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Documenting Spatial and Temporal Distribution of North Atlantic Right Whales off South Carolina and Northern Georgia 2006 – 2007

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WILDLIFE TRUST
AQUATIC CONSERVATION PROGRAM

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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 Georgia and northern Florida have been designated as critical habitat. 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. The purpose of this aerial survey effort is to provide information to answer important management questions. A total of 39 surveys were flown from 15 November 2006 to 15 April 2007 and extended from North Myrtle Beach, South Carolina to St. Catherines Island, Georgia. Seventeen right whale sightings consisting of forty-one right whales were documented (including resights of two individuals). Sightings consisted of two cow/calf pairs, five single whales, and ten groups of two or more adult/juvenile right whales. Preliminary photo analysis has resulted in the identification of the two cow/calf pairs and sixteen of the individual adult/juvenile whales. The individuals documented include six males, nine females, and twenty-four individuals of unknown sex. Of the nine females seen, six gave birth to new calves this season, although only two were seen with their calves within the study area. The remaining four females were seen while pregnant prior to giving birth further south. Sightings of note include fifteen individuals that were unique to the study area and not sighted by other survey teams to the south. Unique sightings include a calving female that has never before been documented in the southeast U.S., and a group of seven adults seen approximately 35 nm from shore that included three males over 26 years of age. The number of sightings was generally consistent across the season, although the average number of whales per sighting was much greater in March resulting in 46% of all whales seen during the month of March.

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. Despite recent increases in calving, modeling exercises still indicate a decline in the population (Kraus et al. 2005). 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 surface due to the lack of a dorsal fin. These factors make them vulnerable to ship strikes, especially in areas of increased vessel traffic and dredging activities. The winter calving grounds off Georgia and northern Florida have been designated as critical habitat for right whales in the SEUS. An Early Warning System (EWS) was created to alert military and commercial vessels transiting the critical habitat area of the presence of right whales. 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 or 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. More information is needed to determine the best strategies for managing the region. The purpose of this aerial survey effort is to provide more complete information to answer these important management questions.

Expanding aerial survey coverage to include the entire Georgia/South Carolina area will enable a better understanding of the residency areas utilized by calving females and other members of the population. Conservationists, researchers, and managers have speculated that the current boundaries of the SEUS critical habitat, established in 1994, and other management boundaries may not accurately represent the areas in need of management measures to protect the species. Through this multi-year study we hope to provide managers with a more thorough understanding of right whale distribution and residency in the region to assist with time-critical management decisions.

This study will also serve as an aid to the research being conducted by the National Marine Fisheries Service (NMFS) to test the feasibility of using passive acoustic monitoring devices, or pop up buoys, to detect the presence of right whales in the Southeast/mid-Atlantic areas. Data from visual sightings by the aerial survey team will be compared to acoustic data collected by these passive detection devices to help determine presence/absence of right whales in the region based on vocalizations.

Methods

Study Area

The South Carolina/northern Georgia (SC-GA) survey season began on 15 November 2006 and concluded on 15 April 2007. The SC-GA survey area for the 2006/2007 season extended from North Myrtle Beach, South Carolina to the southern end of St. Catherines Island, Georgia. The survey area was divided into three sections: northern, middle and southern. The northern area extended from North Myrtle Beach, SC to Cape Romain, SC and consisted of sixteen 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 and consisted of sixteen 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 to St. Catherines Island, GA and consisted of fourteen 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 transit lines were flown in a southeast/northwest direction as opposed to the east/west direction of the southern section in order to cover a larger bathymetric range as well as to provide visual data to substantiate the acoustic data collected by passive detection devices located in the area. 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 Mount Pleasant Regional Airport (formerly known as East Cooper Airport) in Mount 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 Mount Pleasant Regional Airport in Mount Pleasant, SC. In the southern section, the plane would refuel at Hilton Head Airport in Hilton Head, SC or at Frogmore Airport in Beaufort, SC. The plane returned to Mount Pleasant Regional Airport at the end of each normal survey day. Without whale sightings, a complete northern survey took approximately 7.9 Hobbs hours to finish, a complete middle section took approximately 7.6 Hobbs hours, and a complete southern section took approximately 6.2 Hobbs hours, including transit times to and from the airports.

Aerial Surveys

Surveys were scheduled to be flown from 15 November 2006 through 15 April 2007, 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), 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 transects for the 2006-2007 right whale calving season

