EARLY WARNING SYSTEM 2003
Aerial Surveys to Reduce Ship/Whale Collisions In the North Atlantic Right Whale Calving Ground

FINAL REPORT
2003

Monica A. Zani, Amy R. Knowlton, Christopher K. Slay
Elizabeth P. Pike, Scott D. Kraus
New England Aquarium

Robert D. Kenney
University of Rhode Island

Edgerton Research Laboratory
New England Aquarium
Central Wharf
Boston, MA 02110

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U.S. Department of Commerce
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Table of Contents

INTRODUCTION…….....……1
METHODS…….....……3
Aerial Surveys…….. ...……3
Notification of Agencies.....4
Photographic Identification……. 4
Data Analysis and Interpretation……. ...…5
EWS RESULTS……...6
Survey Effort……..……..... 6
Sightings and Photo-identification……...…….…...……7
Demographics….……..……..……..8
Sighting Distances…..……..……...8
Vessels, Other Sightings…….….9
DISCUSSION…….……..11
ACKNOWLEDGMENTS……..……12
REFERENCES CITED……..……13

LIST OF APPENDICES

1. Chart: EWS Study Area
2. Chart: EWS Survey Sightings 2003
3. Chart: Large Vessel Traffic
4. Table: Chronological List of 2003 Right Whale Sightings

INTRODUCTION

There are fewer than 350 North Atlantic right whales *(Eubalaena glacialis*) and the population may be decreasing at 2.4% per year (Caswell, *et al*., 1999), in contrast to southern hemisphere populations which are growing 7%-8% per year (Payne, *et al*, 1990; Best, 1990). Failure of the North Atlantic stock to show signs of recovery, despite international protection since 1937, can be attributed to several factors, including the effects of human activity on mortality rates (Reeves *et al*., 1978; Kraus, 1990, Knowlton and Kraus, 2001). Ship strikes account for the largest number of confirmed deaths (Knowlton and Kraus, 2001). Of 48 right whale mortalities documented from 1970 through 1999, 18 (38%) were due to collisions with vessels (Knowlton and Kraus, 2001). If this source of mortality is not eliminated, recent models predict extinction for right whales (Fujiwara and Caswell, 2001).

Right whales give birth and over-winter in the coastal waters between Savannah, Georgia, and West Palm Beach, Florida, with an area of high whale-density occurring along 100 kilometers (km) of coastline between Brunswick, Georgia, and St. Augustine, Florida. Three major ship channels cross this high-density area. Since 1988, a total of 7 ship/whale collisions are known to have occurred in this region, resulting in 4 mortalities while 3 animals survived with extensive scarring. Commercial vessel traffic in this federally designated critical habitat has increased substantially over the past 40 years (Knowlton, *et al*., 1997). Port expansions and diversions of military traffic to local bases from bases closed elsewhere augment this trend.

The three major entrance channels serve three commercial shipping ports and two military bases. The channel at the north end of the high-density area serves the port of Brunswick, Georgia, home to an automobile importation facility. To the south, centered in the area at the GA/FL border, is the St Marys entrance channel, which runs 14 nautical miles (nm), (25.9 km) offshore and serves the Kings Bay Naval Submarine Base, as well as the port of Fernandina Beach, Florida. Kings Bay is the principal base for the Navy's Atlantic fleet of nuclear submarines. Fernandina is the site of a containerized cargo facility. The St. Johns River entrance is the southernmost channel in the area and serves the port of Jacksonville, Florida and the Mayport Naval Base. This is by far the busiest channel in the area with all forms of large vessel traffic, including container ships, car carriers, tankers, bulk freighters, as well as Coast Guard and US Naval vessels.

The Brunswick and the St. Marys entrance channels are dredged annually to maintain required depths. This occurs during the winter to avoid impacts to sea turtles that frequent the channels in the summer. Dredged material is usually removed from the channels and carried to offshore disposal sites using ocean-going hopper dredges. These vessels work continuously, often making many transits from the channels to the disposal sites within a 24-hour period. Consequently, dredging activities increase the vessel traffic in these channels significantly.

During the 1994 calving season (December 1993 through March 1994), the first comprehensive aerial surveys, referred to as the Early Warning System (EWS) surveys, were conducted to locate right whales and provide whale detection services to all

mariners in the calving ground, including the U.S. Navy, the U.S. Army Corps of Engineers, the U.S. Coast Guard, port authorities and harbor pilots. These groups have used the sighting information in their efforts to avoid collisions with right whales. Prior to this effort, several activities had been initiated to reduce ship collisions with right whales. Since 1989, the Army Corps of Engineers, and/or their dredging subcontractors, supported aerial surveys to detect right whales in the vicinity of dredging activities, and posted marine mammal observers aboard hopper dredges. When right whales were sighted within 10 nm (18.5 km) of the dredging transit zone, the sea-going dredges, capable of speeds up to 14 knots, were slowed to five knots during nighttime or limited visibility operation. These efforts have been successful in avoiding dredging-related mortalities and injuries to right whales. In addition, numerous educational and training programs have been conducted with the harbor pilots associations and Navy personnel at Kings Bay and Mayport to increase awareness about right whales in the area. More recently, the Navy (Commander Navy Region Southeast), has produced an educational video about right whales for distribution to its vessels and the Coast Guard has provided broad-based support for disentangling right whales ensnared in commercial fishing gear.

From 1994 to 2002 the New England Aquarium's EWS surveys covered the majority of the high-density area. Prior to the start of the 2003 calving season, surveys in the Southeastern United States were redesigned to allow for more daily coverage of a larger area. During the 2003 season, the New England Aquarium's EWS surveys were extended eastward by 15-20 nm and reduced in latitudinal range.

