

North Atlantic Right Whale Consortium

2022 Annual Report Card

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SUMMARY

Started in 1986 as a collaborative data sharing group, the North Atlantic Right Whale Consortium (NARWC) has grown to include more than 200 individuals from various research and conservation organizations, shipping and fishing industries, technical experts, U.S. and Canadian government agencies, and state and provincial authorities, all of whom are dedicated to the conservation and recovery of the North Atlantic right whale. North Atlantic Right Whale Consortium members agreed in 2004 that an annual “report card” on the status of right whales would be useful. This report card includes updates on the status of the cataloged population, mortalities and injury events, and a summary of management and research efforts that have occurred over the previous 12 months.

The population estimate for 2021 using data as of August 30, 2022 is 340 (+/- 7), eight fewer than the updated number for 2020. Fifteen mother calf pairs were sighted in 2022, down from 18 in 2021. There were no first time mothers sighted in 2022. Initial analyses detected at least 16 new entanglements in 2022: five whales seen with gear and 11 with new scarring from entanglements. Additionally, there was one non fatal vessel strike detected. No carcasses were detected. Of the 15 calves born in 2022, one is known to have died and another is thought likely to have died. Data analyses to date (2021 and 2022 still being received and processed) indicate that surveys in 2021 captured approximately 95% of the living population. Management measures to mitigate vessel strikes and entanglements were implemented in both the U.S. and Canada. Additional management measures undertaken in both countries are summarized. Lastly, a subset of publications and reports of interest is provided.

NORTH ATLANTIC RIGHT WHALE CONSORTIUM BACKGROUND

The North Atlantic right whale (*Eubalaena glacialis*) remains one of the most endangered large whales in the world. Over the past two decades, there has been increasing interest in addressing the problems hindering the recovery of North Atlantic right whales by using innovative research techniques, new technologies, analyses of existing databases, and enhanced conservation and education strategies. This increased interest demanded better coordination and collaboration among all stakeholders to ensure that there was improved access to data, research efforts were not duplicative, and that findings were shared with all interested parties. The North Atlantic Right Whale Consortium, initially formed in 1986 by five research institutions to share data among themselves, was expanded in 1997 to address these greater needs. Currently, the Consortium membership is comprised of representatives from more than 100 entities including: research, academic, and conservation organizations; shipping and fishing industries; whale watching companies; technical experts; United States (U.S.) and Canadian Government agencies; and state authorities.

The Consortium membership is committed to long-term research and management efforts, and to coordinating and integrating the wide variety of databases and research efforts related to right whales to provide the relevant management, academic, and conservation groups with the best scientific advice and recommendations on right whale conservation. The Consortium is also committed to sharing new and updated methods with its membership, providing up-to-date information on right whale biology and conservation to the public, and maintaining effective communication with U.S. and Canadian Government agencies, state authorities, the U.S. Southeast and Northeast Right Whale Implementation Teams, the Atlantic Large Whale Take Reduction Team, the Atlantic Scientific Review Group, industry, and members of the U.S. Congress. The Consortium membership supports the maintenance and long-term continuity of the separate research databases and serves as executor for database archives that include right whale sightings and photo-identification data contributed by private institutions, government scientists and agencies, and individuals. Lastly, the Consortium is interested in maximizing the effectiveness of management measures to protect right whales, including using management models from other fields.

The Consortium is governed by an Executive Committee and Board members who are elected by the general Consortium Membership at the Annual Meeting.

North Atlantic Right Whale Consortium members agreed in 2004 that an annual “report card” on the status of right whales would be useful. This report card includes updates on the status of the cataloged population, mortalities and injury events, and a summary of management and research efforts that have occurred over the previous 12 months. The Board’s goal is to make public a summary of current research and management activities, as well as provide detailed recommendations for future activities. The Board views this report as a valuable asset in assessing the effects of research and management over time.

ESSENTIAL SPECIES MONITORING AND PRIORITIES

In the 2009 Report Card to the International Whaling Commission (IWC), the Consortium Board identified key monitoring efforts that must be continued and maintained in order to identify trends in the species, as well as assess the factors behind any changes in these trends (Pettis, 2009). The key efforts are: (1) Photographic identification and cataloging of right whales in historically and emerging high-use habitats and migratory corridors, which currently include, but are not limited to, the southeast United States, Cape Cod Bay, Gulf of St. Lawrence, Great South Channel, Gulf of Maine, mid-Atlantic, southern New England, and the Scotian Shelf, (2) Monitoring of scarring and visual health assessment from photographic (including drone) data, (3) Examination of all mortalities, and (4) Continue using photo-ID and genetic profiling to monitor species structure and how this changes over time.

The Consortium Board regards the availability of Consortium databases as essential to recovery efforts for the North Atlantic right whale species. In a review of the federal recovery program for North Atlantic right whales, the Marine Mammal Commission agreed with the Board’s sentiment, stating that “both databases play critical roles in right whale conservation” and that the Identification Catalog “is the cornerstone of right whale research and monitoring” (Reeves et al. 2007). The review went on to recommend that both databases (“both” here and above refers to the [Identification and Sightings databases](#); there are several other Consortium databases available) be fully funded on a stable basis. Additionally, the Board recognizes the importance that passive acoustic monitoring has played in our understanding of right whale distribution and its potential role in mitigating anthropogenic impacts on the species. The Board strongly supports and encourages efforts to maintain the comprehensive [Passive Acoustics Cetacean Map](#) that serves as an additional resource in conservation and management efforts. The ability to implement such measures requires near real-time information on right whale distribution. To this end, the Board strongly supports the efforts to maintain the WhaleMap system (<https://whalemap.org/>) for collating and displaying near real-time whale survey and detection results.

Since 2010, right whale distribution and patterns of habitat use have shifted, in some cases dramatically. These shifts have been observed throughout the range of North Atlantic right whales and have direct implications on research and management activities, and on each of the key efforts identified above. As such, the Board believes that developing alternative survey effort strategies to respond to the distributional changes and identifying potential extralimital and new important habitats should continue to be a priority. These strategies should include efforts to not only locate, both visually and acoustically, and identify individual right whales, but also to ensure that information critical to important monitoring and management efforts (i.e. health assessment, injury and scarring assessments) is effectively and efficiently collected. **This will require a commitment to both aerial and shipboard documentation to ensure that information necessary to evaluate individuals and the species as a whole are captured.** Additionally, these dramatic shifts in distribution over relatively short periods of time highlight the need for management efforts that protect right whales not only in habitats/areas where they are currently known to frequent, but also areas to which they may shift, be it ephemeral or more stable use.

