



FINAL REPORT TO
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

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**Documenting Spatial and Temporal Distribution
of North Atlantic Right Whales off South Carolina and Northern Georgia
2008 – 2009**

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WILDLIFE TRUST
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Abstract

The North Atlantic right whale, *Eubalaena glacialis*, is listed as a federally-protected endangered species under the Endangered Species Act, in addition to being protected by the Marine Mammal Protection Act. The winter calving grounds off the coasts of Georgia and Florida have been designated as critical habitat. The region just north of the critical habitat, including northern Georgia and South Carolina (SCGA), has long been considered an important migratory route. However, recent survey effort and photo-identification data have suggested that some individuals utilize this area not only as a migratory route, but as a residency area as well. The purpose of this aerial survey effort is to collect data on the distribution and use patterns of right whales off the coasts of northern Georgia and South Carolina to assist in determining appropriate management actions in the region. A total of 56 surveys were flown from 15 November 2008 to 15 April 2009 and extended from North Myrtle Beach, South Carolina (33.82°N) to St. Catherine's Island, Georgia (31.58°N). Preliminarily, 49 right whale sightings consisting of 121 right whales were documented (including resights of 21 individuals and two individuals sighted three times). Sightings consisted of 19 cow/calf pairs, 12 single whales, and 19 groups of two or more adult/juvenile right whales (one of which also included a cow/calf pair). Preliminary photo analysis has resulted in the confirmed identification of 14 individual cow/calf pairs and 28 of the individual adult/juvenile whales. The individuals documented include 27 males, 30 females, and 38 individuals of unknown gender (including calves), for a total of 95 individual whales in the study area. Of the 30 females seen, 21 gave birth to new calves this season, although only fourteen were seen with their calves within the study area. The remaining seven females were seen while pregnant prior to giving birth further south. Preliminary sightings of note include sixteen individuals that were unique to the study area and not sighted by other survey teams to the south. Other notable sightings include the first cow/calf pair of the season; eleven surface active groups; and a sighting of Ruffian (EGNO 3530), a whale with prior severe injuries. The number of whales sighted was greatest in February, resulting in 43% of all whales documented during the 2008-2009 season.

Introduction

The North Atlantic right whale, *Eubalaena glacialis*, is listed as a federally-protected endangered species under the Endangered Species Act, in addition to being protected by the Marine Mammal Protection Act. Recent increases in calving may have been accompanied by increases in mortality (Kraus et al. 2005); however examination of the minimum number alive population index suggests a positive trend in numbers (Waring et al. 2007). A slow reproductive rate is further hindered by human related mortality, the largest known threat to the species, including ship impacts and entanglement in fishing gear (NMFS, 2005). It is essential that mitigation measures are enacted quickly and efficiently to minimize human-related mortality, particularly in the calving grounds of the Southeast United States (SEUS).

Right whales are slow moving, especially when accompanied by a calf, and are often not easily seen while at the water's surface due to the lack of a dorsal fin. These factors make them vulnerable to ship strikes, especially in areas of increased vessel traffic. The winter calving grounds off Georgia and northern Florida have been designated as critical habitat for right whales. An Early Warning System (EWS) was created to provide military and commercial vessels with right whale location information while transiting the critical habitat area. The region just north of the critical habitat, including northern Georgia and South Carolina, has long been considered an important migratory route. However, recent survey effort and photo-identification data has suggested that some individuals utilize this area not only as a migratory route, but as a residency area as well. Resource managers are interested in learning more about the extent and the importance of this southern mid-Atlantic region to the reproducing population. In addition, continuing mortality from ship strikes and gear entanglement in the mid-Atlantic region is of concern to researchers and managers. The purpose of this aerial survey effort is to provide more information to aid managers in addressing these recovery challenges.

Aerial survey coverage along the entire coasts of Georgia and South Carolina is enabling a better understanding of the residency areas utilized by calving females and other demographic segments of the population. Conservationists, researchers, and managers have speculated that the current boundaries of the SEUS critical habitat, established in 1994, and other existing management boundaries may not accurately represent the areas in need of management measures to protect the species. Through this continuing multi-year study we hope to provide managers with a more thorough understanding of right whale distribution and residency in the study area to assist with time-critical management decisions.

Methods

Study Area

The South Carolina/northern Georgia (SCGA) survey season began on 15 November 2008 and concluded on 15 April 2009. The SCGA survey area for the 2008-2009 season extended from North Myrtle Beach, South Carolina to the southern end of St. Catherine's Island, Georgia. The survey area was divided into three sections: northern, middle and southern. The northern area extended from North Myrtle Beach, SC (33.82°N) to Cape Romain, SC (33.01 °N) and consisted of 16 southeast/northwest transect lines of varied lengths (35.1 - 35.3 nm) which were flown at approximately 4 nm intervals. The middle area extended from Cape Romain, SC to Fripp Island, SC (32.34 °N) and consisted of 16 southeast/northwest transect lines of varied lengths (35.3 - 35.4 nm) which were also flown at

approximately 4 nm intervals. The southern section extended from Hilton Head Island, SC (32.23 ° N) to St. Catherine's Island, GA (31.58 °N) and consisted of 14 east/west transect lines of varied lengths (11.7 – 29.0 nm) which were flown at 3 nm intervals (Figure 1). The northern and middle transect lines were flown in a southeast/northwest direction as opposed to the east/west orientation of the southern section in order to cover a larger bathymetric range. A complete northern survey consisted of 563.4 nm of trackline flown. A complete middle survey consisted of 565.2 nm of trackline flown. A complete southern survey consisted of 323.5 nm of trackline flown (Table 1). These totals do not include miles flown in transit to, from, and between transect lines. The survey aircraft departed from Mt. Pleasant Regional Airport (formerly known as East Cooper Airport) in Mt. Pleasant, SC. After completing half of the survey lines for the day, the plane would land to refuel and to provide a rest period to avoid observer fatigue. When flying in the northern section, the plane would refuel at Georgetown Airport in Georgetown, SC. In the middle section the plane would refuel at Mt. Pleasant Regional Airport in Mt. Pleasant, SC or at Charleston Executive Airport in Johns Island, SC. In the southern section, the plane would refuel at Hilton Head Airport in Hilton Head, SC. The plane returned to Mt. Pleasant Regional Airport at the end of each normal survey day. Without whale sightings, a complete northern survey took approximately 8.1 Hobbs hours to finish, a complete middle section took approximately 7.7 Hobbs hours, and a complete southern section took approximately 6.3 Hobbs hours, including transit times to and from the airports.

Aerial Surveys

Surveys were scheduled to be flown from 15 November 2008 through 15 April 2009, weather permitting, under VFR (visual flight rules) conditions. Surveys were conducted in a Cessna 337 Skymaster aircraft owned and operated by Orion Aviation. The aircraft was equipped with Global Positioning System (GPS), an Automatic Identification System (AIS), navigation aids, radar, aviation VHF radio, marine VHF radio, a life raft, GPIRB-equipped PFDs, survival suits, flares, EPIRB, and a satellite telephone. Flight protocols included mandatory usage of PFDs and Nomex flight suits. All observers were also required to complete emergency egress training prior to the start of the survey season.

Table 1. South Carolina-Georgia survey trackline waypoints for the 2008-2009 season

Track Line	Latitude West	Longitude West	Latitude East	Longitude East
1	31.58	-81.13	31.58	-80.57
2	31.63	-81.12	31.63	-80.57
3	31.68	-81.12	31.68	-80.57
4	31.73	-81.10	31.73	-80.57
5	31.78	-81.05	31.78	-80.50
6	31.83	-81.00	31.83	-80.50
7	31.88	-80.95	31.88	-80.43
8	31.93	-80.90	31.93	-80.43
9	31.98	-80.85	31.98	-80.43
10	32.03	-80.80	32.03	-80.43
11	32.08	-80.75	32.08	-80.37
12	32.13	-80.70	32.13	-80.37
13	32.18	-80.65	32.18	-80.37
14	32.23	-80.60	32.23	-80.37
15	32.34	-80.45	31.89	-80.00
16	32.41	-80.42	31.96	-79.97
17	32.49	-80.39	32.04	-79.94
18	32.50	-80.30	32.05	-79.85
19	32.54	-80.23	32.09	-79.78
20	32.57	-80.16	32.12	-79.71
21	32.60	-80.08	32.15	-79.63
22	32.62	-79.99	32.17	-79.54
23	32.66	-79.93	32.21	-79.48
24	32.71	-79.88	32.26	-79.43
25	32.76	-79.82	32.31	-79.37
26	32.80	-79.75	32.35	-79.30
27	32.85	-79.70	32.40	-79.25
28	32.89	-79.63	32.44	-79.18
29	32.97	-79.61	32.52	-79.16
30	33.02	-79.56	32.57	-79.11
31	33.01	-79.44	32.56	-78.99
32	33.02	-79.35	32.57	-78.90
33	33.10	-79.32	32.65	-78.87
34	33.13	-79.25	32.68	-78.80
35	33.18	-79.19	32.73	-78.74
36	33.27	-79.18	32.82	-78.73
37	33.35	-79.15	32.90	-78.70
38	33.43	-79.12	32.98	-78.67
39	33.49	-79.08	33.04	-78.63
40	33.54	-79.02	33.09	-78.57
41	33.60	-78.98	33.15	-78.53
42	33.65	-78.92	33.20	-78.47
43	33.70	-78.87	33.25	-78.42
44	33.75	-78.81	33.30	-78.36
45	33.79	-78.74	33.34	-78.29
46	33.82	-78.67	33.37	-78.22

