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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 2012 – 2013

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Submitted by:

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Table of Contents

List of Figures

List of Tables

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, survey effort and photo-identification data since 2004 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 49 surveys were flown from 15 November 2012 to 15 April 2013 and extended from North Myrtle Beach, South Carolina (33.82°N) to St. Catherine's Island, Georgia (31.58°N). Preliminarily, 14 right whale sightings consisting of 25 right whales were documented (including re-sightings of two individuals and two individuals sighted three times). Sightings consisted of 10 cow/calf pairs, three single whales, and one group of two adult right whales. One individual was not photographed and therefore is not identifiable. Preliminary photo-identification has resulted in the confirmed identification of seven individual cow/calf pairs and four individual adult/juvenile whales. The individuals documented include seven females, four males and seven calves of unknown gender, for a total of 18 individual photographed whales in the study area. All seven of the females sighted gave birth to new calves this season and were seen with their calves within the study area. Preliminary sightings of note include five individual whales that were unique to the study area and not sighted by other survey teams to the south. Also of note were the observations of two whales documented with new propeller scars/wounds that occurred over the course of this season. The number of whales sighted was greatest in March, resulting in 36% of all whales documented during the 2012-2013 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. 2012). A slow reproductive rate is further hindered by human-related mortality, the largest known threat to the species, including vessel collisions 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 collisions with vessels, 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 right whale location information to military and commercial vessels 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, survey effort and photo-identification data since 2004 suggests 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 right whale use of this southern mid-Atlantic region. In addition, continuing mortality from vessel collisions and gear entanglement in the mid-Atlantic region is of concern to researchers and managers.

Aerial survey coverage along the entire coasts of Georgia and South Carolina is enabling a better understanding of distribution and use of these habitats 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 delineate the areas in need of management measures to facilitate recovery of the species and reduce anthropogenic mortality. Through this multi-year study we hope to provide managers with a more thorough understanding of right whale use of the study area to assist with management decisions and recovery challenges.

Methods

Study Area

The South Carolina/northern Georgia (SCGA) survey season began on 15 November 2012 and concluded on 15 April 2013. The SCGA survey area for the 2012-2013 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 nautical miles, nmi) which were flown at approximately 4 nmi 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 nmi) which were also flown at approximately 4 nmi 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 nmi) which were flown at 3 nmi 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 nmi of trackline, a complete middle survey consisted of 565.2 nmi of trackline, and a complete southern survey consisted of 323.5 nmi of trackline (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 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 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 2012 through 15 April 2013, weather permitting, under VFR (visual flight rules) conditions. Conditions necessary for a survey flight included a minimum ceiling of 455m, visibility greater than 2 nmi, wind speed less than 12 knots, and Beaufort sea state of ≤ 3. Surveys were conducted in a Cessna 337 Skymaster aircraft owned and operated by Orion Aviation. The aircraft was equipped with Global Positioning System (GPS), Automatic Identification System (AIS), navigation aids, radar, aviation VHF radio, marine VHF radio, life raft, GPIRB-equipped PFDs, flares, EPIRB, and 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.

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 were 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. 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 AerialVisSurvey, 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, position and the specific event into the computer program. Time, location, number and species of all large whales were recorded. In addition, the AIS receiver recorded large vessel (over 33m in length) information including name, position, speed, length, and course.

Table 1. South Carolina-Georgia survey trackline waypoints for the 2012-2013 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

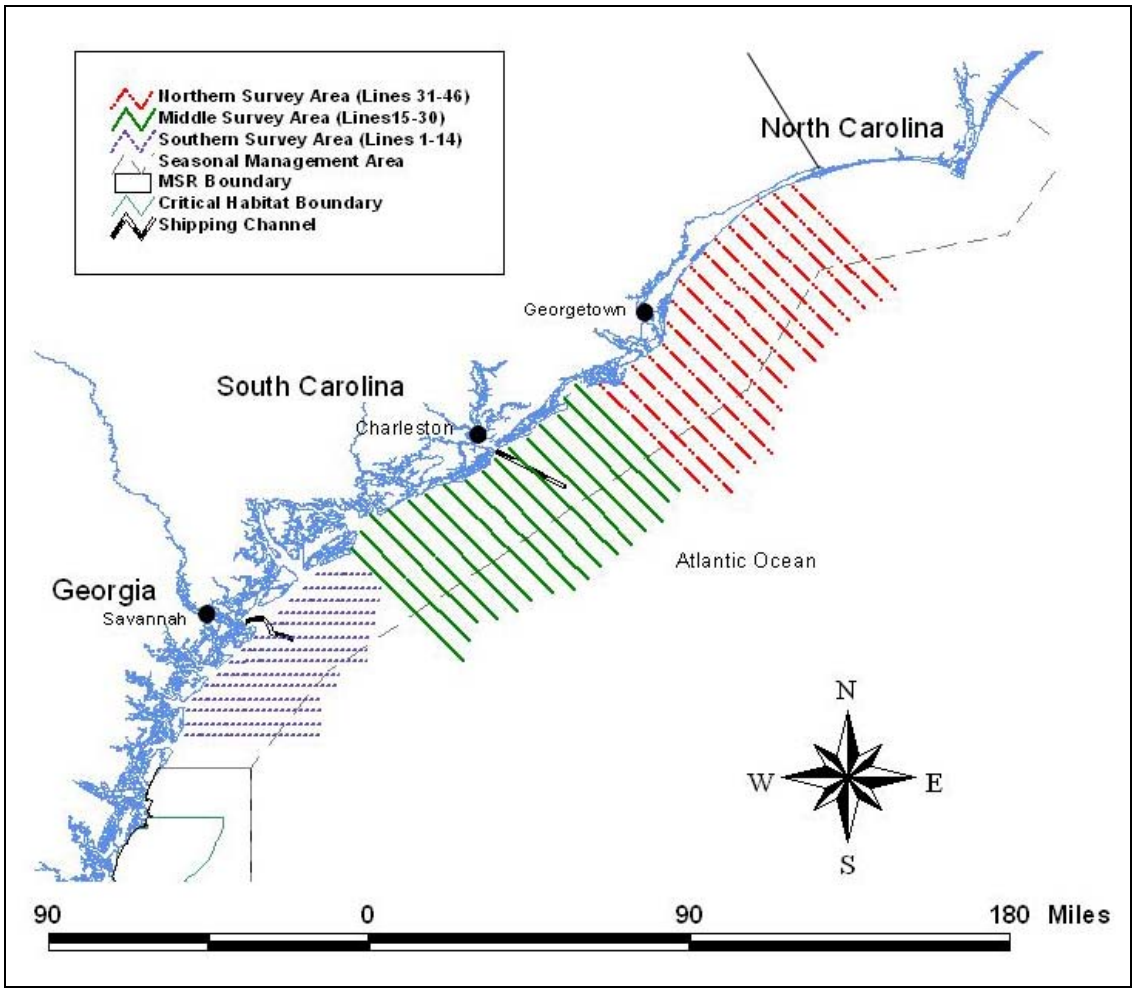

Figure 1. Map of South Carolina-Georgia survey tracklines flown during the 2012-2013 season.