Discussions and management plans for reducing anthropogenic injuries and mortalities on right whales in both Canadian and U.S. waters are ongoing and encouraging. However, despite the relative reduction in overall mortalities in 2020-2022 and increases in births over 2020 (detailed below), the detected mortalities and serious injuries are still well above the Potential Biological Removal (PBR) of 0.7/year. Additionally, the sublethal impacts of injuries on reproduction and health are becoming clearer (Stewart et al., 2021; Knowlton et al., 2022; Moore, 2023) and yet are not adequately addressed in current management and recovery plans. Furthermore, the Consolidated Appropriations Act, 2023 (H.R.2617), passed by U.S. Congress and signed into law by President Biden in December 2022, deemed that the 2021 modifications to the U.S. Atlantic Large Whale Take Reduction Plan are sufficient to meet requirements of the Marine Mammal Protection Act and the Endangered Species Act. Those modifications, which targeted a 60% reduction in entanglement risk to right whales, are quantitatively inadequate to meet necessary risk reductions to ensure recovery of the species (NMFS, 2021). While the Act includes provisions which state that NOAA must work to develop new regulations to be in place by the end of 2028, this leaves the species without necessary and adequate

protections for the next six years. Additionally, Fisheries and Oceans Canada announced in December 2022 that the implementation timeline for lower breaking strength gear modifications in non-tended fixed gear, trap, and pot fisheries in Atlantic Canada and Quebec was extended to 2024, marking another delay in much needed protection for right whales. **Anthropogenic mortalities and injuries that have lasting sublethal effects remain a threat to the existence of North Atlantic right whales and immediate, broad-based mitigation strategies that result in significant risk reduction throughout the right whale’s range must be a priority if this species is to survive. These should include broadened mandatory speed restrictions and the transition of fixed-gear fisheries to utilize on-demand fishing technologies.**

2022 SPECIES STATUS

The ability to monitor North Atlantic right whale vital rates and anthropogenic impacts is entirely dependent on the North Atlantic Right Whale Identification Database (Catalog), curated by the Anderson Cabot Center for Ocean Life at the New England Aquarium. As of August 30, 2022, the database consisted of over two million slides, prints, and digital images collected during the 89,925 sightings of 781 individual right whales photographed since 1935. Each year, ~2,000 to 5,000 sightings consisting of 50-250,000 images are added to the identification database.

Right Whale Species Estimate 2021

Since 1990, using Catalog data, a number of methods have been employed to estimate the number of North Atlantic right whales alive annually, including the Catalog Method, Presumed Alive Number, Minimum Number Alive, and most recently, the Pace et al. (2017) model. Beginning with the 2021 report card, we only present the single, most accurate assessment method, based on the Pace et al. (2017) model. The move to present a single estimate was based on several considerations. First, previous methods suffered from uncertainties that were difficult to quantify, and frequently led to public misunderstanding about what those numbers represented. Additionally, several of the previous population estimates, such as the Minimum Number Alive, were known to be less accurate towards the end of the time series (i.e. for the previous year or two).

The Pace et al. (2017) model “adapted a state-space formulation with Jolly-Seber assumptions about population entry (birth and immigration) to individual resighting histories and fit it using empirical Bayes methodology.” This model estimate accounts for whales that have not been photographed and the full methodology is available in the paper. The model is run annually using updated Catalog data.

The Pace et al. (2017) estimate for 2021 is **340 whales** (95% confidence range +/- 7) using data as of August 30, 2022. Additionally, the model estimate run resulted in slight changes to population estimates for previous years. The estimate for 2020 changed from 336 +/-14 to 348 +/-5, with the updated estimate within the range of error of the previous estimate. The 2021 estimate of 340 individuals represents a continued downward trend for the species. North Atlantic right whales remain red listed as critically endangered by the International Union for Conservation of Nature (IUCN). This designation is made when a species is considered at high risk for global extinction. The North Atlantic right whale is the only large whale species on the list.

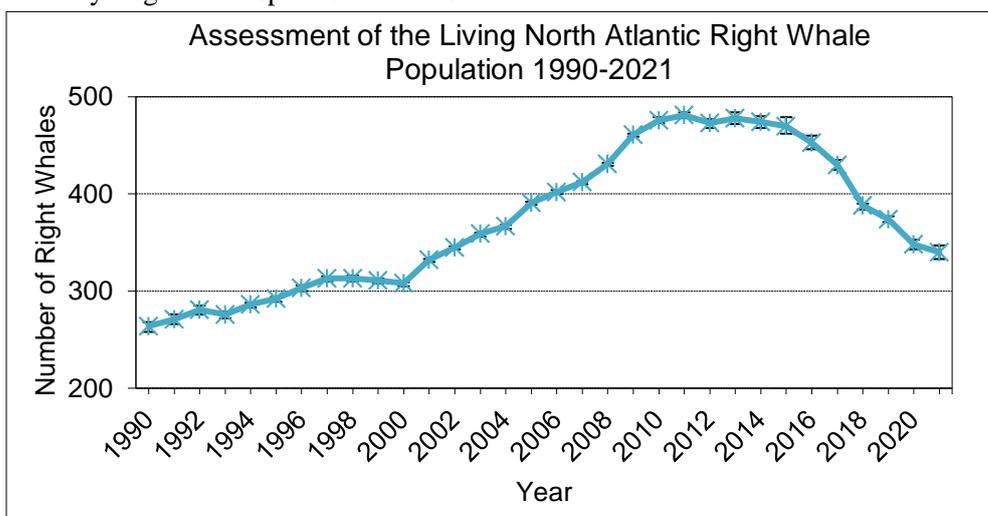


Figure 1. Assessments of the North Atlantic right whale population 1990-2021. Annual assessments are shown by a point "estimate" along with error bars which represent 95% of the posterior probability. The estimate for 2021 was 340 +/- 7. Data from the North Atlantic Right Whale Catalog as of August 30, 2022.

Pettis, H.M., Pace, R.M. III, Hamilton, P.K. 2023. North Atlantic Right Whale Consortium 2022 Annual Report Card. Report to the North Atlantic Right Whale Consortium.

www.narwc.org

How Well Are We Monitoring?

Table 1 is an annual count of sightings, unique individuals, estimated population size, kilometers of effort that have been submitted to the sightings database at the University of Rhode Island, and percent of the estimated population that is identified each year from 2000 onward (Table 1).