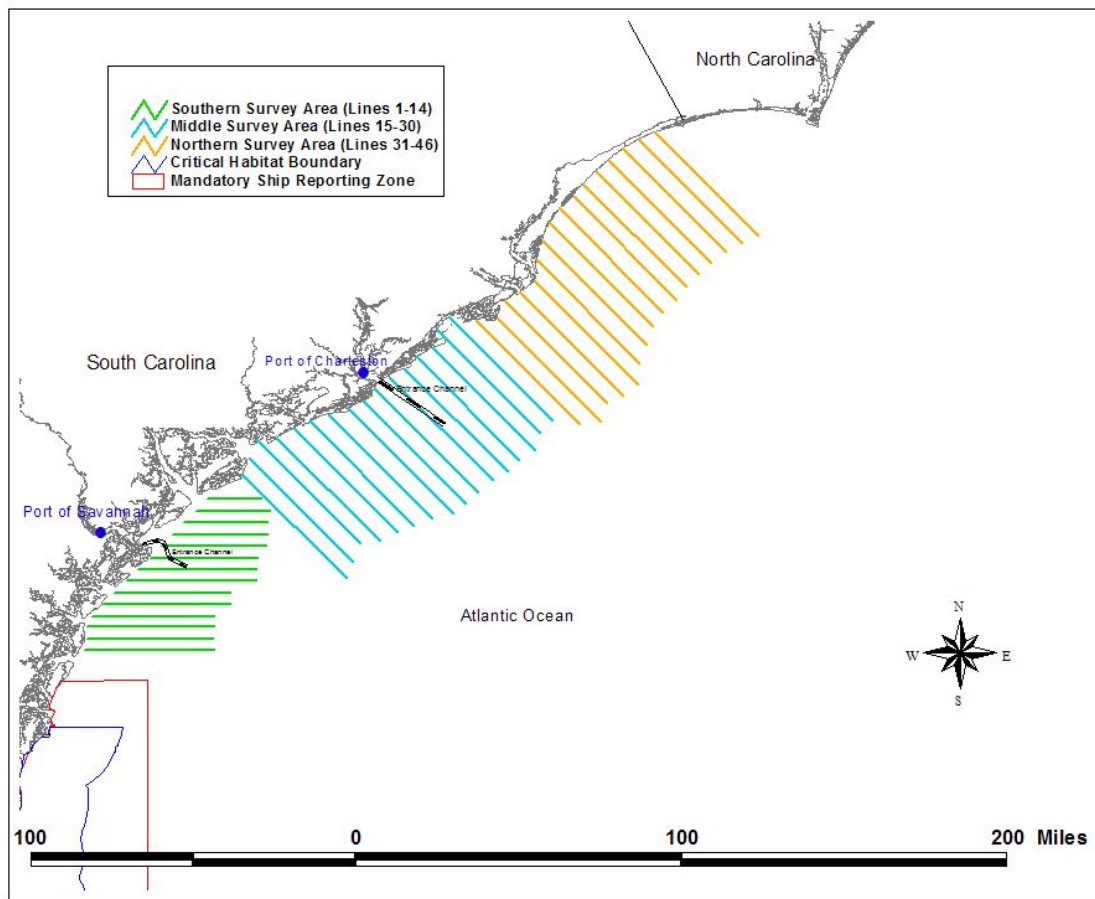


Figure 1. Map of South Carolina-Georgia Survey tracklines flown during the 2008-2009 season

Surveys were flown at an altitude of 1000 ft (303 m) and at a ground speed of 100 knots. The surveys were typically flown south to north with the western waypoint of the southernmost trackline as the start point. However, the section flown, the start point and direction of flight was determined daily, based on weather conditions throughout the survey area and other survey factors, including spreading survey effort equally amongst the survey areas. Conditions necessary for survey flight included a minimum ceiling of 455m, visibility greater than 2nm, wind speed less than 17 knots, and Beaufort sea state of 4 or less. The survey crew consisted of a pilot, co-pilot and two observers. The observers were positioned on either side of the aircraft behind the pilot and co-pilot seats. All events, sightings, and changes in environmental conditions were recorded on a laptop computer using Logger 2000, a software program designed for marine data entry. To minimize time spent looking away from the window, when an event occurred the left observer recorded the time and position of the event on the computer while the right observer recorded the time and event information into a handheld digital voice recorder. Time, location, number and species of all large whales were recorded. In addition, the AIS receiver installed in the plane recorded large vessel (over 33m in length) information including name, position, speed, length, and course.

Sighting distance for all large whales was calculated from overhead GPS locations. When a right whale was observed, a GPS position was recorded along the trackline at the point of observation. The survey aircraft then broke track and flew directly over the right whale to obtain a GPS location. The aircraft also circled at 1000 ft over each right whale encountered to obtain photographs. Circling for photographic documentation was generally limited to 15 minutes for each sighting, with a maximum of 30 minutes during special circumstances. After right whales were documented the aircraft returned to the trackline at the point of departure to continue the survey.

Determination of Sighting Distance from the Trackline

Sighting distance from the trackline for observed right whales was calculated whenever possible, using the latitude and longitude position (lat/long) on the trackline perpendicular to the position of the whale sighting (lat1,long1), and the lat/long of the exact overhead position of the right whale (lat2,long2). The whale's distance in nautical miles from the trackline was determined by the equation¹:

$$= \text{ACOS}(\text{COS}(\text{RAD}(90-a)) * \text{COS}(\text{RAD}(90-b)) + \text{SIN}(\text{RAD}(90-a)) * \text{SIN}(\text{RAD}(90-b)) * \text{COS}(\text{RAD}(c-d))) * 3440.065$$

$$a = \text{lat } 1, b = \text{lat } 2, c = \text{long } 1, d = \text{long } 2$$

The sighting distance from the trackline of large vessels was determined using angles obtained from a digital inclinometer at the time of the vessel's sighting and the equation:

$$= (a/3.281) * (\text{TAN} (\text{RADIANS } (b)))$$

$$a = \text{altitude}, b = \text{angle}$$

Notification of Right Whale Sighting Information

Upon completing data collection for each right whale sighting, the aircraft would immediately use the aircraft satellite phone to call a designated ground contact. The ground contact would then relay the right whale sighting information via email to distribution lists which included harbor pilots, USCG, Navy, and other stakeholders and interested parties. The information sent included date, time, latitude, longitude, number of adults and calves, direction of movement, and distance in nm from the closest sea buoy. In addition, the information was sent to all other military and non-military interests via an alphanumeric pager system (Taylor and Brooks 2002) including all aerial survey teams, ship channel pilots, USCG NAVTEX, and state agencies. The communication system supported real-time notification of right whale presence to ships in order to minimize the probability of right whale death or injury due to ship strike. It also facilitated verification of sighting reports by aerial survey teams from other sources such as military ships and aircraft.

¹equation source: http://bluemm.blogspot.com/2007_01_01_archive.html

Photographic Identification

Right whales are identified by the patterns of cornified skin primarily located on the top of the head between the tip of the rostrum and the blowhole (Payne et al. 1983; Kraus et al. 1986). Photographs of right whale callosity patterns and other features, including scars, are used for identification and the cataloging of individual right whales. Right whales observed during the SCGA aerial surveys were photographed in order to identify individual animals. During a right whale sighting, the left observer recorded all sighting information into the voice recorder and entered the sighting positions into the computer. If possible, the observer also sketched the right whale(s) being photographed, including callosity patterns and body scarring, and recorded observed behaviors. The aircraft would circle at an altitude of 1000 ft (303m) over the whale(s) while the right observer photographed the animals through the co-pilot's sliding window or through the right observer's window which could be opened. Photographs were taken using a Canon 20D digital camera with a fixed 300 mm image stabilizing lens. All photographs obtained during the season were compared against each other and the New England Aquarium's (NEA) catalog of North Atlantic right whales in order to determine the probable identify of individual right whales encountered during the 2008-2009 SCGA survey season. Preliminary photo analysis by the SCGA Wildlife Trust team and initial verification by NEA has been completed and all photographs taken during the 2008-2009 season have been forwarded to NEA for final confirmation. All right whale identification information included in this report is preliminary and should not be considered final until NEA completes the confirmation process.

