Right Whale Research News

Anderson Cabot Center for Ocean Life
at the New England Aquarium

Volume 31, Number 1
May 2022

In this issue:

Catalog#3157 and her young calf photographed off Cumberland Island, GA on February 10, 2022. She is 21 years old and this is her third calf. Photo: Florida Fish and Wildlife Conservation Commission. NOAA Permit #20556-01

News from the Calving Grounds

No matter how dire the right whale story is, we always approach the winter calving months with excitement and anticipation. Some of us make wild predictions on how many calves will be born—rarely are those accurate! As a reminder, each winter, teams from Florida Wildlife Research Institute, Georgia Department of Natural Resources, and Clearwater Marine Research Institute perform the bulk of the regular systematic surveys over the waters of Florida and Georgia, and more recently the Carolinas. These efforts start in mid-November in the Carolinas and in early December off Florida and Georgia and finish by the end of March. These surveys are supplemented by other aerial, shipboard, and land-based efforts, as well as from opportunistic sightings submitted by mariners. In short, there are a lot of eyes looking for right whales in and around the calving grounds!

We barely had a chance to get excited this past season before a mariner spotted a right whale on November 2 off Charleston, S.C. This turned out to be **Slalom (Catalog #1245)**, a 40-year-old female who was seen 22 days later with her sixth calf, the first calf of the 2021-22 calving season. The sightings of other mother/calf pairs came quickly after that with ten more documented in December. These included two mothers, **Derecha** (**#2360**) and **Snowcone** (**#3560**), whose last calves two years ago were both killed by vessel strikes. Besides losing her last calf, **Snowcone** faced additional hardship when she became entangled while pregnant with this calf and still has line wrapping over her head and out the mouth (see *Mortality and Entanglement Report*).

The early start to the season had us wondering if we might approach the 23 calves born in an average good year in the 2000s. But things slowed down after December with just three more calves discovered in January and one in March. In addition to the 15 mothers, there were nine females seen in the southeast U.S. waters that are over ten years old and could give birth, so there is still hope that more calves could be added to the current 15. We also know from the hormone work at the New England Aquarium's Wildlife and Ocean Health Program that 13-year-old **Koala** (**#3940**), was **pregnant last July** but she has not been seen on the calving ground. Did she lose her calf or just escape notice? We will keep an eye out for her and other females in the northern feeding grounds through the remainder of this year to see if any of them have given birth and weren't detected in the calving ground, as was the case with **Lobster** (#**3232**) and her calf **last year** (see *Eighteenth Right Whale*

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News from...

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Mother…in *RWRN December 2021*).

All the mothers have interesting stories, many of which can be found on our **calving season blog**, but one of the more tragic ones is 39-year-old **Half Note** (**#1301**). Her last four calves did not survive, apparently due to her inability to nurse them (see ***The Unusual Case of Half Note*** in *RWRN May 2014*). The fate of her calf from this year is unknown. (**Half Note** has always been seen alone in the Southeast after losing her calf, but this year the pair disappeared early.)

Most of the mothers this year hadn't given birth for a long time. On average, right whales with a healthy blubber layer can give birth every three to four years. The average interval this season was 7.8 years with six mothers having interbirth intervals of 10 years or more. The six mothers that feed regularly in the Gulf of St. Lawrence had slightly shorter intervals than the nine that do not (6.8 years vs. 8.4 years) including **#4180**, a mother of unknown age and the only one with a three-year-calving interval this year.

In addition to the calving females, 32 other whales were seen off the southeast U.S. this past season, including some older males like **Fiddle** (**#1121**) and **Cream** (**#1149**), both over 41 years old, and seven of the 18 calves from last year. During the 2000s, the decade with the highest average calf count, it was not uncommon to see yearlings and other juveniles on the calving ground. This pattern largely disappeared in the 2010s and has only reemerged in the last few years. Of particular interest in this group is the **2021 calf of Lobster**, who was not seen on the calving ground at all last year.

Finally, thanks to the hard work of the teams in the southeast, 13 of the calves have been genetically sampled. As our recent **paper** highlights, collecting samples from these calves is particularly important; it helps to ensure that we can connect genetic identifications back to a calf if photo-identification proves difficult.

