

RIGHT WHALE NEWS

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Southeast U.S. Late-Season Report: 17 Calves

One word—weather! Wind, lumpy seas, cold, and then ... FOG. Sighting effort was reduced—both for the aerial surveys and for the volunteer network of shore spotters. As of 15 March 2015, 44 individual right whales have been identified from the SE U.S. calving and wintering grounds, including 17 mother-calf pairs (34 individuals total).

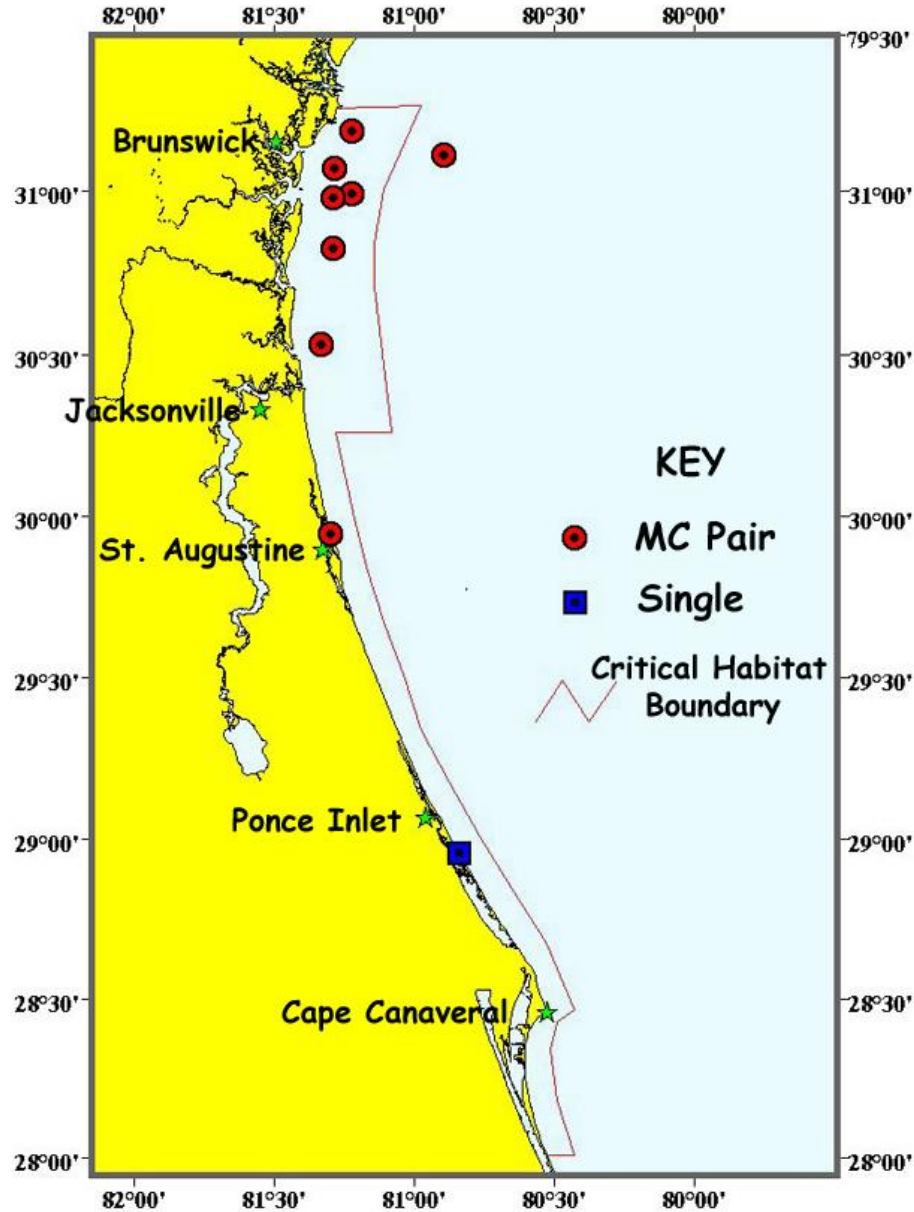
Of the mother-calf pairs, all age classes are represented—from female #1620 (at least 29 years of age with her 6th calf) to female #3693 (more than 9 years of age with her 1st known calf). Additional categories include a yearling male, a sub-adult male, several adult males, sub-adult females, and a few adult females without calves. A few small groups of individuals were reported in December, but none since. The lively mixed-age and mixed-sex groups of 4 to 15 individuals that were common as recently as the 2011 season were absent. Overall, sightings were sparse—attributed in part to the weather, and in part to the near-absence of juveniles and groups.

However, as this issue of *Right Whale News* is finalized, better weather and a bit of good luck in the last few days have resulted in a small but promising late-season surge. First, mother-calf pairs #15 and #16 were sighted off Georgia. Next, via the volunteer sighting network, another new mother-calf pair for the season (#17) was recorded, south of Cape Canaveral on 10 March 2015.



Female #3420, Platypus, with her first calf, traveling south off Melbourne, Florida, on 10 March 2015. She had been tagged (as a single female at the time) on 21 January off Georgia (see article on next page). (Photo from shore: J. Albert, Marine Resources Council)

Overall, with 17 mother-calf pairs, the total number is increasing closer to the average (~22). And, the calf production is more than last year, as well as for the 2011 season. This is encouraging.



Right whale sightings for a 10-day period, 27 January through 05 February, centered around 1 February 2015, provides a general impression of the numbers and distribution at the approximate midpoint of the season. Total sightings for the period are sparse (n=8), and are concentrated in a core area around the Florida/Georgia border. For this period, there were few sightings south of St. Augustine. Weather and the corresponding survey effort are factors in this plot. The collaborative data are from the Florida Fish and Wildlife Conservation Commission, Georgia Department of Natural Resources, Sea to Shore Alliance, Marineland Right Whale Project, and the Marine Resources Council.

To the north, off Cape Cod, the report is similar. Corey Accardo, flight coordinator for the right whale program, Center for Coastal Studies, describes, “...ah, the weather, it has been something to work with this season. The winds have been quite blustery—not allowing for many survey days. And, some of the days where we were able to fly have been squeaked in under less than optimal conditions, including snow and freezing temperatures. A large section of the southeastern part of Cape Cod Bay has had ice, which has persisted. Also due to the weather, our habitat-study vessel cruises have been extremely limited. But, from what has been seen, the food resource seems to be fairly normal for this time of the year. The right whale distribution and behavior has been variable. In view of all factors, we wonder whether there are more whales present than we have sighted.” With regard to the location of the juveniles, Corey reports, “... wherever the juveniles are, they’re not here.”

As the SE U.S. season winds down, and the Cape Cod Bay season passes the mid-point, the hope is for “light winds and heavy whales.”

Limpet Tagging Initiated in the SE U.S.

Methodologies evolve. Researchers and technicians seek answers using improved approaches. The movements, migrations, and habitat-use of right whales have been a long-standing puzzle. In January 2015, LIMPET tagging began on right whales in their SE U.S. habitat. A collaboration of investigators and groups, including the Alaska Sea Life Center, University of Alaska Fairbanks, Georgia Department of Natural Resources, Florida Fish and Wildlife Conservation Commission, Sea to Shore Alliance, and NOAA Fisheries began exploring an improved methodology.

