphins and porpoises) have contributed to a better understanding of habitat use in the Stellwagen Bank National Marine Sanctuary.

Population biology research at CCS involves a large number of collaborators and a wide range of analytical tools. In the past two years, department research has contributed to nine scientific papers (with six more currently in review), over 16 presentations at scientific conferences, and several graduate degrees. Two long-term collaborators, molecular geneticists Drs. Per Palsbøll and Martine Bérubé from the University of Groningen in the Netherlands, are now adjunct scientists.



# Department of Population Biology

## HUMPBACK WHALE STUDIES PROGRAM

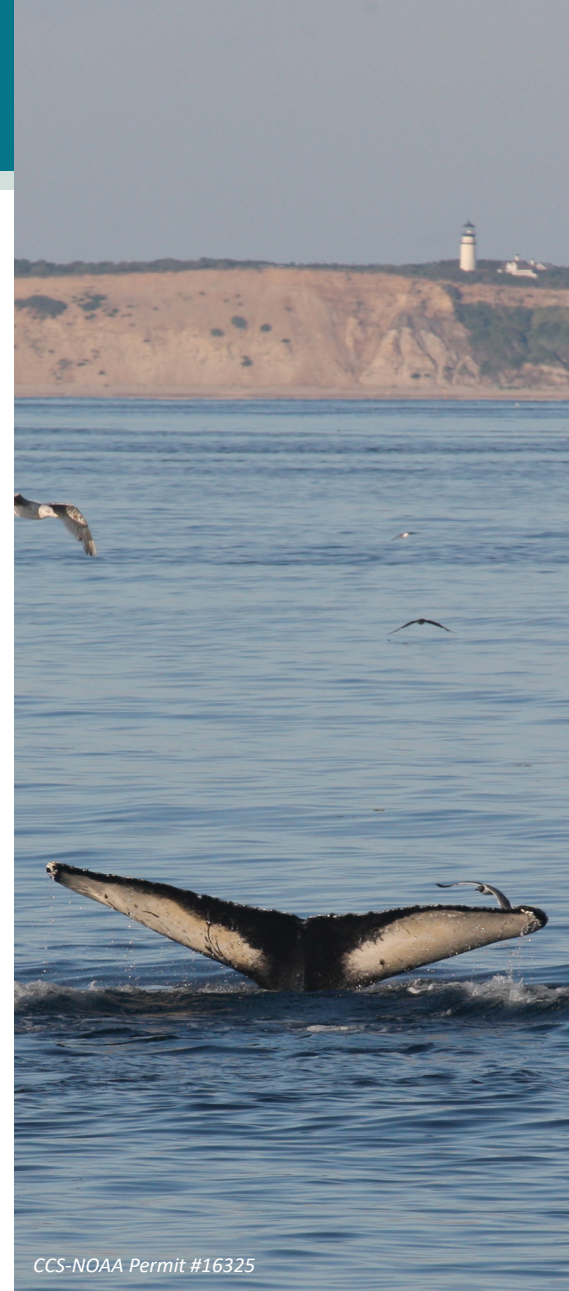
Jooke Robbins, Ph.D., Director  
Theresa Kirchner, Research Assistant  
Martine Bérubé, Ph.D., Adjunct Scientist  
Alex Hill, Adjunct Scientist  
Per Palsbøll, Ph.D., Adjunct Scientist  
Jenn Tackaberry, Adjunct Scientist  
Mason Weinrich, Adjunct Scientist

## SELECTED PROJECT COLLABORATORS

Allied Whale  
Australian Antarctic Division  
American Samoa Department of Marine  
and Wildlife Resources  
Cascadia Research Collective  
Florida Fish and Wildlife Conservation  
Commission  
Georgia Department of Natural Resources  
Groningen University  
Marine Ecology and Telemetry Research  
NOAA Marine Mammal Laboratory  
NOAA Northeast Fisheries Science Center  
NOAA Northwest Fisheries Science Center  
Northern Arizona State University  
Oregon State University  
South Pacific Whale Research Consortium  
Stellwagen Bank National Marine Sanctuary  
University of California, Santa Cruz  
Virginia Aquarium & Marine Science  
Center  
Whale and Dolphin Conservation  
Woods Hole Oceanographic Institution

## GULF OF MAINE CATALOG CONTRIBUTORS

7 Seas Whale Watch  
Blue Ocean Society  
Boston Harbor Cruises  
Brier Island Whale and Seabird Cruises  
Cape Ann Whale Watch  
Coastal Research and Education Society  
of Long Island  
Dolphin Fleet  
Grand Manan Whale and Seabird Station  
Hyannis Whale Watcher Cruises  
Newburyport Whale Watch  
New England Aquarium  
New England Coastal Wildlife Alliance  
Quoddy Link Marine  
Whale and Dolphin Conservation



CCS-NOAA Permit #16325

## Global Whale Entanglement Response Network (GWERN)



Rescue training in Chile's Valparaíso Harbor, 2015.

Since 2011, Center for Coastal Studies has partnered with the International Whaling Commission in order to advance work on the globally recognized urgent issue for all large whales: entanglement in fishing gear.

A major component of this work is to help to build worldwide capacity to safely respond to entangled large whales. To this end (since 2014) both organizations share a staff member (David Mattila) who organizes international trainings and apprenticeships, and coordinates the resulting Global Whale Entanglement Response Network.

This past year has seen trainings in four diverse countries: Chile, Colombia, Norway and Russia, and a meeting of representatives from most of the Global Networks in June, hosted in Provincetown by CCS, the report of which is available at: [https://iwc.int/private/downloads/CwWpktgpiDKkRTZG-BLzqQQ/IWC\\_67\\_WKMWI\\_REP\\_01.pdf](https://iwc.int/private/downloads/CwWpktgpiDKkRTZG-BLzqQQ/IWC_67_WKMWI_REP_01.pdf)



# Right Whale Ecology Program



## Doing Right by the Right Whale

The estimated population of North Atlantic right whale has plummeted from 451 in 2016 to 411 in 2017. There were 21 documented right whale deaths in the last two years, about half of which can be attributed to human-related causes. No calves were born in 2018, and only five in 2017. Only about 100 breeding females remain. Scientists have begun to consider the possibility that the North Atlantic right whale may be functionally extinct by 2040.

