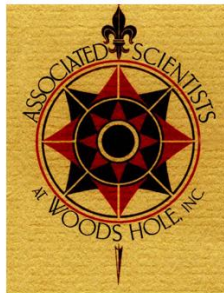


**Monitoring Endangered Right Whales  
in Coastal Waters of Northeast Florida  
by a Volunteer-Based Citizens Network**

**2020–21 Season**

**Annual Progress Report  
for  
Volunteers, Collaborators, and Sponsors**

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8 December 2021

## Table of Contents

Summary .....	3
1.0 Background and Overview .....	4
1.1 The Marineland Right Whale Project .....	4
1.2 Right Whale Calving and Wintering Grounds .....	4
1.3 Monitoring Priorities .....	5
1.4 Collaborations .....	5
2.0 Methods .....	5
2.1 Overview .....	5
2.2 Study Area and Sectors .....	6
2.3 Sighting Protocols .....	6
2.4 Shore-Based Lookouts .....	6
2.5 Response Teams .....	7
2.6 Unmanned Aerial System (UAS) and Observations .....	7
2.7 Monitoring for Human-impacted Individuals .....	8
2.8 Phone Notification System .....	8
2.9 Sea-Surface Temperature (SST) .....	9
2.10 Outreach and Education .....	9
2.11 Data and Photo Analysis and Submission .....	9
3.0 Results .....	9
3.1 Sighting Effort .....	9
3.2 Right Whale Sightings 2020–2021, including Human Impacts .....	10
3.3 Sea-Surface Temperature .....	12
3.4 Collaboration with the FWC Team .....	12
3.5 Professional Meetings and Participation .....	12
3.6 Volunteer Training and Public Outreach .....	13
3.7 Disposition of Data .....	14
4.0 Discussion and Conclusions .....	14
Acknowledgments .....	15
Tables .....	16
Figures .....	23

# Monitoring Endangered Right Whales in Coastal Waters of Northeast Florida by a Volunteer-Based Citizens Network

## 2020-21 Season

### Summary

The COVID-19 pandemic, which resulted in national and international cautionary measures beginning about 20 March 2020, resulted in changes to the 2020-21 program. The large group gatherings and training sessions, typically held at the University of Florida's Whitney Laboratory auditorium were not held this season. Recruitment of new volunteers was de-emphasized and we relied mostly on the large cadre of experienced volunteers. While the surveys and lookouts continued, social distancing, mask wearing, and reduction in group size were observed. The telephone alert system (One Call Now) was cancelled for this season, as we did not wish to encourage large aggregations. However, the monitoring and responses to whale sightings continued with appropriate cautions. Overall, the search effort, sighting responses, and data and photo collection continued at a level comparable to previous seasons, and at a satisfactory level.

After two decades, our experience is, "Every day, every season, and every whale is different." On longer time scales, the changes can be larger. Beginning about 2012, the number of sightings as well as the demographics have been notably different in our study area (St. Augustine to New Smyrna Beach). In 2017 and 2018, and continuing into the first half of the 2019 season (for a total of 2 ½ years), no right whale sightings were recorded by our program. In the second half of 2019, a slight uptick occurred. This continued in 2020. This present report describes the key elements of what appears to be a hint of a continuing rebound in the 2020–21 season—an increase in sightings and change in the demographics.

In the 2020-21 season, the Marineland Right Whale Project received and responded to 30 right whale sightings. The first sighting, female #3520, *Millipede*, and calf, occurred on 7 December 2020; the last sighting, a verified right whale of unknown identify, occurred on 5 March 2021. The use of shore-launched drones considerably enhanced the efficacy of the shore-based sighting network.

There were a number of potential or realized human-impact events. A jet-ski event off Daytona Beach on 14 January potentially impacted female #4040 and her calf, but mitigation measures were successfully conducted. On 11 and on 17 January, paddle boarders, boaters and jet skiers off the Matanzas Inlet potentially impacted the same pair. On 14 February a vessel-struck calf came ashore on Anastasia Island. The mother, #3230, *Infinity*, was also injured. On 18 February, a local drone operator documented an entangled right whale, male #3920,

*Cottontail*, off Indialantic. Nine days later, on 27 February, its carcass was reported off Myrtle Beach, South Carolina.

Due to the COVID-19 cautions, our public presentations were reduced this season. We continued to support the right whale display at the Flagler Beach Museum, and provided photos and materials to the Royal Ontario Museum, Toronto, for an exhibit and booklet. We prepared two summary videos for the season, which are posted on our YouTube channel (Marineland Right Whale Project). We continued to work with the crew of HitPlay Productions on the documentary, *Last of the Right Whales*, which premiered in October 2021.

As we prepare for the 2021–22 season, we are cautiously hopeful that indeed the uptick in calving will continue. The current best population estimate (for September 2021) was 336 individuals (a decline from an estimate of 526 in 2014). However, on the upside, there were 18 calves born in this past season, the most in the past six years.

## **1.0 Background and Overview**

### **1.1 The Marineland Right Whale Project**

A collaboration of two organizations, Associated Scientists at Woods Hole and the Marine Resources Council, have joined in providing monitoring and stewardship of the endangered North Atlantic right whale, *Eubalaena glacialis*, and its nearshore habitat in coastal waters of northeastern Florida. At the core of this effort is a volunteer network—citizen scientists who are provided training and resources and work alongside experienced staff. The Marineland component, “The Marineland Right Whale Project,” (MRWP) was initiated in 2001, and the 2020–21 season was its 21<sup>st</sup>.

### **1.2 Right Whale Calving and Wintering Grounds**

The coastal waters of the southeastern United States (SEUS)—principally Florida and Georgia—are the principal calving and nursing ground for the endangered North Atlantic right whale, *Eubalaena glacialis*. The small population currently numbers about 336, with a small number of calves born each year (the average for the past 10 years has been 11).

Florida's coastline includes 175 nautical miles (nmi) of right whale critical habitat. (Note that a revised and enlarged right whale critical habitat was designated on 27 January 2016.) In the 2020–21 season, as in most preceding seasons, the great majority of aerial survey effort by

the states of Georgia and Florida took place in the northern section—the Mandatory Ship Reporting/Early Warning Survey area. South of St. Augustine (about 125 nmi or 70% of the Florida critical habitat), most sighting effort was provided by the Volunteer Sighting Network—a collaboration between Associated Scientists at Woods Hole and the Marine Resources Council.

### **1.3 Monitoring Priorities**

Monitoring priorities include documenting calf production, health of mother-calf pairs, and human impacts (vessel strikes, fishing gear entanglements, boater harassment, and habitat issues). All are aimed at conservation and recovery of this endangered species.

### **1.4 Collaborations**

Throughout the survey season, we are in near-daily contact with the group to our south, the Marine Resources Council, and the group to our north, the Florida Fish and Wildlife Commission (FWC). More broadly, we collaborate/communicate with the Georgia DNR/Clearwater Aquarium Team, the New England Aquarium right whale group, the Navy, and the National Oceanic and Atmospheric Administration/National Marine Fisheries Service.

## **2.0 Methods**

### **2.1 Overview**

During the course of 21 seasons, the volunteer sighting network has evolved, and refinements and innovation have been incorporated. In its present form, a number of interrelated components have proven essential to success:

- Dedicated survey teams
  - \* Mobile
  - \* Stationary (Community/Condo)
- Opportunistic sightings
- Right Whale Hotline
- Response teams
- Drone photos and videos
- Timely and effective communication with volunteers and collaborators
- Education and outreach
- Collaboration

- Data processing, analyses, synthesis, and presentation

The volunteer handbook, which provides essential information on right whale biology and survey protocols, is posted on the website: [www.aswh.org](http://www.aswh.org).

## 2.2 Study Area and Sectors

The study area, monitored with a combination of a shore-based sighting network and the complementary drone flights, is in the near-shore waters of northeastern Florida between St. Augustine Inlet (latitude 29°54'N) and Canaveral Seashore (28°56'), within 5 nmi of the coast (Figure 1). This ~60nmi section is subdivided into six sectors, each ~10 nmi in latitudinal extent (Figure 2). The shore-based monitoring extends south to Ponce Inlet (29°04'), while some opportunistic monitoring extends farther south to Canaveral Seashore.

