

**Aerial surveys of the coastal waters of Florida to detect the presence of
North Atlantic right whales (*Eubalaena glacialis*)**

December 2002 - January 2003
Final Report



Submitted by:
Alicia A. Windham-Reid & Jamison M. Smith
North Atlantic Right Whale Conservation Project
Fish and Wildlife Conservation Commission
Florida Marine Research Institute
Jacksonville Field Laboratory
6134 Authority Avenue
Jacksonville, FL 32221

TABLE OF CONTENTS

Introduction.....	2
Methods.....	3
Results.....	5
Discussion.....	6
Recommendations.....	7
Acknowledgements.....	7
Literature Cited.....	8
List of Figures	
1. Aerial Survey Area.....	11
2. Map of 2002-2003 right whale sightings.....	12
3. Number of surveys compared to number of sightings since 1991.....	13
List of Tables	
1. List of survey dates and ranges flown.....	14
2. List of right whale sightings	15
3. Demographic breakdown of identified individuals.....	15
4. Species Totals.....	16
List of Appendices	
1. Biopsy Skin Sampling.....	17

INTRODUCTION

Right whales, *Eubalaena* spp., were hunted almost to extinction until 1935, when the League of Nations passed a protective Resolution. There are at least two distinct stocks of right whales, the northern right whale, *Eubalaena glacialis*, and the southern right whale, *Eubalaena australis*. The northern population has made little to no recovery while the southern population has increased at a rate of about 7-8% per year (Caswell et al. 1999; Payne et al. 1990; Best 1990). The northern right whale is one of the most endangered large whales in the world with the population poised around 350 animals (Knowlton et al. 1994).

The North Atlantic right whale is listed as an "endangered" species under the Endangered Species Act of 1973 (ESA) and as an Appendix I species under the Convention for the International Trade in Endangered Species. Protection is afforded to this species in U.S. and territorial waters under the Marine Mammal Protection Act of 1972 (MMPA) and the ESA (NMFS 1991). While inhabiting Florida waters, protection is offered through the Florida Wildlife Code Chapter 39, Florida Administrative Code and the Florida Endangered and Threatened Species Act of 1977. In addition, the Southeastern U.S. Right Whale Recovery Plan Implementation Team for the Recovery of the Northern Right Whale was developed in 1993 as an advisory group to aid efforts to protect, manage and research northern right whales in the southeastern U.S. calving grounds. The Florida Fish and Wildlife Conservation Commission (FWC) have participated as a member of the southeast U.S. Implementation Team since its onset.

The Georgia Bight along the Atlantic coastal waters of Georgia and Florida are the only known calving grounds of the northern right whale (Kraus *at al.* 1993). This area was deemed essential to the future survival of the species and designated as the Southeast United States (SEUS) critical habitat by the National Marine Fisheries Service (NMFS) in 1994. The SEUS Critical Habitat encompasses the waters from 31° 15'N to 30° 15'N from the shoreline out to 15nm, and the waters between 30° 15'N and 28° 00'N from the shoreline out to 5nm (50 CFR Part 226).

The Florida Fish and Wildlife Conservation Commission's Florida Marine Research Institute staff has been conducting aerial surveys with varied coverage and effort since 1991 as part of the Early Warning System (EWS) to detect and report the presence of North Atlantic right whales in Florida waters (Thomas and Ciano 1999; Ciano and Thomas 2001). The funding that was made available for the 2002-2003 calving season enabled FMRI to contribute to the EWS surveys on a daily basis (weather dependent) within a dedicated survey area. Forty two percent (42 %) of all documented right whale mortality is caused by human activities, and 84% of all anthropogenic mortalities result from vessel collisions (Knowlton and Kraus 2001; Kraus 1990; Kenney and Kraus 1993). In addition, Fifty seven percent of all clearly photographed right whales contain evidence of previous entanglement interactions (Kraus 1990). These surveys directly contribute to the first objective of the Final Recovery Plan for the Northern Right Whale (NMFS 1991): "to identify and/or eliminate sources of human-caused injury or mortality" by disseminating sighting information to all mariners within the calving region via the U. S.

Navy, U.S. Coast Guard, harbor pilot associations and port authorities. In addition to FMRI's EWS participation, FMRI concurrently collects age, sex, distribution, reproduction, and abundance data of right whales in Florida waters. The aerial surveys provide an excellent platform to monitor right whales for individual identification, gross health assessment including photographing any undocumented scars and in the event of sighting an entangled whale, notification and documentation for monitoring and/or disentanglement action.

Due to the tragic accident and loss of our right whale research colleagues, Emily Argo, Jackie Ciano, Tom Hinds and Michael Newcomer, this report describes the FMRI 2002-2003 aerial survey results from December 02, 2002 through January 26, 2003. Following the accident and beginning February 11, 2003, the FMRI aerial crew merged with the Wildlife Trust (WT), contracted by Georgia Department of Natural Resources, and New England Aquarium (NEAq) observer teams in a combined EWS effort that conducted aerial surveys the remainder of the right whale calving season in a NOAA twin otter as the platform. The FMRI team did not conduct any dedicated aerial survey efforts between January 27, 2003 and February 10, 2003. FMRI research staff out of the Melbourne field station flew one ancillary flight during this time frame to successfully verify a public sighting. Currently, locating right whales by conducting aerial surveys in the SEUS and disseminating location information to mariners remains the best available method for reducing the likelihood of vessel/whale collisions. These surveys are funded primarily by the National Marine Fisheries Service and supplemented by the Florida Fish and Wildlife Conservation Commission.

