

# **Massachusetts Large Whale and Sea Turtle Conservation Program 2019-2021**

NOAA Grant No. NA19NMF4720080

## **Final Report**

July 1, 2019 – June 30, 2021

Principal Investigator – Erin Burke

Massachusetts Division of Marine Fisheries  
836 S. Rodney French Blvd, New Bedford, MA 02740  
[erin.burke@mass.gov](mailto:erin.burke@mass.gov)

Federal Aid Coordinator – Stephanie Cunningham

Massachusetts Division of Marine Fisheries  
30 Emerson Ave, Gloucester, MA 01930  
978-282-0308 x 133  
[stephanie.cunningham@mass.gov](mailto:stephanie.cunningham@mass.gov)

Submitted to NOAA: October 2021

## **SUMMARY**

The Massachusetts Division of Marine Fisheries (DMF) in conjunction with the Center for Coastal Studies (CCS) manages the Massachusetts Large Whale and Sea Turtle Conservation Program, partially supported by the National Marine Fisheries Service (NMFS), to assess and protect large whale species found in Massachusetts state and adjacent waters. The program is comprised of three distinct yet mutually supportive long-term projects with direct conservation impact: aerial surveillance of North Atlantic right whales (*Euabalaena glacialis*) during the winter and spring in Cape Cod Bay and adjoining waters; right whale feeding habitat assessment and forecasting during the winter and spring seasons; and entanglement readiness and response year round in waters from New Hampshire to Rhode Island. Survey effort among all platforms within the study area was mutually beneficial. For example, aerial surveillance allowed for directed right whale habitat monitoring and expanded coverage for detection and documentation of entangled whales.

Three prominent events occurred during the award period, the global covid-19 pandemic limited the opportunities to collect data during the 2019-2020 field season, nevertheless, more than 80% of the estimated right whales in the North Atlantic Ocean were documented around CCB and the islands, based on the most recent presumed alive estimate available (2019) and high densities of large ctenophores and jellyfish (including Lion's Mane) were present in the early spring of both years likely depleting the zooplankton food resource of the right whales.

The Marine Animal Entanglement Response program (MAER) at CCS continued its work to document and mitigate confirmed entangled whale and sea turtle cases within its response area off Massachusetts, New Hampshire and Rhode Island. Thirty-six cases of live and dead entangled whales were discovered within this area, representing 65% of all confirmed cases discovered along the US and Canadian east coast. The program also confirmed 25 cases of entangled leatherback sea turtles off Massachusetts. The MAER team mounted thirty responses and disentangled or partially disentangled three North Atlantic right whales, eight humpback whales, one minke whale and 16 leatherback sea turtles.

The observations of the 2020 and 2021 field seasons highlight the importance of the area covered by the Massachusetts Large Whale and Sea Turtle Conservation Program as an effective capture point for a large segment of the North Atlantic right whale population, including entangled individuals; thus, the findings and actions of the program were directly supportive of diverse conservation efforts throughout the entire range of the species.

## **RIGHT WHALE AERIAL SURVEILLANCE**

During the award period, the CCS aerial survey team flew 66 surveys, with a total of 355 flight hours aboard a Cessna 337 or O-2 Skymaster. Our goals were to document the occurrence, distribution, behavior and individual identification of right whales. Our efforts were concentrated in our primary study region, Cape Cod Bay and the area east of Cape Cod. We also surveyed portions of Massachusetts Bay, and Southeast New England when circumstances dictated. Flights were predominantly conducted between December and May with additional inter-season flights conducted throughout the summer and fall. For a detailed description of aerial survey methods, including aerial track lines, please see Cetacean and Turtle Assessment Program, 1982 and Surveillance, Monitoring and Management of North Atlantic Right Whales in Cape Cod Bay and Adjacent Waters – 2009 (Leeney *et al.* 2009).

Right whales were first observed in Cape Cod Bay in January 2019 and again in December 2020 and last observed in May, typical of past field seasons. The CCS aerial team recorded 1,380 sightings of right whales during the contract period, with at least 278 individual right whales including 15 cow/calf pairs documented. One right whale, EGNO 3596, had only been sighted three times since 2012, and this was the first known documentation of this individual in Massachusetts Bay.