Trackline	Length (nm)	Latitude West	Longitude West	Latitude East	Longitude East
1	29	31 34.8	-81 7.8	31 34.8	-80 34.2
2	28.1	31 37.8	-81 7.2	31 37.8	-80 34.2
3	28.1	31 40.8	-81 7.2	31 40.8	-80 34.2
4	27.3	31 43.8	-81 6.0	31 43.8	-80 34.2
5	28.1	31 46.8	-81 3.0	31 46.8	-80 30.0
6	25.5	31 49.8	-81 0.0	31 49.8	-80 30.0
7	26.4	31 52.8	-80 57.0	31 52.8	-80 25.8
8	23.8	31 55.8	-80 54.0	31 55.8	-80 25.8
9	26.3	31 58.8	-80 51.0	31 58.8	-80 25.8
10	18.8	32 01.8	-80 48.0	32 01.8	-80 25.8
11	19.4	32 04.8	-80 45.0	32 04.8	-80 22.2
12	16.8	32 07.8	-80 42.0	32 07.8	-80 22.2
13	14.2	32 10.8	-80 39.0	32 10.8	-80 22.2
14	11.7	32 13.8	-80 36.0	32 13.8	-80 22.2
15	35.4	32 20.4	-80 27.0	31 53.4	-80 0.0
16	35.4	32 24.6	-80 25.2	31 57.6	-79 58.2
17	35.4	32 29.4	-80 23.4	32 2.4	-79 56.4
18	35.4	32 30.0	-80 18.0	32 3.0	-79 51
19	35.3	32 32.4	-80 13.8	32 5.4	-79 46.8
20	35.3	32 34.2	-80 9.6	32 7.2	-79 42.6
21	35.3	32 36.0	-80 4.8	32 9.0	-79 37.8
22	35.3	32 37.2	-79 59.4	32 10.2	-79 32.4
23	35.3	32 39.6	-79 55.8	32 12.6	-79 28.8
24	35.3	32 42.6	-79 52.8	32 15.6	-79 25.8
25	35.3	32 45.6	-79 49.2	32 18.6	-79 22.2
26	35.3	32 48.0	-79 45	32 21.0	-79 18.0
27	35.3	32 51.0	-79 42.0	32 24.0	-79 15.0
28	35.3	32 53.4	-79 37.8	32 26.4	-79 10.8
29	35.3	32 58.2	-79 36.6	32 31.2	-79 9.6
30	35.3	33 1.2	-79 33.6	32 34.2	-79 6.6
31	35.3	33 0.6	-79 26.4	32 33.6	-78 59.4
32	35.3	33 1.2	-79 21.0	32 34.2	-78 54.0
33	35.3	33 6.0	-79 19.2	32 39.0	-78 52.2
34	35.3	33 7.8	-79 15.0	32 40.8	-78 48.0
35	35.2	33 10.8	-79 11.4	32 43.8	-78 44.4
36	35.2	33 16.2	-79 10.8	32 49.2	-78 43.8
37	35.2	33 21.0	-79 9.0	32 54.0	-78 42.0
38	35.2	33 25.8	-79 7.2	32 58.8	-78 40.2
39	35.2	33 29.4	-79 4.8	33 2.4	-78 37.8
40	35.2	33 32.4	-79 1.2	33 5.4	-78 34.2
41	35.2	33 36.0	-78 58.8	33 9.0	-78 31.8
42	35.2	33 39.0	-78 55.2	33 12.0	-78 28.2
43	35.2	33 42.0	-78 52.2	33 15.0	-78 25.2
44	35.2	33 45.0	-78 48.6	33 18.0	-78 21.6
45	35.1	33 47.4	-78 44.4	33 20.4	-78 17.4
46	35.1	33 49.2	-78 40.2	33 22.2	-78 13.2

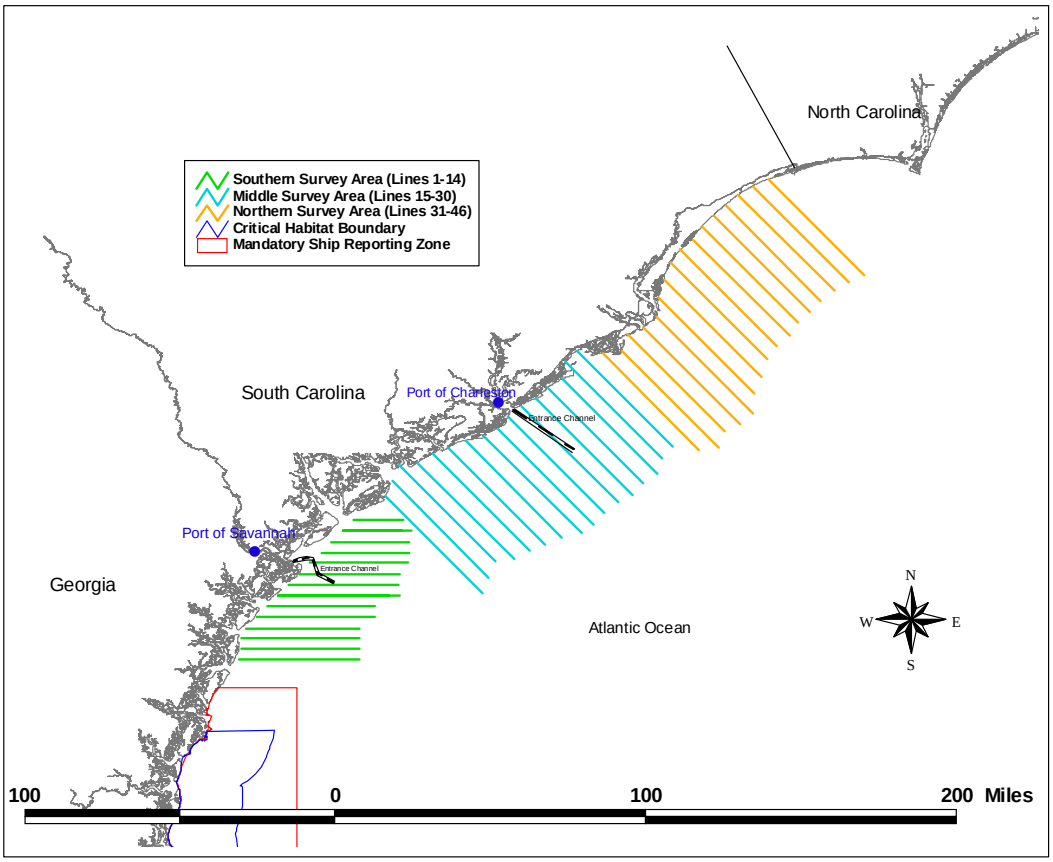

Figure 1. Map of South Carolina-Georgia survey tracklines flown from 15 November 2006 through 15 April 2007.

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. Spreading survey effort equally amongst the survey areas was also a factor. Conditions necessary for survey flight included a minimum ceiling of 455m, visibility greater than 2nm, wind speed less than 10 knots, and Beaufort sea state of 3 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, positioned in front of and between the two observers, 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, all types of large vessels (over 33m in length) observed in the survey area were recorded. Sighting angles for the vessels were recorded using a digital inclinometer. 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 over each right whale encountered to obtain photographs. The 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 lat/long position on the trackline perpendicular to the position of the whale sighting (lat_1,$long_1$), and the lat/long exact overhead position of the right whale (lat_2,$long_2$). The whale's distance in nautical miles from the trackline was determined by subtracting the distance between the two latitude positions, as one minute of latitude equals one nautical mile in the study area. 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.

