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North Atlantic Right Whale Calving Area Surveys: 2015/2016 Results

by

Claire Surrey-Marsden, Kelsey Howe, Melanie White, Clay George,
Tim Gowan, Philip Hamilton, Katie Jackson, Jen Jakush, Tom Pitchford,
Cynthia Taylor, Leslie Ward, and Barb Zoodsma

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

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Claire Surrey-Marsden¹, Kelsey Howe², Melanie White³, Clay George⁴, Tim Gowan², Philip Hamilton⁵, Katie Jackson², Jen Jakush², Tom Pitchford², Cynthia Taylor³, Leslie Ward², and Barb Zoodsma¹

¹*NOAA Fisheries, Southeast Regional Office, 263 13th Avenue South, St. Petersburg, Florida 33701*

²*Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th Avenue Southeast, St. Petersburg, Florida 33701*

³*Sea to Shore Alliance, 4411 Bee Ridge Road #490, Sarasota, FL 34233*

⁴*Georgia Department of Natural Resources, Nongame Conservation Section, 1 Conservation Way, Brunswick, Georgia 31520*

⁵*New England Aquarium, Central Wharf, Boston, MA, 02110*

U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Oceanic and Atmospheric Administration
RDML Tim Gallaudet, Ph.D., Acting Administrator

National Marine Fisheries Service
Chris Oliver, Assistant Administrator for Fisheries



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Copies of this report may be obtained from:

Barb Zoodsma
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue North
St. Petersburg, FL 33701

Or online at:

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Introduction

Aerial surveys are flown December 01 through March 31 each year in the Southeast United States to detect North Atlantic right whales in their primary calving area. The purpose of the aerial surveys is to contribute to (in prioritized order):

- Population monitoring via detection and identification of individual right whales including cow/calf pairs occurring in the Southeast United States.
- Monitoring trends in human-related serious injuries and mortality.
- Vessel-strike reduction.

Given these objectives, we focused aerial surveys in areas where we expected the highest number of right whale detections.

Additionally, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries), U.S. Navy, U.S. Coast Guard, and U.S. Army Corps of Engineers have agreed to implement the "Early Warning System" (EWS) –a system of aerial surveys and communications designed to provide mariners with information on whale locations. The goal of the EWS is vessel-whale collision mitigation.

This report briefly summarizes results from the NOAA Fisheries-administered aerial surveys and the EWS during the 2015/2016 North Atlantic right whale calving season.

Methods

Aerial Surveys

Teams/Platform

Two dedicated teams flew aerial surveys in 2015/2016. The Sea to Shore Alliance (S2S) team, contracted by the Georgia Department of Natural Resources (GDNR), was based out of St. Simons Island, Georgia, and flew aboard a NOAA-owned De Havilland Twin Otter. The flight team consisted of 2 observers and a dedicated data recorder. The Florida Fish and Wildlife Conservation Commission (FWC) team was based out of St. Augustine, Florida and flew aboard a Cessna Skymaster. The FWC flight team consisted of 2 observers; one of these also served as the data recorder. Two pilots were seated at the controls in each aircraft.

2015/2016 Survey Zone and Frequency

Flight lines were selected from a geographic area ranging from near Savannah, Georgia to just north of Cape Canaveral, Florida. Surveys could be shifted if few right whales were sighted in the main survey area and dynamic combinations of habitat features in adjacent areas were suitable for right whales. Transects oriented east-west and parallel to shore were used (Figure 1). Generally, each team attempted to fly every day that visibility was greater than 2 nautical miles (nmi) and sea state was less than 4 on the Beaufort Wind Scale.