## 2.3 Sighting Protocols

Sightings, photo documentation, and data collection are based on interrelated sources and responses. The initial sightings are made almost exclusively from the shore. The response, extended observations, and photographs may be from the shore, or air (drone), or a combination. Throughout, there are standardized search effort and data collection protocols. This includes photo documentation and photo-identification, which are essential to monitoring and data collection. The results are optimized through communication, collaboration, and by utilizing multiple platforms.

## 2.4 Shore-Based Lookouts

As described, the study area is divided into six sectors. A shore-based volunteer sighting network works with experienced scientists. The volunteer sighting network includes two components: 1) scheduled, and 2) opportunistic observers. The scheduled observers, typically teams of two to four volunteers, are of two types: a) mobile and b) stationary. The mobile teams meet at 0800 hr at a designated point and travel by vehicle to a series of lookout stations where a 15 minute search is conducted at each. At the end of the series (typically five stations per team), they reverse the search and end back at the starting point.

The stationary teams (typically based in shore-front condos or housing communities) maintain lookouts from dune walkovers, or the balconies of shorefront buildings. In both cases, most watches are concluded by 1200 hr.

The opportunistic observers are residents and/or workers who have been provided information and the sighting-report hotline number; and report sightings made during the course of normal recreation or work. Opportunistic observers include, for example, the Volusia County Beach Patrol.

The 200+ member volunteer sighting network and its several components (Figure 3) provides effective coverage of our ~ 60 nmi section of coastal habitat.

## 2.5 Response Teams

A central location (the office in Marineland) is manned during daylight hours and is linked to the central call-in hotline maintained by the Marine Resources Council. When a sighting is reported, a response team that includes experienced scientists and volunteers is deployed. The response team carries portable GPS units (Garmin 12XL or similar) and digital cameras with long lenses (*e.g.*, Canon EOS 60D with a Canon EF 600-mm image-stabilized f 4.0 telephoto lens fitted with either a 1.5 or 2.0 Canon telextender). On many occasions, the response includes a drone and drone operator.

Standardized protocols are followed for data collection. Bearings are measured using binoculars with built-in compasses (*e.g.*, Nikon OceanPro 7X50 Model #7441). Ranges are estimated visually by experienced observers based on calibration and training trials. Data and sighting sheets are standardized and reviewed for quality control. Whenever possible, whale locations are recorded by the GPS function of the drone; otherwise they are estimated from shore.

## 2.6 Unmanned Aerial Systems (UASs)

Since the 2016 season, drones (unmanned aerial systems or UASs) replaced the airplane that we flew from 2007 through 2017. The MRWP currently has three drones, two DJI Phantom 3 Pros, and a DJI Phantom Pro 4 v.2. In addition, two volunteers operates a DJI Phantom Pro 4 v.2 and a DJI Mavic 2 Pro. With a total of five drones and five operators, the plan is that for any given sighting event, at least two will be available. All drones are registered with the Federal Aviation Administration (FAA). As we are considered to be a commercial operation (*e.g.*, includes scientific research) under CFR 14, Part 107, two of our operators have an FAA Remote Pilot Certificate. Four of our operators are listed in our NOAA/NMFS research permit, #20626.

Because of the proximity of several coastal airports to our study area, we have applied for, and received, FAA airspace waivers for Northeast Florida Regional (SGJ), Flagler (FIN), and Ormond (OMN) airports. (This waiver provides for operations within five nautical miles of the

airport). In addition, we have the AirMap app on our mobile phones to utilize the Low Altitude Authorization Capability (LAANC) and provide for operation within five nmi of Daytona Beach International (DAB). In the future, we will apply for authorization for New Smyrna Beach (EVB). The Canaveral Seashore National Park is closed to drone operations, making this section of the coast unavailable.

The protocol for drone use in the course of our work is as follows: When a sighting is reported, a response team is deployed. This will typically include one or more drone operators. An assessment will be made as to weather and sea state conditions, as well as the distance from shore to the whale(s)—*i.e.*, is it reasonably within range? A drone will be deployed to first obtain high-quality identification photos and second, to record video that will contribute to behavioral studies. As detailed in our NOAA/NMFS permit, operators and assistants wear vests identifying them to the public as researchers. In many cases, images will be sent to members of the FWC Team for assessment in decisions about darting and boat/aircraft deployment. Likewise, if conditions or distance preclude a drone launch, this information will be relayed so that FWC has the option of deploying their aircraft for photo-ID.

## **2.7 Monitoring for Human-impacted Individuals**

In the field and during photo archiving and analysis, particular attention is paid to noting and documenting human-impacted individuals. Impacts or potential impacts include ship/boat collisions, fishing gear entanglement, and harassment by boaters, paddle boarders/surfers, and jet skiers.

Data and photo documentation are submitted to NOAA law enforcement, the Whale-Vessel-Interaction database maintained by FWC, as well as the database and photo catalog maintained by the New England Aquarium, Boston, Massachusetts.

## **2.8 Phone Notification System**

The phone notification system, which was implemented several years ago, has proven to be a success. The system was temporarily discontinued in 2020–21 due to the pandemic to avoid groups gathering at a sighting location. The volunteers were advised and were understanding. When the system is operating, we contract with One Call Now, an automated telephone messaging service, to facilitate fast, efficient, and complete notification of survey team members during whale sightings. After importing the team members' names and contact numbers, One Call Now allows us to create a voice message and deliver it to certain sectors, or, to the entire list, within 20 minutes. Volunteers either answer the call live and hear the message, or, the service leaves a voice mail. Having the opportunity to see right whales is a high-priority goal,



both as a reward for the volunteers' assistance, and, to help new volunteers establish their right-whale sight image for better detection/species identification during surveys and follows. An additional function of the phone network is to advise volunteers on weather conditions and changes to the survey schedule.

## **2.9 Sea-Surface-Temperature (SST)**

Sea-surface temperature (SST) satellite images are received daily from the Naval Oceanographic Office, Stennis Space Center, Mississippi. The images are based on Advanced Very High Resolution Radiometer (AVHRR) reflective measurements interpolated, averaged, and analyzed within a 10 km (~5 nmi) grid. The SST value is ground-truthed with drifting buoys. The error estimate for the images with reference to the buoys is described as  $\pm 0.5$  degrees. In parallel, for a nearshore fine-grain measurement, we use the SAUF1 National Data Buoy Station at the end of the St. Augustine Pier. Data are posted on the National Data Buoy Center website (Station SAUF1-St. Augustine, FL), and are available for download.

## **2.10 Outreach and Education**

Engaging citizens and community is an important part of our core mission. Training and orientation sessions are given to volunteers and potential volunteers prior to and at the beginning of the season. As the season progresses, updates with information and results are scheduled. We also give public talks, and respond to media requests, both print and television. We also partner with other organizations, *e.g.*, the Blue Ocean Society, Portsmouth, New Hampshire.

## **2.11 Data and Photo Analysis, and Submission**

As is the custom, the right whale data and photos are submitted to the database and photo catalog maintained by the New England Aquarium. The humpback whale data and photos are submitted to FWC, and subsequently to the Center for Coastal Studies, Provincetown, Massachusetts.

# **3.0 Results**

## **3.1 Sighting Effort**

Cautions resulting from the COVID-19 pandemic affected us throughout the season. Adjustments were made and the survey effort continued. The dedicated shore-based surveys ran

from 3 January through 14 March 2021. The network included ~ 200 volunteers monitoring a 60 nautical mile section of coastline from St. Augustine to New Smyrna Beach (Figures 1 – 3). Conservatively estimated, 3,000 hours of volunteer sighting effort took place.

In advance of the formal lookouts, dedicated and experienced volunteers maintained monitoring. This resulted in a number of sightings and successful responses in the preceding month (December 2020).

## 3.2 Right Whale Sightings 2020-21

### 3.2.1 Overall Sighting Summary

In the 2020-21 SEUS season, the MRWP received and responded to 30 right whale sightings (Table 1, Figures 4 & 5). Of these, 24 were mother-calf pairs with identifiable photographs, and three were mother-calf pairs with unknown identities. There was also one yearling, one pair, and a trio. Of the mother-calf pairs, 21 were of Catalog #4040, *Chiminea*, a 13-year-old with her first calf. There were three additional identified mother-calf pairs in the Marineland area this season. As mentioned, six sightings were recorded prior to the start of dedicated surveys on 3 January.