METHODS

The content of this report comprises the FMRI early warning system (EWS) aerial surveys, designated as Florida Warning System (FWS) on the EWS pager system, beginning December 2, 2002 and concluding on January 26, 2003. The FMRI aerial team continued to contribute to the EWS aerial surveys after January 26th, as part of a combined effort (designated as REWS on the pager system) that also included NEAq and WT observers. The REWS surveys that began on February 11, 2003 are described in the Georgia DNR/Wildlife Trust 2002-2003 right whale calving season final report.

The 2002-2003 right whale calving season was the 12th season during which aerial surveys were conducted by the FWC/FMRI (Brooks et al. 1993; Brooks 1994; Brooks 1995; Brooks and Thomas 1996; Thomas and Brooks 1997; Thomas 1998; Thomas and Ciano 1999; Thomas and Ciano 2000; Ciano and Thomas 2001; Smith and Windham-Reid 2002). Two survey configurations or combinations of the two were flown during the 2002-2003 calving season: 10 east/west lines and two north/south coastal tracks as illustrated in figure 1. The FMRI team surveys the southern section of the SEUS critical habitat from Ponte Vedra Beach (30°14'N) to North Crescent Beach (29°47.0) from the shoreline (east/west) from 30°14'N to 29°47'N out to 080°47'W and when time and/or conditions permitted, followed by two lines flown parallel to the shoreline (coastal track lines) from Crescent Beach (29°47'N) to as far as Cape Canaveral (28°25'N). Coastal

track lines are flown parallel to the shoreline at distances approximately 1nm and 4nm. Each completed east/west survey has a length of 334nm (including transits). Each completed coastal survey has a length of 272nm (including transits).

East/west aerial surveys were scheduled up to 7 days per week and flown every good weather day. Survey protocols are outlined in Scott and Gilbert (1982) for the Cetacean and Turtle Assessment Program (CeTAP 1982). Survey personnel included a pilot, a data recorder, and one observer on each side of the aircraft scanning a corridor out to approximately 2nm. Observation of all marine life, excluding birds, as well as environmental conditions, marine debris, and vessel activity were recorded in a PC computer based data logging program with locations, headings and altitudes being automatically recorded from the platform's Global Positioning System (GPS) every ten seconds or recorded on by hand and entered into the Dbase III program for submission to the North Atlantic right whale consortium database. Surveys were flown under visual flight rules (VFR) conditions. Environmental conditions necessary to conduct a survey included visibility greater than 2nm, winds less than 17kts and a minimum ceiling of 366m over the survey area. The aircraft flew at an altitude of 305m with a ground speed of 100kts. The survey platform was a twin engine Cessna 337 equipped with a yoke mounted GPS unit. Additionally, the aircraft was also equipped with two aviation very high frequency (VHF) radios and one VHF handheld marine radio, personal flotation devices (PFDs) for all persons on board, flares, an inflatable life raft and an emergency position indicator radio beacon (EPIRB).

Right whales are identified primarily by the callosity patterns located on the top of the head between the tip of the rostrum and the blowhole (Payne *et al* 1983; Kraus *et al.* 1986). In addition to callosity patterns, any visible scar placement and pattern were additionally utilized for ID purposes. Images obtained during aerial surveys of each individual are critical to the ongoing right whale conservation research project. Photographs taken during the 2002-2003 survey season were achieved with one Canon EOS D60 Digital camera and one Canon EOS3 cameras using 200 ASA Kodak Gold print film. Both cameras were equipped with Canon, image stabilizing, fixed 300mm (f4.0) lenses. The data recorder and right side observer photographed the animals through the opened right front window of the plane. The data recorder, positioned in the most advantageous seat for photographing, used the digital SLR as the primary camera while the observer seated in the right rear seat, used the film SLR as the back up system. The use of a digital format camera allowed for expeditious image review for rapid whale identification utilizing image-downloading programs. The film camera served as a back up tool in case the primary, digital camera malfunctioned or any digital image files were prematurely deleted. This process allowed researchers to efficiently and rapidly document, identify the individuals encountered and easily share image files with other survey teams during the right whale calving season.

RESULTS

The first 2002-2003 FMRI aerial survey conducted of the southern portion of the Southeast United States right whale critical habitat was flown on December 02, 2002. The survey team conducted 34 aerial surveys from December 02, 2002 - January 26, 2002. A breakdown of survey dates and the ranges flown on each survey is listed in Table 1. Flight effort increased for FMRI from the previous season (2001-2002) due to the increase in funding and the designation of a dedicated survey area that was designed to cover the southeast corner of the mandatory ship-reporting (MSR) boundary. Hours flown in the Cessna 337 do not reflect total FMRI observer effort during the season due to the use of the NOAA Twin Otters after January 26, 2003.

The FMRI's, Florida Warning System (FWS) aerial survey team conducted and completed a total of 23 aerial surveys of the southern portion of the Southeast U.S. critical habitat during the 2002-2003 right whale calving season (Dec. 02 – Jan. 26); 6 flights were partially completed due to unfavorable weather conditions, 2 surveys were cut short due to controlled zones (or hot areas) closed by the military within the survey area, and 3 coastal surveys were conducted when environmental conditions were unfavorable in the east/west survey area for a total of 34 complete or partial surveys flown. In addition, two ancillary/verification flights were conducted during the entire calving season (Dec. 02 - Mar. 31) for a total of 36 fly-days and 158 flight hours.

