

**APPENDIX A**  
**DATASETS INCLUDED IN THE NARWC SPUE DATA**

Northeast US (north of 39 00 N, between 65 00 and 72 00 W) survey data sources currently included in the North Atlantic Right Whale Consortium database or in a separate database (identically formatted) created for the Navy Marine Resource Assessments.

---

#### **AERIAL SURVEYS:**

CETAP line-transect surveys, AT-11—1978, 1979, 1980, 1981, 1982  
CETAP line-transect training flights, AT-11—1978, 1979  
CETAP line-transect Great South Channel surveys, AT-11 & Skymaster—1980, 1981  
CETAP POP surveys, private single-engine aircraft, USCG Albatross, B-N Islander, USCG helicopter—1978, 1979, 1980, 1981  
URI line-transect Great South Channel surveys, Skymaster—1984, 1985, 1987, 1988, 1989, 1991, 1992, 1993  
URI POP Great South Channel surveys, Skymaster—1985, 1986, 1987, 1988, 1989, 1992  
Provincetown Center for Coastal Studies, Cape Cod Bay surveys, Skymaster—1998–2011  
Associated Scientists at Woods Hole, Cape Cod Bay, blimp—1990  
NEFSC broad-scale and focused right whale surveys, Twin Otter—1998–2010 (2011 received but not yet processed)  
NEFSC stock assessment, harbor porpoise, other surveys, Twin Otter (maybe some AT-11 and other aircraft)—1991, 1995, 1998, 1999, 2002, 2004  
East Coast Ecosystems, Bay of Fundy/Scotian Shelf, various aircraft—1997–2001  
New England Aquarium, Bay of Fundy, Scotian Shelf, Gulf of Maine, various aircraft—1994–1997, 2004, 2011  
Riverhead Foundation, New York/New Jersey, Skymaster—2005

#### **SHIPBOARD POP SURVEYS:**

CETAP, various platforms: 1978, 1979, 1980, 1981  
URI, Great South Channel, various platforms—1986–1989, 1991, 1992  
URI, Rhode Island Sound to Kelvin Seamount, USNS Bartlett—1986  
URI, Southern New England, Gulf of Maine, Scotian Shelf, Gulf Stream, SSV Westward—1986  
Manomet Bird Observatory, NE continental shelf, NOAA ships—1980–1988  
Provincetown Center for Coastal Studies, Cape Cod Bay, various—1987–1992, 1997–2003  
East Coast Ecosystems, Bay of Fundy, various—1994–2002  
New England Aquarium, mostly Bay of Fundy, some Scotian Shelf, Mass Bay, Gulf of Maine, various—1987–2011  
NEFSC, large whale, stock assessment, and harbor porpoise surveys, various—1991, 1992, 1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005  
International Fund for Animal Welfare, Gulf of Maine, Song of the Whale—1997, 1999, 2000  
Canadian Dept. of Fisheries and Oceans, Bay of Fundy/Scotian Shelf—2006–2008  
Whale Center of New England, Mass Bay/Jeffreys Ledge—2004

Mid-Atlantic and Southeast US (west of 72 00 W) survey data sources currently included in the North Atlantic Right Whale Consortium database or in a separate database (identically formatted) created for the SEUS Navy Marine Resource Assessments. These data were all included in the SPUE dataset sent to Industrial Economics for the ALWTRT.

---

#### **AERIAL SURVEYS:**

CETAP line-transect surveys, AT-11—1978, 1979, 1980, 1981  
 CETAP line-transect training flights, AT-11—1978, 1979  
 CETAP POP surveys, private single-engine aircraft, USCG Albatross, B-N Islander, USCG helicopter—1978, 1979, 1980, 1981  
 Continental Shelf Associates, offshore surveys, Skymaster—1996, 1997  
 Associated Scientists at Woods Hole, SEUS blimp surveys—1991, 1992, 1993, 1994  
 Florida Wildlife Research Institute, nearshore, misc. aircraft—1992-1999  
 FWRI, offshore surveys, misc. aircraft—1996, 1997, 1998  
 FWRI, nearshore, Skymaster—1999-2002  
 FWRI, nearshore, low-wing twin—2002  
 FWRI, EWS surveys—2002-2010  
 Georgia DNR, nearshore, misc.—1993-1998  
 Georgia DNR, nearshore, Skymaster—2001, 2002  
 Georgia DNR, nearshore, Partenavia—1998-2001  
 Georgia DNR, offshore, misc.—1996  
 Georgia DNR, offshore, Skymaster—1998-2001  
 Georgia DNR, offshore, NOAA Twin Otter—2001, 2002  
 Wildlife Trust, Georgia, nearshore, NOAA Twin Otter—2002-2010  
 Wildlife Trust, offshore, Skymaster—2002, 2003  
 Wildlife Trust, offshore, NOAA Twin Otter—2003, 2004  
 Wildlife Trust, South Carolina, nearshore, Skymaster—2004-2010  
 New England Aquarium, nearshore, misc.—1988-1997  
 New England Aquarium, North & South Carolina, misc.—2000  
 New England Aquarium, EWS, Skymaster—1997-2010  
 New England Aquarium, MMS line-transect surveys, Skymaster—1989-1992  
 URI, Florida-Georgia, AT-11—1987  
 Riverhead, New York, Twin Otter—2005  
 UNC Wilmington, USWTR, Wallops & Onslow, Skymaster—1998, 1999  
 UNC Wilmington, North Carolina, Skymaster, 2001, 2002  
 Navy, ship shock trials?, Skymaster—1995, 1997, 1999  
 NMFS, AT-11/Twin Otter comparison—1991  
 NMFS, SECAS, Twin Otter—1992, 1995  
 NMFS, MATS, Twin Otter, 1995, 2002, 2004, 2005  
 NMFS, stock assessment, Twin Otter—1995, 1998, 2004  
 NMFS, right whale, Twin Otter—1999-2007  
 NMFS, right whale, Wigeon—1999, 2001  
 NMFS, right whale, Goose—2002

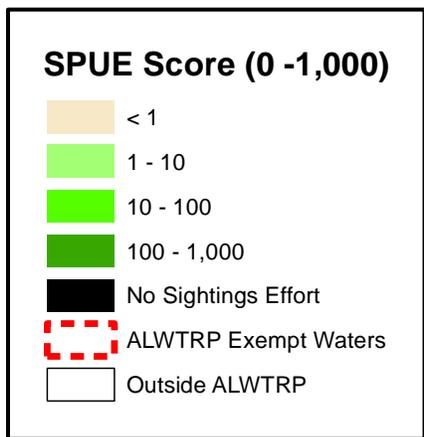
**SHIPBOARD SURVEYS:**

CETAP, POP observers, various platforms—1978, 1979, 1980  
Manomet Bird Observatory, NMFS cruises—1980–1988  
NMFS, Delaware II 92-05—1992  
NMFS, Oregon II, 92-01—1992  
NMFS, Pelican 95-01—1995  
NMFS, Abel J 95-01—1995  
NMFS, Delaware II 97-05—1997  
NMFS, Delaware II 98-04—1998  
NMFS, Gordon Gunter, AT198—1998  
NMFS, Oregon II, 236—1999  
NMFS, Gunter, 02-01—2002  
NMFS, Gunter, cetacean—2004  
NMFS, Endeavor, EN 04395—2004  
NMFS, Gunter, biopsy—2005

**APPENDIX B**  
**MONTHLY SPUE DATA**

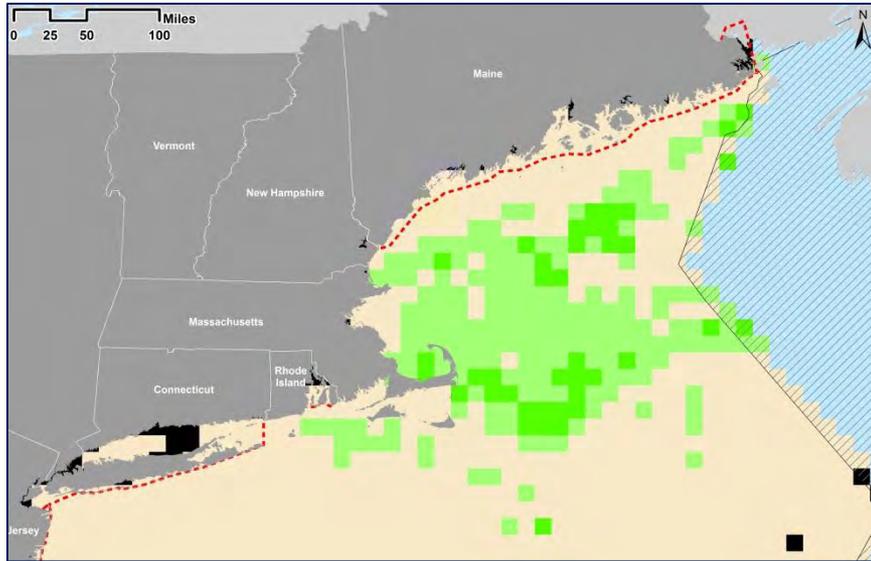
Appendix B provides maps illustrating the Sightings per Unit Effort (SPUE) scores derived from the effort-corrected whale sightings data provided by the North Atlantic Right Whale Consortium (NARWC). Each page presents four maps: three illustrating SPUE scores for right whales, humpback whales, and fin whales, respectively, and a fourth showing scores for sightings of both right and humpback whales, combined. The maps are grouped by region: the Northeast, Mid-Atlantic, and Southeast. For the Northeast and Mid-Atlantic regions, maps are presented for each month of the year; maps illustrating 12-month average scores for each 10-minute grid cell are also included. For the Southeast region, maps are presented for November through April (SPUE values for this region from May through October are minimal); the maps illustrating average SPUE scores for the Southeast reflect sightings per unit of survey effort during the November through April period.

The legend for the maps presented in this appendix is shown below. All SPUE scores shown are indexed on a common scale (0 – 1,000), with the maximum score (1,000) assigned to the grid cell/month with the highest observed SPUE value (right and humpback whales combined).