While 15 calves is far below the average in the 2000s, it is more calves than were born annually from 2016 to 2020. Many of the females whose ages are known are delaying the birth of their first calf well past the median-age of ten. In fact, none of the mothers this year are first time mothers. When those females finally do start calving, we hope for an improvement in the calving numbers. Check our **blog** to get updates, find out if more calves are discovered, and whether they were born to first-time mothers! *—Philip Hamilton*

The team, bundled up in anti-exposure float suits, wait in the January cold for right whales to resurface.
Photo: Kate McPherson/ACCOL/NEAQ

New Survey Area: Southern New England

In January 2019, the Aquarium's right whale research team sat in a conference room in downtown Boston to discuss new ideas for survey areas and research tools. One such idea was the feasibility of conducting vessel surveys for right whales in the waters south of Nantucket and Martha's Vineyard, an area that has seen an increasing frequency of right whale sightings and is also slated for wind power. That area, referred to as southern New England, is extremely large and for that reason, aerial surveys have typically been used to monitor the area for right whale management, distribution, and photo-identification. However, only vessel-based surveys can collect skin, blubber, and fecal samples, as well as the vessel-based photos that are needed for the health assessment of individuals. Although aerial surveys, flown by the Aquarium and other groups, and acoustic monitoring programs have detected right whales in southern New England every month of the year, most sightings were in December through April. During winter months in particular—specifically December 2018 through January 2019—right whales were seen there in great numbers.

When you're sitting around a table in a sterile conference room, it's easy to get excited about field work: Let's go to southern New England in the winter on a boat! Simple, right? But the idea of starting a new field season can quickly become overwhelming. We need funding, a vessel, housing, equipment, and perhaps most importantly, the time (and good weather) to do the work.

Once we left the conference room, the real-world snuck back in with all its workload, deadlines, and meetings. Soon the energy of the day dissipated and the idea of a new field season seemed farther away as we all slipped back into our daily, weekly, and monthly routines. Over the next year and half, the topic would come up but lack of funding continuously impeded the idea.

That changed in 2021, when the Aquarium's right whale team made a hard decision: Due to the lack of right whale sightings in the Bay of Fundy during the previous few years, the team would not conduct surveys there. Ending a 40-year tradition of summer field work in the bay became the catalyst to propel survey work in southern New England forward—the funding that was allocated for the Bay of Fundy could be used to support surveys there instead. By the fall of 2021, we were ready to start planning and in a very short period of time we secured a field house on Cape Cod and a vessel charter. We purchased a new camera, updated software, bought additional floatation suits (worn mainly for thermal protection), activated our satellite communications, and tested our telemetry equipment (in case we encountered an entangled whale). We scheduled our cruises to be on standby for two separate two-week windows at the end of January and in late February

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New Survey Area...

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and early March. New England winters are long, cold, and stormy, so getting good weather for working offshore at that time of year would be our biggest challenge.

Luckily, there were breaks in the weather which allowed us to do four surveys. We found right whales on every trip, so our inaugural southern New England field season was successful in that regard. Although the density of right whales in area was lower than we expected (in comparison to previous years) and they did not spend long at the surface, we were able to photograph 17 whales. Aerial survey teams from the Aquarium, Center for Coastal Studies, and Northeast Fisheries Science Center helped direct us to right whales, which was really valuable to our effort, when their aerial surveys coincided with our time on the boat. The captain and the crew of our charter vessel, *Helen H*, were amazing and we are grateful they were available and interested in this work. But our sightings and photographs were hard won with very cold, long days. In order to maximize the short winter daylight hours, we departed Hyannis, MA, well before dawn and didn't return until late in the evening. We were also transiting through "**slow zones**" established by NOAA to protect right whales, so our speed was limited to 10 knots, which made the trip even longer. As we review all the pros and cons of this pilot effort, we will decide how and if we will do these surveys next year, so stay tuned! For more details about the four cruises, please check out our **blog**. —*Monica Zani*

New Right Whale Webpage

To help further educate the public about North Atlantic right whales and the action steps necessary to save the species from extinction, the New England Aquarium recently started running a 90-second video in its Simons Theatre, featuring Senior Scientists Amy Knowlton and Philip Hamilton. The video, which runs before every film, ends by encouraging audience members to visit **neaq.org/rightwhales**, a new landing page on the Aquarium's website with general information on right whales, research highlights, and advocacy resources for the public to get involved. The webpage also links to information available on the Anderson Cabot Center for Ocean Life website.

Unsung Hero

Jessamine Crowder with a few of her right whale posters. Photo: Isabelle Crowder

Occasionally we hear about someone who is working hard to raise awareness in their neighborhood or community about the plight of the North Atlantic right whale. These unsung heroes are an inspiration to us and so we share their story to inspire you! This time we're highlighting Jessamine (Jess) Crowder, a 10-year-old fifth grader who hails from Athens, Georgia.

When Jess was in second grade, she chose to research the North Atlantic right whale for a class project on endangered species. She shared her work with classmates and parents at an end-of-year school event and then created an informative presentation that she shared with the entire school. Jess did not let the pandemic or online learning deter her from advocating for right whales. A virtual presentation by one of our colleagues, Chris Slay, inspired Jess and her friends to form a right whale club. They made posters about saving right whales, which they hung on posts and in storefronts in her neighborhood. Jess is committed to learning as much as she can about right whales and feels empowered to make a difference.