Table 1. Annual counts of photo-ID sightings, unique individuals, presumed living whales, survey effort (in Beaufort conditions ≤ 4), and the percentage of the population seen. Survey effort from dedicated surveys only; opportunistic sightings do not have associated effort. Additionally, the NARWC does not currently receive effort data for surveys completed by the Department of Fisheries and Oceans Canada or Transport Canada. All reported fields are updated annually with the most available catalog data. At the time of reporting, data for 2021 were still being received, processed, and analyzed. Data as of August 30, 2022.

Year	Sightings	Unique IDs	Population Estimate	Survey Effort (1,000 km)	% of Estimated Population Seen*
2000	3286	246	308	125	80
2001	3983	286	332	127	86
2002	2725	315	345	248	91
2003	2406	315	359	178	88
2004	1841	299	367	280	81
2005	3408	364	391	350	93
2006	2806	348	402	313	87
2007	3771	384	412	266	93
2008	4164	408	431	253	95
2009	4698	428	461	246	93
2010	3236	432	476	270	91
2011	3479	444	481	233	92
2012	2127	384	473	269	81
2013	1904	296	478	214	62
2014	2404	379	474	200	80
2015	1774	270	470	183	57
2016	2211	328	453	155	72
2017	3126	380	430	179	88
2018	3833	363	388	191	94
2019	4919	360	374	221	96
2020	2322	306	348	171	88
2021**	3457	323	340	290	95

*In previous Report Cards, the population estimate and resulting % presumed alive seen were based on the Catalog Method (see previous report cards for explanation). Starting with the 2020 report card, we use the Pace et al. (2017) model results as the population estimate and as the denominator for the calculation of the % estimated population seen. The population estimates are updated annually with a model run using all available data.

** The data for 2021 are not final as not all of the data for that year have been submitted and/or analyzed.

Reproduction

Fifteen mother/calf pairs were sighted in the 2022 calving season, down from 18 in 2021 (Table 2). Two calves of the year are suspected to have died. The first, born to right whale #1301, was first observed on January 18, 2022 on the southeast calving ground in poor body condition. The calf was last sighted on January 31, 2022 on the calving ground. On April 15, 2022, #1301 was sighted in Cape Cod Bay without her calf. Given the poor condition of #1301's calf at

its last sighting, the calf is believed to have died. This is the fifth consecutive calf that #1301 has lost shortly after birth. The reason for these calf losses are unknown.

The second calf was born to right whale #3560 who was entangled when she gave birth. The pair were seen together on the southeast calving grounds and then in March and April 2022 in Cape Cod Bay. On July 22, 2022, #3560 was sighted in the Gulf of St. Lawrence, still entangled, in declining condition, and without her calf. She was sighted again with a new entanglement (see below), still without her calf, and in extremely poor condition on September 21, 2022 in Southern New England waters. The fate of the calf is uncertain, though given the poor body condition of #3560 during her spring and summer sightings, there is concern that the calf did not survive.

Right whale births remain significantly below what is expected and the average inter-birth interval remains high. Additionally, there were no first-time mothers in 2022, underscoring recent research findings that fewer adult, nulliparous females are becoming reproductively active (Reed et al., 2022).

Table 2. Summary of mother/calf pairs sighted and associated inter-birth interval times for North Atlantic right whales from 2009-2022. The number of available cows, defined as females who have given birth to at least one previous calf, were seen in the last 6 years, and have not given birth in the last two years, are followed by the percentage of available cows to successfully calve. First time mothers are now included in the available to calve count.

Year	Calf Count	Available Cows/ % that calved	Average Interval (yrs)	Median Interval (yrs)	Min/Max Interval (yrs)	First time Moms
2009	39	59/66.1%	4.0	4	2/6	8
2010	19	46/32.2%	3.3	3	2/5	4
2011	22	49/37.3%	3.7	3	2/6	3
2012	7	65/11.9%	5.4	4	4/10	2
2013	20	84/33.9%	4.6	4	2/8	7
2014	11	86/18.6%	4.4	4.5	2/7	1
2015	17	82/28.8%	5.5	6	4/7	4
2016	14*	84/16.7%	6.6	7	4/9	4
2017	5	74/8.5%	10.2	8	7/20	0
2018	0	78/0.0%	-	-	-	-
2019	7	89/11.9%	7	7	3/10	1
2020	10	80/16.9%	7.6	7	4/11	1
2021	18	72/30.5%	9.2	10	5/11	6
2022	15	56/25.4%	7.7	8	2/13	0

*There were 14 mothers seen with calves in the 2015/2016 season, however, due to a three-way calf switch that included the presumed loss of one calf that was never photographed, only 13 calves were photographed.

Mortalities

In 2022, **zero** right whale mortalities were **detected** for the first time since 1985 (Figure 2). Although detected mortalities represent a fraction of actual mortalities (Pace et al., 2021) the zero detection in 2022 is encouraging.

Although there were no documented deaths in 2022, the Consortium Board wishes to reiterate that it recognizes necropsies as significant data collection events that provide valuable information on which management and conservation measures can be (and have been) based. The Board views consistent necropsy response and support (both financial and personnel) as critical to monitor both right whale recovery and the efficacy of management actions.

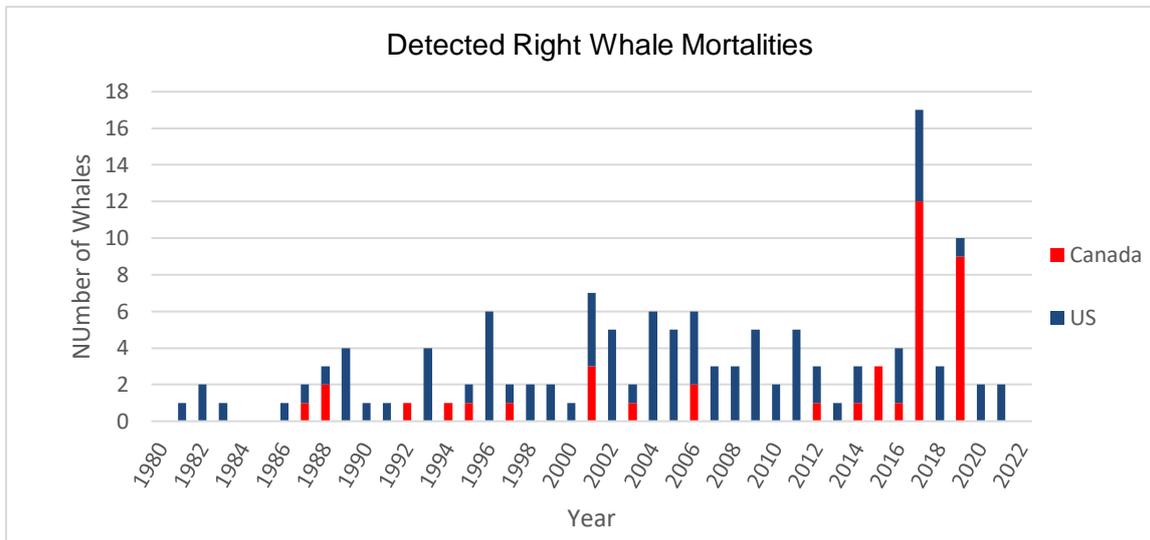


Figure 2. Number of right whale mortalities detected by year. Detections are summarized by the country in which they were made. Detected right whale mortalities represent a fraction of true mortalities and therefore these annual values are known underestimates.