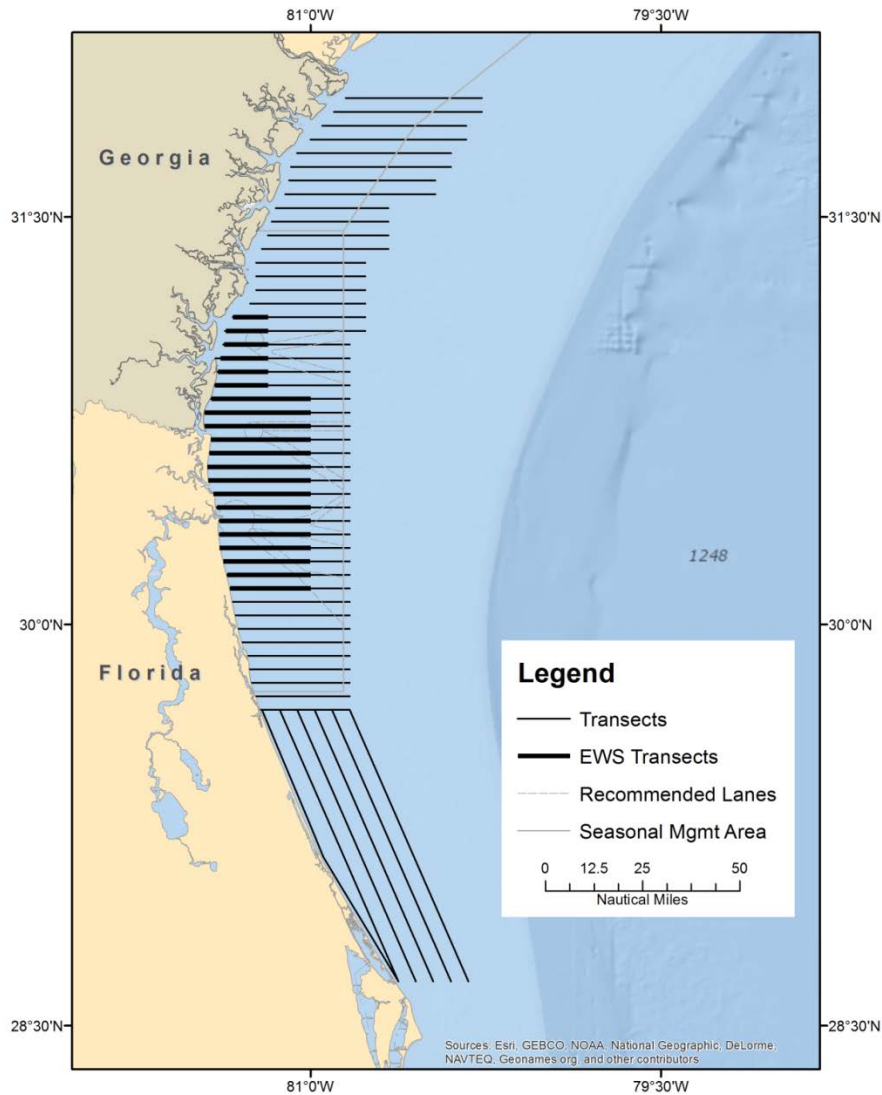


Figure 1. Transects available to be flown by aerial survey teams during the 2015/2016 North Atlantic right whale calving season. Thick black lines represent EWS transects.

Daily Survey Area

The aerial survey zone was too large for 2 aerial survey teams to survey in a single day, so a subset of the area was selected and flown each day. In general, the following criteria were used in daily flight planning:

1. EWS transects
2. Avoiding airspace conflicts with military operations
3. Weather

4. Predicted whale locations¹
5. Recent whale sightings
6. Distributing effort throughout the survey area
7. NOAA-affiliated, boat-based biopsy/tagging projects
8. Aircraft availability/hours

Aerial Survey Data

Survey data collection methods followed those described in Keller *et al.* (2012) and Gowan and Ortega-Ortiz (2014).

Whale Alerts

Whale alerts were generated from aerial survey sightings or from public sightings which were verified by or relayed through a reliable source. Teams issued whale alerts to marine users and other users in near-real time using geographically-based email distribution lists² (Figure 2).