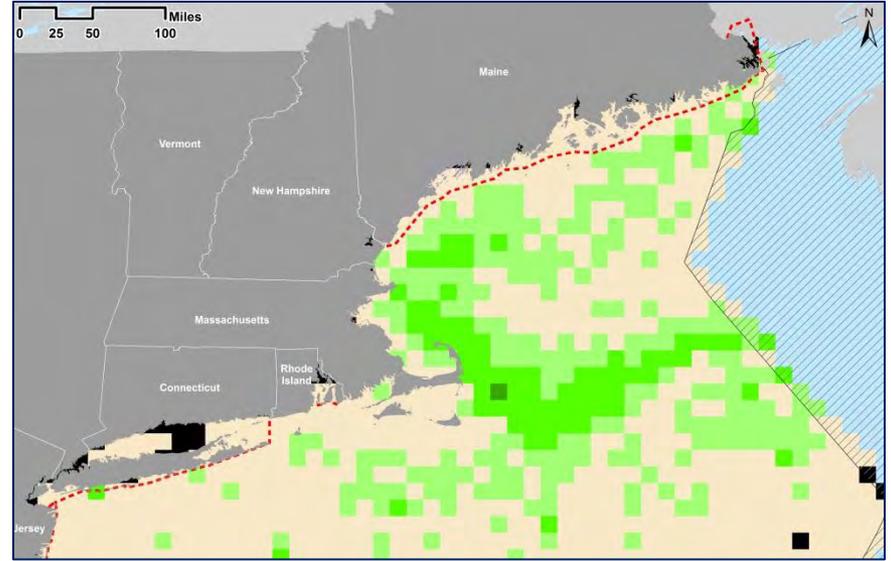


# NORTHEAST - MONTHLY AVERAGE (JANUARY - DECEMBER)

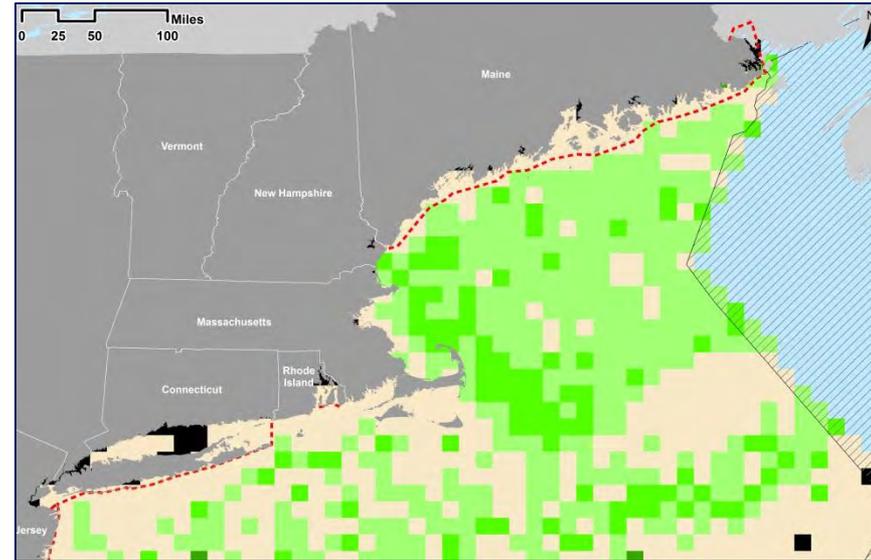
## Right Whale



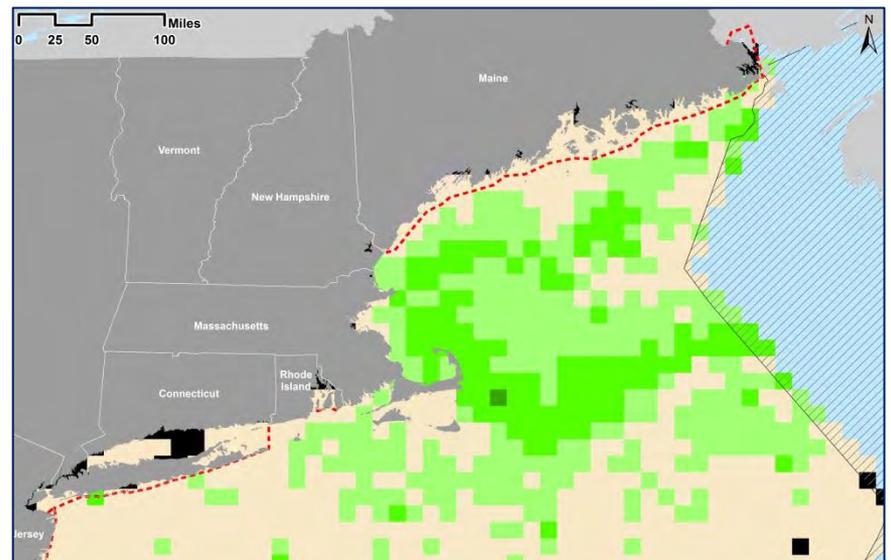
## Humpback Whale



## Fin Whale

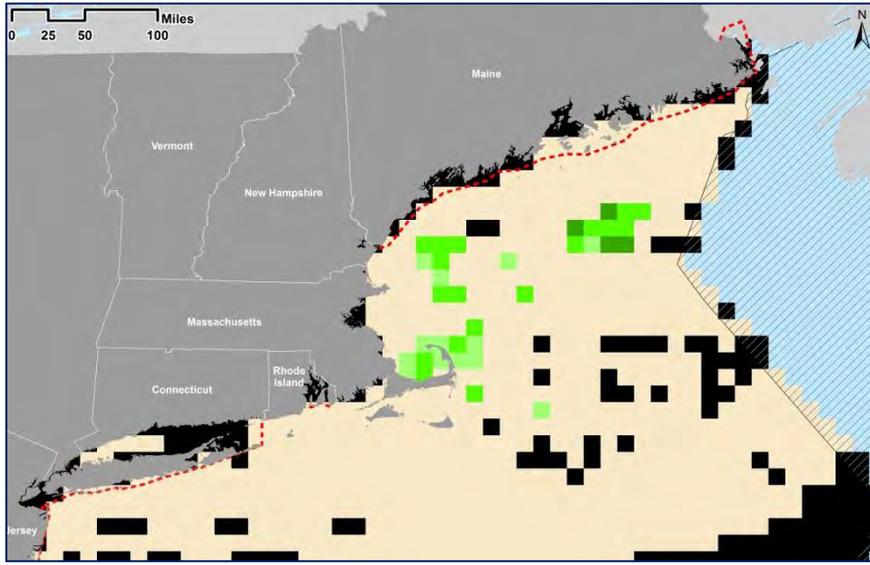


## Combined Right & Humpback Whale

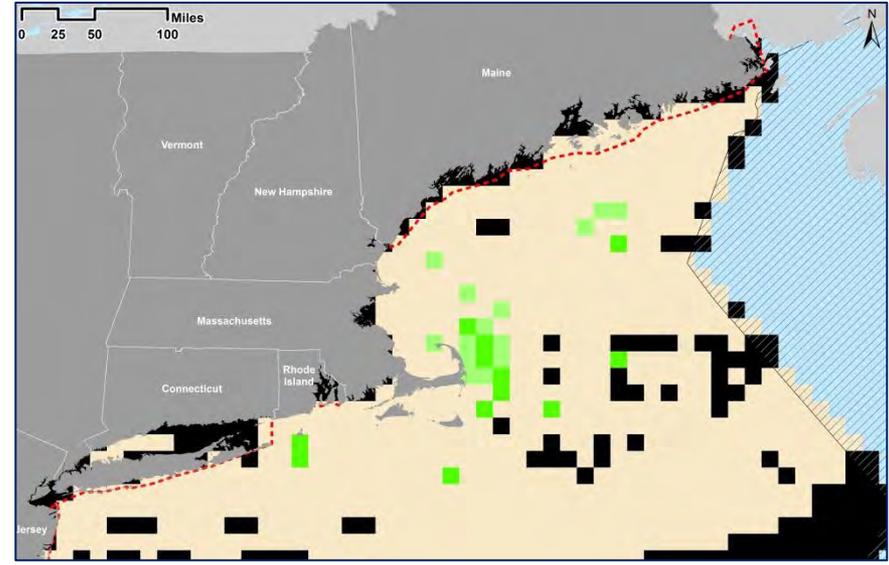


# NORTHEAST - JANUARY

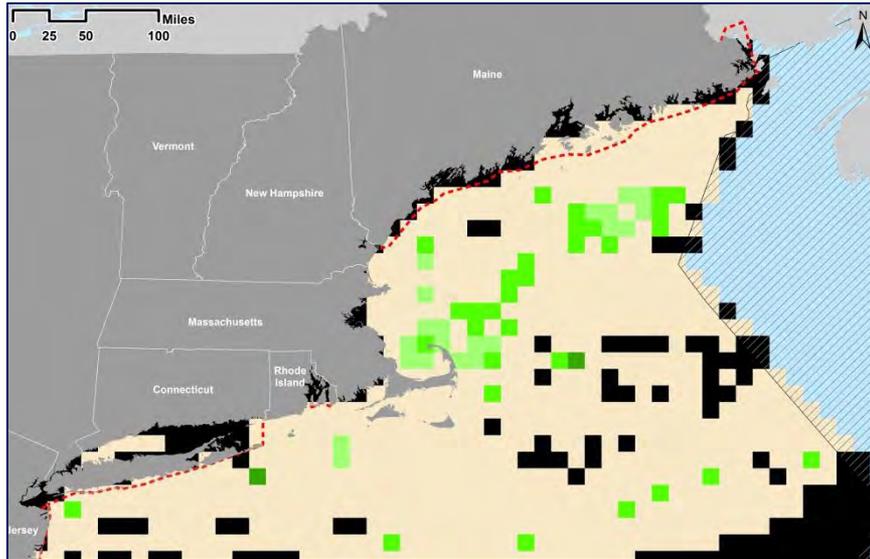
## Right Whale



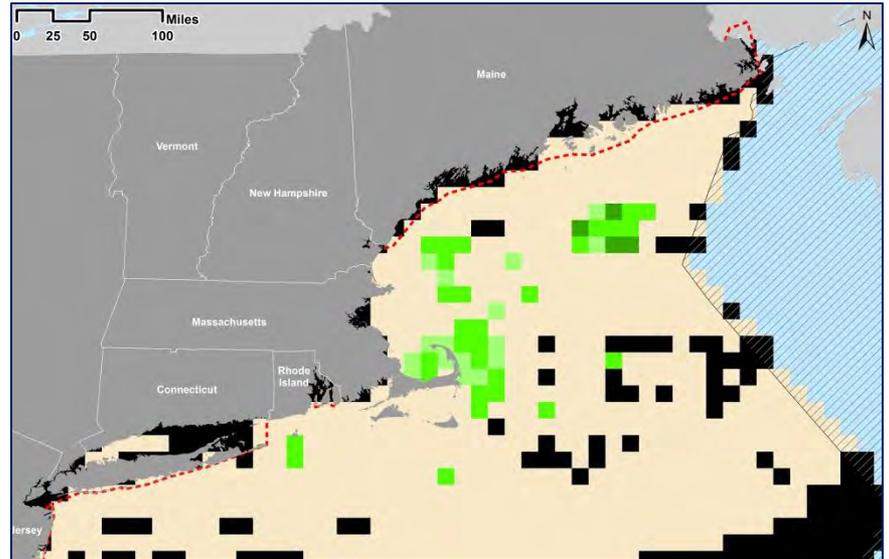
## Humpback Whale



## Fin Whale

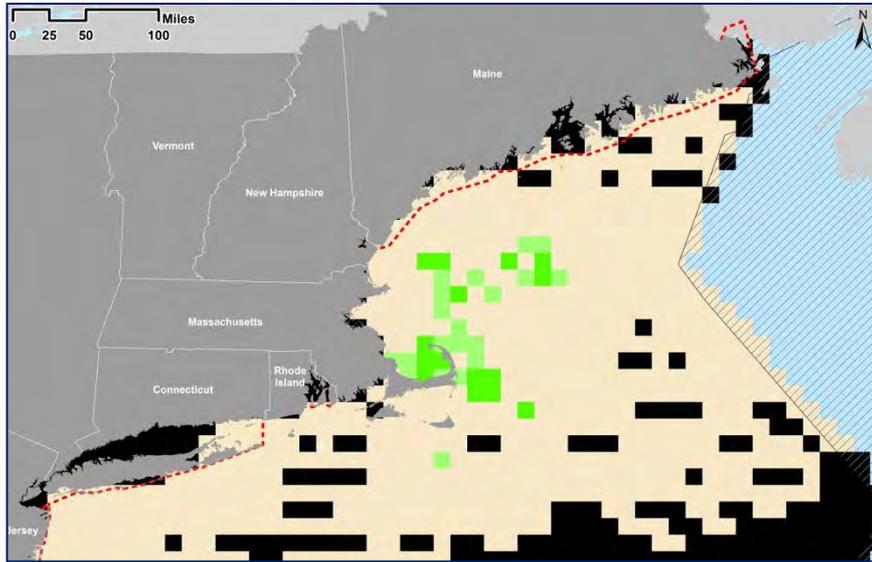


## Combined Right & Humpback Whale

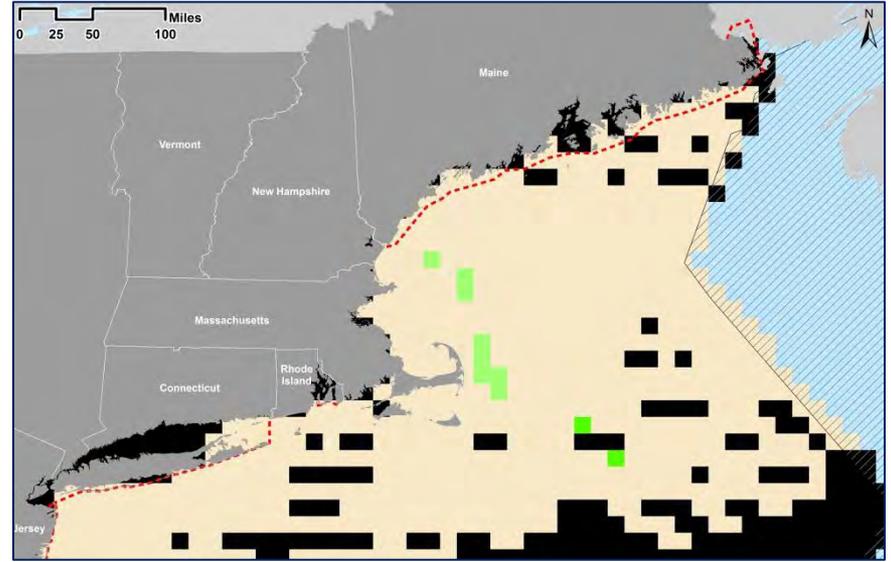


# NORTHEAST - FEBRUARY

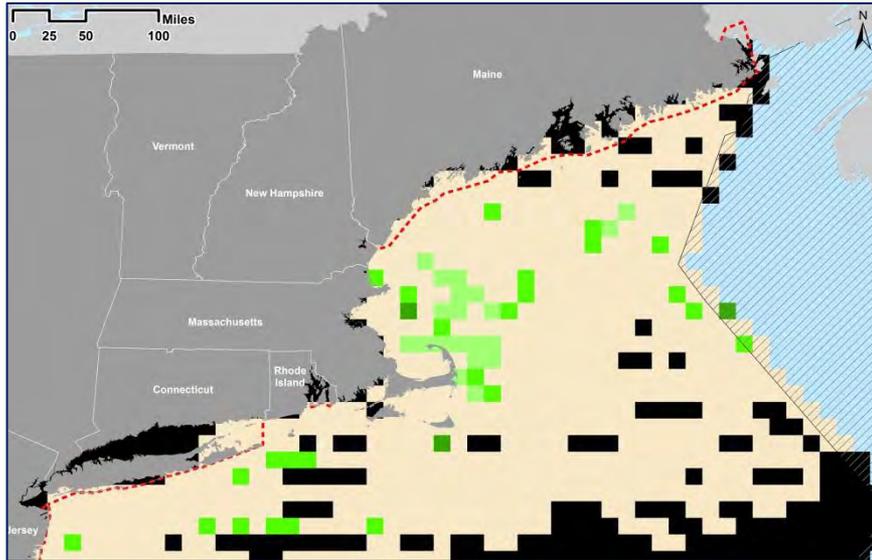
## Right Whale



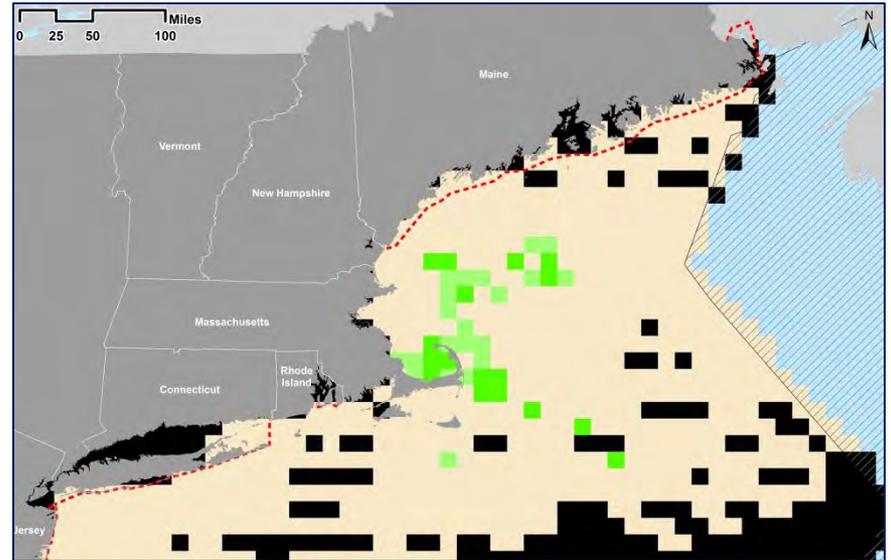
## Humpback Whale



## Fin Whale

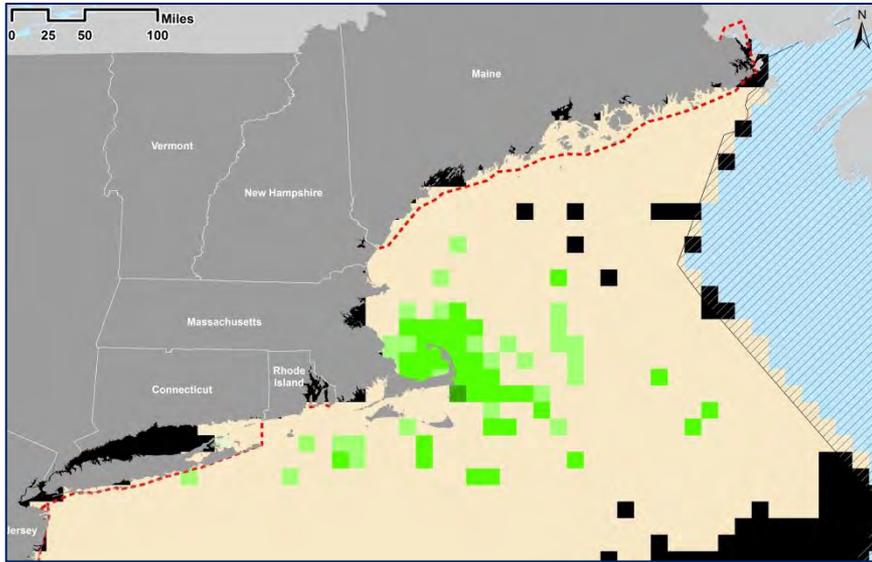


## Combined Right & Humpback Whale

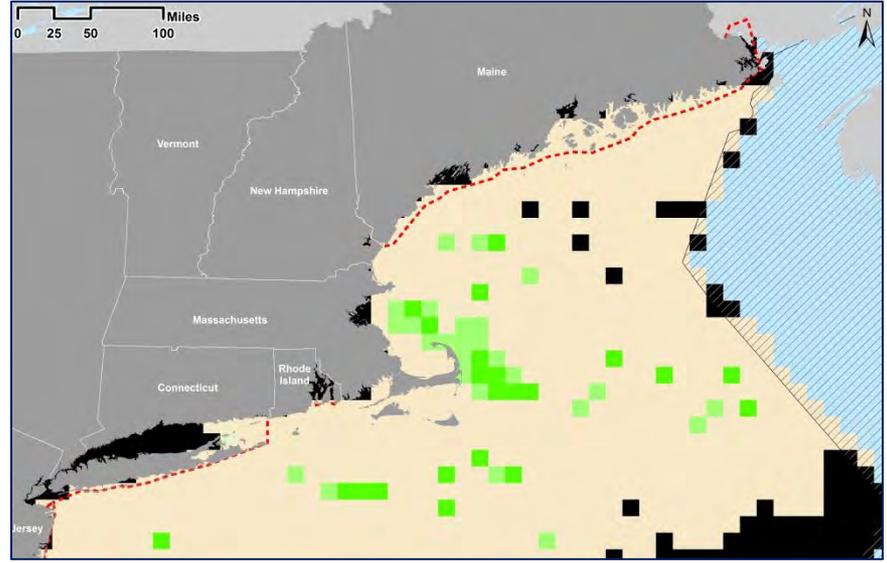


# NORTHEAST - MARCH

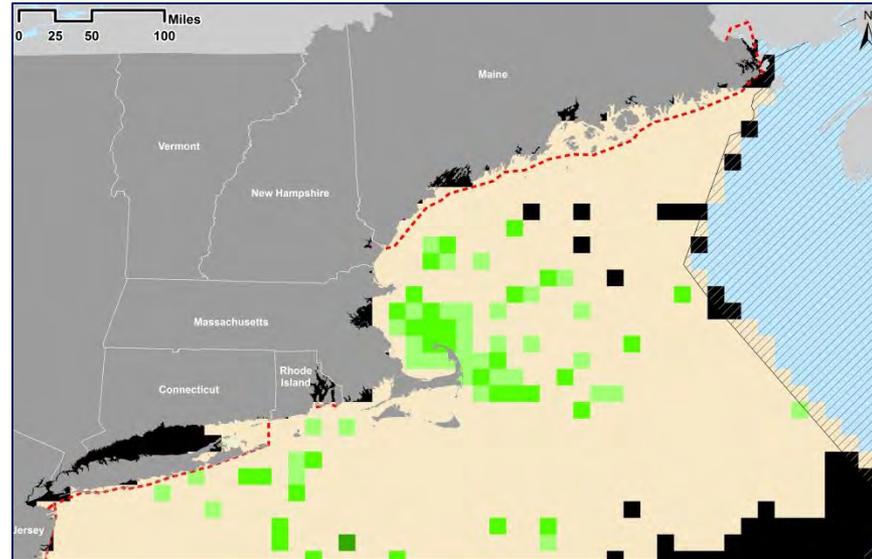