Sighting distance for all large whales was calculated from overhead GPS positions. 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 position. 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 equation[1]:

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

=ACOS(COS(RAD(90-a)) *COS(RAD(90-b)) +SIN(RAD(90-a)) *SIN(RAD(90-b)) *COS(RAD(c-d))) *3440.065
a = lat 1, b= lat 2, c = long 1, d = long 2

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 nautical miles from the nearest sea buoy. 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 a ship strike. It also facilitated verification of sighting reports by aerial survey teams from other sources such as military ships and aircrafts.

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 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 identity of individual right whales encountered during the 2012-2013 SCGA survey season. Preliminary photo-identification by the SCGA Sea to Shore Alliance team and initial verification by NEA has been completed and all photographs taken during the 2012-2013 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 49 SCGA surveys were flown from 15 November 2012 through 15 April 2013 (Tables 2 and 3). A total of 299.8 hours of Hobbs time were logged, averaging 6.5 hours per survey in the northern section, 6.0 hours in the middle section, and 6.0 hours in the southern section (including complete and partial surveys). A total of 6239.9 nm of trackline was flown in the northern section, 7124.2 nmi in the middle, and 5160.0 nmi in the southern, for a total of 18524.1 nmi of trackline flown. The northern, middle, and southern survey areas were completed on six, seven, and 13 days, respectively; and partially

completed on nine, 10, and four survey days, respectively (Figure 2). 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 0.57 (SD = 0.27) nmi from the trackline (Figure 3).

Sightings of Large Vessels

Automatic Identification System (AIS) data for large vessels was collected continuously during the surveys and saved into a text file using the software Coastal Explorer.

Table 2. Survey effort for SCGA surveys conducted during the 2012-2013 season. "N" refers to the northern survey area, "M" to the middle, and "S" to the south.

Date	Complete Surveys	Partial Surveys	Hobbs	Total Trackline NM Flown	Trackline NM Flown in Beaufort 3 or Less	Number of Right Whales Seen	Comments
21-Nov-12		M	2.1	0	0	0	Incomplete-wind
23-Nov-12	M		7.5	565.20	565.20	0	Complete
25-Nov-12	S		5.8	323.50	323.50	0	Complete
26-Nov-12	N		7.8	563.40	563.40	0	Complete
27-Nov-12		M	4.5	352.09	352.09	0	Incomplete-low clouds and rain
30-Nov-12	N		7.9	563.40	563.40	0	Complete
3-Dec-12	S		6.1	323.50	323.50	0	Complete
4-Dec-12		M	6.4	461.04	461.04	0	Incomplete-sunset
8-Dec-12		M	3.4	218.73	218.73	0	Incomplete-sunset
9-Dec-12		N	5.2	313.60	313.60	0	Incomplete-sunset
16-Dec-12		M	4.6	351.98	351.98	0	Incomplete-sunset
19-Dec-12		N	7.1	404.28	401.69	3	Incomplete-wind
23-Dec-12	S		6.9	323.50	323.50	2	Complete
28-Dec-12	M		7.5	565.20	565.20	0	Complete
31-Dec-12	N		7.8	563.40	563.40	0	Complete
5-Jan-13		S	5.8	291.81	291.81	0	Incomplete-sunset
9-Jan-13		N	5.9	362.35	362.35	0	Incomplete-sunset
12-Jan-13		S	5	259.14	259.14	0	Incomplete-sunset
14-Jan-13		M	4.9	352.68	352.68	0	Incomplete-sunset

Date	Complete Surveys	Partial Surveys	Hobbs	Total Trackline NM Flown	Trackline NM Flown in Beaufort 3 or Less	Number of Right Whales Seen	Comments
15-Jan-13		S	5.4	214.31	214.31	3*	Incomplete-sunset
20-Jan-13		M	6.6	452.81	450.36	0	Incomplete-wind
21-Jan-13		N	6	301.61	301.61	0	Incomplete-wind
28-Jan-13		N	3.9	204.34	204.34	0	Incomplete-fog
2-Feb-13	S		6.5	323.50	323.50	2	Complete
4-Feb-13		M	6.3	423.30	423.30	2	Incomplete-sunset
5-Feb-13	S		6.1	323.50	323.50	0	Complete
6-Feb-13	M		7.5	565.20	565.20	0	Complete
15-Feb-13		N	5.9	351.58	351.58	0	Incomplete-sunset
18-Feb-13	M		7.5	565.20	565.20	0	Complete
20-Feb-13		N	5.7	350.74	350.74	0	Incomplete-sunset
21-Feb-13	S		5.9	323.50	323.50	0	Complete
24-Feb-13		S	5.1	189.26	189.26	4	Incomplete-sunset
1-Mar-13		N	6.0	385.64	385.64	0	Incomplete-sunset
2-Mar-13		N	3.9	185.36	185.36	0	Incomplete-wind
4-Mar-13	S		6.4	323.50	323.50	6	Complete
7-Mar-13	S		6.1	323.50	323.50	2	Complete
10-Mar-13		M	5.7	343.97	339.51	1	Incomplete-wind
15-Mar-13	M		7.8	565.20	565.20	0	Complete
18-Mar-13	S		6.3	323.50	323.50	0	Complete
19-Mar-13	S		6.3	323.50	323.50	0	Complete
22-Mar-13	N		7.6	563.40	563.40	0	Complete
27-Mar-13	S		6.0	323.50	323.50	0	Complete
28-Mar-13	S		6.0	323.50	323.50	0	Complete
29-Mar-13	M		8.4	565.20	565.20	0	Complete
30-Mar-13	N		8.2	563.40	563.40	0	Complete
7-Apr-13	S		6	323.50	323.50	0	Complete
8-Apr-13	M		7.4	565.20	565.20	0	Complete
9-Apr-13	N		8	563.40	563.40	0	Complete
13-Apr-13	M		3.1	211.22	211.22	0	Incomplete-wind

*One right whale was sighted in the middle section while transiting to the southern section for survey.

Table 3. Survey effort totals for SCGA surveys conducted during the 2012-2013 season.

Survey Area	Complete Surveys	Partial Surveys	Hobbs Time	Total Trackline Miles Flown	Total Trackline Miles Beaufort 3 or less	Number of Right Whales Seen
Northern	6	9	96.9	6239.9	6237.31	3
Middle	7	10	101.2	7124.2	7117.3	3*
Southern	13	4	101.7	5160.0	5160	19**
Totals	26	23	299.8	18524.1	18514.61	25

*One additional right whale was sighted in the middle section while the aircraft was off survey and transiting to southern section to begin survey.
**One of these right whales was sighted in the middle section while the aircraft was off survey and transiting to the southern section to begin survey.