Results

Aerial Surveys

A total of 56 SCGA surveys were flown from 15 November 2008 through 15 April 2009 (Tables 2 and 3). A total of 357.7 hours of Hobbs time was logged for the SCGA season, averaging 6.5 hours per survey in the northern section, 6.4 hours in the middle section, and 5.9 hours in the southern section (including complete and partial surveys). A total of 6533.6 nautical miles (nm) of trackline were flown in the northern section, 10879.5 nm in the middle, and 5532.7 nm in the southern, for a total of 22945.8 nm of trackline flown. Additionally, the total amount of trackline miles flown in a Beaufort sea state of 3 or less was 21682.8nm. The northern survey area was completed on six survey days during the season and partially completed on eight survey days. The middle survey area was completed on 15 survey days and partially completed on eight survey days. The southern survey area was completed on 15 survey days and partially completed on four survey days. The 20 partially completed SCGA flights were largely due to factors such as weather and sea state conditions. See Figure 2 for a graphical representation of survey effort. Days with no survey effort in the SCGA survey area were primarily due to unacceptable weather conditions.

Sighting Distances for Right Whales

Sighting distances were calculated whenever possible, and the average sighting distance for all right whale sightings was 0.95 (SD = 0.87) nautical miles from the trackline (Figure 3).

Sightings of Large Vessels

AIS data for large vessels were collected continuously during the surveys and saved into a text file using the software Coastal Explorer to be analyzed at a later date.

Table 2. Survey effort for SCGA surveys conducted during the 2008-2009 season. “S” refers to the southern survey zone, “M” the middle survey zone, and “N” the northern survey zone.

Date	Complete Surveys	Partial Surveys	Hobbs	Total Trackline NM Flown	Trackline NM Flown in Beaufort 3 or Less	Number of Right Whales Seen	Comments
16-Nov-08	-	-	4.3	-	-	-	Training flights
17-Nov-08	M		7.1	565.20	565.20	0	Complete
20-Nov-08	N		7.1	563.40	493.20	0	Complete
23-Nov-08	M		7.7	565.20	565.20	2	Complete
24-Nov-08	S		7	323.50	323.50	3	Complete
26-Nov-08	N		7.4	563.40	563.40	0	Complete
27-Nov-08		S	3.4	157.40	157.40	0	Incomplete
2-Dec-08	S		6.3	323.50	260.50	4	Complete
3-Dec-08	M		6.9	565.20	565.20	0	Complete
4-Dec-08	S		5.9	323.50	323.50	1	Complete
6-Dec-08	M		7.2	565.20	565.20	3	Complete
16-Dec-08		M	3.3	221.96	221.96	0	Incomplete-fog
18-Dec-08	S		6.9	323.50	323.50	10	Complete
19-Dec-08		N	6.3	482.00	335.70	0	Incomplete-sea state
28-Dec-08		M	5.1	424.00	424.00	0	Incomplete-fog
2-Jan-09	S		6.6	323.50	323.50	2	Complete
5-Jan-09		M	5.8	353.40	353.40	2	Incomplete-wind
6-Jan-09		S	1.5	0.00	0.00	0	Incomplete-fog
9-Jan-09		M	5.6	353.40	353.40	2	Incomplete
10-Jan-09		S	7.8	261.40	261.40	14	Incomplete-daylight
14-Jan-09		N	5.3	352.40	352.40	0	Incomplete-wind
15-Jan-09		S	4.6	261.40	216.30	0	Incomplete-wind
17-Jan-09		M	5.2	423.60	43.91	0	Incomplete
21-Jan-09		N	4.5	202.00	202.00	3	Incomplete-wind
22-Jan-09	S		5.9	323.50	293.45	2	Complete
26-Jan-09		M	3.8	282.40	225.41	0	Incomplete-fog
30-Jan-09	N		7.7	563.40	563.40	0	Complete
31-Jan-09	S		6.6	323.50	323.50	5	Complete
1-Feb-09	M		7.6	565.20	565.20	2	Complete
2-Feb-09		N	4.9	352.40	352.40	0	Incomplete- fog, rain
6-Feb-09	S		6	323.50	323.50	0	Complete
7-Feb-09	N		7.9	563.40	563.40	1	Complete
8-Feb-09	S		5.5	323.50	297.36	2	Complete
9-Feb-09	M		7.2	565.20	565.20	0	Complete

Date	Complete Surveys	Partial Surveys	Hobbs	Total Trackline NM Flown	Trackline NM Flown in Beaufort 3 or Less	Number of Right Whales Seen	Comments
10-Feb-09	M		7.1	565.20	565.20	0	Complete
12-Feb-09	S		7	323.50	323.50	11	Complete
13-Feb-09	N		7.7	563.40	563.40	0	Complete
21-Feb-09	M		8.1	565.20	565.20	9	Complete
25-Feb-09	N		7.8	563.40	563.40	2	Complete
26-Feb-09	M		9.1	565.20	565.20	19	Complete
27-Feb-09	S		6.6	323.50	323.50	6	Complete
4-Mar-09	M		8.5	565.20	565.20	2	Complete
5-Mar-09	S		5.8	323.50	323.50	0	Complete
6-Mar-09		N	7	493.20	374.81	2	Incomplete-wind
7-Mar-09	S		5.7	323.50	323.50	0	Complete
8-Mar-09	M		7.5	565.20	565.20	2	Complete
10-Mar-09		M	4.5	342.71	342.71	0	Incomplete-fog
18-Mar-09		N	7.2	522.41	313.78	0	Incomplete-wind
19-Mar-09	M		7.4	565.20	565.20	0	Complete
23-Mar-09	M		7.6	565.20	565.20	2	Complete
24-Mar-09	S		6.5	323.50	280.80	4	Complete
30-Mar-09	M		6.9	565.20	565.20	0	Complete
31-Mar-09		N	7.8	326.01	326.01	2	Incomplete
4-Apr-09	M		7	565.20	565.20	0	Complete
5-Apr-09	S		6.6	323.50	323.50	2	Complete
9-Apr-09		N	5.3	422.80	347.01	0	Incomplete-wind
11-Apr-09		M	1.1	0.00	0.00	0	Incomplete-sea state

Table 3. Survey effort totals for SCGA surveys conducted during the 2008-2009 season

Survey Area	Complete Surveys	Partial Surveys	Hobbs Time	Total Trackline Miles Flown	Total Trackline Miles Beaufort ≤ 3	Number of Right Whales Seen
North	6	8	98.2	6533.6	5914.3	10
Middle	15	8	147.3	10879.5	10442.8	45
South	15	4	112.2	5532.7	5325.7	66
Totals	36	20	357.7	22945.8	21682.8	121

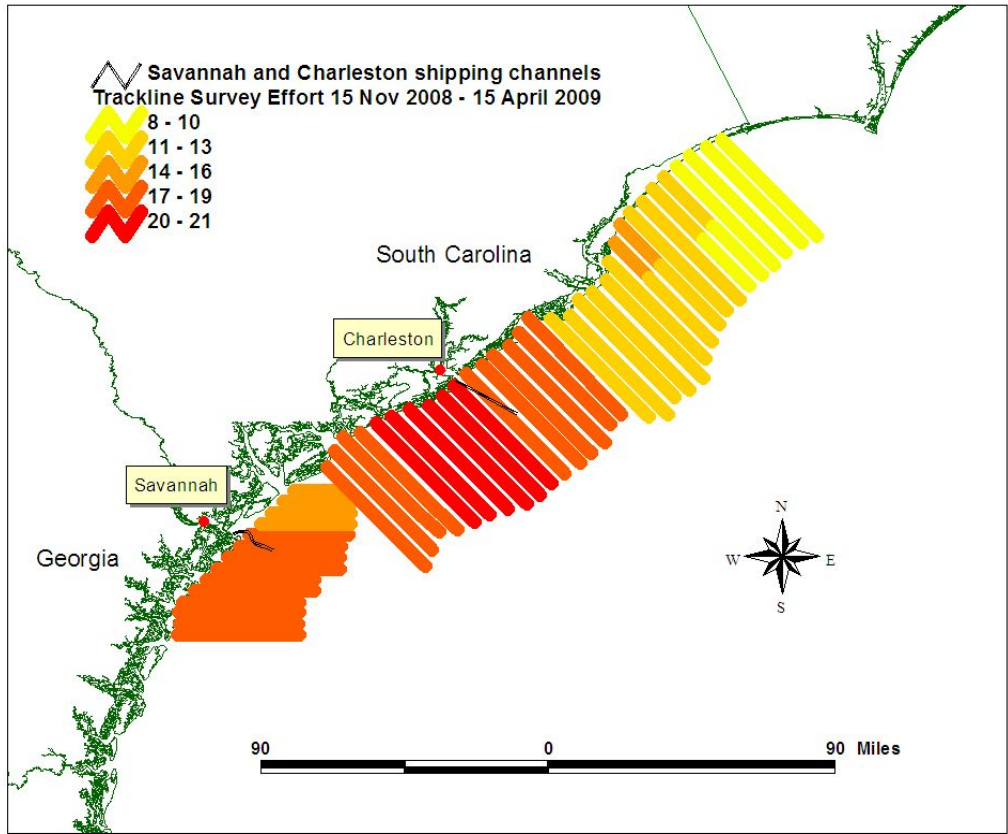


Figure 2. Survey effort for SCGA surveys conducted during the 2008-2009 season. Areas with higher (20-21 surveys) effort are depicted in red; areas with lower (8-10 surveys) effort are depicted in yellow.

