

R/V Song of the Whale: 2023 North Atlantic right whale surveys



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A North Atlantic right whale seen from Song of the Whale takes a breath. Photo: Andrea Spence / © IFAW. Activity was conducted pursuant to NMFS ESA/MMPA Permit No. 21371

90%

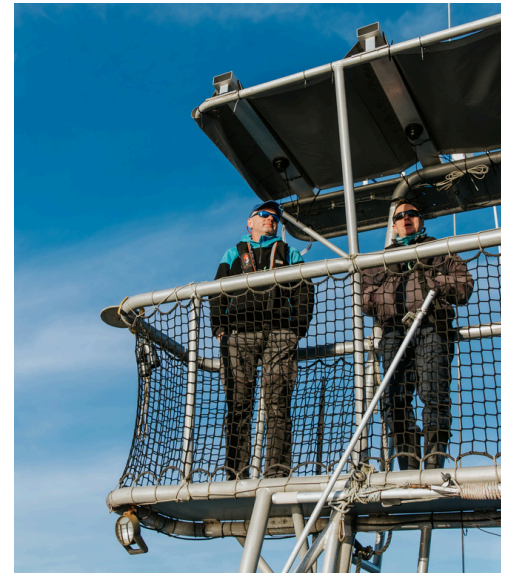
of definitively determined North Atlantic right whale mortalities between 2003 and 2018 were caused by vessel strikes or entanglement

Introduction

The North Atlantic right whale is one of the most critically endangered species in the world, with an estimated population of about 350 individuals, including fewer than 70 reproductive females. This species migrates every year between calving grounds in waters off the US Southeast and feeding grounds off the US Northeast and Canada, facing a maze of threats along their journey.

In 2017 the National Oceanic and Atmospheric Association (NOAA) declared an Unusual Mortality Event for this species. Since then, 142 North Atlantic right whales have been killed, seriously injured, or sublethally injured, primarily due to the leading threats facing this species, vessel strikes and entanglement in fishing gear.

Recent years have brought about changes to right whale distribution along the Eastern Seaboard, and whales are traveling into new areas void of any protections in place for their survival. An improved understanding of their movements is urgently needed to reduce human-induced threats in high activity areas, especially those that have not yet been systematically surveyed during key time periods. In 2023, IFAW commissioned Marine Conservation Research (MCR) to conduct collaborative right whale surveys aboard the *R/V Song of the Whale*, a purpose-built research sailing vessel. This expedition aimed to provide vessel-based visual and passive acoustic surveys to fill data gaps and support efforts to conserve the North Atlantic right whale.



Song of the Whale crew on A-frame observation watch. Photo: Andrea Spence / © IFAW



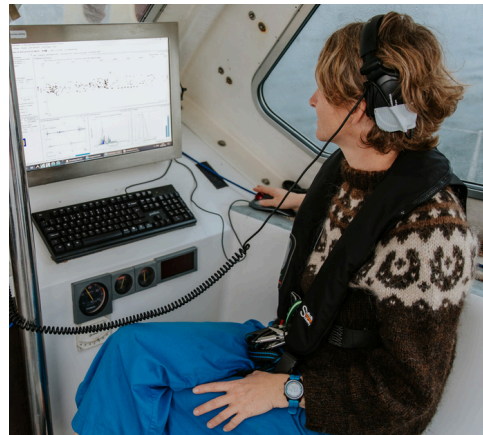
Dr. Oliver Boisseau and field researcher Eleanor Heywood look over photo ID images of North Atlantic right whales. Photo: Andrea Spence / © IFAW

Methods

Launched in 2004, *Song of the Whale* is a purpose-built 70-foot research vessel originally commissioned by IFAW and granted to MCR in 2014. The vessel is designed for research purposes, with outriggers for towing acoustic hydrophone arrays, a 36-foot-high crow's nest and an elevated A-frame for visual surveying, and a dedicated computer room for acoustic detection and data logging. Additionally, it is non-invasive, with features to reduce noise pollution including vibration-dampening engine mounts, a five-bladed propeller, and state-of-the-art exhaust systems.