This report describes the results of the New England Aquarium's EWS right whale aerial surveys in 2003. Survey effort was modified after the tragic events of January 26, 2003. For the purpose of this report the time frame of December 1, 2002-January 26, 2003 will be referred to as the EWS 2003 season. The New England Aquarium's central EWS survey area (30° 50.0 south to 30° 17.0 out to 80° 47.0) will be referred to as the EWS area. The funding for the EWS surveys is provided by the U.S. Army Corps of Engineers, U.S. Coast Guard and the U.S. Navy with support from the National Marine Fisheries Service.

The New England Aquarium survey team remained on site and was a collaborator during the modified EWS surveys. This collaboration effort included New England Aquarium, Wildlife Trust and Florida Conservation Commission (Florida Marine Research Institute. Survey effort was resumed on February 11, 2003 and continued through March 31. These surveys were conducted in a NOAA Twin Otter.

METHODS

Aerial Surveys

Surveys were flown daily between December 1, 2002 and January 26, 2003. The surveys covered the southern end of Cumberland Island GA, approximately 6.5 nm (12 km) north of the St. Marys River entrance, to Jacksonville, FL, approximately 6.5 nm (12km) south of the St. Johns River entrance. Twelve east/west transects were flown perpendicular to the coast under VFR ("visual flight rules") conditions at 3 nm (5.5 km) intervals from 0.5 nm (0.9km) off the shoreline out to approximately 32 nm (60km) from the shore. (see Appendix 1). A total of 406 on-transect nm (761 km) were flown during each completed survey.

Necessary conditions for all flights included a minimum ceiling of 1000 feet (305 meters), visibility greater than 2 nm (3.7 km) and winds less than 18 knots. Surveys were conducted in a twin engine Cessna 337, or the military version of the 337, the Cessna 02. The aircraft was equipped with a sea surface temperature (SST) probe, GPS, full IFR ("instrument flight rules") instrumentation, a life raft, PFD's, flares, a medical kit, a waterproof VHF marine radio, an EPIRB, and an aircraft mounted ELT.

The survey was flown at an altitude of 1000 feet (305m) above sea level. The survey team consisted of a pilot, data recorder, and two observers positioned on each side of the aircraft in the rear seats. The observers scanned the water surface out to at least 2 NM (3.7 km). In order to maintain standardized sighting effort, the pilot and data recorder were instructed not to alert the observers to any sightings, but were allowed to report a sighting after it had been passed by the aircraft if missed by the observers. The distance of each right whale sighting from the flight track was measured using GPS positions of the sighting and the transect line.

All sightings were recorded directly into a computerized logging program. Logger 2000 was created by the International Fund for Animal Welfare (IFAW) and designed for compatibility with the Right Whale Consortium (RWC) database, curated by the University of Rhode Island (URI). During surveys, Logger 2000 downloaded data directly from the aircrafts GPS. Every 20 seconds Logger 2000 downloaded the time, position, altitude, heading and speed of the aircraft into a database. In addition to the automatically downloaded data, the recorder could manually enter sighting information into the database. This computerized logging system improved the efficiency of the data recorder by streamlining the collection process. This allowed the recorder to accurately record all necessary sighting data from the GPS with a single keystroke.

All sightings of marine animals except birds (including cetaceans, sea turtles, sharks, rays, other large fishes, schools of fish, etc.) were recorded without breaking the transect in order to maximize flight time available for investigating right whale sightings. When sightings of right whales occurred, the aircraft left the transect line at a right angle to the sighting and flew directly over the whale(s) to obtain an exact GPS location and distance from the trackline of the whale(s). The aircraft then circled the whale(s), allowing observers to obtain photographic identifications of the individuals sighted. Circling time was dependent on number of whales and behavior. Circling time averaged

20 minutes per right whale sighting. At the conclusion of photographic work on each sighting, the aircraft returned to the transect line at the point of departure. These methods conformed to research protocols followed by the North Atlantic Right Whale Consortium as approved by the National Marine Fisheries Service.

All vessel traffic was recorded. Large vessels were recorded with an estimate of direction and distance from the transect in order to plot actual locations, heading and estimated speed where possible. The speeds of large vessels were determined by obtaining two exact GPS positions of the vessel at different times during the survey. Speed was determined using a distance, time, speed formula (D/T=S). The distance of large vessels (excluding military vessels) were determined by calculating the difference between GPS position of the aircraft on the trackline versus the GPS position of the vessel as the aircraft passes directly over the top. Distance and speed of military vessels were roughly estimated by eye (the survey aircraft would stay a minimum of 1 mile from military vessels).

In addition to marine animals and vessel traffic all debris observed was also recorded into the RWC database using a coded entry format. Debris include oil, plastic, balloons and natural debris such as Sargassum and wood.

During each survey sea surface temperature was also recorded using an aircraft mounted sea surface temperature probe. Sea surface temperature was continuously recorded throughout the flight at one-minute increments.

Notification of Agencies

During the EWS season, all sightings were reported in real time to the Fleet Area Control and Surveillance Facility (FACSFACJAX) at Naval Air Station Jacksonville. This near real- time data is forwarded to the NAVTEX system via the U.S. Coast Guard (USCG), and is received automatically by all commercial shipping. The USCG also transmits an Urgent Marine Information Broadcast (UMIB) over VHF marine-band radio channel 16. A right whale user group, which includes local, state, federal, non-profit and commercial interests is provided with pagers and receive sighting information from FACSFACJAX almost immediately via the pager system.

Photographic Identification

During aerial surveys, primary digital images were taken using a hand-held Nikon D1X with a Nikkor 400mm fixed lens. Secondary photographs were taken on Kodak Kodachrome 200 slide film using hand-held Nikon SLR 35mm cameras equipped with a fixed Sigma 300mm lens.

Photographers attempted to obtain good images of the entire callosity pattern of every right whale and any other scars or markings that were obvious on the body. The roll and frame/image numbers used by each photographer were recorded.