Our decades of work in Cape Cod Bay have given us a clear understanding of how the whales use this important feeding ground and have helped determine how best to manage human activity in the area to reduce incidences of entanglement and ship strikes. Unfortunately, the same cannot be said for the areas that the right whales travel through to get here. CCS is addressing those critical gaps in knowledge by launching our Right Whale Emergency Initiative (RWEI).

We are expanding our current aerial surveillance and habitat research to incorporate critical right whale habitat on Jeffreys Ledge off the Massachusetts and New Hampshire coasts and extending our research season by two months to cover the entire duration of the whales' increasingly lengthy presence in and around Cape Cod Bay.

Naturally, increased effort requires increased funding, so CCS, in partnership with Shawn DeLude (CCS Board Member and Nauset Disposal owner), established the 1,000 Friends of Right Whales campaign with the goal of raising \$100,000 by December 2018 to support the RWEI. In the first six months, \$80,000 has been raised to help CCS monitor and protect remaining right whales.

### RIGHT WHALE ECOLOGY PROGRAM

Charles "Stormy" Mayo, Ph.D., Director  
Christy Hudak, Associate Scientist  
Amy James, Aerial Observer & Flight Coordinator  
Brigid McKenna, Aerial Observer & Data/Photo Manager  
Alison Ogilvie, Aerial Observer  
Christopher W. Clark, Ph.D., Adjunct Scientist  
Stephen DeVincent, DVM, Adjunct Scientist

### COLLABORATORS

Atlantic Large Whale Take Reduction Team  
Cornell University Bioacoustics Laboratory  
Massachusetts Division of Marine Fisheries  
New England Aquarium  
North Atlantic Right Whale Consortium  
Oregon State University  
UMass Boston  
University of Rhode Island

### FUNDING PROVIDED BY

Massachusetts Division of Marine Fisheries  
Massachusetts Environmental Trust  
NOAA Fisheries  
Seaworld Busch Gardens

We believe there is still time to save the right whales from extinction. Their population, once a mere 250 individuals, almost doubled in just three decades. If we continue to work together with our research partners and colleagues in the U.S. and Canada to understand why and how right whale habitat is changing, and can anticipate and implement policy and management changes to protect them, there is every reason to be hopeful that the species will survive and thrive.

## Best Day Ever?!

In both 2017 and 2018 more than 250 individual right whales visited Cape Cod Bay between January and May. On a single April day, our Aerial Survey team identified 206 individual right whales in the bay during a 10+ hour flight. This record-breaking number represents about 40% of the entire population. On that special day, our team also documented 25 fin whales, 24 humpback whales, 40 sei whales, 9 minke whales, 3 unidentified large whales, and 13 unidentified dolphins.

*Right whales feeding in Cape Cod Bay. CCS-NOAA permit #19315-1*





# Marine Fisheries Program

## All Aboard: Fishermen and Scientists Team Up

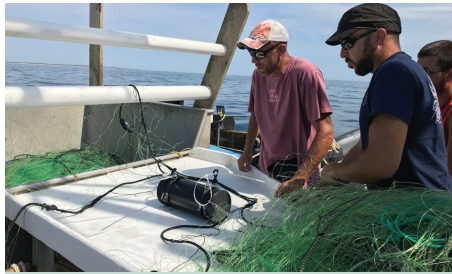
CCS's Marine Fisheries Program is studying the way that potential "predators," such as dogfish and seals, affect the sink gillnet fisheries around Cape Cod.

This project, funded by the National Marine Sanctuary Foundation (NMSF), is a collaboration between CCS, commercial fishermen, and scientists at Woods Hole Oceanographic Institution (WHOI).

Using a remotely operated vehicle and cameras fixed directly to fishing nets, fishermen and scientists are collecting video of these animals' behavior in and around the fishing gear. This study, developed in cooperation with local fishermen, is designed to better understand when and how predators eat the catch and provide an estimate of the volume of catch consumed. These data will also help quantify differences between the perceived and actual cost of depredation on the fishery.

Armed with this information, fishermen will be able to determine how fishing practices can be modified to reduce possible conflicts between gear, catch, and predators. Ultimately, this may also result in a reduction in the frequency of interactions between marine mammals and gillnet gear.

Owen Nichols (right) setting up video camera on gill net to study predator interactions with the fishery.



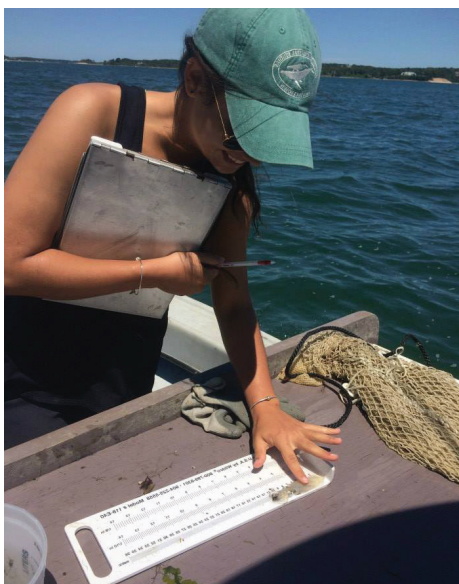
"With fishermen and CCS and WHOI researchers working together to understand these interactions through a transparent and inclusive process, this is a great example of how unique collaborations have the potential to educate and inform both the working partners and policy makers and resource managers."