Historically, studies of right whales were based on visual data, but in recent decades, passive acoustic monitoring (PAM) has been used to better capture whale presence. IFAW and the *Song of the Whale* team conducted early studies that established PAM as a vital detection method for right whales, and it has gone on to reveal right whale presence and habitat use nearly year-round in the western North Atlantic Ocean.

Acoustic surveying is paramount for detecting right whales, given that their dark coloring and lack of a dorsal fin make them difficult for even the most experienced observers to sight.



Marine crew Judith Matz listens to the hydrophone to log acoustic detections. Photo: Andrea Spence / © IFAW

To conduct our 2023 surveys, the Eastern Seaboard of the US Atlantic coast was divided into several survey blocks. Acoustic and visual surveying was conducted both on and off track, either following pre-determined survey transects or on an ad hoc basis following previous sightings. Acoustic surveys were conducted 24 hours a day across multiple hydrophones to maximize survey efforts, allowing for real-time monitoring of detections and the recording of audio files for later analysis. Visual surveying was conducted by at least two dedicated on-deck observers, atop an elevated platform when weather allowed, who logged key information when sightings were made. Using a thermal camera mounted on the mast, we captured video of sighted right whales. Additionally, AIS data was continuously captured to conduct a characterization of the speeds of vessels in proximity to right whales.

Survey results

Visual sightings

15,781 kilometers (about 9805.86 miles) of survey effort was realized between January 11 and November 18, 2023. Throughout the study period, there were 449 confirmed sightings of cetaceans, pinnipeds, turtles, and large fish species, of which 209 were cetacean sightings and 25 were right whale group sightings. Baleen whale encounters predominately occurred in the Great South Channel and the western Gulf of Maine.

The North Atlantic right whale group sightings can be loosely defined as nine discrete aggregations, or sightings made within a few kilometers or hours of each other, and thus likely within acoustic range of each other. Right whale sightings accounted for at least 32 individuals, including two mother-calf pairs, Archipelago (New England Aquarium catalog #3370) and her 2022 calf, and Porcia (#3293) and her 2022 calf. Other individuals identified in the field include Salem (#3617), Sebastian (#4650), and Nimbus (#3812). Photos of whale sightings were submitted to the New England Aquarium for identification of catalogued individuals.

Acoustic detections

Recordings were made of species encounters across the study area, including North Atlantic right whales. Definite right whale vocalizations were evident for five of nine aggregations, and an additional 12 acoustic encounters were recorded for unseen individuals. A total count of 306 right whale calls were recorded, differentiated by frequency variations,

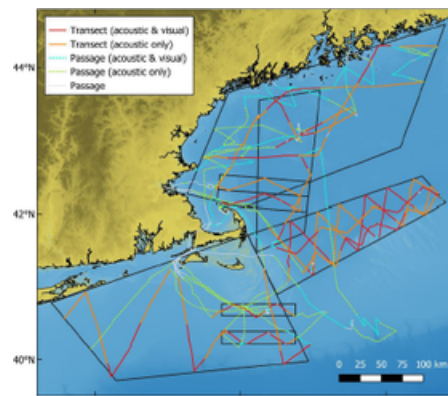
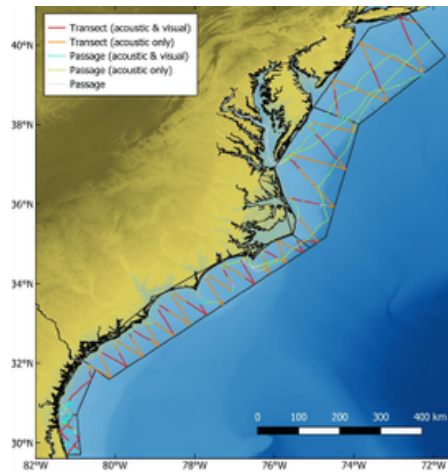


Figure 1. Realized survey effort from Florida to Long Island (top) and Long Island to the Gulf of Maine (bottom).