The project aims to develop a minimally invasive satellite tag optimized for use on North Atlantic right whales. The aim is for a tag that will provide sufficient attachment duration to track movements of whales migrating north from the Southeast U.S. and into the Mid-Atlantic region. In Year 1 (2015), the plan was to deploy up to five LIMPET tags, which have been used successfully on 21 species of whales and dolphins. LIMPET tags are small, Argos satellite transmitter packages (2 inches x 1.5 inches x ¾ inches) that are attached to the whale by two medical-grade titanium darts that penetrate 2.75 inches into the tissue of the whale. LIMPET tag attachment darts were optimized for implantation into the fibrous tissue of dorsal fins, but because right whales do not have a dorsal fin, the tag darts are implanted into skin and blubber. These darts can be pulled out of blubber much more easily than dorsal-fin tissue, so the duration of attachment when implanted in blubber is expected to be fairly short. After observing the performance of the current LIMPET tag dart design in Year 1, improved methods of tag attachment will be developed to achieve implant durations of approximately one month yet retain their minimally invasive characteristics. Improved designs will be deployed in years two and three of the project.

If successful, this project will enhance researchers' capabilities to track right whales for numerous research, management, and monitoring purposes—such as tracking entangled right whales, or tracking whales that move into high-risk areas such as rivers or narrow bays.

Tagging History

Methods to elucidate the movements, migrations, and habitat-use of whales have evolved during the last several decades. Implantable tags were developed beginning in the late 1970s and 80s (Watkins *et al.* 1981, 1996). Tagging of right whales was conducted in the 1990s (Goodyear 1993, Mate *et al.* 1997, Slay and Kraus 1997, Slay *et al.* 1999, Winn *et al.* 1995). However, concerns about the efficacy and impacts of tagging arose. A workshop to review tagging on North Atlantic right whales (Kraus 2000) summarized impacts on the whales and a need for continued improvements in tag technology, as well as for follow-up studies on tagged whales. A hiatus in the tagging of right whales took place in the following decade, corresponding in part to a cessation of authorized research permits for this method.

Preliminary Results from 2015 Field Work

Field work began in early January 2015 via collaborations with researchers searching for whales in small boats and responding to whale sighting reports from the Georgia and Florida aerial survey crews, other vessels, and on-shore volunteer sighting networks. The first tag was deployed on Right Whale #4092, an approximately six-year old female, only seven miles offshore of Fernandina Beach, Florida on 06 January 2015. The second LIMPET tag was deployed on 20 January 2015, after receiving a report from a lifeguard of a young whale swimming within 100 yards of the coast near New Smyrna Beach, Florida. The Marineland Right Whale Project's survey aircraft maintained a visual on the whale until the boats arrived. This whale is possibly a two-year-old female, although the tentative match awaits genetic confirmation, so she is currently referred to by her temporary field ID S078. The third tag was attached to Right Whale #3420, nicknamed *Platypus*, about 14 miles east of Cumberland Island, Georgia, on 21 January 2015 (see also page 1).

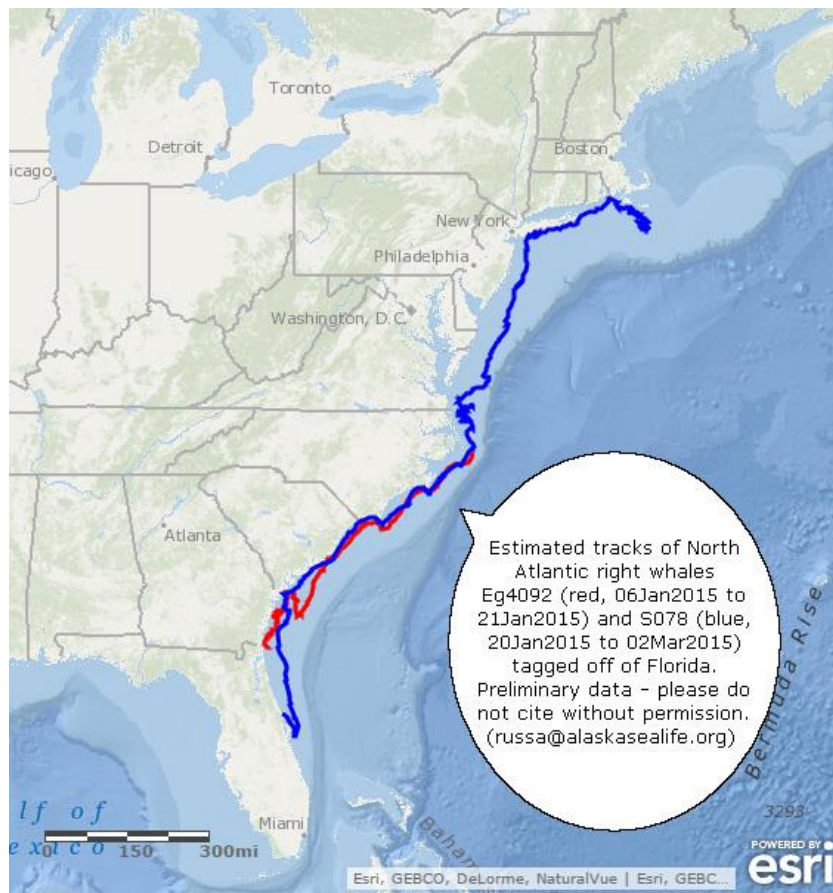


LIMPET tag, side view



LIMPET tag, top view

The tag on #3420 only transmitted for 20 hours. On the other hand, the tag on #4092 transmitted for 15 days, allowing the team to follow her migration up the coast of the Carolinas to Cape Hatteras on the last day of transmissions. Likewise, as of 11 March 2015, the tag on S078 was still transmitting, 50 days after attachment. This surprisingly long attachment has allowed following her route as she made her way through the Mid-Atlantic before arriving off Long Island, New York, in the middle of one of this season's heavy snowstorms. Those storms prevented any boats getting out to re-sight her, but as she is currently milling about south of Nantucket Island, the team is collaborating with research teams in that area in an effort to relocate her and photo-document the tag and surrounding tissue; and determine whether she is in the company of other whales.



The two successful LIMPET tags placed in January 2015 revealed a northward track.

Russ Andrews, Alaska SeaLife Center and University of Alaska Fairbanks, and the principal investigator on the project, notes that, “We have received tremendous help from right whale researchers and enthusiasts up and down the coast, for which we are extremely grateful.”

Additional information, including images and video can be accessed at: www.alaskasealife.org, (enter satellite tagging in the search box at the bottom of the home page).

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Update on the North Atlantic Right Whale Photo-Identification Catalog, March 2015

Contributed by Philip Hamilton, New England Aquarium

The North Atlantic Right Whale Photo-Identification Catalog remains the mainstay of information about the North Atlantic right whale. However, there have been substantial changes in right whale demographics in recent years, and, these changes impact the data submitted to the catalog maintained at the New England Aquarium in Boston, Massachusetts. For example, the number of individuals off the southeast U.S. has decreased from 150-250 to around 50, the numbers in Cape Cod Bay have increased from around 80-150 to nearly 300, and the numbers in

late spring and summer (mostly from Great South Channel, Bay of Fundy, and Roseway Basin) have been inconsistent, but generally low, with whales exhibiting short residency times. These changes impact the number of sightings contributed to the Catalog and individuals identified annually. Further, it hinders our ability to track scarring rates and health assessments, discover entanglements and mortalities, collect samples (biopsy, fecal, blow), and identify and catalog calves while they are still associated with their mothers and in subsequent years.