The only group recorded in our area this season was a trio on 28 December 2020. This consisted of two males, #1307 and #2681, *Hyphen*, and female #4041, *Cassiopeia*, born in 2010 and a potential mother. On 5 January 2021, #1307 and #4041 were observed off Cape Hatteras, North Carolina. Their travel to the SEUS was short-lived.

As for the pair sighted on 20 January, they were #4340 (*Pilgrim*, an 8 year-old female) and #3810 (a 13 year-old male).

Neither #4041 nor #4340 appear to have calved this season. These females migrated to the SEUS and engaged in some socialization. These events remind us of the past (when singles, pairs, and groups of males and non-calving females were sighted in the SEUS) and perhaps hint at a recurrence in the future.

Returning to overall sightings, our partners and collaborators, the Marine Resources Council, reported 26 right whale sightings, 25 mother-calf pairs, and one yearling. In combination, the volunteer sighting network reported 56 sightings this season. (Table 1)

### 3.2.2 UAS Assisted Sightings

The use of shore-launched drones considerably enhanced the efficacy of the shore-based sighting network. The MRWP had 19 days and 22 sightings with successful drone flights 21 December through 5 March (Table 2, Figure 6). The total # of flights = 59; and total # of unique individuals/sightings = 16. Belly-up calves were sexed on two occasions. Drones also aided in documenting human interactions on several occasions (see below), including documenting a vessel-struck calf (13 February, Anastasia State Park). Similarly, the Marine Resources Council team had 10 days with successful drone flights.

### 3.2.3 Human Impacts

#### Matanzas Inlet

The Matanzas Inlet is an active area for surfers, paddleboarders, and kite sailors. On 11 January and again on 17 January, whale #4040, *Chiminea*, and calf were exposed to human impacts (paddle boarders, boaters, and jet skis) in this area. Reports, images, and videos were submitted to FWC Law Enforcement and NOAA.

#### Daytona jet ski event

On 14–17 January, the Hard Rock Café in Daytona Beach sponsored a Daytona Freeride, Pro Water Cross (a jet-ski event). On 14 January, whale #4040, *Chiminea*, and calf were in the area. MRWP volunteers and staff aided in notifying the Volusia County Beach Patrol, who in turn, interrupted the event for a period of several hours until the whales had cleared the area.

#### Vessel-struck calf

On Saturday, 13 February, at 12:40, we received a call from the FWC Team. A vessel strike had been reported on the previous evening (Friday the 12th), and subsequently, a dead calf was reported on the beach at Anastasia Island, inside Anastasia State Park. We were requested to bring our drone.

We arrived at 13:43 and received a ride up the beach in a state park vehicle. We were on site from 14:00 to 18:14 photo-documenting wounds on the carcass as well as the research activity. The following day, Sunday the 14th, we went to a marina in St. Augustine, and took photos and videos of the 52-foot sport fishing boat that had struck the whales.

Photographs, videos, and notes were provided to FWC and passed along to (NOAA) (Figure 7).

While on site, we helped coordinate with the local TVmedia: Jax4 and First Coast News. We also supplied some video footage. The stories ran that evening, and links were provided on the following day.

Days later, another human-impact event was reported south of Cape Canaveral: On 18 February, a local drone operator, Joey Antonelli, sighted an entangled whale (a 12-year-old male, #3920, *Cottontail*) around noon off Indialantic, Florida. He called NOAA Fisheries. He aided in tracking the whale south down the beach. Response teams included Blue Water Research Institute, the Marine Resources Council, Harbor Branch Oceanographic Institution (HBOI), Clearwater Marine Aquarium (CMARI), and FWC. The CMARI team responded in the NOAA aircraft. A telemetry tag was provided by HBOI, and attached to the trailing gear. The event was described on social media: YouTube = [https://www.youtube.com/watch?v=\\_ee2JLR5E9E](https://www.youtube.com/watch?v=_ee2JLR5E9E).

The 12-year-old male was tracked offshore until the tag ceased transmitting. Nine days later, on Saturday, 27 February, its carcass was reported offshore of Myrtle Beach, South Carolina. A report of the event was prepared by the Atlantic Large Whale Disentanglement Network, based at the Center for Coastal Studies, Provincetown, Massachusetts. Records showed that *Cottontail* had first been sighted with severe entanglement south of Nantucket on 19 October 2020, and had thus been entangled for at least four months.

### 3.3 Sea Surface Temperature

As has been our practice for more than a decade, daily sea-surface temperature plots were obtained from the Naval Oceanographic Office (NAVOCEANO), Stennis Space Center, Mississippi. Water temperature data were also downloaded from the NOAA National Data Buoy Center monitoring site on the St. Augustine pier. Analyses are underway.

### 3.4 Collaboration with the Florida Fish and Wildlife Conservation Commission Team

We collaborate and communicate with other research groups on a near-daily basis. This includes the FWC team. This collaboration includes several components, among them the photo-identification and the genetic sampling of calves (**Figure 8**).

### 3.5 Professional meetings and participation

The MRWP provided summary information for presentation at the Southeast U.S. right whale implementation team virtual meeting on 7 May 2021. We also provided a sightings plot

and descriptive information for the 26-27 October 2021 annual meeting of the North Atlantic Right Whale Consortium.

### 3.6 Volunteer Training and Public Outreach

#### 3.6.1 Volunteer Training

Due to constraints surrounding the COVID-19 Pandemic, the usual large gathering volunteer training sessions were not held in 2021. Rather, engagement of new volunteers was limited, and emphasis placed on returning experienced volunteers.

#### 3.6.2 Public presentations

As in the above, our public presentations were curtailed this year. Past interactions with the Audubon Society, Gamble Rogers State Park, Road Scholar, etc. were deferred. As restrictions eased, Frank Gromling gave a talk on 22 April, Earth Day; Education Forum, at the Ocean Art Gallery in Ormond. We continue to support the right whale display at the Flagler Beach Museum (Figure 9). On 28 July, we provided images and materials to the Royal Ontario Museum, Toronto, for an exhibit and booklet. We continued to work with the production crew of HitPlay Productions on the documentary, *Last of the Right Whales*, which premiered in October 2021.

#### 3.6.3 YouTube channel

Sharing images, videos, and results with our volunteers is central to the program. To this end, we prepared two summary videos for the 2021 season. These are on our YouTube Channel, Marineland Right Whale Project:

2021 Survey Season: First Half, runtime 6:04

2021 Survey Season: Second Half, runtime 7:23

#### 3.6.4 Right whale education

Looking ahead to future seasons, on 24 March 2021, Jean Cardany and Sara Ellis met with Terran McGinnis of the Marineland Dolphin Adventure to compare experiences on developing and providing Right Whale education programming for young people. Terran shared how for a number of years, she has been providing right whale programs to classes at a nearby elementary school, as well as presenting numerous community outreach programs. Moving forward with a cooperative effort, thoughts included:

- Outreach to elementary school: existing relationship at [Osceola Elementary School](#) in St. Augustine: Kathryn Walker ([Kathryn.Walker@stjohns.k12.fl.us](mailto:Kathryn.Walker@stjohns.k12.fl.us))
- Outreach to middle/HS career fairs
- Involvement with STEM clubs/events
- Outreach to libraries, community centers, senior centers, etc.
- Recruiting of homeschoolers, scout groups, families for surveying
- Presentation for public and rangers at Florida State Parks
- The Marineland Dolphin Adventure can help share messaging via social media channels.

### 3.7 Disposition of Data

The submission of data and photographs to the Right Whale Catalog at the New England Aquarium, Boston, Massachusetts, took place on Monday, 29 March 2021. Archiving of data, images, videos, and reports is continuing. In an intentionally redundant system, complete backup utilizes two multi-Terabyte external hard drives.

## 4.0 Discussion and Conclusions

The overall and central question for scientists, managers, and the interested public is: “How are the right whales doing?” After a slow but steady increase during more than two decades, the population estimate seemed to peak at the end of 2014 with an estimate of 526. Both the methodology and the survey effort is/was changeable. Since then, the population trend has been downward. The estimate in September 2021 was 336. On the other hand, a hopeful sign is the birth of 18 calves in 2021—the most in several years (Figure 10, see also Figure 5). Does this increase signal an upturn?