The FMRI aerial survey team sighted the first right whale on December 12, 2002. The FMRI survey team generated 23 right whale sightings shown in Figure 2 and two reported public sighting verifications totaling 25 sighting events during the 2002-2003 season. Right whales sighted and reported by FMRI were seen on fifteen different days during the aerial surveys and are represented in Table 2, a breakdown of number of surveys flown per season compared with the number of sightings is listed in Figure 3.

On January 14th the FMRI aerial team sighted an entangled adult female later matched to the consortium catalog as Eg# 2240. She was sighted at 1540hr local time at position 30° 15.5N 81° 08.4W, approximately 13 miles ESE of Jacksonville, FL. This was not a known entanglement for Eg #2240. The FMRI team, out of communication range with land, contacted the right whale aerial survey team north of the FMRI position to request assistance to relay the location, animal heading and basic description of the entanglement to the SEUS stranding coordinator. Due to the waning light, deteriorating seas and the whale's fast travel, the assessment boat dispatched from Amelia Island, Florida was unable to relocate her. Despite the immediate, increased survey coverage, the entangled whale was not re-sighted in the southeast U.S. calving area during the remainder of the season. There were three instances where the FMRI survey team witnessed and documented harassment that resulted in behavior changes. Two instances were from small recreational vessels (RV) that were within 20-50 feet of the whales causing the animals to alter their behaviors. The other instance was from multiple un-permitted aircraft circling on a mother/calf pair well below 500 yards. In addition there was one observed close call between a shrimping vessel and a mother/calf pair. The aerial teams

tried repeatedly and unsuccessfully to hail the transiting vessel on Ch. 16 to warn of the pair's location. The vessel passed with 30 feet of the mother/calf pair causing them to dive and alter their heading.

FMRI aerial survey photographs of right whales were compared with the Catalog of Identified Right Whales from the Western North Atlantic: 1935-1997 (Hamilton and Martin 1999) for preliminary analysis and were confirmed with photo identifications verified by the New England Aquarium. Identified cows included Eg#'s: 1208, 1233, 1301, 1515, 1612, 1817, and 2114 identified non-cows included Eg#'s: 1909, 2240 and 2413. One adult photographed has yet to be identified. Two entangled whales, Eg# 2240 and Eg# 3120, were sighted by FMRI during the 2002-2003 survey season. One was sighted during a routine aerial survey and one during a vessel biopsy cruise. Table 3 represents the demographic breakdown of individuals sighted by the FMRI aerial team. Table 4 presents total marine species encountered including right whales during the course of the surveys.

DISCUSSION

It has been estimated that right whales often go undetected in SEUS waters due to aerial survey limitations such as sight-ability issues and inclement weather. Even when considering that newborn calves spend substantial amounts of time at the water's surface, sight-ability is estimated to be at approximately 33% during a typical aerial survey (Hain *et al.* 1999). Although aerial surveys should not be viewed as the sole solution to mitigating human caused mortalities to right whales in the southeast U.S., it currently remains the best available strategy.

The FMRI aerial team continued to observe instances of harassment by small vessels and planes, despite encouraging local media coverage, giving presentations, providing website right whale information and performing school outreach efforts on right whale issues. Several small recreational vessels were observed altering whale behavior, including mother/calf interaction, within the critical habitat area during the 2002-2003 season. With the steady growth along Florida's east coast and the increase in boat registrations, it is likely that whale/vessel interactions will continue to be a management concern. The southeast U.S. calving ground is important not only because of its environmental attributes conducive to the birthing process but also as an area where important and necessary bonding behaviors between the right whale cows and calves occur.

FMRI will continue to fly daily aerial surveys to monitor the calving grounds for right whales, give presentations and encourage outreach activities to inform and educate the public and mariners to the status of the right whales and the importance of the calving grounds. In addition, FMRI researchers will strive to identify, implement and participate in additional research projects to further our knowledge of the northern right whale.

RECOMMENDATIONS

Continuation of the coastal monitoring of the calving grounds through aerial surveys is critical in order to assess distribution, life history, calving intervals, population growth, gross health status, and entanglements in addition to protecting the right whales from vessel collisions. The limitations of aerial survey effectiveness for the detection of right whales as well as overall research methodology safety should be viewed as equal motivators to generate alternative and/or additional management methods. In addition, due to the significance of the SEUS critical habitat area to the survival of this species, the development of more efficient means of detecting and identifying right whales should be encouraged. Research such as telemetry studies, passive acoustic research, genetic biopsy skin sampling, habitat use assessments and boat-based behavioral studies can be utilized in the SEUS to guide management in an even more effective right whale monitoring direction.

Safety guidelines for aerial surveys should be continually reviewed and modified to reflect upgraded research methods due to changing technology. Regular exchange between management and experienced right whale aerial biologists participating in the monitoring effort will help to facilitate and fine-tune this process. With the continued adoption of thorough safety guidelines as they become available, comprehensive sea survival training for the members of the survey teams and ongoing open communication between all concerned, the chance of any additional accidents or loss of life will remain significantly reduced.