The peak number of individuals right whales documented in Cape Cod Bay during both 2020 and 2021 differed from the timing documented in past seasons. Unlike the usual peak of early to mid-April, in 2020, the peak during the two-year study period occurred in late February to early March, and in 2021, the peak occurrence was bimodal, with the first being observed in late March, and the second in late April. Note: for a two-week period in March 2020 no survey effort was conducted due to safety requirements during the COVID-19 pandemic.

The distribution was heavily concentrated in the mid to northeast portion of the bay during the onset of the peak in 2020, while in 2021 the dense aggregations moved, ranging between the southern to middle to northern portions of Cape Cod Bay (Figures 1 and 2). In 2021, the whales departed to Massachusetts Bay in late March, but returned by mid-April with the distribution concentrated along the western side of Cape Cod Bay.

Of the estimated living right whale population based on individual identification and the Pace model (Pace *et al.* 2017), a minimum of 80.0% (n= 285) of the population was documented by CCS (Pettis *et al.* 2018) in Cape Cod Bay and the adjacent Massachusetts waters during the award period. This number includes right whales seen by all CCS research teams (aerial, shipboard, and opportunistic land based). For the purpose of this report only individual whales matched to the catalog or given intermatch codes were considered in the total number of identified individuals; this preliminary number may increase as photo analysis continues.

Of the 285 individuals documented: 151 were male, 100 were female, and 34 were of unknown sex; 227 were adults, 42 were juveniles, and 1 was of unknown age. Twenty-nine live births were documented during 2020 and 2021 calving seasons, and of those, fifteen cow-calf pairs were

documented by CCS in the Cape Cod study area. In 2020, the first cow-calf pair was documented in Cape Cod Bay on 12 April. The first cow-calf pair was observed in Cape Cod Bay on 03 March 2021 (EGNO 3520/Millipede and calf), which is the earliest recorded arrival from the southeast calving grounds in our program's history.

Three actively entangled right whales were documented by the CCS aerial team in the reporting period: EGNOs 3466, 3560, and 3920. Two of these were the first reports of the entanglements (EGNOs 3560 in March 2021, and 3920 in October 2020), and the other was a January 2020 resighting of EGNO 3466's known entanglement from December 2019. The aerial team reported and documented the entanglements, and provided support for the disentanglement response by MAER when possible.

Of the seventy-two right whales listed as injured or in poor condition in 2019- 2020 (Pettis 2020) and the sixty-two right whales listed in 2020- 2021 (Pettis 2021), nineteen and fifteen, respectively, were photo-documented by CCS. Additionally, twenty-one individuals were submitted by CCS for consideration as new additions to the injured or in poor-condition list.

The number of individual right whales identified per 100 nm of aerial survey effort (IPUE) was 2.00 in 2020, and 3.25 in 2021. Resightings of individual right whales in Cape Cod Bay and adjacent waters were not common throughout the 2020 season (2.04 surveys on average) and residency times ranged from 1 to 75 days, with the average being 14.5 days. In 2021, residency and resightings increased with the residency ranging from 1 to 98 days (average 36.35 days), and resightings on 3.77 surveys. Demography of the longest resident(s) differed between the two seasons, with a juvenile female (EGNO 4520) having the longest in 2020 (75 days), and adult males (EGNOs 3651 and 4353) with 98 days in 2021.

During the award period the CCS Right Whale Ecology Program continued to input the near-real-time sightings of all right whales into the NMFS operated Sighting Advisory System (SAS) database directly as well as contributing sightings and effort data to the publicly available WhaleMap resource (Johnson *et al.* 2021). We submitted photographs used for individual right whale identification and collected by all three elements of the Large Whale Conservation Program to the North Atlantic Right Whale Consortium (NARWC) housed at New England Aquarium (NEAq) for further confirmation of individual identifications, for inclusion in the North Atlantic right whale catalog, and ongoing population monitoring. CCS personnel submitted all sightings of right whales, other marine mammals, fishing gear, and vessels during the aerial and shipboard surveillance to the Massachusetts Division of Marine Fisheries and the NARWC database housed at University of Rhode Island and archived in-house.