## Right Whale



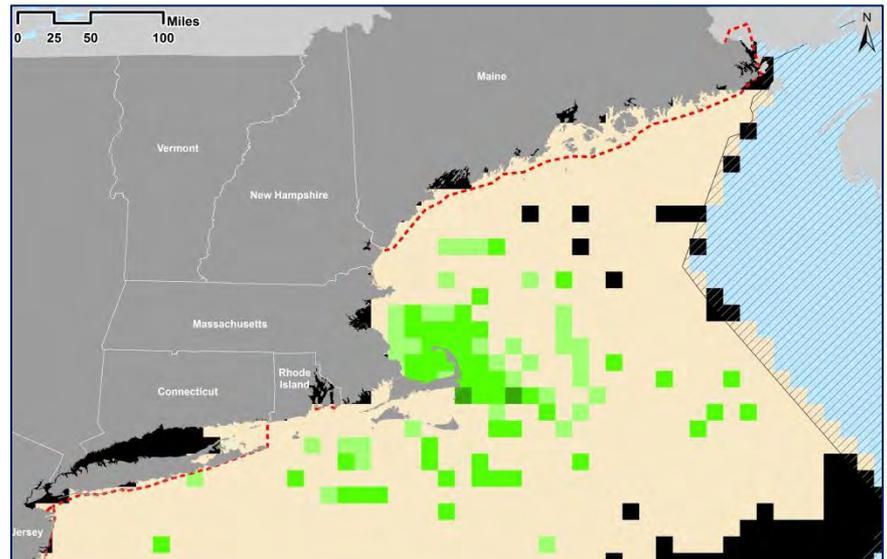
## Humpback Whale



## Fin Whale

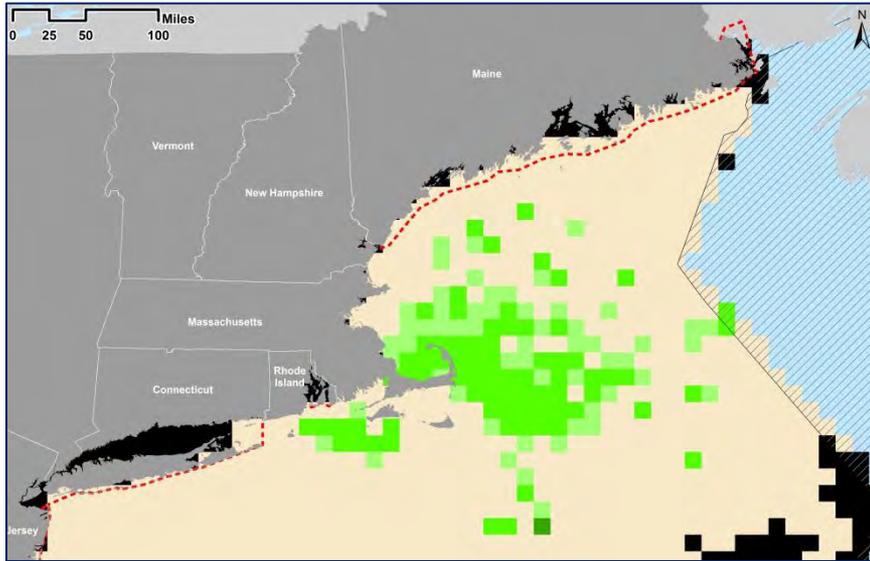


## Combined Right & Humpback Whale

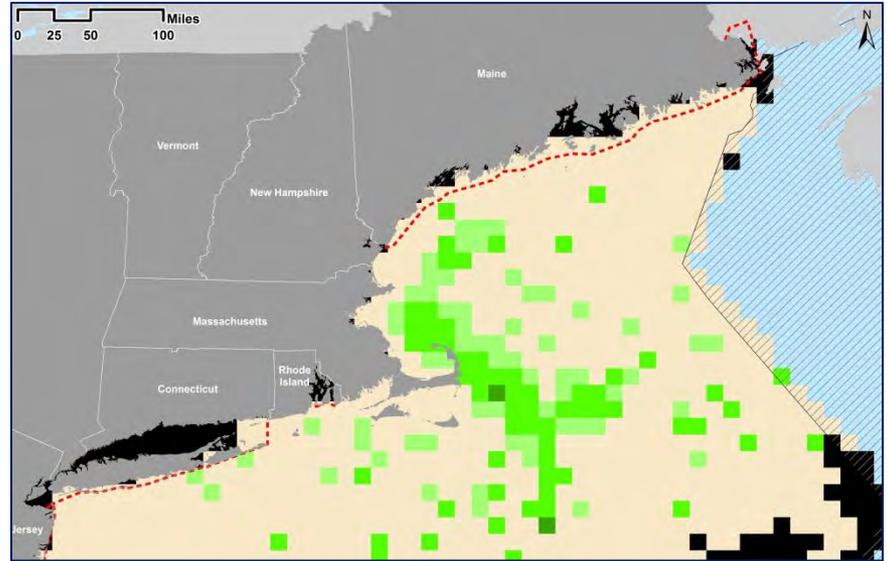


# NORTHEAST - APRIL

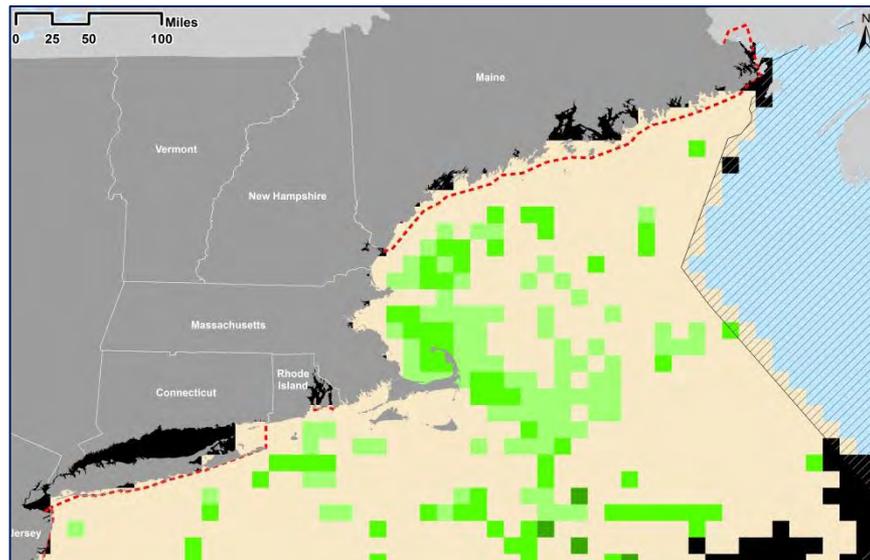
## Right Whale



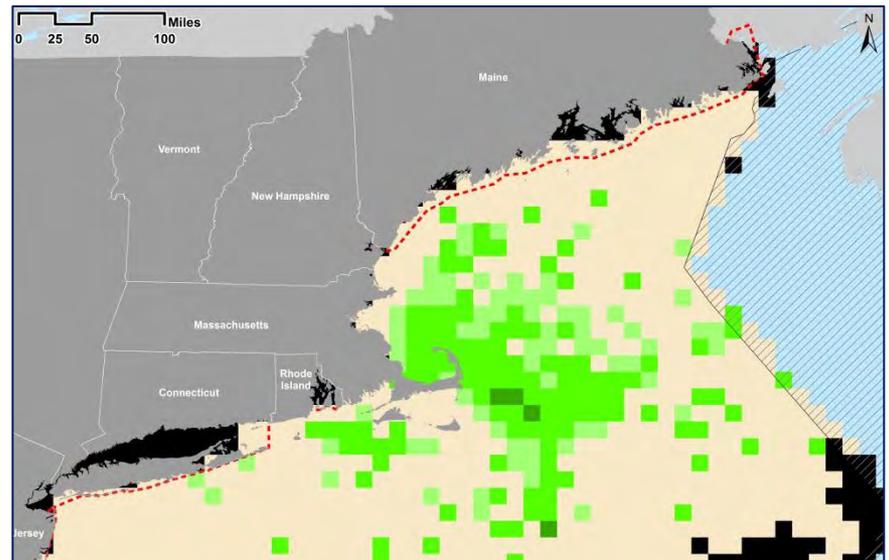
## Humpback Whale



## Fin Whale

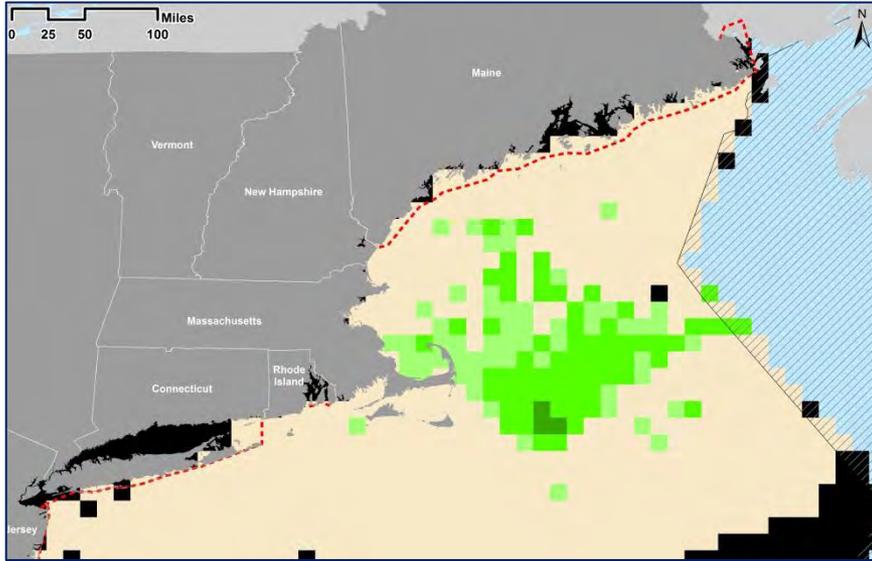


## Combined Right & Humpback Whale

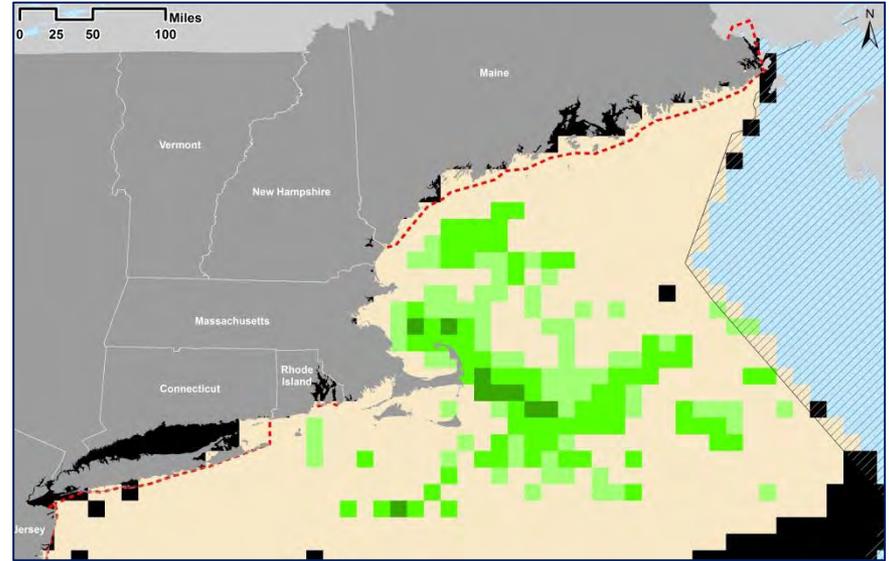


# NORTHEAST - MAY

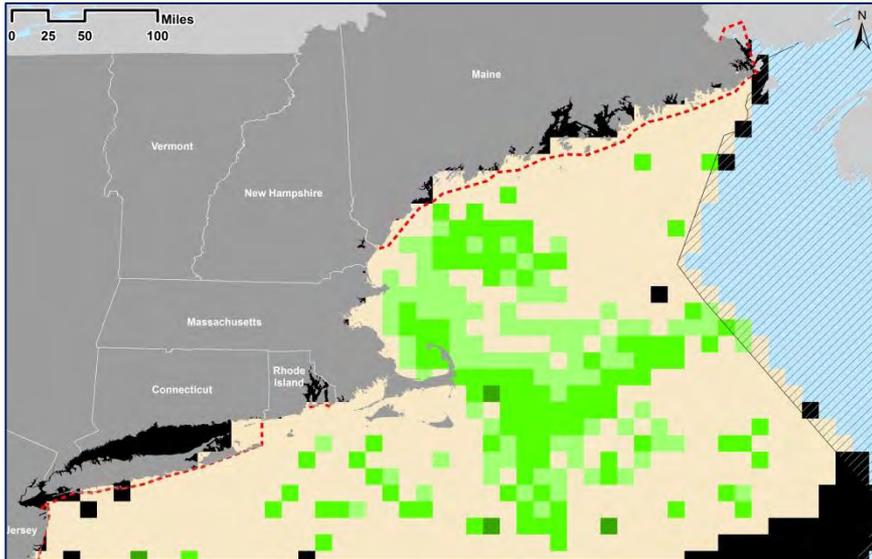
## Right Whale



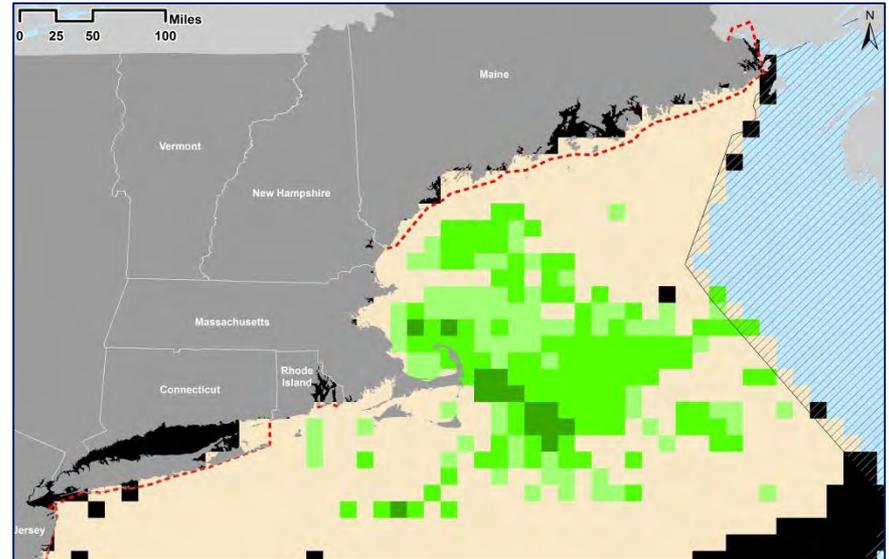
## Humpback Whale



## Fin Whale

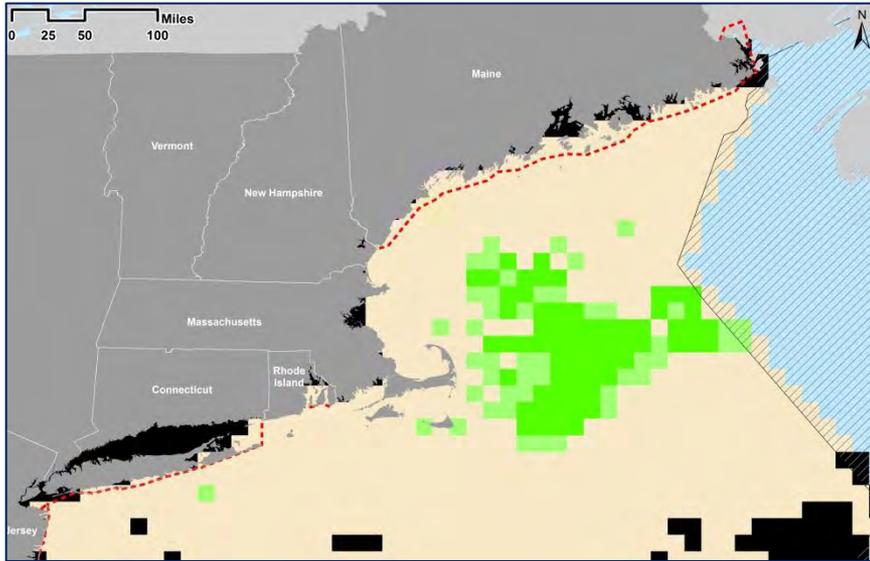


## Combined Right & Humpback Whale

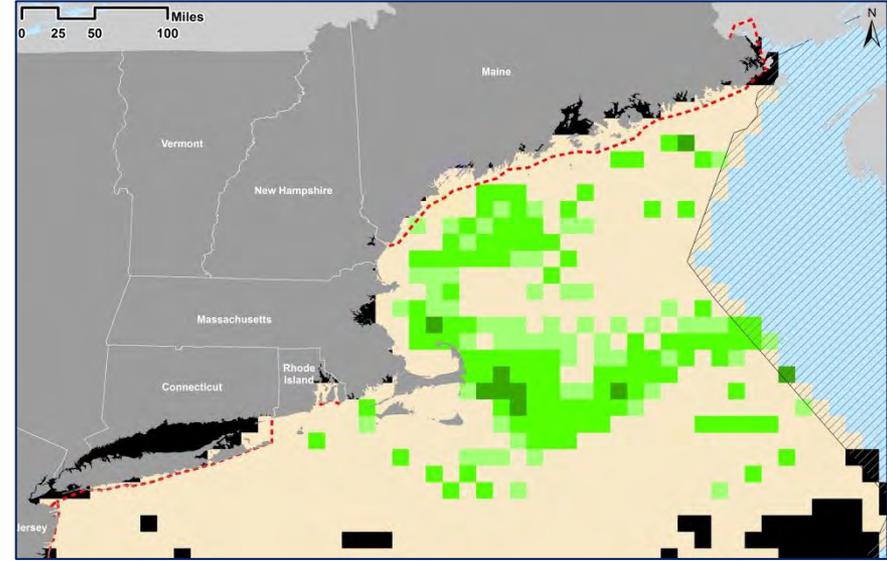


# NORTHEAST - JUNE

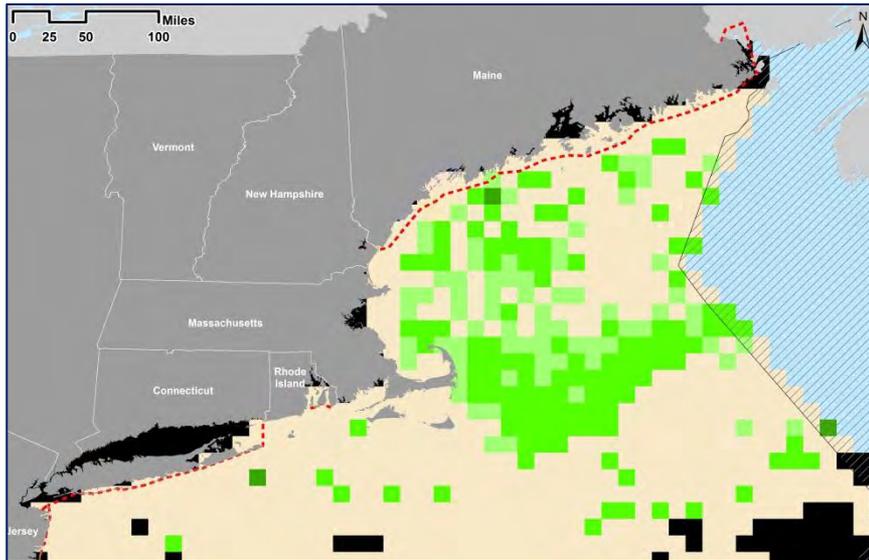
## Right Whale



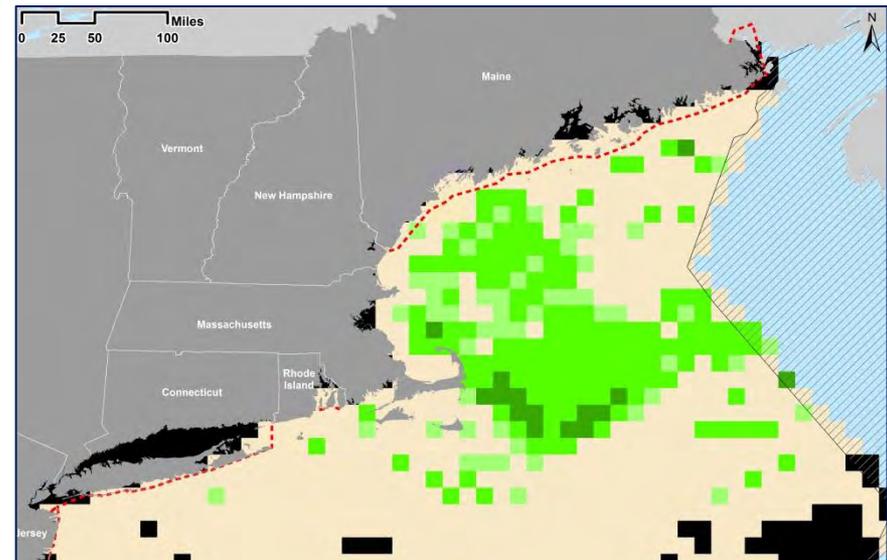
## Humpback Whale



## Fin Whale

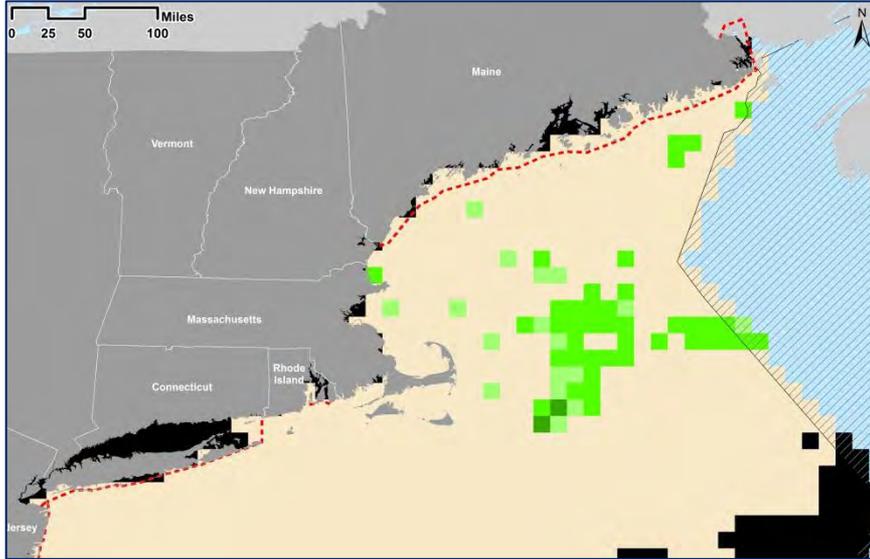


## Combined Right & Humpback Whale

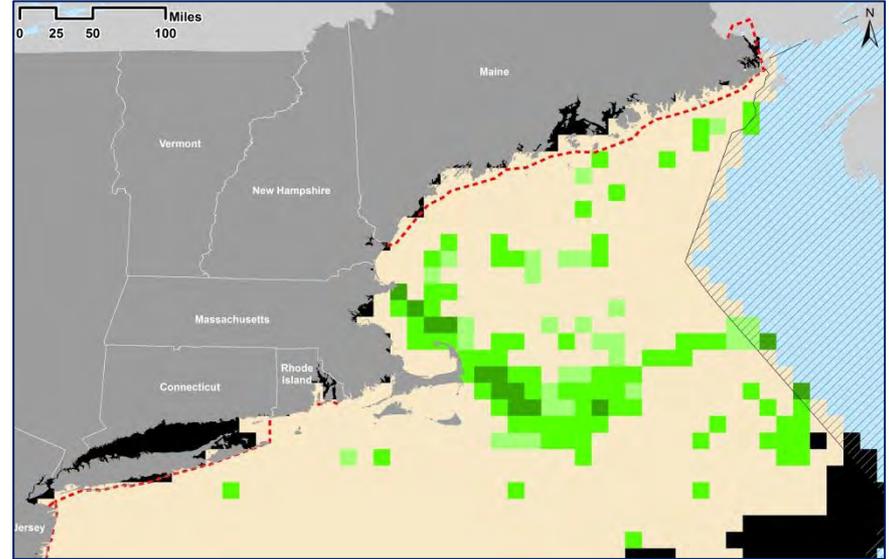