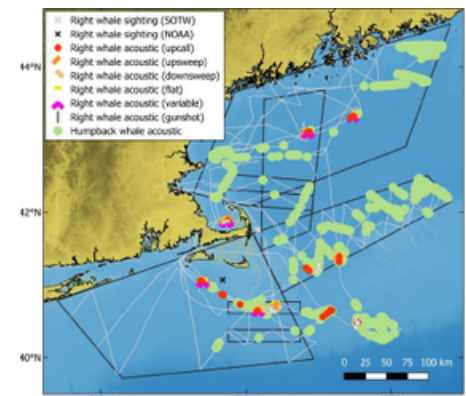
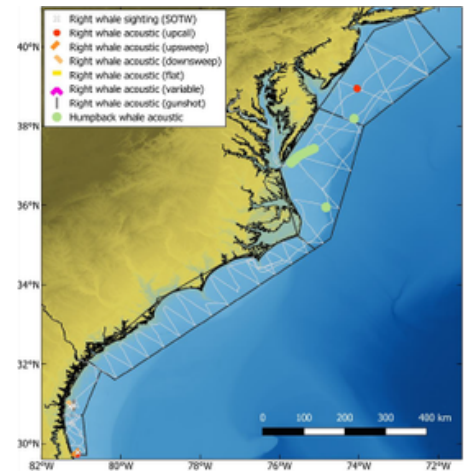


Figure 2. Summary of all North Atlantic right whale sightings and acoustic detections from Florida to Long Island (top) and Long Island to the Gulf of Maine (bottom), with humpback acoustic detections for comparison.

including upcalls, upsweeps, downsweeps, flat calls, gunshots, and 'variable' frequency sweeps. Vocalization rates were low in southern waters, as in previous studies, but began to increase in waters from north of Delaware Bay

to the Gulf of Maine, where call rates were moderately high. Survey efforts indicate that the Gulf of Maine is still being used by North Atlantic right whales in early summer and early fall by all age classes of right whale.

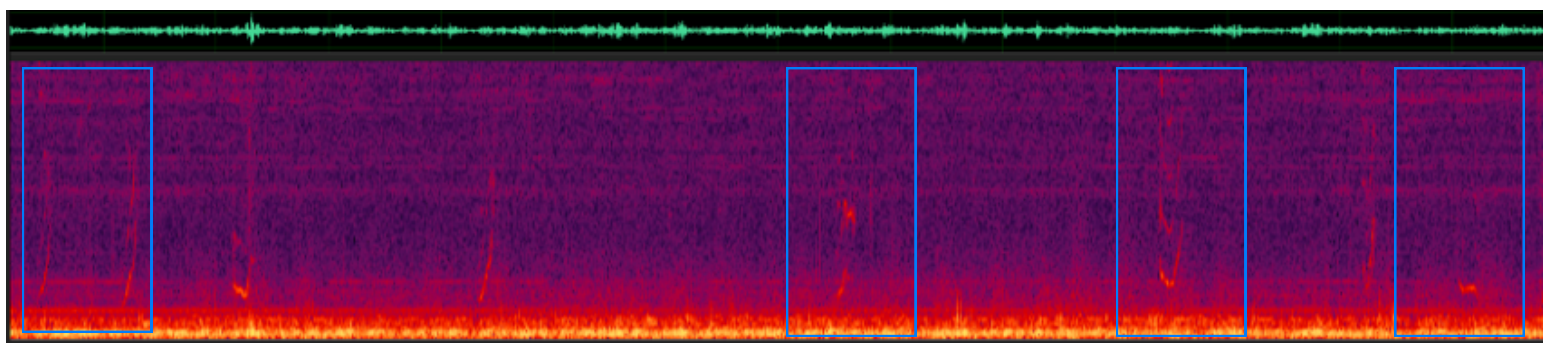


Figure 3. Examples of different right whale vocalizations recorded on March 16. Nine calls are shown in the main plot over approximately 2 minutes 20 seconds. Outlined in blue, from left to right are two upcalls, two variable calls, and a flat call.