These sightings data directly contributed to the documentation of the ongoing Unusual Mortality Event (UME) for North Atlantic right whales declared by NOAA. In June 2020, following the end of a survey, we rerouted to New Jersey to confirm a report of a possible right whale carcass floating close to shore. After a search pattern was established, the carcass was resighted and documented

allowing responders to assemble and land the carcass for further investigations. Results of the necropsy of #5060 concluded that our initial documentation showing propeller wounds on the carcass were consistent with the cause of death for that calf of the year. Further data for the UME was collected in the form of noting serious injuries caused by entanglements. In October 2020, during a response mounted to relocate #4680, CCS aerial team found documented the new entanglement case of #3920/Cottontail. The other serious injury from entanglement found and documented by CCS Aerial was that of breeding female #3560/Snow Cone in March 2021.

Additionally, sightings made by the CCS surveillance contributed to establishing dynamic protections at state and federal levels. Fixed fishing gear and vessel speed restrictions were extended then rescinded based on real-time evidence or right whale presence and departure respectively in April 2020. In 2021, both the fixed fishing gear closure and vessel speed restrictions were extended for two weeks until surveys documented right whale departure from the area. Federally, our sightings data contributed to establishing five and extending one Dynamic Management Area(s) (DMAs)/Slow Zones during the award period.

## **RIGHT WHALE HABITAT PROGRAM**

The CCS habitat research crew, on board the R/V Shearwater, conducted 33 research cruises, totaling approximately 229 hours at sea. The research crew's field season covered the months December - May through the award period. This contract supported 6 of the research cruises, with 27 cruises supported by CCS donor and grant funding. Our research goals were to photograph and identify individual right whales and document the right whale food resource in Cape Cod Bay and surrounding waters. The 2020 - 2021 studies of the zooplankton resource distribution and movement and the behavioral response of right whales contributes important information to the understanding of the influence of zooplankton structure and aggregation as it impacts distribution and aggregation of whales and, hence, the exposure of right whales to ship strike and entanglement.

A total of 123 individual right whales were identified via habitat vessel operations. The right whales displayed a wide range of behaviors with the majority of the sightings consisted of long diving, skim feeding, or subsurface feeding. Through both study seasons reported here, right whale behaviors transitioned from long diving / fluking dives to skim and subsurface feeding. In the 2021 field season the long diving behavior persisted later in the season (through mid-March) than in previous years.

A total of 770 zooplankton samples were collected, counted, and analyzed to map the food resources that control the distribution of right whales in Cape Cod Bay and surrounding waters. Zooplankton samples were obtained using two methods, conical nets towed through the water at 8-9 fixed stations to obtain data on the bay-wide food resource or from a pump system to obtain a vertical profile map of zooplankton patches.

The Cape Cod Bay zooplankton resource is continually changing due to dynamic physical, chemical, and biological processes (ex: currents, temperatures, species movement). The typical pattern of the zooplankton resource during the period when right whales have been present starts in December with average densities (organisms/m<sup>3</sup>) in the thousands, decreasing through February to the low hundreds, and then increasing to the thousands again through May. Three main taxa driving this change in densities are *Calanus finmarchicus*, *Pseudocalanus* spp., and *Centropages* spp. These taxa appear to be primarily drivers of the right whale movements, distribution and aggregation in Cape Cod Bay.

Two important events related to habitat conditions were documented during this award period. In the 2020 and 2021 field seasons, higher densities of the *Centropages* spp. than usual were present in January and February, similar to the field season of 2017, potentially giving right whales a food resource early in the season. At the end of both seasons (mid-March - April in 2020 & mid-late April in 2021) large ctenophores and jellyfish were present in high numbers. This influx of the gelatinous plankton-feeding animals depleted the zooplankton resource. However in May 2021, the *C. finmarchicus* densities increased again to densities seen in 2017 and 2018.