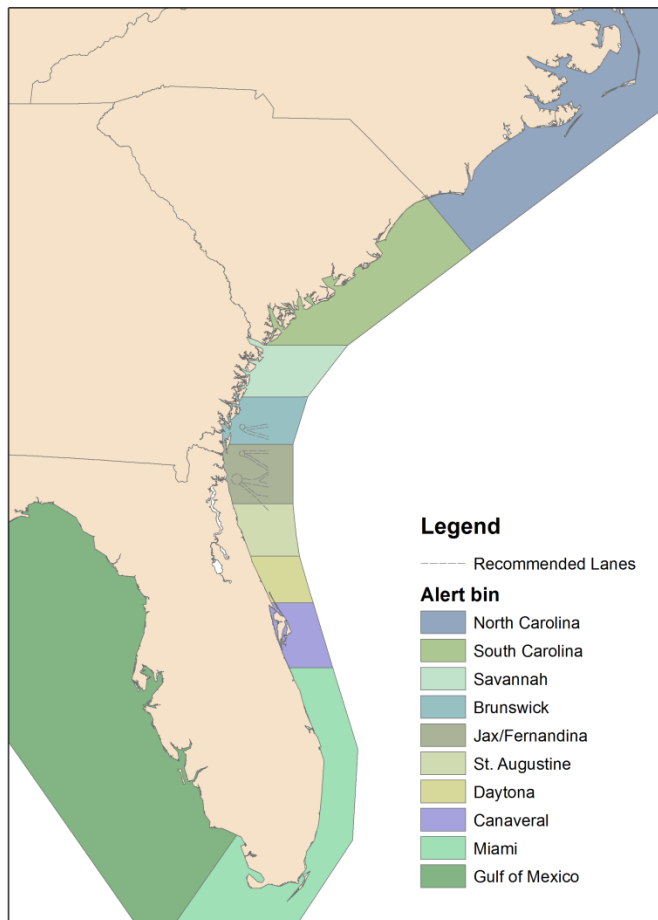


Figure 2. Areal coverage of whale alert email distribution lists.

¹ The FWC produced bimonthly predictions of right whale distribution using methods described by Gowan and Ortiz (2014). This paper validated hindcasted predictions, but not forecasted predictions (i.e., before sea surface temperature data for the period are available).

² Users received email or text message alerts; text messages were possible if users provided a short message service (SMS) to email gateway.

Results

Aerial Surveys

Of the 122 days in the season, FWC and S2S teams conducted surveys on 56 and 44 days, respectively. Survey duration varied and was limited by weather, military activity in survey area, aircraft limitations, etc. On average, survey days were cut short 51% of days that were flown (38 of 56 days for FWC and 15 of 44 days for S2S). Search effort was unevenly distributed throughout the survey season (Table 1) and area (Figure 3). One survey was flown off South Carolina for exploratory purposes.

Table 1. Number of Nautical Miles (nmi) Flown While On Effort³

Month	On-Effort Trackline Distance (nmi)
December	11843
January	10774
February	7160
March	6973

The two survey teams observed and/or verified 111 right whale sightings⁴ and 21 sightings of those were first reported from other sources (collaborating research vessels, volunteer sighting network, public, dredge, U.S. Navy, U.S. Coast Guard, etc.). Most sightings were associated with the area of highest effort (Figure 4) and varied by month (Table 2).

³ “On effort” is defined as those times when the following conditions are met: Beaufort sea state < 4, visibility at least 2 nmi (3.7 kilometers), altitude < 1200 feet (366 meters), and not circling a sighting, or on verification survey.

⁴ A “sighting” consists of 1 or more right whales.