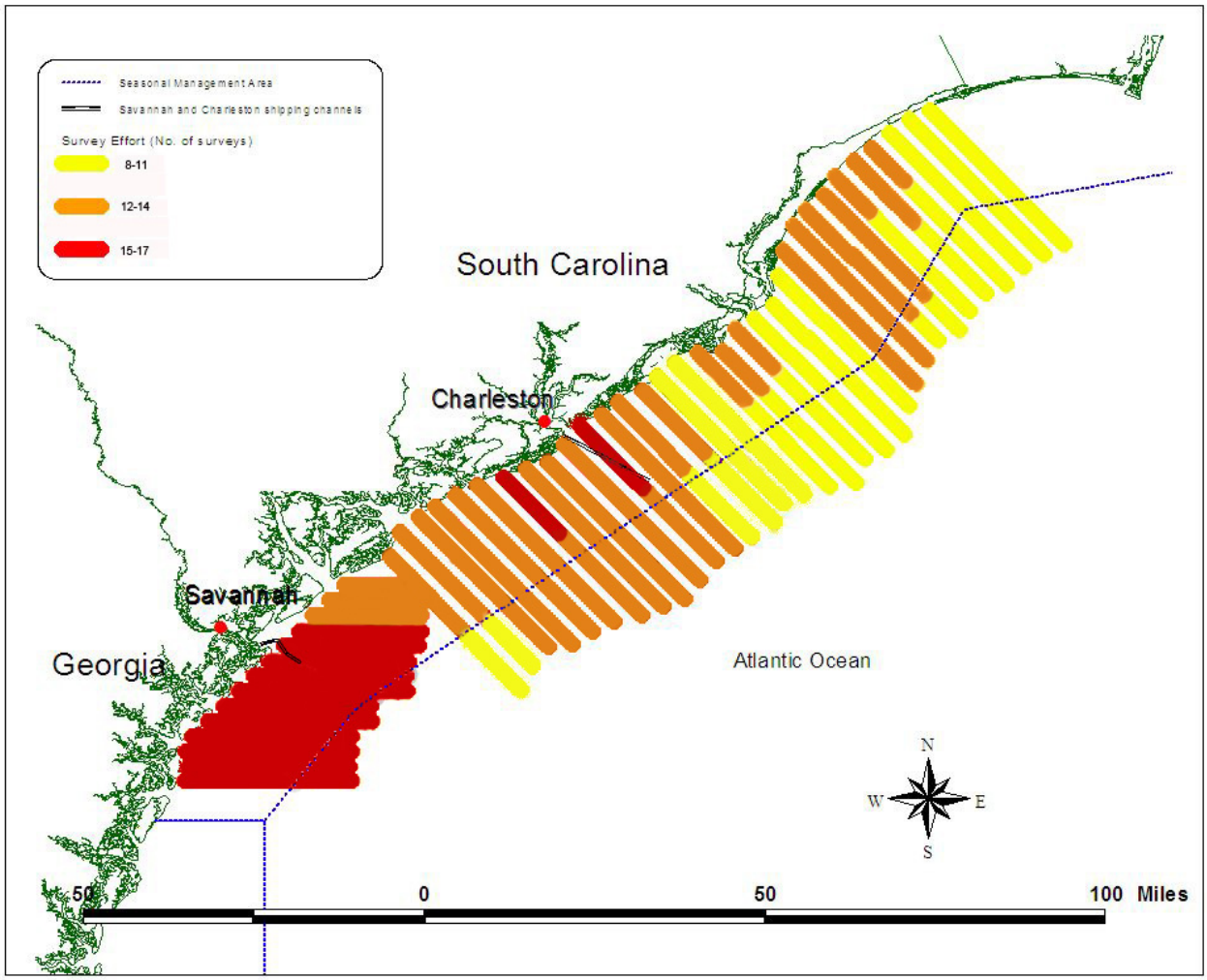

Figure 2. Survey effort during the 2012-2013 season. Areas with higher (15-17 surveys) effort are depicted in red; areas with lower (8-11 surveys) effort are depicted in yellow.

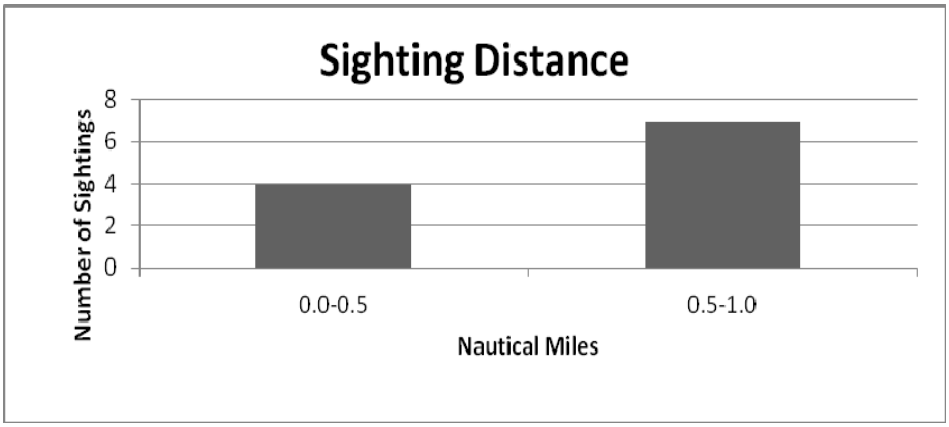

Figure 3. Right whale sighting distances during the 2012-2013 season.

Whale/Ship Interactions

No co-occurrence of whales and vessels were documented in the SCGA survey area during the 2012-2013 survey season.

Dead/Injured/Entangled Right Whales

Two right whales that were struck by vessels during the 2012-2013 season were observed within the SCGA study area. On 24 February 2013, EGNO 1612 and her 2013 calf were documented in the southern section at position 31° 50.4N, -080° 30.1W, approximately 19 nmi SE of Tybee Island, GA at 1520(L). The 2013 calf of 1612 was first documented with likely propeller/skeg-induced injuries on 29 January 2013 by the Central EWS survey team. While the injuries were still visible on the whale's body the behavior of the calf was considered normal during this sighting, as the calf was seen breaching, rolling, and nursing alongside its mother.

On 07 March 2013, EGNO 3692 and her 2013 calf were documented in the southern section at position 32° 09.8N, -080° 28.1W, approximately 12 nmi E of Hilton Head, SC at 1649(L). This was the first time EGNO 3692 was observed with a propeller wound on her right fluke during the 2012-2013 season. The previous sighting of EGNO 3692 and her 2013 calf was on 24 February 2013 by the Central EWS survey team. While photo-documentation was not conclusive (fluke remained subsurface throughout observations), it is unlikely she had the wounds at that time. During the SCGA sighting on 07 March 2013, EGNO 3692 did not raise her tail above the waterline which resulted in no above-water documentation of the injury. Following analysis of sighting photos, the condition of the 2013 calf of 3692 was also of concern due to the calf's small size, grey coloration and potential additional presence of orange cyamids on its tail. The pair did not indicate any general direction of movement and was last seen at position 32° 10.2N, -080°27.8W at 1706(L).

Humpback Whales

Four humpback whales were observed within the SCGA study area during the 2012-2013 season. On 30 November 2012, a pair of humpback whales was documented in the northern section at position 33° 30.5N, -078° 41.3W at 1425(L). The pair was traveling northeast. On 19 March 2013, two humpback whales were documented in the southern section at position 32° 10.7N, -080° 28.5W at 1739(L). This pair was initially spotted due to one of the whales breaching before both whales began heading south.