A North Atlantic right whale shows scarring from prior run-ins with gear/boats as it flukes in Cape Cod Bay as seen from Song of the Whale. © Marine Conservation Research, NOAA/NMFS permit #21371-01.

15,781 km

of survey effort between January 11 and November 18, 2023

449

sightings of cetaceans, pinnipeds, turtles, large fish species

209

sightings of cetaceans

25

North Atlantic right whale group sightings of at least 32 individuals

Vessel speeds

AIS data were collected during the survey to identify large vessels traveling at speeds over 10 knots near right whale encounters. While on the water, the speed and course of each unique vessel was sampled once per day at the point of closest approach. Vessels equipped with Class A systems, typically larger, commercial vessels, were the most numerous detections and typically the fastest, with speeds over 30 knots routinely detected. Vessels equipped with Class B systems, typically recreational vessels with lower transmission power, traveled at varying speeds; cargo ships primarily traveled at 10-15 knots. Fishing vessels, sailing vessels, and pleasure craft were typically encountered at speeds of less than 10 knots.

Areas with the highest quantity of fast vessels were typically entrances to river systems and/or ports; for example, vessels traveling at over 20 knots were often encountered in the mouths of the Chesapeake, Delaware Bay, and on the approaches to New York.

When considered in relation to the sightings and acoustic detections of right whales made from Song of the Whale, vessels moving at speeds greater than 10 knots were evident in the vicinity

of most of the encounters, including Brunswick (Georgia), Delaware Bay, south of Nantucket and Martha's Vineyard, the Great South Channel, and the Gulf of Maine.

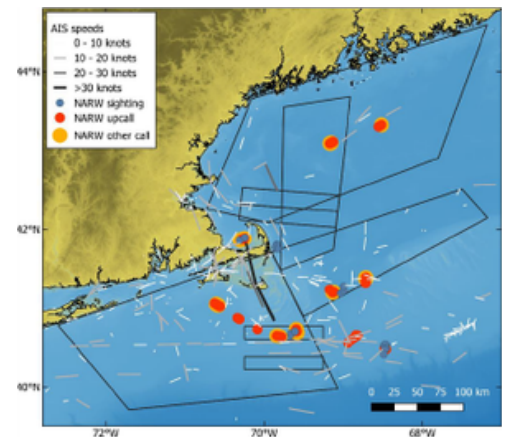
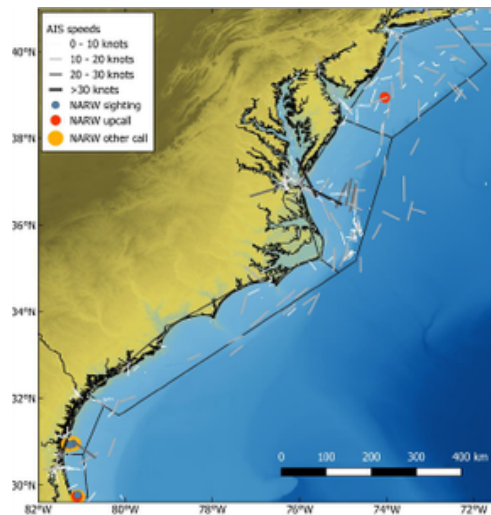


Fig 4. AIS data for vessels detected from Florida to Long Island (left) and Long Island to the Gulf of Maine (right). Vectors show vessel heading, with arrow length representing speed over ground in knots. Vessels were sampled once per day when closest to Song of the Whale.