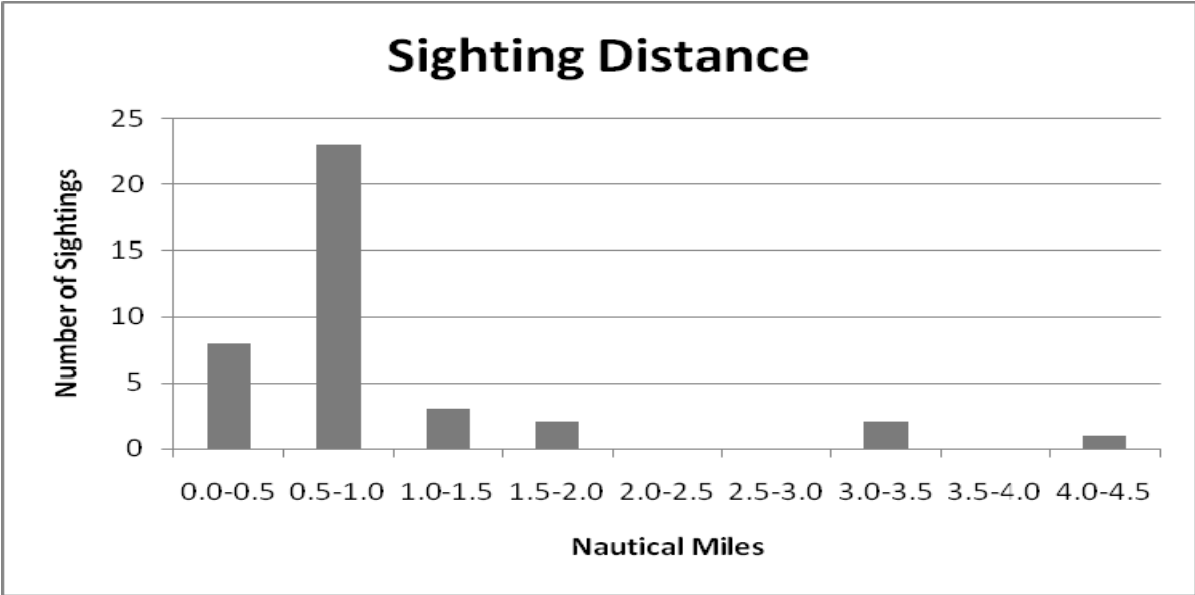


Figure 3. Right Whale sighting distances during the 2008-2009 season

Whale/Ship Interactions

No whale/ship interactions were documented this season. However, on 31 March 2009, a vessel reported striking a right whale off Hilton Head, SC, in the southern survey area. The survey plane was working in the northern survey area that day but transited to the southern area to assist in the relocation of the whale. After refueling, the survey plane arrived at the initial position where the accident occurred and began a search pattern. After searching for approximately 1.5 hours, the survey team was called off the search and the whale was not relocated.

Dead/Entangled Right Whales

One entangled whale was observed this season. On 31 January 2009, EGNO 3311, recently named “Bridle”, was observed alone in the southern survey area at 31.83947N, 080.82944W and moving slowly south. Bridle was first documented entangled near Brunswick, GA on 14 January 2009. A telemetry buoy was attached to trailing line. Bridle’s track passed through, or just outside of, the SCGA survey areas at least four times over the nearly two months it was in the southeast U.S. As this whale was being tracked and its location documented, the NOAA SEUS Right Whale Recovery Program Coordinator was contacted and confirmed that the whale should be documented but there was no need to remain with the whale.

On 12 February 2009, the 2007 calf of 2614 was located in the southern SCGA survey zone. A disentanglement attempt was initiated and the Wildlife Trust Northern EWS survey team located the whale using telemetry tracking equipment and then stood by to assist during the attempt. The disentanglement team was able to remove most of the entangling line from the whale.

No dead right whales were observed within the SCGA study area during the 2008-2009 season.

Humpback Whales

One humpback whale was observed within the SCGA study area during the 2008-2009 season. On 02 February 2009, a single humpback whale was observed in the northern survey area at 33.03635N, 079.27365W. This whale was associated with several bottlenose dolphins and was not traveling in any particular direction.

A dead humpback was sighted on 18 March 2009 in the northern section at 33.32708N, 78.41503W, approximately 33 nautical miles SE of Myrtle Beach, SC. The whale appeared to be of an advanced decomposition level (Code 4). Barb Zoodsma was contacted immediately, and images were distributed to Barb Zoodsma and Blair Mase of NOAA Fisheries after the survey was completed. A dead humpback, presumably this whale, stranded 10 days later on Edingsville Beach near Edisto.

Right Whale Sightings and Identifications

Forty-nine right whale sightings were documented during the SCGA surveys, consisting of 121 right whales. The total number of whales seen includes resights of twenty-one individuals, two individuals sighted three times, and two that have not been identified for a total of 95 different individual whales. Nineteen cow/calf pairs, 12 single whales, and 19 groups of two or more adult/juvenile right whales were documented (Figure 4). Preliminary photoanalysis by the SCGA Wildlife Trust team and verification by New England Aquarium (NEA) has resulted in the identification of fourteen cow/calf

pairs (five of the pairs were observed twice) and 28 of the individual adult/juvenile whales which accounts for 56 of the 95 animals sighted during the season (Tables 4 and 5). The numbers and codes listed in the “EGNO” column of Table 4 include EGNO numbers for known whales and intermatch codes (i.e. SE06CT05). These intermatch codes were created to assist in the preliminary matching of juvenile whales until they are assigned EGNOs. Whales with “poss” next to their EGNO indicate preliminary photo-identification that has not yet been verified by NEA. Thirty-nine individual whales have not been positively identified at the time of this report. All right whale identification information included in this report is preliminary and should not be considered final until NEA completes the confirmation process.

The 95 individual right whales documented include 27 males, 30 females, and 38 individuals of unknown gender, which includes the 14 calves (Table 5). Adult males (nine or more years old) accounted for 21% of the individuals observed, while females that had calved (either before or after being observed in the SCGA study area) accounted for 22% of the observed individuals (Figure 5). Of the 30 females seen, 21 gave birth to new calves during the 2008-2009 season, although only fourteen were seen with their calves within the SCGA study area. The remaining seven females were seen in the SCGA survey area while pregnant prior to giving birth further south. Of the 21 2008-2009 mothers seen in the SCGA survey area, two last gave birth in 2003, one last gave birth in 2004, six last gave birth in 2005, seven last gave birth in 2006, one last gave birth in 2007 and four were primiparous.

Table 4. Right Whale sightings from SCGA surveys conducted during the 2008-2009 season (“poss” indicated photo-identification that has not yet been verified by NEA).

Sighting #	Whale #	Month	Day	Year	Time (L)	Survey Name	Latitude	Longitude	RIWH Letter	NEA EGNO	NRW Number
1	1	11	23	2008	14:13	SCRW20081123	32.55937	-79.65282	A	3108	SCGA001
1	2	11	23	2008	14:13	SCRW20081123	32.55937	-79.65282	B	1817	SCGA001
2	3	11	24	2008	11:51	SCRW20081124	31.97623	-80.63512	A	1266	SCGA002
3	4	11	24	2008	14:09	SCRW20081124	32.14258	-80.45527	B	1946	SCGA003
3	5	11	24	2008	14:09	SCRW20081124	32.14258	-80.45527	C	1946's calf	SCGA003
4	6	12	02	2008	13:35	SCRW20081202	32.12982	-80.55071	A	1946	SCGA004
4	7	12	02	2008	13:35	SCRW20081202	32.12982	-80.55071	B	1946's calf	SCGA004
5	8	12	02	2008	13:55	SCRW20081202	32.12678	-80.53630	C	3317	SCGA005
5	9	12	02	2008	13:55	SCRW20081202	32.12678	-80.53630	D	1240	SCGA005
6	10	12	04	2008	9:26	SCRW20081204	31.57727	-80.90290	A	3314 poss	SCGA006
7	11	12	06	2008	11:29	SCRW20081206	32.55403	-80.03719	A	2611	SCGA007
7	12	12	06	2008	11:29	SCRW20081206	32.55403	-80.03719	B	1158	SCGA007
7	13	12	06	2008	11:29	SCRW20081206	32.55403	-80.03719	C	1303	SCGA007
8	14	12	18	2008	9:27	SCRW20081218	31.55350	-80.90358	A	3510	SCGA008
8	15	12	18	2008	9:27	SCRW20081218	31.55350	-80.90358	B	2007CalfOf2430 poss	SCGA008
8	16	12	18	2008	9:27	SCRW20081218	31.55350	-80.90358	C	3550	SCGA008
9	17	12	18	2008	9:38	SCRW20081218	31.56247	-80.90313	D	3530	SCGA008
9	18	12	18	2008	9:38	SCRW20081218	31.56247	-80.90313	E	2006CalfOf1946 poss	SCGA008