Vessel Strikes, Entanglements, and Entrapments

Vessel Strikes:

There was **one** vessel strike injury documented in 2022 that was not immediately lethal (Table 3). The whale, #5012, is a two-year-old who was sighted on May 24, 2022 on George’s Bank with a series of at least four propeller wounds on its left body. Several of the wounds were raised with associated orange cyamids. The whale was sighted without the injury on March 9, 2021 in Southern New England. The whale has not been resighted since the initial injury detection.

Table 3. Right whale vessel strikes 2022. Newly reported vessel strikes with whale, location, and injury information. Dead whales first sighted with vessel strikes are not included here.

Whale #/Name	Date of First Injury Sighting	First location	Sex	Age (2022)	Comments
5012	05/24/2022	George’s Bank	U	2	A few of the cuts/wounds are raised with cyamids. Whale doesn't appear to be thin. Skin is a bit ratty/sloughed, but overall doesn't appear to be in terrible shape. Would like additional images as well as confirmation that there are any more recent pre-injury sightings to compare. Whale was last seen injury free on March 9, 2021 in Southern New England.

Entanglement and Entrapments

There were six active entanglement/entrapment cases reported between January 1 and December 31, 2022, five of which were new and one was a new entanglement case detected for a whale still entangled from a previous event (Table 4). At least five of the whales are presumed to still be entangled and their fate is uncertain.

Whales with attached gear tell only part of the entanglement story. Annual assessments of scarring show that interactions with fishing gear often occur without detection of the actual entangling gear. Ongoing efforts to monitor anthropogenic injuries to right whales in near real time provides an assessment of the minimum number of new entanglement events seen annually without attached gear but with injuries of concern. While still in preliminary analyses, there were at least **11** additional entanglement events in Canadian and U.S. waters in 2022 resulting in notable wounds/scars only, highlighting the ongoing nature of this anthropogenic threat to the species throughout its range and the shortcomings of current management strategies. While the precise location for these events cannot be determined, the locations of, and timeframe between, pre-injury sightings and injury detections does provide useful information on the area/region where events might have occurred (Table 5).

Table 4. Right whale active entanglements and status updates 2022. Newly reported active entanglements (carrying gear) and updates to previously reported entanglements are in **bold**. Dead whales first sighted entangled at death are not included here. However, whales sighted alive as entangled and later dead are included.

Whale #/Name	Date of First Entanglement Sighting	First location	Sex	Age (2022)	Comments
3560/Snow Cone	03/10/2021 09/21/2022	Cape Cod Bay South of Nantucket	F	17	Entangled with gear. Partially disentangled, removed ~300ft of line. Resighted multiple times between May and August 2021 in the Gulf of St Lawrence and additional rope was removed. Whale was resighted 10/24/2021 in Southern New England and again on 12/02/2021 off the coast of Georgia with a calf. Two short lengths of line (less than a body length) anchored in the mouth remains on the whale with an embedded wrap in forward part of rostrum. #3560 was sighted in April and May 2022 in Cape Cod Bay with her calf. On 07/22/2022, she was sighted in the Gulf of St. Lawrence without her calf and her body and skin condition had declined. On 09/21/2022, #3560 was resighted without her calf, with her original entanglement and a new attached set of entangling gear. Her condition had declined significantly with decreased body condition and increase orange cyamid load visible from the air.
3823/Sundog	05/19/2022	Gul of St. Lawrence	F	14	The whale appears to have a pass of line through the mouth leading to a possible bridle under the chin. One portion of the line continues hundreds of feet aft of the whale where it terminates at a bullet buoy and polyball. Due to way the line behaves in the images, and no observable bitter end it is assumed that the other end of the line has some form of weight present. The condition of the animal appears fair, with rope burn, opening of old wounds (the whale has had prior entanglements), and new wounds around the rostrum. Line is not currently present where some of these new wounds are suggesting that the entanglement configuration has shifted a bit since the event began. Previously sighted gear free on 03/11/2022 in Cape Cod Bay.
1403/Meridian	06/30/2022	Gulf of St. Lawrence	M	38	There is a single wrap of rope around the body aft of the middle of the body. There did not appear to be any chafing on the skin in the vicinity of the rope. The rope appears taught, tight enough to not be moving or chafing skin but not embedded. The rope is furthest back on the dorsal ridge and appears pulled forward on both sides indicating that the rope is either in the mouth or around the flippers. Resighted 07/07/2022 in the Gulf of St. Lawrence still entangled. Previously sighted gear free on 03/07/2022 in Cape Cod Bay.
2021 Calf of 3720	08/20/2022	Gulf of St. Lawrence	F	1	Whale sighted entangled ~50miles east of Shippagan, NB. The whale appears to have been free-swimming with its entanglement. Documentation indicates that the whale has at least one wrap of line around the peduncle and fluke blade, two small floats and perhaps 200' of line in tow. The trailing line appears to be at the surface when the whale is at the surface. The whale may have been feeding at the time of the sighting and wounds at the peduncle indicate that this is not likely a fresh entanglement. Previously sighted gear free on 03/11/2022 in Cape Cod Bay.
4501	08/24/2022	Gulf of St. Lawrence	M	7	Whale entangled with at least one wrap around the body and another forward of the peduncle. The entanglement likely occurred very recently (that day or the previous day) given its behavior (very fast swimming, partial rolls, fluking frequently) and evidence of blood at the wound on the peduncle. By the end of the initial sighting, the two body wraps are gone and the whale continues very fast swimming. There is no way to determine whether it was still entangled (the flipper and mouth were not seen). It had very minor abrasions on the body and peduncle. – whales often have extensive grey skin abrasions and peduncle abrasions from struggling against gear. Its behavior of surfacing and sinking or fluking in the same area suggests there may still be weighted gear attached. Previously seen gear free on 08/06/2022 in the Gulf of St. Lawrence.