By the end of 2013 (the cutoff for the November 2014 North Atlantic Right Whale Consortium report), there were 685 whales in the Catalog: 489 of these were presumed to be alive (36 were known to be dead and another 160 were presumed to be dead due to a lack of sightings over six or more years). The living population continues to be skewed towards males (60% of the known-sex whales) due to high female mortality/disappearances. Because there is always a lag in processing data and identifications, the North Atlantic Right Whale Consortium agreed in 2006 to develop an annual report card which, among other things, determines a best assessment for the number of living, photographed whales. The number for 2013 is 522, which includes photographed individuals that have not yet been cataloged, but which we think will be cataloged in the near future.

During the last two decades, the percentage of the living population that is photographed and identified annually has increased. We identified an average of 62% of the living population annually from 1990 to 2000, and from 2001 to 2011, that percentage increased to 83%. This increase is caused by a combination of factors: increased offshore aerial surveys in the northeast, large numbers of whales returning to the southeast U.S. along with substantial effort there, and unprecedented numbers in Cape Cod Bay. Figure 1 below shows the annual count of whales in the population; the colored portion indicates they were seen that year. However, in 2012, the percentage identified decreased to 74 % of living individuals, and the percentage will likely remain low for 2013 and 2014 (further information on this point follows).

The number of calves born to the population and the proportion of those calves that have been cataloged has been stochastic over the years (Figure 2). Calves are not cataloged if they are not appropriately photographed after developing the identifying characteristics needed to confidently match them to subsequent sightings. This lack of photographic evidence may be due to an early death, or few to no sightings of them with their mothers on the commonly surveyed feeding grounds. Also, some are simply delayed in being added to the catalog because they have not been seen since their birth year (again a function of some whales going to currently unknown habitats). For example, we may have excellent images of a distinctive white belly pattern from a calf, but it is several years before that pattern is photographed again and the whale can be cataloged. During the intervening years, the calf remains in catalog limbo. Time will tell what the final number of cataloged 2012 and 2013 calves will be, we currently believe as many as 18 may be identifiable. As previously described in *Right Whale News* and elsewhere, genetic

sampling can assist. The effort to get genetic samples from calves on the calving ground is extremely valuable, and it becomes even more important when so few calves are seen with their mothers on the feeding grounds. If we are not able to photographically link post-calf sightings of the calf back to their calf sightings, eventually we should be able to do so genetically.

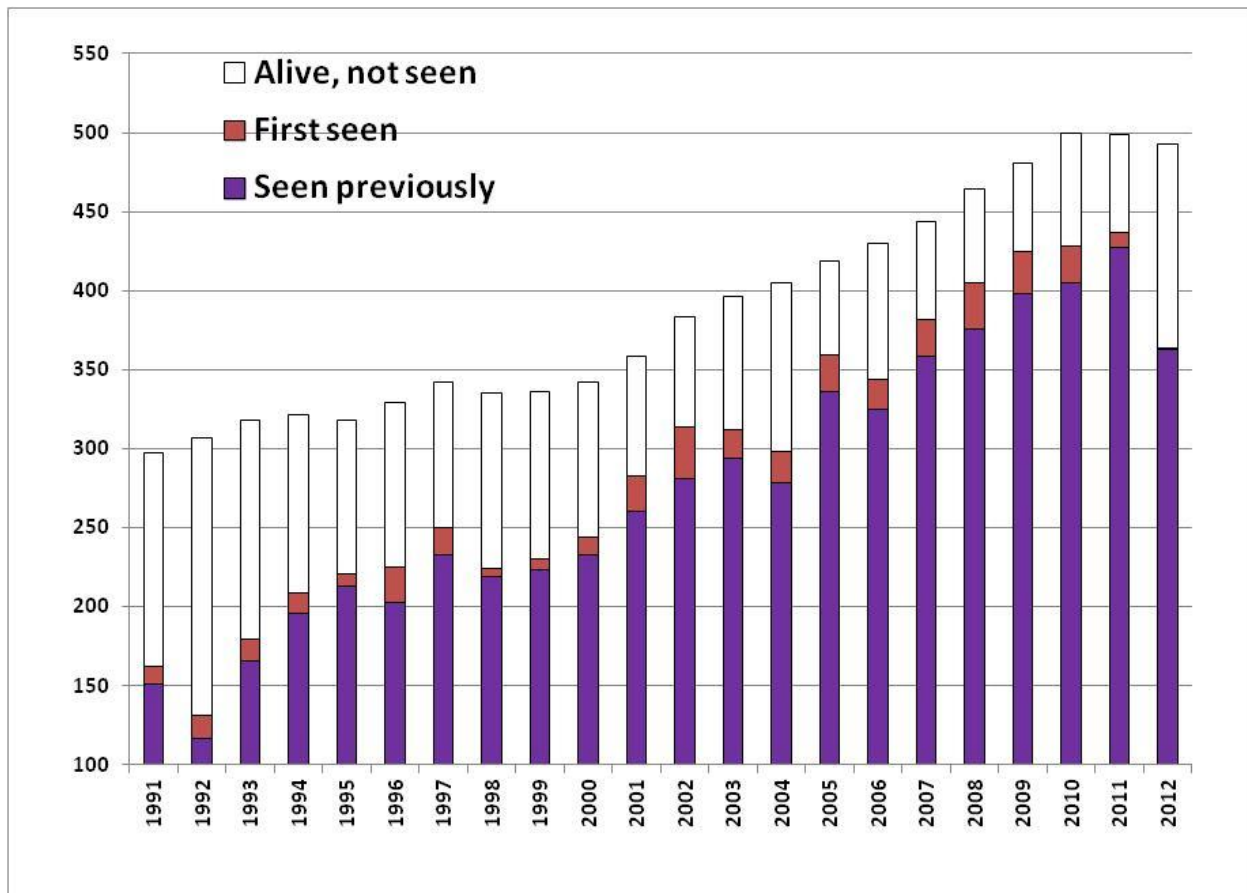


Figure 1. Number of cataloged right whales presumed alive and whether they were seen for the first time, seen previously as well as that year, or not seen but assumed to be alive. Notice the drop in whales first seen in 2011 and 2012, which is mostly due to so few calves from those years being photo-identified yet (see Figure 2 below for more detail).

Because of the decrease in submissions, we continue to catch up on a backlog of data, and the data from 2013 are 86% matched. Most of the remaining unmatched sightings from 2013 are calves in limbo, so the percent likely will not change quickly. There will always be some time lag in data processing, and that lag is partially dependent on when data are contributed.