Military Exercises

Potential airspace conflicts with scheduled military exercises and the SCGA aerial surveys were recorded over the course of the 2012-2013 season. There were 152 possible flight days for the SCGA team this season, however only 49 of those days met required survey parameters. Within the 49 flyable days there were seven days where Navy exercises overlapped a portion of the SCGA survey area. Ultimately only one survey day was directly affected by the scheduled exercises. On 19 December 2012 a hot event occurred in the 1X, 2X and 3X sections of the designated military airspace area (Figure 4). Weather conditions were favorable to fly and in order to maintain similar effort amongst all SCGA survey areas the team was due to fly the southern section. However, because of the scheduled hot event the team instead flew a northern section flight in order to avoid all potential conflicts between aircrafts.

On 13 April 2013, a hot event was scheduled in section 157-A of the designated military exercise areas (Figure 5). This day also had acceptable parameters to fly one of the SCGA survey areas. Due to unexpected increased winds the SCGA team only flew the northern most lines of the middle section, to stay within acceptable flying parameters, and thus never came close to penetrating area 157-A where military exercises were occurring resulting in the exercises not affecting the survey.

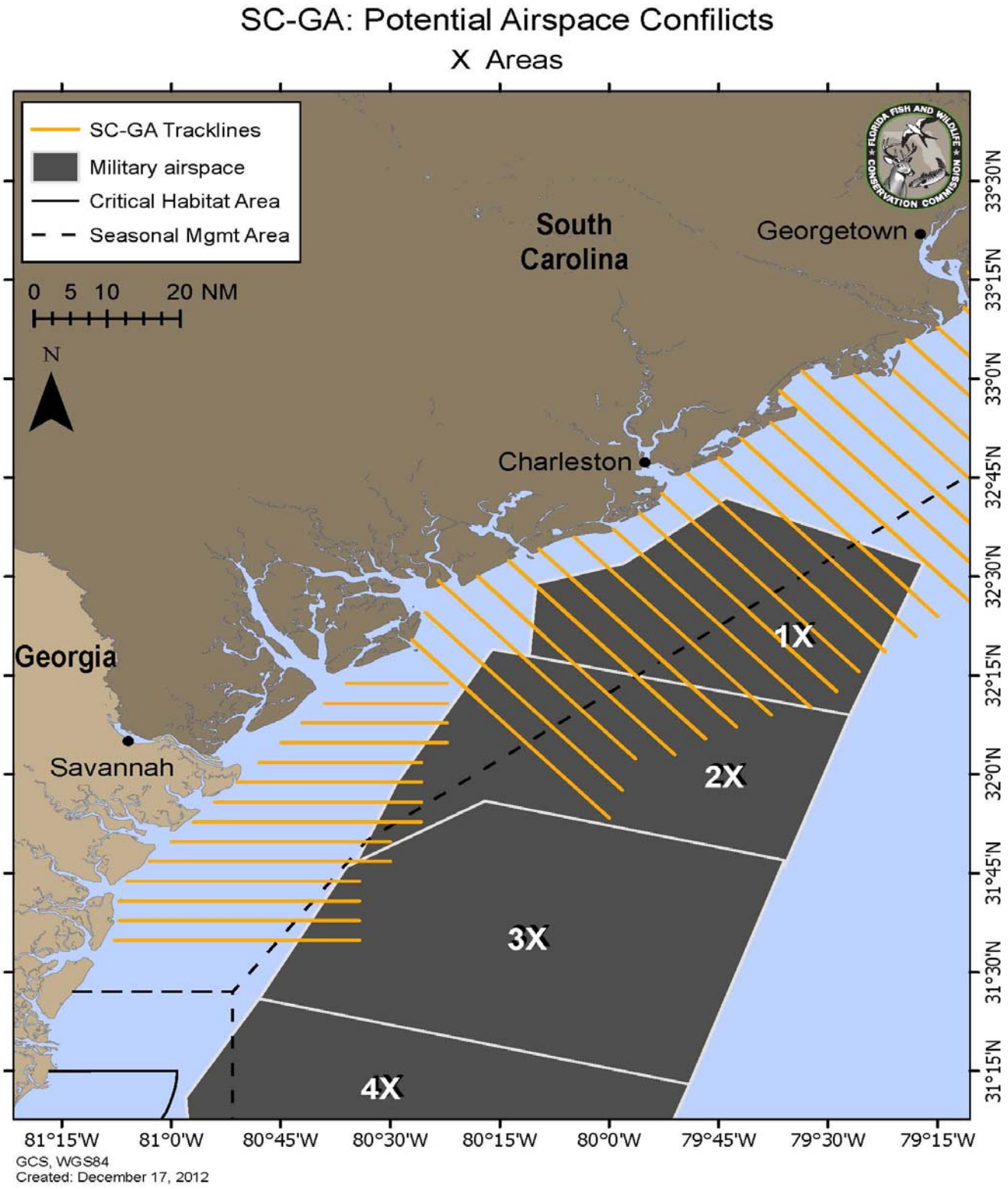

Figure 4. Designated zones of navy exercises ("X" areas) and the potential airspace conflicts for the SCGA survey areas during the 2012-2013 season (map provided by Florida Fish and Wildlife Conservation Commission).