Table 5. Newly detected right whale entanglement events evidenced by wounds/scars only. These cases represent a **minimum** number of new events for 2022 and are meant to inform near real time monitoring efforts for injury impacts on right whale health, stock assessment reports, and morbidity information for the Unusual Mortality Event. A full injury analysis of all right whale sightings for the year will be completed once all data are received and processed.

Whale #/Name	Pre-Injury Date	Pre-Injury Location	Injury Detection Date	Injury Detection Location	Sex	Age (2022)	Comments
2021 Calf of 3020	01/13/2022	North Carolina	03/05/2022	Cape Cod Bay	M	1	Entanglement wounds on peduncle, left fluke insertion, and right lip.
4042	03/05/2022	Cape Cod Bay	05/06/2022	Massachusetts Bay	M	12	Entanglement wounds on peduncle and head.
3401/Tux	03/26/2022	Cape Cod Bay	05/20/2022	Gulf of Maine	M	18	Entanglement wounds on peduncle and leading fluke edges. Several wounds open and raw, particularly right leading fluke edge.
2753/Arpeggio	02/10/2022	SEUS	06/06/2022	Gulf of St. Lawrence	F	25	Entanglement wounds on peduncle, leading fluke edges.
2022 Calf of 2753	02/10/2022	SEUS	08/15/2022*	Gulf of St. Lawrence	Unk	calf	Entanglement scars on peduncle. This area can't clearly be seen in the 06/06/2022 photos of the calf, but scars are clearly visible in images taken on 8/15/2022 in the Gulf of St. Lawrence.
4650/Sebastian	05/26/2022	Gulf of St. Lawrence	07/08/2022	Gulf of St. Lawrence	M	6	Severe wounds on peduncle and leading edges. Wounds are open and raw. Head and lip wounds as well.
4917	02/11/2022	Cape Cod Bay	07/08/2022	Gulf of St. Lawrence	F	3	Entanglement wounds on peduncle and left leading fluke edge
3191	06/15/2022	Gulf of St. Lawrence	07/15/2022	Gulf of St. Lawrence	M	22	Entanglement wounds on peduncle. Wounds are open and raw.
3579	05/12/2022	Gulf of St. Lawrence	07/18/2022	Gulf of St. Lawrence	M	17	Severe wounds on peduncle, fluke insertions, and leading fluke edges
2642/Echo	05/12/2022	Gulf of St. Lawrence	07/18/2022	Gulf of St. Lawrence	F	26	Entanglement wounds on dorsal and ventral ped, left leading edge. Open and raw.
4310	08/23/2022	Gulf of St. Lawrence	12/22/2022	Florida	F	9	Entanglement wounds on peduncle, leading fluke insertions. Wounds are open and raw.

AERIAL AND VESSEL-BASED SIGHTING SUMMARY: 2021

Prior to the 2017 Report Card, sighting information was reported for the time period following the previous NARWC Annual Meeting. However, that reporting included the current year for which not all data has necessarily been received and/or processed. Therefore, beginning with the 2017 Report Card, sighting summaries will be presented for the *previous* calendar year. Cataloged sighting information for the year 2021 (data as of August 30, 2022) is summarized below (Table 6) and includes survey, research, and opportunistic sightings. Months with sightings, survey types, and major contributing organizations (>10% total sightings for region) are listed.

Major Contributing Organizations (*Indicates individual contributor)

AMTU*: Amy Tudor
AS: Associated Scientists
CCS: Center for Coastal Studies
CMARI: Clearwater Marine Aquarium Research Institute
CWI: Canadian Whale Institute
DFO: Fisheries and Oceans Canada
FTR: Fundy Tide Runner

FWRI: Florida Fish and Wildlife Research Institute
GDNR: Georgia Department of Natural Resources
JOST*: Joni Stryde
NEAq: New England Aquarium
NEFSC: Northeast Fisheries Science Center
QLM: Quoddy Link Marine
TC: Transport Canada

Table 6. Summary of 2021 right whale sightings by habitat region as defined in the Catalog Database. Analyses for 2022 data are ongoing and therefore the data presented here should not be considered complete.

Region	# Sightings	Sighting Months	Survey types/activities	Organizations
Bay of Fundy	5	May, Aug	Opportunistic	AMTU*, DFO, FTR, JOST*, QLM
East (East of Mainland US (Azores, Nova Scotian Shelf, Spain, Bermuda, Canary Islands))	1	May	Opportunistic	TC
Gulf of Maine	49	Feb, Apr, Jul-Aug, Oct-Nov	Aerial surveys	NEAq, NEFSC
Great South Channel	106	Mar - May, Sep, Dec	Aerial surveys	CCS, NEAq, NEFSC
Mid-Atlantic (includes south of Cape Cod)	402	Jan – Apr, Aug, Oct-Dec	Aerial surveys	CMARI, NEAq, NEFSC
New England (Massachusetts Bay/Cape Cod Bay)	1192	Jan – May, Aug-Sep	Aerial and Vessel surveys, biopsy and habitat sampling, drone photogrammetry, whale watch, opportunistic	CCS, NEAq, WHOI
North (North of latitude 46 degrees including Newfoundland, Gulf of St. Lawrence, Iceland)	1235	Apr - Nov	Aerial and Vessel surveys, drone photography	CWI, DFO, NEAq, NEFSC, TC
Southeast United States	466	Jan - Mar, Dec	Aerial and Vessel surveys, biopsy and drone sampling	AS, CMARI, FWRI, GDNR

MANAGEMENT AND MITIGATION ACTIVITIES

The following management summaries were submitted by the National Marine Fisheries Service (NMFS), Department of Fisheries and Oceans Canada (DFO), and Transport Canada (TC) for inclusion in the 2022 NARWC Annual Right Whale Report Card.

Note: Because the summary provided by NMFS below is linked to pages that will update with post-2022 information, listed below is a subset of key management activities undertaken in 2022. Additionally, while not yet available, NMFS anticipates a summary of DMAs and Slow Zones previous to those that are currently active, to be available via their [Reducing Vessel Strike page](#).