As described, the hint of an upturn was provided by the birth of 18 calves in the 2021 season. At the same time, human-caused mortality and injury continued to offset the calf production. The calf of *Infinity* died from a boat strike, *Infinity* herself was struck but appeared to survive, the calf of *SnowCone*, #3560, died in June 2020 as a result of a boat strike, *SnowCone* herself has been documented as entangled in fishing gear, and male #3920 died from a boat strike in February 2021.

The MRWP has continued its demonstrated success—both in terms of monitoring and coverage, scientific results, and citizen engagement. We look forward to the 2022 season.

## **Acknowledgments**

First and foremost, we are grateful for the good efforts and strong commitment of our research associates, Sara Ellis and Joy Hampp. Ralph Bundy, Terry Clark, and Sara Ellis are our capable drone operators. Bill Gough and Martha Garito are successful photographers. Program support is or has been provided by the U.S. Army Corps of Engineers, Jacksonville District; the Batchelor Foundation; the Brookby Foundation, the Deerbrook Trust, and private donors. In-kind services are provided by the University of Florida's Whitney Laboratory, the Guana-Tolomato-Matanzas National Estuarine Research Reserve, the Volusia County Beach Patrol, Jacoby Development, Inc., the Marineland Dolphin Adventure, and many others. Collaboration and assistance with research and analysis was provided by the Marine Resources Council, the Florida Fish and Wildlife Conservation Commission, and the New England Aquarium. Research was authorized by NOAA/NMFS permit #20626.

Table 1. Sighting summary 2020-2021 season for the Volunteer Sighting Network, collaborative reports of the Marineland Right Whale Project and the Marine Resources Council.

Date	Day	Time <sup>1</sup>	Location	Lat <sup>2</sup>	Long <sup>2</sup>	Species/ Class	Hdg	Pager #	Notes (Who sighted, etc.)	Verified?/ Photos?
7 Dec 2020	Mon	11:06	Washington Oaks to Flagler Pier	29 28.8	81 07.1	MC		VSN001	Martha shore photos Terry flew drone but gremlin with SD card	#3520, Millipede
8 Dec	Tues	16:50	Amelia Island	30 37.8		MC		VSN002		#4040, Chiminea
9 Dec	Wed	14:10	Amelia Island	30 35.5		MC		VSN003		#4040, Chiminea
10 Dec	Thur	11:08	S of Ponce Inlet	29 02.4	80 53.6	MC		VSN004	** , Julie & Joel on BWRI boat, Jamie drone	#3520, Millipede
12 Dec	Sun	07:58	Amelia Island	30 38.8		MC		VSN006	MRC	#4040, Chiminea
14 Dec	Tues	14:25	Amelia Island	30 34.9		MC		VSN007	MRC	#4040, Chiminea
18 Dec			Vilano	30 03.6				VSN008	FWC nearly dark	
20 Dec	Sun	12:40	Hammock Dunes	29 35.0	81 10.2	MC		FLWS002	HD called, Julie, FWC plane responded	#4040, Chiminea
21 Dec	Mon	11:20	S of Hammock Dunes	29 31.4	81 08.7	MC		VSN009	Call via Becky Bush, Terry drone	#4040, Chiminea
22 Dec	Tues	07:12	Sea Colony to Malacompra	29 36.4	81 10.9	MC		VSN010	Donna McCutcheon, Martha, Terry drone,	#4040, Chiminea
23 Dec	Wed	09:35	Beverly Beach	29 31.4	81 08.6	MC		VSN011	Terry on site, FWC boat	#4040, Chiminea
26 Dec	Sat	17:25	N of Ponce Inlet	29 06.4	80 54.8	MC		VSN012	MRC	#4040, Chiminea
27 Dec	Sun	10:02	N of Ponce Inlet	29 05.6	80 55.9	MC		VSN013	MRC	#4040, Chiminea
27 Dec	Sun	13:15	S of Beverly Beach to Flagler	29 30.4	81 08.3	TRIO		VSN014	V. Palazzolo, MLD, no luck with drone, FWC plane	A trio, #4041, Cassiopeia; males 1307 & 2681
28 Dec	Mon	12:36	N of Ponce Inlet	29 05.2	80 55.2			VSN015	MRC,	
29 Dec	Tues	11:40	N of Sunglow Pier	29 08.9	80 57.7	MC		VSN016	MRC, Beach patrol pic	#4040, Chiminea
30 Dec	Wed	12:15	S of Sunglow Pier	29 08.0	80 57.2			VSN017	MRC	
1 Jan	Fri	10:45	Daytona Beach Shores	29 09.1	80 57.4	MC		VSN018	MRC	#4040, Chiminea



1 Jan	Fri	16:57	Daytona Beach Shores	29 08.8	80 57.5			VSN019	MRC	
2 Jan	Sat	13:37		29 09.4	80 57.7			VSN020	MRC	
2 Jan	Sat	17:28		29 10.2	80 58.0			VSN021	MRC	
3 Jan	Sun	09:39	Sunglow Pier	29 09.3	80 57.6			VSN022	MRC	
3Jan	Sun	17:31	Sunglow Pier	29 07.5	80 56.5			VSN023	MRC	
4 Jan	Mon	12:24	New Smyrna Beach	28 58.4	80 50.7			VSN024	MRC	Not Chiminea ?
5 Jan	Tues	09:15	New Smyrna Beach	28 58.3	80 50.7			VSN025	MRC	
5 Jan	Tues	16:55	New Smyrna Beach	28 57.9	80 50.4			VSN026	MRC	
6 Jan	Wed	16:53	Sunglow Pier	29 08.9	80 57.3			VSN027	Barnes, Caruso, MRC	
7 Jan	Thur	12:13	Daytona	29 11.5	80 59.1	MC		VSN028	MRC, MLD, Ralph drone, Sara drone	#4040, Chiminea
8 Jan	Fri	11:10	Ormond-by-the Sea	29 20.9	81 03.7	MC		VSN029	MLD, Team 4	#4040, Chiminea
8 Jan	Fri		Vilano					VSN030		#4040, Chiminea
9 Jan	Sat	09:25	Beverly Beach	29 31.4	81 08.7	MC		VSN031	Sara drone	#4040, Chiminea
9 Jan	Sat	16:00	N of Varn Park	29 33.1	81 09.1	MC			Carol Logan drone	
10 Jan	Sun	10:43	Jungle Hut	29 35.2	81 10.5	MC		VSN032	Team 2, Sara & Carol Logan drones	#4040, Chiminea
11 Jan	Mon	08:35	Old A1A, Matanzas Inlet	29 41.4	81 13.0	MC		VSN033	Sara drone	#4040, Chiminea
11 Jan	Mon	11:15	S of Matanzas Inlet	29 42.2	81 13.1	MC			Sara drone	#4040, paddle boarder, FWC LE
12 Jan	Tues	08:58	N of Matanzas Inlet	29 42.5	81 13.3	MC		VSN034	Team 2 verify, Sara drone	#4040, Chiminea
13 Jan	Wed	09:31	Flagler, S of pier	29 26.8	81 06.4			VSN035	MLD, Team 3, Oceanside, Sara & Terry drone	#4040, Chiminea
14 Jan	Thur	17:27	Daytona			MC		RSRCH006	Jet ski event, Hard Rock Cafe, FAU, Ed, Julie, Joel,	#4040, Chiminea