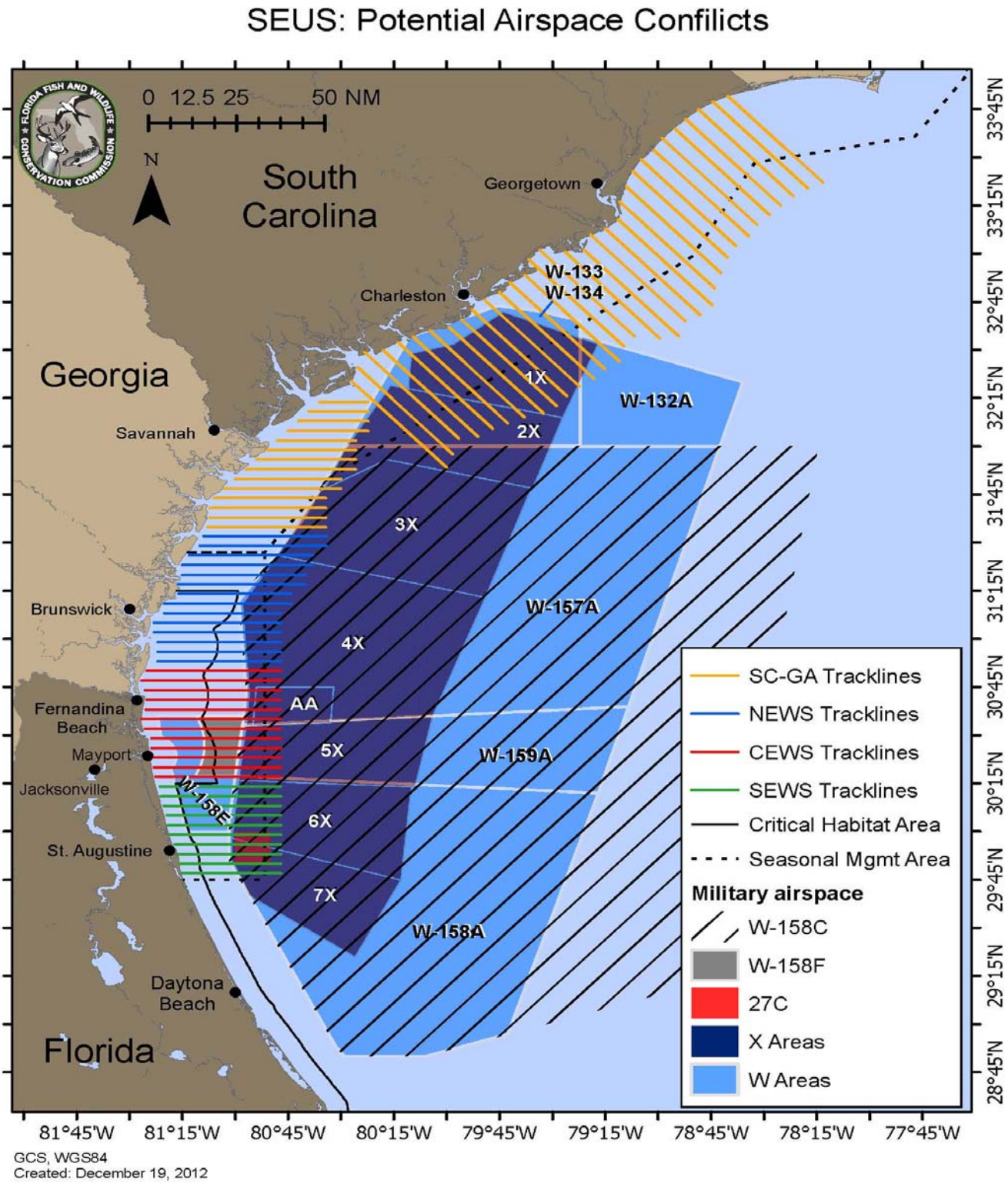

Figure 5. All military exercise areas and all SEUS right whale aerial survey areas during the 2012-2013 season (map provided by Florida Fish and Wildlife Conservation Commission).

Right Whale Sightings and Identifications

Fourteen right whale sightings consisting of 25 right whales were documented during the SCGA surveys. The total number of whales seen includes resights of two individuals and two individuals sighted three times for a total of 18 different individual whales (including seven calves). Ten cow/calf pairs, three single whales, and one group of two adult right whales were documented (Figure 6). One whale was not photographed. Preliminary photo-identification by the SCGA Sea to Shore Alliance team and verification by New England Aquarium (NEA) has resulted in the identification of seven cow/calf pairs (one pair was observed twice and one pair was sighted three times) and four individual adult/juvenile whales which accounts for the 18 animals photographed during the season (Tables 4 and 5). All right whale identification information included in this report is preliminary and should not be considered final until NEA completes the confirmation process.

The 18 individual right whales documented include seven females, four males and seven individuals of unknown gender, which were the seven calves seen (Table 5). Adult males (nine or more years old) accounted for 17% of the individuals observed. Of the seven females documented all were seen with their calves within the SCGA study area and accounted for 39% of all observed individuals (Figure 7). Of the seven mothers, four were first time mothers, two last gave birth in 2009 and one last gave birth in 2008.

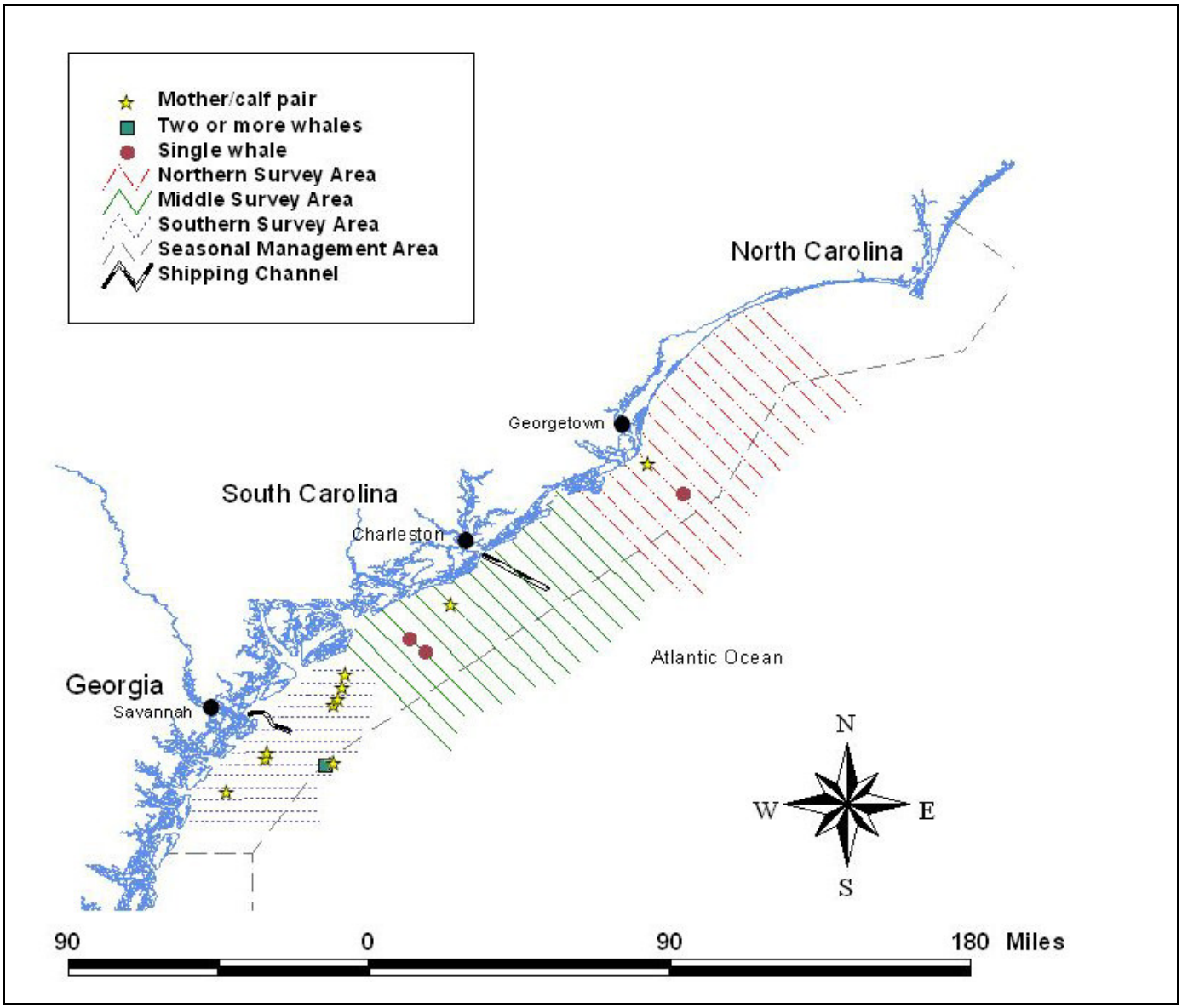

Figure 6. Right whale sightings by group type during the SCGA 2012-2013 season.

Table 4. Right whale sightings from SCGA surveys conducted during the 2012-2013 season. The numbers and codes listed in the "EGNO" column include EGNO numbers for known whales and temporary codes for young whales that have yet to be assigned an EGNO (i.e. 2013CalfOf1612).