Photographs of right whale callosity patterns were used as a basis for identification and cataloging of individuals, following methods developed by Payne *et al*. (1983) and Kraus *et al*. (1986b). Photographs taken during the field effort were used to classify individuals on the basis of callosity patterns, topography, pigmentation and scars. Final matches were confirmed using original photographs cataloged and archived at NEAq.

The recent use of digital photography allows for prompt identification of whales by the New England Aquarium (NEAq). In addition digital images play a critical role in the on-site assessment of entangled whales.

Data Analysis and Interpretation

Distribution

Sightings of all species were recorded by location and time within the study area. Integration of the right whale sightings data collected during these surveys with previously collected data will help to further identify high-use areas within the southeast region. All right whale sightings for the season were plotted and displayed as M/C pairs, singles and groups of 2-7 right whales. Ship traffic was also plotted to visually compare right whale sightings versus ship traffic.

Demographics

An analysis of the age and sex composition of the wintering population of right whales along the southeastern U.S. was conducted using data from the aerial surveys and the existing photo-ID catalog, to determine demographics and habitat use patterns. Right whales first identified as calves were classified as calves (first year animals), juveniles (1-9 yrs) or adults (>9 yrs). Whales that were not first sighted as calves were classified as unknown age until their ninth year in which they become classified as an adult. All calving females were classified as adults. Sexes were determined by one of the following methods: 1) direct observation of the genital area, 2) by association with a calf, 3) by the testing of biopsy samples for a genetic marker unique to the Y chromosome (Brown *et al*., 1994).

Calving Intervals and Rates

Right whale cows in this population have been monitored since 1980, and records of calf production are documented in the North Atlantic Right Whale Catalog (Knowlton *et al*., 1994). Seasonal data collected on cows (reproductive females) that gave birth in the study area during the survey period were used to update information on calving intervals and rates of reproduction. The calving intervals were calculated for the 2003 EWS season mothers and compared to the present average for the population.

EWS RESULTS

Survey Effort

The survey team was on-site for 121 days of the 2003 right whale calving season. Of the 121 days on-site the team flew 36 surveys of the central EWS in a Cessna Skymaster in the first 57 days. The first survey was conducted on December 1, 2002 and the last survey occurred on January 26, 2003. On February 11, 2003 the modified survey known as the revised Early Warning System (REWS) began. The REWS was a collaborative effort by New England Aquarium, Wildlife Trust and Florida Marine Research Institute (Florida Conservation Commission). The modified survey effort was continued through March 31, 2003 and conducted in a NOAA Twin Otter.

Some surveys were conducted with favorable conditions throughout the duration of the survey, where as others were flown with favorable conditions part of the time. Favorable conditions are considered to consist of a Beaufort force 3 or less and good visibility for a least 2 nautical miles. Beaufort force 3 is wind at 7-10 knots and only occasional whitecaps (Chapman, 1976).

Protection is considered to be somewhat effective when surveys are flown with sea conditions of less than Beaufort force 4 (Slay *et al*, 2002). Over 77% of all EWS survey sightings during the 2003 season occurred in Beaufort sea state less than force 4.

For the 2003 season, 25 complete surveys (>90% of survey area flown) 10 partial surveys (50% - 90% of survey area flown), and 1 opportunistic survey were flown, but only 7 (28%) of these surveys were completed in favorable conditions (Table 1). Thus, some measure of aerial coverage was provided for only 36 days (63% of available days).

In previous years complete surveys with favorable sighting conditions were, on average, flown only 32% each winter calving season (Slay *et al*,. 2002).

To evaluate how much of the available effort for the season was conducted in decent sighting condition, the number of days on site was multiplied by on-transect miles per survey. There are 406 on-transect miles to be flown per survey, so there were 23, 142 nautical miles available to be flown during the 2003 season (57 days x 406nm). This is a relevant figure when discussing the protection afforded to right whales by these surveys.

Table 1: EWS 2003 Survey Effort

Year	Survey Team on Site	Days on Site	Complete Surveys (% of Days on Site)	Complete Surveys In Sea State < 4	On Transect Miles Available (406 X 57 days on site)	On Transect Miles Flown (% of total available miles)	On Transect Miles Flown in Sea State < 4 (% of total flown miles)
2003	12/01/02 – 03/31/03	57	25 (40%)	7 (28%)	23,142	12,121.5 (54%)	3,088 (26%)

Sightings and Photo-identifications

There were 54 right whale sighting events in the EWS survey area during the 2003 season (Appendix 2). Of the 18 females known to have given birth in 2003, 13 were documented by the EWS surveys. Of the 54 right whale sightings documented by the EWS surveys in 2003, 39 (72%) were adult females with calves. All 54 sightings were photo documented and reported to the EWS pager system via FACSFACJAX.

. The first documented sighting in the New England Aquarium's EWS survey area occurred on December 17, 2002. As the coastal, southern progression of right whales continued the number of right whale sightings increased drastically from 1 to a maximum of 6 sightings per day with as many as 17 individual whales.

During the 2003 season, 4 adult, female right whales gave birth for the first time. This data will update these females from a non-reproductive to a reproductive status.

Two known reproductive females (1151 and 2123), both documented in 2001 with calves were seen in 2003 with new calves. In both cases the 2001 calves were known mortalities. These represent only the second and third documented cases of a two-year calving interval in the population. During the 2003 calving season, calving intervals ranged from of 2-14 years with an average of 6 years.

On one occasion the EWS 2003 surveys documented a single sighting of 7 adult males moving through the calving ground together. The survey team was on site for 39 minutes as the group of males headed southeast through the area. This single sighting was the only documented sighting of the group of 7 males in the EWS area in 2003.