Sighting #	Whale #	Month	Day	Year	Time (L)	Survey Name	Latitude	Longitude	RIWH Letter	NEA EGNO	NRW Number
9	19	12	18	2008	9:38	SCRW20081218	31.56247	-80.90313	F	S010	SCGA008
10	20	12	18	2008	11:39	SCRW20081218	31.63040	-80.88761	G	3290	SCGA009
10	21	12	18	2008	11:39	SCRW20081218	31.63040	-80.88761	H	2660	SCGA009
11	22	12	18	2008	14:10	SCRW20081218	31.97175	-80.66952	I	1503	SCGA010
11	23	12	18	2008	14:10	SCRW20081218	31.97175	-80.66952	J	1503's calf	SCGA010
12	24	01	02	2009	10:16	SCRW20090102	31.61465	-80.94120	A	1158	SCGA011
12	25	01	02	2009	10:16	SCRW20090102	31.61465	-80.94120	B	3290	SCGA011
13	26	01	05	2009	12:52	SCRW20090105	32.39890	-80.08590	A	1310	SCGA012
13	27	01	05	2009	12:52	SCRW20090105	32.39890	-80.08590	B	1310's calf	SCGA012
14	28	01	09	2009	11:14	SCRW20090109	32.39742	-80.04709	A	1310	SCGA013
14	29	01	09	2009	11:14	SCRW20090109	32.39742	-80.04709	B	1310's calf	SCGA013
15	30	01	10	2009	9:34	SCRW20090110	31.62017	-80.89883	A	3651 poss	SCGA014
15	31	01	10	2009	9:34	SCRW20090110	31.62017	-80.89883	B	3620 poss	SCGA014
16	32	01	10	2009	10:45	SCRW20090110	31.67233	-80.90140	C	3440	SCGA015
16	33	01	10	2009	10:45	SCRW20090110	31.67233	-80.90140	D	3440's calf	SCGA015
17	34	01	10	2009	11:02	SCRW20090110	31.69458	-80.79788	E	3310 poss	SCGA016
18	35	01	10	2009	12:07	SCRW20090110	31.71445	-80.97519	F	1711	SCGA017
18	36	01	10	2009	12:07	SCRW20090110	31.71445	-80.97519	G	1711's calf	SCGA017
19	37	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	H	3623 poss	SCGA018
19	38	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	I	3503 poss	SCGA018
19	39	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	J	2006CalfOf1248 poss	SCGA018
19	40	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	K	3520 poss	SCGA018
19	41	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	L	3513 poss	SCGA018
19	42	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	M	2006CalfOf1946 poss	SCGA018
19	43	01	10	2009	15:03	SCRW20090110	31.93543	-80.61680	N	3317	SCGA018
20	44	01	21	2009	13:32	SCRW20090121	32.95307	-79.28703	A	2791	SCGA019
21	45	01	21	2009	13:57	SCRW20090121	33.02211	-79.22042	B	1613	SCGA020
21	46	01	21	2009	13:57	SCRW20090121	33.02211	-79.22042	C	1970	SCGA020
22	47	01	22	2009	13:55	SCRW20090122	32.23919	-80.39889	A	S019	SCGA021
22	48	01	22	2009	13:55	SCRW20090122	32.23919	-80.39889	B	BK52	SCGA021
23	49	01	31	2009	12:44	SCRW20090131	31.66193	-80.93096	A	3760	SCGA022
24	50	01	31	2009	13:54	SCRW20090131	31.78843	-80.48611	B	2743	SCGA023
24	51	01	31	2009	13:54	SCRW20090131	31.78843	-80.48611	C	3279	SCGA023
25	52	01	31	2009	14:47	SCRW20090131	31.83947	-80.82944	D	3311	SCGA024
26	53	01	31	2009	15:53	SCRW20090131	32.01737	-80.58607	E	2791	SCGA025
27	54	02	01	2009	13:42	SCRW20090201	32.21630	-79.90348	A	1240	SCGA026
27	55	02	01	2009	13:42	SCRW20090201	32.21630	-79.90348	B	1240's calf	SCGA026
28	56	02	07	2009	9:24	SCRW20090207	32.97450	-79.21358	A	1204	SCGA027
29	57	02	08	2009	12:15	SCRW20090208	31.71502	-80.70027	A	1266	SCGA028
29	58	02	08	2009	12:15	SCRW20090208	31.71502	-80.70027	B	1266'S calf	SCGA028
30	59	02	12	2009	12:15	SCRW20090212	31.88330	-80.60120	A	1813	SCGA029
31	60	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	B	2201 poss	SCGA030
31	61	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	C	2750 poss	SCGA030

Sighting #	Whale #	Month	Day	Year	Time (L)	Survey Name	Latitude	Longitude	RIWH Letter	NEA EGNO	NRW Number
31	62	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	D	1711	SCGA030
31	63	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	E	1711's calf	SCGA030
31	64	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	F	SE06CT05 poss	SCGA030
31	65	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	G	2209	SCGA030
31	66	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	H	CT03RB06 poss	SCGA030
31	67	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	I	1402	SCGA030
31	68	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	J	1506 poss	SCGA030
31	69	02	12	2009	15:20	SCRW20090212	31.59667	-80.74329	K	S013	SCGA030
32	70	02	21	2009	10:16	SCRW20090221	32.46885	-79.54398	A	No ID	SCGA031
32	71	02	21	2009	10:16	SCRW20090221	32.46885	-79.54398	B	3411 poss	SCGA031
32	72	02	21	2009	10:16	SCRW20090221	32.46885	-79.54398	C	3681	SCGA031
33	73	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	D	2042	SCGA032
33	74	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	E	3343 poss	SCGA032
33	75	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	F	SE06CT05 poss	SCGA032
33	76	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	G	1971	SCGA032
33	77	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	H	1804	SCGA032
33	78	02	21	2009	13:20	SCRW20090221	32.23463	-79.71903	I	2541	SCGA032
34	79	02	25	2009	11:25	SCRW20090225	33.33532	-79.00848	A	1970	SCGA033
34	80	02	25	2009	11:25	SCRW20090225	33.33532	-79.00848	B	1970's calf	SCGA033
35	81	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	A	2795 poss	SCGA034
35	82	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	B	2615 poss	SCGA034
35	82	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	C	2541	SCGA034
35	84	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	D	3391 poss	SCGA034
35	85	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	E	S034	SCGA034
35	86	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	F	2310	SCGA034
35	87	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	G	3160 poss	SCGA034
35	88	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	H	3230 poss	SCGA034
35	89	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	I	2713	SCGA034
35	90	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	J	2480	SCGA034
35	91	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	K	1971	SCGA034
35	92	02	26	2009	10:45	SCRW20090226	32.45485	-79.59332	L	08CalfOf2753 poss	SCGA034
36	93	02	26	2009	15:27	SCRW20090226	32.21185	-80.19552	M	2770 poss	SCGA035
36	94	02	26	2009	15:27	SCRW20090226	32.21185	-80.19552	N	08CalfOf2790	SCGA035
36	95	02	26	2009	15:27	SCRW20090226	32.21185	-80.19552	O	2427 poss	SCGA035
36	96	02	26	2009	15:27	SCRW20090226	32.21185	-80.19552	P	3110 poss	SCGA035
36	97	02	26	2009	15:27	SCRW20090226	32.21185	-80.19552	Q	3421 poss	SCGA035
37	98	02	26	2009	15:54	SCRW20090226	32.22722	-80.18328	R	3343 poss	SCGA036
37	99	02	26	2009	15:54	SCRW20090226	32.22722	-80.18328	S	No ID	SCGA036
38	100	02	27	2009	9:58	SCRW20090227	31.69497	-80.55827	A	SE06CT05 poss	SCGA037
38	101	02	27	2009	9:58	SCRW20090227	31.69497	-80.55827	B	SE07CT06 poss	SCGA037
38	102	02	27	2009	9:58	SCRW20090227	31.69497	-80.55827	C	06CalfOf1248 poss	SCGA037
39	103	02	27	2009	10:15	SCRW20090227	31.70448	-80.55553	D	BK03BOF07 poss	SCGA037
40	104	02	27	2009	11:04	SCRW20090227	31.77203	-80.70363	E	1503	SCGA038

Sighting #	Whale #	Month	Day	Year	Time (L)	Survey Name	Latitude	Longitude	RIWH Letter	NEA EGNO	NRW Number
40	105	02	27	2009	11:04	SCRW20090227	31.77203	-80.70363	F	1503's calf	SCGA038
41	106	03	04	2009	10:05	SCRW20090304	32.71580	-79.45983	A	SE07BK08 poss	SCGA039
42	107	03	04	2009	12:30	SCRW20090304	32.47045	-79.62122	B	3232 poss	SCGA040
43	108	03	06	2009	11:20	SCRW20090306	33.42855	-79.08233	A	1970	SCGA041
43	109	03	06	2009	11:20	SCRW20090306	33.42855	-79.08233	B	1970's calf	SCGA041
44	110	03	08	2009	13:06	SCRW20090308	32.30480	-79.89835	A	1151	SCGA042
44	111	03	08	2009	13:06	SCRW20090308	32.30480	-79.89835	B	1151's calf	SCGA042
45	112	03	23	2009	14:56	SCRW20090323	32.48092	-79.99400	A	1612	SCGA043
45	113	03	23	2009	14:56	SCRW20090323	32.48092	-79.99400	B	1612's calf	SCGA043
46	114	03	24	2009	11:40	SCRW20090324	31.73709	-80.73030	A	1204	SCGA044
46	115	03	24	2009	11:40	SCRW20090324	31.73709	-80.73030	B	1204's calf	SCGA044
47	116	03	24	2009	11:50	SCRW20090324	31.72128	-80.73241	C	1611	SCGA045
47	117	03	24	2009	11:50	SCRW20090324	31.72128	-80.73241	D	1611's calf	SCGA045
48	118	03	31	2009	9:52	SCRW20090331	33.02528	-79.11783	A	1315	SCGA046
48	119	03	31	2009	9:52	SCRW20090331	33.02528	-79.11783	B	1315's calf	SCGA046
49	120	04	05	2009	10:57	SCRW20090405	31.65975	-80.76975	A	2791	SCGA047
49	121	04	05	2009	10:57	SCRW20090405	31.65975	-80.76975	B	2791's calf	SCGA047

Table 5. Demographics of individual right whales seen during the SCGA 2008-2009 season. Asterisk (*) indicates right whales that are unique to the SCGA survey area. "poss" indicates an ID that has not yet been confirmed by the New England Aquarium. "U" is an abbreviation for "unknown". Individuals in bold are 2008-2009 mothers.