									Team 5S Lillian deployed	
15 Jan	Fri	18:18	Sebastian Inlet	27 56.1	80 28.7	SING		VSN036	MRC, Julie & Joel	Yearling, 2020 calf of 3101, Harmonia
16 Jan	Sat	11:50	Hammock Dunes	29 34.5	81 10.2	MC		VSN037	Sharon & Tina, Sara drone	#4040, Chiminea
16 Jan	Sat	13:55	Flagler, S of pier	29 27.2	81 06.7	SING		VSN038	Terry drone, Martha photos, Sara assist	2020 calf of 1612, yearling
17 Jan	Sun	13:38	S of Matanzas Inlet	29 42.2	81 13.2	MC		VSN039	Sara drone, M. Cook & Team 1, reported to NOAA	#4040, Chiminea, boaters & jet skiers harassment event
20 Jan	Wed	16:55	Ormond by-the-Sea	29 21.9	81 04.2	PAIR		VSN040	MLD, Ralph drone, Jim	Pair, #4340 female (Pilgrim), #3810 male
23 Jan	Sat	10:45	Beverly Beach	29 30.9	81 08.4	MC		VSN041	Team 3, Terry drone	#4040, Chiminea
23 Jan	Sat	11:05	Ormond Beach	29 16.5	81 01.2	MC		VSN042	MRC, Team 4, Jim & Sara	#3904, Champagne
24 Jan	Sun	16:50	Ponce Inlet	29 04.8	80 54.6			VSN043	Jim & Carol Logan	UNK
25 Jan	Mon		New Smyrna Beach			MC			FWC plane	#4040, Chiminea
25 Jan	Mon	17:40	Vero Beach	27 40.2	80 21.0	MC		VSN044	MRC, Julie & Joel	#3904, Champagne
26 Jan	Tues	13:00	Daytona Beach Shores	29 11.6	80 58.7	MC		VSN045	Team 5, Jamie, Nadine, Ed, Starbuck, Sara & Jim	#4040, Chiminea
27 Jan	Wed	11:45	Ormond by-the-Sea	29 22.5	81 04.4	MC		VSN046	Team 4, Dale & Peach Sara drone, Ed & Starbuck, Jim photos	#4040, Chiminea, mother interacts with sonobuoy
29 Jan	Fri	11:49	Flagler	29 29.2	81 07.3	MC		VSN047	Team 3, Terry, Jim & Sara	#4040, Chiminea
29 Jan	Fri	16:00	Flagler	29 29.1	81 07.5	MC			Terry drone	#4040, Chiminea
30 Jan	Sat		Hammock Dunes	29 34.8	81 10.2	MC		FWC	H Dunes calls, Jim & Sara, Sara drone, Lily & Nadine	#4040, Chiminea
31 Jan	Sun	10:20	Crescent Beach	29 46.1	81 14.8	MC		VSN048	Teams 1&2, Jim & Sara, Sara drone	#4040, Chiminea

14 Feb	Sun	14:22	Daytona Beach Shores	29 09.2	80 57.6	MC		VSN050	Jim & Sara, verified, no images	UNK
15 Feb	Mon		Highbridge to Ormond by-the-Sea	29 23.2	81 04.7	MC		VSN051	Sara drone	#1243 Magic
20 Feb	Sat		St. Augustine						Not verified, UNK	UNK
23 Feb	Tues		Flagler Beach						Not verified, UNK	UNK
24 Feb	Wed		St. Augustine						Not verified, UNK	UNK
5 Mar	Fri	09:39	Flagler Beach	29 29.8	81 07.4	MC		VSN052	Verified RW	ID UNK
14 Mar	Sun		Flagler Beach						Not verified, UNK	UNK

Table notes:

>> all positions are whale positions rather than observer positions

<sup>1</sup> Time = time of initial report or species verification

<sup>2</sup> Lat and Long = position when verified and photographed

Table 2. Summary of land and drone images by sighting.

Date	Day	Location	Whale identity	# Drone flights	# Drone videos of whales	# Drone stills of whales	# Land stills of whales	Notes
7 Dec 2020	Mon	Washington Oaks to Flagler Pier	#3520, Millipede and calf	1	0	0	26	1 drone flight on whales, but error with SD card
21 Dec	Mon	S of Hammock Dunes	#4040, Chiminea and calf	1	4	17	0	With bottlenose dolphins, extensive skin sloughing on mother and calf
22 Dec	Tues	Sea Colony to Malacompra	#4040, Chiminea	1	2	77	20	
23 Dec	Wed	Beverly Beach	#4040, Chiminea and calf	3	1	146	38	Photos of FWC team darting calf from boat; video of mother cradling calf
27 Dec	Sun	S of Beverly Beach to Highbridge	Trio:, #4041, Cassiopeia; males 1307 & 2681	9	0	0	0	Trio, 9 drone attempts by two pilots, but whales elusive; FWC identifies by plane
7 Jan 2021	Thur	Daytona	#4040, Chiminea and calf	3	44	38	0	Two drone pilots
8 Jan	Fri	Ormond-by-the Sea	#4040, Chiminea and calf	2	9	61	0	Possible nursing on video
9 Jan	Sat	Beverly Beach	#4040, Chiminea and calf	1	5	64	0	Possible nursing on video; genital slit visible indicating male calf
9 Jan	Sat	N of Varn Park	#4040, Chiminea and calf	1	2	108	0	
10 Jan	Sun	Jungle Hut	#4040, Chiminea and calf	2	5	118	0	Two drone pilots, one flight each
11 Jan	Mon	Old A1A, Matanzas Inlet	#4040, Chiminea and calf	1	2	28	0	Active calf; black-belly male; bottlenose dolphins and turtle
11 Jan	Mon	S of Matanzas Inlet	#4040, Chiminea and calf	2	5	26	0	Video of whale behavior before and after paddle boarder incident
12 Jan	Tues	N of Matanzas Inlet	#4040, Chiminea and calf	1	2	12	0	
13 Jan	Wed	Flagler, S of pier	#4040, Chiminea and calf	2	7	41	0	Two drone pilots, 1 flight each: 1st for ID photos, 2nd for behavioral video
14 Jan	Thur	Daytona Beach	#4040, Chiminea and calf	0	0	0	0	Jet ski event, Hard Rock Café; no drone or camera response; obtained video from external sources (jet skiers and MRC)

Date	Day	Location	Whale identity	# Drone flights	# Drone videos of whales	# Drone stills of whales	# Land stills of whales	Notes
16 Jan	Sat	Hammock Dunes	#4040, Chiminea and calf	1	3	11	0	
16 Jan	Sat	Flagler, S of pier	Yearling: 2020 Calf of 1612	2	0	27	14	
17 Jan	Sun	S of Matanzas Inlet	#4040, Chiminea and calf	2	8	69	0	Video of jet ski harassment submitted to NOAA
20 Jan	Wed	Ormond by-the-Sea	Pair: #4340 female (Pilgrim), #3810 male	3	10	23	0	Video of surface-active behavior
23 Jan	Sat	Beverly Beach	#4040, Chiminea and calf	2	4	171	34	
23 Jan	Sat	Ormond Beach	#3904, Champagne and calf	0	0	0	31	Too windy for drone flight
24 Jan	Sun	Ponce Inlet	Probable m/c pair; not identified	3	0	0	0	3 drone flights, but whales not located before batteries exhausted
26 Jan	Tues	Daytona Beach Shores	#4040, Chiminea and calf	0	0	0	43	No drone launch due to other research teams with drones (MRC & BWRI)
27 Jan	Wed	Ormond by-the-Sea	#4040, Chiminea and calf	2	4	53	30	Photos show mother interacting with sonobuoy
29 Jan	Fri	Flagler	#4040, Chiminea and calf	0	0	0	69	Too windy for drone
29 Jan	Fri	Flagler	#4040, Chiminea and calf	1	2	8	0	Drone flight late in day after wind subsided: short videos in turbid water; possible nursing, underwater exhalation by mother
30 Jan	Sat	Hammock Dunes	#4040, Chiminea and calf	2	8	65	0	Second video shows calf far from mother in turbid water, as well as reunion
31 Jan	Sun	Crescent Beach	#4040, Chiminea and calf	1	1	14	0	
13 Feb	Sat	Anastasia State Park	Dead calf: 2021Calf of 3230	4	14	99	132	FWC asked MRWP to bring drone for aerial photos and video of carcass and research
14 Feb	Sun	Daytona Beach Shores	m/c pair not identified	1	0	0	0	1 drone flight, but whales not located before winds became too strong
15 Feb	Mon	Highbridge to Ormond by-the-Sea	#1243 Magic and calf	3	7	169	13	Probable nursing; cownose rays and cannonball jellies, resting w mother hanging just below surface

5 Mar	Fri	Flagler Beach	m/c pair not identified	2	0	0	0	Two drone flights, but whales not located before winds became too strong
			<b>TOTALS</b>	<b>59</b>	<b>149</b>	<b>1,445</b>	<b>450</b>	