Jess's mom shared with us what Jess hopes for this endangered species: "Jess wants the population of right whales to grow so they can be removed from the list of endangered species. She hopes other kids and adults will learn more about right whales and see they are worth fighting for! She hopes young people in particular will realize they can make a difference. Jess also hopes scientists and researchers will create/find/use new technologies to protect right whales from commercial fishing nets. Her second-grade slogan stands today: 'It's a whaley good idea to save the right whales!'"

When we asked Jess what she loved about right whales, she told us "They are gentle giants! They seem like they are big and scary, but they are so intelligent and a lot like humans, including their ability to communicate with one another and how they bond with each other, particularly mother whales and their babies."

Thank you, Jessamine Crowder, for ALL that you do on behalf of right whales!

Summer 2022 Fieldwork

Spring is here, which means planning for our summer field season is fully underway. Our focus is on the Gulf of St. Lawrence, where last year, we were able to photograph about a third of the right whale population. As in previous years, we will be conducting two separate two-week offshore cruises in July and August aboard the *F/V Jean-Denis Martin* in collaboration with the Canadian Whale Institute and the University of New Brunswick (see related articles in *RWRN December 2018*, *2019* and *2021*). In addition to photo identification, behavioral observations, and biopsy and fecal collection, our colleagues will conduct oceanographic sampling and collect drone footage.

Check in on field season activities with our blog posts!

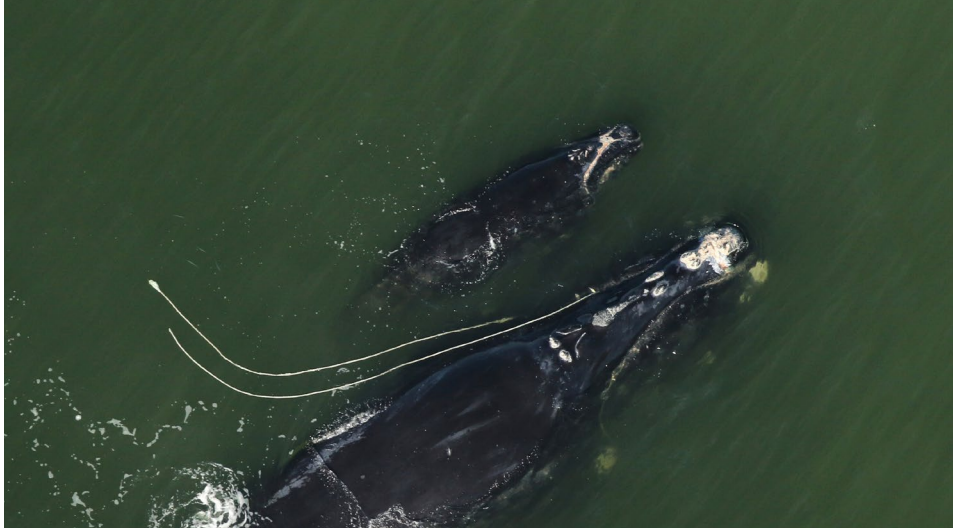
andersoncabotcenterforoceanlife.org/category/right-whale-research/

Last of the Right Whales

In February, the New England Aquarium hosted the U.S. premiere of *Last of the Right Whales*, a documentary examining the plight of North Atlantic right whales. The film follows the efforts of a group of allies (including the Canadian Whale Institute's Moira Brown and Charles "Stormy" Mayo of the Center for Coastal Studies) to better understand and save the critically endangered species. More than 200 people attended the screening and panel discussion at the New England Aquarium's Simons Theatre. The discussion, moderated by Michael Conathan of the Aspen Institute Energy and Environment Program, featured Nadine Pequeneza, producer and director of *Last of the Right Whales*; Marc Palombo, Massachusetts lobsterman; Heather Pettis, research scientist in the Anderson Cabot Center for Ocean Life at the New England Aquarium; and Patrick Ramage, senior director of outreach and program collaboration at International Fund for Animal Welfare. The award-winning film wrapped its U.S. coastal tour in Portland, ME, on April 27 and was also featured at the International Wildlife Film Festival in Montana.

Mortality and Entanglement Report

In each newsletter we report on new entanglements and mortalities that we have observed in North Atlantic right whales since the last issue. Although this number is always concerning, we know that it drastically underrepresents what the species is actually experiencing. A recent study determined that for every carcass observed, there may be three times that number of undocumented deaths. This species is in decline and until entanglements and vessel strikes are dramatically reduced, North Atlantic right whales will continue to inch closer to extinction. By sharing these stories, we are keeping you, our readers, apprised of these deadly anthropogenic events.