Identification code (EGNO/Intermatch)	Date Sighted	Birth Year	Calf of	Gender	First Seen	Last Seen	# calves produced (inc. 0809)	Last Known Calving
1151	3/8/2009	U	U	F	1980	2006	6	2006
1151's 2009 calf	3/8/2009	2009	1151	U	2009	2009		
1158	12/6/2008	U	U	F	1981	2006	1	1991
1158	1/2/2009	U	U	F	1981	2006	1	1991
1204	2/7/2009	U	U	F	1982	2005	7	2005
1204	3/24/2009	U	U	F	1982	2005	7	2005
1204's 2009 calf	3/24/2009	2009	1204	U	2009	2009		
1240	12/2/2008	U	U	F	1974	2006	8	2005
1240	2/1/2009	U	U	F	1974	2006	8	2005
1240's 2009 calf	2/1/2009	2009	1240	U	2009	2009		
1266	11/24/2008	U	U	F	1982	2005	7	2004
1266	2/8/2009	U	U	F	1982	2005	7	2004
1266's 2009 calf	2/8/2009	2009	1266	U	2009	2009		
1303	12/6/2008	U	U	F	1979	2006	6	2005
1310	1/5/2009	U	U	F	1979	2006	7	2005

	Identification code (EGNO/Intermatch)	Date Sighted	Birth Year	Calf of	Gender	First Seen	Last Seen	# calves produced (inc. 0809)	Last Known Calving
	1310	1/9/2009	U	U	F	1979	2006	7	2005
	1310's 2009 calf	1/5/2009	2009	1310	U	2009	2009		
	1310's 2009 calf	1/9/2009	2009	1310	U	2009	2009		
	1315	3/31/2009	1983	1314	F	1983	2006	5	2005
	1315's 2009 calf	3/31/2009	2009	1315	U	2009	2009		
	1402	2/12/2009	1984	1157	M	1984	2006		
	1503	12/18/2008	1985	1240	F	1985	2006	4	2006
	1503	2/27/2009	1985	1240	F	1985	2006	4	2006
	1503's 2009 calf	12/18/2008	2009	1503	U	2009	2009		
	1503's 2009 calf	2/27/2009	2009	1503	U	2009	2009		
	1506 poss	2/12/2009	1985	1248	M	1985	2008		
	1611	3/24/2009	1986	1034	F	1986	2008	3	2006
	1611's 2009 calf	3/24/2009	2009	1611	U	2009	2009		
	1612	3/23/2009	U	U	F	1986	2003	5	2003
	1612's 2009 calf	3/23/2009	2009	1612	U	2009	2009		
*	1613	1/21/2009	1986	1612	M	1986	2006		
	1711	1/10/2009	1987	1710	F	1987	2006	2	2003
	1711	2/12/2009	1987	1710	F	1987	2006	2	2003
	1711's 2009 calf	1/10/2009	2009	1711	U	2009	2009		
	1711's 2009 calf	2/12/2009	2009	1711	U	2009	2009		
	1804	2/21/2009	1988	1160	M	1988	2008		
*	1813	2/12/2009	U	U	M	1988	2006		
	1817	11/23/2008	U	U	F	1988	2008	4	2006
	1946	11/24/2008	1989	1246	F	1989	2006	4	2006
	1946	12/2/2008	1989	1246	F	1989	2006	4	2006
	1946's 2009 calf	11/24/2008	2009	1946	U	2009	2009		
	1946's 2009 calf	12/2/2008	2009	1946	U	2009	2009		
	1970	1/21/2009	U	U	F	1989	2005	4	2005
	1970	2/25/2009	U	U	F	1989	2005	4	2005
	1970	3/6/2009	U	U	F	1989	2005	4	2005
	1970's 2009 calf	2/25/2009	2009	1970	U	2009	2009		
	1970's 2009 calf	3/6/2009	2009	1970	U	2009	2009		
	1971	2/21/2009	1989	1171	M	1989	2007		
	1971	2/26/2009	1989	1171	M	1989	2007		
	2042	2/21/2009	1990	1142	F	1990	2008	0	
*	2201 poss	2/12/2009	1992	1001	M	1992	2006		
	2209	2/12/2009	1992	1509	M	1992	2006		
*	2310	2/26/2009	U	U	M	1993	2005		
	2427 poss	2/26/2009	1994	1127	M	1994	2005		
*	2480	2/26/2009	U	U	U	1994	2006		
	2541	2/21/2009	1995	1241	M	1995	2005		
	2541	2/26/2009	1995	1241	M	1995	2005		
	2611	12/6/2008	1996	2610	F	1996	2007	2	2007

	Identification code (EGNO/Intermatch)	Date Sighted	Birth Year	Calf of	Gender	First Seen	Last Seen	# calves produced (inc. 0809)	Last Known Calving
	2615 poss	2/26/2009	1996	1815	M	1996	2005		
	2660	12/18/2008	1996	1160	F	1996	2006	2	2006
*	2713	2/26/2009	1997	1013	M	1997	2005		
	2743	1/31/2009	1997	1243	M	1997	2006		
*	2750 poss	2/12/2009	1997	1950	M	1997	2008		
	2770 poss	2/26/2009	U	U	M	1996	2005		
	2791	1/21/2009	U	U	F	1997	2008	2	2006
	2791	1/31/2009	U	U	F	1997	2008	2	2006
	2791	4/5/2009	U	U	F	1997	2008	2	2006
	2791's 2009 calf	4/5/2009	2009	2791	U	2009	2009		
	2795 poss	2/26/2009	U	U	M	1997	2005		
	3108	11/23/2008	2001	1308	F	2001	2006	1	
	3110 poss	2/26/2009	2001	1710	M	2001	2005		
*	3160 poss	2/26/2009	2001	1160	U	2001	2007		
*	3230 poss	2/26/2009	2002	2040	F	2002	2008	0	
	3232 poss	3/4/2009	2002	1632	F	2002	2006	0	
	3279	1/31/2009	2002	1179	M	2002	2008		
	3290	12/18/2008	2002	1810	F	2002	2007	1	
	3290	1/2/2009	2002	1810	F	2002	2007	1	
	3310 poss	1/10/2009	2003	2301	M	2003	2008		
	3311	1/31/2009	2003	1711	U	2003	2008		
	3314 poss	12/4/2008	2003	2114	F	2003	2007	0	
	3317	12/2/2008	2003	1817	F	2003	2008	1	
	3317	1/10/2009	2003	1817	F	2003	2008	1	
	3343 poss	2/21/2009	2003	1243	M	2003	2008		
	3343 poss	2/26/2009	2003	1243	M	2003	2008		
	3391 poss	2/26/2009	U	U	M	2003	2003		
	3411 poss	2/21/2009	2004	1911	F	2004	2007	0	
	3421 poss	2/26/2009	2004	1321	M	2004	2009		
	3440	1/10/2009	U	U	F	2004	2007	1	
	3440's 2009 calf	1/10/2009	2009	3440	U	2009	2009		
	3503 poss	1/10/2009	2005	1703	F	2005	2008	0	
	3510	12/18/2008	2005	3010	M	2005	2008		
	3513 poss	1/10/2009	2005	2413	F	2005	2008	0	
	3520 poss	1/10/2009	2005	2040	F	2005	2008	0	
*	3530	12/18/2008	U	U	M	2005	2008		
	3550	12/18/2008	2005	1145	U	2005	2007		
	3620 poss	1/10/2009	2006	2503	M	2006	2008		
	3623 poss	1/10/2009	2006	2123	U	2006	2008		
	3651 poss	1/10/2009	2006	1151	M	2006	2008		
	3681	2/21/2009	2006	1281	U	2006	2007		
	3760	1/31/2009	2007	2360	U	2007	2007		
	2006CalfOf1248 poss	1/10/2009	2006	1248	U	2006			