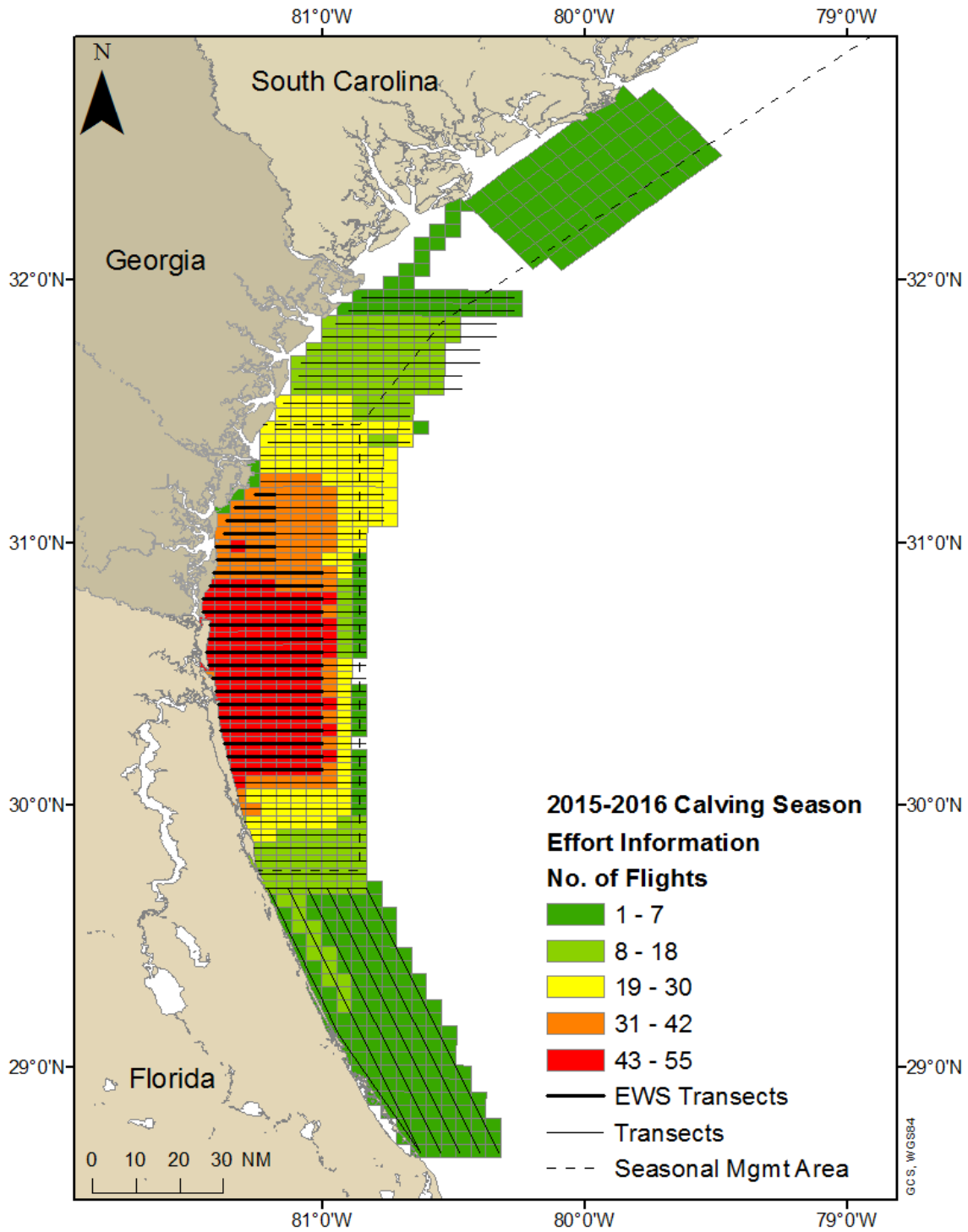


Figure 3. Density distribution of survey effort in the 2015/2016 survey area. Effort is displayed as number of flights in 3- by 3-nmi grid cells or 4- by 4-nmi in SC (gray lines). Transects are black and EWS transects are thick black.