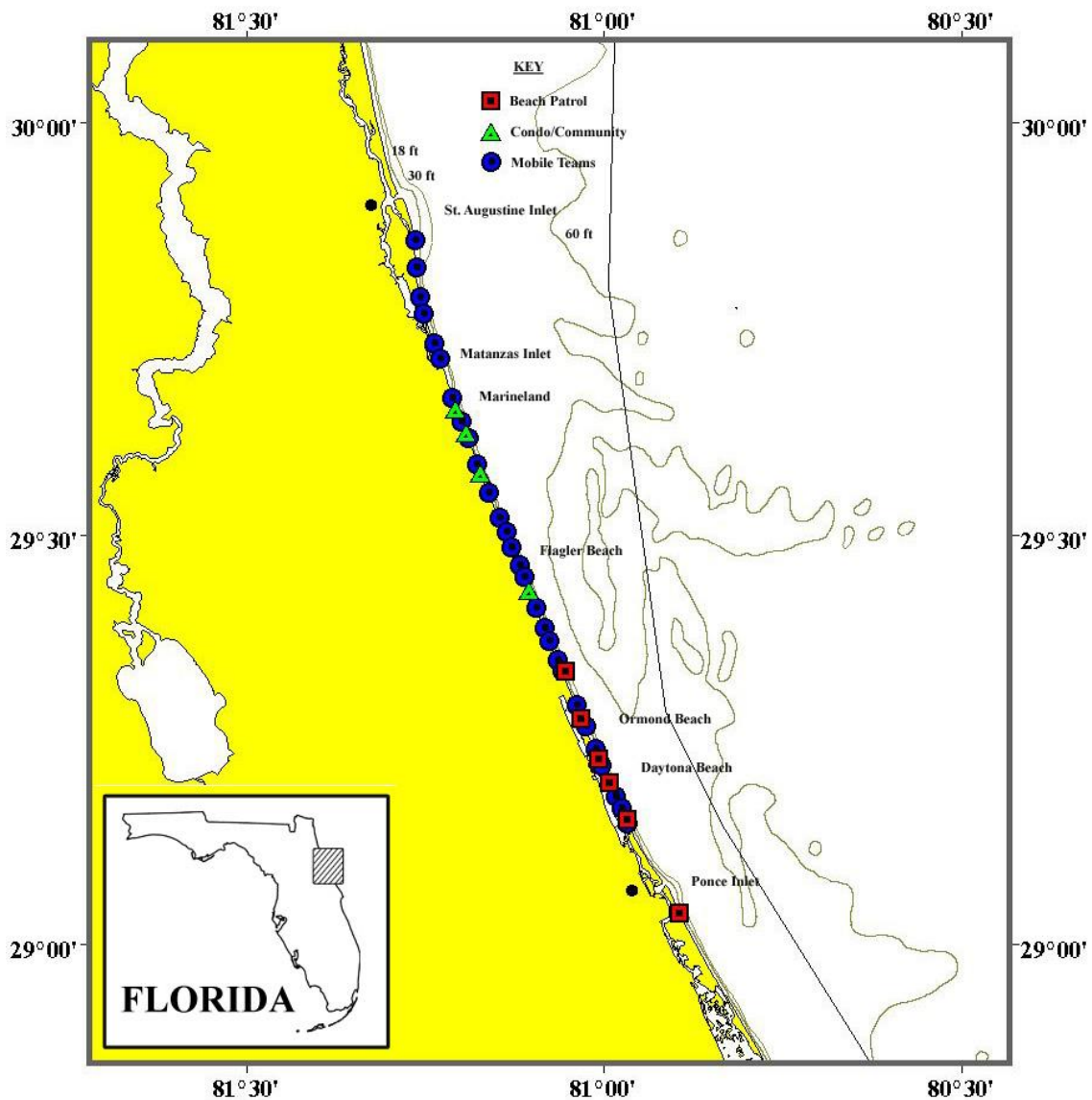


Figure 1. The 37 lookout points used by shore-based spotters in the Marineland Right Whale Project during the 2020–21 season. Although there may be small adjustments to locations, and points may be added and subtracted, the overall sighting effort has remained fairly constant for the past several years. The boundary of the 2016 SEUS right whale critical habitat (blue line) and three near-shore depth contours (labeled) are shown.

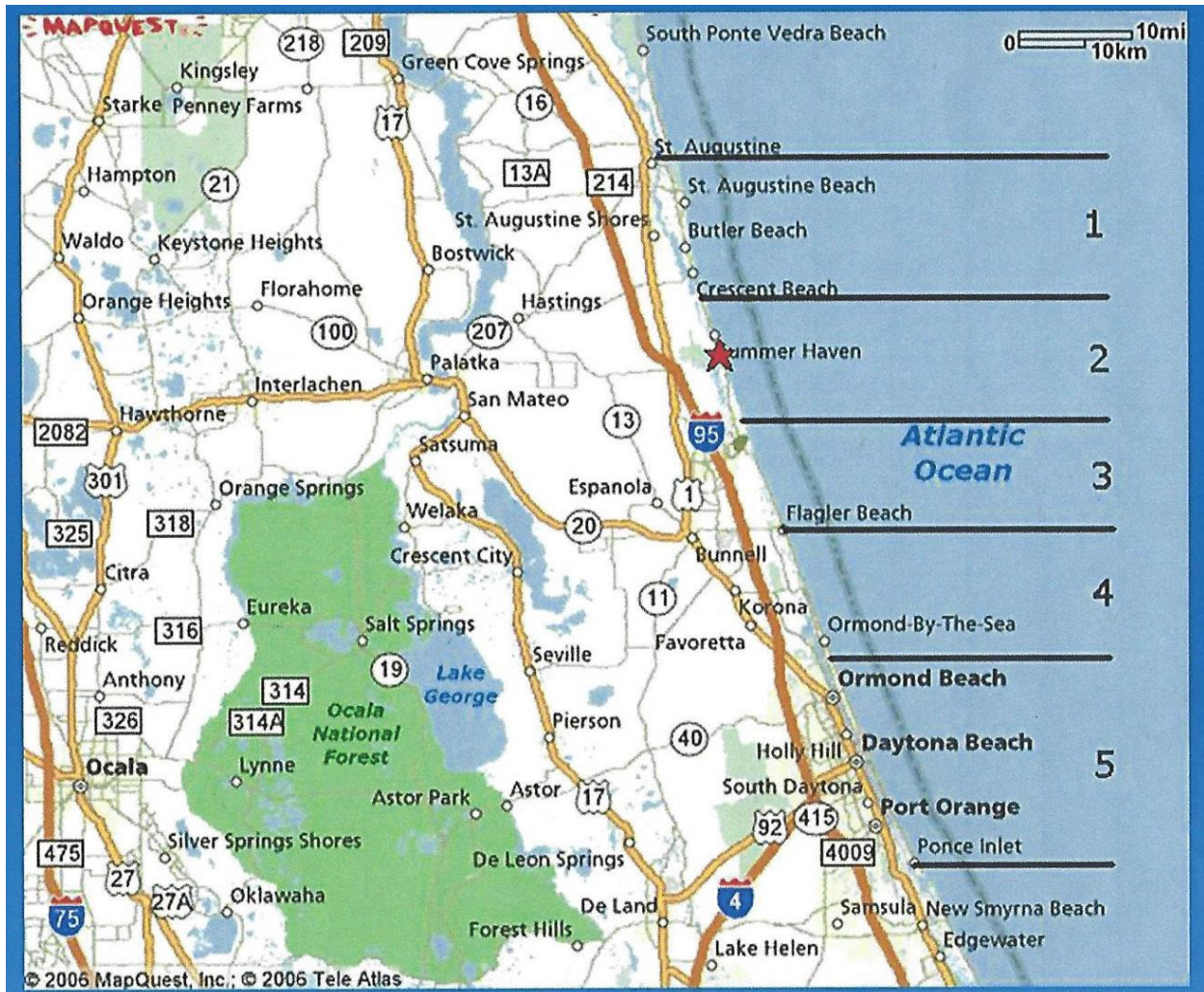


Figure 2. The study area is divided into five sectors. Each sector is monitored by a mobile team, with the exception of Sector 5, a larger sector that is divided into north and south, each with a team.