Discussion

Climate change

Human-induced climate change has caused a global increase in sea surface temperature, with 2023 having the warmest temperatures ever recorded. Oceanographic changes in the Northwest Atlantic, with the Gulf of Maine warming faster than 99% of the global ocean, are contributing to right whales' increased susceptibility to the deadly threats of entanglement and vessel strikes. Right whales' shifting distribution can likely be attributed to changes in the abundance and location of their copepod prey, which has led them to occupy areas with fewer protections.

Understanding the temporal and spatial distribution of North Atlantic right whales allows for more effective protections. *Song of the Whale's* surveys indicate presence of right whales in both of their critical habitats, off the coast of New England and the US southeast, and support research that right whales are spending more time year-round in southern New England shelf waters. Continued survey efforts are crucial for ensuring the most accurate management of critical right whale habitats.

Entanglement

One of the leading causes of mortality and serious injury to North Atlantic right whales, entanglement in fishing gear prevents whales from moving freely. As injuries from entanglements worsen over time, whales die slow, painful deaths. It is estimated that over one million vertical lines, lines connecting a surface buoy to a trap on the sea floor, are deployed in right whale migration and feeding areas off the US and Canadian East Coast.

To protect right whales from this deadly threat, NOAA Fisheries implements seasonal area closures of trap/pot fisheries in specific New England waters during critical seasons. *Song of the Whale* surveyed several of these regions during seasonal closures to determine if they were effectively protecting right whales.

In March, the *Song of the Whale* team had sightings and acoustic detections of right whales within both the Massachusetts Restricted Area and South Islands Restricted Area (in effect annually from February 1 through April 30). The cluster of sightings circled in green on Figure 5 occurred on March 23, less than 50 kilometers (30 miles) from the border of the South Island Restricted Area within the EEZ Offshore Management Area 3.

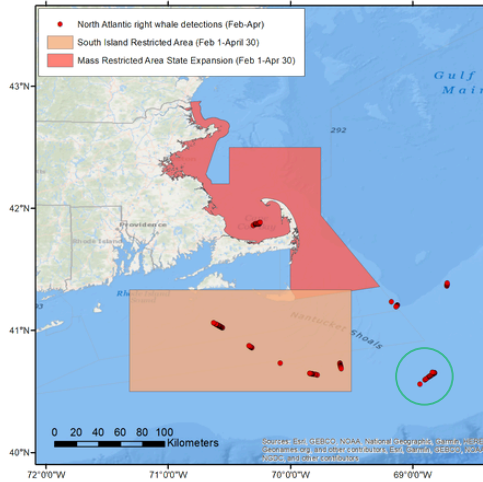


Fig 5. North Atlantic right whale detections made in and adjacent to the South Islands and Massachusetts Restricted areas during their active seasons.

Similarly, surveys in April and May returned detections of right whales in the Great South Channel Restricted Area (in effect annually from April 1 to June 30). Figure 6 shows detections within the restricted area on April 28, April 30, and May 13 - indicating that right whales stay active in the region over time. A cluster of detections circled in green (May 14) occurred roughly 80 kilometers (50 miles) away from the border of the restricted area, within the EEZ Offshore Management Area 3.

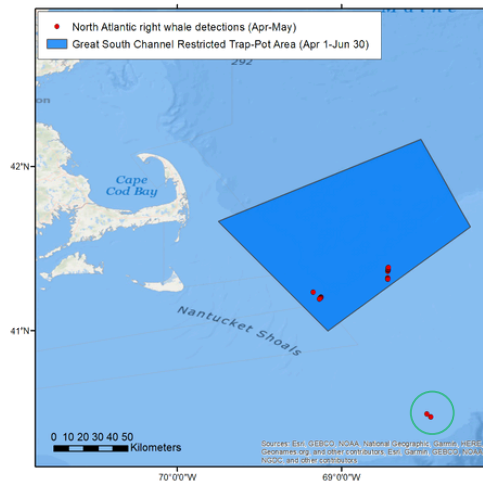


Fig 6. North Atlantic right whale detections made in and adjacent to the Great South Channel Restricted Area during its active season.