# NORTHEAST - JULY

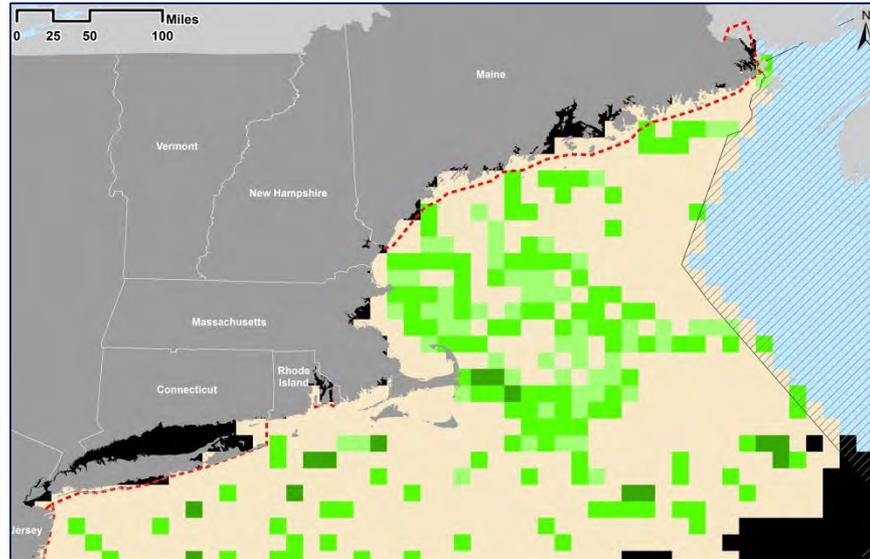
## Right Whale



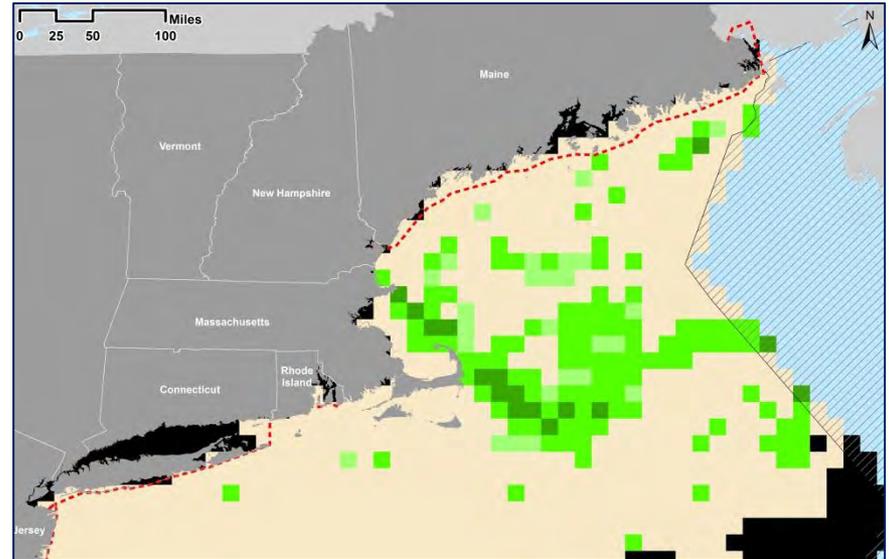
## Humpback Whale



## Fin Whale

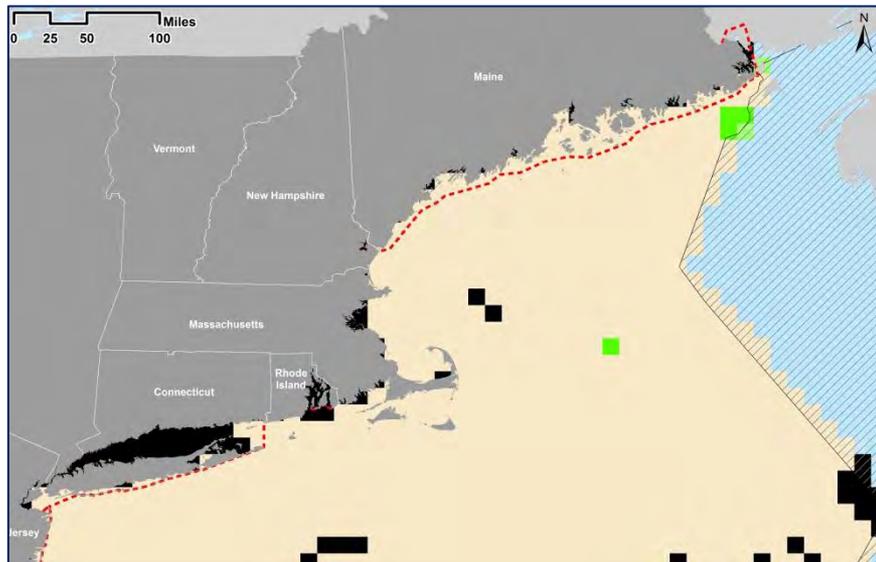


## Combined Right & Humpback Whale

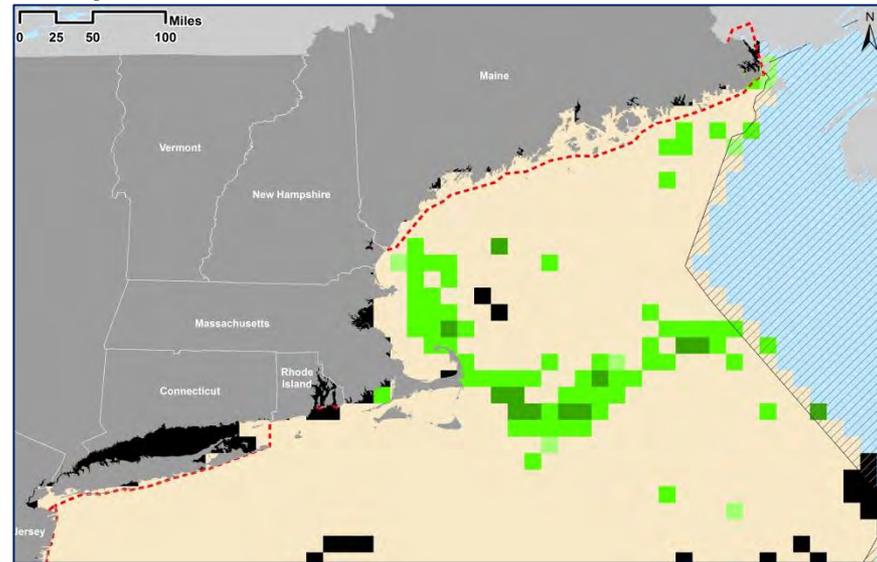


# NORTHEAST - AUGUST

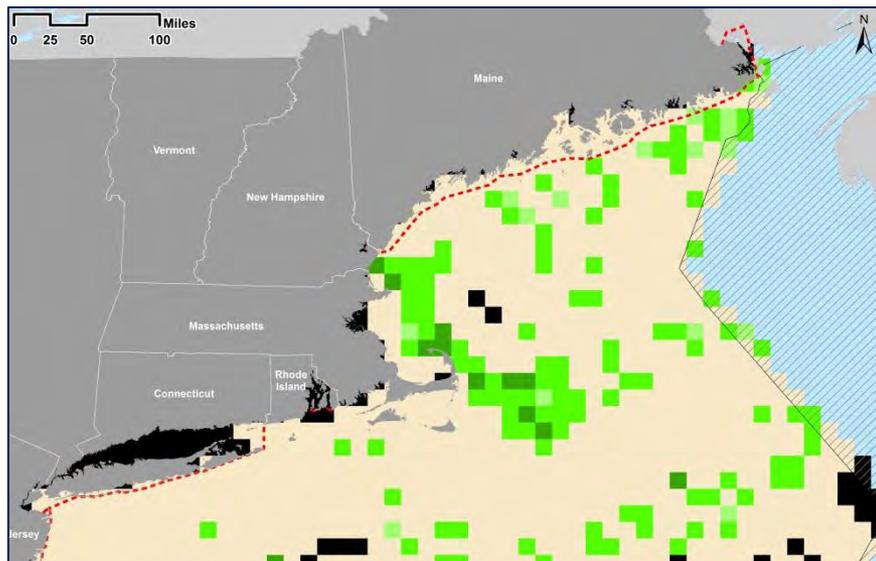
## Right Whale



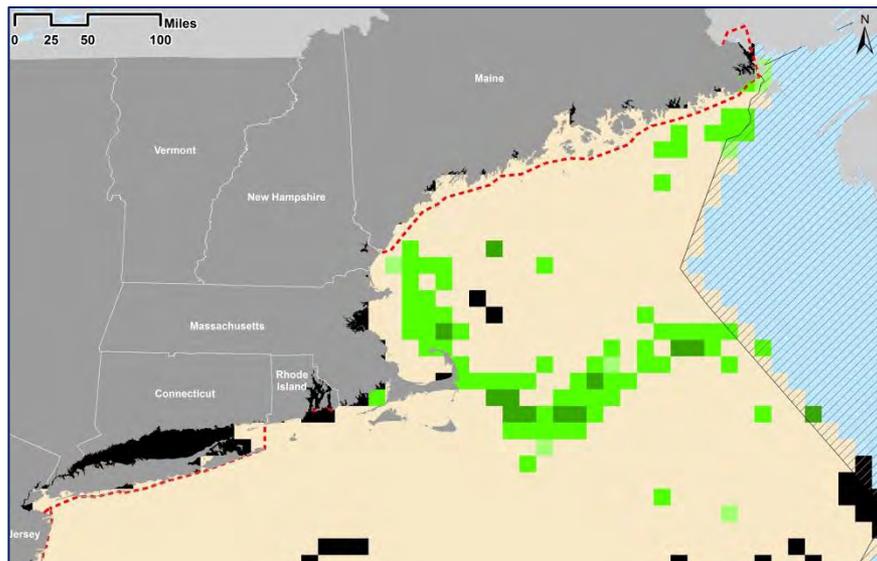
## Humpback Whale



## Fin Whale

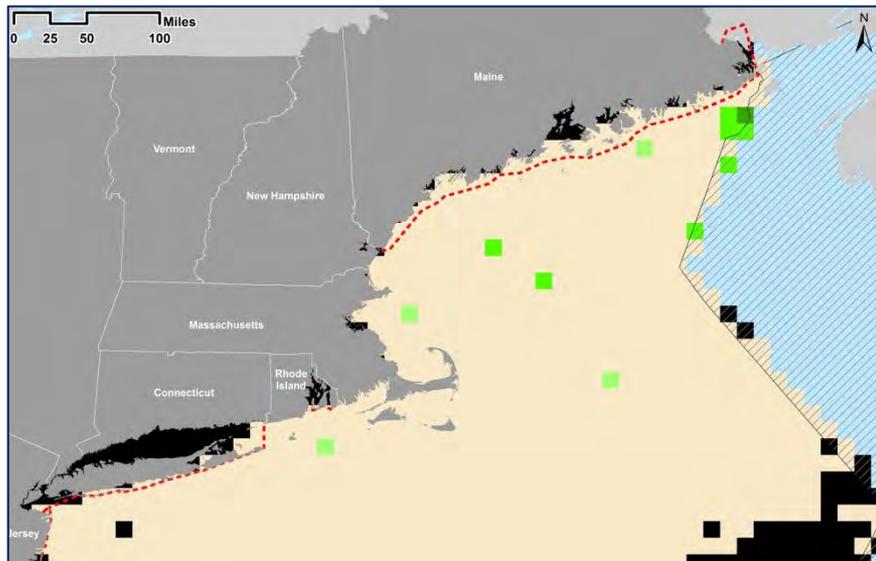


## Combined Right & Humpback Whale

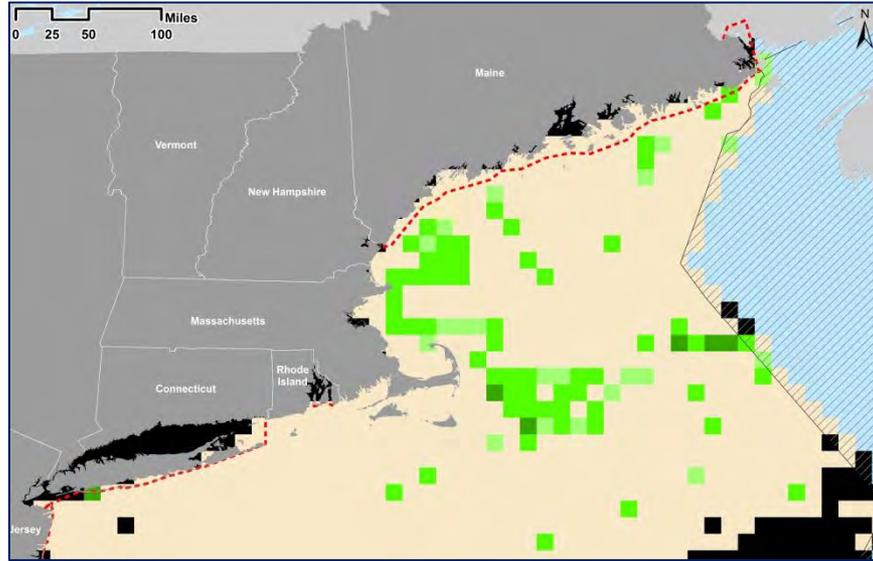


# NORTHEAST - SEPTEMBER

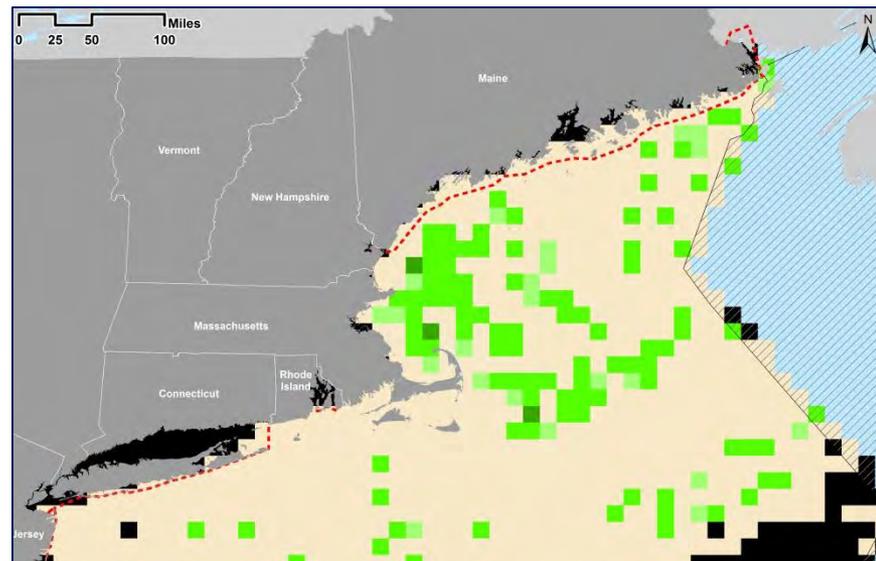
## Right Whale



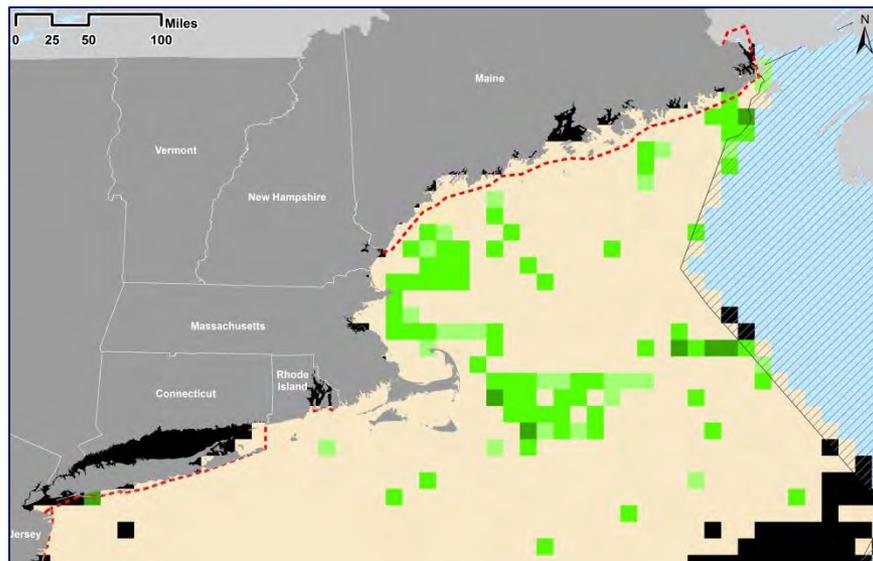
## Humpback Whale



## Fin Whale

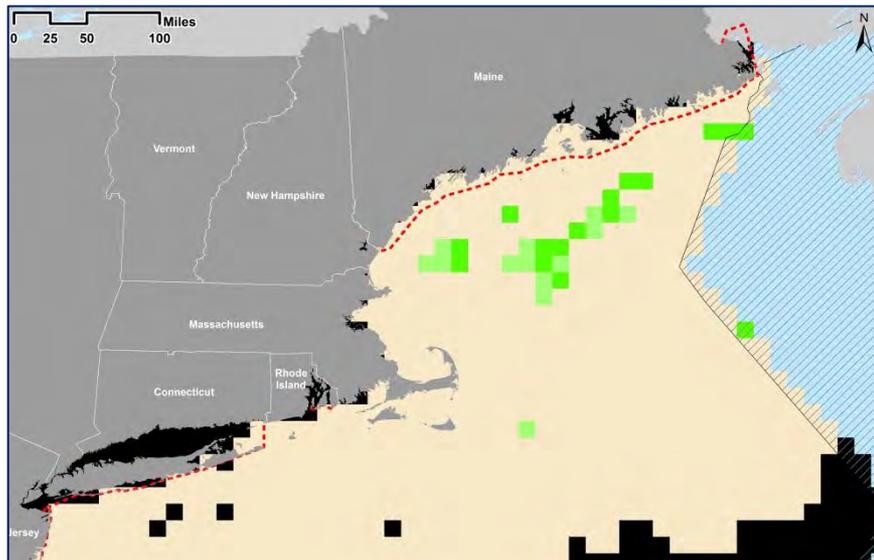


## Combined Right & Humpback Whale

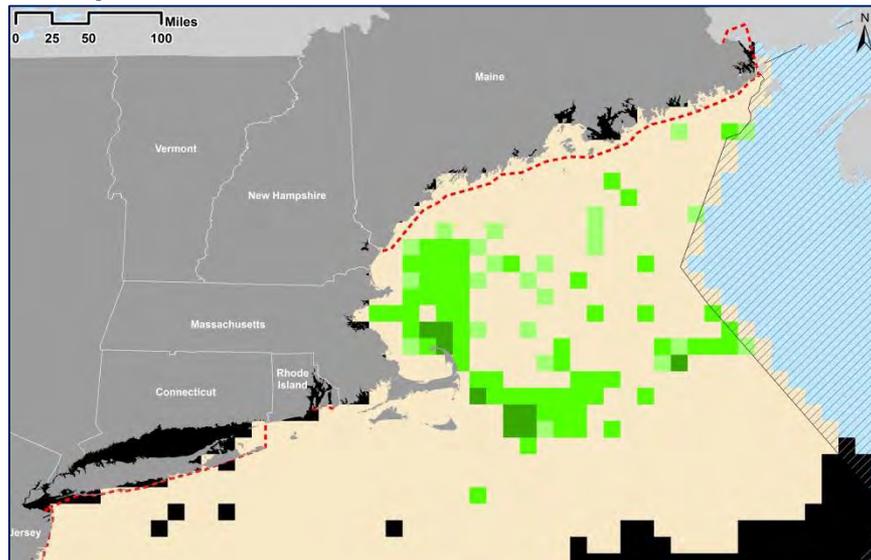


# NORTHEAST - OCTOBER

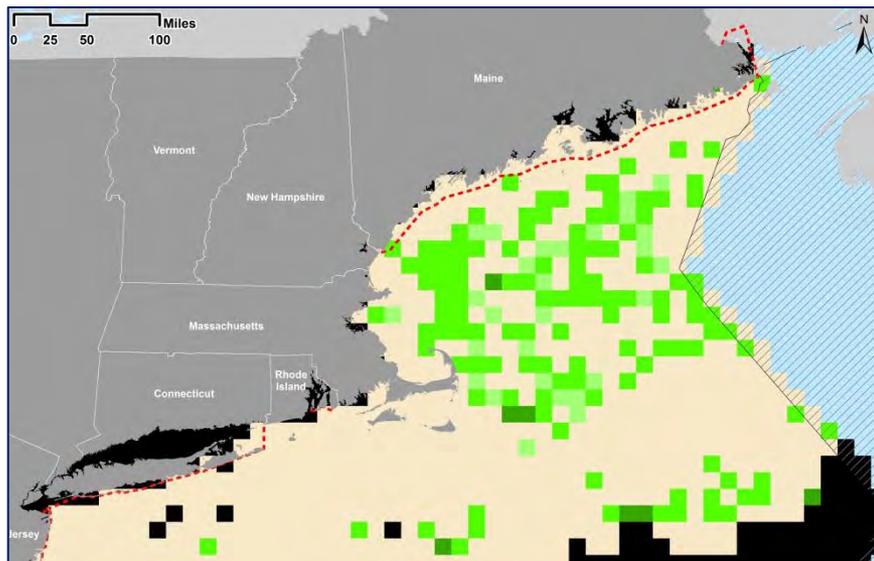
## Right Whale



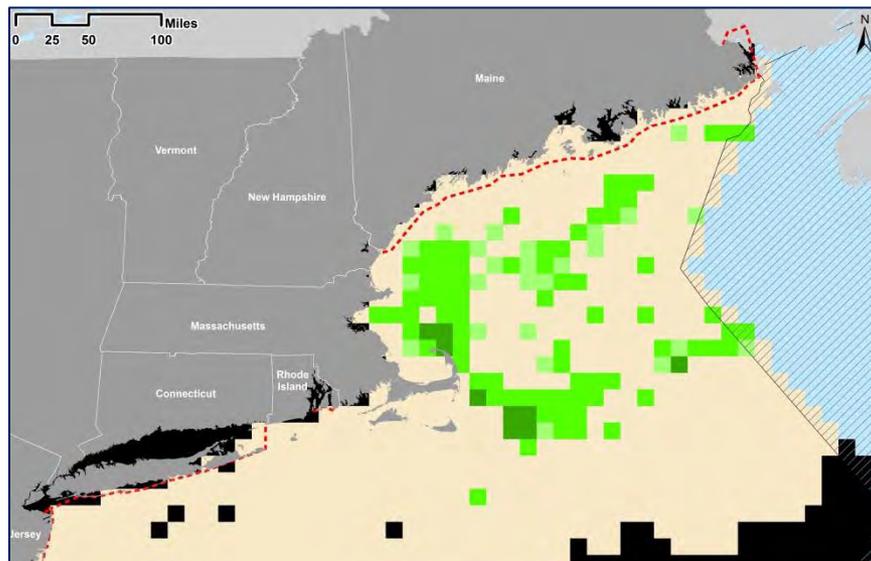