1. An [Unusual Mortality Event](#) remains in place for North Atlantic right whales. Between 2017-2022, 92 right whale mortalities, serious injuries, and morbidity cases have been documented, including six in 2022 (analyses are ongoing).
2. In October 2022, NOAA Fisheries and the Bureau of Ocean Energy Management released a joint draft [North Atlantic right whale and Offshore Wind Energy strategy](#). The public comment period for the strategy closed on December 5, 2022.
3. In September 2022, NOAA announced a notice of intent to prepare an Environmental Impact Statement on Phase 2 modifications to the Atlantic Large Whale Take Reduction Plan. The comment period for public input closed on October 11, 2022.
4. In July 2022, NOAA Fisheries announced [proposed changes](#) to the North Atlantic right whale vessel speed rule to further reduce the likelihood of mortalities and serious injuries to right whales from vessel collisions. Proposed changes sought to address:
 - Misalignment between areas and times of high vessel strike risk and current Seasonal Management Areas spatial and temporal bounds

- Lack of mandatory speed restriction on vessels between 35 and 65 feet in length that present a lethal threat to right whales

Additionally, proposed changes to the rule also included

- Creation of a mandatory Dynamic Speed Zone program establishing temporary 10-knot transit zones when right whales are detected outside designated Seasonal Speed Zones
- Updates to the rule's safety provisions, allowing vessels to exceed the 10-knot restriction in limited circumstances

The comment period for the proposed changes closed October 31, 2022.

5. In July 2022, NOAA Fisheries released its draft [Ropeless Roadmap: A strategy to Develop On-Demand Fishing](#) for public comment. The report outlines the current state of on-demand fishing and outlines a path for increasing adoption of the technology in Northwest Atlantic commercial fisheries. As of December 31, 2022, the comment [form](#) remains open.
6. In July 2022, NOAA Fisheries solicited public input on its [draft revisions](#) to the Process for Injury Determination, Distinguishing Serious from Non-Serious Injury of Marine Mammals (NMFS Procedural Directive (PD) 02–038–01). The comment period closed August 19, 2022.
7. [2021 Atlantic Large Whale Take Reduction Plan Phase 1 Modifications](#) went into effect on May 1, 2022.
8. In March 2022, NOAA Fisheries announced an [emergency closure](#) for lobster and Jonah crab pot fishery in the area between the Massachusetts Restricted Area and Massachusetts Restricted Area North for April 2022.
9. In February 2022, NOAA Fisheries initiated a 5-year review for North Atlantic right whales, a requirement under the Endangered Species Act to ensure that the listing classification of the species is accurate. Public comment closed on May 4, 2022. Previous 5-year reviews from [2012](#) and [2017](#) are available.

NMFS Submission for the North Atlantic Right Whale Consortium Report Card 2022

In previous years, the National Marine Fisheries Service (NOAA Fisheries) has provided detailed updates on North Atlantic right whale (*Eubalaena glacialis*) science and management activities over the prior calendar year in the annual NARW Consortium Report card. However, as the breadth and pace of North Atlantic right whale science and management activities continues to increase, NOAA Fisheries is striving to provide the public with more frequent, up to date information on our activities. In this vein, in July 2022, NOAA Fisheries announced the release of the *North Atlantic Right Whale Road to Recovery*. This framework describes NOAA Fisheries' ongoing efforts to halt the North Atlantic right whale decline and encapsulates all of our ongoing work across the agency and in collaboration with our partners and stakeholders to conserve and rebuild the population. The framework is built on the foundation of the statutory requirements that NOAA Fisheries is charged with implementing under the Endangered Species Act and the Marine Mammal Protection Act.

The *Road to Recovery* complements the *North Atlantic Right Whale 2021-2025 Priority Action Plan* by identifying two related, overarching goals: (1) Address Threats to the Species and (2) Monitor Recovery Progress. Each goal has three associated objectives. Goal 1 aims to (1.1) Address Vessel Strikes; (1.2) Address Fishing Gear Entanglements; and (1.3) Address Potential and Emerging Threats, including impacts from climate change, new and expanded ocean uses, and ocean noise. Goal 2 aims to (2.1) Monitor Population and Health, (2.2) Monitor Threats, and (2.3) Monitor Effectiveness of Conservation.

Through this framework, NOAA Fisheries is demonstrating and communicating progress on major activities and associated milestones to help protect, rebuild, and conserve the North Atlantic right whale population. The *Road to Recovery* is a living resource and is updated regularly. To view the latest North Atlantic right whale updates from NOAA Fisheries you can visit our [Road to Recovery webpage](#). Archived information is available upon request.

Canadian Submission for the North Atlantic Right Whale Consortium Report Card 2022

Below is the combined submission from Fisheries and Oceans Canada (DFO) and Transport Canada (TC) identifying management measures enacted by the Government of Canada for the protection and recovery of the North Atlantic right whale.

Additional and updated information on ongoing research and management measures in Canada can be found [HERE](#).