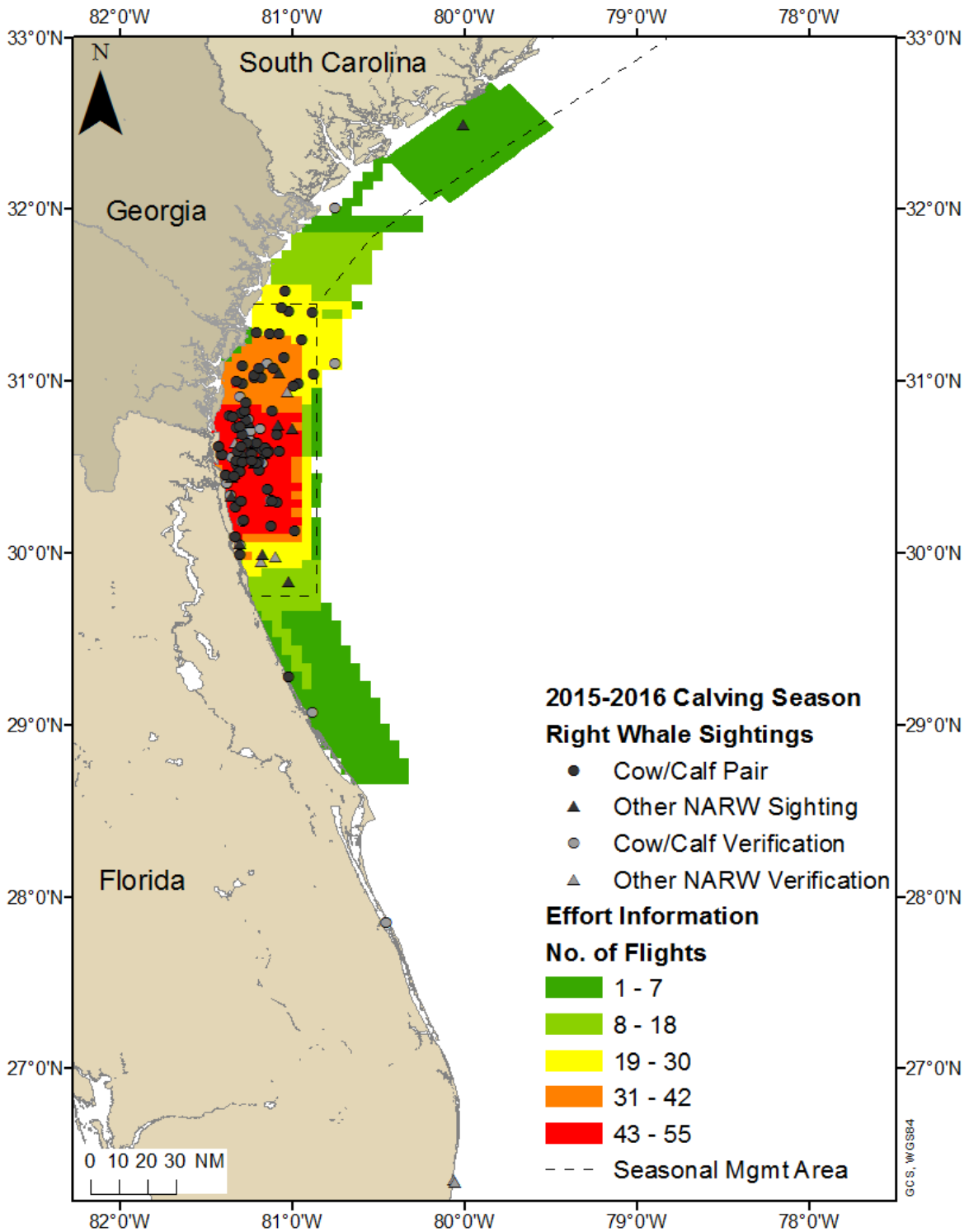


Figure 4. Geographic distribution of right whales sighted while on effort (black symbols) or reported to aerial survey teams and verified (grey symbols) during the 2015/2016 season. Circles represent sightings of cow/calf pairs and triangles represent sightings of other right whales.

Table 2. Monthly Number of Right Whales and Right Whale Sightings (detected per nautical mile of on-effort trackline).

Month	Number of Right Whale Sighting Events	Number of Right Whales**	Sighting Events/1,000 nmi	Individual Right Whales/1,000 nmi
December	13	23	1.1	1.9
January	44	76	4.1	7.1
February	41	81	5.7	11.3
March	13	26	1.9	3.7

* A right whale sighting consists of 1 or more right whales.

** Individuals may have been re-sighted within the same or different months.

First sightings of individual right whales (i.e., whale detected for the first time in the season) were made throughout the calving season and into mid-February (Figure 5).