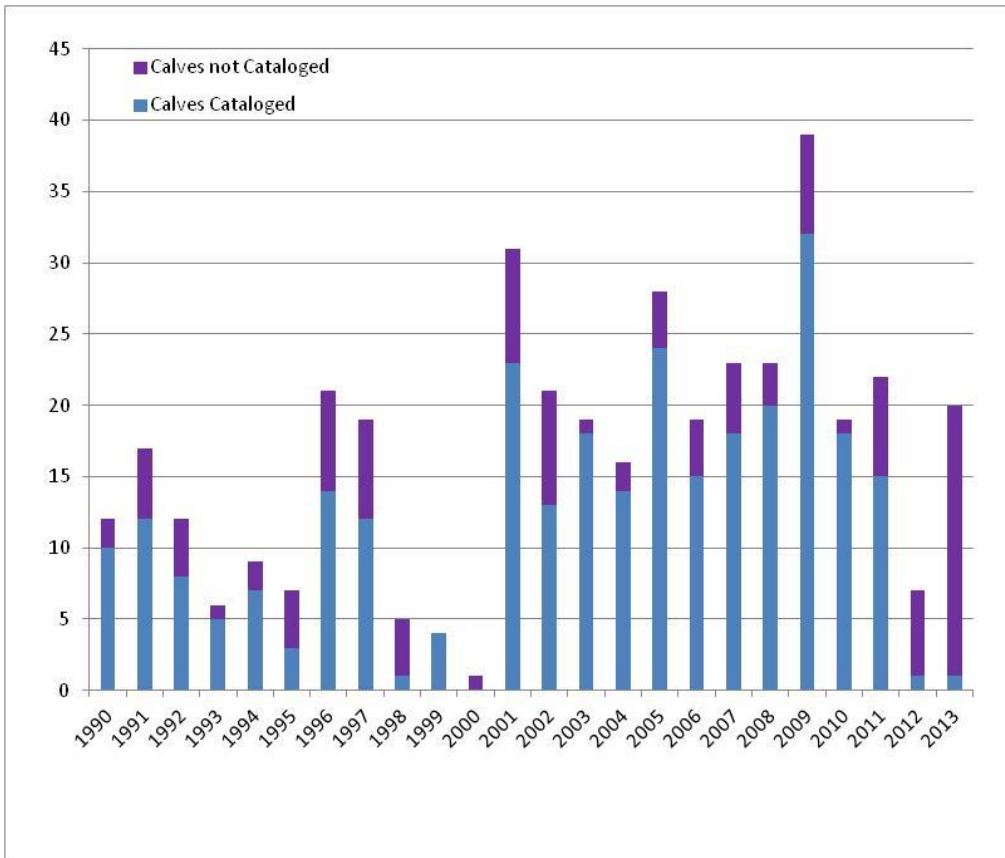


Figure 2. Right whale calves born into the population 1990 to 2013, and whether they have been added to the catalog

Table 1. The regional count and proportion of all 2013 sightings that are in the Catalog.

Region	No. of Sightings	Percent of Total
Cape Cod and Mass. Bays	1227	64.4%
Southeast U.S.	419	22.0%
Great South Channel	97	5.1%
Mid-Atlantic	58	3.0%
Roseway Basin	55	2.9%
Bay of Fundy	24	1.3%
Gulf of Main	9	0.5%
Jeffreys Ledge	8	0.4%
North (Gulf of St. Lawrence)	8	0.4%
1905		

Note that the number of sightings contributed to the Catalog in 2013 was 1,905, the lowest in 10 years, compared to a peak of 4,700 in 2009).

A large number of individuals as well as sightings were seen in Cape Cod Bay, which helps with some of the Catalog analyses (Table 1). However, the fact that whales in Cape Cod Bay are frequently skim feeding (not showing lips, back, or flukes) hampers scarring and health assessment analyses, as well as matching to previous calves, which requires the comparison of lip crenulations along the top margin of the lower lip.

Ideally, future field efforts should have contingency plans when possible, to shift the geographic (and potentially temporal) focus of their studies in response to these ongoing demographic shifts. Some of these shifts are documented through social media and non-right-whale-focused surveys, but not all of these sightings (and original images and data) are submitted to the Aquarium. Any assistance in directing images and data to rwdata@neaq.org would be appreciated. Finally, researchers need to be mindful of the impacts of these distribution shifts on the Catalog when interpreting Catalog data. Clearly these distribution shifts have dramatic impacts on these data; time will tell what impacts they will have on the right whales themselves.

Proposed Expanded Critical Habitat Rule Open for Public Comment

On 13 February 2015, NOAA Fisheries announced a Proposed Rule to Revise Right Whale Critical Habitat. Through this action, and in light of updated information, the existing critical habitat for the species will be expanded. The area under consideration is approximately 29,945 square nautical miles and includes feeding areas in the Gulf of Maine and Georges Bank, and calving grounds from North Carolina to Florida. NOAA Fisheries describes that the key benefit of designating critical habitat is to put other federal agencies on notice so that they must consult with NOAA Fisheries if they intend to authorize, fund, or carry out an action that may affect the critical habitat of a species listed under the Endangered Species Act. In these situations, NOAA Fisheries provides guidance as to how an action might be carried out in a manner that avoids or minimizes impacts to the critical habitat.

NOAA Fisheries is soliciting comments on all aspects of the proposal. The comment period began on 17 February and extends for 60 days (until 21 April 2015). Comments, identified by NOAA-NMFS-2014-0085, may be submitted by either of the following methods:

* Electronic submissions: Use the Federal eRulemaking Portal at www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2014-0085, and select “Comment Now,” complete the required fields, and enter or attach your comments.

*Mail: Assistant Regional Administrator, Protected Resources Division, NMFS, Greater Atlantic Regional Office, 55 Great Republic Drive, Gloucester, MA 01930.

All comments received are part of the public record, and will generally be posted to www.regulations.gov without change.

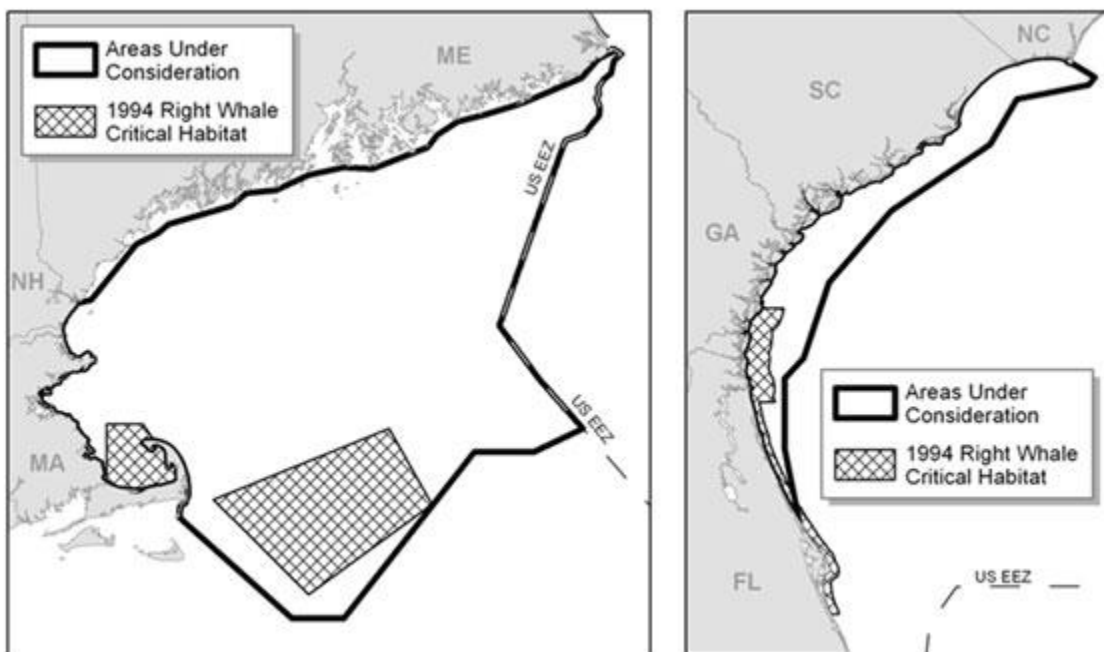


Figure 1. Comparison of existing right whale critical habitats with proposed critical habitats.