The zooplankton density at which a right whale opens its mouth to feed or closes it to stop feeding is termed the “feeding threshold”. Approximately 35 percent of the samples collected during the field seasons were above the estimated feeding threshold (2019-2020: 29%, 2020-2021: 38%). Note: the large difference between the percentages is more likely the limited sampling effort in the 2019-2020 field season due to reduced field effort during the onset of the global pandemic. Both *Centropages* spp. and *C. finmarchicus* dominated the majority of high-density samples in 2020, while *Centropages* spp. dominated in 2021.

The rapid dissemination of information collected and analyzed during aerial survey flights and habitat research cruises was delivered to the Massachusetts Division of Marine Fisheries and to more than 70 colleagues via email in the form of a post-aerial survey report, a detailed post cruise report, and/or a “Preliminary Habitat Assessment” report. The reports provided a coinciding detailed background of right whale behavior, sighting information, food resource-based forecasting of aggregation and feeding, as well as in-depth analysis of zooplankton ecology and species composition and its effect on right whales.

CCS personnel shared data collected during this and prior grants/contracts with the conservation community, along with multiple phone and in-person interviews and press releases through printed, electronic, and audio news outlets resulting in media coverage locally, nationally, and internationally.

## **WHALE ENTANGLEMENT RESPONSE**

During the reporting period the CCS response team maintained daily readiness and response with a minimum of three trained responders, appropriate safety equipment, documentation media,

disentanglement tools and access to a response vessel (*R/V Ibis* and *R/V Shearwater* when necessary). The Massachusetts entanglement reporting hotline was staffed by the response team throughout this period, fielding calls that were solicited through a variety of outreach efforts. The CCS team immediately shared all confirmed entangled whale reports with National Marine Fisheries Service (NMFS) and subsequently shared with *Marine Fisheries*.

Over 350 emergency calls came into the hotline concerning marine animals and of these reports 100 were confirmed as entangled whale calls, representing 55 live and dead cases, from the Gulf of St. Lawrence to Florida. Of these 55 cases, 36 were seen within the CCS response area, representing six right whales, 24 humpback whales and six minke whales (see figure 3). Not all cases represented lethal entanglements, with 9/24 of the humpback whale cases involved individuals carrying hook and/or monofilament line. The CCS team mounted 22 responses and managed to disentangle or partially disentangle 3 North Atlantic right whales, 8 humpback whales and one minke whale. Gear samples were collected from 12 of these cases and these were remanded to the NMFS gear team for ongoing analysis. CCS supported tracking efforts for an entangled right whale that was tagged in the Gulf of St. Lawrence. The whale eventually traveled into US waters and was partially disentangled by CCS responders. Specialized entanglement response tools were distributed to the Atlantic Large Whale Disentanglement Network, including NMFS GARFO, Florida Fish and Wildlife Conservation Commission, Department of Fisheries and Oceans, Brier Island Whale and Seabird Cruises, Campobello Whale Rescue Team, Grand Manan Whale and Seabird Research Station and Marine Animal Response Society.

## **SEA TURTLE ENTANGLEMENT RESPONSE**

Between July 1, 2019 and June 30, 2021 the CCS response team maintained daily readiness and response with a minimum of three trained responders, appropriate safety equipment, documentation media, disentanglement tools and access to a response vessel (*R/V Ibis*). The Massachusetts entanglement reporting hotline was staffed by the response team throughout this period, fielding calls that were solicited through a variety of outreach efforts. All confirmed entangled sea turtle reports were immediately shared with NMFS and subsequently shared with *Marine Fisheries* and the Massachusetts Sea Turtle Disentanglement Network (MASTDN). CCS received 87 calls regarding sea turtles during the reporting period and 25 entanglement cases were confirmed, all leatherbacks, including 23 live and 2 dead animals (see figure 3). CCS mounted 17 responses and coordinated five responses with network partners and disentangled 16 turtles. All information gathered during responses was shared with all network partners and STERF forms were sent to the NMFS sea turtle coordinator. Gear from three cases were collected and remanded to NMFS or DMF.

Additionally, the following conference presentations and peer-reviewed publications occurred during the reporting period:

**Ganley, L.C.** 2020. Identifying drivers of and quantifying North Atlantic right whale local abundance. (Document no. 27832858). Doctoral dissertation. University of Massachusetts, Boston.