In addition to reaching the general public about the plight of the right whale, outreach emphasis may also be focused towards educating the growing number of mariners that navigate within the critical habitat area. Strategically placed informational signs, manned booths at mariner trade shows and boating group presentations that emphasize the 500-yard law (50 CFR Part 224.103) and the plight of the right whale can serve to encourage responsible conduct. Pro-active outreach efforts may serve to lessen the increasing incidences of close calls and whale/vessel harassment interactions.

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LITERATURE CITED

Best, P.B. 1990. Trends in inshore right whale populations off South Africa, 1969 - 1987. *Mar. Mamm. Sci.* 6:93-108.

Brooks, W.B. Jr., Valade, J.A. and Ackerman, B.B. 1993. Right whale aerial surveys, northeast Florida winters of 1991-1992 and 1992-1993. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.

Brooks, W.B. Jr. 1994. Right whale aerial surveys of the nearshore coastal waters of northeast Florida: November 1993 - April 1994. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.

Brooks, W.B. Jr. 1995. Right whale aerial surveys of the nearshore coastal waters of northeast Florida: December 1994 - April 1995. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.

Brooks, W.B. Jr. and Thomas, C.T. 1996. Right whale aerial surveys of the nearshore coastal waters along the east coast of Florida: December 1995 - April 1996. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.

Brooks, W.B. Jr., Zoodsma, B.J., Maise, B. and Tarr, S. 1997. Investigations of right whale use of areas offshore of the southeast U.S. calving area critical habitat: 1995/96 and 1996/97. Progress report to the National Marine Fisheries Service. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.

Caswell, H., Fujiwara, M. and Brault, S. 1999. Declining survival probability threatens the North Atlantic right whale. *Proceeding of the National Academy of Sciences* 96: 3308-3313.

CeTAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Final Report of the Cetacean and Turtle Assessment Program to the U.S. Department of the Interior under Contract AA551-CT8-48. U.S. Dep. Int., Wash., D.C. 450pp.

Ciano, J.N. and Thomas, C.T. 2001. Aerial surveys of the coastal waters of Florida to detect the presence of northern right whales (*Eubalaena glacialis*): December 2000 - March 2001. Florida Marine Research Institute, St. Petersburg, FL. 11pp.

- Hain, J.H.W., S.L. Ellis, R.D. Kenney, and C.K. Slay. 1999. Sightability of right whales in coastal waters of the southeastern United States with implications for the aerial monitoring program. Pp. 191-207, *In*, Marine Mammal Survey and Assessment Methods, G.W. Garner, S.C. Amstrup, J.L. Laake, B.F.J. Manley, L.L. McDonald, and D.G. Robertson (eds). A.A. Balkema: Rotterdam, Netherlands.
- Hamilton, P.K. and Martin, S. 1999. A catalog of identified right whales from the western North Atlantic: 1935-1997. New England Aquarium, Boston, MA 02110.
- International Whaling Commission. 2001. Report of the Workshop on the Comprehensive Assessment of Right Whales: A Worldwide Comparison. *J. Cetacean Res. Manage.* (Special Issue 2): 1-60.
- Kenney, R.D. and Kraus, S.D. 1993. Right whale mortality - a correction and an update. *Mar. Mamm. Sci.* 9:445-446.
- Knowlton, A.R. and Kraus, S.D. 2001. Mortality and serious injury of the northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean. *J. Cetacean Res. Manage.* (Special Issue 2): 193-208.
- Knowlton, A.R., Kraus, S.D. and Kenney, R.D. 1994. Reproduction in North Atlantic right whales (*Eubalaena glacialis*). *Canadian Journal of Zoology* 72: 1297-1305.
- Kraus, S.D., Prescott, J.H., Knowlton, A.R. and Stone, G.S. 1986. Migration and Calving of Right Whales (*Eubalaena glacialis*) in the Western North Atlantic. *Rep. Int. Whal. Comm.* (Special Issue 10): 139-144.
- Kraus, S.D. 1990. Rates and potential causes of mortality in North Atlantic right whales (*Eubalaena glacialis*). *Mar. Mamm. Sci.* 6: 278-291.
- Kraus, S.D., Kenney, R.D., Knowlton, A.R. and Ciano, J.N. 1993. Endangered Right Whales of the Southwestern North Atlantic. Final report to the Minerals Management Service, Herndon, VA. 69 pp.
- National Marine Fisheries Service. 1991. Recovery Plan for the Northern Right Whale (*Eubalaena glacialis*). Prepared by the Right Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 86 pp.
- Payne, R. B., O.; Dorsey, E. M.; Perkins, J.S.; Rowntree, V. J. & Titus, A. 1983. External Features in Southern Right Whales (*Eubalaena australis*) and Their Use in Identifying Individuals. Communication and Behavior of Whales. R. Payne. Boulder, Westview Press: 371-445.