~ Richard Delaney  
CCS President & CEO

MARINE FISHERIES PROGRAM  
Owen Nichols, Director

COLLABORATORS  
Commercial fishermen and shellfish farmers  
Japan Fisheries Research Agency  
Massachusetts Division of Marine Fisheries  
NOAA Fisheries  
Northeast Fisheries Science Center  
NOAA Marine Debris Program  
Northwest Atlantic Seal Research Consortium  
UMass Dartmouth School for Marine  
Science and Technology  
Woods Hole Oceanographic Institution

FUNDING PROVIDED BY  
Friends of Pleasant Bay  
NPS/Cape Cod National Seashore  
National Marine Sanctuary Foundation  
NOAA National Ocean Services  
NOAA Saltonstall-Kennedy Grants Program  
Pleasant Bay Community Boating  
Quebec-Labrador Foundation



CCS Intern Emily Sgarlett assisting with finfish survey in Pleasant Bay.

## Interdisciplinary Project

### Marine Ecosystem Assessment of Pleasant Bay

This three-year interdisciplinary study of Pleasant Bay was conducted by CCS's Marine Policy, Seafloor Mapping, Marine Fisheries, and Seal Research programs. Researchers and volunteers collected extensive physical, chemical and biological data to develop high-resolution benthic habitat maps of the bay floor; surveyed the distribution and abundance of fish and shellfish; and examined the seasonal occupancy and diet of gray and harbor seals in the bay. Once integrated, those studies produced an incredibly detailed snapshot of the Pleasant Bay ecosystem from seabed to shoreline that will be used by resource managers to identify, monitor and address changes to this increasingly vulnerable habitat. The full Ecosystem Assessment and a summary report can be found on our website.



# Seal Research Program



*Lisa Sette (left) collecting seal scat.*

## Investigating prey of harbor and gray seals in Southeastern Massachusetts

Since 2016, Marine Biologist Lisa Sette has been working with collaborators from International Fund for Animal Welfare (IFAW) and Northeast Fisheries Science Center (NEFSC) to collect scat samples from seal haul-outs across Southeastern Massachusetts. One of the key study areas is Pleasant Bay; other locations include Jeremy Point in Cape Cod Bay and Head of the Meadow on the Outer Beach in Truro. The results of the Pleasant Bay study are included in the CCS Ecosystem Assessment of Pleasant Bay.

Lisa works in conjunction with Louisiana State University (LSU), IFAW, and NEFSC to collect samples from seal haul-outs throughout the year.

Back at the lab, each sample is dissected and hard parts such as fish otoliths (ear bones), squid beaks, dermal denticles (modified scales from skate species), shells, bones and teeth are collected. Diet is estimated based on the identification of the source species of those hard parts and the frequency with which they appear in the samples.

Based on hard part analysis completed for Pleasant Bay, harbor and gray seals are feeding on prey that are seasonally available.

During scat collection Lisa also gathered samples for LSU graduate student Keith Hernandez. Keith is using these to complete prey DNA analysis to identify prey that is often missed by hard part analysis alone.

Lisa continues work with IFAW to monitor gray and harbor seal haul-outs for entangled animals.

### SEAL RESEARCH PROGRAM

Lisa Sette, Program Manager

### COLLABORATORS

Atlantic Marine Conservation Society  
Canada Department of Fisheries and Oceans  
Environmental Protection Agency  
Friends of Pleasant Bay  
International Fund for Animal Welfare  
Isle of Shoals/Shoals Marine Laboratory  
Louisiana State University  
Massachusetts Division of Marine Fisheries  
Mass Audubon Wellfleet Bay Wildlife Sanctuary  
NPS/Cape Cod National Seashore  
New England Aquarium  
North Atlantic Seal Research Consortium  
Northeast Fisheries Science Center  
UMass Boston  
Woods Hole Oceanographic Institution

### FUNDING PROVIDED BY

Friends of Pleasant Bay  
International Fund for Animal Welfare  
Island Foundation  
Mandel Family Foundation/Amy Mandel & Katina Rodis Fund  
University of New Hampshire

*Gray seals and one lone harbor seal resting on haul-out in Chatham. NEFSC Permit #17670*







Left to right: benthic map showing bathymetry of Wellfleet Harbor paired with sonar images of shellfish beds and eelgrass; invertebrate (*Elasmopus levis*) collected in benthic survey; erosion at Herring Cove Beach after storm event.

## Land–Sea Interaction

In 2017 and 2018, CCS’s Geology team calculated the sediment budget for Wellfleet and Eastham shorelines bordering Cape Cod Bay, completing the sediment budget analysis for the entire Cape Cod coastline. This massive undertaking was initiated by Graham Giese in 2005 on the Outer Beach at Chatham. Sediment budgets document the areas where sediment is added and removed to the beach (called sources and sinks) and the direction and volume of sediment movement along the coast. This data is then used to identify and map littoral cells, which are discrete sections of coastline that have their own complete cycle of sedimentation including sources, transport paths, and sinks.

This information—knowing where, when and how much a coastline will change over time—helps inform decision makers about the impacts associated with altering the nearshore zone with coastal engineering structures such as sea walls, beach replenishment projects, and other related activities. When combined with maps of Inundation or Storm Tide Pathways (routes to low-lying coastal areas most likely to flood during storm-related high tides), town planners and resource managers have the tools they need to prepare for the impacts of climate-related sea level rise and increasingly frequent and severe storm events on coastal communities and infrastructure.

## Mapping the Seafloor

CCS geologists are combining fine-scale side-scan sonar images of the seafloor in shallow coastal areas with analysis of the benthic ecology (the number and type of invertebrates that live in and on various areas of the seabed) to create benthic habitat maps at several locations across Cape Cod. These data can be used to identify changes to the ecosystem related to both natural processes and human activities. Recent study areas include Pleasant Bay (as part of the interdisciplinary Pleasant Bay Ecosystem Assessment), Wellfleet Harbor, East Harbor/Pilgrim Lake in North Truro (part of a study by Owen Nichols funded by the National Park Service and the Town of Truro to evaluate the condition of this partially-restored lagoon), and the stretch of coastline between Long Point and Race Point in Provincetown (to assess the impacts of hydraulic clamming on the of the seafloor).