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 to Fleet Area Control and Surveillance Facility (FACSFACJAX) at Naval Air Station Jacksonville via a land line. Information, including date, time, latitude and longitude, direction of movement, number of animals and age class was reported to the dispatcher. FACSFACJAX has the capability to contact all military ships and aircraft almost instantaneously with right whale location information. In addition, the facility notifies 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. This supports 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 allows aerial survey teams to verify sightings reported from other sources such as military ships and aircraft.

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 SC-GA 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 whales 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. Photographs were taken using a Canon 20D digital camera with a fixed 300 mm image stabilizing lens. All the photographs obtained during the season were compared against each other and against 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 2006/2007 SC-GA survey season. Preliminary photo analysis by the SC-GA Wildlife Trust team

and initial verification by New England Aquarium has been completed and all photographs taken during the 2006/2007 season have been forwarded to the researchers at the New England Aquarium for final confirmation.

Results

Aerial Surveys

A total of 39 SC-GA surveys were flown from 15 November 2006 through 15 April 2007 (Tables 2 and 3). A total of 260 hours of Hobbs time was logged for the SC-GA season, averaging 7.0 hours per survey in the northern section, 6.5 hours in the middle section, and 5.9 hours in the southern section. A total of 5403.0 nautical miles (nm) of trackline were flown in the northern section, 4815.3 nm in the middle, and 4143.6 nm in the southern, giving an overall total of 14361.9 nm of trackline flown. The northern survey area was completed eight times during the season and partially completed four times. The middle survey area was completed on six survey days and partially completed on five days. The southern survey area was completed nine times and partially completed seven times. The 16 partially completed SC-GA flights were largely due to factors such as weather and sea state conditions. See Figure 3 for a graphical representation of survey effort. Days with no survey effort in the SC-GA 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 0.42 (SD = 0.412) nautical miles from the trackline (Figure 2).

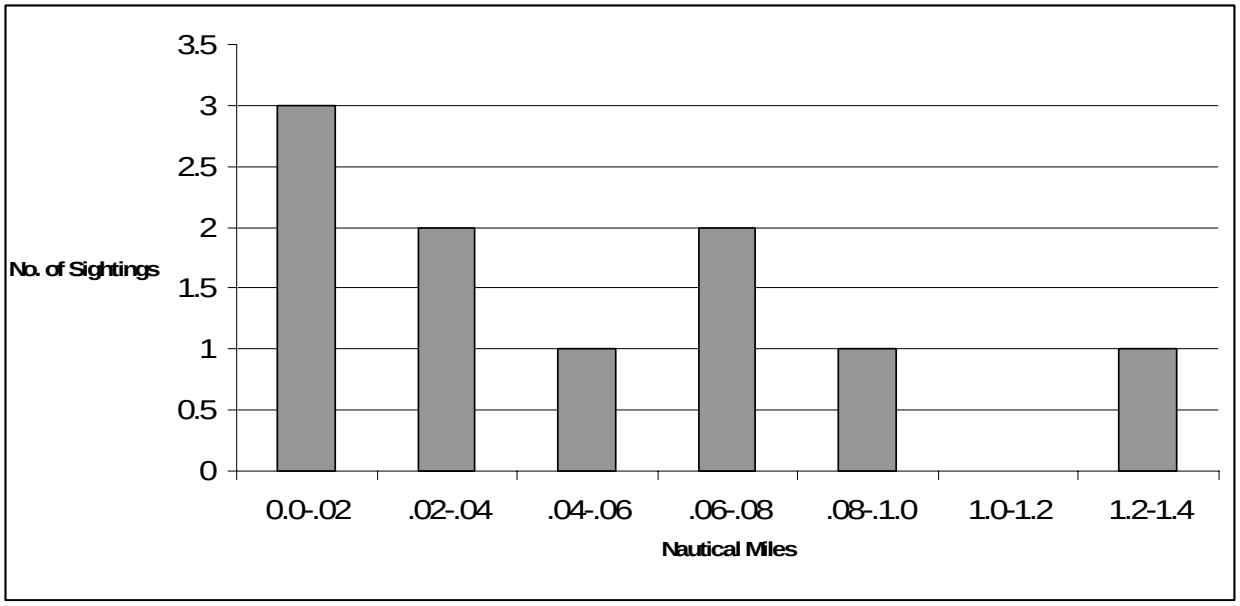

Figure 2. Right Whale sighting distances during the 2006/2007 survey season.

Sighting Distances for Large Vessels

Sighting angles were obtained for large commercial and military ships whenever possible, and used to calculate distance from the trackline. Average distance from the

trackline for large vessels with documented sighting angles was 3736.6 meters from the survey plane.

Whale/Ship Interactions
There were no "close-call" whale/ship interactions observed within the SC-GA study area during the 2006/2007 season.

Dead/Entangled Right Whales
There were no dead or entangled right whales observed within the SC-GA study area during the 2006/2007 season.

Humpback Whales
One humpback whale was observed within the SC-GA study area on 7 March 2007 in association with a group of bottlenose dolphins. The humpback whale was seen at 31.78119N and -80.93222W, east of Ossabaw Island, Georgia.

Table 2. Survey effort for SC-GA surveys conducted during the 2006/2007 season.