Table 2: Sightings and Photo-Identification

Year	Right Whale Sightings	Temporal Occurrence	Sightings Of Cow/Calf Pairs	EWS Cow/Calf pairs (% of Total 2003 Cow/Calf pairs)	Sightings of Non-Calving Whales
2003	54	Dec 17-Jan 26	39	13 (72%)	15

All right whale sightings from the 2003 season are plotted on a chart of the study area in Appendix 2. All sightings of photo-identified whales are detailed in a table in Appendix 4 with the date, time and location of each sighting. Also included are the catalog identification number, sex and age of each whale.

Demographics

A summary of the demographic structure within the EWS 2003 survey area is given in Table 3. The demographic structure of the 2003 season is consistent with most previous years survey data. Analysis of the demographics of right whales seen in the Southeastern United States allows for further understanding of how the critical habitat is being utilized by the Northern Right Whale. This table indicates that the area was primarily utilized by calving females and their newborn calves.

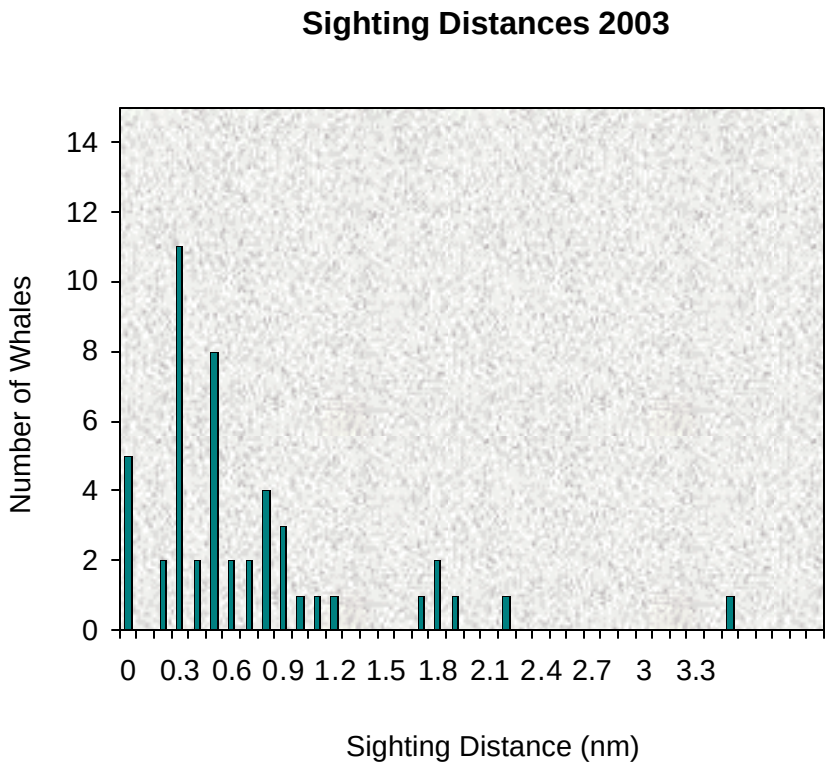
Table 3: Demographics

		Adult Females			Adult		Juvinile				
Year	Individual Whales Sighted	2003 Calving Females	Non Reproductive	Reproductive	Males	Unknown Gender	Females	Males	Unknown Gender	Females Unknown Repro. Status	Males Unknown Repro. Status
2003	29	13	1	3	7	0	1	1	0	0	0

Sightings Distances

The sighting distance was determined for each right whale sighting event and all sightings are summarized in Figure 2 by 1/10 nm increments. Right whales that were sighted while the aircraft was not on transect were not included in this analysis graph. Although some sightings were made at distances of 2-3 miles, most sightings occurred at distances less than 1 mile from the trackline.

Figure 2: EWS 2003 Sighting Distances



Vessels and Other Sightings

All vessel traffic sighted during a survey is entered into the database; this includes all recreational, commercial and military vessels. All entries include time, latitude/longitude position, heading (for commercial merchant and military) and survey parameters such as Beaufort, visibility, clouds and glare. Appendix 3 contains a chart on which positions for commercial (excluding commercial fishing) and military vessels are plotted.

On at least two occasions, the EWS survey team observed vessels heading towards right whales and attempted to make direct contact with the vessel operators (see Table 5).

At least 4 species of cetaceans(Eg, Mn, Tt and Stanella sp.), 3 species of sea turtles (Lk, Dc and Cc) and numerous species of sharks, rays and other fish were sighted while performing these surveys. All sightings from each survey were entered into the database. This database also contains coded entries for all behaviors and/or associations that may have been observed for these species.

Table 5: Ships and Whales

Date	Time	Origin or Destination of Vessel	Vessel Type	Whale Behavior	Relationship of Ship to Whale	Observers' Communication	Closest Distance	Action/Reaction
12/31/02	1242	Kings Bay Naval Base	Submarine	Logging	5 NM NE	VHF direct	N/A	Submarine acknowledged transmission and recorded whales position in order to stay clear
1/10/03	1539	Jacksonville	Tug and Barge	Slow, surface swim	0.5NM NE	Tug and barge cleared whales before communication could be made	0.5NM	No Change in whales behavior

Discussion

The critical habitat of the coastal waters of the southeastern United States is currently the only known calving ground for the Northern Right Whale. For the past 9 years there has been extensive survey effort of the calving ground in the form of Early Warning System surveys (EWS). Originally the EWS surveys were designed to reduce the potential for ship strikes in the calving ground. However, over the past 9 years, the EWS surveys have proved to be more than a conservation tool to reduce the threat of ship strikes. In addition to the main objective to the EWS, these surveys have contributed hundreds of photographically documented right whale sightings. This data plays an important role in the understanding of right whale habitat, distribution, associations and reproduction.