Input from Fisheries and Oceans Canada

- Since 2017, Canada has implemented targeted management measures with the objective of protecting and recovering the North Atlantic right whale (NARW) when it is found in our waters. The NARW is listed as Endangered under Canada's *Species At Risk Act*.
- DFO has enacted fishing gear entanglement prevention measures which include: changes to the open and close date of fisheries to avoid interactions; and, the implementation of closure protocols during peak 'whale season' in areas like the Gulf of St. Lawrence, Bay of Fundy and Roseway Basin, as well as, a closure protocol throughout Atlantic Canada and Quebec year-round to address aggregations and mother and calf detections. During the NARW season these closures are supported by a comprehensive whale monitoring and detection regime which includes flights, vessels, and acoustic devices. Closure areas, some of which remain in place for several months, are adaptive and occur in areas where whales are found to aggregate.
- In 2019 Canada launched the Ghost Gear Fund, a contribution program that focuses on reducing and mitigating abandoned, lost, or otherwise discarded fishing gear (ALDFG), both in Canada and internationally. To date \$26.7M has been dedicated to fund 91 industry-led projects (10 international and 81 domestic) from 2020-2023 to address the threat of ghost gear, including the retrieval of lost gear, thereby reducing threats to vulnerable fish stocks, marine mammals, including endangered large whale species such as NARW, and vital ecosystems. These projects have engaged over 700 partners internationally and domestically, including private industry stakeholders, various levels of government and local fishing communities. In addition, the program has provided \$1.83M to outfit 39 small craft harbours in support of industry-led retrieval, storage and responsible disposal.
- To date, the program facilitated the retrieval of approximately 1,441 tonnes of marine debris and ghost gear, including more than approximately 188 km of rope from Canada's Atlantic and Pacific coasts. Thus far, 1,115 retrieval trips have been completed, retrieving 10,874 units of lost gear. Retrieval efforts have resulted in 361 units of retrieved gear returned to harvesters.
- In 2020, DFO implemented a mandatory requirement to report gear loss and to report the retrieval of gear previously reported lost to all commercial fishing licences. This information is collected and used to guide retrieval efforts and inform analyses of the ghost gear issue in Canada. These reports collect information such as the owner of the gear, the location that the gear was set, the type of gear, and the date (or timeframe) that the gear was lost.
- The Fishing Gear Reporting System (FGRS) is an online tool developed under the Ghost Gear Program that makes reporting lost fishing gear easier for commercial harvesters. Launched July 2021, the FGRS allows commercial harvesters to conveniently input a description of their lost gear, the cause of loss, and its location from any online device.
- The reporting system allows for increased reporting of lost gear which helps DFO to generate accurate gear loss hotspots maps and trends, guiding more effective retrieval efforts and identifying high-priority areas. More effective retrievals will result in larger amounts of ALDFG recovered, which will be returned to its original owner if tagged and in usable condition. To date, over 13,100 lost gear reports have been submitted, reporting 41,280 units of gear, 16 km of nets, and 532 km of rope lost.
- On September 22nd, 2022, Canada became the first country to share its lost gear reporting data with the Global Ghost Gear Initiative's global data portal. The global portal is the world's largest freely available repository of ghost gear data. The GGGI incorporates this data into their research, removal projects, and strategic recommendations for how to address ghost gear.
- In September 2022, Hurricane Fiona impacted infrastructure and communities across Atlantic Canada and Eastern Quebec. Several fisheries were active during this period and have reported significant loss of set gear that could not be removed in advance of the storm. Harvesters estimate thousands of units of gear have been lost in Eastern Canada due to gear drifting and infrastructure damage caused by the storm. 1.5M in emergency funding has been allocated towards immediate cleanup and recovery efforts of the hardest hit areas through 11 Ghost Gear Fund projects. In addition, a call for proposals to support ghost gear efforts to reduce the impacts from Hurricane Fiona in 2023-2024 is now open, with DFO providing up to 28.4M in funding. The funding will be available for projects focusing work on areas directly affected by the Hurricane.
- From April to November, 2022, temporary and season-long closures, triggered by single whale detections, covered a total 55,229.89 km² within Canadian waters. A total of 1,173 verified NARW sightings were recorded during this time (this includes duplicate sightings). Additionally, there were 88 total days of acoustic detections (with more than 1,300 NARW acoustic detections recorded).

- From April to November 2022, up to four planes from DFO and Transport Canada were monitoring different areas for right whales and potential overlap with fishing activity and vessel traffic. During this time, over 2000 hours of flights were designated for NARW monitoring.
- There were no reported right whale mortalities in Canadian waters in 2022 and 4 new entanglements (with gear present) were reported, one of which appeared to have shed gear based on subsequent sightings. The other three whales were not resighted despite significant surveillance efforts. The origin of fishing gear cannot be confirmed at this time as no gear has been retrieved and photos could not confirm US or Canadian origin of gear.
- Fisheries and Oceans has been working with the fishing industry and partners to identify gear solutions to prevent and alleviate harm to right whales from entanglements. The Department's objective is to protect right whales while also supporting sustainable fisheries. Since 2018, the Department has supported industry trials of whalesafe gear, including rope on demand fishing gear that can be used in areas closed to traditional fixed gear fishing methods because of right whale presence. Harvesters report the landing and sale of upwards of ¾ of a million pounds of snow crab caught using rope on demand gear. The use of such fishing gear is authorized under s.52 scientific licence, in areas closed to fishing under Canada's right whale closure protocols.
- In addition to rope on demand gear, trials of low breaking strength devices have been undertaken in fisheries in Eastern Canada. Canada is extending the timeline to test and implement low breaking strength fishing gear in non-tended, fixed gear and trap and pot commercial fisheries in Atlantic Canada and Quebec to 2024, so we can take the time needed to ensure that low breaking-strength fishing gear is safe, effective at protecting whales, and readily available to harvesters. The Whalesafe Gear Adoption Fund (WSGF) has provided nearly \$20 million to 34 projects that are testing and refining low breaking strength gear, rope on demand, and ropeless systems; 18 of the 34 projects are undertaking trials of rope on demand gear.
- Fisheries and Oceans has continued its annual investment of over \$1 million for marine mammal response organizations, as well as investments in science to better understand threats to right whales, and to inform future management measures. The Department has also delivered \$5.5 million over five years to build additional capacity across Canada for safe and effective marine mammal incident response. The funds were used to support necropsies, build Indigenous community response capacity, and in particular increased large whale disentanglement response capacity. Additionally, the Large Whale Disentanglement Advisory Committee has been created to discuss actions underway and planned by Fisheries and Oceans Canada (DFO) and disentanglement experts regarding the disentanglement of large whales, and to allow participants to provide advice on government decision-making, such as disentanglement training and succession planning.
- On November 22, 2022, Fisheries and Oceans Canada held the North Atlantic Right Whale Advisory Committee meeting (formerly the Roundtable) with Indigenous groups, the fishing industry, provinces, and marine mammal experts. The advisory committee meeting and other discussions with harvesters and Indigenous groups, non-government organizations and academic institutions plays an important role in the preparation of Canada's measures to protect right whales and to support sustainable fisheries for 2023 and beyond.

Input from Transport Canada

- In 2022, Transport Canada once again implemented a large mandatory static speed restriction zone covering much of the Gulf of St. Lawrence, and dynamic speed restriction zones in the shipping lanes north and south of Anticosti Island to reduce the risk of vessel collisions with the North Atlantic right whale. These measures, applicable to all vessels longer than 13m, came into force on April 20, 2022 and were in place until November 15, 2022.
- Additionally, Transport Canada instituted Seasonal Management Areas from April 20 to June 28, 2022 to expand the static speed restriction zone for part of the season.
- A mandatory restricted area covering 4,000 km² in and near the Shediac Valley to protect aggregating North Atlantic right whales was in effect from June 23 to October 7, 2022 – the area was closed to all vessels longer than 13m with exceptions for fishing vessels and certain other activities. Vessels permitted to transit in or through the zone were limited to speeds of no more than 8kn over ground.
- Transport Canada also conducted a trial voluntary slowdown for a third and last year in Cabot Strait from April 20 to June 28, 2021, and September 28 to November 15, 2022.