## Humpback Whale



## Fin Whale

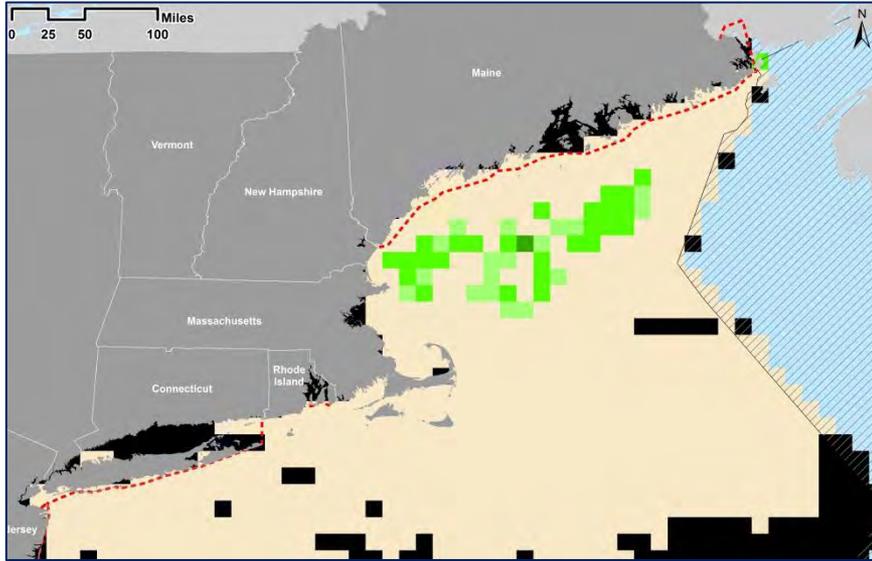


## Combined Right & Humpback Whale

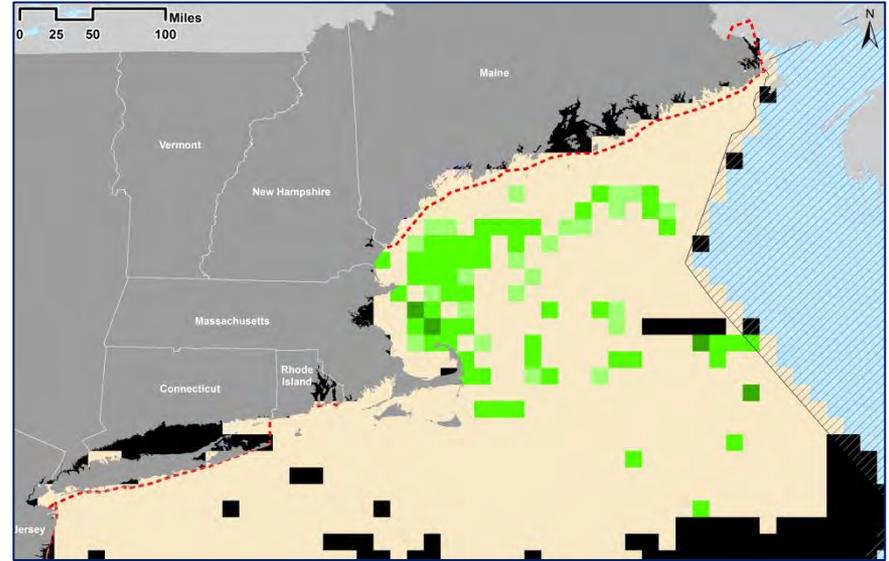


# NORTHEAST - NOVEMBER

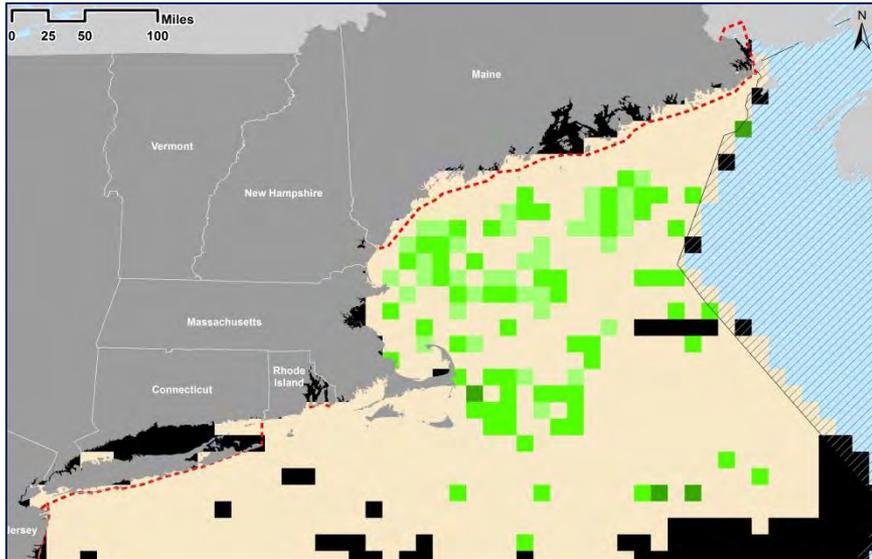
## Right Whale



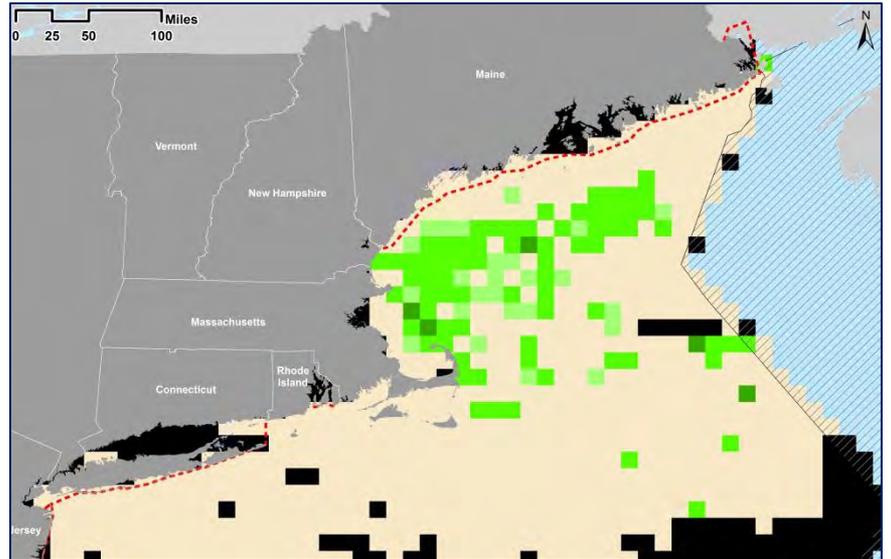
## Humpback Whale



## Fin Whale

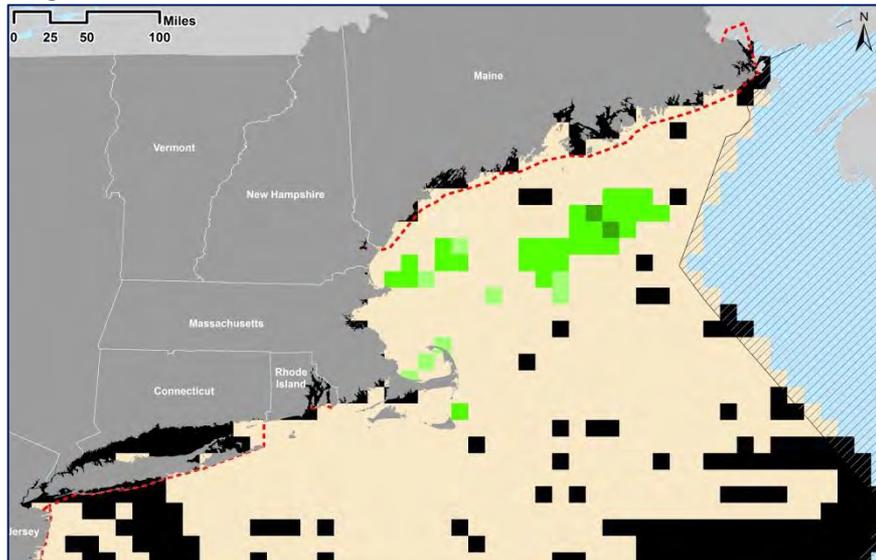


## Combined Right & Humpback Whale

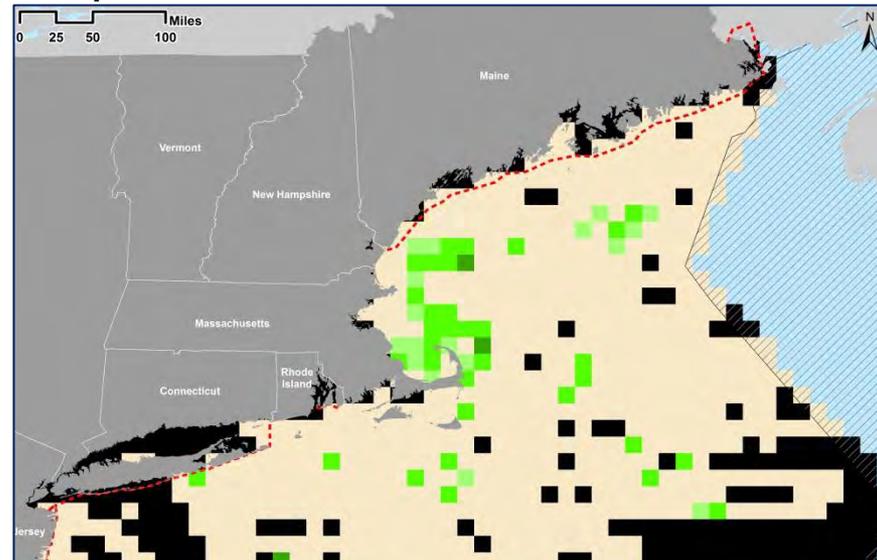


# NORTHEAST - DECEMBER

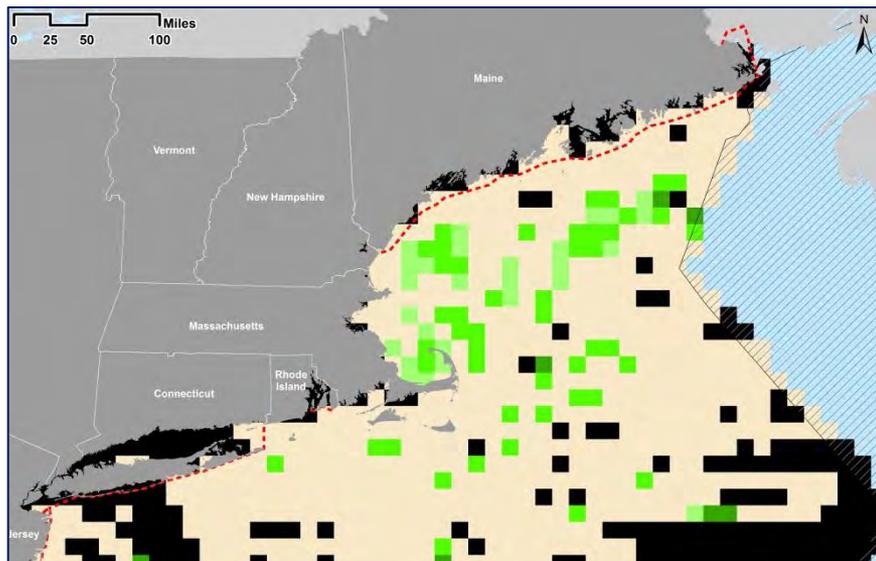
## Right Whale



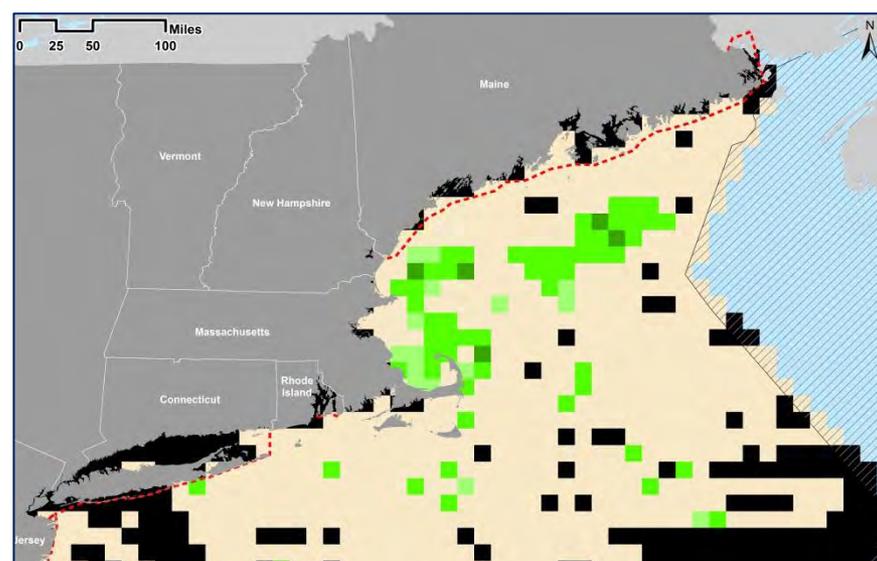
## Humpback Whale



## Fin Whale

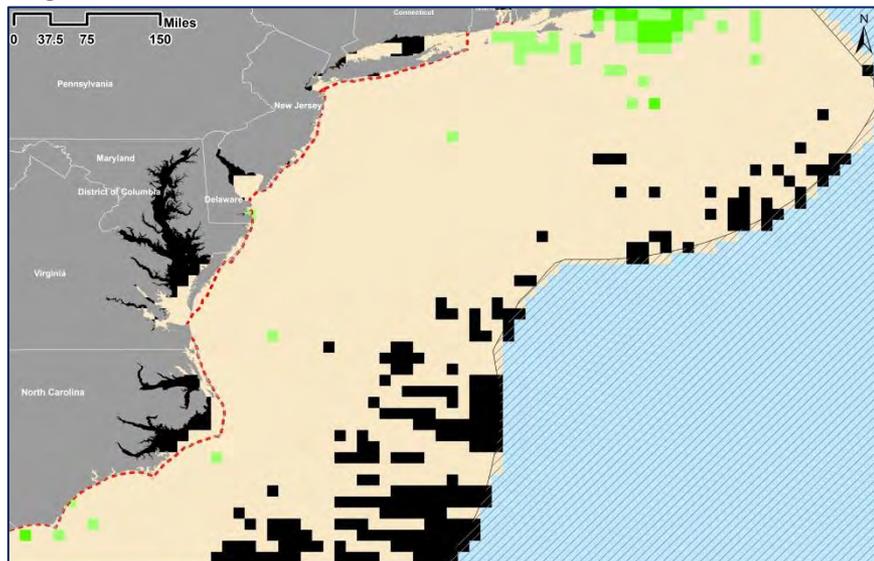


## Combined Right & Humpback Whale

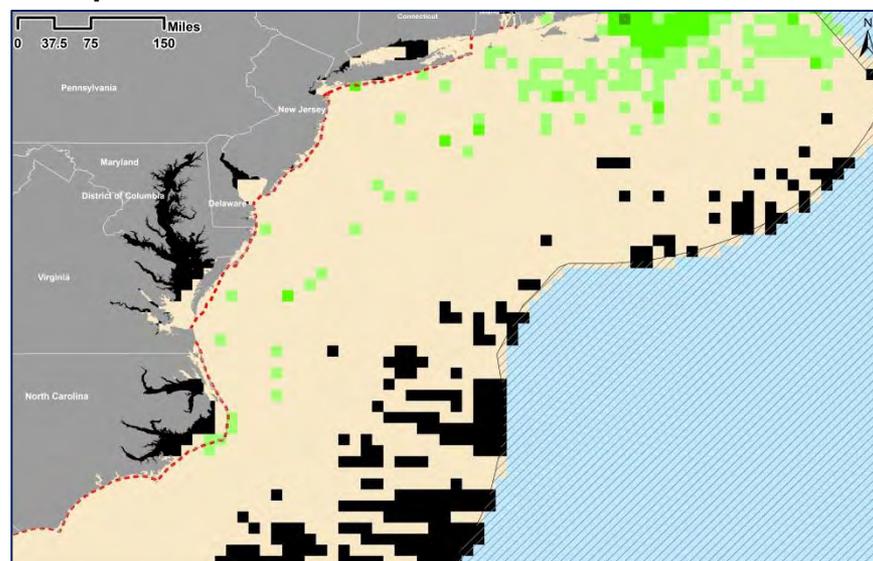


# MID-ATLANTIC - MONTHLY AVERAGE (JANUARY - DECEMBER)

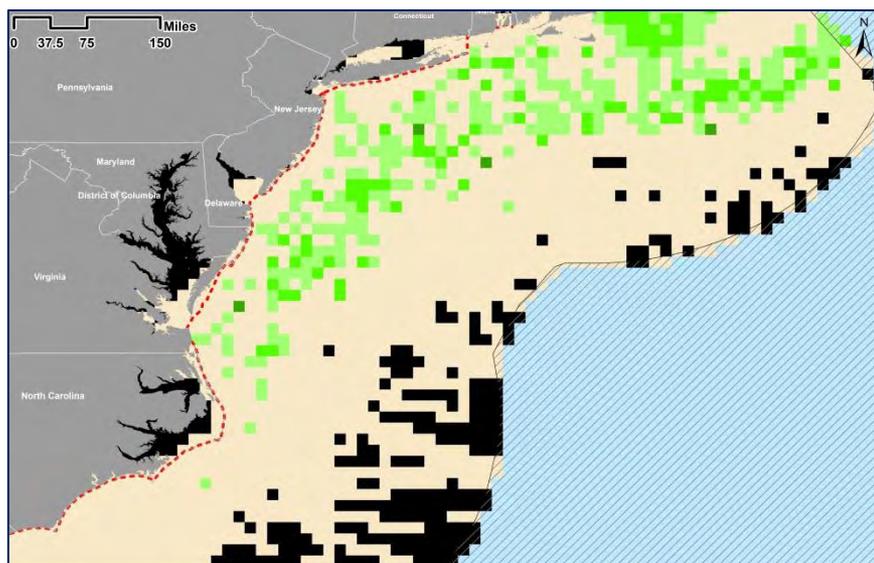
## Right Whale



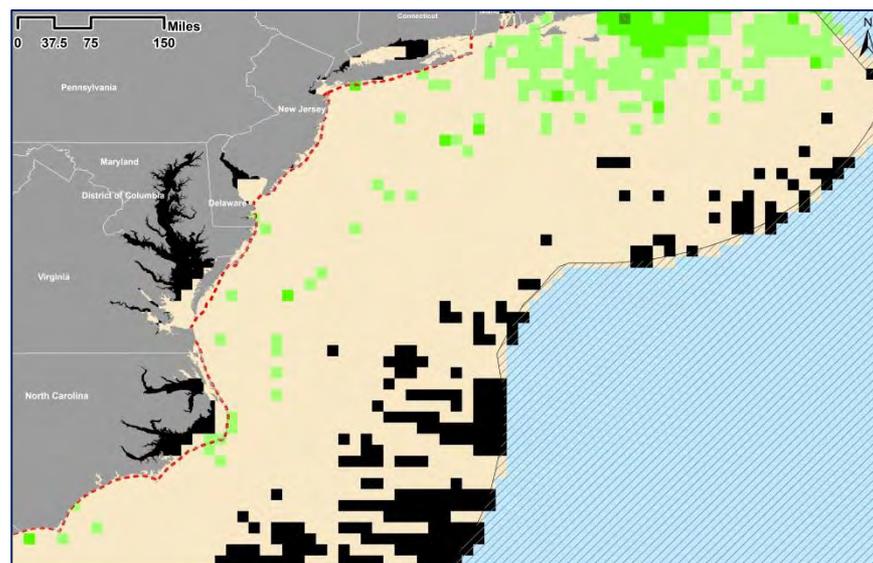
## Humpback Whale



## Fin Whale

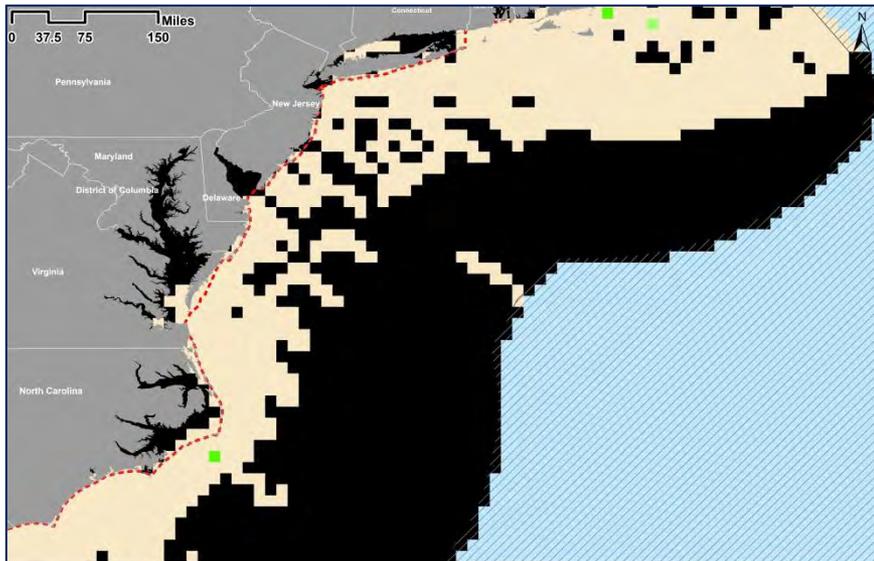


## Combined Right & Humpback Whale

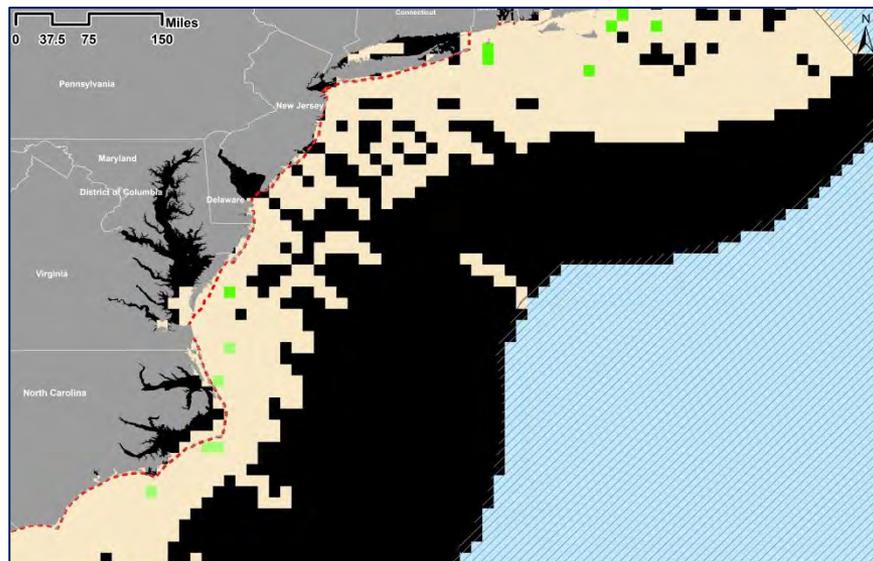