The 2003 EWS season produced sightings that had infrequently been reported in the calving grounds. Documentation of SAG's (surface active group) are unusual in the area. On at least three occasions during the season the EWS survey team identified, documented and reported the presence of a SAG in the southeast calving ground.
The presence of adult, male right whales and their associations in the calving ground was also unusual for the southeastern U.S. critical habitat. Finally the documentation of many juvenile (not currently identified) right whales shows that the southeastern calving ground, while primarily utilized by cows with calves, is an important and seasonal habitat for many whales in the population.

Photo analysis to identify all the right whales photographed in the southeast in 2003 is currently being conducted. At least 18 M/C pairs of the known 19 M/C pairs were documented (New England Aquarium, Wildlife Trust and Florida Marine Research Institute (Florida Conservation Commission) in the calving ground during the 2003 season. In the 23 years of documented calving for this population, 2003 yielded the 5th highest calf production. This season also produced the second and third known documentations of a two-year calving interval. Two right whale cows that gave birth in 2001 but lost their calves in that year returned to the southeast calving grounds with new calves. This suggests that early calf mortality may lead to shorter calving intervals in healthy cows.

Acknowledgements

First and foremost we must mention and thank the EWS right whale observers of 2003. These surveys would never be possible without the loyalty and extreme dedication of a team of highly qualified individuals. The New England Aquarium EWS team consisted of Gill Braulik, Jennifer Cucksey, Holly Fearnbach, Cally Harper, Lindsay Hall and Terri Krauska. Jessica Damon and Heather Pettis relocated to Fernandina Beach, FL for December to help with the startup and training of a new team.

Since the start of the season, digital photography allowed for almost instant matching and with the help of the right whale team in Boston, matches were made daily thanks to the dedication and abilities of Heather Pettis and Beth Pike. I must also thank the team in Boston for all their help and support throughout the season, includes Lisa Conger, Philip Hamilton, and Marilyn Marx and to Laura Lane.

FACSFAC JAX, Naval Air Station Jacksonville went to great lengths to keep the system running efficiently. Lt Josh Russell and Kenneth Conley of Naval Air Station Jacksonville, championed our cause. As always, the U.S. Coast Guard displayed a great willingness to help with the effort. The U.S. Army Corps of Engineers, South Atlantic Division, has backed right whale conservation for over 10 years and continues to support our efforts. The cooperation of the St. Johns Bar pilots, the Cumberland Sound pilots and the Brunswick pilots has been essential and is greatly appreciated. The generous assistance of Wayne McFee, of the National Ocean Service, and Kathy Wang and Steve Swartz, of the National Marine Fisheries Service, has been invaluable.

It is with my most endearing sentiments that I thank everyone who pulled together during the days and weeks after the unfortunate and tragic events of January 26 and the loss of fellow colleagues and dear friends. Kerry Irish, Dave Mattingly, Buzz Kraus, Jim Hain and the observers and members of the Southeast and mid-Atlantic right whale survey teams deserve recognition for their compassion and professionalism during this time. Amongst them Alicia Windham Reed and Jamison Smith of Florida Marine Research Institute (FMRI), Buddy Powell of Wildlife Trust, Barb Zoodsma, southeast right whale coordinator for NOAA Fisheries and Bill McClellan of the University of North Carolina at Wilmington (UNCW). I applaud Cyndi Taylor of Wildlife Trust for her hard work and dedication to the conservation effort and her outstanding ability as a leader.

Amy Knowlton, Dr. Scott Kraus and Chris Slay gave me a tremendous amount of advice and support throughout the season. In the days following January 26 it was their knowledge, compassion and dedication that helped pull the survey teams together and fuel the discussions and decisions that later led to the continuation of surveys in the Southeast in 2003.

With my deepest gratitude I thank the EWS pilots, Bill Foster, Ron Salmon, and Robert Murphy and Chong Yee of Environmental Aviation Services who have shown extreme dedication to the conservation of right whales in the Southeast. Their ongoing involvement in the project makes their knowledge and commitment irreplaceable. For many years and hundreds of surveys, it is their outstanding wisdom and abilities that have set our standards in pilots.