The Department of Geology is also utilizing Unmanned Aerial Systems (drones) to create 3D surface models of coastal areas with very high and detailed accuracy that can be used to record and measure the effects of seasonal changes and storm events, and has launched a multiyear study to develop maps of Storm Tide Pathways for ten towns along Cape Cod Bay.

### DEPARTMENT OF GEOLOGY

Mark Borrelli, Ph.D., Director  
Graham Giese, Ph.D., Director, Scientist Emeritus  
Bryan Legare, Marine Researcher  
Brian McCormack, Research Assistant  
Agnes Mittermayr, Ph.D., Marine Ecologist  
Theresa Smith, Researcher II, Quaternary Geologist  
Steve Mague, Adjunct Scientist, Cartographer  
Benjamin Giese, Ph.D., Adjunct Scientist

### COLLABORATORS

Cape Cod National Seashore  
Eastern Connecticut State University  
Massachusetts State Geological Survey  
NOAA Marine Debris Program  
Salem State University  
UMass Amherst  
UMass Boston  
University of New Hampshire  
Woods Hole Oceanographic Institution

FUNDING PROVIDED BY: Friends of Herring River, Friends of Pleasant Bay, NPS/Cape Cod National Seashore, NOAA National Ocean Services, Pleasant Bay Alliance, Town of Barnstable, Town of Brewster, Town of Chatham, Town of Eastham, Town of Nantucket, Town of Provincetown, Town of Truro, Town of Wellfleet, UMass Amherst/STATEMAP, Wellfleet SPAT, and Woods Hole Group.



# Marine Animal Entanglement Response Program (MAER)

## The MAER Team and Community Respond

Between 2017 and 2018, the MAER team hosted entanglement response trainees from Washington State, Maine, Chile, Oman, and Scotland, and provided disentanglement tools to 17 authorized entanglement response teams, stretching from Hawaii to Oman. They also disentangled twenty leatherback turtles and ten whales.

Sometimes it takes a village to save an entangled whale.

Beginning in October 2017 the MAER team attempted to remove gillnet gear, line and buoys from a young humpback whale three times. By the time the whale was partially disentangled in New York Harbor in July 2018, more than twenty government agencies, NGOs, businesses and individuals from three states had assisted in the monitoring and disentanglement of the whale. Below is a summary of one the MAER team's lengthiest responses to date. The many collaborators in this successful rescue are in bold type.

**October 7, 2017:** Young whale humpback whale with a portion of gillnet gear, line, and buoys wrapped around upper jaw and rostrum (blow-holes) spotted off Cape Cod.

**November 4, 2017:** **Gotham Whale** reports seeing the same whale off Long Beach, NY. Due to distance and forecast, no response could be mounted.

**November 12, 2017:** CCS MAER team (supported by **USCG Jones Beach**, housed by the **Atlantic Beach Rescue Inc.**, and with offer of field support from **Atlantic Marine Conservation Society**) drove to NY to attempt disentanglement. Despite very challenging conditions, MAER team able to make several attempts to free the animal before weather closed in and they were forced to return home.

**December 4, 2017:** Following up on reports of additional sightings, MAER team took advantage of a short weather window to attempt another response but, despite assistance from **Northeast Fisheries Science Center (NEFSC)** aerial survey team, they were unable to locate the whale.

**June 22, 2018:** The whale—still entangled—spotted by members aboard the **American Princess Whale Watch** in the vicinity of Raritan Bay, NY.

**June 30–July 2, 2018:** Multiple sightings of the whale off Sandy Hook, NJ reported by **USCG, state and local police, New Jersey Department of Environment, the whale watch community, and local NGOs**. Logistical issues stymied attempts by CCS and **National Marine Fisheries Service (NMFS)** to mount a response.

**July 11, 2018:** Thanks to the generosity of volunteer pilot **Philip Greenspun** of the East Coast Aero Club, two MAER team members flew to NJ where (with the help of **NOAA, USCG Sandy Hook, a USCG helicopter, New Jersey Fish and Wildlife Conservation Police, Monmouth County Sheriff's Office, Middletown Fire and Rescue, and Atlantic Highlands Fire and Rescue**) they finally remove most of the gear from the whale. A few hours after the teams left the whale, whale watchers reported that the whale was actively feeding on menhaden not far from the Verrazano Bridge.



Photo courtesy NOAA



# MAER Program

If you spend time on or by the water, please keep the **MAER Hotline** number with you at all times: **800-900-3622**. Call in your report as quickly as possible then stand by the animal at safe distance until responders arrive.

## MAER STAFF

Scott Landry, Director  
Maria Harvey, Rescue Assistant  
Bob Lynch, Rescue Assistant  
David Mattila, Coordinator, Global Entanglement Response Network  
Everett Sacrey, Rescue Assistant  
Lisa Sette, Rescue Assistant

## COLLABORATORS

Atlantic Large Whale Disentanglement Network  
Campobello Whale Rescue Team  
Canada Department of Fisheries and Oceans  
Duke University  
Florida Fish and Wildlife Research Institute  
Georgia Department of Natural Resources  
Grand Manan Whale and Seabird Research Station  
International Fund for Animal Welfare (IFAW)  
Maine Marine Patrol  
Mass Audubon Wellfleet Bay Wildlife Sanctuary  
New England Aquarium  
NOAA Fisheries  
North Carolina Outer Banks Disentanglement Team  
Rhode Island Division of Fish and Wildlife  
University of North Carolina  
US Coast Guard  
Virginia Aquarium  
Massachusetts Sea Turtle Disentanglement Network  
Massachusetts Environmental Police  
Northeast Fisheries Science Center  
Stellwagen Bank National Marine Sanctuary  
Wampanoag Natural Resource Department  
Numerous whale watching companies in Gulf of Maine, and beyond  
International Whaling Commission (IWC)  
External entanglement response networks in the US, Canada, Australia, South Africa, and the UK.