- Payne, R., Rowntree, V.J., Perkins, J.S., Cooke, J.G. and Lankester, K. 1990. Population Size, trends and reproductive parameters of right whales (*Eubalaena australis*) off Peninsula Valdes, Argentina. Report of the International Whaling Commission Special Issue No. 12:271-278.
- Scott, G.P. and Gilbert, J.R. 1989. Problems and progress in the US BLM-sponsored CeTAP surveys. Report of the International Whaling Commission 32:587-600.
- Slay, C.K., Windham-Reid, A., Martin, S.M, Knowlton, A.R., Beaudin-Ring, J.S., Kraus, S.D., Conger, L.A., Kenney, R.D., and Tobias, J. 2000. Early Warning System 1994-2000: Aerial Surveys to Reduce Ship/Whale Collisions in the North Atlantic Right Whale Calving Ground - Final Report, 2000 Edition. Final Report to the National Marine Fisheries Service, Miami, FL. 17pp.
- Smith, J.M. and Windham-Reid, A.A. 2002. Aerial surveys of the coastal waters of Florida to detect the presence of northern right whale (*Eubalaena glacialis*): December 2001 – March 2002. Florida Marine Research Institute, St. Petersburg, FL. 15pp.
- Thomas, C.T. and Brooks, W.B. 1997. Right whale aerial surveys of the nearshore coastal waters along the east coast of Florida: December 1996 - April 1997. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL.
- Thomas, C.T. 1998. Right whale aerial surveys of the nearshore coastal waters along the east coast of Florida: December 1997 - March 1998. Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL. Progress Report to the National Marine Fisheries Service, St. Petersburg, FL. 8pp.
- Thomas, C.T. and Ciano, J.N. 1999. Aerial surveys of the coastal waters of Florida to detect the presence of northern right whales (*Eubalaena glacialis*): December 15, 1998 - March 31, 1999. Florida Marine Research Institute, St. Petersburg, FL. 11pp.
- Thomas, C.T. and Ciano, J.N. 2000. Aerial surveys of the coastal waters of Florida to detect the presence of northern right whales (*Eubalaena glacialis*): December 1999 - March 2000. Florida Marine Research Institute, St. Petersburg, FL. 11pp.