MAZ

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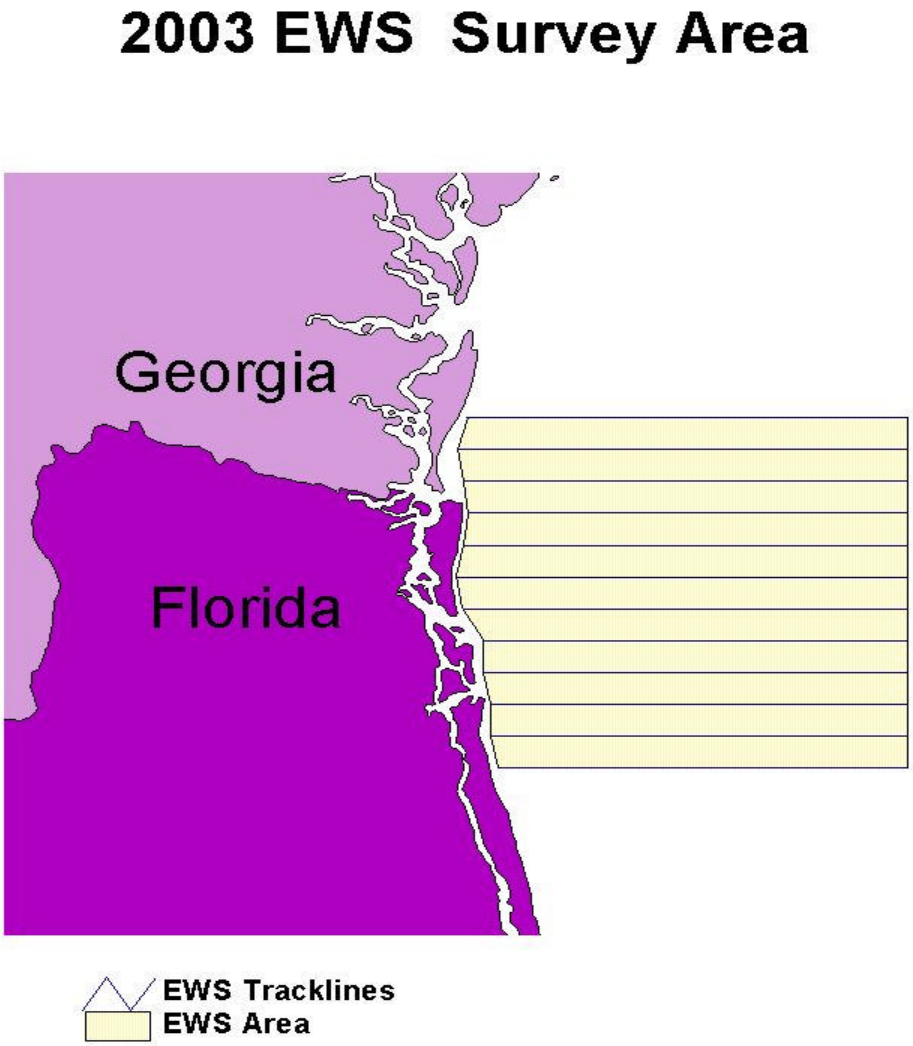
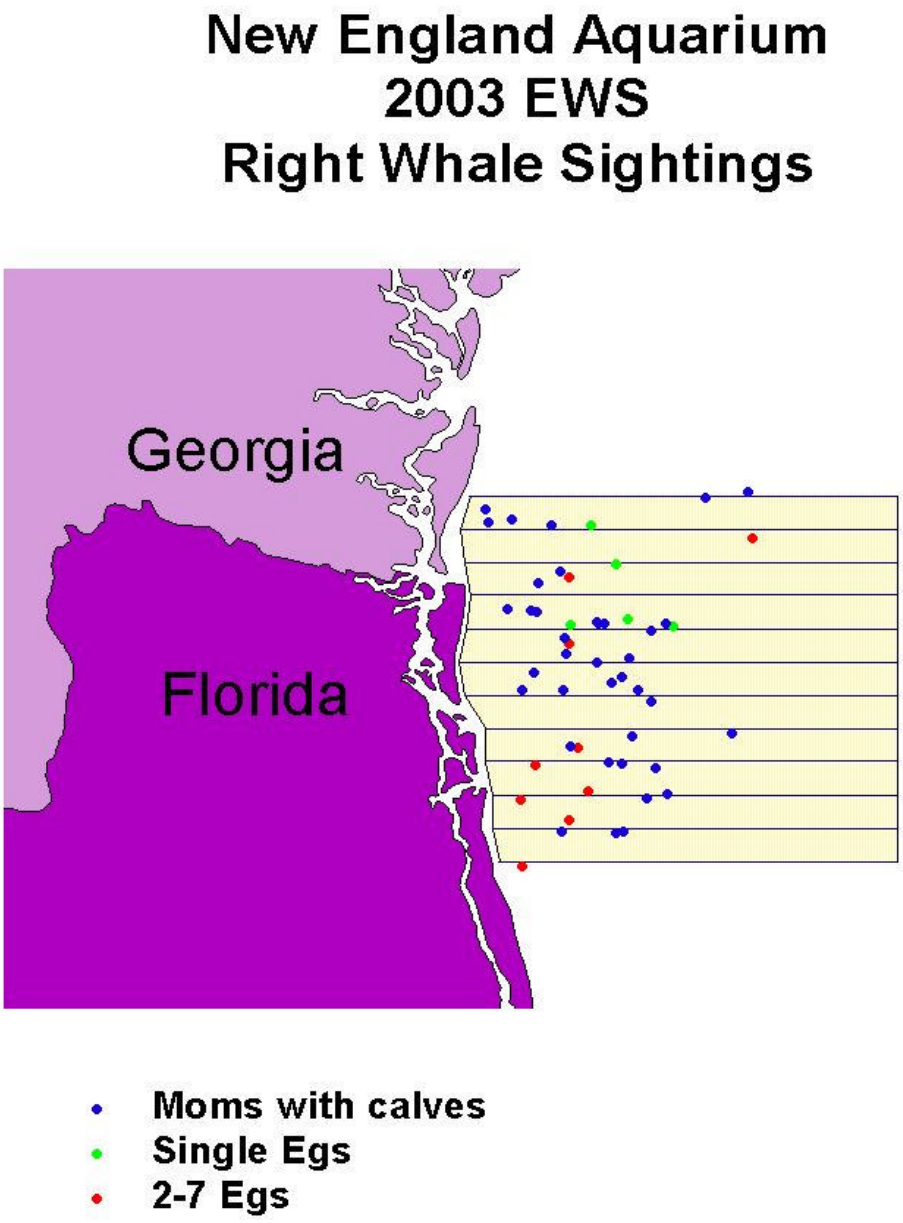
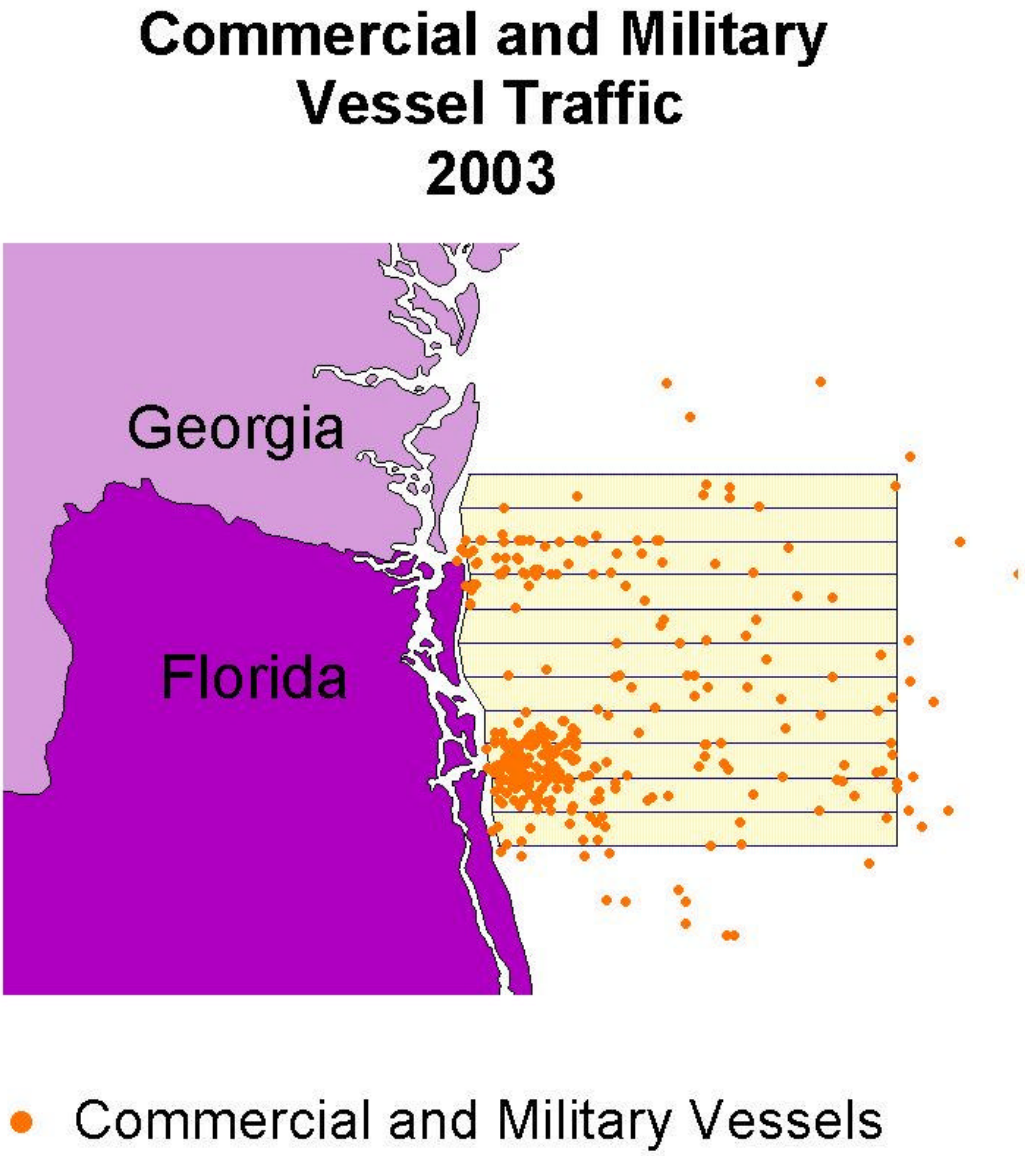
Appendix 1
2003 EWS Survey Area