# MID-ATLANTIC - JANUARY

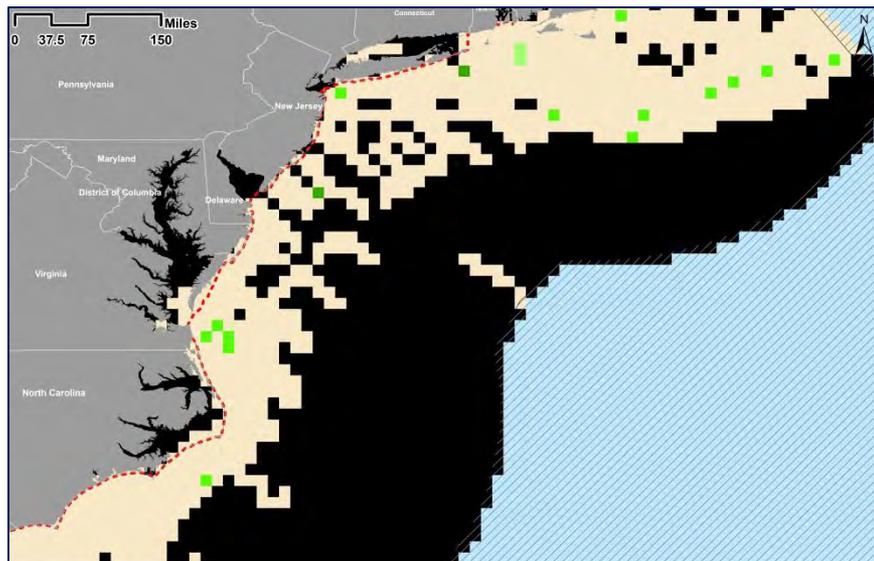
## Right Whale



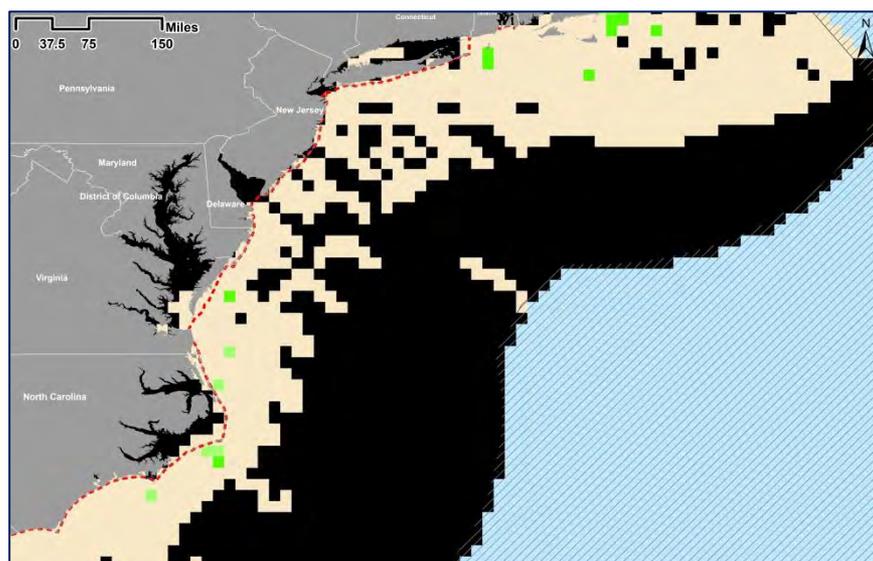
## Humpback Whale



## Fin Whale

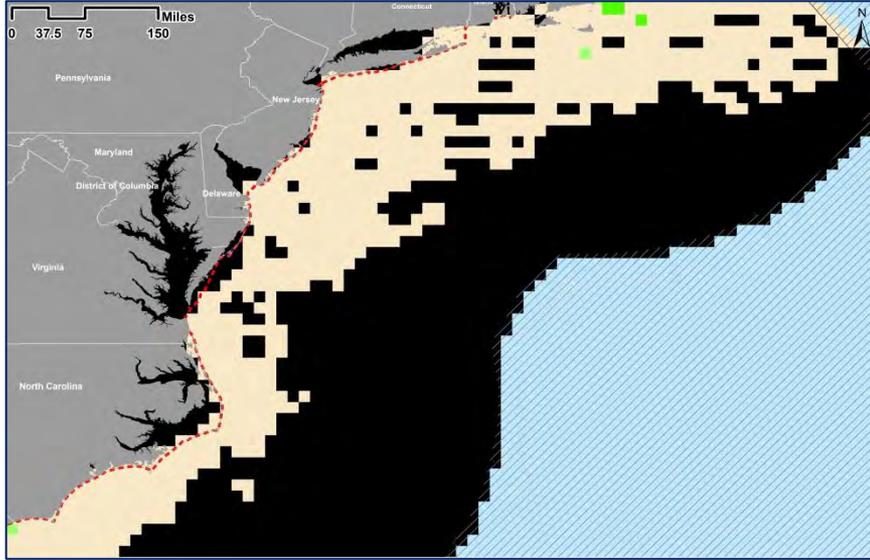


## Combined Right & Humpback Whale

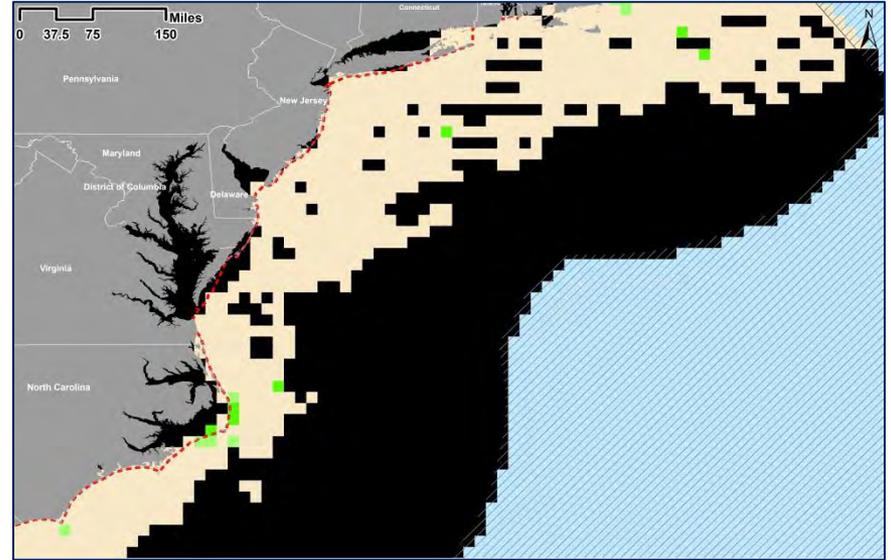


# MID-ATLANTIC - FEBRUARY

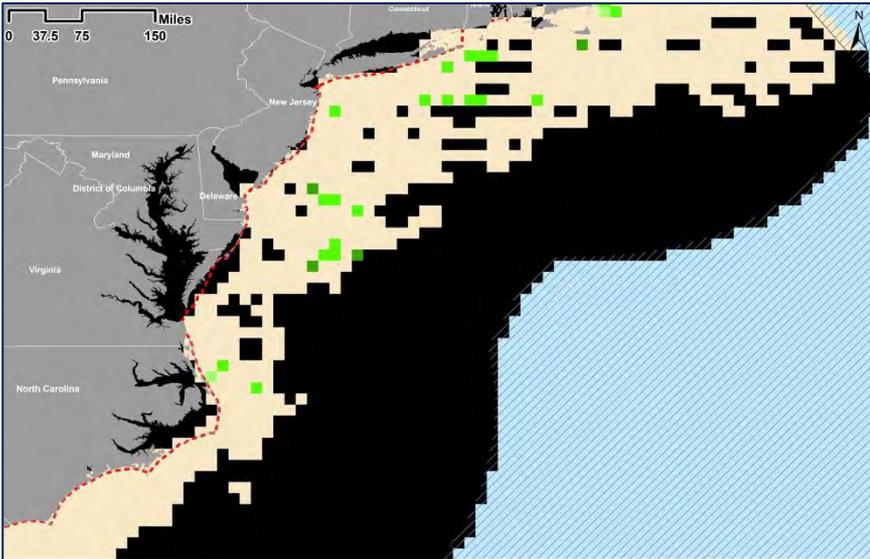
## Right Whale



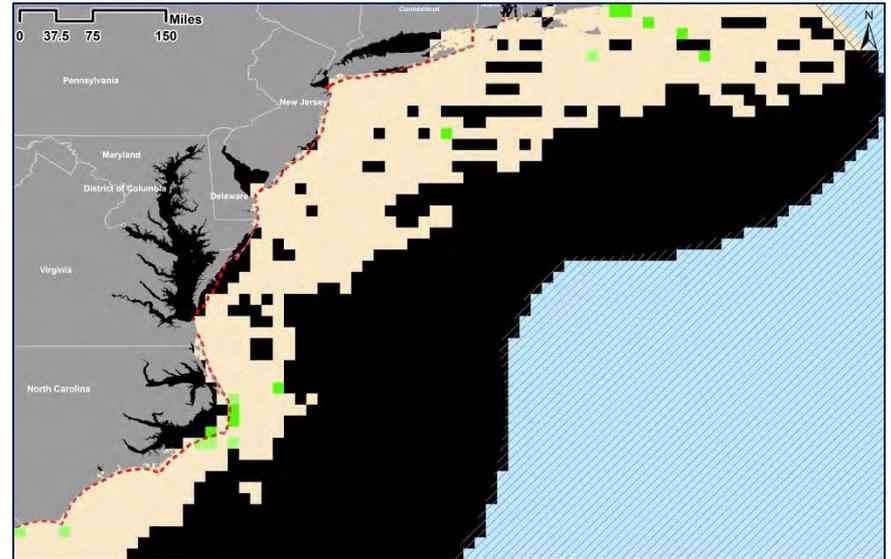
## Humpback Whale



## Fin Whale

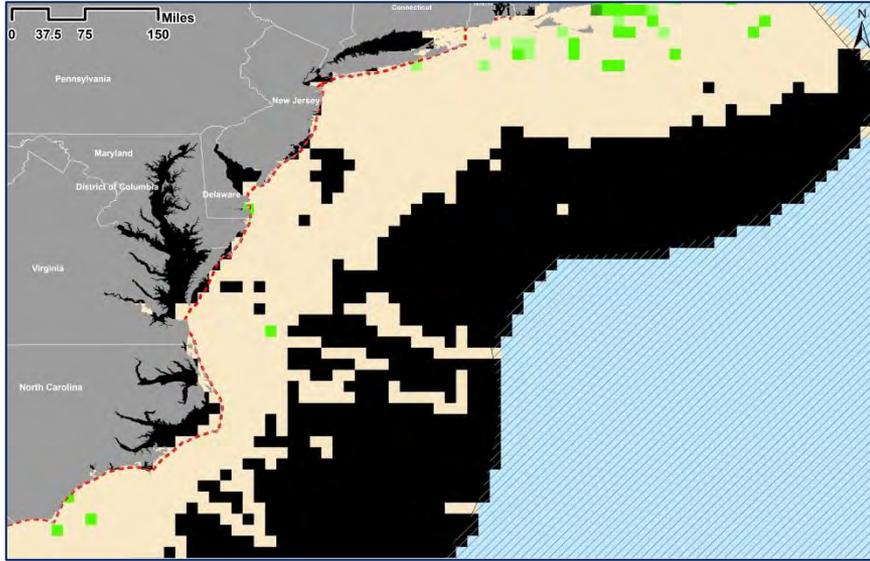


## Combined Right & Humpback Whale

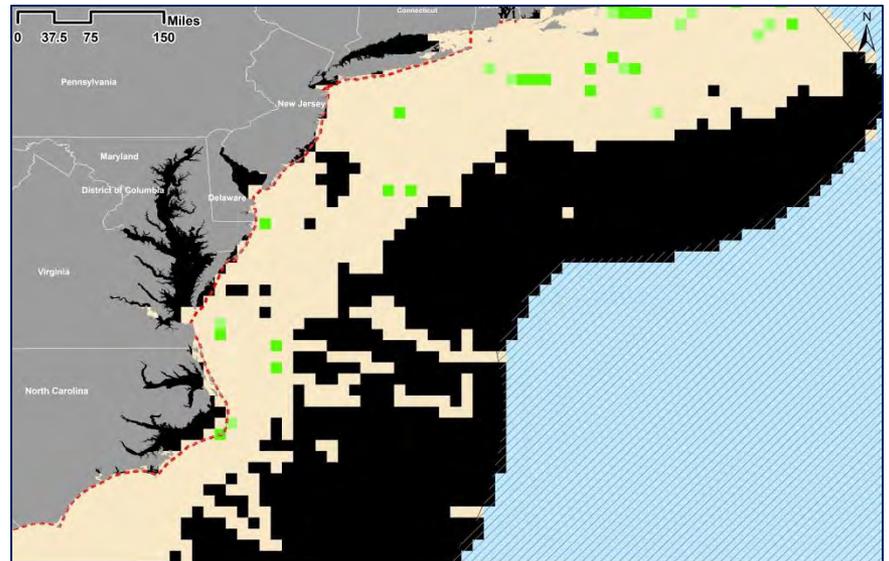


# MID-ATLANTIC - MARCH

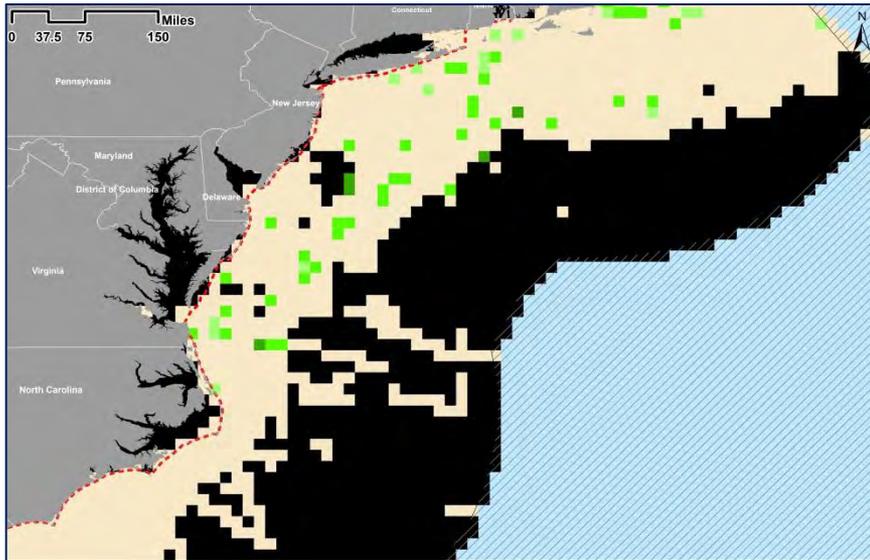
## Right Whale



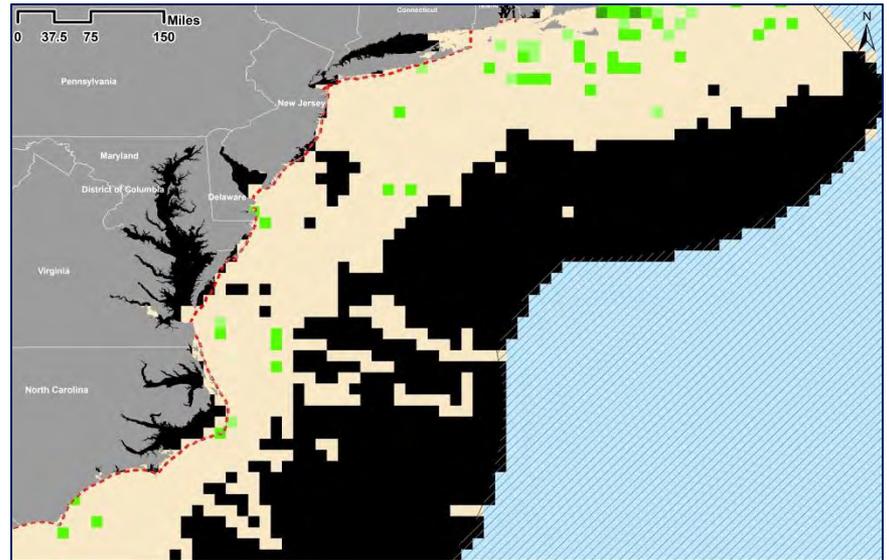
## Humpback Whale



## Fin Whale

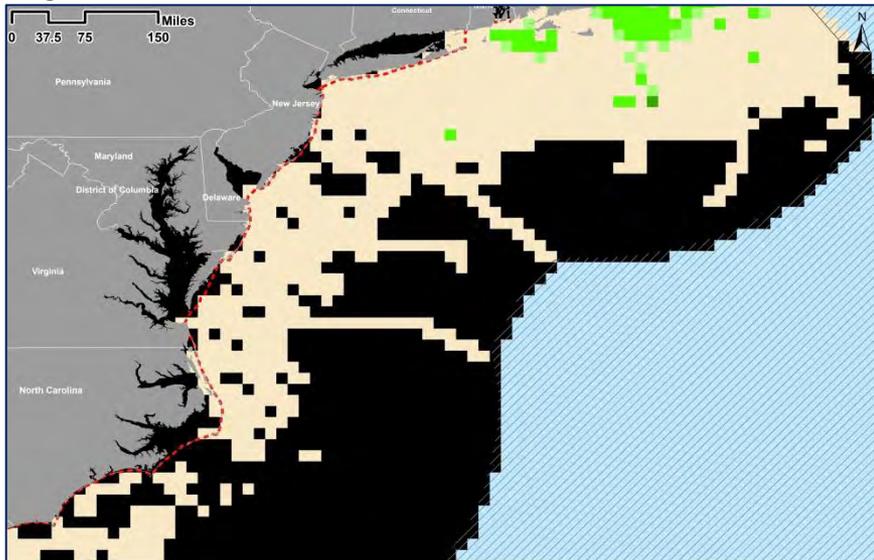


## Combined Right & Humpback Whale

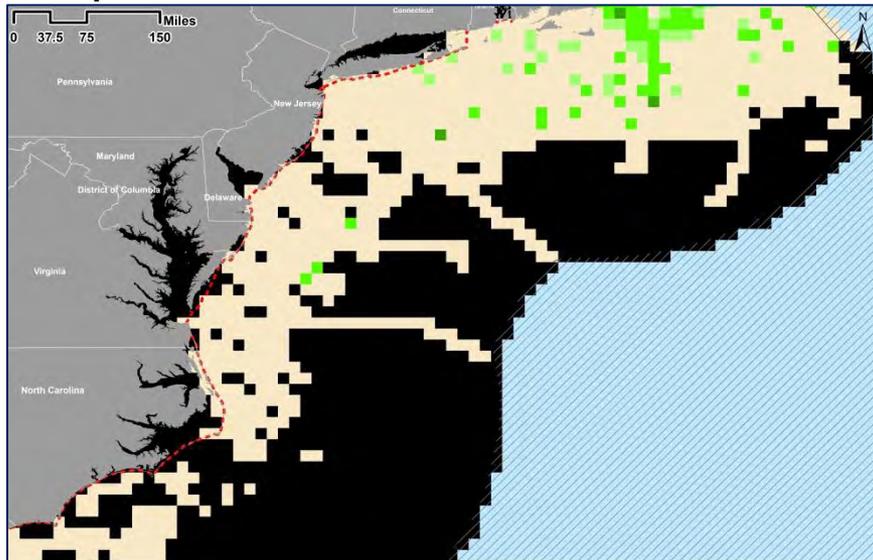


# MID-ATLANTIC - APRIL

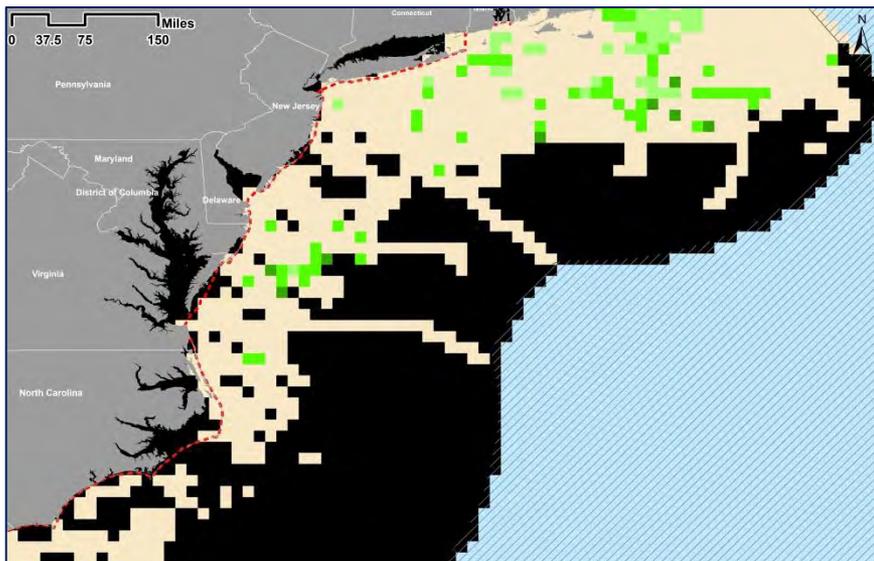
## Right Whale



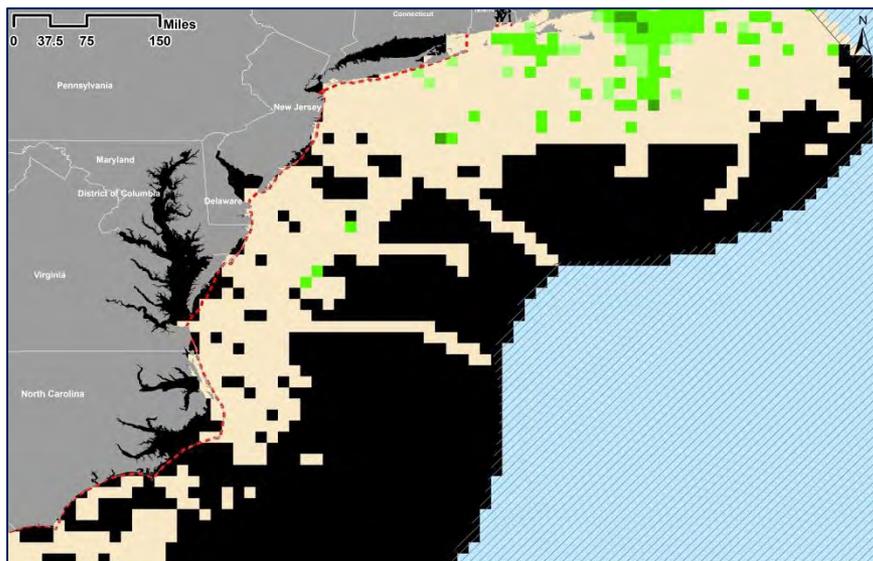