In November, *Song of the Whale* recorded acoustic detections of right whales both inside and outside of Lobster Management Area 1 (LMA 1 - in effect annually from October 1 to January 31). Figure 7 shows two discrete clusters of definitive calls detected within the LMA

(November 15) and over eight kilometers (five miles) away (November 17).

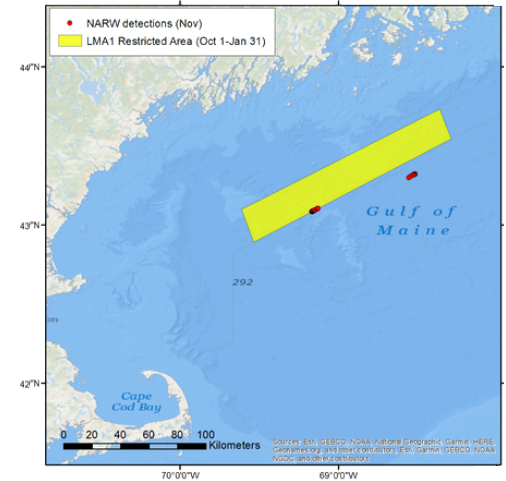


Fig 7. North Atlantic right whale detections made in and adjacent to LMA 1 during its active season.

Continued evidence of right whale presence in active restricted areas is critical for reinforcing the need to remove vertical lines from these areas. However, repeated detections of right whales outside active restricted areas demonstrate whales are also present in fishing grounds beyond the boundaries of protected waters. Notably, the proximity of sightings made in November within and adjacent to LMA 1 indicate that this restricted area is not providing protection for all whales in the Gulf of Maine and could be expanded.

To ensure the livelihoods of those working within restricted waters, IFAW works closely with fishermen, gear manufacturers, and scientists to test, refine, and promote acoustic, on-demand fishing technology; a cutting-edge, innovative technology that removes the need for the vertical buoy rope. By removing the need for vertical buoy rope, this gear protects right whales from the risk of entanglement while allowing fishermen to continue maintaining their livelihoods and fishing traditions.

Vessel strikes

Migrating through regions of heavy vessel traffic and spending a lot of time at the water's surface, right whales are particularly susceptible to the threat of vessel strikes. Strikes caused by vessels of all sizes pose a risk to right whales, causing blunt or sharp force trauma that often leads to serious injury and death. To protect right whales from this lethal threat, NOAA

enacted the North Atlantic right whale vessel speed rule in 2008, which established 1) seasonal management areas requiring vessels 65 feet (19.8 meters) and over to travel at 10 knots or less in critical habitats during key seasons, and 2) dynamic management areas triggered by visual sightings of North Atlantic right whales with voluntary speed restrictions. Reducing vessel speeds to 10 knots is estimated to reduce the likelihood and lethality of vessel strikes for North Atlantic right whales by 80 to 90%.

The *Song of the Whale* crew surveyed the range of right whale habitat in US waters, from Florida into the Gulf of Maine, including several active Seasonal Management Areas (SMAs), providing data on the effectiveness of these zones in protecting right whales from vessel strike risk.

Southeast SMA

Active between November 15 and April 15, *Song of the Whale* detected right whales within and adjacent to the Southeast US SMA between January 17 and 21 (see Figure 8). These waters make up the calving and breeding grounds of the right whale population and are home to several of the busiest ports in the US. Mother-calf pairs are critical to the survival of the North Atlantic right whale species but are at heightened risk of vessel strikes due to spending nearly all their time close to the water's surface. Protecting them during the calving season is paramount, yet the current SMA network does not reflect the entirety of their habitat.