Ganley, L.C., Byrnes, J., Pendleton, D., **Mayo C.A.**, Friedland, K., Turner, J., Brault, S. 2020. Assessing local, regional, and basin-scale drivers of local right whale habitat use. Presentation at the Regional Association for Research on the Gulf of Maine (RARGOM) October 2020.

**Landry, S.**, Pettis, H., Henry A. 2019. Predicting right whale responses to rapid oceanographic changes. Presentation at the Society for Marine Mammalogy Biennial Conference December 2019.

**Landry, S.**, Pettis, H. M., Henry, A. 2019. North Atlantic right whale entanglement and serious injury update, November 2018 – October 2019. Oral Presentation at: North Atlantic Right Whale Consortium held in Portland, Maine, 14 - 15 November 2019.

**Landry, S.**, Pettis, H., & Henry, A. 2020. North Atlantic right whale entanglement and serious injury update, November 2019 – October 2020. Presentation at the North Atlantic Right Whale Consortium Oct. 2020.

**Lynch, B., Harvey, M., Landry, S., Mattila, D., Robbins, J., Sacrey, E., Sandilands, D., Sette, L., Tackaberry, J.** 2019. Rethinking the process of whale entanglement through first person observations. Presentation at the Society for Marine Mammalogy Biennial Conference December 2019.

Pendleton, D., Hamilton, P., Pettis, H., Kraus, S., Knowlton, A., **Landry, S.**, Moore, M., McLellan, W. 2019. Entanglements of North Atlantic right whales increase as their distribution shifts in response to climate change: The need for a new management paradigm. Presentation at the Society for Marine Mammalogy Biennial Conference December 2019.

Ramp, C., Gaspard, D., Gavrilchuk, K., Unger, M., Schleimer, A., **Landry, S.**, Sears, R. 2019. Perception bias: How aerial imagery revealed underrated threat of entanglement in large rorquals. Presentation at the Society for Marine Mammalogy Biennial Conference December 2019.

Record, N. R., Runge, J. A., Pendleton, D. E., Balch, W. M., Davies, K. T. A., Pershing, A. J., Johnson, C., Stamieszkin, K., Ji, R., Feng, Z., Kraus, S. D., Kenney, R. D., Thompson, C. R. S., **Hudak, C. A., Mayo, C. A.**, Chen, C., Salisbury, J., Thompson, C., Ross, C. 2019. Predicting right whale responses to rapid oceanographic changes. Oral Presentation at: North Atlantic Right Whale Consortium held in Portland, Maine, 14 - 15 November 2019.

**Robbins, J.**, Asmutis-Silvia, R., Bérubé, M., Hill, A., Howes, L., **Landry, S.**, Lonergan, S., **Mattila, D.**, Palsbøll, P., Schulte, D., **Tackaberry, J.**, Weinrich, M., Pace III, R. 2019. Abundance, population growth and latent mortality of humpback whales in the Gulf of Maine in



relation to human activities. Presentation at the Society for Marine Mammalogy Biennial Conference December 2019.

Ross, C.H., Pendleton, D.E., Tupper, B., Brickman, D., Zani, M.A., **Mayo, C.A.**, Record, N.R. 2020. Projecting regions of North Atlantic right whale (*Eubalaena glacialis*) habitat suitability in the Gulf of Maine in 2050. Presentation at the North Atlantic Right Whale Consortium Oct. 2020

Schick, R.S., Clark C., Durban, J., Falvo, C., Knowlton, A.R., **Mayo, C.**, Miller, C., Moore, M., Nowacek, D., Pettis, H.M., Pirota, E., Tyack, P.L. 2020. Understanding the cumulative impacts of multiple stressors on North Atlantic right whales: introducing the PCOMS Working Group. Presentation at the North Atlantic Right Whale Consortium Oct 2020.