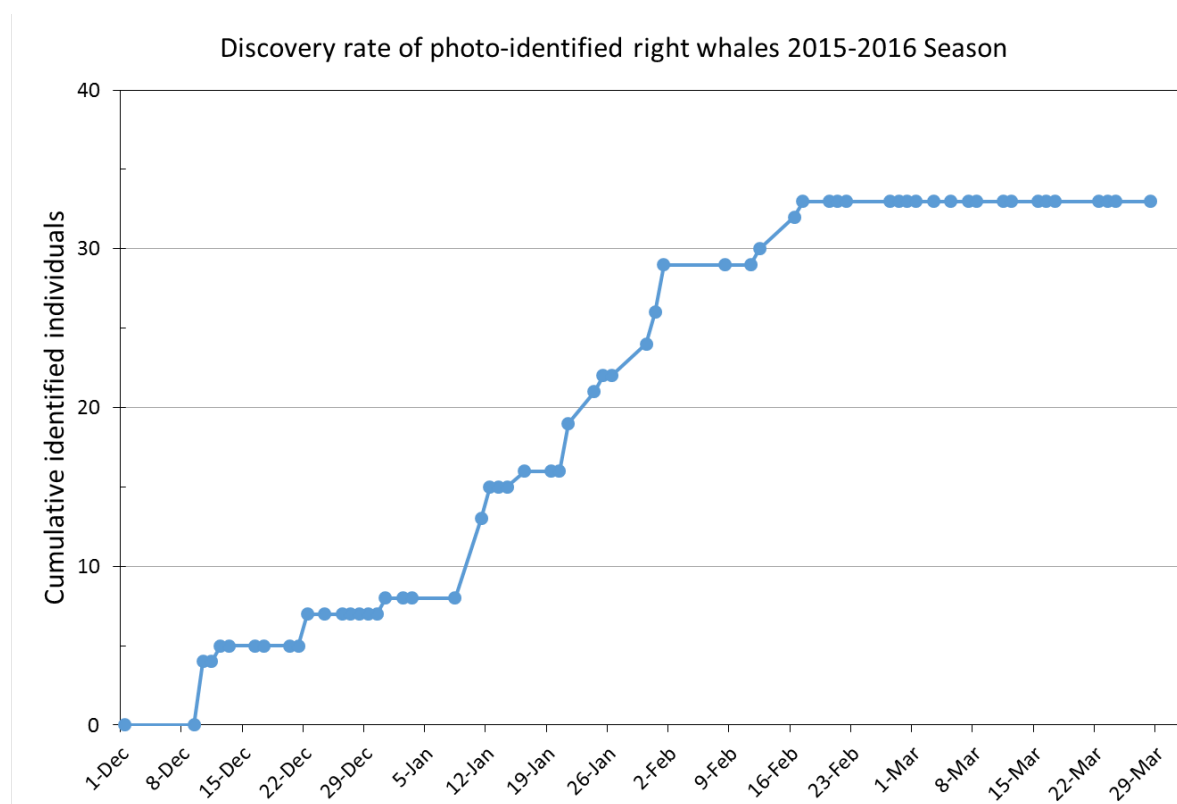


Figure 5. Rate of right whale discovery by the S2S and FWC aerial survey teams in the calving area (calves included). Points represent all flight days. No new whales were sighted after February 17, 2016.

Fourteen cow/calf pairs were detected in the Southeast United States during the 2015/2016 calving season (Table 3).⁵

The mean calving interval observed across known calving females was 6.6 years (median = 7 years). Most of the calving females are seen elsewhere either every year or with occasional one year gaps (i.e. calves would have likely been seen); however, 3 of the females (Catalog #1810, #2520, and #3180) aren't seen very regularly and it is possible that previous calves were missed. Excluding these 3 females results in a mean calving interval of 6.3 years.

Table 3. Catalog Numbers, Ages, and Other Known Calving Information for Calving Females observed in the Southeast United States during the 2015/2016 Calving Season

(Note: Numbers reflect known calving information –some calving events may have gone undetected).

Whale ID	Age ¹	Number of Calves Known to Have Been Produced by a Given Female ¹	Age At First Known Calving ¹	Last Known Calving Year ¹	Presumed Calving Interval ¹
3405	12	1		N/A	
3450	>12	1		N/A	
3860	8	1		N/A	
4094	6	1		N/A	
3101	15	2	8	2009	7
3317	13	2	6	2009	7
3440	14	2	7	2009	7
3115	15	3	7	2011	5
3180	15	3	7	2010	6
1810	>28	5	>6	2007	9
2520	>22	5	>1	2009	7
1233	>42	6	>15	2009	7
1812	>28	6	>8	2012	4
1281	>35	8	>5	2009	7

¹Data Source: North Atlantic Right Whale Consortium, 2017

Six right whales other than cow/calf pairs were observed in the Southeast United States calving area (Figure 6). These were 4 adult females, 1 juvenile of unknown sex, and 1 adult of unknown sex (later identified as female when found dead in the Gulf of Maine in September, 2016). Aerial survey teams observed/documented 5 of these whales and a member of the public detected the sixth, which was identified via photographs. The number of known calves produced for 2015/2016 and the previous 10 years is included in Appendix A.

⁵Post-season photo analysis indicates calf swapping/adoption occurred between 3 females.