Figure 3. A core of 200+ dedicated and capable volunteers provide “eyes on the water.” (Many eyes are the antidote to few and widely scattered whales.) The volunteers include fishermen, beachwalkers, condo dwellers, town and county employees, and the teams that conduct surveys from January through mid-March. In this example, a team called in a sighting and a response team with a drone was deployed and obtained images and video. (Photo: J. Hain)

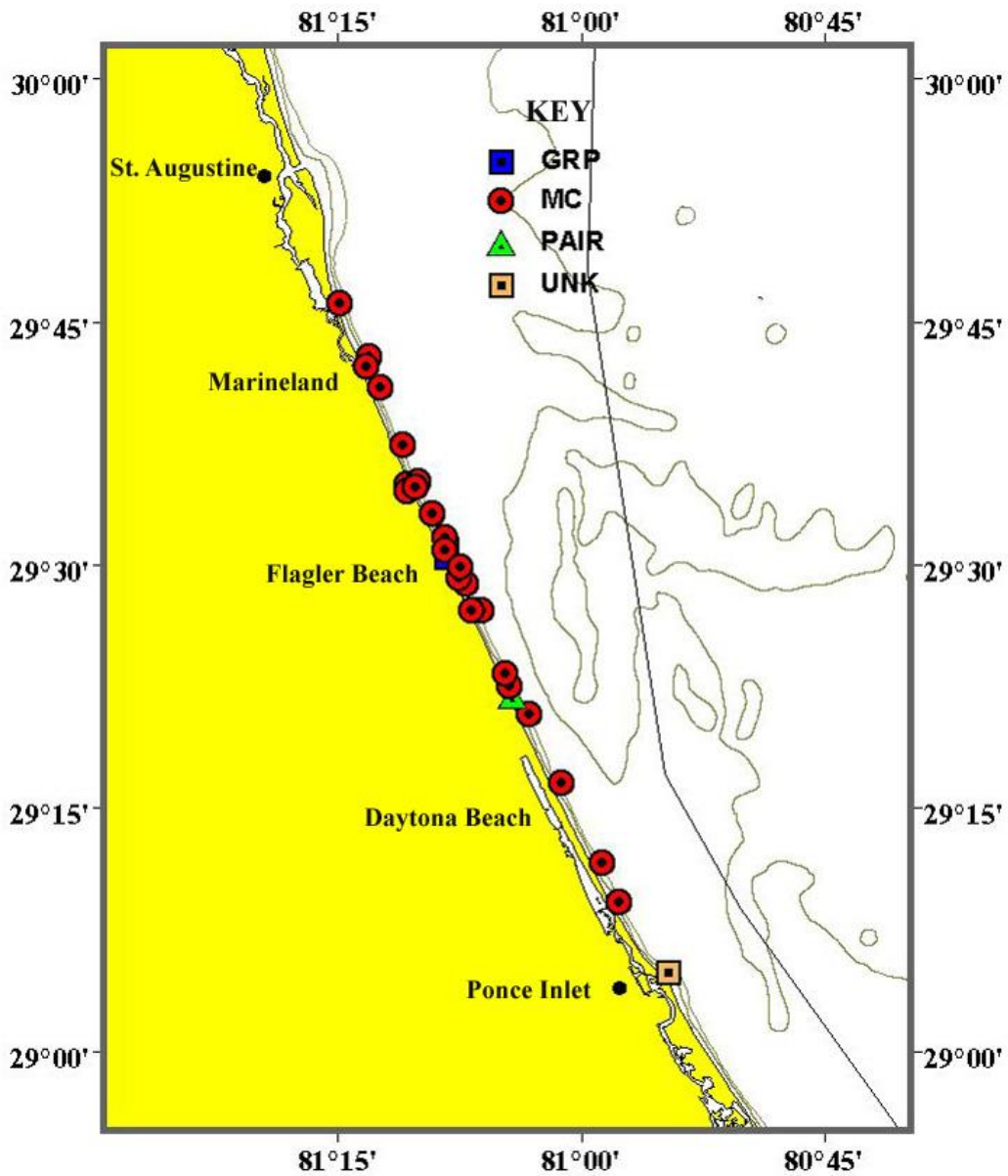


Figure 4. Verified right whale sightings by the MRWP during the 2020–21 southeastern U.S. season. The first sighting was on 7 December 2020 and the last on 5 March 2021. The total number of sightings = 30. The depth contour shown = 60 ft. The solid vertical line is the boundary of the right whale critical habitat.

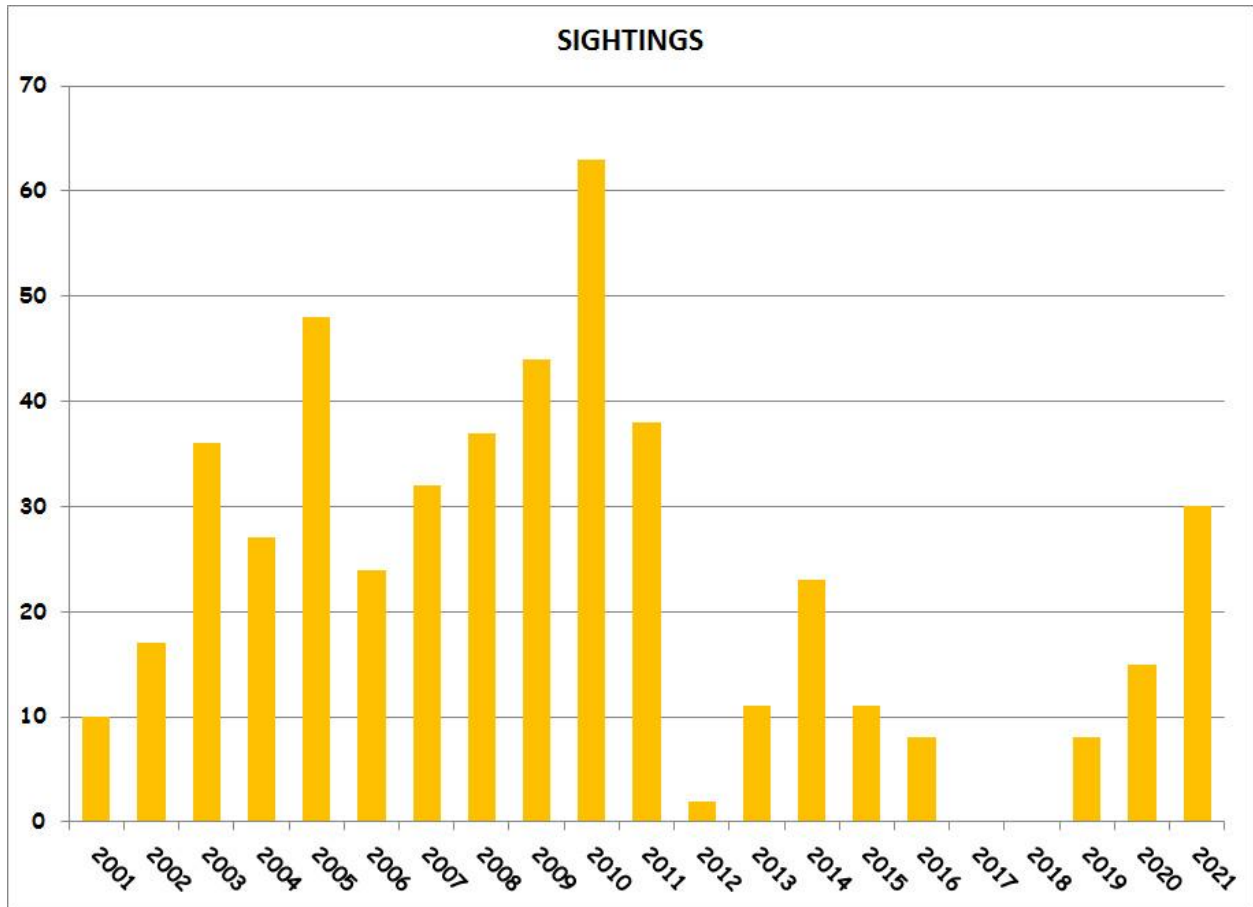


Figure 5. Total number of right whale sightings in the Marineland area, 2001 through 2021. Note the variability, with a low year in 2012 (two sightings both of the same individual) and the absence of sightings in 2017 and 2018. The most recent three-year period hints at an upturn.



Figure 6. The use of multi-rotor drones has increased the efficacy of the shore-based volunteer sighting network. (Photo: W. Gough)



Figure 7. In the late afternoon of Friday, 12 February 2021, a sport-fishing vessel struck a right whale in the channel entrance to the St. Augustine harbor. The vessel was damaged, and intentionally grounded to prevent sinking. The following day, the calf came ashore on the beach at Anastasia Island, inside Anastasia State Park. Propeller scars were strongly evident on the dorsal surface. The MRWP was contacted and we assisted with documentation (stills and video) and helped facilitate interaction with the media. A necropsy was performed the following day, 14 February. (Images: M. Alyea, S. Ellis, and J. Hain.)