Figure 1. FMRI survey area

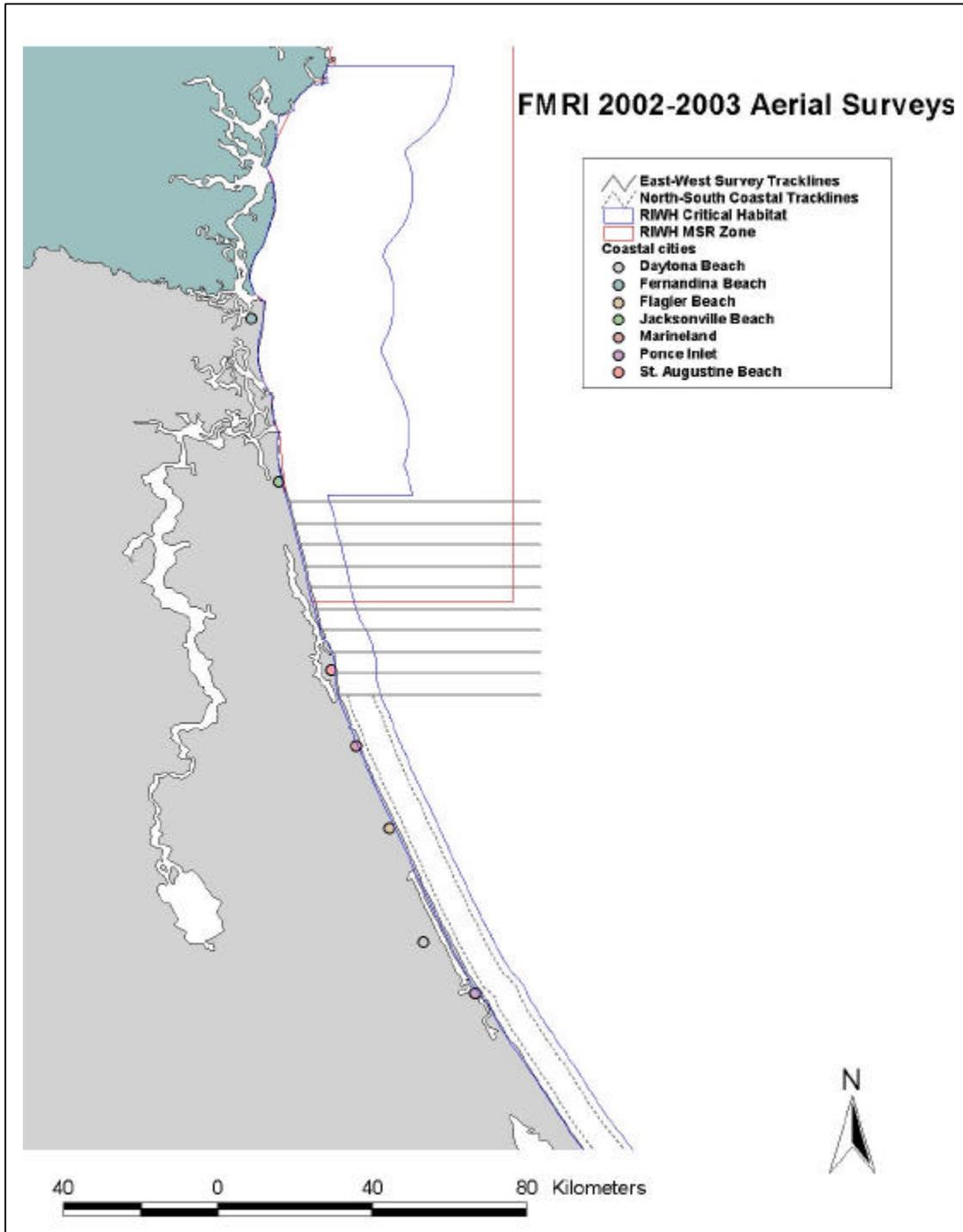


Figure 2. 2002-2003 FMRI right whale sightings

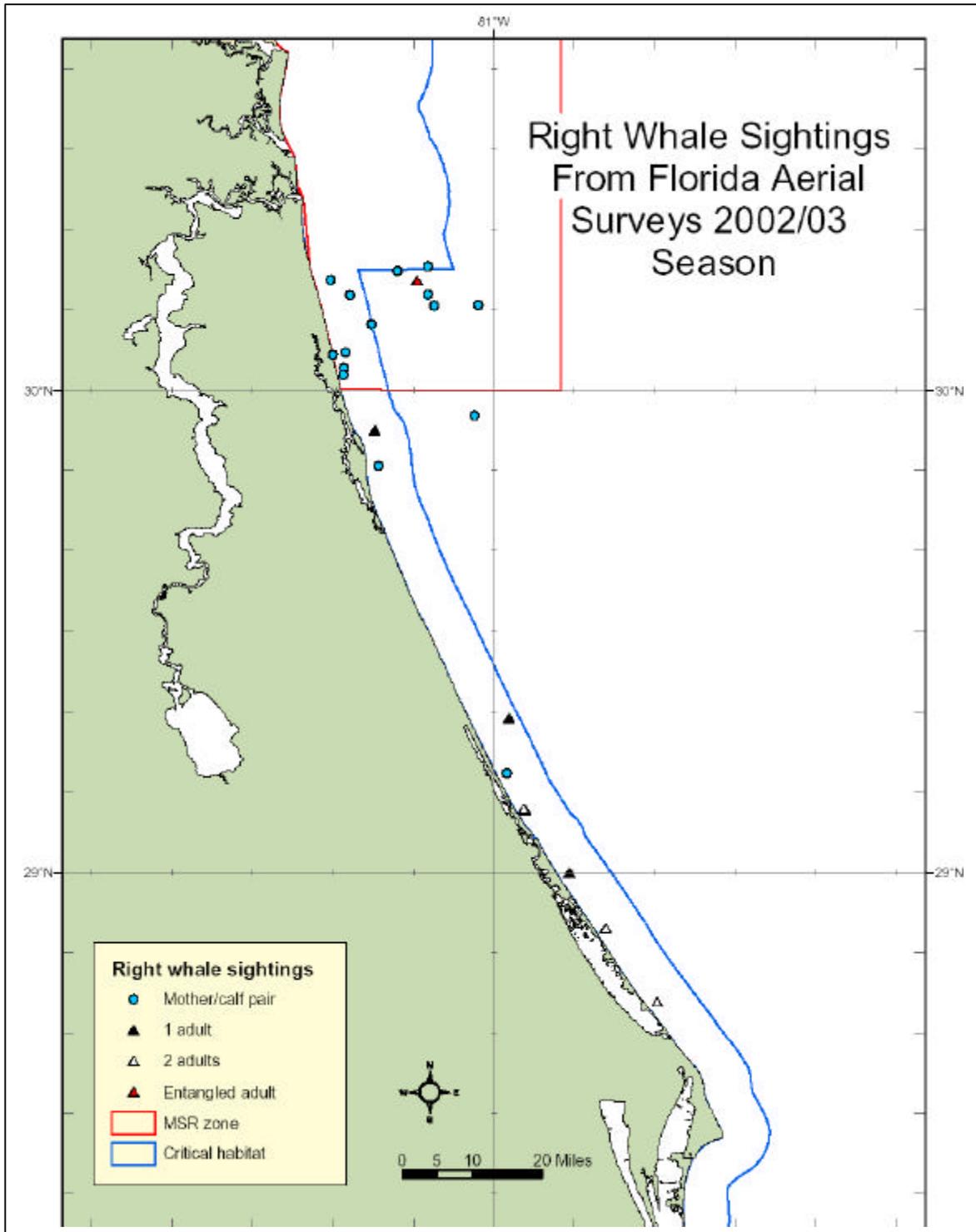


Figure 3. Number of surveys compared to number of sightings since 1991

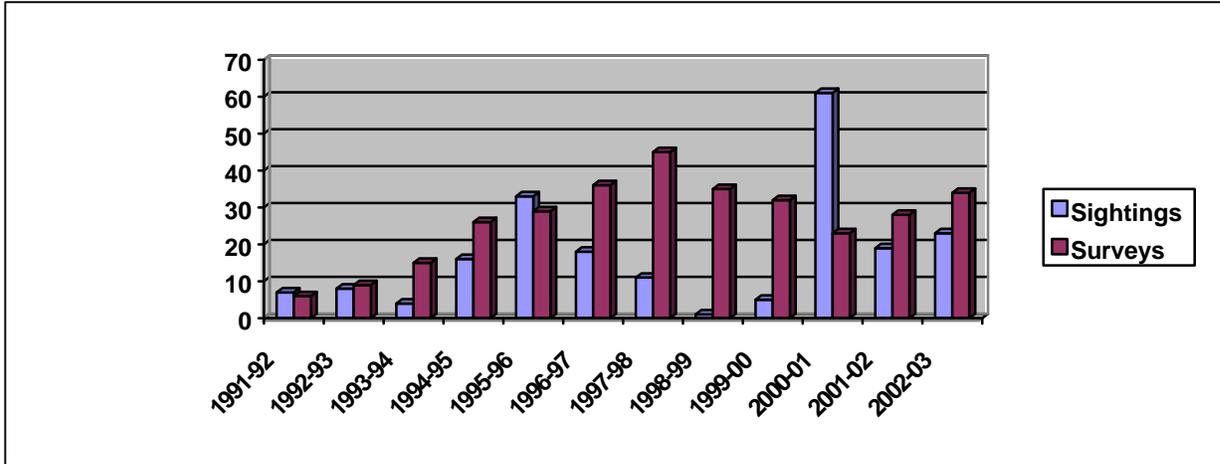


Table 1. List of survey dates and ranges flown

DATE	SURVEY TYPE	MILES	NOTES
02Dec2002	10 E/W lines	354 miles	
03Dec2002	6 E/W lines		Navy (hot) zone closure
04Dec2002	10 E/W lines	354 miles	
07Dec2002	2.5 E/W lines		Abort / high wind
08Dec2002	10 E/W lines	354 miles	
12Dec2002	8 E/W lines		Navy (hot) zone closure
15Dec2002	10 E/W lines	354 miles	
16Dec2002	10 E/W lines	354 miles	
17Dec2002	10 E/W lines	354 miles	
18Dec2002	6 E/W lines		Late take off, weather
19Dec2002	4 E/W lines		Late take off, weather
22Dec2002	10 E/W lines	354 miles	
23Dec2002	10 E/W lines	354 miles	
26Dec2002	10 E/W lines	354 miles	
27Dec2002	10 E/W lines	354 miles	
28Dec2002	6 E/W lines		Late take off, weather
29Dec2002	10 E/W lines	354 miles	
30Dec2002	10 E/W lines	354 miles	
31Dec2002	10 E/W lines	354 miles	
02Jan2003	10 E/W lines	354 miles	
05Jan2003	10 E/W lines + Coastal		to Canaveral
06Jan2003	10 E/W lines + Coastal		to Canaveral
11Jan2003	10 E/W lines + Coastal		to Canaveral
13Jan2003	10 E/W lines + Coastal		to Flagler
14Jan2003	10 E/W lines	354 miles	
15Jan2003	10 E/W lines + Coastal		to Flagler
16Jan2003	10 E/W lines + Coastal		to Canaveral
18Jan2003	10 E/W lines + Coastal		to Canaveral
19Jan2003	Coastal		to Daytona (inland smooth)
20Jan2003	Coastal		to New Smyrna (inland smooth)
21Jan2003	Coastal		to Canaveral (inland smooth)