Snow Cone and calf, sighted December 17, 2021 just off Ponte Vedra Beach, FL. **Snow Cone** has been entangled in fishing gear since March 2021; the white scarring on the front of her head indicates where the rope is embedded. Photo: Florida Fish and Wildlife Conservation Commission. NOAA Permit #20556-01

Mortalities

There have been no new documented mortality events since the last newsletter, which is welcome news. However, there are several individuals whose health was of concern at their last sighting; we hope to have more news on these whales in the coming months.

Entanglements

There have been no new documented entanglement events since the last newsletter.

Update on Previous Entanglements

Snow Cone (**#3560**, 15-year-old female): First documented entangled in March 2021, she was sighted several times in the Gulf of St. Lawrence between July and September, and in the waters of southern New England in October. She was seen off the coast of Georgia on December 2, 2021, with a calf in tow, which is exciting given that her previous calf was killed by a vessel strike in 2020 when he was only six months old. However, **Snow Cone** is still entangled with two short lengths of line trailing from her mouth and the line appears to be deeply embedded in her rostrum. Since she is currently nursing her young calf, responders have made the decision to not attempt any disentanglement efforts at this time as this would pose a risk to both mom and calf.

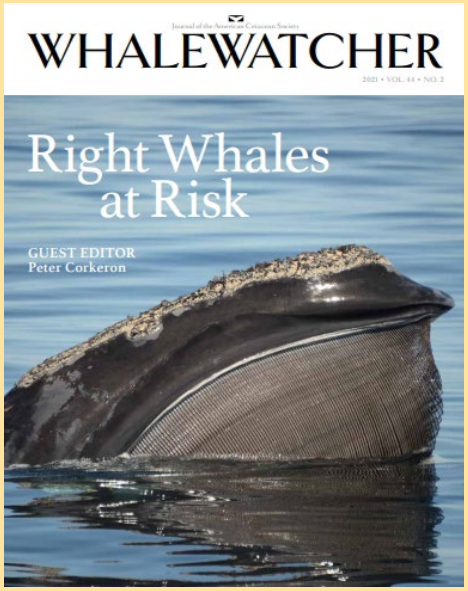
Unfortunately, there have been no sightings of **Catalog #4615**, the 6-year-old male last seen badly entangled in the Gulf of St. Lawrence in July 2021 (see *Summer Field Work Updates* in *RWRN December 2021*). His current status is unknown.

Entanglements are documented every year and not all cases can be resolved through disentanglement. Sadly, many entangled whales are never seen again after their initial sightings, while others are seen for months or even years with gear still attached before they disappear, likely succumbing to their injuries. In addition, some individuals are seen with severe wounds from entanglement but have no gear attached. With or without gear, the entanglement injuries can lead to death. We monitor these cases in order to better describe the impacts right whales are facing from entanglements. Just in the past five years, at least **47** whales were last sighted with attached gear or with severe entanglement-related injuries and many of them will likely never be seen again. These numbers highlight the need to change the fishing industry as quickly as possible to operate in a way that keeps whales safe. *—Kate McPherson*

Whalewatcher: Right Whales at Risk

Dr. Peter Corkeron, senior scientist at the Aquarium's Anderson Cabot Center for Ocean Life, guest-edited Vol. 44 No. 2 of *Whalewatcher*, the membership journal of the American Cetacean Society which is published once yearly and features "credible, timely science and research on cetacean-related issues." This issue, *Right Whales at Risk*, explores the lives and difficulties of Southern right whales, North Pacific right whales, and critically endangered North Atlantic right whales with contributions from more than a dozen scientists, including four from the Aquarium's right whale team: Senior Scientists Peter Corkeron, Amy Knowlton, and Philip Hamilton, as well as Research Scientist Heather Pettis and Emeritus Scientist Scott Kraus.

acs.memberclicks.net/assets/Whalewatchers/Whalewatcher-2021-final.pdf



Are Governments Doing Enough?

The decline of North Atlantic right whales in this past decade has created a greater level of attention to the plight of this species. To help, both the U.S. and Canadian governments have been engaged in developing stronger regulations and implementing more helpful measures to protect right whales (see *Management Updates* in *RWRN December 2021*). To reduce entanglement risk in the U.S., NOAA Fisheries developed new regulations to address entanglement threats from the lobster and Jonah crab fisheries, which include seasonal closures, integration of weak points in buoy lines, a minimum number of traps per trawl to reduce buoy line numbers, and expanded gear-marking requirements. These changes started in October 2021 with all required measures to be in place by May 2022. Additional measures will be developed to expand protections to other fisheries. In Canada, the Department of Fisheries and Oceans (DFO) will continue to implement dynamic fishery closures if right whales are observed in Canadian waters. Closures to fixed fishing gear will last for at least 15 days unless right whales are sighted in the area more than once, in which case the closure may be put in place for the season. DFO also requires Canadian fishing gear to be "whale safe" by 2023, meaning the gear will either have lower breaking strength rope or weak links integrated. They are also testing ropeless fishing gear in the snow crab fishery.