FUNDING PROVIDED BY: Bernatchez Family Foundation, Davis Conservation Foundation, Grace W. Allsop Foundation, Max and Victoria Dreyfus Foundation, Mary P. Dolciani Halloran Foundation, Hermann Foundation, International Whaling Commission, Island Foundation, MA Division of Marine Fisheries, Massachusetts Environmental Trust, Thomas C. McGowan Fund for Animals of the Cape Cod Foundation, NOAA Fisheries, Pegasus Foundation, and G. Unger Vetlesen Foundation.



## Interdisciplinary Project

### Derelict Fishing Gear Assessment & Recovery

CCS Marine Debris and Plastics, Seafloor Mapping, and Marine Fisheries programs collaborated with commercial fishermen, Massachusetts Division of Marine Fisheries, Massachusetts Environmental Police, Provincetown Harbormaster's office, Nauset Disposal, and several other local businesses to identify, recover, document and properly dispose of derelict fishing gear from Cape Cod Bay.

High resolution side-scan sonar surveys conducted by the Seafloor Mapping Program were used to locate derelict fishing gear including lobster traps and parts, dragging gear and gillnets, line, buoys and cable. Commercial fishermen working on their own boats hauled the gear aboard. The type, age and condition of the gear was recorded, along with data on vertebrate and invertebrate species found on and in it. Reusable traps and pots were salvaged and, if possible, returned to the owner.

Recyclable materials were taken to the local transfer station and the remaining gear disposed of at a waste-to-energy facility. Overall, approximately nine tons of derelict fishing gear, much of which was plastic, was removed from the Bay.

MARINE DEBRIS AND PLASTICS PROGRAM  
Laura Ludwig, Program Manager

## COLLABORATORS

Commercial lobstermen  
Massachusetts Division of Marine Fisheries  
Massachusetts Environmental Police  
Massachusetts Lobstermen's Association  
NOAA Marine Debris Program  
Provincetown, Sandwich & Harwichport Harbormaster's Offices  
South Shore Lobster Fishermen's Association

## FUNDING PROVIDED BY

Everything Important LLC (Orly Genger)  
Gulf of Maine Lobster Foundation  
NOAA National Ocean Service



# Marine Policy Program

## In Good Hands with CCS Marine Policy Program

Working in tandem with President and CEO Rich Delaney and our researchers, CCS Marine Policy Director Pat Hughes communicates complex scientific data and theories to resource managers, grant makers, and the public.



*Mussels in Pleasant Bay.*

In 2017, Pat worked with the CCS Geology Department to secure a state grant award to develop a sediment budget for the Orleans, Eastham, and Wellfleet shorelines that will ultimately help those communities prepare for rising seas and increased erosion.

She was instrumental in securing support from the Friends of Pleasant Bay (FOPB) for the interdisciplinary, multi-scale ecosystem assessment of Pleasant Bay conducted by the CCS Seafloor Mapping, Marine Fisheries, and Seal Research programs, which she herself managed.

Pat also served on an Advisory Committee to the Cape Cod Commission for their Resilient Cape Cod project and on the Cape Coastal Conference steering committee.

CCS provides sound, unbiased scientific data to management discussions at the local, state, national and federal level. CCS helped inform important policy and legislative decision making on several recent issues including:

Proposed changes to the Environmental Protection Act / Endangered Species Act that would weaken protections for endangered and threatened animals and their habitats.

Amendments to the Marine Mammal Protection Act that would weaken permitting requirements and restrictions on seismic exploration, a practice that has been found to be hugely detrimental to the health of cetaceans.

The Atlantic Herring Fishery Management Plan, which reduced 2018 catch limits to lessen the risk of overfishing, increase the estimated herring biomass in 2019-2021, and provide for more catch for the fishery.

Funding for coastal water quality monitoring in the 2018 Massachusetts Environmental Bond Bill.

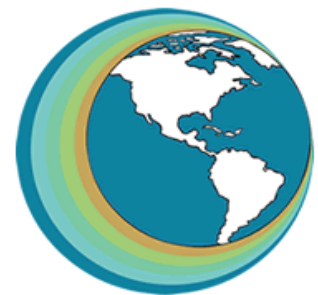
## Cape Cod Climate Change Collaborative

CCS President and CEO Rich Delaney continues to drive efforts to understand and address the impacts of climate change on our coasts and ocean. In Spring 2016, he worked with ten local community and environmental organizations to form the Cape Cod Climate Change Collaborative. The Collaborative has become a model for the rest of the state in stimulating a comprehensive approach to climate change by promoting local and regional strategies for climate change planning, mitigation and adaptation. Rich also works with the county and state to reinforce and promote the Cape's Blue Economy.

MARINE POLICY PROGRAM  
Pat Hughes, Director  
Robert Brock, Ph.D., Adjunct Scientist

COLLABORATORS  
Cape Cod Climate Change Collaborative  
Chatham Marconi Maritime Center  
Friends of Pleasant Bay  
Pleasant Bay Alliance  
Pleasant Bay Community Boating  
Cape Cod Commission

FUNDING PROVIDED BY  
Friends of Pleasant Bay  
Massachusetts Environmental Trust  
NOAA National Ocean Service  
Town of Nantucket  
Town of Provincetown



CC CLIMATE CHANGE COLLABORATIVE  
CO-FOUNDERS  
Association to Preserve Cape Cod  
Cape Cod Chamber of Commerce  
Cape Cod Commercial Fishermen's Alliance  
Cape Cod National Seashore  
Cape Light Compact  
Center for Coastal Studies  
Friends of Pleasant Bay  
Pleasant Bay Alliance  
Pleasant Bay Community Boating  
Wellfleet Bay Wildlife Sanctuary

CC CLIMATE CHANGE COLLABORATIVE  
COLLABORATORS  
CARE for the Cape and Islands  
Cape & Vineyard Electric Cooperative, Inc.  
Cape Air  
Cape Cool  
Ocean Protection Advocacy Kids, Inc.  
Women's International League for Peace  
and Freedom  
Federated Church of Orleans  
Unitarian Church of Barnstable  
Unitarian Church of Brewster



# Water Quality Monitoring Program



Jennifer Burkhardt tests water sample.