22Jan2003	4 E/W lines + Coastal		to Canaveral (inland smooth)
25Jan2003	10 E/W lines + Coastal		to Canaveral
26Jan2003	8 E/W lines + Coastal		to Canaveral (fog developed)

Table 2. 2002-2003 right whale sightings

DATE	TIME (L)	LAT	LONG	COMMENTS
12Dec2002	1027	30° 14.8N	81° 12.0W	M/C
17Dec2002	0956	30° 13.7N	81° 20.3W	M/C
19Dec2002	1444	30° 11.8N	81° 17.9W	M/C
19Dec2002	1527	30° 08.2N	81° 15.2W	M/C
22Dec2002	0928	30° 02.7N	81° 18.6W	M/C – aircraft harassment observed
23Dec2002	1006	30° 10.6N	81° 02.0W	M/C
31Dec2002	0949	30° 04.4N	81° 20.0W	M/C
31Dec2002	1136	30° 01.9N	81° 18.7W	2 Adults
05Jan2003	1015	30° 10.5N	81° 07.4W	M/C
05Jan2003	1507	29° 12.4N	80° 58.4W	M/C
05Jan2003	1538	28° 43.9N	80° 39.7W	2 Adults
14Jan2003	1050	30° 11.9N	81° 08.2W	M/C
14Jan2003	1540	30° 13.6N	81° 09.5W	1 Adult, Entangled
16Jan2003	1334	29° 07.8N	80° 55.8W	1 Adult
18Jan2003	1245	29° 50.6N	81° 14.3W	M/C – Shrimp vessel close call
20Jan2003	1501	30° 04.7N	81° 18.4W	M/C
20Jan2003	1551	29° 07.9N	80° 56.3W	M/C (duplicate) Small RV harassment
21Jan2003	1020	29° 00.0N	80° 50.6W	1 Adult
22Jan2003	1320	28° 53.1N	80° 46.1W	2 Adults
25Jan2003	1435	29° 55.0N	81° 14.8W	1 Adult – Small RV harassment
26Jan2003	0954	30° 15.4N	81° 08.2W	M/C
26Jan2003	1225	29° 56.8N	81° 02.4W	M/C
26Jan2003	1608	29° 19.2N	80° 58.1W	1 Adult

Table 3. Demographic breakdown of identified individuals

AERIAL SURVEYS

Cows – 2002-2003			Non Cows – 2002-2003		
ID NO	SEX	YOB	ID NO	SEX	YOB
1208	F	1999	1909	F	1989
1233	F	n/a	2240*	F	n/a
1301	F	1983	2413	U	1994
1515	F	n/a	Unknown	U	n/a
1612	F	n/a			
1817	F	n/a			
2114	F	1991			