Figure 8. The MRWP collaborates with several other groups. As an example, on Wednesday, 23 December 2020, MRWP volunteers relayed sighting information to the FWC team. They subsequently assisted in directing the FWC boat to the location so that a DNA sample could be obtained from the calf. These collaborations result in synergistic use of resources and help optimize the conservation science. (Photo: M. L. Garito.)

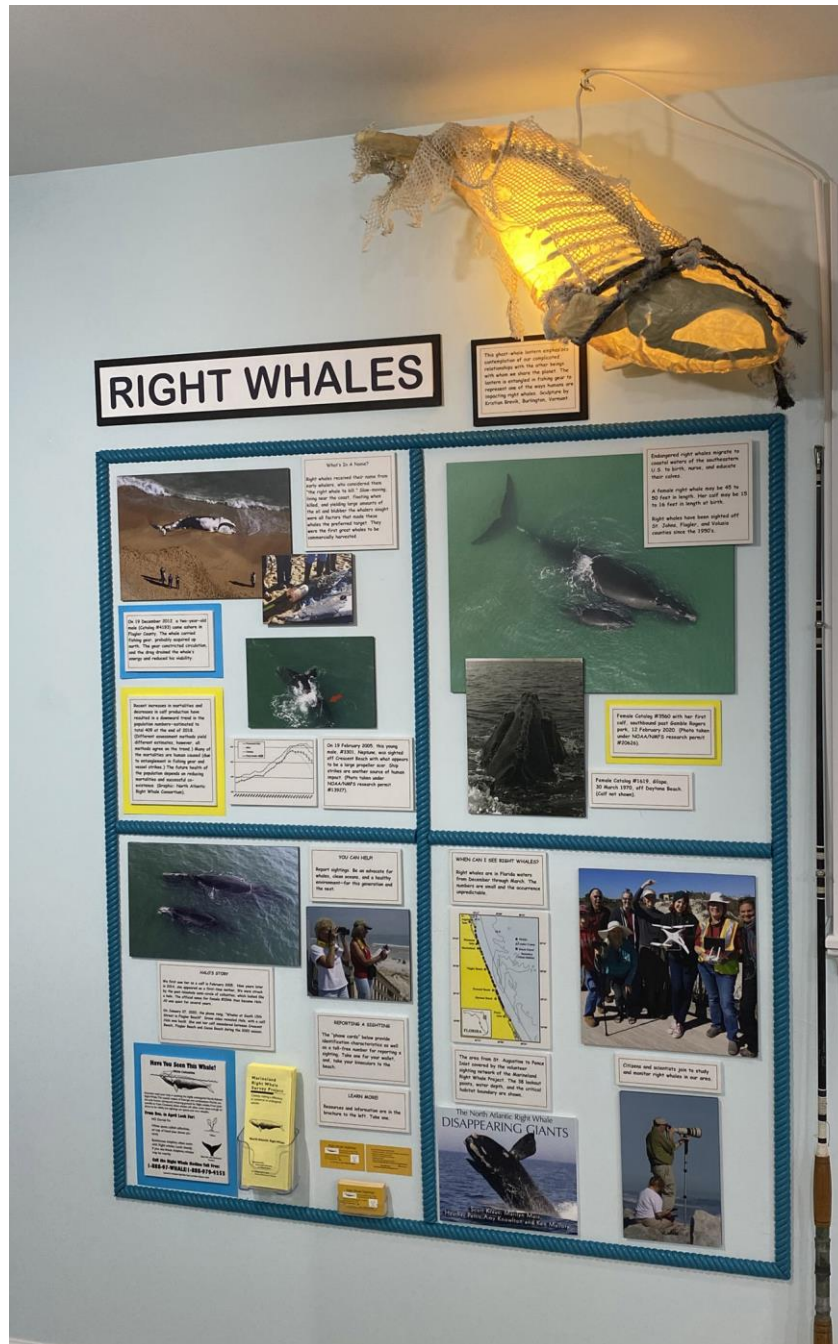


Figure 9. As part of our public outreach and engagement, a right whale exhibit was installed at the Flagler Beach Historical Museum. A feature of the exhibit was the “ghost whale” lantern sculpture by Kristian Brevick of Burlington, Vermont. The sculpture seeks to draw attention to the impact of ghost nets (lost, derelict, or abandoned fishing gear that entangles whales, causing suffering and death). The exhibit also includes brochures, phone cards, and a book suggestion to engage the public as well as potential volunteers. (Image: J. Hain)

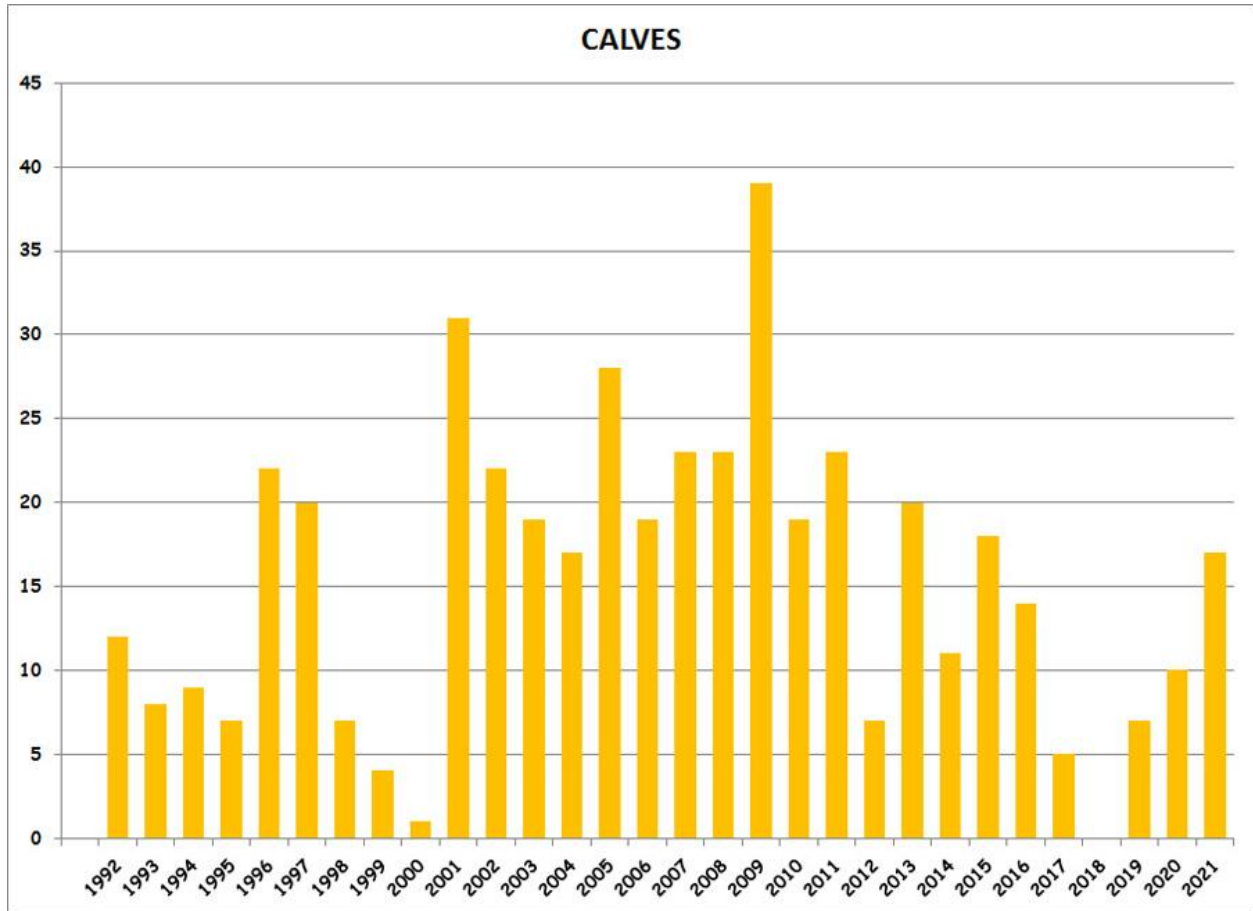


Figure 10. Calf births during three decades. The births in the most recent five years appears to suggest an increasing trend. We are hopeful that this might continue. (Records compiled by the North Atlantic Right Whale Consortium)