## Deepening our Understanding of Cape's Water Quality

CCS, in collaboration with several other organizations and towns on the Cape Cod, is conducting the longest running and only bay-wide monitoring in Cape Cod Bay, and the only comprehensive water quality monitoring in Nantucket Sound.

Key research in 2018 by the CCS Water Quality Monitoring Program utilizes stable isotope analysis to identify the source of nitrogen originating from different human activities in our coastal waters. Each of the sources of nitrogen— atmospheric deposition, surface water run-off (primarily fertilizers), and groundwater (septic systems)—has

a distinct isotopic ratio of  $^{14}\text{N}$ :  $^{15}\text{N}$ . Calculating this ratio enables scientists to determine where the nitrogen in our coastal waters originated, and if changes in nitrogen concentrations are reflective of changes in atmospheric deposition, groundwater concentrations, or runoff. This information allows resource managers to evaluate the steps being taken to address nitrogen pollution to our coastal waters and assess whether current management strategies are adequate.

In 2017, CCS, in partnership with the Silent Spring Institute (SSI), University of Rhode Island, US Geological Survey, and others, completed a comprehensive

assessment of contaminants of emerging concern (CECs) in Cape Cod Bay estuaries. CECs include pharmaceuticals, personal care products, household cleansers and flame retardants. Some CECs are known to cause endocrine (hormone) disruption, antibiotic resistance, cancer, and effects on development and reproduction. These types of contaminants are introduced into the environment through various pathways but are predominantly associated with wastewater and run-off.

Prior research by SSI documented CECs in septic systems, groundwater, ponds, and public and private drinking water wells throughout Cape Cod. A 2012 study by CCS, funded in part by MassBays, was the first to document the presence of CECs in the coastal waters of Massachusetts. The latest study evaluated the relationship between land use activity and the extent of CEC contamination. Perhaps not surprisingly, researchers found that CECs were most commonly detected in tidal creeks that were found to be impacted by septic systems.

As Cape Cod's current Section 208 wastewater management and pollution mitigation plans progress, the data amassed during these projects and in future water quality monitoring activities will enable us to measure the success of current and future wastewater management strategies.

Visit our interactive website to learn more about environmental threats to Cape Cod Bay and Nantucket Sound and to access water quality data for your area.

[www.capecodbay-monitor.org](http://www.capecodbay-monitor.org)

### WATER QUALITY MONITORING PROGRAM

Amy Costa, Ph.D., Director  
Jennifer Burkhardt, Research Assistant

### FUNDING PROVIDED BY

Barnstable County  
Coastal Zone Management/Mass Bays  
Friends of Herring River  
MA DEP/Buzzards Bay Coalition  
Merrimack River Planning Committee  
Massachusetts Environmental Trust  
Massachusetts Water Resources Authority  
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### COLLABORATORS

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Silent Spring Institute  
Town of Dennis  
Town of Harwich  
University of Rhode Island  
US Geological Survey  
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# Marine Education Program

## Educating the Next Generation

Director of Marine Education Jesse Mechling works with schools, communities and other organizations to share information about climate change and pollution and the impacts they have on our oceans and coasts. He explains how CCS is working to understand and address those issues, and lets audiences of all ages and abilities know what they, as individuals, can do to help make the world a better place.

Jesse teaches people of all ages how to make a difference. Whether it's educating 1400 students in eight local public schools about steps they can take to reduce their carbon footprint, encouraging communities to help clean trash from our beaches, or working with local businesses and towns to reduce single-use plastics in restaurants and shops, every CCS-led education activity and event is geared towards a better tomorrow.

In summer 2018, Jesse and his terrific young interns presented 60+ activities and programs to more than 650 kids and adults. An additional 5,500+ people visited SEA Space Marine Discovery Center at its new location in Whaler's Wharf in the heart of Provincetown, and many more visited the new Spinnaker Exhibit at CCS's Hiebert Marine Lab. As the number of people who learn from CCS grows, so does the next generation of passionate, dedicated environmental stewards, and so does our hope for a healthy future for our coasts and ocean.



### MARINE EDUCATION PROGRAM

Jesse Mechling, Director

Moncrieff Cochran, Ph.D., Adjunct Educator

### COLLABORATORS

Cape Cod Wildlife Collaborative

CARE for the Cape and Islands

Family Equality Council

Friends of the Cape Cod National Seashore

Massachusetts Marine Educators Association

New England Ocean Science Education Collaborative

NOAA Marine Debris Program

Pilgrim Monument and Museum

Pleasant Bay Alliance

### FUNDING PROVIDED BY

Cape Cod Five Cents Savings Bank Charitable Trust

CARE for the Cape and Islands

Massachusetts Cultural Council

Eastern Bank

Provincetown Aquasports

Provincetown Visitor Services Board



*Volunteers are invaluable at our outreach kiosk on the Pier (above) and they sorted through more than 18,000 invertebrates in our lab in 2018 alone (below).*



## Thank you Volunteers!

The success of several CCS programs is due in great part to our dedicated volunteers. In the first nine months of 2018 alone the Water Quality Monitoring program's 23 volunteer Citizen Scientists collected 256 samples from 22 sites across the Cape and Islands, and South Shore.

The Geology Department's benthic ecology lab team sorted 18,818 individual invertebrates from 50 jars of sediment samples retrieved from eight stations around Herring Cove. Others volunteers digitized decades of data, conducted outreach at the CCS kiosk on MacMillan Pier and in the Hiebert Marine Lab, and helped plan and present special events and lectures. Still more sit on our Board of Directors and Advisory Council.

Our volunteers are informed, talented, inspiring and incredibly supportive of our endeavors. They give generously of their time and wisdom, and are our greatest ambassadors. We are incredibly fortunate and grateful to have these wonderful people on our team.