	Identification code (EGNO/Intermatch)	Date Sighted	Birth Year	Calf of	Gender	First Seen	Last Seen	# calves produced (inc. 0809)	Last Known Calving
	2006CalfOf1248 poss	2/27/2009	2006	1248	U	2006			
	2006CalfOf1946 poss	12/18/2008	2006	1248	U	2006			
	2006CalfOf1946 poss	1/10/2009	2006	1946	U	2006			
	2007CalfOf2430 poss	12/18/2008	2007	2430	U	2007			
*	2008CalfOf2790	2/26/2009	2008	2790	U	2008			
	2008CalfOf2753 poss	2/26/2009	2008	2753	U	2008			
	BK03BOF07 poss	2/27/2009	U	U	U	U			
*	BK52	1/22/2009	U	U	U	U			
	CT03RB06 poss	2/12/2009	U	U	U	U			
	SE06CT05 poss	2/12/2009	U	U	U	U			
	SE06CT05 poss	2/21/2009	U	U	U	U			
	SE06CT05 poss	2/27/2009	U	U	U	U			
	SE07BK08 poss	3/4/2009	U	U	U	U			
	SE07CT06 poss	2/27/2009	U	U	U	U			
*	S010	12/18/2008	U	U	U	U			
	S013	2/12/2009	U	U	U	U			
*	S019	1/22/2009	U	U	U	U			
	S034	2/26/2009	U	U	U	U			
*	20090221 A	2/21/2009	U	U	U	U			
*	20090226 S	2/26/2009	U	U	U	U			

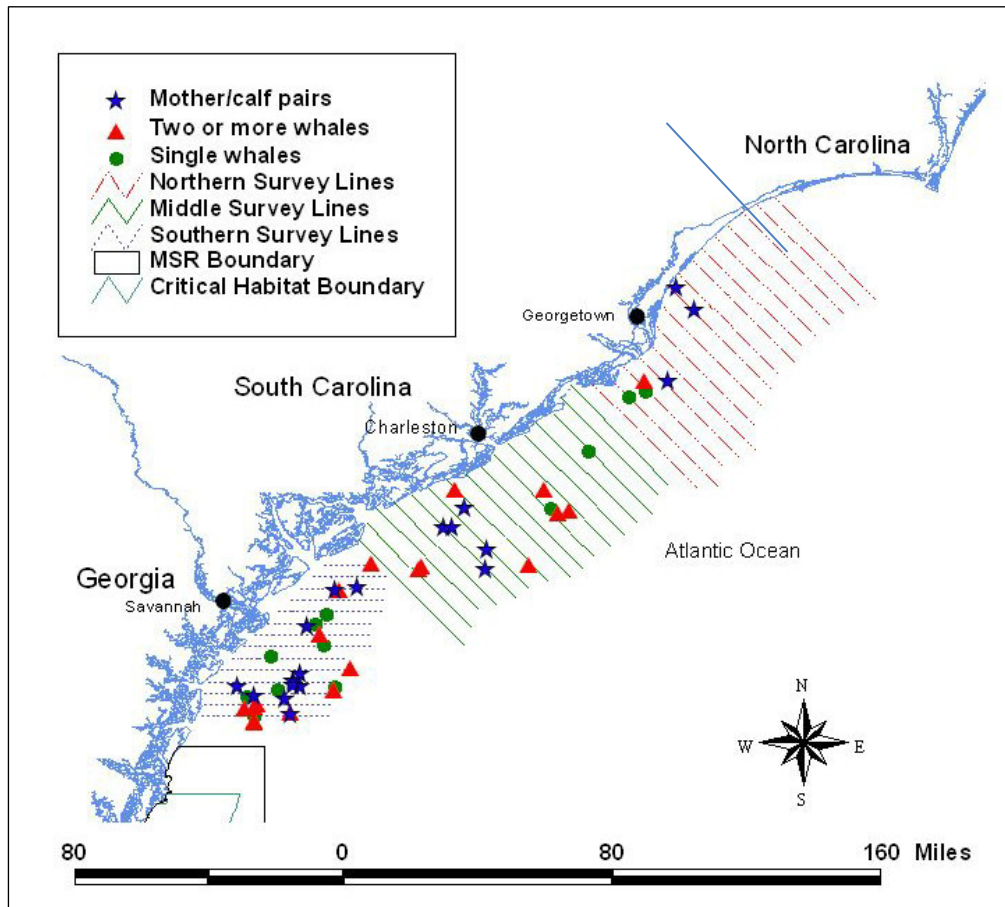


Figure 4. Right whale sightings by group type during the SCGA 2008-2009 season.

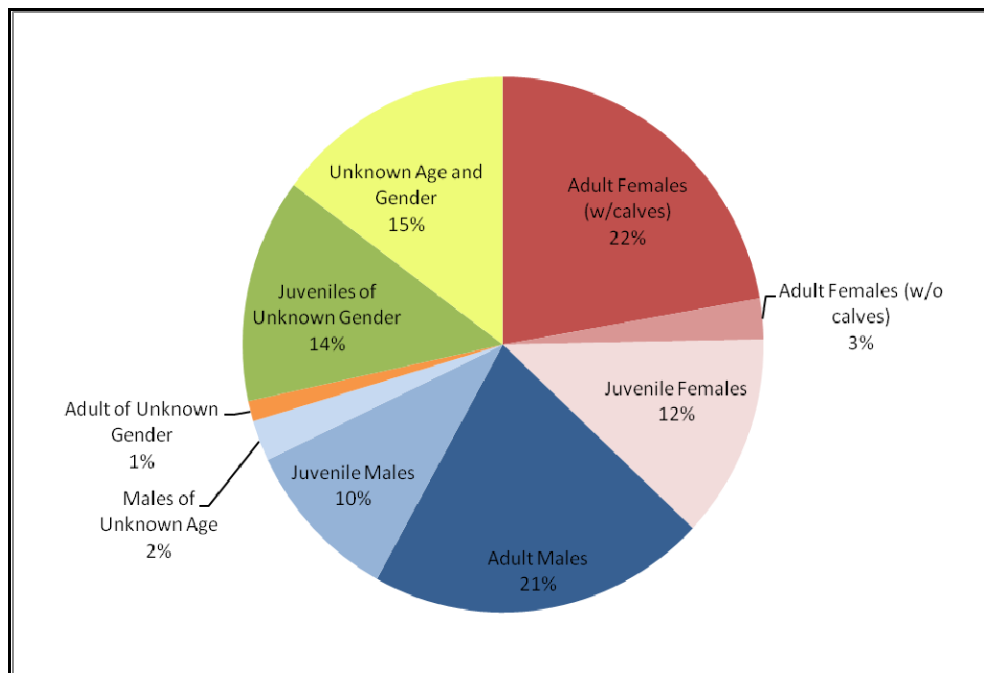


Figure 5. Demographic distribution of right whales observed during the SCGA 2008-2009 season.

Sightings of note include 16 individuals that were unique to the study area (based on preliminary analysis) and not sighted by EWS survey teams to the south: EGNOs 1613, 1813, 2201, 2310, 2480, 2713, 2750, 3160, 3230, 3530, 2008 calf of 2790, BK52, S010, S019, and the two whales currently without possible identifications. Also of note was the sighting of EGNO 1946 and calf on 24 November 2008 as this was the first documented calf of the season. This pair was observed in the southern SCGA section approximately 18 nm northeast of the Savannah channel entrance buoy. Throughout the season 11 surface active groups (SAG) were observed. Group size varied from two to 12 individuals. The largest SAG, consisting of 12 individuals, was comprised of six adult males, one juvenile male, one juvenile female and four individuals of unknown gender or age. The next largest SAG, consisting of ten individuals, was comprised of five adult males, one juvenile male, a cow/calf pair (EGNO 1711 and calf) and 2 individuals of unknown gender or age. A third interesting SAG was dominated by juvenile females. This group consisted of four juvenile females and three other juveniles of unknown gender. A smaller SAG (consisting of three whales) included Ruffian (EGNO 3311). Ruffian was documented in the Central EWS survey area last season (29 January 2008) with severe wounds and scars on his head and back. Based on our images taken this season on 18 December 2008, his wounds and scars appear to be healing.

Geographic locations of the 49 SCGA right whale sightings are depicted by month in Figure 5. During the 2008-2009 season, 47% of the right whale sightings occurred in December and January, and 45% of the sightings occurred in February and March (Figures 5 and 6). Compared to previous seasons, this evenly distributed result is similar to the 2007-2008 and 2006-2007 seasons but is in contrast to the 2005-2006 and 2004-2005 seasons in which the sightings were less evenly distributed temporally (Figure 7). During the 2004-2005 season 88% of all sightings occurred during December and January, and during the 2005-2006 season 72% of all sighting occurred during February and March.

The average number of whales per sighting during the 2008-2009 season was greatest in February (3.7 whales/sighting) and 43% of all whales seen during this season were documented during this month (Figure 6).