The current proposal dates back to 16 September 2009, when the Center for Biological Diversity, Humane Society of the U.S., Defenders of Wildlife, Whale and Dolphin Conservation, and Ocean Conservancy submitted a legal petition for expansion of critical habitat. In the absence of a response from NOAA Fisheries, a notice of intent to sue was filed. NMFS agreed to publish a decision on revision of critical habitat by “the second half of 2011”. In the absence of any published decision within this time frame, the organizations once again notified the agency of their intent to sue in 2013. As a result of the settlement agreement, a deadline was set for a finding on the petition, and NMFS determined that there was sufficient information to justify going forward with public comment. The settlement agreement called for a proposed rule to be published in February 2015, with a final decision to be published in February 2016.

Sharon Young (Marine Issues Field Director, Humane Society of the U.S.), described that the original petition for expanding critical habitat had proposed including a migratory corridor and a SE U.S critical habitat that extended farther to the east and south. The agency elected not to go forward with these requests. In addition, the inshore waters of coastal Maine were exempted from the final proposal. Ms. Young stated that she is pleased that the proposed critical habitat is larger, and believes that the present proposal represents the minimum that should be designated. She also continues to support the inclusion of a migratory corridor, and a critical habitat that would include the area to the south of Martha’s Vineyard and Nantucket. She also

clarified that, if adopted as proposed, the revised critical habitat would replace the former (*e.g.*, the SE US critical habitat would no longer extend south of Cape Canaveral).

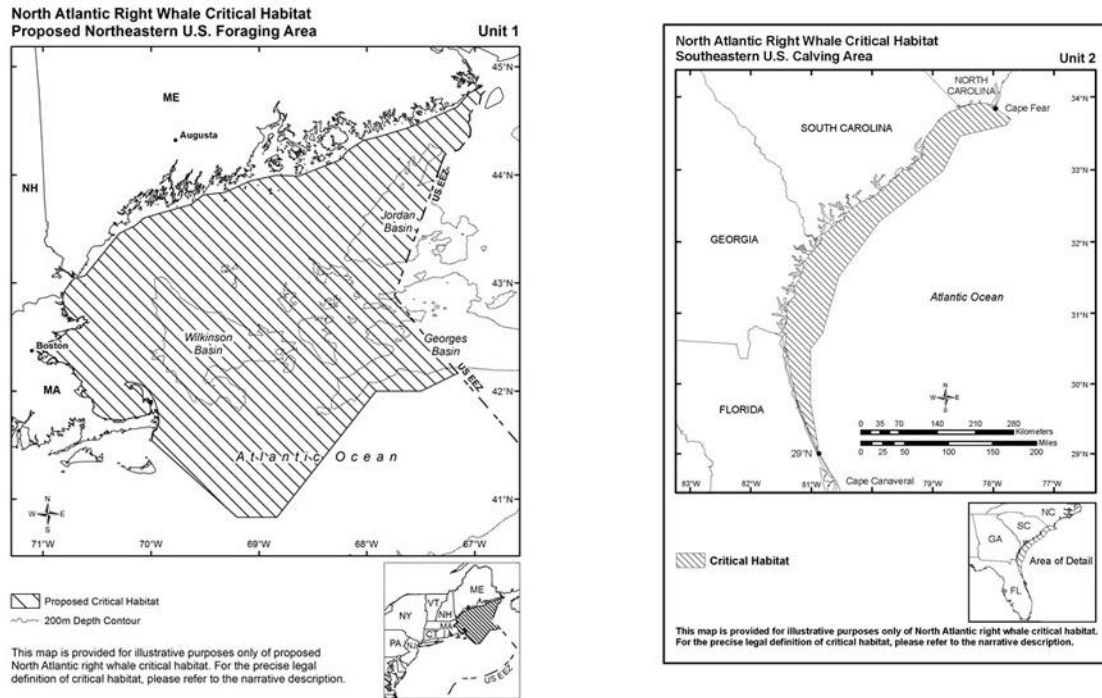


Figure 2. The proposed expanded right whale critical habitats. The proposed areas are based, in part, on analyses reported in Keller et al. (2012) and Pace and Merrick (2008).

The complete proposed rule (Federal Register notice) is available at:

<http://www.greateratlantic.fisheries.noaa.gov/regs/2015/February/15narwcriticalhabitatpr.html>

(By definition, under the ESA, critical habitat is intended to include specific areas within the geographical area occupied by the species in which are found physical and biological features essential to the conservation of the species, and which may require special management considerations or protection.)

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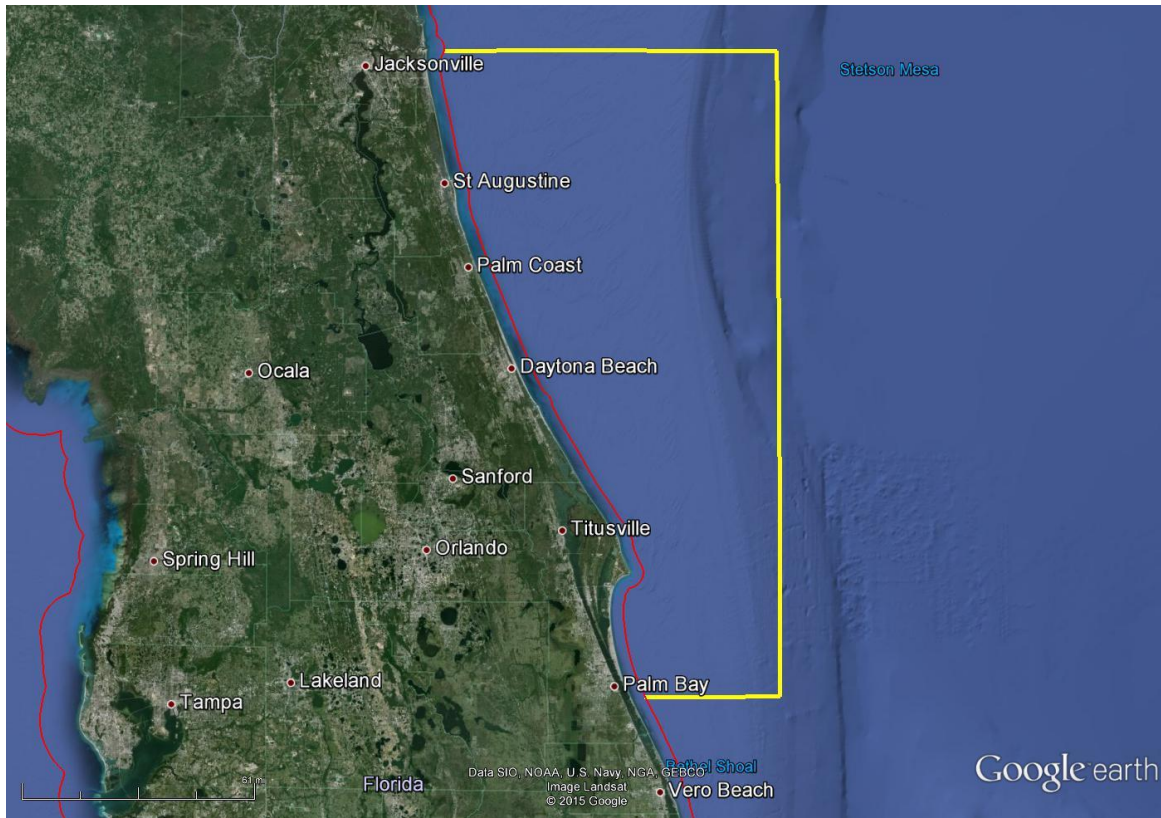
Proposed Southeast National Marine Sanctuary to be Re-submitted