Date	Complete Surveys	Partial Surveys	Hobbs Time	Trackline Miles Flown	Number of Right Whales Seen	Comments
15-Nov-06	-	-	2.8		-	Test/training flight
17-Nov-06		S	4.3	117.5	1	
18-Nov-06	M		7.8	565.2	-	
26-Nov-06	-	-	1.4	0.0	-	Winds too high
28-Nov-06	S		6.2	323.5	-	
2-Dec-06		M	3.8	242.8	-	
5-Dec-06	N		8.1	563.4	-	No GPS data
7-Dec-06		S	2.6	8.6	2	
9-Dec-06	N		7.9	563.4	-	
10-Dec-06		M	2.6	86.6	-	
17-Dec-06	S		6.5	323.5	2	
18-Dec-06	N		8.0	563.4	-	
28-Dec-06		N	4.5	251.9	-	
30-Dec-06	S		6.2	323.5	-	
6-Jan-07		S	7.5	305.5	5	
7-Jan-07		M	3.8	215.2	-	
12-Jan-07	S		6.7	323.5	3	
13-Jan-07	M		8.3	565.2	2	
21-Jan-07	-	-	2.0	0.0	-	Winds too high
24-Jan-07	M		8.2	565.2	1	
25-Jan-07		S	3.2	65.2	-	
8-Feb-07	S		7.1	323.5	4	
10-Feb-07		N	3.0	117.0	-	
11-Feb-07		S	5.6	231.4	-	
12-Feb-07	M		8.0	565.2	-	
19-Feb-07		M	4.9	353.4	-	
20-Feb-07	-	-	2.4	0.0	2	Winds too high, Whales observed during transit
26-Feb-07		N	3.5	130.4	-	
27-Feb-07	M		8.3	565.2	-	Oil slick observed
28-Feb-07	-	-	2.5	0.0	-	Winds too high
3-Mar-07		S	5.5	216.3	2	
7-Mar-07	S		6.7	323.5	-	1 humpback seen
11-Mar-07	N		8.3	563.4	-	
12-Mar-07	M		8.7	565.2	7	
13-Mar-07	N		8.1	563.4	-	
19-Mar-07	N		8.3	563.4	-	
20-Mar-07	S		6.8	323.5	8	
28-Mar-07	S		6.9	323.5	2	
31-Mar-07	N		8.5	563.4	-	
3-Apr-07	N		8.5	563.4	-	
9-Apr-07		N	6.7	396.5	-	
12-Apr-07	S		6.7	323.5	-	
13-Apr-07		S	5.3	287.6	-	
14-Apr-07		M	7.3	526.1	-	

Table 3. Survey effort totals for SC-GA surveys conducted during the 2006/2007 season.

Section	Complete Surveys	Partial Surveys	Hobbs Time	Total Trackline Miles Flown	Number of Right Whales Seen
Northern	8	4	83.4	5403.0	0
Middle	6	5	71.7	4815.3	10
Southern	9	7	93.8	4143.6	29
(other)	-	-	11.1	-	2
Total	**23**	**16**	**260.0**	**14361.9**	**41**

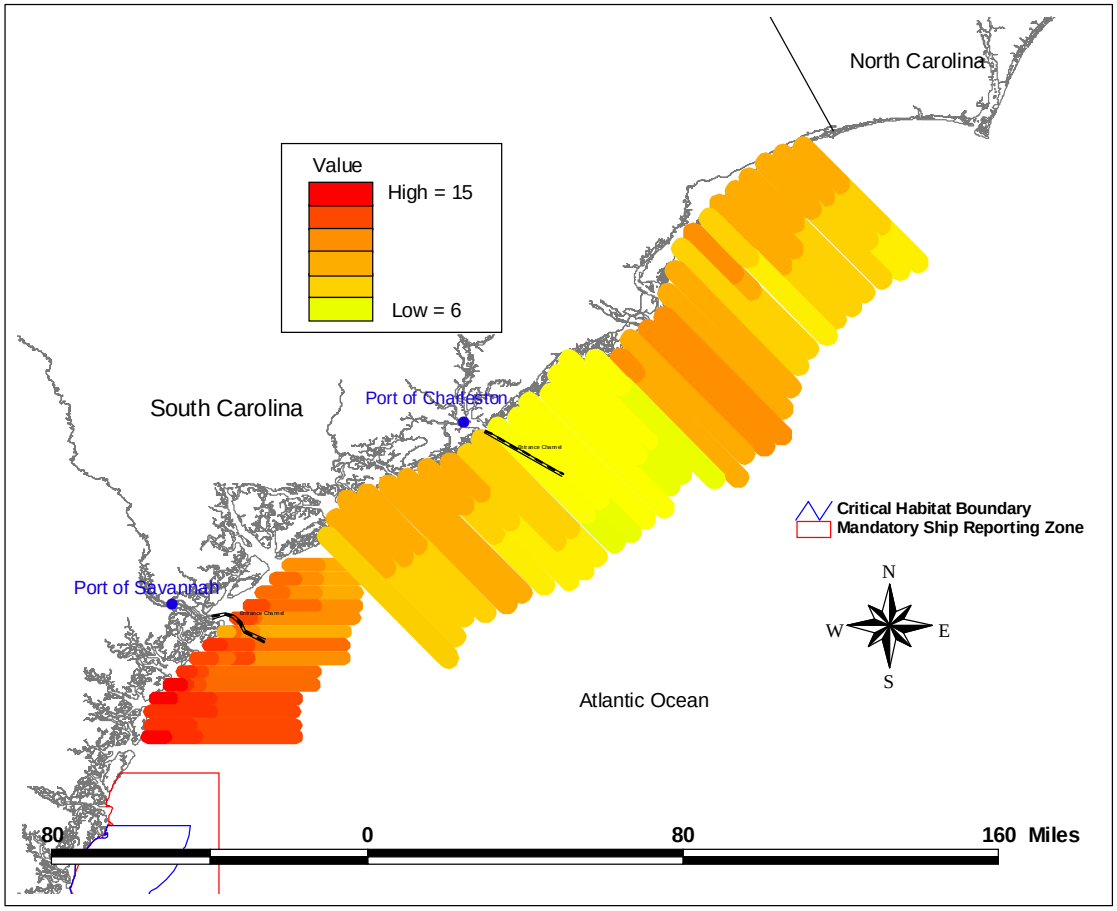

Figure 3. Survey effort for SC-GA surveys conducted during the 2006/2007 season. Areas with higher (15 surveys) effort are depicted in red; areas with lower (6 surveys) effort are depicted in yellow.