## Humpback Whale



## Fin Whale

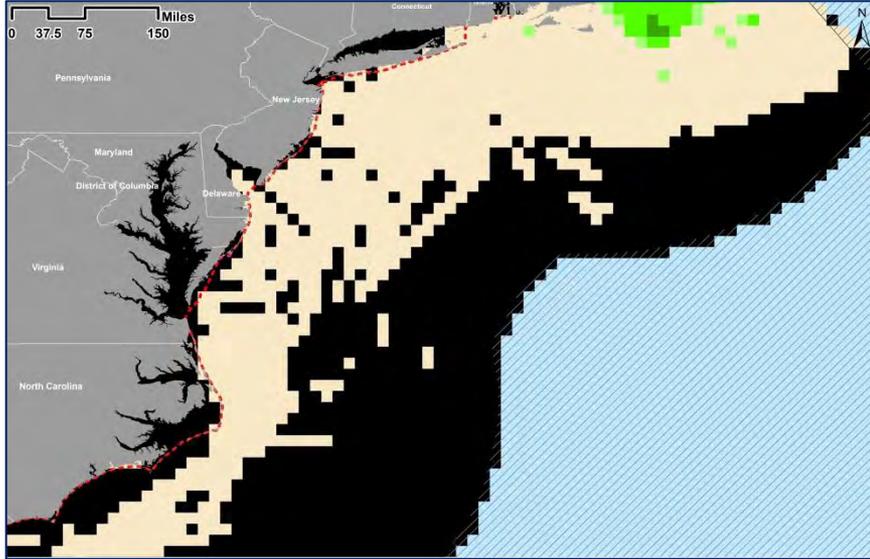


## Combined Right & Humpback Whale

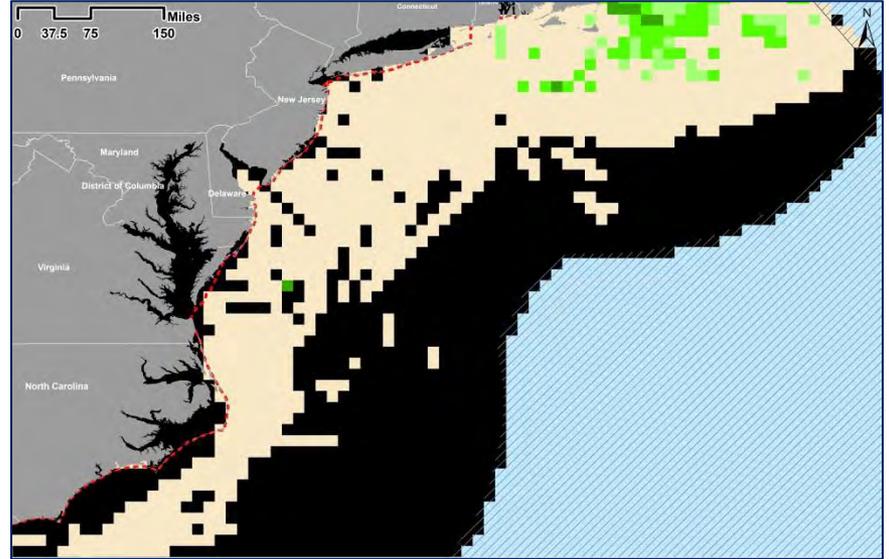


# MID-ATLANTIC - MAY

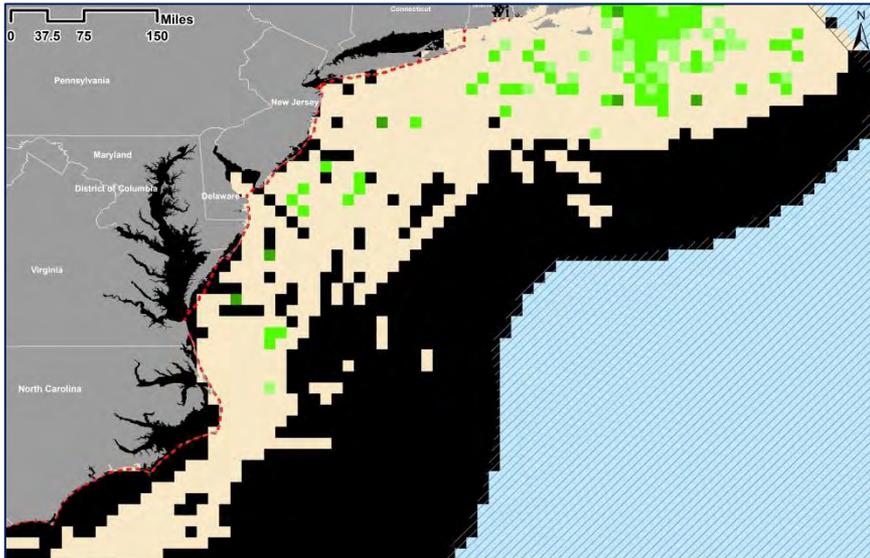
## Right Whale



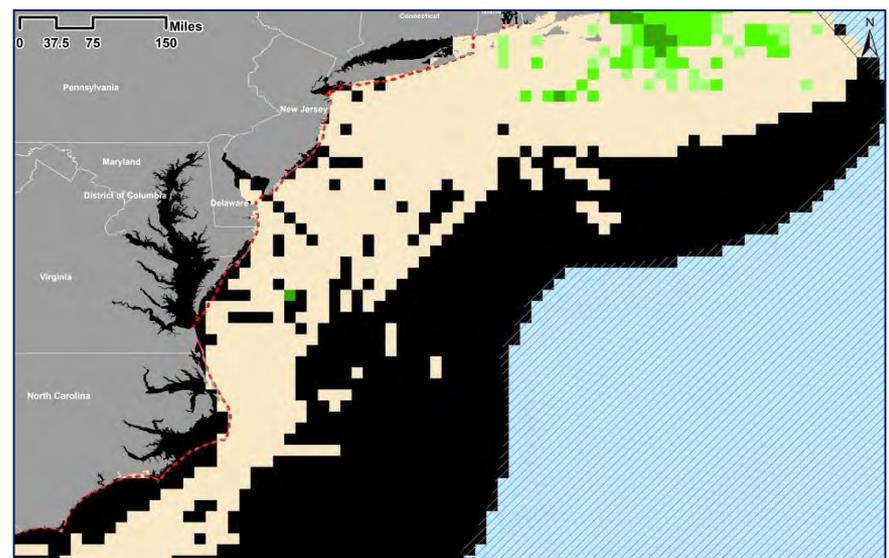
## Humpback Whale



## Fin Whale

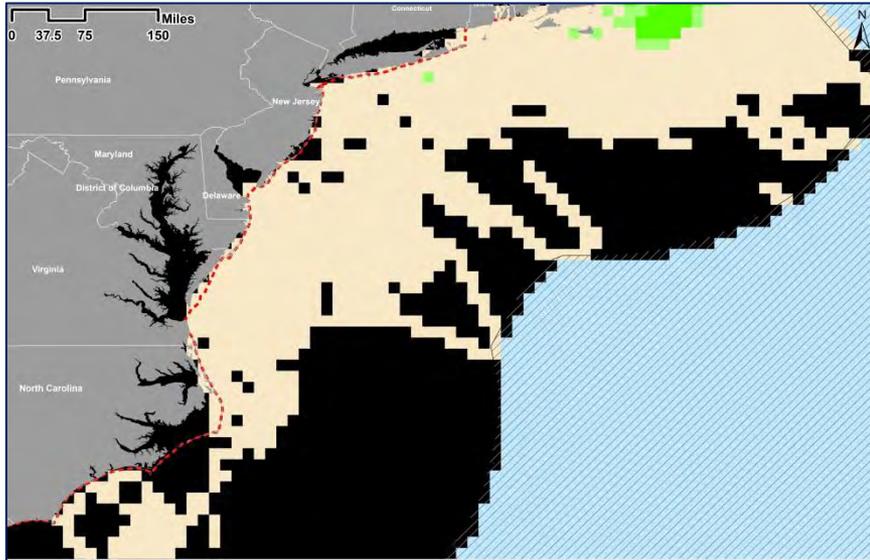


## Combined Right & Humpback Whale

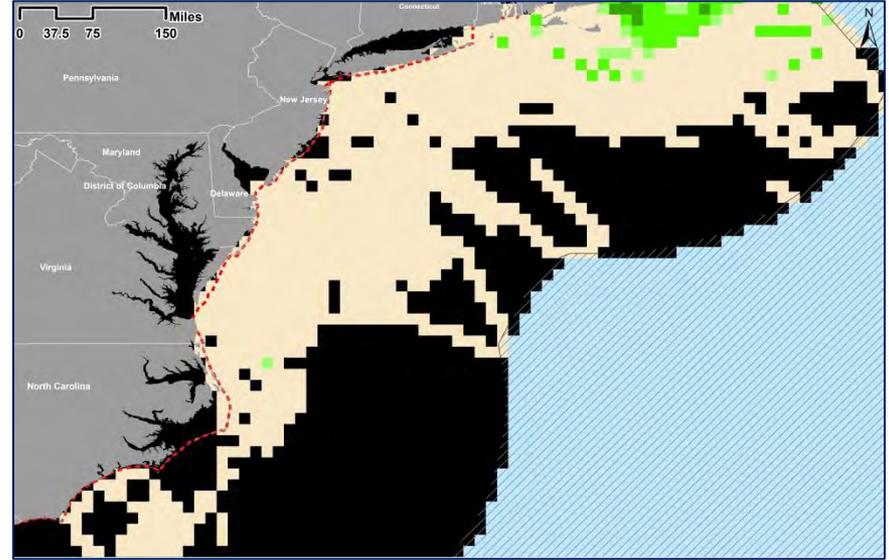


# MID-ATLANTIC - JUNE

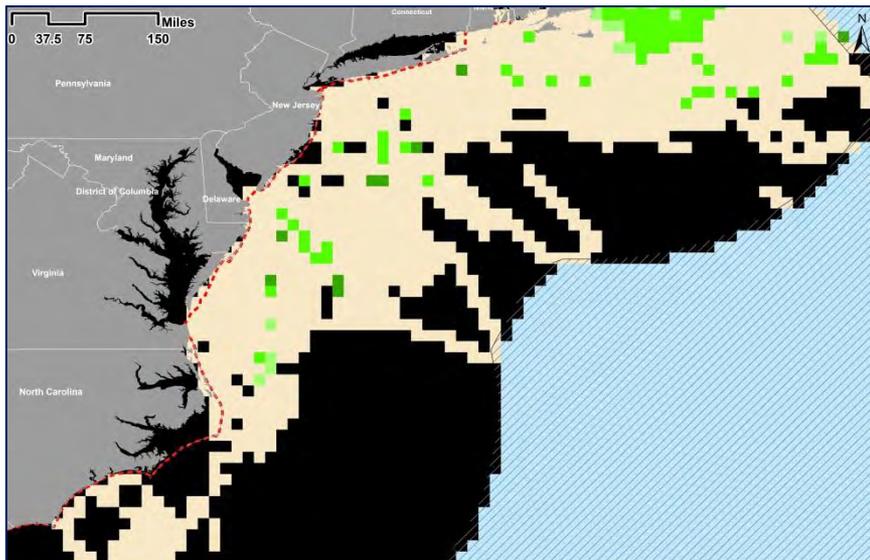
## Right Whale



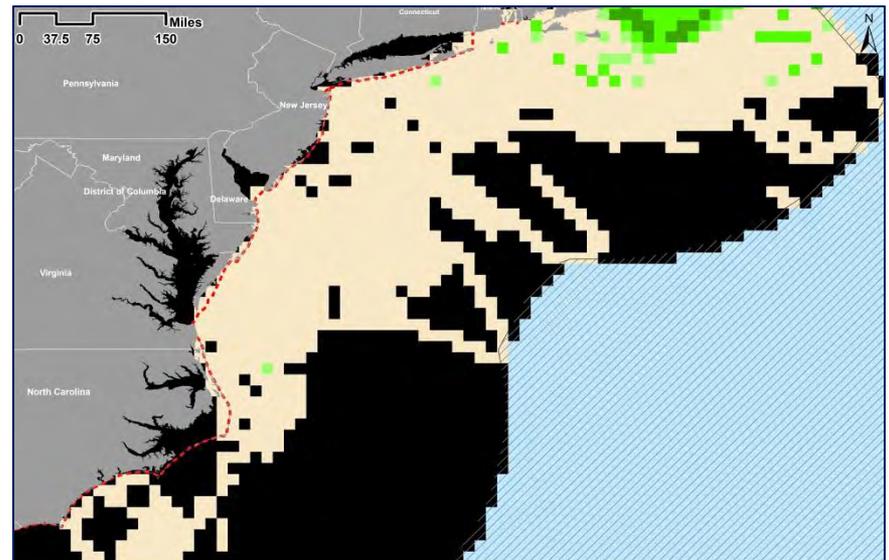
## Humpback Whale



## Fin Whale

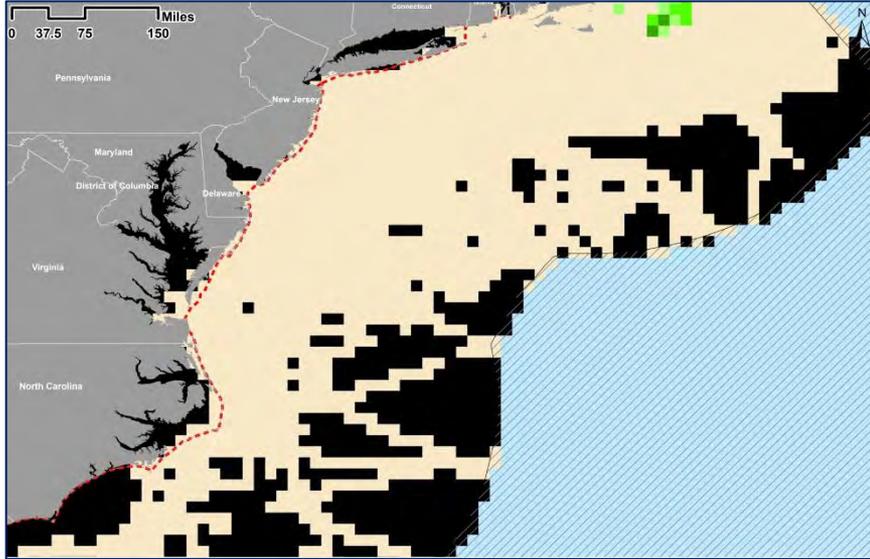


## Combined Right & Humpback Whale

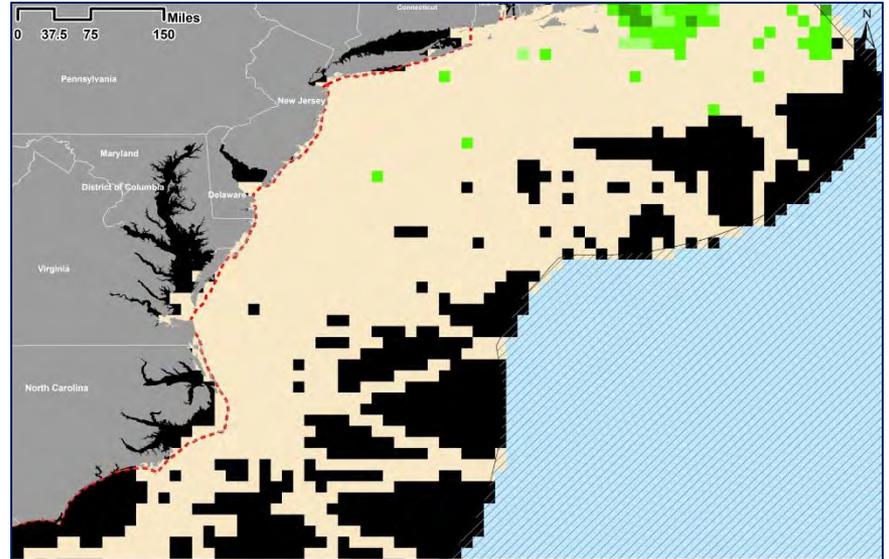


# MID-ATLANTIC - JULY

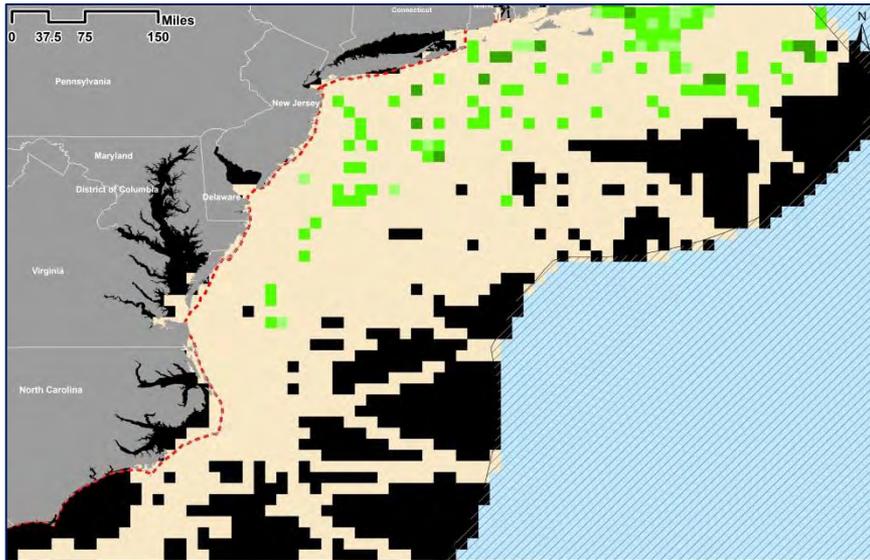
## Right Whale



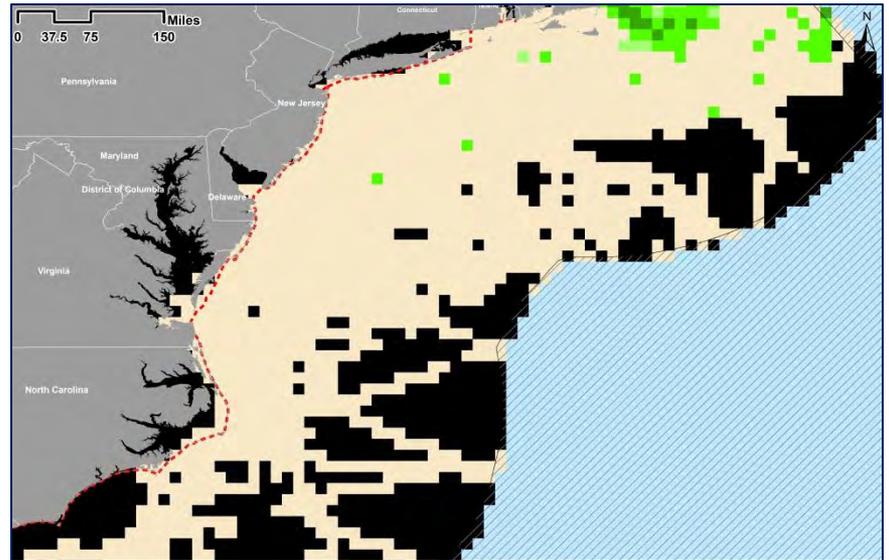
## Humpback Whale



## Fin Whale

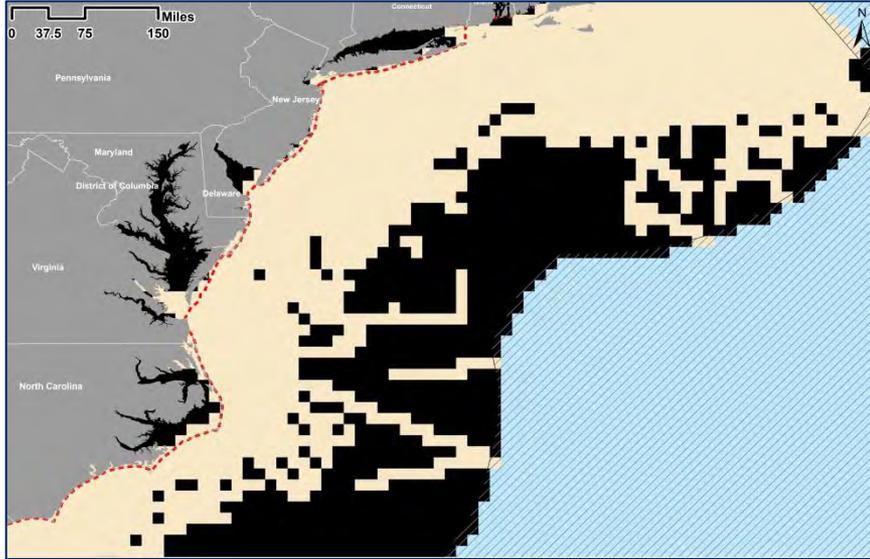


## Combined Right & Humpback Whale

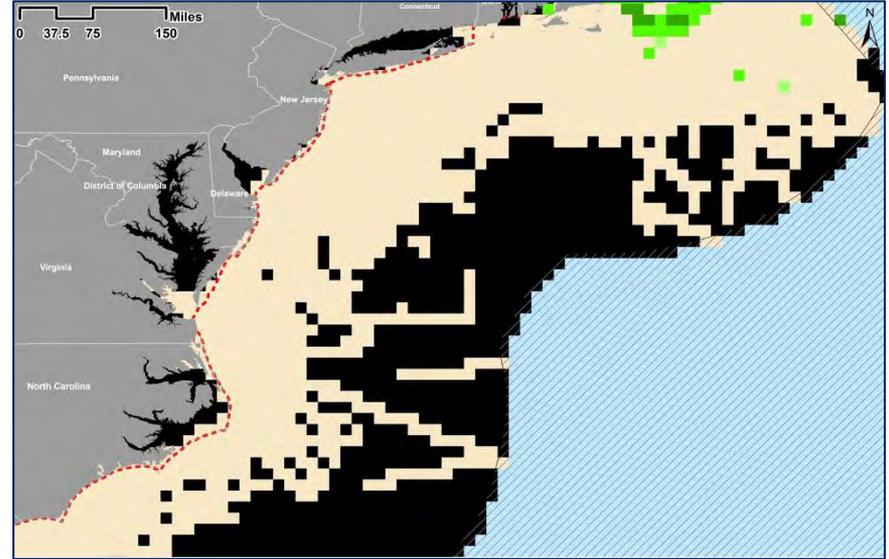