Appendix 2
2003 EWS Right Whale Sightings



Appendix 3
2003 EWS Vessel Traffic



Appendix 4: Chronological List of EWS 2003 Right Whale Sightings

Age: J- Juvenile (1-9 yrs), A- Adult (>9 yrs), C-Calf

EGNO	Time	Day	Month	Year	Latitude	Longitude	Sex	Age	Comments
1243	913	17	12	2002	30.8133	-81.3950	F	A	
	913	17	12	2002	30.8133	-81.3950		C	Calf
1968	1316	21	12	2002	30.6500	-81.1800	U	A	
1301	1411	21	12	2002	30.5900	-81.2700	F	A	
	1411	21	12	2002	30.5900	-81.2700		C	Calf
1515	1506	21	12	2002	30.4800	-81.0300	F	A	
	1506	21	12	2002	30.4800	-81.0300	U	C	Calf
	1331	22	12	2002	30.7100	-81.2700	U		
	1331	22	12	2002	30.7100	-81.2700			
1301	937	23	12	2002	30.7217	-81.2850	F	A	
	937	23	12	2002	30.7217	-81.2850	U	C	Calf
1208	1530	23	12	2002	30.8300	-81.0683	F	A	
	1530	23	12	2002	30.8300	-81.0683	U	C	Calf
1208	1459	26	12	2002	30.5233	-81.1500	F	A	
	1459	26	12	2002	30.5233	-81.1500	U	C	
2123	1001	27	12	2002	30.7900	-81.2300	F	A	
1151	1200	29	12	2002	30.6300	-81.1483	F	A	
	1200	29	12	2002	30.6300	-81.1483	U	C	Calf
2114	1006	30	12	2002	30.7900	-81.3000	F	A	
	1006	30	12	2002	30.7900	-81.3000	U	C	Calf
1151	1127	30	12	2002	30.6400	-81.2200	F	A	
	1127	30	12	2002	30.6400	-81.2200	U	C	Calf
2413	1521	30	12	2002	30.2800	-81.3500	F	A	
	1521	30	12	2002	30.2800	-81.3500	U	C	
1301	931	31	12	2002	30.8400	-81.0100	F	A	
	931	31	12	2002	30.8400	-81.0100	U	C	Calf
2301	1209	31	12	2002	30.5800	-81.2300	F	A	
	1209	31	12	2002	30.5800	-81.2300	U	C	Calf
2029	1417	4	1	2003	30.6183	-81.2783	F	A	
	1417	4	1	2003	30.6183	-81.2783	U	C	Calf
1711	1125	5	1	2003	30.5617	-81.1933	F	A	
	1125	5	1	2003	30.5617	-81.1933	U	C	Calf
1817	1144	5	1	2003	30.5667	-81.3233	F	A	
	1144	5	1	2003	30.5667	-81.3233	U	C	Calf
1711	1312	5	1	2003	30.5417	-81.1683	F	A	
	1312	5	1	2003	30.5417	-81.1683	U	C	Calf
1817	1535	5	1	2003	30.5383	-81.2783	F	A	