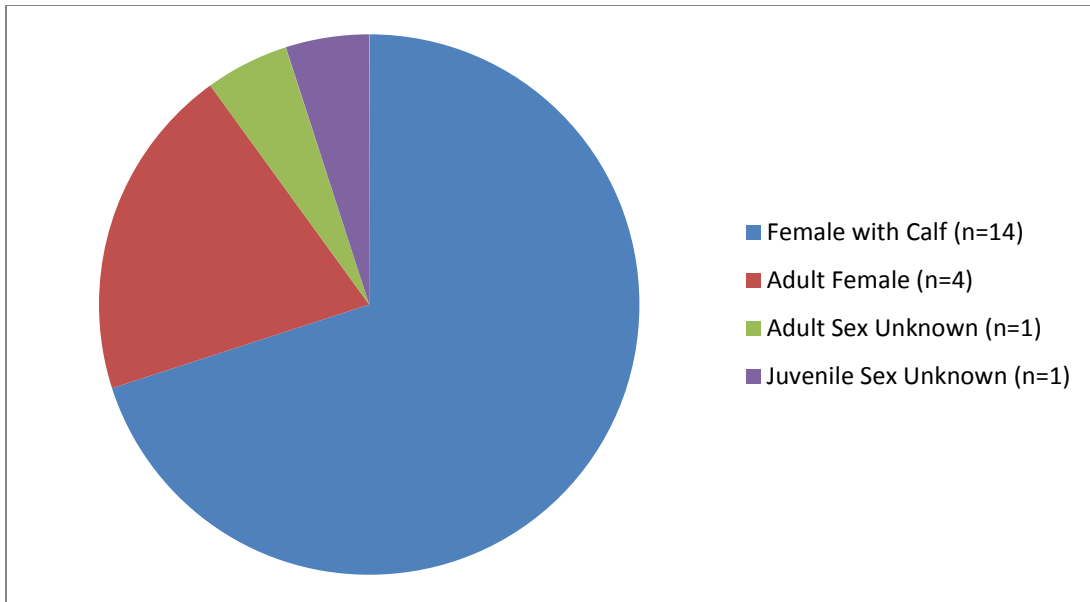


Figure 6. Demographic information of North Atlantic right whales seen in the Southeast United States during the 2015/2016 calving season.

In all, 20 different right whales (excluding calves) were seen in the Southeast United States calving area during the calving season.

Aerial survey teams also sighted eight different humpback whales. No other large whale species were observed.

Whale Alerts

A total of 188 subscribers representing various industries, agencies, and organizations were receiving whale alerts at the end of March 2016 (Table 4). Some entities (e.g., Navy and Coast Guard) subscribed using an email address that automatically distributed whale alerts to several recipients.

A total of 150 whale alerts were issued for the 2015/2016 season. Sightings were generated from a number of sources (Figure 7).

Table 4. Number of Representatives from Various Organization Types Receiving Whale Alerts at the End of the 2015/2016 Right Whale Calving Season

Recipient Type	Count
Commercial Fishing	1
Commercial Shipping/Harbor Pilots	41
Law Enforcement (federal, state, local)	23
Resource Managers (Federal, State, Local)	31
U.S. Army Corps of Engineers/Dredge/Dredge Observers	26
U.S. Coast Guard	9
U.S. Navy	9
Volunteer Sighting Networks	3
Whale Researchers	41
Other	4
Total	188