## **REFERENCES**

Johnson H, Morrison D, Taggart C (2021). WhaleMap: a tool to collate and display whale survey results in near real-time. Journal of Open Source Software, 6(62), 3094, <https://joss.theoj.org/papers/10.21105/joss.03094>

Leeney R.H., Stamieszkin K., Mayo C.A., Marx M.K. (2009). Surveillance, monitoring & management of North Atlantic right whales in Cape Cod Bay and adjacent waters – 2009. Final Report, November 2009.

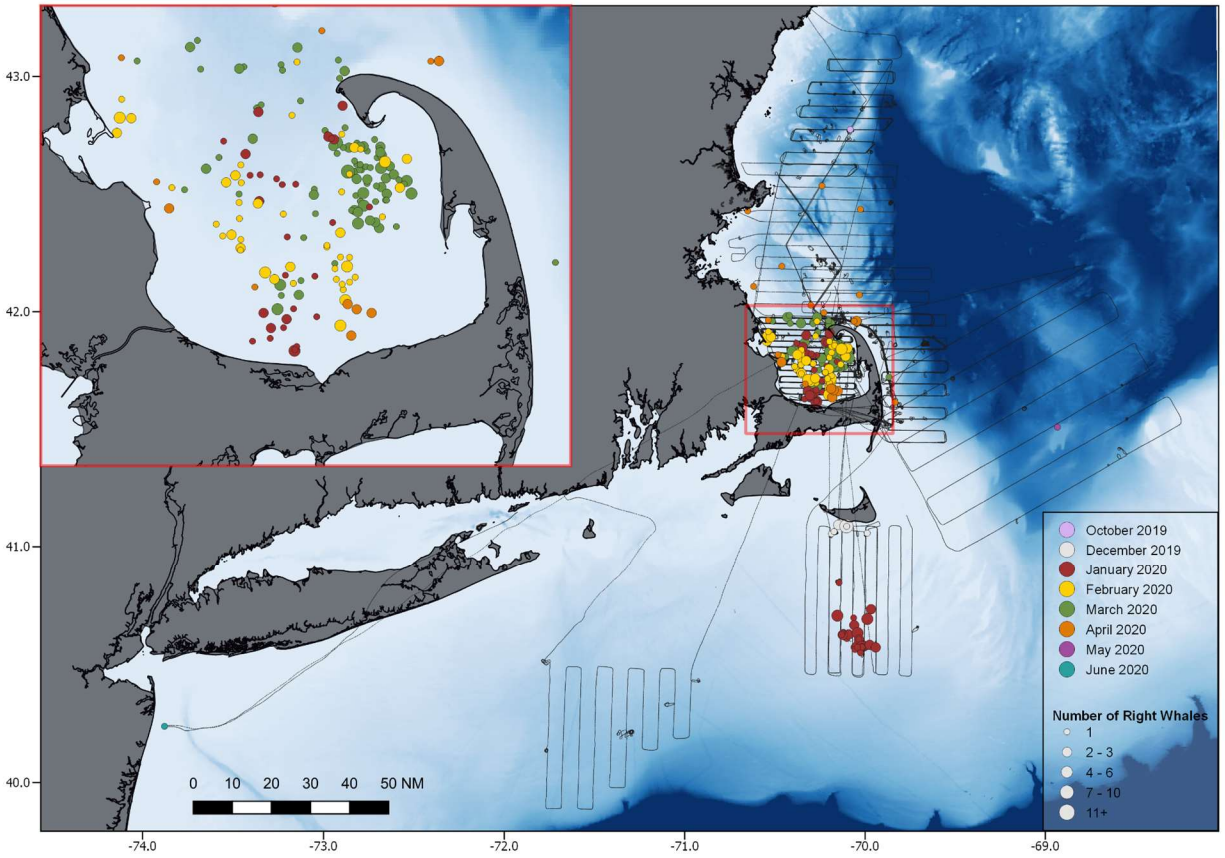
Pace, R.M., Corkeron, P.J., Kraus, S.D. (2017). State–space mark–recapture estimates reveal a recent decline in abundance of North Atlantic right whales. Ecol Evo. 1-12.

Pettis, H.M., Pace, R.M. III, Hamilton, P.K. (2018). North Atlantic Right Whale Consortium 2018 Annual Report Card. Report to the North Atlantic Right Whale Consortium, November 2018.