For vessel strikes, in the spring of 2022, the U.S. will introduce a proposed rule to strengthen vessel strike measures. Although the nature of these changes is not known, we anticipate a spatial expansion of mandatory speed restrictions will be considered. There may also be a measure to reduce the vessel sizes that would be affected by speed restrictions. In Canada, Transport Canada continues their efforts to reduce vessel strike risk by mandating static and dynamic speed restrictions and implementing voluntary speed restrictions in the Gulf of St. Lawrence from April through November.

In addition to the measures that are or will soon be in place in both countries, here in the U.S., a bill has been introduced in Congress called the Right Whale Coexistence Act of 2022 (see sidebar). On March 17, 2022, Dr. Jessica Redfern from the Aquarium's Anderson Cabot Center testified in front of the Congressional Subcommittee on Water, Oceans, and Wildlife in support of this bill. And in Canada, a $20 million Whalesafe Gear Adoption Fund was developed to support efforts to purchase, test, and refine whale safe fishing gear over the next two years.

Are the U.S. and Canadian governments doing enough to protect right whales? No, not yet. Although the changes being developed are important, until broader measures—including vessel speed restrictions and a shift to weak rope (and ultimately ropeless fishing gear)—are implemented throughout their range, right whales will continue to face serious injury and death from these human activities. Our governments have a long way to go to adequately manage activities that we know harm right whales. We will continue to monitor and share information about how right whales are doing but we also need government agencies to do much more to save this species from extinction. *—Amy Knowlton*

The Right Whale Coexistence Act (H.R. 6785 / S.3664)

Introduced by:
Rep. Seth Moulton (D-MA)
Sen. Cory Booker (D-NJ)

The Right Whale Coexistence Act of 2022 (H.R.6785 / S.3664) provides financial resources for projects that develop innovative solutions within and across industries (*e.g.*, commercial and recreational fishing, shipping) to reduce the lethal and sub-lethal effects of human activities on North Atlantic right whales.

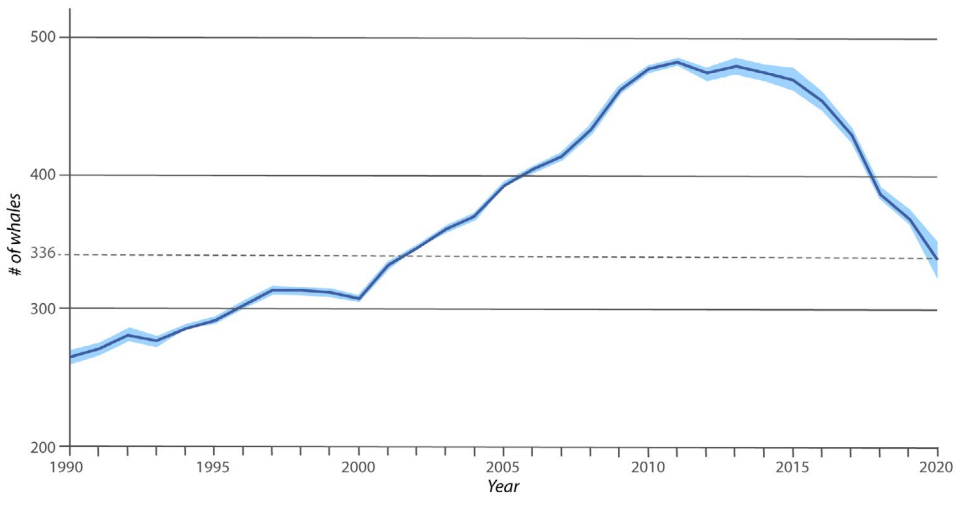
This bill enables the conservation of North Atlantic right whales and the success of ocean industries by promoting projects that support cooperation with multiple stakeholders from foreign governments to affected local communities and industries.

The bill authorizes $15 million annually from 2022-2032 in new funding and directs the Department of Commerce to prioritize projects that are most likely to reduce impacts from vessel strikes and gear entanglement. The Subcommittee on Water, Oceans, and Wildlife discussed the bill at a legislative hearing on March 17, 2022. Aquarium Senior Scientist and Chair of the Anderson Cabot Center for Ocean Life's Spatial Ecology, Mapping, and Assessment Program, Dr. Jessica Redfern, provided scientific testimony during this congressional hearing.

Follow the progress of the Right Whale Coexistence Act online.

North Atlantic Right Whales 1990-2020

as of October 2021



This graph estimates the number of North Atlantic right whales alive from 1990 to 2020.

The dark blue line represents scientists' best estimate for the species count and the light blue area represents the range of uncertainty.