Sighting #	Whale #	Month	Day	Year	Time (L)	Survey Name	Latitude	Longitude	RIWHLetter	NEAq EGNO	NRWNumber
1	1	12	19	2012	10:32	SCRW20121219	33.13012	-79.14207	A	1612	SCGA001
1	2	12	19	2012	10:32	SCRW20121219	33.13012	-79.14207	B	2013CalfOf1612	SCGA001
2	3	12	19	2012	11:14	SCRW20121219	32.99446	-78.99357	C	3651	SCGA002
3	4	12	23	2012	13:45	SCRW20121223	32.22496	-80.45274	A	3520	SCGA003
3	5	12	23	2012	13:45	SCRW20121223	32.22496	-80.45274	B	2013CalfOf3520	SCGA003
4	6	01	15	2013	11:36	SCRW20130115	32.36962	-80.17907	A	Not photographed	SCGA004
5	7	01	15	2013	14:47	SCRW20130115	31.86046	-80.79590	B	1632	SCGA005
5	8	01	15	2013	14:47	SCRW20130115	31.86046	-80.79590	C	2013CalfOf1632	SCGA005
6	9	02	02	2013	11:12	SCRW20130202	31.71463	-80.96740	A	1204	SCGA006
6	10	02	02	2013	11:12	SCRW20130202	31.71463	-80.96740	B	2013CalfOf1204	SCGA006
7	11	02	04	2013	13:36	SCRW20130204	32.52562	-79.99624	A	3540	SCGA007
7	12	02	04	2013	13:36	SCRW20130204	32.52562	-79.99624	B	2013CalfOf3540	SCGA007
8	13	02	24	2013	14:43	SCRW20130224	31.82713	-80.54207	A	1311	SCGA008
8	14	02	24	2013	14:43	SCRW20130224	31.82713	-80.54207	B	1323	SCGA008
9	15	02	24	2013	15:20	SCRW20130224	31.84029	-80.50174	C	1612	SCGA009
9	16	02	24	2013	15:20	SCRW20130224	31.84029	-80.50174	D	2013CalfOf1612	SCGA009
10	17	03	04	2013	11:43	SCRW20130304	32.08996	-80.50490	A	1632	SCGA010
10	18	03	04	2013	11:43	SCRW20130304	32.08996	-80.50490	B	2013CalfOf1632	SCGA010
11	19	03	04	2013	12:28	SCRW20130304	31.88713	-80.79024	C	3294	SCGA011
11	20	03	04	2013	12:28	SCRW20130304	31.88713	-80.79024	D	2013CalfOf3294	SCGA011
12	21	03	04	2013	16:38	SCRW20130304	32.11596	-80.48407	E	1632	SCGA012
12	22	03	04	2013	16:38	SCRW20130304	32.11596	-80.48407	F	2013CalfOf1632	SCGA012
13	23	03	07	2013	16:49	SCRW20130307	32.16346	-80.46740	A	3692	SCGA013
13	24	03	07	2013	16:49	SCRW20130307	32.16346	-80.46740	B	2013CalfOf3692	SCGA013
14	25	03	10	2013	13:42	SCRW20130310	32.31246	-80.10824	A	3245	SCGA014

Table 5. Demographics of individual right whales sighted during the 2012-2013 SCGA season. Asterisk (*) indicates right whales that are unique to the SCGA survey area. "U" is an abbreviation for "unknown". Individuals in bold type are 2012-2013 mothers.

Unique to SCGA	Identification code (EGNO/Intermatch)	Date Sighted	Birth Year	Age	Mother	Gender	First Seen	Last Seen	# calves produced (inc. 1213)	Last Known Calving
	1204	2/2/2013	N/A	>31	N/A	F	1982	2011	8	2009
*	1311	2/24/2013	1983	30	1310	M	1983	2011	0	N/A
*	1323	2/24/2013	N/A	>30	N/A	M	1983	2011	0	N/A
	1612	12/19/2012	N/A	>27	N/A	F	1986	2012	6	2009
	1632	1/15/2013	N/A	>27	N/A	F	1986	2011	3	2008
*	3245	3/10/2013	2002	11	1145	M	2002	2012	0	N/A
	3294	3/4/2013	N/A	>11	N/A	F	2002	2012	1	N/A
	3520	12/23/2012	2005	8	2040	F	2005	2012	1	N/A
	3540	2/4/2013	2005	8	1140	F	2005	2012	1	N/A
*	3651	12/19/2012	2006	7	1151	M	2006	2012	0	N/A
	3692	3/7/2013	N/A	>7	N/A	F	2006	2012	1	N/A
	2013CalfOf1204	2/2/2013	2013	0	1204	U	2013	2013	0	N/A
	2013CalfOf1612	12/19/2012	2013	0	1612	U	2013	2013	0	N/A
	2013CalfOf1632	1/15/2013	2013	0	1632	U	2013	2013	0	N/A
	2013CalfOf3294	3/4/2013	2013	0	3294	U	2013	2013	0	N/A
*	2013CalfOf3520	12/23/2012	2013	0	3520	U	2013	2013	0	N/A
	2013CalfOf3540	2/4/2013	2013	0	3540	U	2013	2013	0	N/A
	2013CalfOf3692	3/7/2013	2013	0	3692	U	2013	2013	0	N/A

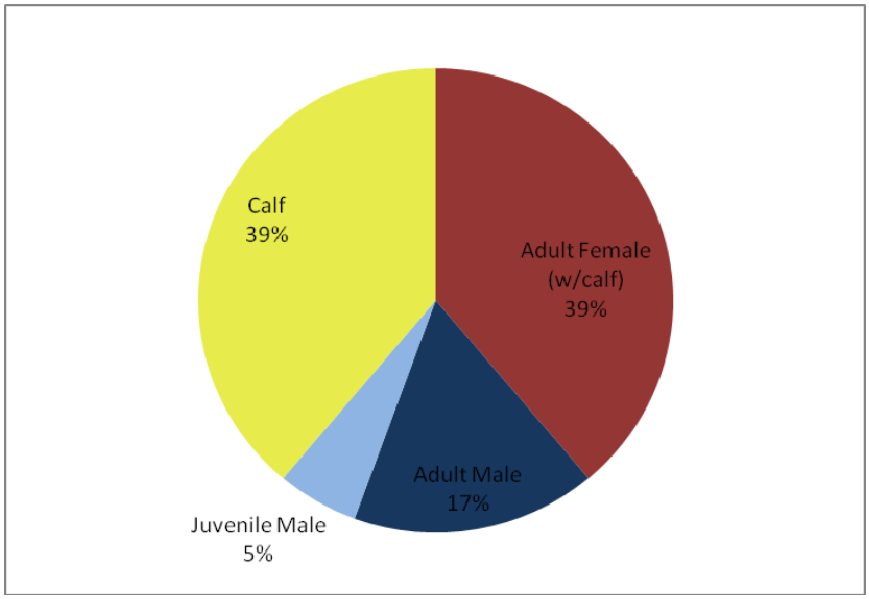

Figure 7. Preliminary demographic distribution of right whales observed during the SCGA 2012-2013 season.

Sightings of note include five individuals that were unique to the study area (based on preliminary analysis) and not sighted by EWS survey teams to the south: EGNO 1311, 1323, 3245, 3651 and the 2013 calf of EGNO 3520. No SAGs were documented during the entire season. Other notable sightings include the observation of two whales that were struck by vessels over the course of the season (see Injured Section, pg. 13).