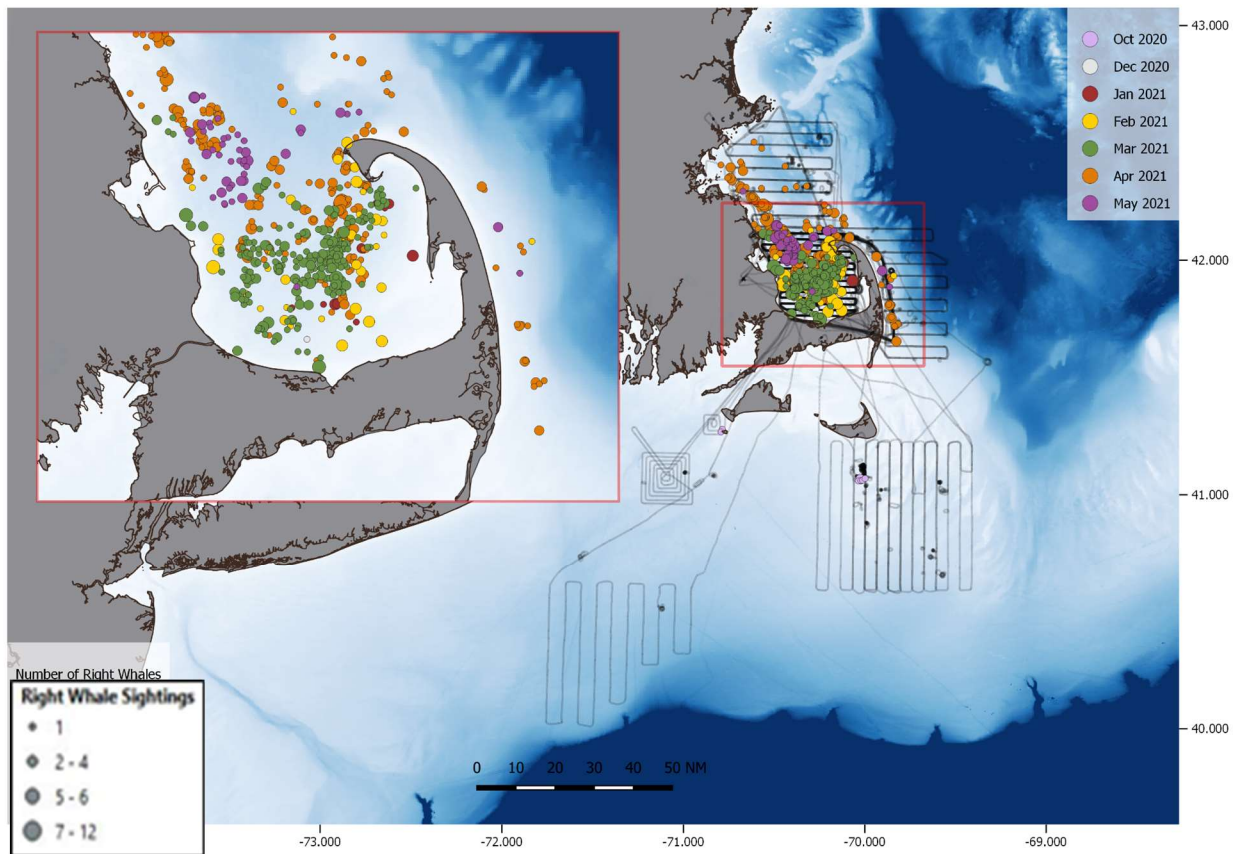
Pettis, H.M. (2020). Monitoring Injured North Atlantic Right Whales: 2019 Report to the North Atlantic Right Whale Consortium.

Pettis, H.M. (2021). Monitoring Injured North Atlantic Right Whales: 2020 Report to the North Atlantic Right Whale Consortium.