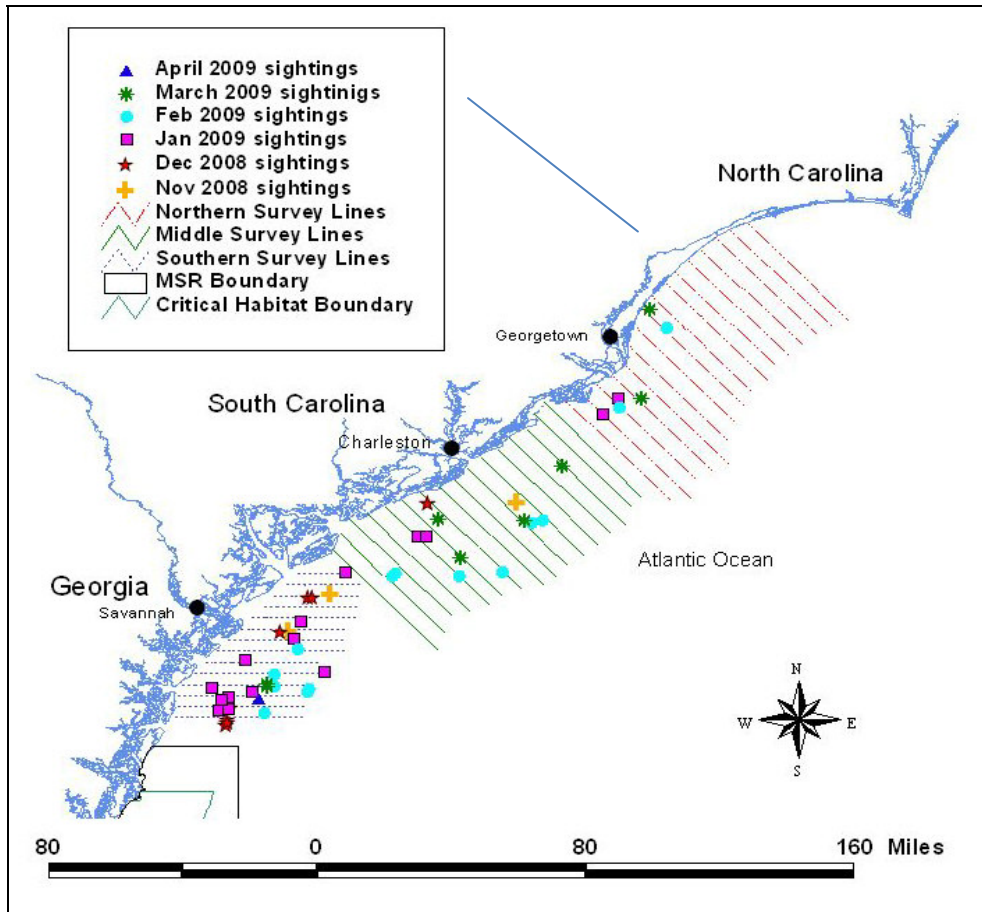


Figure 6. Right whale sightings by month during the SCGA 2008-2009 season.

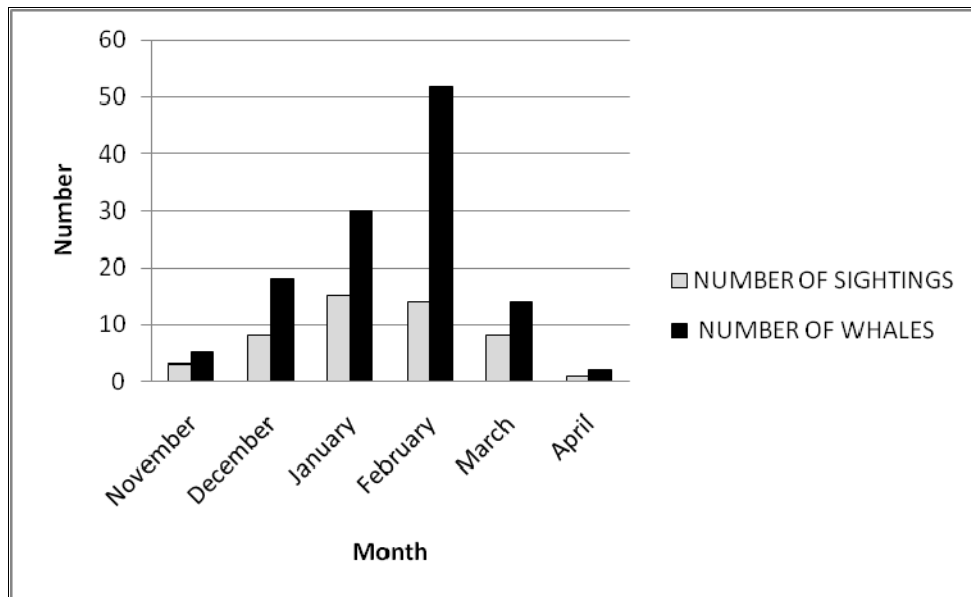


Figure 7. Number of sightings and right whales by month during the SCGA 2008-2009 season.

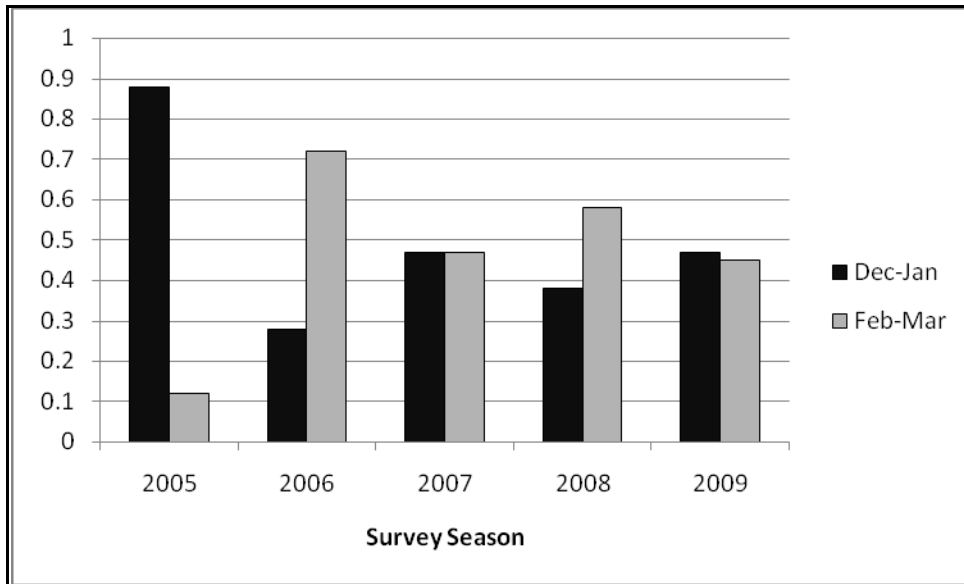


Figure 8. Temporal distribution of SCGA right whale sightings for all survey seasons.

Discussion and Recommendations

The calving ground off the SEUS is an extremely important area for reproduction in the North Atlantic right whale. In addition, this area is vital to military and commercial interests. Three major shipping routes pass through the designated critical habitat, and provide a constant threat to the slow-moving right whale, particularly females with calves. Three additional shipping routes are located in the vicinity, to the north and south of the critical habitat boundary. The Early Warning System and associated aerial surveys and communication systems, as well as the newly implemented ship speed zones, have likely decreased the risk of ship strikes to whales while in the critical habitat. Five years of expanded aerial survey coverage has provided more reliable information on right whale distribution and habitat use and additional protection outside the traditional SEUS survey areas. The coast of South Carolina had been surveyed sporadically in the past, but for the past five years consistent survey effort throughout the migration and calving season has provided valuable additional sightings and increased warnings to mariners. The number of right whale sightings in the SCGA survey area (95) is lower than the EWS survey areas to south, however survey effort expended in the region was also lower due to funding levels and a large coverage area. A sightings-per-unit-effort analysis would be useful to compare effort-corrected data throughout the region to determine whale densities and important whale habitat in the SEUS and mid-Atlantic.

The boundary of the current critical habitat was designated in 1994 by NMFS based on the best available scientific data at the time. Fifteen additional years of spatial and temporal distribution data now exist, which will provide a more accurate picture of right whale distribution in the southeast and mid-Atlantic. The data from these surveys will provide valuable information regarding the most appropriate boundaries for critical management designations that will protect features essential to the conservation of the species. Additionally, distribution data in this region will assist with other management actions that may be implemented in the future, such as ship reporting systems, speed zones, or routing. Data collected during these surveys will assist in determining the effectiveness of the recently implemented ship speed rule along the eastern seaboard.

Portions of the east coast of the United States are without consistent survey effort, limiting spatial and temporal distribution data and ultimately protection available for the right whale. However, limitations of these aerial survey efforts must also be addressed, including high costs, the inability to fly in inclement weather and darkness, safety issues, observer bias, observer fatigue, etc. If the goal is to provide maximum protection for right whales, we must investigate new technologies and management techniques that may provide a more reliable means for detecting and protecting right whales throughout their range. Without moving forward on these fronts it is unlikely that we will ever reach a potential biological removal level of zero for North Atlantic right whales, as calculated in Marine Mammal Protection Act stock assessment reports (NMFS 2007).

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