A meeting at the St. Augustine lighthouse museum on 17 February 2015 brought voices of Florida fishermen to the discussion on a proposed nomination for a Southeast U.S. National Marine Sanctuary. The nomination title is *The Eubalaena Oculina National Marine Sanctuary*, a nod toward the endangered right whale and the *Oculina* coral. Marcella Matthei was the spokesperson for the citizens nominating group, Friends of Matanzas, 1093 A1A Beach Blvd., St. Augustine, Florida. Dr. George Sedberry (Southeast Region Sanctuary Science Coordinator) represented the National Marine Sanctuary Program.

The nomination was previously submitted in September 2014, but was not accepted due to lack of broad community support (one of several criteria). In re-grouping, Friends of Matanzas sought to assuage fishermen who verbalized concerns that additional government regulation would impede fishing. Commenters represented the Ancient City Gamefish Association, Southeastern Fisheries Association, and Shrimp Producers Association and included diverse fishermen and owners of seafood markets. Contained in the unanimous opposition of the fishing interests was the message, "There is a better way." This was in response to the stated agenda of the proponents that the proposed designation would aid in preventing oil and gas seismic exploration and possible development. Friends of Matanzas plan to resubmit the nomination prior to 1 April 2015.



A portion of the 45 fishermen and fishing interests that generally opposed the nomination of a new National Marine Sanctuary for the southeastern United States, opining that, for the stated agenda of denying oil and gas exploration and development in these waters, "There is a better way".



The proposed area as submitted for nomination for consideration as a new southeastern U.S. National Marine Sanctuary. The inshore boundary of the sanctuary would be the offshore boundary of Florida state waters.

The Office of National Marine Sanctuaries serves as the trustee for a network of 14 marine protected areas encompassing more than 170,000 square miles of marine and Great Lakes waters from Washington State to the Florida Keys and from Lake Huron to American Samoa. For the first time in two decades, NOAA, via a new, locally driven sanctuary nomination process developed with input from more than 18,000 public comments, has invited communities to nominate their most treasured places in our marine and Great Lakes waters for consideration as national marine sanctuaries. As nominations are submitted, NOAA will review each one in several steps. Nominations that pass this review will be added to an inventory of areas NOAA may consider for potential designation as national marine sanctuaries. NOAA notes that nomination is not the same thing as sanctuary designation. Designation occurs as a separate process that, by law, is highly public and participatory, and often takes several years to complete. Further information can be found at: sanctuaries.noaa.gov, and, nominate.noaa.gov.

As described in the article on page 6, the Right Whale Catalog along with the genetics database are central to knowledge and recovery of the North Atlantic right whale. The third component is the long-term sightings and survey-effort database maintained at the Graduate School of Oceanography, University of Rhode Island. As elsewhere, changes are on the horizon. The history, status, and future of this important component are reported below.

Status Update: The NARWC Survey and Sightings Database

Contributed by Robert D. Kenney, URI Graduate School of Oceanography

After a one-year hiatus (FY2014) caused by scarcity and uncertainty in federal funding, in September 2014 I got back into active curation and management of the North Atlantic Right Whale Consortium (NARWC, or simply Consortium) database at the University of Rhode Island, Graduate School of Oceanography (URI-GSO). Adding to the uncertainty for the funding agency (NMFS) was my semi-retirement and, in the not-too-distant future, retirement. The database had been in more or less continuous service from the fall of 1986 through August 2013. This report is intended as an update on the status of the Consortium database at URI-GSO. I will provide a summary description of the database and what information it contains, try to explain how it relates to the photoID catalog curated at New England Aquarium (NEAq), clarify some common misconceptions about the database, and finally describe the near-term changes in store. However, my first task will be to present a little bit of the history of the Consortium—as a refresher for the other old veterans out there and as background for the younger readers.

NARWC History

The Consortium's beginnings actually go back to June 1983. At an IWC workshop on right whales held at the NEAq in Boston (the proceedings and papers are summarized in Brownell *et al.* 1986), Howard Winn (a URI-GSO professor and my Ph.D. advisor) stood up and made one of his regular rants about the inadequacy of federal funding for marine mammal research and recovery activities in the U.S. He suggested that the research community should ask Congress for a dedicated appropriation focused specifically on right whales. Lobbying by the NGO community, including Greenpeace and the Connecticut Cetacean Society (now Cetacean Society International), was pivotal in obtaining Congressional support for an appropriation. Both Howard Winn and NEAq president John Prescott testified at a hearing of the Senate Appropriations Subcommittee on Commerce, Justice, State, and Judiciary. The subcommittee approved a budget for the Dept. of Commerce that included a line item directing \$500,000 to right whale research, which was enacted by the Congress.

After some foot-dragging by the agency, NMFS made \$381,000 available and requested a single proposal from the research community for a collaborative research program. The Principal Investigators on that proposal were Howard Winn* and myself at URI-GSO, John Prescott* and Scott Kraus at NEAq, Stormy Mayo at the Center for Coastal Studies (CCS), Bill Watkins* and Karen Moore at the Woods Hole Oceanographic Institution (WHOI), and Dave Caldwell* and

* Howard, John, Bill, Dave, and Melba are all now deceased.

Melba Caldwell* at Marineland of Florida (MLF). The proposal was submitted with URI-GSO as the lead and the other organizations as subcontractors. After the usual negotiations, a contract was awarded to begin in October 1986. From the beginning, we called ourselves the “North Atlantic Right Whale Consortium” although there was no formal organization. The Consortium as we know it today was created in 1998.

From the very beginning, a critical component of the Consortium project was to maintain a centralized data archive to which everyone would contribute and have full access (Kenney and Winn, 1986; Kenney, 2001). We attempted as much as possible to standardize the methods for conducting field surveys and recording data, as well as for managing the resulting computerized information. Of the NARWC collaborators, URI-GSO had the most experience in handling large databases. From late 1978 through early 1982, we had conducted the Cetacean and Turtle Assessment Program (CETAP, 1982). CETAP was a large project designed to characterize the distribution, abundance, and seasonality of all whales, dolphins, porpoises, and sea turtles in U.S. continental shelf waters from North Carolina to Maine. The underlying rationale was environmental assessment relative to proposed oil and gas development. CETAP resulted in a substantial database that was archived at URI. Because of this existing data archive and database management expertise, URI-GSO was selected to manage the NARWC database, and, as the only person left standing from CETAP who was familiar with the data, I became the data manager. The CETAP database became the original core of the NARWC database with many of the data structures, conventions, and protocols following or adapted from those that were originally developed for CETAP.