EGNO	Time	Day	Month	Year	Latitude	Longitude	Sex	Age	Association Type
	1535	5	1	2003	30.5383	-81.2783	U	C	Calf
2029	1617	5	1	2003	30.5883	-81.1817	F	A	
1515	1617	5	1	2003	30.5883	-81.1817	F	A	
1243	1007	6	1	2003	30.7967	-81.3533	F	A	
	1007	6	1	2003	30.7967	-81.3533	U	C	Calf
	1050	6	1	2003	30.7933	-81.3917			Calf
	1050	6	1	2003	30.7933	-81.3917			
1946	1633	7	1	2003	30.7733	-81.2567	F	A	
	1633	7	1	2003	30.7733	-81.2567	U	C	Calf
1151	1538	10	1	2003	30.3450	-81.2717	F	A	
	1538	10	1	2003	30.3450	-81.2717	U	A	Calf
1946	1237	11	1	2003	30.7017	-81.3167	F	A	
	1237	11	1	2003	30.7017	-81.3167	U	C	Calf
1151	1306	11	1	2003	30.6283	-81.1483	F	A	
	1306	11	1	2003	30.6283	-81.1483	U	C	Calf
1301	1424	11	1	2003	30.4717	-81.1783	F	A	
	1424	11	1	2003	30.4717	-81.1783	U	C	Calf
2413	1543	11	1	2003	30.4283	-81.3217	F	A	
	1543	11	1	2003	30.4283	-81.3217	U	C	Calf
1711	1521	14	1	2003	30.3300	-81.2000	F	A	
	1521	14	1	2003	30.3300	-81.2000	U	C	Calf
1909	1601	14	1	2003	30.3700	-81.3400	F	A	
	913	16	1	2003	30.3883	-81.2433			
1817	1039	16	1	2003	30.3767	-81.1567	F	A	
	1039	16	1	2003	30.3767	-81.1567	U	C	Calf
1158	1420	16	1	2003	30.4533	-81.2583	F	A	
1303	1420	16	1	2003	30.4533	-81.2583	F	A	
2029	1451	16	1	2003	30.4550	-81.2683	F	A	
	1451	16	1	2003	30.4550	-81.2683	U	C	Calf
1243	1456	16	1	2003	30.5383	-81.3400	F	A	
	1456	16	1	2003	30.5383	-81.3400	U	C	
	1152	18	1	2003	30.6383	-81.2700			
1158	1152	18	1	2003	30.6383	-81.2700	F	A	
1151	1217	18	1	2003	30.6433	-81.2283	F	A	
	1217	18	1	2003	30.6433	-81.2283	U	C	Calf
	1358	18	1	2003	30.6583	-81.3200			
	1358	18	1	2003	30.6583	-81.3200			
3111	1413	18	1	2003	30.6567	-81.3283	U	J	
1243	1555	18	1	2003	30.6633	-81.3633	F	A	
	1555	18	1	2003	30.6633	-81.3633	U	C	Calf
1151	1613	18	1	2003	30.6417	-81.2267	F	A	
	1613	18	1	2003	30.6417	-81.2267	U	C	Calf
2123	1254	21	1	2003	30.3283	-81.2817	F	C	
	1254	21	1	2003	30.3283	-81.2817	U	C	Calf
	1655	21	1	2003	30.6100	-81.2717			
	1655	21	1	2003	30.6100	-81.2717			
	1655	21	1	2003	30.6100	-81.2717			

EGNO	Time	Day	Month	Year	Latitude	Longitude	Sex	Age	Association Type
	1730	21	1	2003	30.3283	-81.1917			
	1730	21	1	2003	30.3283	-81.1917			
3101	1218	22	1	2003	30.7300	-81.2017	F	J	
2140	955	25	1	2003	30.7683	-81.0000	M	A	
1803	955	25	1	2003	30.7683	-81.0000	M	A	
	955	25	1	2003	30.7683	-81.0000			
2406	955	25	1	2003	30.7683	-81.0000	M	A	
2410	955	25	1	2003	30.7683	-81.0000	M	A	
2303	955	25	1	2003	30.7683	-81.0000	M	A	
2057	955	25	1	2003	30.7683	-81.0000	M	A	
1233	1157	25	1	2003	30.6383	-81.1267	F	A	
	1157	25	1	2003	30.6383	-81.1267	U	C	Calf
1151	1526	25	1	2003	30.4233	-81.1433	F	A	
	1526	25	1	2003	30.4233	-81.1433	U	C	Calf
3101	1526	25	1	2003	30.4233	-81.1433	F	J	
	1526	25	1	2003	30.4233	-81.1433			
2123	1554	25	1	2003	30.4317	-81.1933	F	A	
	1554	25	1	2003	30.4317	-81.1933	U	C	Calf
2029	1622	25	1	2003	30.3817	-81.1250	F	A	
	1622	25	1	2003	30.3817	-81.1250	U	C	Calf
	1048	26	1	2003	30.6367	-81.1167			
1817	1129	26	1	2003	30.5517	-81.2083	F	A	
	1129	26	1	2003	30.5517	-81.2083	U	C	Calf
2123	1346	26	1	2003	30.4317	-81.2117	F	A	
	1346	26	1	2003	30.4317	-81.2117	U	C	Calf