With 95% confidence, scientists report a right whale count of 336 (+/- 14). This is an 8% decrease from the 2019 species estimate.

Data from the 2021 NARWC Report Card.

New England Aquarium
Protecting the blue planet

Anderson Cabot Center for Ocean Life
at the New England Aquarium

NARWC
THE NORTH ATLANTIC RIGHT WHALE CONSORTIUM

Sponsored Whale Update

Thank you so much for sponsoring a right whale and supporting our program! Since the last issue of our newsletter, we have new sightings to report for all our sponsorship whales, with the exception of **Calvin** (**#2223**), who was last seen in August 2021 in the Gulf of St. Lawrence.

Gemini (**#1150**) was photographed subsurface feeding on February 26, 2022 by the Center for Coastal Studies' (CCS) aerial survey team in Cape Cod Bay.

Manta (**#1507**) was seen several times in February by two different aerial teams. He was photographed traveling east in southern New England waters on February 6 by the Aquarium's aerial team. Less than a week later, he was photographed subsurface feeding in Cape Cod Bay by the CCS team on February 11 and again on February 26.

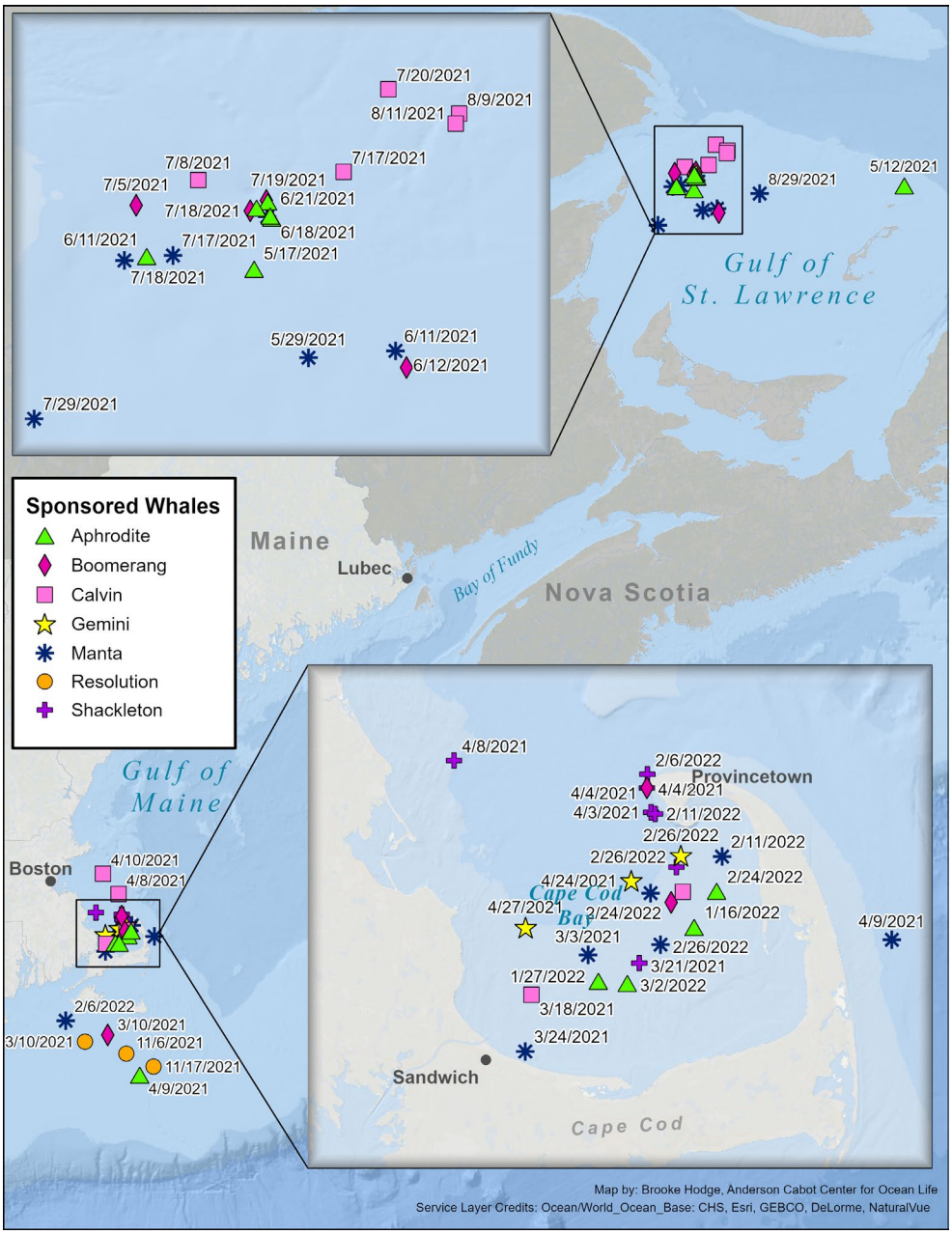
Aphrodite (**#1701**) was documented by CCS on four occasions in Cape Cod Bay between January 16 and March 2, 2022. On February 24, she was photographed engaging in a surface active group (SAG) as the focal female.