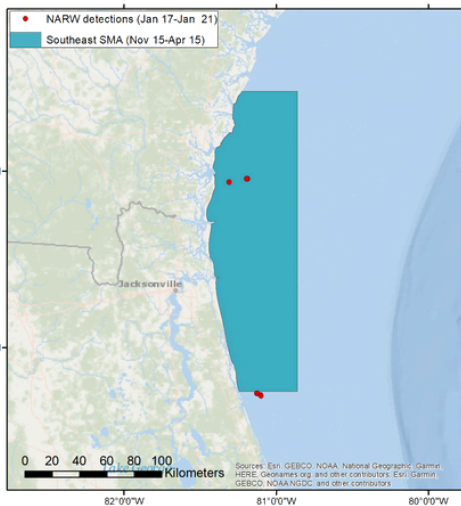


Fig 8. North Atlantic right whale detections made in and adjacent to the Southeast SMA during its active season.

Mid-Atlantic SMA

The Mid-Atlantic SMA, active from November 1 to April 30, is made up of several discrete zones

based around key ports and channels. Right whale detections made between February 21 and April 30 are shown in Figure 9. The Block Island Sound SMA is a particular region of concern; there were a significant number of discrete detections of right whales near the SMA in unprotected waters.

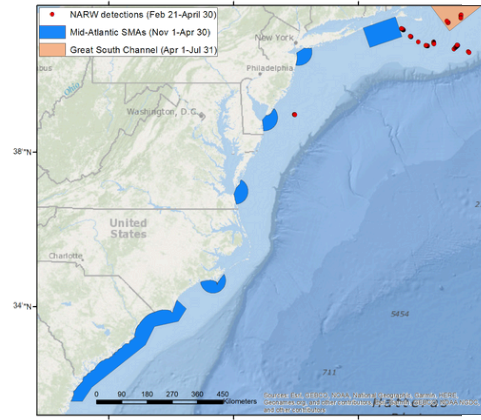


Fig 9. North Atlantic right whale detections made adjacent to Mid-Atlantic SMAs during their respective active seasons. Also shown is the Northeast Great South Channel SMA due to its proximity to sightings made off the Block Island SMA.

Northeast SMAs

There are three SMAs in the US Northeast, differentiated by their active seasons. Cape Cod Bay SMA is active January 1 through May 15, Off Race Point SMA is active March 1 through April 30, and Great South Channel SMA is active April 1 through July 31. *Song of the Whale* had frequent right whale detections in this region from March 15 to May 14 (see Figure 10). While this region is noted for its high compliance with vessel speed restrictions, there were numerous detections made during this period outside of

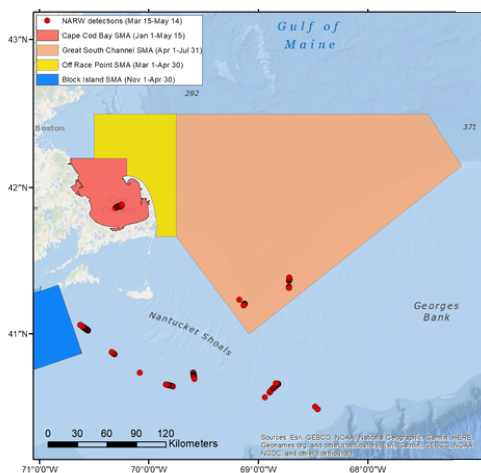


Fig 10. North Atlantic right whale detections made in and adjacent to Northeast SMAs during their respective active seasons. The Mid-Atlantic Block Island SMA is shown due to its proximity to sightings.

any SMA, where right whales do not receive formal protection from mandatory speed reduction rules.