Right Whale Sightings and Identifications

Seventeen right whale sightings were documented during the SC-GA surveys, consisting of 41 right whales. A sighting is defined as the documentation of right whales in one location during an aerial survey, regardless of the size of the group. For example, one sighting may consist of one individual right whale or a group of multiple right whales in the same vicinity. The total number of whales seen includes resights of two individuals, leaving a total of 39 different individuals. Two cow/calf pairs, five single whales, and ten groups of two or more adult/juvenile right whales were documented (Figure 4). Preliminary photo analysis by the SC-GA Wildlife Trust team and verification by New England Aquarium has resulted in the identification of the two cow/calf pairs and 16 of the adult/juvenile whales which accounts for 20 of the 39 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. SEUS07CT01). 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. Nineteen 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 the New England Aquarium completes the confirmation process.

The 39 individual right whales documented include six males, nine females, and 24 individuals of unknown sex (Table 5). Of the nine females seen, six gave birth to new calves during the 2006/2007 season, although only two were seen with their calves in the SC-GA survey area. The remaining four females were seen in the SC-GA survey area while pregnant prior to giving birth further south. Of the six 2006/2007 mothers seen in the SC-GA survey area, three last gave birth in 2004, two are first time mothers, and one last gave birth in 2005. The female right whale who last gave birth in 2005, EGNO 2645, is presumed to have lost her calf that same year.

Sightings of note include 15 individuals that were unique to the SC-GA study area (based on preliminary analysis) and not sighted by other SEUS survey teams: SE07CT01, EGNO 3301, SE07CT04, poss 1131, SE07CT23, poss 1152, poss 1628, poss 1032, SE07BK16, poss 2904, poss 1616, SE07CT29, SE07CT30, as well as EGNO 2460 and her calf. The sighting of EGNO 2460 and her calf was especially important as this female has never before been documented in the Southeast United States. Her sighting history dates back to 1994 and she has been seen on numerous feeding grounds including the Bay of Fundy, Cape Cod Bay, Great South Channel, Gulf of Maine, Roseway Basin, Massachusetts Bay, and Jeffrey's Ledge. EGNO 2460 last gave birth in 2004, and her 2004 calf was seen in the Southeast this season as well. Other interesting sightings included two large groups dominated by older males that were seen in March. A group of seven adults unique to the survey area was seen on 12 March 2007 approximately 35 nm from shore and included three males over 26 years of age. A group of six adults was observed on 20 March 2007, five of which were unique to the SC-GA survey area. This group also included at least three males over 20 years of age.

Table 4. Right whale sightings from SC-GARW surveys conducted during the 2006/2007 season ("poss" indicates photo-identification that has not yet been verified by the New England Aquarium)

Sighting #	Month	Day	Year	Time (L)	Survey Name	Decimal Latitude	Decimal Longitude	RIWH Letter	EGNO / Intermatch Code	NRW Number
1	11	17	2006	9:49	SCRW20061117	31.79893	-80.89260	A	2645	NRW07001
2	12	07	2006	9:36	SCRW20061207	32.24190	-80.45440	A	SEUS07CT01	NRW07004
2	12	07	2006	9:36	SCRW20061207	32.24190	-80.45440	B	2614	NRW07004
3	12	17	2006	10:46	SCRW20061217	31.83097	-80.76637	A	3260	NRW07020
3	12	17	2006	10:46	SCRW20061217	31.83097	-80.76637	B	1705	NRW07020
4	01	06	2007	9:47	SCRW20070106	32.10155	-80.65025	A	BK21	NRW07068
4	01	06	2007	9:47	SCRW20070106	32.10155	-80.65025	B	SEUS06CT01	NRW07068
4	01	06	2007	9:47	SCRW20070106	32.10155	-80.65025	C	3301	NRW07068
5	01	06	2007	10:55	SCRW20070106	31.59287	-80.95945	D	BK23	NRW07069
6	01	06	2007	12:24	SCRW20070106	31.72082	-80.92844	E	3101	NRW07072
7	01	12	2007	14:27	SCRW20070112	32.21570	-80.50021	A	SEUS06BK18	NRW07099
7	01	12	2007	14:27	SCRW20070112	32.21570	-80.50021	B	1241's Calf from 2005	NRW07099
7	01	12	2007	14:27	SCRW20070112	32.21570	-80.50021	C	1705's Calf from 2004	NRW07099
8	01	13	2007	8:33	SCRW20070113	32.59867	-79.88402	A	SE07CT04	NRW07102
8	01	13	2007	8:33	SCRW20070113	32.59867	-79.88402	B	1608	NRW07102
9	01	24	2007	12:58	SCRW20070124	32.58583	-79.96891	A	2123's Calf from 2006	NRW07159
10	02	08	2007	13:15	SCRW20070208	31.93139	-80.81492	A	BK21	NRW07235
11	02	08	2007	15:33	SCRW20070208	32.12648	-80.40159	B	SE07CT09	NRW07240
11	02	08	2007	15:33	SCRW20070208	32.12648	-80.40159	C	2330's Calf from 2004	NRW07240
11	02	08	2007	15:33	SCRW20070208	32.12648	-80.40159	D	SE07BK07	NRW07240
12	02	20	2007	11:26	SCRW20070220	32.35303	-80.31071	A	SE07CT17	NRW07324
12	02	20	2007	11:26	SCRW20070220	32.35303	-80.31071	B	SE07BK11	NRW07324
13	03	03	2007	8:31	SCRW20070303	32.43747	-80.01510	A	SE07CT20	NRW07415
13	03	03	2007	8:31	SCRW20070303	32.43747	-80.01510	B	poss 1146	NRW07415
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	A	poss 3193	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	B	poss 1131	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	C	SE07CT23	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	D	poss 1152	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	E	poss 1628	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	F	poss 1032	NRW07477
14	03	12	2007	12:07	SCRW20070312	32.02234	-79.93935	G	SE07BK16	NRW07477
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	A	poss 2904	NRW07508
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	B	poss 1616	NRW07508
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	C	SE07CT29	NRW07508
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	D	poss 1032	NRW07508
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	E	SE07CT30 (poss 1323)	NRW07508
15	03	20	2007	10:41	SCRW20070320	31.68298	-80.78308	F	1317	NRW07508
16	03	20	2007	12:37	SCRW20070320	31.90914	-80.75294	G	2642	NRW07511
16	03	20	2007	12:37	SCRW20070320	31.90914	-80.75294	H	2642's Calf	NRW07511
17	03	28	2007	14:06	SCRW20070328	31.82040	-80.68486	A	2460	NRW07523
17	03	28	2007	14:06	SCRW20070328	31.82040	-80.68486	B	2460'S Calf	NRW07523