Shackleton (**#2440**) was seen several times in February 2022 in Cape Cod Bay by CCS. He was subsurface feeding on two occasions and seen in a SAG earlier in the month.

Boomerang (**#2503**) was also documented in Cape Cod Bay in February. The CCS team photographed her on February 24, 2022.

Resolution (**#3532**) was seen twice in November 2021 in southern New England waters by the CCS and NOAA's Northeast Fisheries Science Center aerial teams, respectively.

Please check the map to see where all the sponsorship whales have been spotted in the past year, and click their catalog numbers to view their pages in the North Atlantic Right Whale Catalog! *—Kelsey Howe*



Sponsored whale sightings March 2021 through March 2022. Map: Brooke Hodge /ACCOL/NEAQ

Shackleton bearing old propeller scars on his left side, swims alone in Cape Cod Bay in March 2021. Photo: Center for Coastal Studies. NOAA Permit #25740-01

Recent Peer-Reviewed Team Papers

Highlighting our expertise and productivity, below is a list of recent peer-reviewed publications on which members of the Aquarium's Right Whale Team are either lead authors or co-authors, noted in bold. This work is made possible due to grants and contracts we apply for, and through direct donations to our program. Thank you all for your support!

Baumgartner, et al. (co-author **P. Corkeron**) 2021. Near real-time detection of low-frequency baleen whale calls from an autonomous surface vehicle: Implementation, evaluation, and remaining challenges. *The Journal of the Acoustical Society of America*. **https://doi.org/10.1121/10.0004817**
Peter Corkeron: "This paper describes work on a passive acoustic instrument capable of real-time detection and classification of low-frequency tonal sounds integrated with a wave glider. Compared to a moored passive acoustic monitoring buoy, the system greatly underestimated the occurrence of sei, fin, and North Atlantic right whales and therefore is not suitable for use in scientific or management applications for these species at this time."

Crowe, et al. (co-authors **M. Brown, P. Corkeron, P. Hamilton**) 2021. In plane sight: a mark-recapture analysis of North Atlantic right whales in the Gulf of St. Lawrence. *Endangered Species Research*. **https://doi.org/10.3354/esr01156**
Philip Hamilton: "Using data from 2015 to 2019, the authors provide the first thorough assessment of right whale abundance, residency, and inter-annual return rate in the Gulf of St Lawrence- a previously under studied habitat."

P. Hamilton, et al. 2022. Case studies of North Atlantic right whale (*Eubalaena glacialis*) calves: genetic identifications challenge our assumptions of physical development and mother-calf associations and separation times. *Journal of Mammalogy*. **https://doi.org/10.1007/s42991-021-00177-4**
Philip Hamilton: "Using genetic samples collected from young calves, we discovered that four calves thought to be dead were actually alive, two dead whales thought to be calves were older, and mothers and calves can separate earlier than previously thought."

King et al. (co-authors **H. Pettis, P. Corkeron**) 2021. Assessing North Atlantic Right Whale (*Eubalaena glacialis*) Welfare. *Journal of Zoological and Botanical Gardens*. **https://www.mdpi.com/2673-5636/2/4/52**
Heather Pettis: "This paper explores the applicability of a variety of animal welfare assessments for North Atlantic right whales as a supplement to current conservation and research efforts. It includes a prototype assessment tool for right whales to be used and evaluated by the right whale research community."

Moore, et al. (co-authors **P. Hamilton, A. Knowlton, H. Pettis, R. Rolland**) 2021. Assessing North Atlantic right whale health: A review of threats, and development of tools critical for conservation of the species. *Diseases of Aquatic Organisms*. **https://doi.org/10.3354/dao03578**
Amy Knowlton: "Monitoring a wild marine species such as the right whale is challenging and requires scientists to develop unique approaches to understand the threats they face. This paper provides a detailed synthesis of the techniques used and lessons learned about this species."

Murphy, et al. (co-author **M. Marx**) 2022. Feeling for food: Can rostro-mental hair arrays sense hydrodynamic cues for foraging North Atlantic right whales? *The Anatomical Record*. **https://doi.org/10.1002/ar.24858**
Marilyn Marx: "This paper describes the array of fine hairs on the rostrum and chin of right whales and considers the role they play in right whale feeding. Since the size of the hair is scaled to the size of the prey these hairs likely provide the right whale sensory feedback on prey densities and patch boundaries, leading to successful and efficient foraging."