2022 proposed changes to North Atlantic right whale seasonal speed zones

In 2022, NOAA released proposed amendments to the North Atlantic right whale vessel speed rule to further reduce the likelihood of mortality and serious injury resulting from vessel strikes. Updates include changing the spatial and temporal boundaries of mandatory SMAs to more accurately address regions and times of high vessel strike risk, including vessels 35 feet (10.7 meters) and greater in size within speed restrictions, and implementing mandatory dynamic speed zones instead of voluntary. *Song of the Whale's* right whale detections support the need for this update, given the quantity of detections outside current SMAs. Almost all detections would be included within the proposed bounds of an updated SMA, as shown in Figure 11, indicating the new bounds would more accurately reflect whale presence.

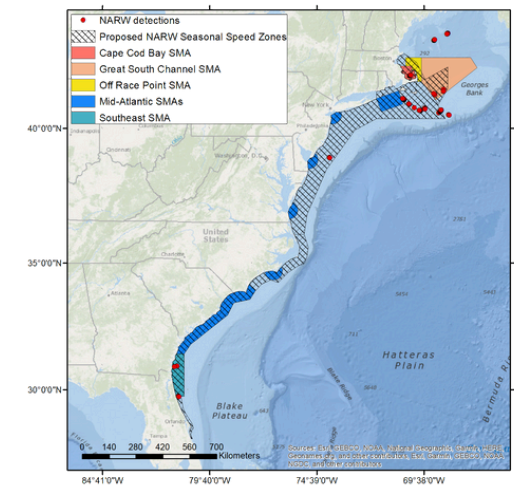


Fig 11. Proposed North Atlantic right whale seasonal speed zones overlaid over current SMAs and *Song of the Whale's* right whale detections.

There has been significant pushback on the proposed rule, leading to multiple bills and amendments that would stop the proposed rule from being put in place. IFAW led a coalition of groups in laying the groundwork to protect from these legislative attacks, organizing and meeting with congressional and federal offices and hosting a fly-in and briefing for key stakeholders. We work to innovate new boater awareness technologies to reduce vessel strike risk, and work on the ground in coastal communities to educate the public on the risks posed by vessel strikes to boaters and North Atlantic right whales.



A North Atlantic right whale surfaces in Cape Cod Bay as seen from *Song of the Whale*. © Marine Conservation Research, NOAA/NMFS permit #21371-01.

Conclusion

Every individual North Atlantic right whale is vital for the survival of the entire species. A continued understanding of the temporal and spatial movement of whales will help us to address the lethal risk of vessel strike and entanglement—and prevent the extinction of this imperiled species. *Song of the Whale*'s surveys provide evidence of right whale activity across the Eastern Seaboard, including in areas with otherwise little systematic vessel survey effort, such as in waters south of Cape Cod and the Islands. Recordings of right whale presence in numerous speed management areas and fisheries closures support ongoing protections, but detections of right whale activity in unprotected waters suggest the need for reevaluation of current models of protection to incorporate evidence-based movement patterns.

As migration patterns continue to shift, systems for protecting whales will need to reflect the dynamic nature of whale activity. Surveys like *Song of the Whale*'s will be crucial for

determining where and when to reduce life-threatening risks, so IFAW and others can work to put better protections in place and save this critically endangered species before it's too late.

Recommendations

- ▶ Continue acoustic and visual surveying across the North Atlantic right whale migratory range, with particular attention to areas of increasing importance to the species for feeding and calving.
- ▶ Improve mariner awareness of right whale habitats, the risk of vessel strikes, and the requirement to reduce speed. Incorporate live communications and notifications to mariners entering speed zones to increase compliance in real-time.
- ▶ Support and uphold the MMPA and ESA to ensure science-based protections continue to be implemented in the future to bring this species back from the brink of extinction.

How to help?

Join us in our innovative, lasting solutions to create a world where animals and people can thrive together!

- ▶ Contact your representative and urge them to support right whale research and conservation efforts.
- ▶ Spread the word: Many people have never heard of the North Atlantic right whale. Help us build public awareness of the plight of this endangered species.
- ▶ Take part in citizen science—use the QR code to download the Whale Alert app.



- ▶ **Learn more at rightwhales.org**