## Staff News and Appointments

In 2018 **Dr. Mark Borrelli** was appointed Director of The Coastal Processes and Ecosystems (CaPE) Lab, a joint research effort between CCS and UMass Boston's School for the Environment.

Marine Ecologist **Dr. Agnes Mittermayr** joined CCS in Spring 2017 to work with the Marine Geology Department and Water Quality Monitoring program.

**Karen Langfield** took on the role of CCS Controller in February 2018. Karen's twenty years of organizational and business expertise has streamlined our accounting and administrative practices.

**Sue Nickerson**, Director of Development, came aboard in June 2018. An avid environmentalist with over thirty years of fundraising and advocacy experience, Sue has spent most of her career working to protect Cape land and waters.

**Melissa Lowe** is our new Outreach Coordinator. Melissa comes to us from Mass Audubon's Wellfleet Bay Wildlife Sanctuary where she was responsible for building the nature center's hugely successful adult education programs.

**Angela McNerney** manages our retail outlets on MacMillan Pier, in the SEA Space Discovery Center, and at the Hebert Marine Lab. She has introduced a range of sustainable merchandise that encourages customers to indulge in guilt-free retail therapy.

**John Shea**, CCS Controller for more than 15 years, retired in February 2018 and **Deborah Magee**, Director of Development, retired in June 2018. We thank them wholeheartedly for their sterling work and wish them well as they continue on to new, more relaxing endeavors.

## In Memorium

*The CCS family was devastated by the loss of these dear friends and colleagues. Words can never express how much we appreciated and enjoyed learning and working with them.*

**Carole A. Carlson, Ph.D.** Adjunct Scientist at CCS, Director of Research and Education for the Dolphin Fleet Whale Watch and Research Associate at College of the Atlantic. Carole was an educator, advocate and innovator whose work influences whale research and protection efforts in many parts of the world. Her close friends are working together in the grounds of the Marine Lab to create the Carole Carlson Memorial Garden. The plants and flowers in this restful space are from Carole's own garden, which was one of the most beautiful in Provincetown.

**Doug Coughran**. Former Wildlife Officer for Western Australia and a key member of the Global Whale Entanglement Response team.

**Joe Howlett**. Former commercial fisherman and co-founder of the Campobello Whale Rescue Team in New Brunswick, Canada.



### ADMINISTRATION

Richard Delaney, President & CEO  
Karen Langfield, Business Manager  
Melissa Lowe, Outreach Coordinator  
Cathrine Macort, Executive Assistant, Communications Director  
Angela McNerney, Merchandise & Kiosk Manager  
Mary Moore, Donor Relations Coordinator  
Sue Nickerson, Development Director  
Stephanie Richardson, HR Manager  
Kathy Shorr, Development Officer  
Dan Towler, Facilities Manager  
Jan Young, Volunteers & Outreach, Accounts Payable

### EXECUTIVE COMMITTEE

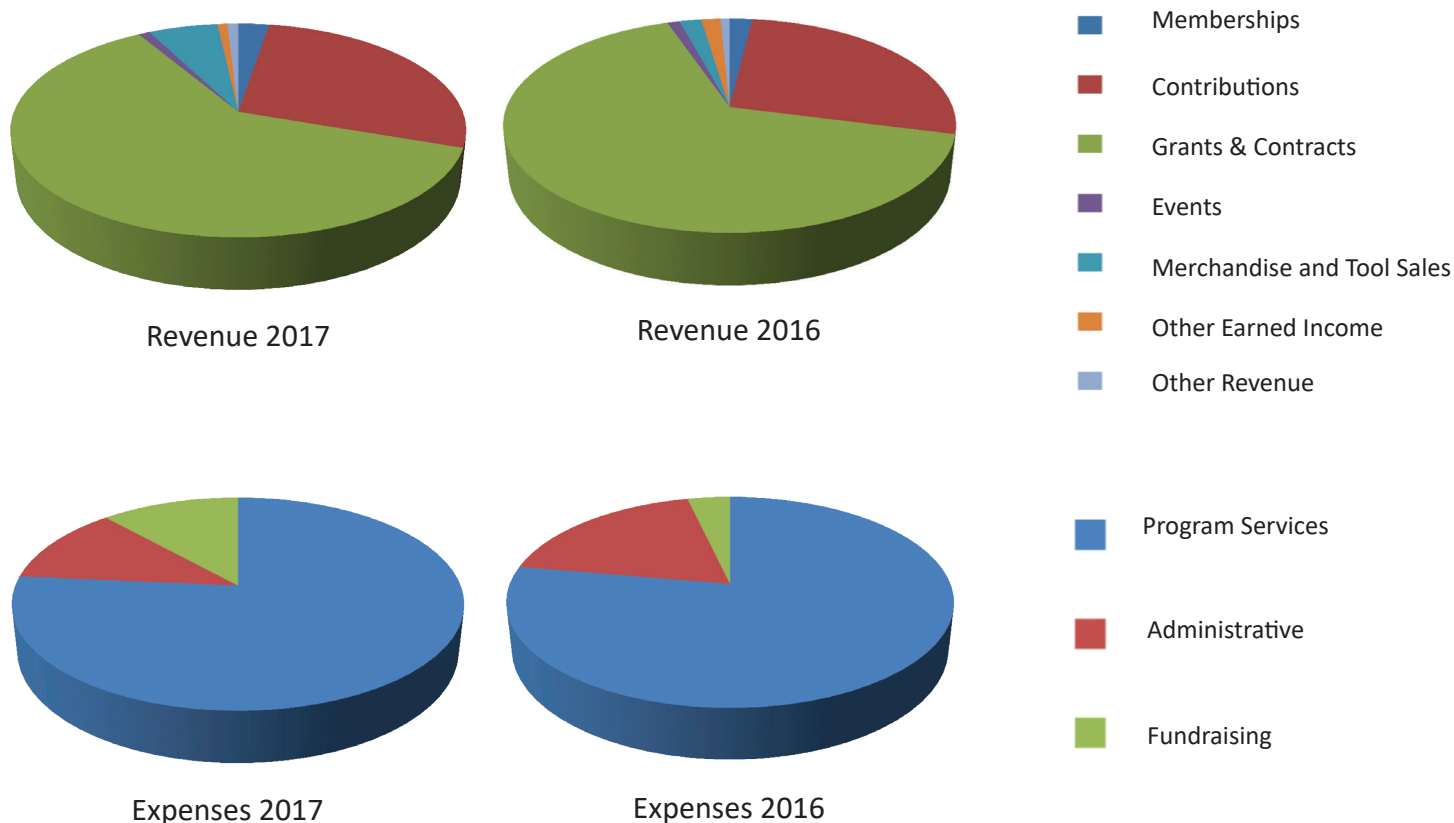
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# Financial Report