Pacheco, et al. (co-author **P. Corkeron**) 2021. Editorial: Whale-Watching Impacts: Science, Human Dimensions and Management. *Frontiers in Marine Science*. **https://doi.org/10.3389/fmars.2021.737352**
Peter Corkeron: "This is the introductory editorial article for a series of papers that look into the role and effects of whale-watching, that highlight the value of monitoring of biological impacts, the need for this work to continue internationally and the importance of the enforcement of regulations surrounding the whale watching industry."

Pershing, **Pendleton D**. 2021. Can Right Whales Out-Swim Climate Change? Can We? *Oceanography*. **https://doi.org/10.5670/oceanog.2021.315**
Dan Pendleton: "This essay offers a unique perspective on dual challenges that right whales face as they adapt to our changing climate."

Pershing, et al. (co-author **D. Pendleton**) 2021. Climate impacts on the Gulf of Maine ecosystem. *Elementa: Science of the Anthropocene*. **https://doi.org/10.1525/elementa.2020.00076**
Dan Pendleton: "This paper shows the temperatures we can expect in 2050, and discussed the potential impacts on whales, fish, zooplankton and lobster. Climate-drive changes across the ecosystem will affect all of us, and understanding the interplay of species as the climate warms will help us prepare for the future."

E. Quintana-Rizzo, et al. (co-authors **S. Leiter, M. Hagbloom, A. Knowlton, P. Nagelkirk, O. O'Brien, S. Kraus**) 2021. Residency, demographics, and movement patterns of North Atlantic right whales *Eubalaena glacialis* in an offshore wind energy development area in southern New England, USA. *Endangered Species Research*. **https://doi.org/10.3354/esr01137**
Amy Knowlton: "Aerial surveys since 2011 have shown this area to be an important habitat for right whales with sightings increasing and occurring nearly year-round. Slated for offshore wind, this area will need to be monitored carefully both during and after construction to determine whether there are any negative impacts of wind energy on right whales."

Ross, et al. (co-authors **D. Pendleton, M. Zani**) 2021. Projecting regions of North Atlantic right whale, *Eubalaena glacialis*, habitat suitability in the Gulf of Maine for the year 2050. *Elementa: Science of the Anthropocene* 9:00058. **https://doi.org/10.1525/elementa.2020.20.00058**
Dan Pendleton: "This paper offers scientifically derived projections of what the right whale distribution could look like in the year 2050. It helps us understand what new threats they may face in the coming decades."

Stewart, et al. (co-author **A. Knowlton**) 2021. Decreasing body lengths in North Atlantic right whales. *Current Biology*. **https://doi.org/10.1016/j.cub.2021.04.067**
Amy Knowlton: "Right whales are growing more slowly in recent years and data suggests some of their stunted growth is related to severe entanglement in fishing gear when the individual is less than 10 years old or if their mother was severely entangled when they were nursing. Reduced body size can lead to reduced reproductive output and highlights the need for better measures to mitigate entanglement risk."

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Give the Gift of Endangered Species Conservation

The 17th annual Endangered Species Day is May 20, 2022. You can honor the day by helping us protect one of the most endangered species in the world!

Today, there are fewer than 350 right whales in the North Atlantic. And, while no longer commercially hunted, the long-term survival of this critically endangered species is still under intense threat from fatal vessel strikes and fishing gear entanglements.

Started in 1980, the Aquarium's Right Whale Research Program is one of the longest continuously-running whale research and conservation programs in the world. Working with government, conservation, industry, and commercial interests, the Right Whale Research Program seeks to find ways to ensure the survival of these majestic creatures.

North Atlantic right whale-themed gifts and tax-deductible sponsorships are available with proceeds directly supporting our research and conservation work to save this critically endangered whale.

Visit rightwhaleresearch.bigcartel.com to learn more!

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In this newsletter, all photographs of right whales in U.S. waters were taken under NOAA research permits under the authority of the Marine Mammal Protection Act and the U.S. Endangered Species Act. Right Whale Research News is produced and published by the New England Aquarium. We welcome your comments and suggestions.

Read more about our project at accol.org.

You may access past issues of Right Whale Research News on our website at andersoncabotcenterforoceanlife.org/about-us/newsletters/right-whale-research-news. The archive goes back to 2005, and all but the two most recent issues of RWRN are available. Now when one of the articles in the current issue refers to an earlier piece on the same subject, it's easy to check it out!

Thank you!

We would like to thank all the individuals, organizations, and schools that continue to support our research with annual sponsorships and donations. In these difficult economic times, with federal research budgets shrinking, your support is more critical than ever, and we truly appreciate your generosity. Sponsorship funds are used by our Right Whale Program to support activities that directly contribute to the conservation of North Atlantic right whales.