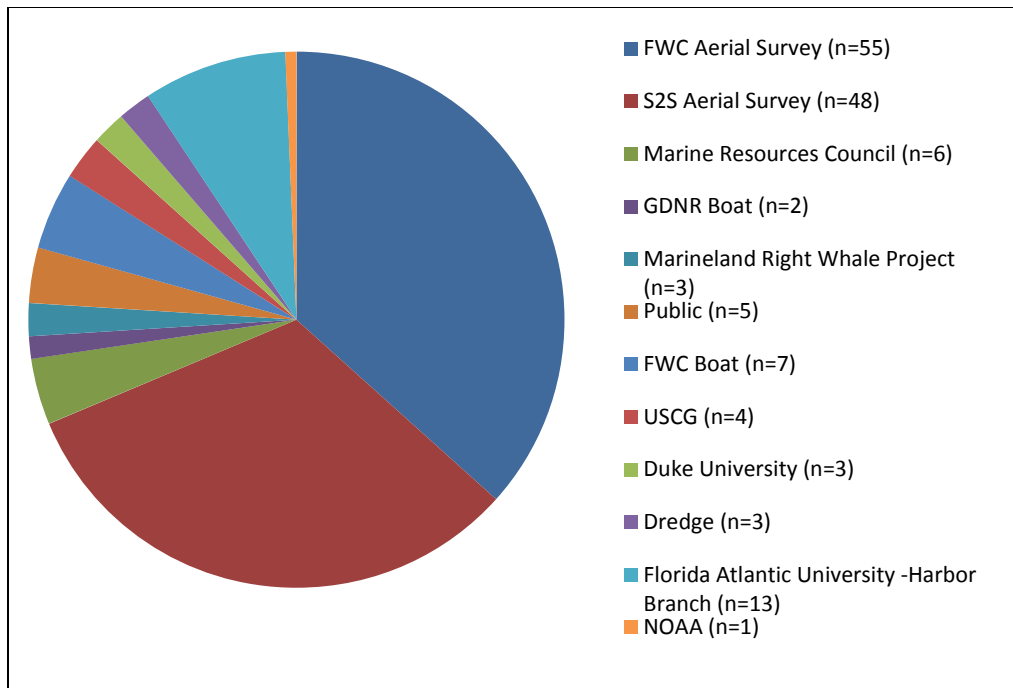


Figure 7. Right whale sighting sources for whale alerts (includes only sightings that were verified).

Miscellaneous

Injured and Entangled Whales

No entangled whales were documented by either survey team.

The New England Aquarium (NEAq) maintains a list of right whales that are either injured or in poor condition and are, therefore, monitored. The following right whale was already on that list and was observed in the calving area.

- Catalog #3670 was observed in the calving area once on December 12, 2015. The whale was in poor health with injuries likely from a previous entanglement.

The following whale, not previously on the NEAq's monitoring list, was observed in the calving area, and was subsequently added to the monitoring list.

- Catalog #1968 was observed in poor health. No gear was seen but there were new entanglement wounds on the peduncle and fluke, and a portion of baleen was sticking out of the mouth.

Mortalities

No dead whales were observed by the survey teams; however, based on sighting and photo history, we suspect that the calf of catalog #3860 died while in the calving area.

Dynamic Management Areas

No Dynamic Management Areas were established within the Southeast United States during the 2015/2016 calving season.

Inlet Incursion

Catalog #3450 and her 2016 calf were initially observed in Sebastian Inlet, FL on February 08, 2016. On several occasions the pair moved eastward as if they were going to exit the inlet, but each time they abruptly and radically changed direction of travel as they approached an overhead bridge (and its shadow) crossing the inlet. The pair remained inside the inlet (approximately $\frac{3}{4}$ nmi from the ocean) for a total of 28 hours and exited on February 09, 2016 when the tide swept the pair under the bridge tail first.

Key Points

- Weather and the EWS lines were substantial factors determining when and where surveys were flown.
- Fourteen cow/calf pairs were documented in the Southeast United States during the 2015/2016 season.
- The mean and median calving interval was 6.6 and 7 years, respectively.
- Six right whales from other demographic groups other than cow/calf pairs were sighted in the calving area.
- Individual whales were seen for the first time and, therefore, were potentially arriving in the calving area as late as mid-February.
- The New England Aquarium is monitoring the health of 2 of the 20 juvenile or adult right whales (10%) that were observed in the calving area.
- One cow/calf pair exhibited avoidance behavior of an overhead bridge.
- One dependent calf disappeared and likely died during the calving season.
- Photo analysis indicated calf swapping/adoption between three female adults.

Acknowledgements

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238. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts. 501 pp.

Appendix A. Known North Atlantic right whale calves born December 2005 - March 2016 (not exclusive to the SEUS calving area) (Waring *et al.* 2016, North Atlantic Right Whale Consortium 2017).

North Atlantic right whale calf production, 2006-2016		
Year ^a	Reported calf production	Reported and assumed calf mortalities ^b
2006	19	2
2007	23	2
2008	23	2
2009	39	1
2010	19	0
2011	22	0
2012	7	1
2013	20	1
2014	11	1
2015	17	0
2016	14	1

^a Includes December of the previous year.

^b Includes assumed deaths based on observations of mothers seen with a calf and then resighted later that same year without a calf.