F - female, M - male, U - Unknown , YOB - year of birth, * entangled

Table 4. Species Totals - 2002-2003

DATE	RIWH	HUWH	BODO	UNDO	LOTU	LETU	GRTU	UNTU	HMSH	UNSH	CNRA	MARA	UNRA	OCSU
2-Dec	0	0	23	22	38	0	0	5	0	0	300	4	0	2
3-Dec	0	0	17	0	3	0	0	0	0	0	0	0	0	0
4-Dec	0	0	5	0	5	0	0	2	0	0	25	0	0	0
7-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Dec	0	0	3	1	13	0	0	1	0	0	0	0	1	0
12-Dec	2	0	20	0	30	0	0	3	0	0	0	0	0	2
15-Dec	0	0	28	0	12	0	0	0	0	0	0	0	0	0
16-Dec	0	0	130	5	10	0	0	0	0	0	0	0	0	0
17-Dec	2	0	72	1	2	0	0	0	0	0	0	0	0	3
18-Dec	0	0	40	0	27	0	0	3	0	0	0	0	1	0
19-Dec	4	0	10	4	10	0	0	2	0	0	0	0	0	2
22-Dec	2	0	9	0	17	0	0	1	0	0	0	0	0	1
23-Dec	2	0	175	0	22	2	0	0	0	0	0	0	0	1
26-Dec	0	0	12	0	1	0	0	0	0	0	0	0	0	0
27-Dec	0	0	106	0	22	1	0	16	0	0	0	0	0	0
28-Dec	0	0	47	0	5	0	1	5	0	0	0	0	0	0
29-Dec	0	0	79	0	6	1	0	4	0	0	0	0	0	0
30-Dec	0	0	301	2	36	0	0	7	0	0	7	0	0	6
31-Dec	4	0	25	0	3	0	0	3	0	0	30	0	0	0
2-Jan	0	0	52	0	0	0	0	3	0	0	0	0	0	0
5-Jan	6	0	525	20	34	7	0	10	0	0	0	0	0	0
6-Jan	0	1	0	0	0	0	0	0	0	0	125	3	0	0
9-Jan	0	0	1	0	0	0	0	0	0	0	0	0	0	0
11-Jan	0	0	51	0	12	0	0	2	0	0	0	0	0	0
12-Jan	0	0	7	0	7	1	0	0	0	0	0	0	0	0
14-Jan	2	0	19	12	13	0	0	1	0	2	0	0	0	0
15-Jan	0	0	0	0	2	0	0	1	0	0	0	0	0	0
16-Jan	1	1	0	0	0	0	0	0	0	0	0	0	0	0
18-Jan	2	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jan	4	0	34	0	5	0	0	0	0	0	0	0	0	0
21-Jan	1	1	155	0	14	2	0	3	0	1	0	0	0	1
22-Jan	2	0	122	0	7	0	0	1	0	0	0	0	1	1
25-Jan	1	0	32	1	17	4	0	6	0	0	0	0	0	1
26-Jan	5	1	14	0	3	3	0	1	0	0	0	0	0	0
Total	40	4	2114	68	376	21	1	80	0	3	487	7	3	20

RIWH: northern right whale (*Eubalaena glacialis*)
 HUWH: humpback whale (*Megaptera novaeangliae*)
 BODO: bottlenose dolphin (*Tursiops truncatus*)
 UNDO: unidentified dolphin
 LOTU: loggerhead turtle (*Caretta caretta*)
 LETU: leatherback turtle (*Dermochelys coriacea*)
 KETU: kemp's ridley turtle (*Lepidochelys kempii*)

GRTU: green turtle (*Chelonia mydas*)
 UNTU: unidentified turtle
 UNSH: unidentified shark
 CNRA: cownose ray (*Rhinoptera bonasus*)
 MARA: manta ray (*Manta birostris*)
 UNRA: unidentified ray
 OCSU: ocean sunfish (*Mola mola*)

Appendix 1. FMRI biopsy sampling results

In addition to conducting aerial surveys, FMRI research staff participated as co-investigators in conjunction with Dr. M. Brown on research **Permit No. 633-1483-03**. All biopsy sampling equipment and supplies were provided by Dr. Brown.

Whales Darted by FMRI on Vessel Cruises

Date	Time	Area	Sampled By	Type of Sample	Pre approach Behavior	Whale's reaction	Post darting behavior	Comments
1/5/2003	1400	N. Florida	J. Smith FMRI	skin blubber	Logging	No obvious reaction	Calf playful with 4-5 breaches. M/C slow swimming. We left the pair.	Darted calf of 1301
1/20/2003	1255	N. Florida	A. Windham FMRI	skin blubber	Body contact, calf - rolling, cow - head lifts	initially speeded up the roll it was into, no other obvious reaction.	Same behaviors as pre approach	Darted calf of 1233
1/22/2003	1648	Florida	J. Smith FMRI	skin	rolling / interaction between whales	No obvious reaction	Same behaviors as pre approach	Darted 2413
1/22/2003	1648	Florida	A. Windham FMRI	skin blubber	rolling / interaction between whales	No obvious reaction	Same behaviors as pre approach	Darted unk. Continuous frequently associated w/ 2413 in SE
2/19/2003	1550	N. Florida	J. Smith FMRI	skin	interaction between whales	No obvious reaction	Same behaviors as pre approach	Darted unk. Continuous w/ tag divot on right shoulder