Geographic locations of the 14 SCGA right whale sightings are depicted by month in Figure 8. During the 2012-2013 season, 36% of the right whale sightings occurred in the months of November-January while 64% of the sightings occurred during February-April (Figures 9 and 10). This uneven distribution of sightings is very similar to the results of the 2005-2006 and 2009-2010 seasons where the vast majority of the sightings occurred in one half of the season, in contrast to the other seasons where the sightings were relatively evenly distributed between both halves of the season. The number of right whale sightings per trackline nautical miles flown was calculated for each week of the season (Figure 11). A peak in the number of sightings per trackline nautical miles flown was noted in March.

The average number of whales per sighting during the 2012-2013 season was greatest in February with 2.0 whales per sighting (average for entire season was 1.79 whales per sighting) yet 36% of all whales seen were documented during March compared with 32% seen in February (Figure 9).

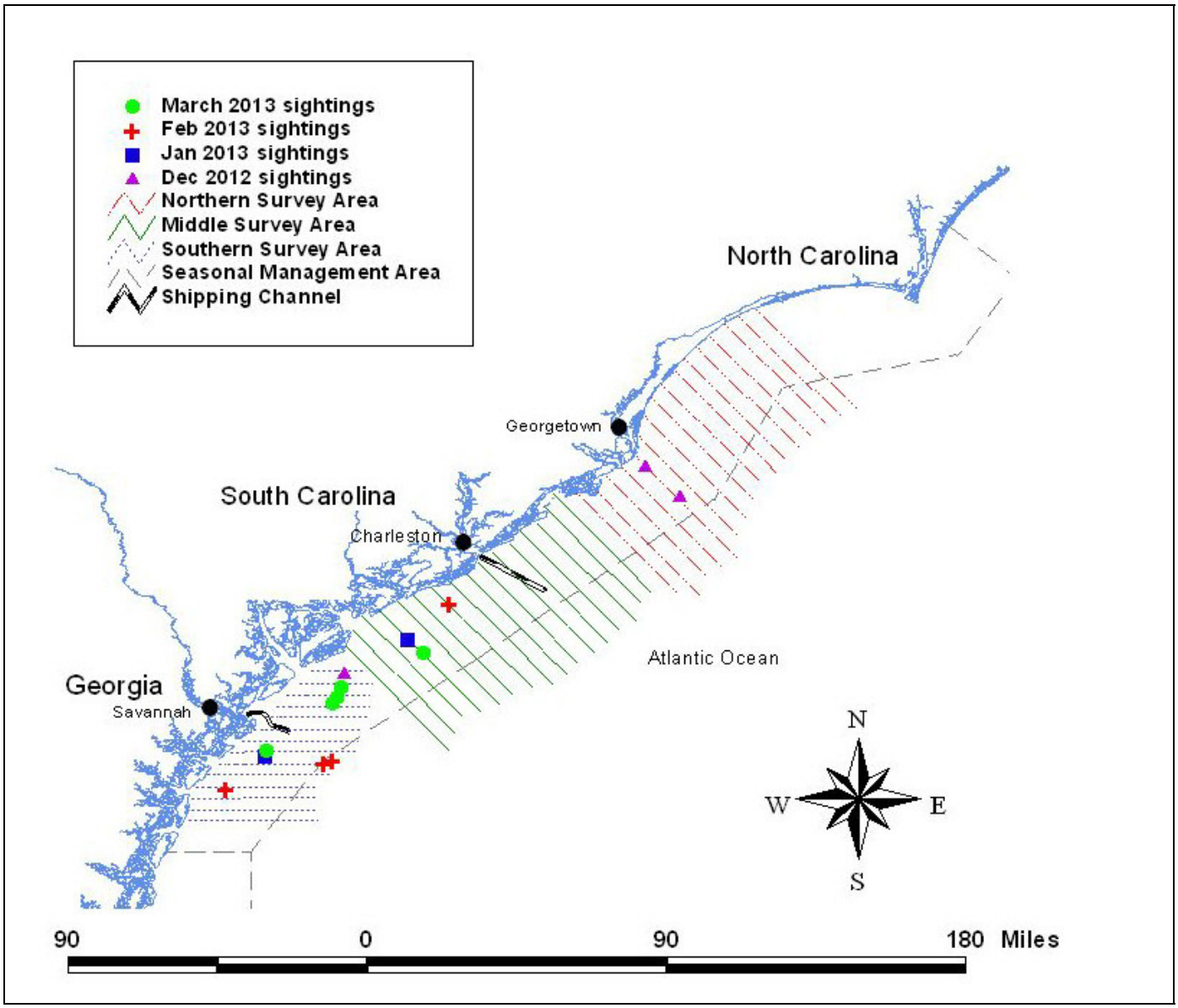

Figure 8. Right whale sightings by month during the SCGA 2012-2013 season.

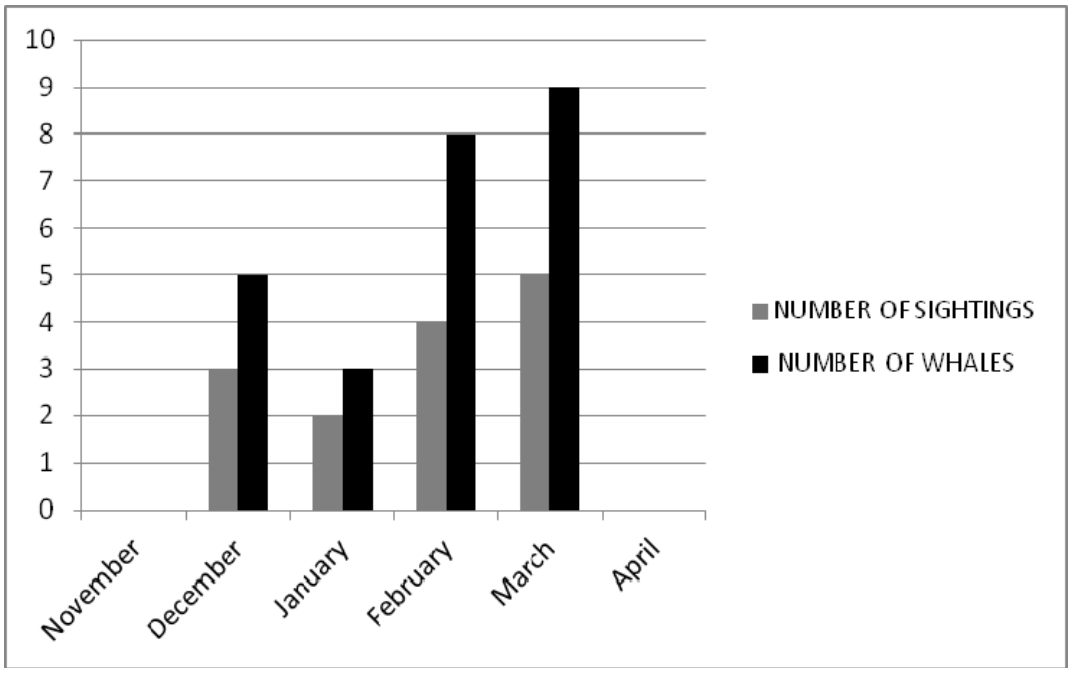

Figure 9. Number of sightings and right whales by month during the SCGA 2012-2013 season.