Table 5. Demographics of individual right whales seen during SC-GA 2006/2007 surveys. Asterisk indicates right whales that are unique to the SC-GA 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 2006/2007 mothers.

	Identification Code (EGNO / Intermatch)	Date Sighted	Birth Year	Calf of	Sex	First Seen	Last Seen	# Calves Produced (incl 0607)	Last Known Calving
*	Poss 1032 "Thorny"	12-Mar-07	U	U	Male	1980	2006	-	-
*	Poss 1032 "Thorny"	20-Mar-07	U	U	Male	1980	2006	-	-
*	Poss 1131 "Snowball"	12-Mar-07	U	U	Male	1979	2006	-	-
	Poss 1146 "Van Halen"	3-Mar-07	U	U	Male	1977	2005	-	-
*	Poss 1152 "Necklace"	12-Mar-07	U	U	Male	1981	2006	-	-
	1241's Calf from 2005	12-Jan-07	2005	1241	U	2005	-	-	-
	1317	20-Mar-07	1983	1316	Male	1983	2006	-	-
	1608 "Morse"	13-Jan-07	1986	1163	Female	1986	2006	1	2003
*	Poss 1616	20-Mar-07	U	U	Male	1986	2006	-	-
*	Poss 1628	12-Mar-07	U	U	U	1986	2006	-	-
	1705 "Phoenix" (Mom)	**17-Dec-06**	**1987**	**1004**	**Female**	**1987**	**2005**	**3**	**2004**
	1705's Calf from 2004	12-Jan-07	2004	1705	U	2004	-	-	-
	2123's Calf from 2006	24-Jan-07	2006	2123	U	2006	-	-	-
	2330's Calf from 2004	8-Feb-07	2004	2330	U	2004	-	-	-
*	**2460 (Mom)**	**28-Mar-07**	**U**	**U**	**Female**	**1994**	**2005**	**< 2**	**2004**
*	2460's Calf from 2007	28-Mar-07	2007	2460	U	2007	-	-	-
	2614 (Mom)	**7-Dec-06**	**1996**	**1114**	**Female**	**1996**	**2005**	**2**	**2004**
	2642 (Mom)	**20-Mar-07**	**1996**	**1142**	**Female**	**1996**	**2006**	**1**	**New Mom**
	2642's Calf from 2007	20-Mar-07	2007	2642	U	2007	-	-	-
	2645 (Mom)	**17-Nov-06**	**1996**	**1245**	**Female**	**1996**	**2005**	**2**	**2005 (Calf lost)**
*	Poss 2904	20-Mar-07	1999	1204	U	1998	2004	-	-
	3101	6-Jan-07	2001	1701	Female	2001	2006	-	-
	Poss 3193	12-Mar-07	U	U	U	2001	2005	-	-
	3260	17-Dec-06	U	U	Female	2002	2006	-	-
*	3301	6-Jan-07	2003	1301	U	2002	2005	-	-
	BK21	6-Jan-07	U	U	U	2002	-	-	-
	BK21	8-Feb-07	U	U	U	2002	-	-	-
	3360 / BK23 (Mom)	**6-Jan-07**	**U**	**U**	**Female**	**-**	**-**	**1**	**New Mom**
	SE06BK11/SE06BK18	12-Jan-07	U	U	U	-	-	-	-
	SE06CT01	6-Jan-07	U	U	U	-	-	-	-
	SE07BK07	8-Feb-07	U	U	U	-	-	-	-
	SE07BK11	20-Feb-07	U	U	U	-	-	-	-
*	SE07BK16	12-Mar-07	U	U	U	-	-	-	-
*	SE07CT01	7-Dec-06	U	U	U	-	-	-	-
*	SE07CT04	13-Jan-07	U	U	U	-	-	-	-
	SE07CT09	8-Feb-07	U	U	U	-	-	-	-
	SE07CT17	20-Feb-07	U	U	U	-	-	-	-
	SE07CT20	3-Mar-07	U	U	U	-	-	-	-
*	SE07CT23	12-Mar-07	U	U	U	-	-	-	-
*	SE07CT29	20-Mar-07	U	U	U	-	-	-	-
*	SE07CT30	20-Mar-07	U	U	U	-	-	-	-