At the beginning, the NARWC contract included all of the familiar tasks: aerial surveys, shipboard surveys, photoID, data management, data analysis, and publication. After the first few years of the project, NMFS decided to split the subcontracts off into their own separate contracts to the individual organizations, at least, in part, to avoid double-charging of overhead. After that time MLF no longer had any part of the funded research. Over the years, budgets got tighter, priorities changed, and some tasks began to drop out. Beginning in 1993, URI’s contracts had been narrowed down to include only database management, including data analyses and publication, except in the last few years as funding shrank even further. For 1986–1993, NMFS funding to URI for all right whale projects, including the subcontracts in the first several years, totaled \$1.62M (a seven-year period, at about \$230,000 per year). Funding for 1993–2013 for database management only, totaled \$1.77M (a 20-year period, at about \$89,000 per year).

The Database

The Consortium database currently encompasses four separate databases, and all of the summary statistics below refer to the aggregated whole. The four databases, all of which are in identical formats so they could be easily combined, include:

- The main Consortium database.
- A second similar collection of files put together for a project where I worked with Geo-Marine, Inc. on a series of environmental summaries (“Marine Resources Assessments”) for the Navy. This was almost entirely NMFS surveys, mostly but not exclusively in the Southeast. I never got around to asking all the relevant individuals for permission to add the data to the main archive, so for now they have been kept separate.

- All of the survey files from the Northeast Large Pelagics Survey Collaborative (NLPSC)—the aerial surveys that have been conducted in the Massachusetts–Rhode Island Wind Farm Area since the fall of 2011 (see Kenney 2011, 2014). The contract from the Massachusetts Clean Energy Center places restrictions on data release until the completion of the project.
- A collection of mostly stranding data, including large-whale records for the Northeast from the Smithsonian Institution’s computer files and more general stranding records from NMFS for Rhode Island, Connecticut, New York, and New Jersey for 1993–2005. These were assembled for a publication project on the marine mammals of New York.

Eventually, I expect that the NMFS survey database and the NLPSC dataset will both be incorporated into the main archive. On the other hand, because the stranding data are available elsewhere where they are updated regularly and because the coverage (geographic and taxonomic) in what I have is incomplete, it does not seem wise to incorporate them.

The NARWC database today comprises about 5 million records. The data are archived, managed, and analyzed using SAS software (SAS Institute, Inc., Cary, NC). At the beginning in 1986, SAS only ran on a full-sized IBM mainframe computer where the data were stored on 9-track magnetic tape reels. Today, SAS runs in the standard personal computer environment (either 32-bit or 64-bit), so the entire operation is housed in a desktop computer in my lab (and backed up in multiple locations).

The database includes both survey and sighting data. The database was designed so that there is a single data structure that fits all data types. For a survey dataset, track (*e.g.*, date, time, location, heading, altitude), environmental (*e.g.*, weather, sea state, visibility), and sighting (*e.g.*, species, number, behavior) parameters are included within the same data records rather than being separated into different files as in some data-logging or archival systems. Several different classes of data are included:

- Line-transect (“dedicated”) aerial surveys: These are surveys designed to generate estimates of density and abundance of the species encountered using distance-sampling methods. Survey methodologies are strictly defined to maintain statistical rigor. There are also line-transect shipboard surveys, but we have never conducted any ourselves, so the necessary data structures have never been created.
- POP aerial surveys: During CETAP we established a “Platforms of Opportunity Program” (POP). We had a cadre of skilled observers under contract who could be placed aboard any aircraft flying over the study area, most typically Coast Guard fishery patrols and aerial radio-thermography missions (this was before satellites measuring sea surface temperature existed). The trackline of the aircraft was determined by the primary mission, and the observer kept a continuous log of both track and environmental data and recorded all sightings. Today, the primary missions of most of our aerial surveys include detection of right whales for sighting alert systems and photoID, and the data are recorded in this POP format. Some line-transect surveys by others (*e.g.*, NMFS) are archived in the NARWC database in the POP format, since we consider it outside the scope of our research to be re-doing density estimates from other people’s data.
- POP shipboard surveys: This is essentially the same as above, but using vessel platforms rather than aerial.

- Opportunistic and historical sightings: An opportunistic record is simply a sighting without any associated platform or track information. There may or may not be associated environmental data; most often there are not. There is nearly no difference between opportunistic and historical data other than the time factor. During the first year of CETAP, there was an effort to identify and incorporate any pre-existing sighting records as “historical” data. Since that time, older and current opportunistic sightings have not really been distinguished.
- Strandings: In addition to the separate stranding dataset identified above, there are some stranding records included in the primary NARWC database. Stranding records in the original CETAP data were identified by a different first character of the FILEID variable, which differed between mammal and turtle strandings. Currently, a stranding record would be an opportunistic sighting with a behavior code that indicates “dead, stranded” or “dead, floating”.

The survey data in the NARWC database go back to the first CETAP surveys in the fall of 1978. The opportunistic data go back further, with three records before 1800, all representing whales killed by whalers. The two oldest right whale records were whales killed off Cape May, New Jersey: two in April 1762 and one in April 1764. Both of those came from old newspaper articles in a folder of miscellaneous historical data from the NEAq. The oldest record in the database is for a humpback killed in Nantucket Harbor on an unknown date in 1608—“when a party of Indians killed a humpback whale which got stranded on a part of Nantucket, called Caton, in the inner harbor” (Allen 1916, quoting from A. H. Clark, in G. B. Goode, *Fisheries and Fishery Industries of the U.S.*, 1887). That record came from the file of mostly strandings obtained from the Smithsonian. Jim Mead, the retired curator of marine mammals there, does not get enough credit for being a pioneer in computerizing marine mammal data. The Smithsonian dataset includes many older records painstakingly extracted from Allen’s monograph and many other similar sources.

The combined database presently includes 44,413 right whale records. That total includes 44,412 records of North Atlantic right whales and one southern right whale. One sighting in the Gulf of Guinea off West Africa came into the database from the photoID catalog (see below).

Misconceptions

Maybe it’s because the Consortium includes “North Atlantic Right Whale” in its name, but some people mistakenly conclude that the database contains only right whale sightings. In fact, right whales are only the third most frequently sighted species in the database following loggerhead sea turtles and bottlenose dolphins. Right whales represent only 11% of the total number of 392,417 records of marine biota. The total includes 77 species of cetaceans, pinnipeds, other marine mammals, sea turtles, sharks, other fishes, and other marine species. Other broader categories, including two species (*e.g.*, fin or sei whale, pilot whale sp., common or white-sided dolphin), multiple species in a genus (*e.g.*, *Balaenoptera* sp., *Mesoplodon* sp., *Stenella* sp.), and broad general terms (*e.g.*, unidentified large whale, unidentified dolphin, unidentified sea turtle), bring the total number of “species” to 111. In addition, there are 55,946 sightings of 77 species and 22 unidentified categories of birds, mainly from the Manomet

surveys (see below) but a few from whale-watch naturalists. Finally, there are another 170,291 sightings of vessels, fishing gear, human activities, debris, or oceanographic phenomena.