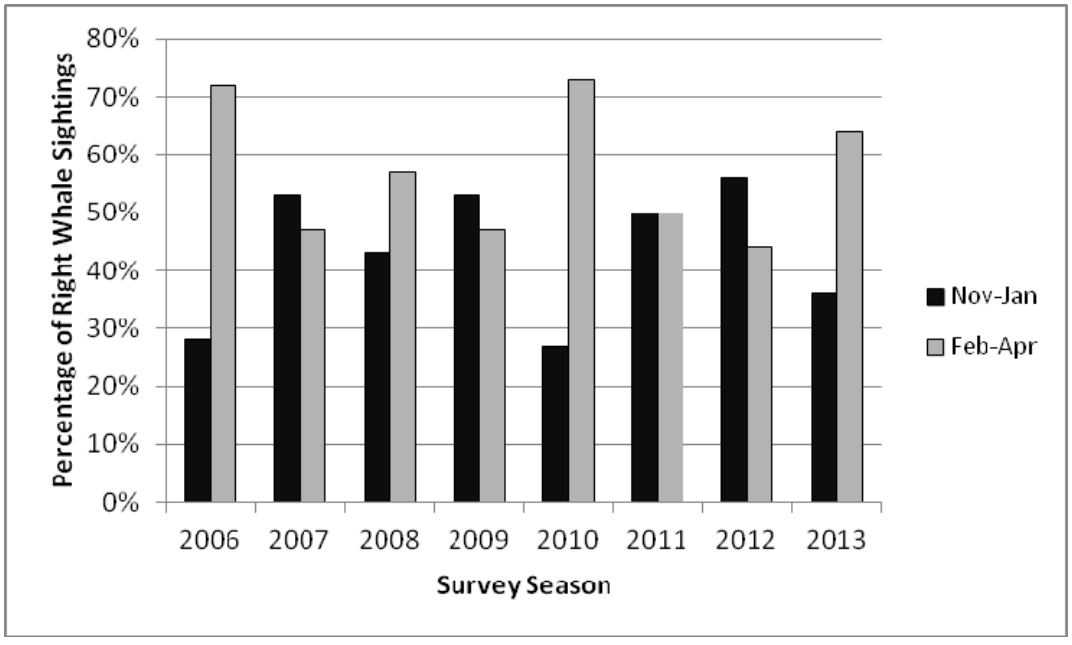

Figure 10. Temporal distribution of SCGA right whale sightings for all survey seasons.

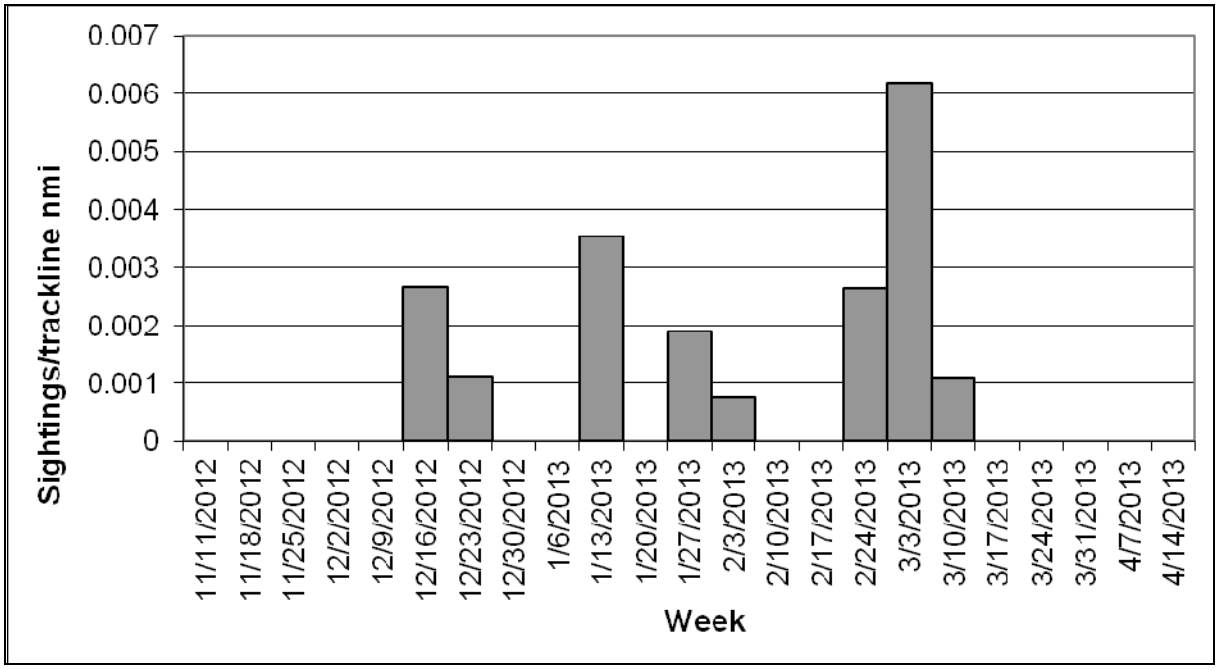

Figure 11. Weekly right whale sightings per trackline nmi flown during the 2012-2013 season.

Discussion and Recommendations

A total of 18 individual right whales (including seven calves) were documented in the SCGA survey areas during the 2012-2013 season, which is considerably lower than the average number of right whales documented seasonally since 2004 (n = 55). Of all the whales documented this season, 17% were adult males and 5% were juveniles. Based on preliminary analysis, the single juvenile, a known male, as well as the adult males were not documented by aerial survey teams to the south, indicating potential importance of the region to demographic groups other than calving females. Also, these sightings indicate that a portion of the population may migrate to the mid-Atlantic region rather than continuing south to the Florida/Georgia critical habitat. No surface active groups (SAGs) were observed during the season.

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 present a 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 federal ship speed zones (implemented in December 2008), have likely decreased the risk of ship strikes to whales while in the critical habitat (Conn and Silber 2013). Nine 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.

For the past nine years consistent survey effort throughout the migration and calving season has provided valuable additional sightings and increased warnings to mariners along the coasts of South Carolina and northern Georgia. The number of right whales sighted in the SCGA survey area (n = 25) is lower than the Northern and Central EWS survey areas (n = 100 and 174 right whales, respectively) as well as the number of right whales sighted by the Southern EWS survey team (n = 49). However, the number of right whales seen by the Southern EWS survey team also includes whales seen outside of the Southern EWS survey area as a result of altered surveys over the course of the season due to multiple factors including contingency plans. The number of right whales documented within only the Southern EWS survey area (n = 32, respectively) is much more consistent with the entire SCGA survey area despite much lower survey effort in the SCGA area.

The boundary of the current critical habitat was designated in 1994 by NMFS based on the best available scientific data at the time. Nineteen additional years of spatial and temporal distribution data now exist, which provides a more accurate picture of right whale distribution in the southeast and mid-Atlantic. The data from these surveys 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 potentially assist in determining the effectiveness of the seasonal management area implemented in 2008 along the eastern seaboard (50 CFR Part 224).

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.

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