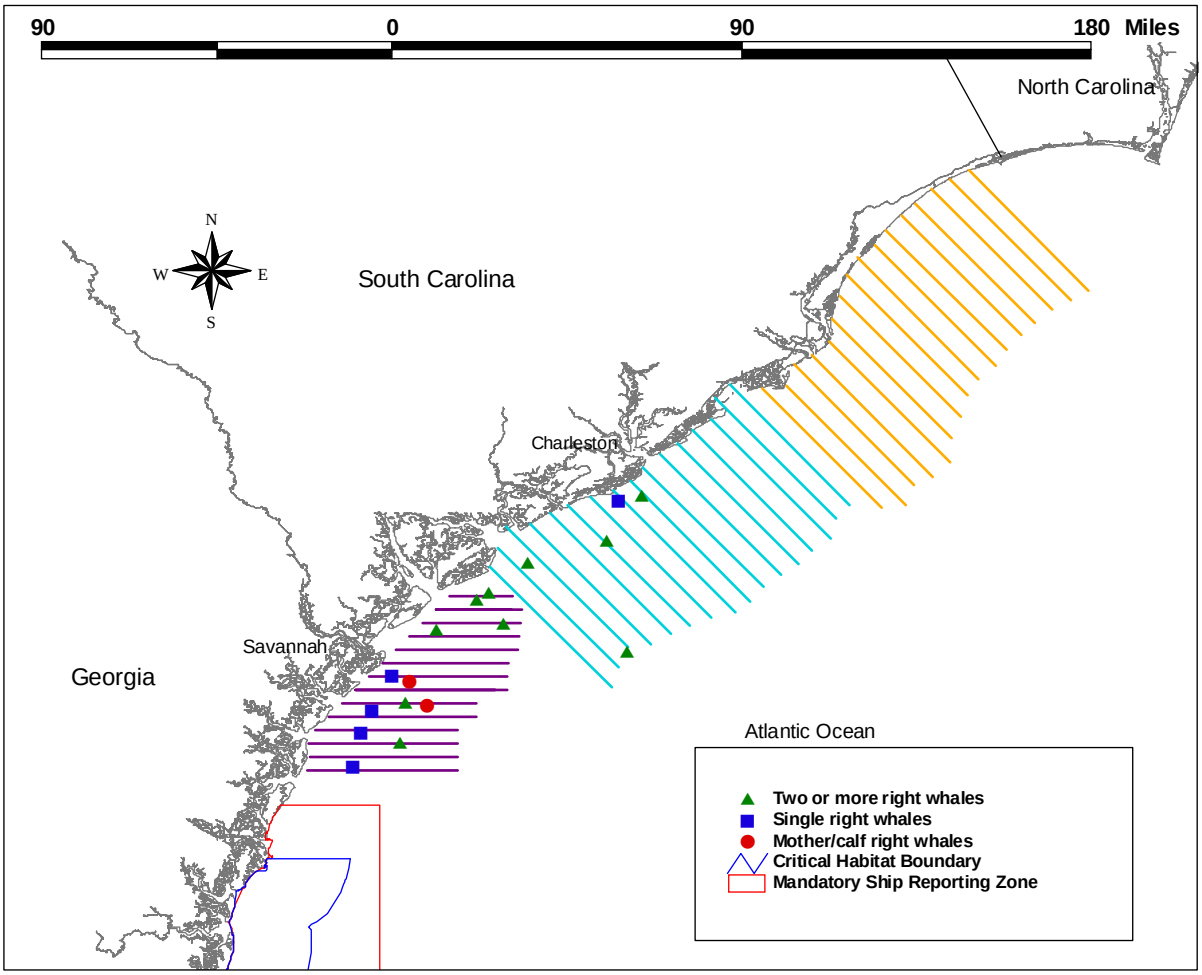

Figure 4. Right whale sightings by group type during the 2006/2007 SC-GA right whale aerial surveys.