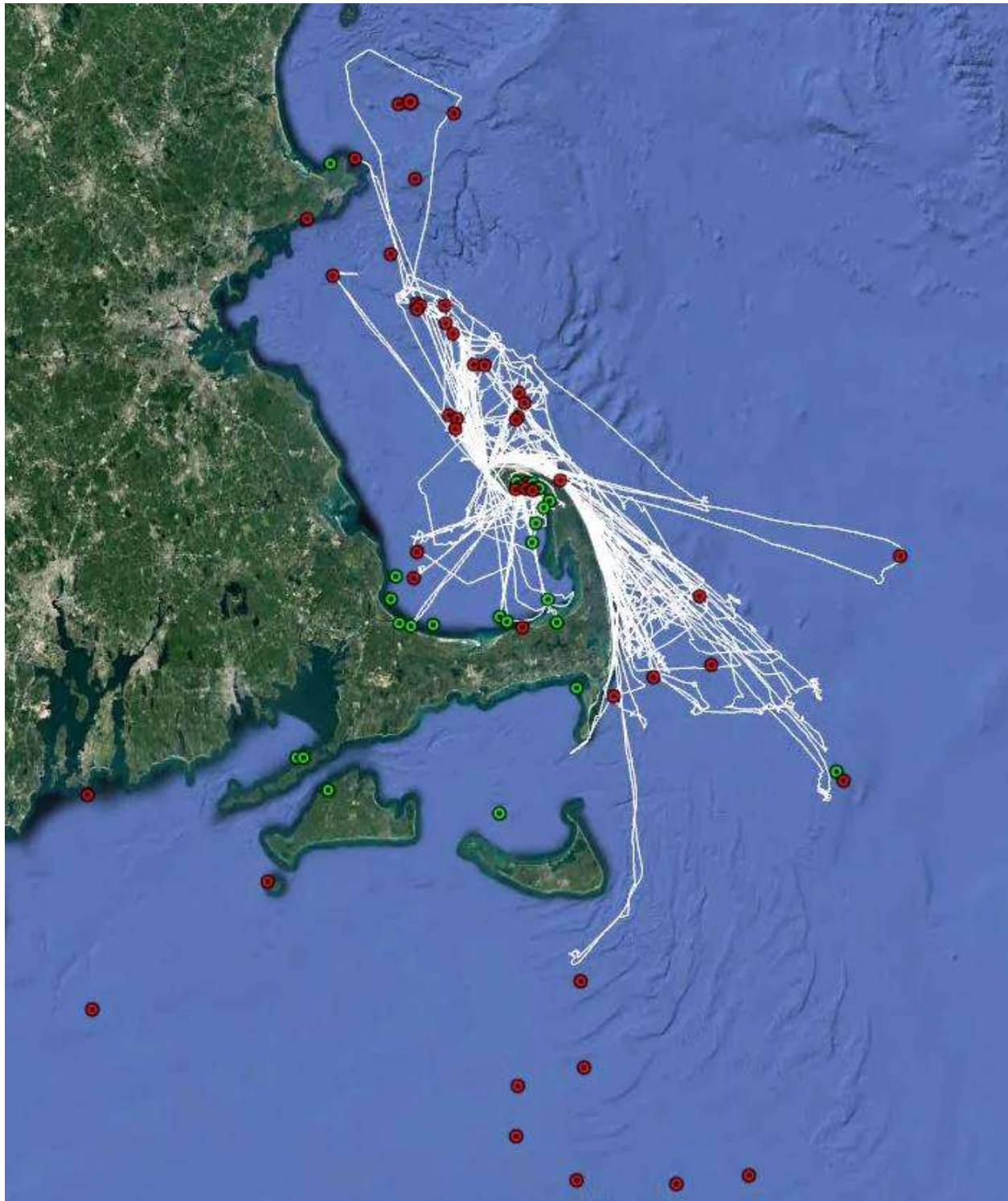
## **APPENDIX**



**Figure 1.** Right whale sightings and track lines throughout the 2020 field season (October 2019 – June 2020) from CCS aerial surveys.



**Figure 2.** Right whale sightings and track lines throughout the 2021 field season (October 2020 – September 2021) from CCS aerial surveys.



**Figure 3.** All confirmed whale (in red) and sea turtle (in green) sightings within the MAER response area, during the reporting period. Multiple sightings of individual cases shown. Tracks of the response vessel in white.