- Transport Canada once again incorporated a Remotely Piloted Aircraft System (RPAS or drone) and an acoustic underwater glider into its surveillance technologies to detect North Atlantic right whales to inform active management of dynamic vessel speed management measures. These two technologies complimented the surveillance flights flown by Transport Canada's National Aerial Surveillance Program (NASP).
- Transport Canada began evaluating the 2022 measures before the conclusion of the season, and continues to engage with the marine transportation industry, fishers, scientists, and other stakeholders to refine and develop measures for 2023.

2022 NORTH ATLANTIC RIGHT WHALE PUBLICATIONS/REPORTS

Reports and publications that utilized NARWC databases in 2022 and/or those of general interest to the right whale community are listed and hyperlinked (when available) below.

[Baille, L.M. and Zitterbart, D.P. \(2022\). Effectiveness of surface-based detection methods for vessel strike mitigation of North Atlantic right whales. *Endangered Species Research*, 49, pp.57-69.](#)

[Bishop, A.L., Crowe, L.M., Hamilton, P.K. and Meyer-Gutbrod, E.L. \(2022\). Maternal Lineage and Habitat Use Patterns Explain Variation in the Fecundity of a Critically Endangered Baleen Whale. *Front. Mar. Sci.*, 9, p.880910.](#)

[Ceballos, V., Taggart, C. and Johnson, H. \(2022\) Comparison of visual and acoustic surveys for the detection and dynamic management of North Atlantic right whales \(*Eubalaena glacialis*\) in Canada. *Conservation Science and Practice*, p.e12866.](#)

[Durette-Morin D, Evers C, Johnson HD, Kowarski K, Delarue J, Moors-Murphy H, Maxner E, Lawson JW and Davies KTA \(2022\). The distribution of North Atlantic right whales in Canadian waters from 2015-2017 revealed by passive acoustic monitoring. *Front. Mar. Sci.* 9:976044. doi: 10.3389/fmars.2022.976044](#)

[Estabrook, B. J., Tielens, J. T., Rahaman, A., Ponirakis, D. W., Clark, C. W., & Rice, A. N. \(2022\). Dynamic spatiotemporal acoustic occurrence of North Atlantic right whales in the offshore Rhode Island and Massachusetts Wind Energy Areas. *Endangered Species Research*, 49, 115-133.](#)

[Franklin, K. J., Cole, T. V., Cholewiak, D. M., Duley, P. A., Crowe, L. M., Hamilton, P. K., Knowlton, A.R., Taggart, C.T., and Johnson, H. D. \(2022\). Using sonobuoys and visual surveys to characterize North Atlantic right whale \(*Eubalaena glacialis*\) calling behavior in the Gulf of St. Lawrence. *Endangered Species Research*, 49, 159-174.](#)

[Frasier, B. A., Springate, L., Frasier, T. R., Brewington, S., Carruthers, M., Edvardsson, R., Harrison, R., Kitchener, A. C., Mainland, I., and Szabo, V. E. \(2022\). Genetic examination of historical North Atlantic right whale \(*Eubalaena glacialis*\) bone specimens from the eastern North Atlantic: Insights into species history, transoceanic population structure, and genetic diversity. *Marine Mammal Science*, 1–20. <https://doi.org/10.1111/mms.12916>](#)

[Garrison, L.P., Adams, J., Patterson, E.M., and Good, C.P. \(2022\). Assessing the risk of vessel strike mortality in North Atlantic right whales along the U.S East Coast. NOAA Technical Memorandum NOAA NMFS-SEFSC-757: 42 p.](#)

[Hamilton, P.K., Frasier, B.A., Conger, L.A., George, C.R., Jackson, K.A., and Frasier, T.R. \(2022\) Genetic identifications challenge our assumptions of physical development and mother–calf associations and separation times: a case study of the North Atlantic right whale \(*Eubalaena glacialis*\). *Mamm Biol.* <https://doi.org/10.1007/s42991-021-00177-4>](#)

[Hamilton, P.K., Knowlton, A.R., Howe, K.R., Marx, M.K., McPherson, K.D., Pettis, H.M., Warren, A.M., Vance, S.L., and Zani, M.A. \(2022\) Maintenance of the North Atlantic Right Whale Catalog, Scarring and Visual Health Databases, Anthropogenic Injury Case Studies, and Near Real-Time Matching for Biopsy Efforts, Entangled, Injured, Sick, or Dead Right Whales. NOAA Final Report 1305M2-18-P-NFFM-0108](#)

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- [Moore, M.J. \(2023\). Policy enabling North Atlantic right whale Reproductive health could save the species. *ICES Journal of Marine Science*, 0:1-6 DOI: 10.1093/icesjms/fsac239](#)
- [National Marine Fisheries Service. Greater Atlantic Regional Fisheries Office. \(2021\). Endangered Species Act Section 7 Consultation on the: \(a\) Authorization of the American Lobster, Atlantic Bluefish, Atlantic Deep-Sea Red Crab, Mackerel/Squid/Butterfish, Monkfish, Northeast Multispecies, Northeast Skate Complex, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Jonah Crab Fisheries and \(b\) Implementation of the New England Fishery Management Council’s Omnibus Essential Fish Habitat Amendment 2 \[Consultation No. GARFO-2017-00031\] DOI : <https://doi.org/10.25923/cfsq-qn06>](#)
- [Pace, R.M., Corkeron, P.J., Kraus, S.D. \(2017\). State–space mark–recapture estimates reveal a recent decline in abundance of North Atlantic right whales. *Ecol Evo.* 1-12.](#)
- [Pace III, R.M., Williams, R., Kraus, S.D., Knowlton, A.R. and Pettis, H.M. \(2021\). Cryptic mortality of North Atlantic right whales. *Conservation Science and Practice*, 3\(2\), p.e346.](#)
- [Pettis, H.M. \(2009\). North Atlantic Right Whale Consortium Annual Report Card \(01 November 2007 – 30 April 2009\). International Whaling Commission Annual Meeting, May 2009. Reference Document *SC/61/BRG1*.](#)
- [Reed, J.T., New, L., Corkeron, P. and Harcourt, R. \(2022\). Multi-event modelling of true reproductive states of individual female right whales provides new insights into their decline. *Frontiers in Marine Science*, p.2008.](#)
- [Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., Bonnes, D.J. \(2007\). Report of the North Atlantic Right Whale Program Review. Marine Mammal Commission. Bethesda, Maryland.](#)
- [Stewart, J.D., J.W. Durban, A.R. Knowlton, M.S. Lynn, H. Fearnbach, J. Barbaro, W.L. Perryman, C.A. Miller, and M.J. Moore. \(2021\). Decreasing body lengths in North Atlantic right whales. *Current Biology* 31\(14\):3174-3179.E3.](#)