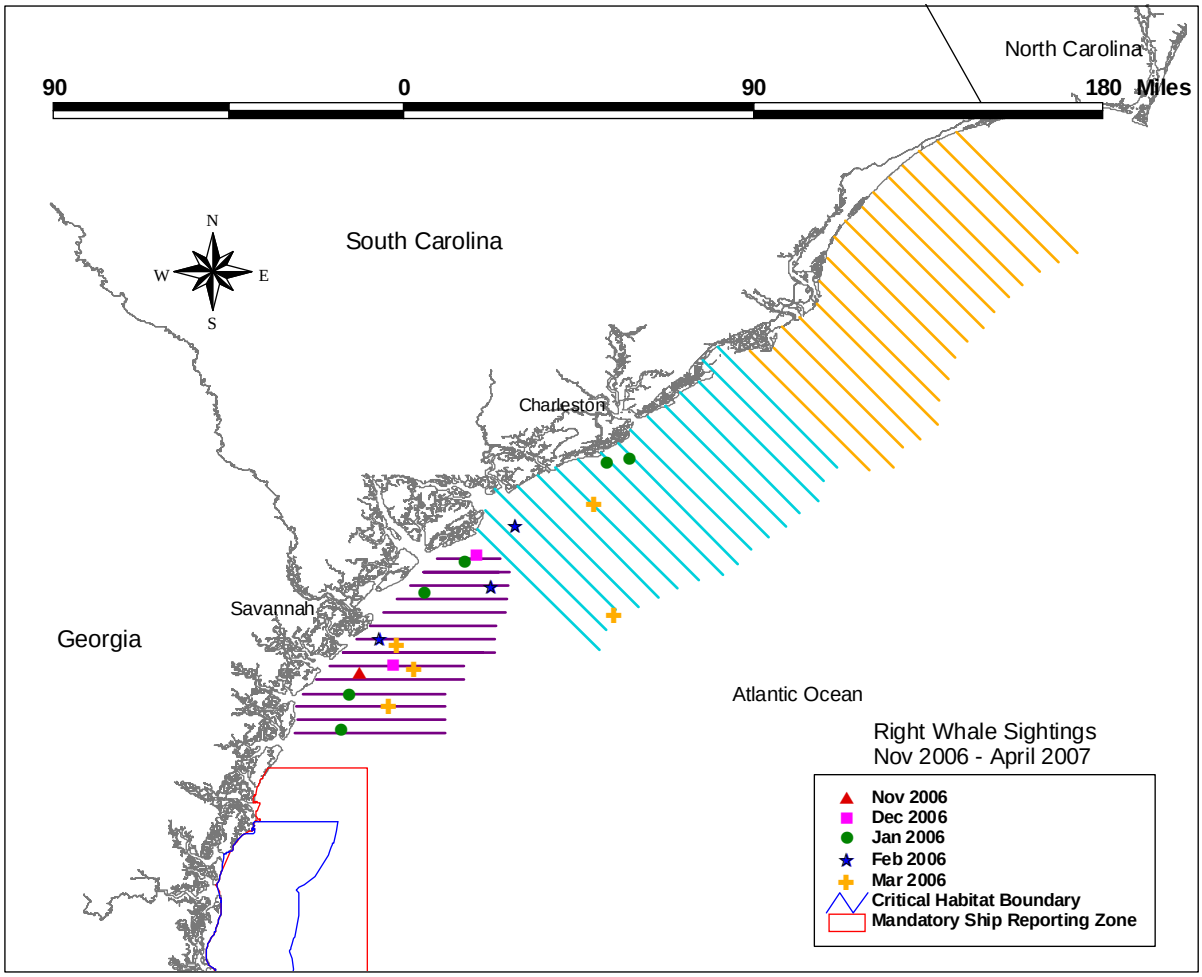

Figure 5. Right whale sightings by month during the 2006/2007 SC-GA right whale aerial surveys.

Geographic locations of the 17 SC-GA right whale sightings are depicted by month in Figure 5. Right whale sightings were further offshore during the month of March compared to sightings during other months. During the 2006/2007 season, 47% of the right whale sightings occurred in December and January and 47% of the whale sightings occurred in February and March (Figures 5 and 6). This result is in contrast to prior seasons in which the sightings were less evenly distributed temporally. During the 2005/2006 SC-GA surveys, 72% of all sightings occurred during February and March. During the 2004/2005 SC-GA surveys, 88% of all sightings occurred during December and January. However, even though the number of sightings was generally consistent across the 2006/2007 season, the average number of whales per sighting was much greater in March. In fact, 46% of all whales documented during these surveys were seen in March (Figure 6).

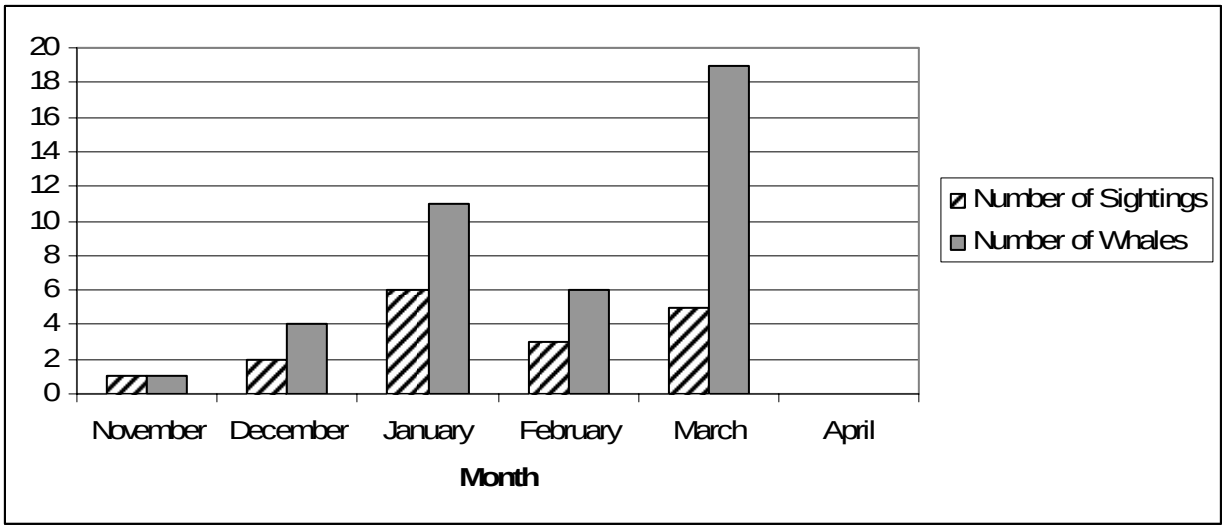

Figure 6. Number of sightings and right whales by month during the 2006/2007 SC-GA right whale aerial surveys.

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 to the north and south of the critical habitat boundary. The Early Warning System and associated aerial surveys, communication system, and other components have likely decreased the risk of ship strikes to whales while in this critical habitat. However, very little is known about right whale distribution outside the traditional survey areas. By expanding the survey areas to the north, more reliable information regarding right whale distribution and habitat use has become available, providing more protection to the right whale. The coast of South Carolina has been surveyed sporadically in the past, but by providing consistent survey effort throughout the migration and calving season valuable additional sightings and warnings to mariners were made available. In comparison to the EWS survey areas, the number of right whales sighted in the SC-GA area this season (39) was low. However, survey effort expended in the region was much lower, and the numbers were much higher than expected in a region that is traditionally not considered a residency area for right whales.

The boundary of the current critical habitat was designated in 1994 by NMFS based on the best available scientific data at the time. Thirteen 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. This study is also serving as an aid to research being conducted by NMFS to test passive acoustic monitoring devices. Our survey data will be available to groundtruth right whale calls collected remotely. We will provide all data for comparison with acoustic data when it becomes available.

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 2006).

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