## FY2016 and FY2017 Source and Use of Funds Summary\*



<b>REVENUE</b> (restricted and unrestricted)	<b><u>2017</u></b>	<b><u>2016</u></b>
Memberships	\$92,278	\$80,589
Contributions	\$1,004,089	\$1,152,361
Grants and contracts	\$2,164,941	\$2,741,763**
Events	\$33,787	\$43,603
Merchandise/tool sales	\$208,459	\$77,449
Other earned income	\$29,414	\$68,355
Other revenue	\$32,704	\$31,957
<b>Total</b>	<b>\$3,565,672</b>	<b>\$4,196,077</b>
<b>EXPENSES</b>	<b><u>2017</u></b>	<b><u>2016</u></b>
Program Services	\$2,794,131	\$2,537,466
General and Administrative	\$432,803	\$607,382
Fundraising	\$428,404***	\$118,915
<b>Total</b>	<b>\$3,655,338</b>	<b>\$3,263,763</b>
<b>Net</b>	<b>\$(89,666)</b>	<b>\$932,314</b>

\*A copy of our audited Financial Statements is available on our website.

\*\*Includes additional capital donations for the renovation of the Hiebert Marine Laboratory.

\*\*\*2017 increase due to reallocation of certain staff expenses at recommendation of audit.

# Center for Coastal Studies Donors: 2016–2017

CCS wishes to thank the many individuals, businesses, organizations, academic institutions, foundations, corporations, and government agencies that provided gifts, grants, and in-kind support in 2016 and 2017.

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Massachusetts Environmental Trust  
Massachusetts Office of Coastal Zone Management  
Massachusetts Water Resources Authority  
National Marine Fisheries Service  
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ABOVE (top to bottom): Marine Animal Entanglement Response team responding to humpback whale in trouble off Wood End; CCS Marine Education team "Getting to the Bottom of It" during guided program; gray seals rest on a sandbar just outside Chatham Harbor; Christy Hudak, Associate Scientist in the Right Whale Ecology Program, samples for plankton.

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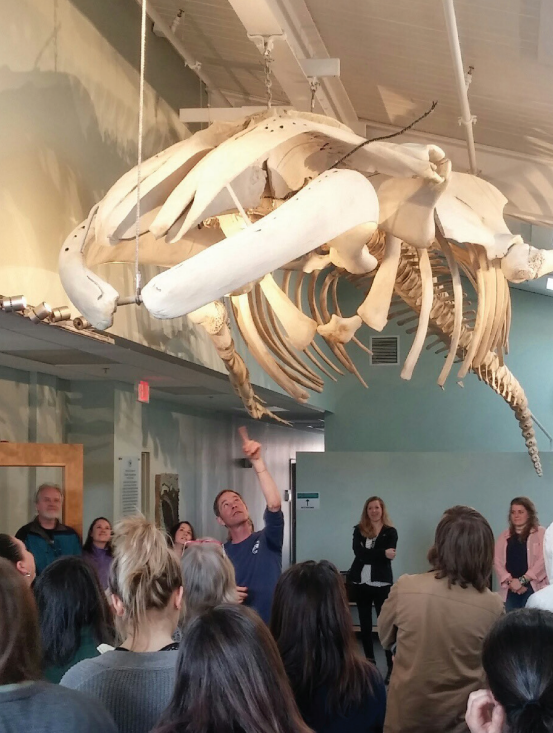
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ON THE COVER: Owen Nichols, Director of Marine Fisheries Program, and fisherman Billy Souza with retrieved lobster traps from the Derelict Fishing Gear and Recovery Project.



### Spinnaker rests in Provincetown: CCS honored to display her skeleton

Spinnaker, an 11 year-old humpback, was well known at CCS. Her life history, and that of her mother (Palette) and grandmother (Compass), was documented in great detail by CCS scientists as part of our Gulf of Maine humpback whale population research.

During her short life, Spinnaker was entangled in gear at least four times. On three of those occasions she was freed by our MAER team and colleagues from Campobello Whale Rescue and Maine Marine Patrol.

Spinnaker died in June 2015 and her body came ashore in Acadia National Park in Maine. A necropsy was performed, and samples collected for future studies. Her cause of death has yet to be determined.

The preservation and articulation of her skeleton took almost two years. During the process researchers found a tangle of rope and gillnet embedded in the flesh

and bone of the roof of her mouth. The gear—remnants of an entanglement that she had survived almost a year before—had almost split her upper jaw in two.

In May of 2017, Spinnaker's 1,300 pound skeleton, with the entanglement still lodged in her skull, was raised in CCS's Ruth Hiebert Marine Lab for ongoing research and display. Spinnaker's story is a remarkably detailed example of the life of whales in the modern world and a testament to the value of collaborative research and entanglement response efforts.

Spinnaker's skeleton was preserved, rearticulated and installed by marine biologist Dan DenDanto and his team from Whales and Nails in Maine. Her acquisition was funded in part by the Jeffrey M. Conklin and Family Charitable Giving Fund in honor of Charlotte and Teddy Butler-Conklin and through contributions from over 400 individuals.

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