Conversely, there are those who think that the database includes parameters or estimates that it actually does not. Occasionally, I receive requests for density or abundance estimates. While it may be possible to calculate those estimates from the line-transect survey data in the database, the estimates themselves are not included. Likewise sightings-per-unit-effort (SPUE) values are not contained in the database. Those are computed from the aggregate of aerial line-transect, aerial POP, and shipboard POP survey data. The survey area, the target species, and the study objective all impact how SPUE data are worked up. A new SPUE dataset is typically generated for each request; however, at times a data requester is able to utilize a previously generated dataset without incurring additional expense or time delays. One final item frequently requested by those interested in distribution patterns is GIS shapefiles. The data are not stored in a GIS environment so there are no shapefiles, although it is a simple matter to output data files in the appropriate format for input to ArcGIS or any other software.

The biggest misconception is that the NARWC database is so biased toward right whales that it is not useful for analysis for other species. The corollary is that there is little or no survey effort outside of right whale habitats. Both of these statements are simply untrue. It is the case that the current surveys by the Consortium partners are focused in right whale habitats: the winter EWS surveys in the Southeast, the winter-spring aerial Cape Cod Bay surveys by CCS, and the summer-fall Bay of Fundy and Scotian Shelf surveys by NEAq. However, the database does include extensive broad-scale survey effort. In addition to the CETAP surveys, there was a survey program conducted by the Manomet Bird Observatory from 1980 to 1988. Manomet observers went out on NMFS fisheries and oceanographic research cruises and collected POP-type data on seabirds, marine mammals, and sea turtles. There also are past and current more broad-scale surveys by NMFS, including some focused on right whales and others on general stock assessment. The whole point of SPUE analysis is to factor out as much as possible any bias introduced by sampling patterns. Even broken down month by month, SPUE distributions derived from the NARWC data are geographically complete and reliable enough to be used in the co-occurrence model of entanglement risk in the Atlantic Large Whale Take Reduction Plan (http://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/eis2013/march_2014_draft_v1_model_documentation_appendices.pdf).

The Database vs. the Catalog

One other class of information that is not included in the NARWC database is the right whale photoIDs. Those data, including individual whale identity, age, and sex, are contained in the photoID database (i.e., the “Catalog”) curated at NEAq. It is not always easy to keep the differences between the two datasets straight, not least because records in both are referred to as “sightings”. A sighting in the database and a sighting in the catalog, however, are not exactly equivalent. As an example, consider an aerial survey flying down a transect line. They sight something and break from the track to investigate. After circling and taking lots of photographs, they record a “sighting” of 23 right whales. Back in the lab they go through all of their photographs, and decide that they actually saw 25 different whales so they amend their data, and eventually submit the data for incorporation into the database. They also submit all of the

photographs to NEAq for inclusion in the Catalog. If they were perfectly correct in their analysis, the catalog will end up with 25 “sightings” of right whales—one per animal. It could be more or less, depending on the quality of the photos, the existence of duplicates of the same whale, or the presence of more individuals than showed up in the preliminary analysis. For that reason, and to keep things straight in my own mind, I always try to restrict the term “sightings” to the database and to refer to records in the Catalog as “records” or “identifications.”

The two datasets periodically get cross-referenced, which is one of my least favorite jobs. I generate a chronological listing of all right whale sightings in the database. Then, I obtain an updated copy of the Catalog data from NEAq, sort it chronologically, and filter it for only records not already matched to sightings in the database. Then, I just match up catalog records line by line to database sightings (by matching date, time, location, and source), and manually enter the FILEID, EVENTNO, and SIGHTNO fields from the database into the appropriate record(s) in the Catalog. The process cannot be automated because the data attached to the photoID records do not always exactly match those in the database. Because it takes around two years for the photo-matching at NEAq to be considered relatively complete, and the cross-referencing task happens only once a year at best, data users can never expect the database cross-references within the Catalog to be fully up to date. Once the matching process is complete, any photoID records that do not correspond to sightings in the database and that are not likely to be from surveys where the data are expected to be submitted in the future are extracted, creating a file of new opportunistic right whale sightings to be added to the database.

The Future

A new one-year contract is now in place through August of 2015. Some changes have already taken place, and others are coming. I now have four co-PI’s on the project: Dr. Peter August, Charles LaBash, and Christopher Damon from the URI Dept. of Natural Resources and the URI Environmental Data Center (EDC), and Dr. Kathleen Vigness-Raposa from Marine Acoustics, Inc. EDC (www.edc.uri.edu) is the primary provider of spatial data at URI and within the State, and the home of both the state geographic information system (RIGIS; <http://www.edc.uri.edu/rigis/>) and mapping for NOAA’s Large Marine Ecosystems initiative (<http://lme.edc.uri.edu/>). Dr. August has a background in terrestrial mammals and bats before turning to landscape ecology, but little experience with marine mammals. Dr. Vigness-Raposa’s role is to provide the marine mammal expertise. She completed her M.S. in oceanography with Howard Winn on modeling visual vs. acoustic whale surveys before going on to earn a Ph.D. in landscape ecology with Pete August on modeling North Atlantic humpback whale habitats.

The first task in the new contract is to get caught up on the backlog of data that did not get processed during the hiatus year. We also need to stay current with newly generated data submissions, and complete a database-catalog cross-referencing on two years of new catalog records.

The more important task is to begin designing a new database structure in a more modern, useful software environment. The way that the current system has evolved piece-meal over the years has resulted in a system that relies on software that is not particularly available or user-friendly (dBASE, SAS) and that has a large number of relatively “clunky” processes. They work

perfectly well for me, but I could never expect another person to step in and figure out the whole thing. We need to develop new software to perform all the current functions: data entry, conversion of data from a variety of input formats to the defined standard, quality-control testing and corrections, archival, queries via the Consortium data-sharing process, and the analyses often necessary for particular queries (e.g., SPUE analysis). The long-term expectation would be to transfer all database management, quality-control, archival, and query functions to the EDC, although expecting that to be fully complete within this one year may be optimistic. The final, even longer-term goal is to develop a stable source of funding, rather than needing to rely on a series of one-year federal contracts in what is sure to remain an unpredictable budget environment.

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Calendar

21-22 April, 2015. Southeastern U.S. Right Whale Forum and Implementation Team meeting, to be held at the University of North Florida, Ballroom C in the Student Union Building (Bldg 58), 1 UNF Drive, Jacksonville, Florida. Parking available in adjacent parking garage. A link, including map: www.unf.edu/studentunion. To request agenda: thomas.pitchford@myFWC.com

3 May 2015, Second Annual New England Right Whale Festival, Boston, Massachusetts. New England Aquarium's Harbor Terrace Tent from 11am-3pm, rain or shine. There will be opportunities to learn more about right whales, meet right whale scientists and partake in family friendly activities for all! The event is free to the public, but Aquarium admission is not included.

5-7 May 2015. Annual meeting of the U.S. Marine Mammal Commission, Francis Marion Hotel, Charleston, South Carolina. At this meeting, the Commission will engage other federal agencies, stakeholders, and interested members of the public in reviewing and discussing the science, policy, and management issues related to the Commission's mission to conserve marine mammals and the ecosystems upon which they depend. Topics include North Atlantic right whales (fishery interactions and vessel strikes), conservation of Florida manatees and dolphins, and renewable and non-renewable energy development in the Atlantic. Updated information will be posted at www.mmc.gov as the date draws near.

13-18 December 2015. Society of Marine Mammalogy Biennial Conference. San Francisco, California. Abstract submission deadline 15 May, registration opens 6 April.

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Right Whale News

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