# MID-ATLANTIC - AUGUST

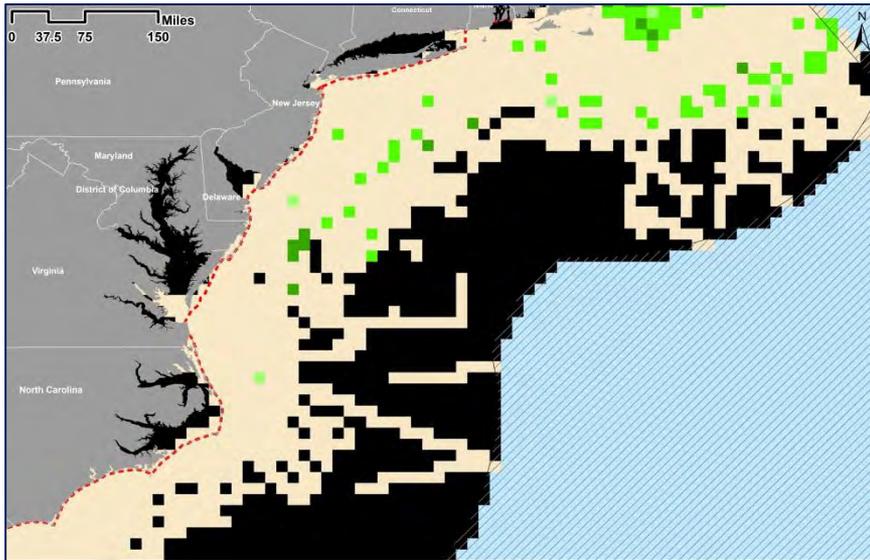
## Right Whale



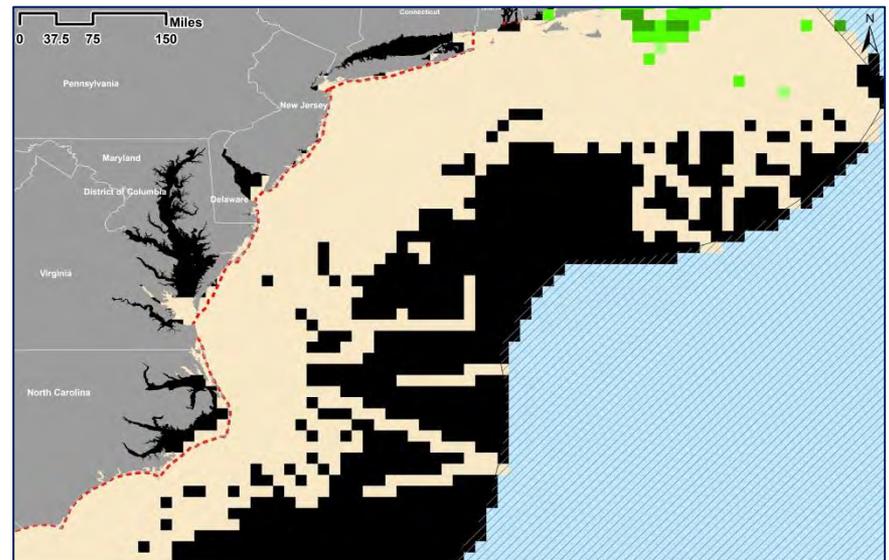
## Humpback Whale



## Fin Whale

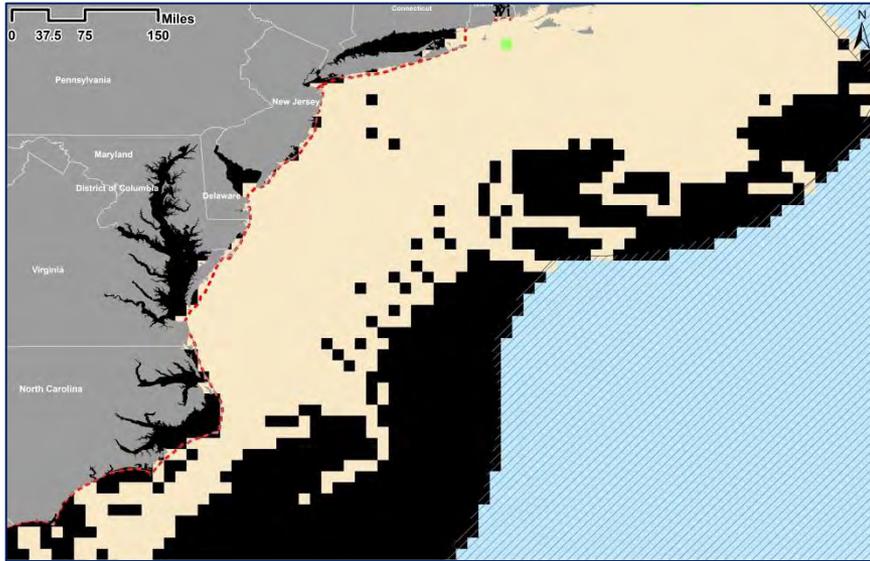


## Combined Right & Humpback Whale

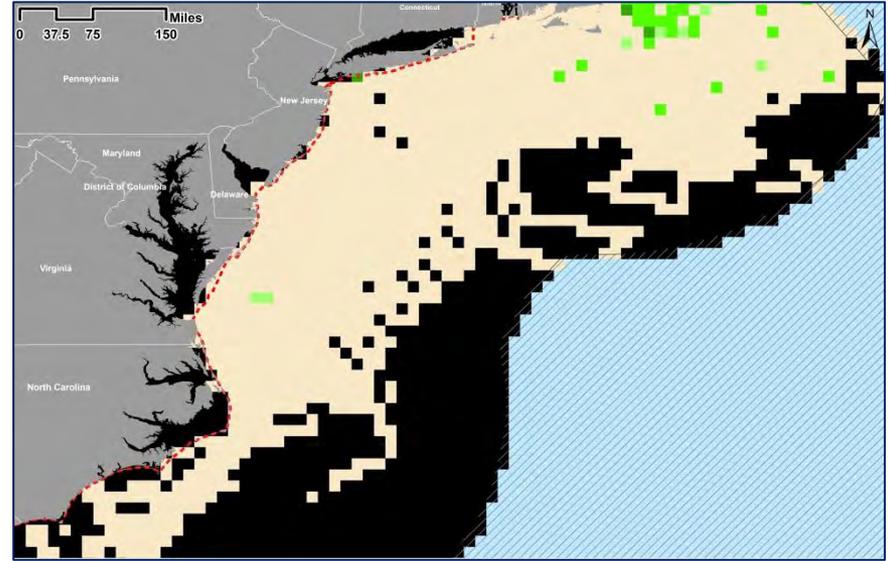


# MID-ATLANTIC - SEPTEMBER

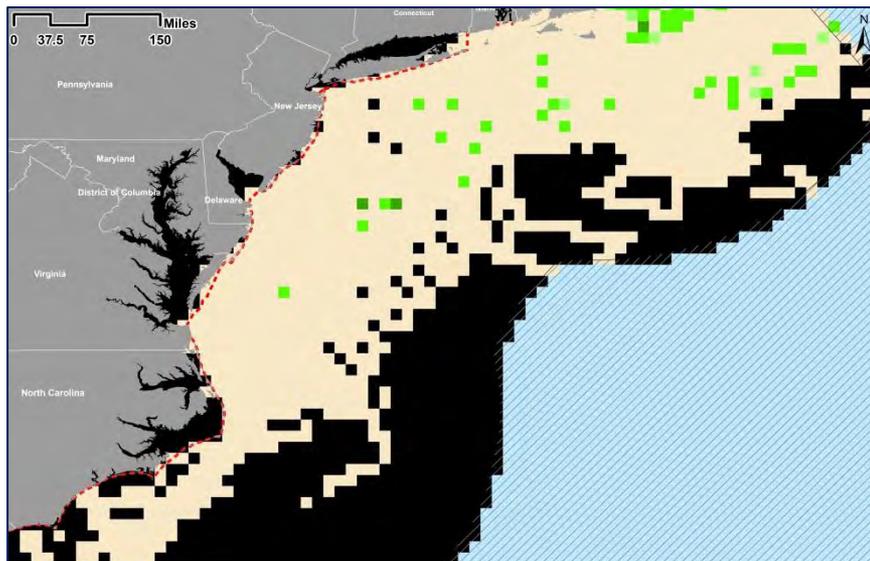
## Right Whale



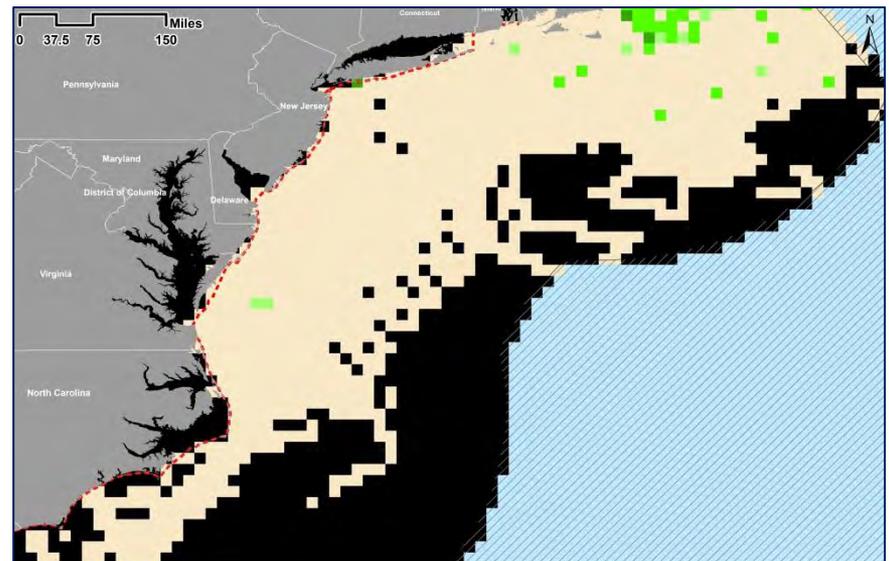
## Humpback Whale



## Fin Whale

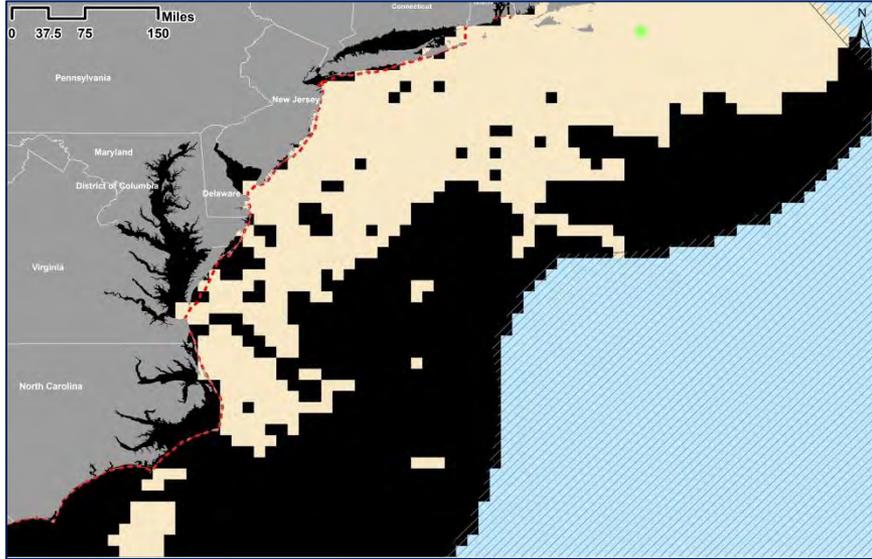


## Combined Right & Humpback Whale

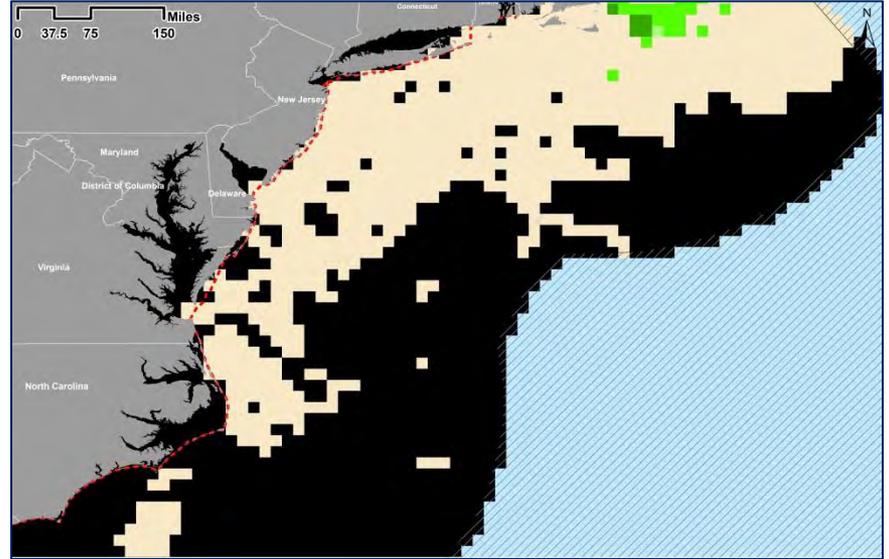


# MID-ATLANTIC - OCTOBER

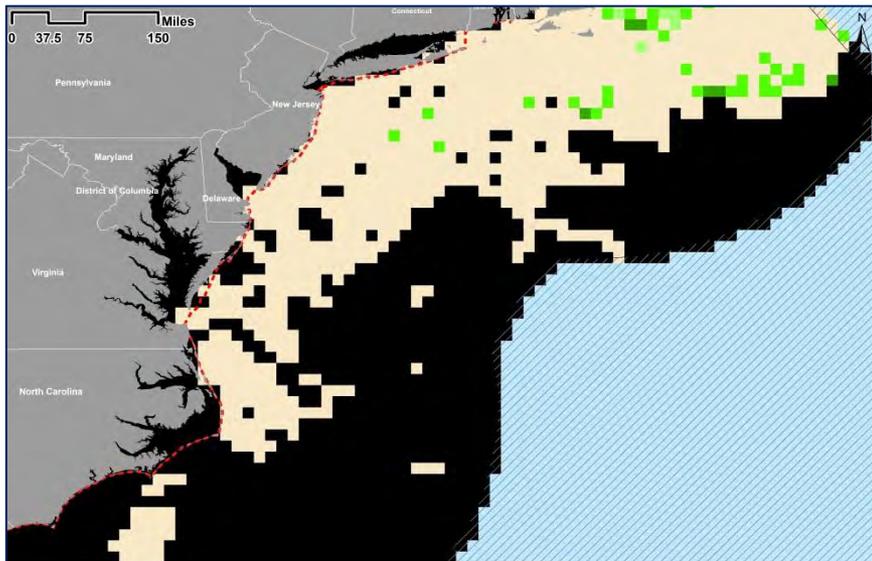
## Right Whale



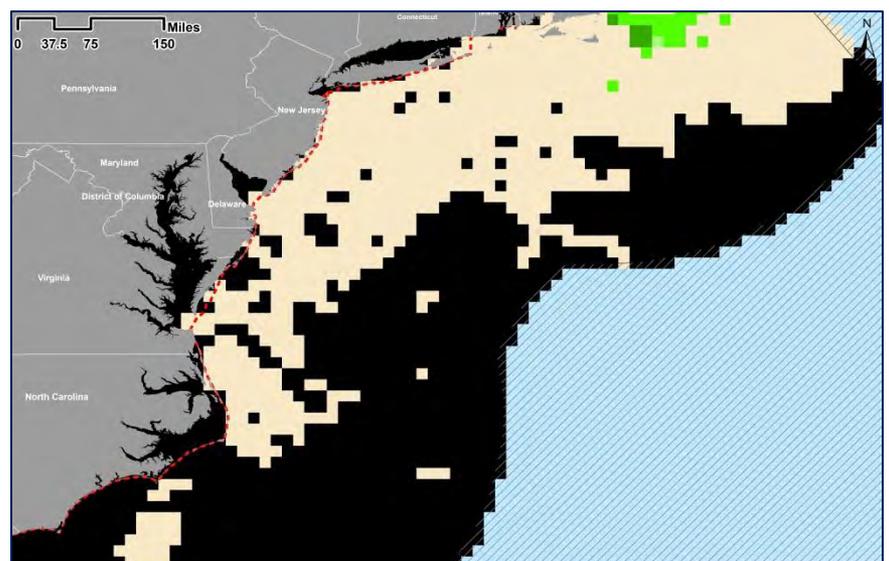
## Humpback Whale



## Fin Whale

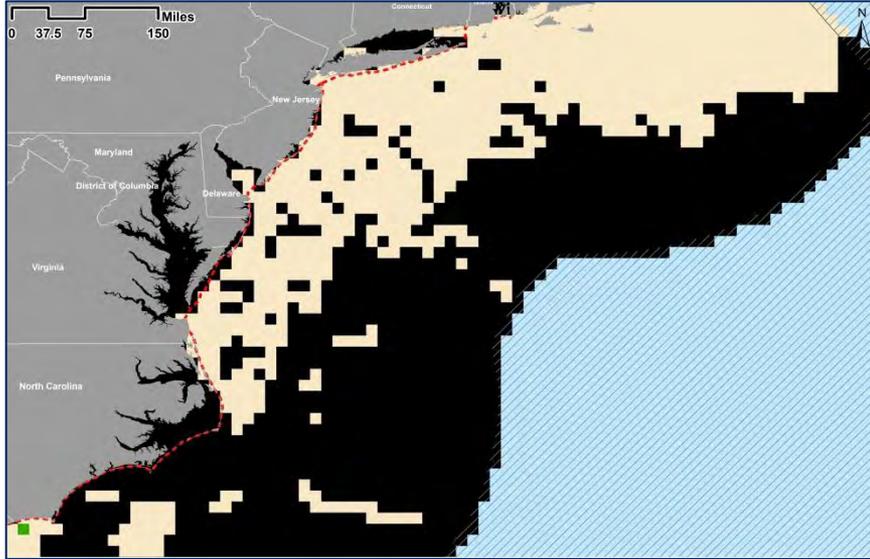


## Combined Right & Humpback Whale

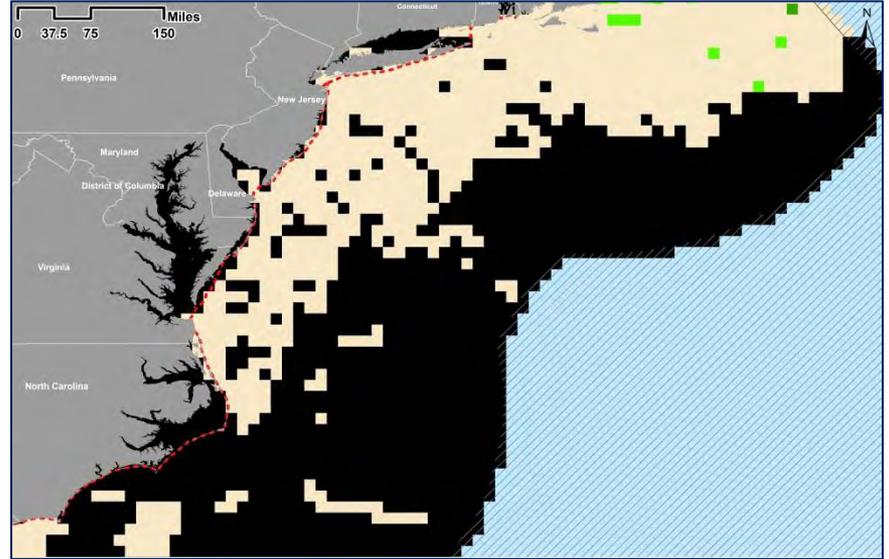


# MID-ATLANTIC - NOVEMBER

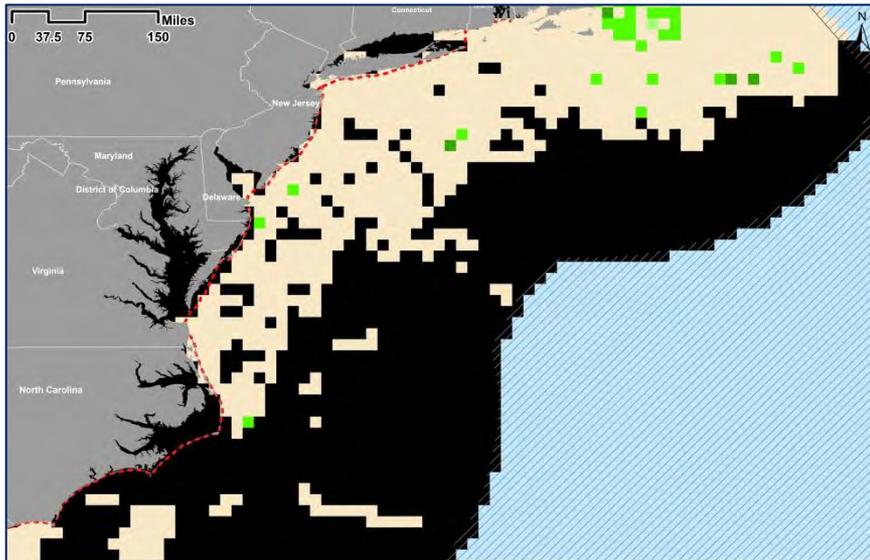
## Right Whale



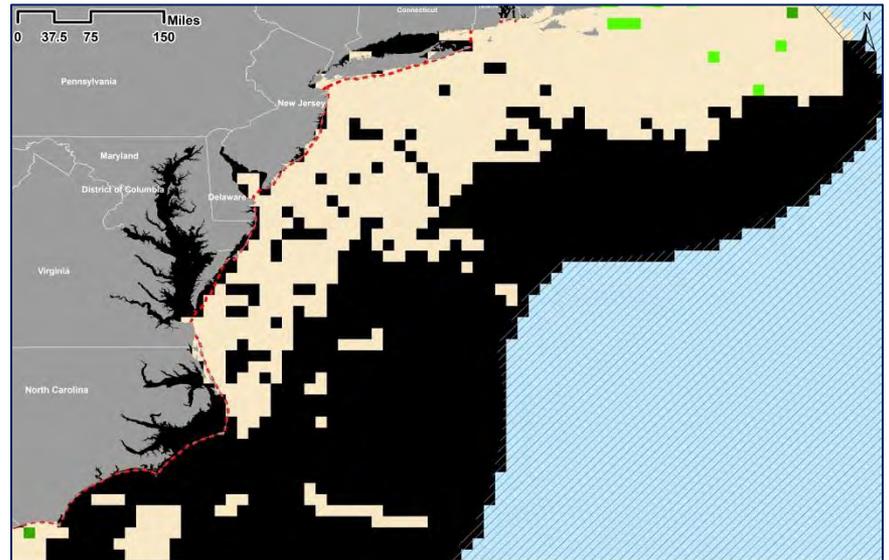
## Humpback Whale



## Fin Whale

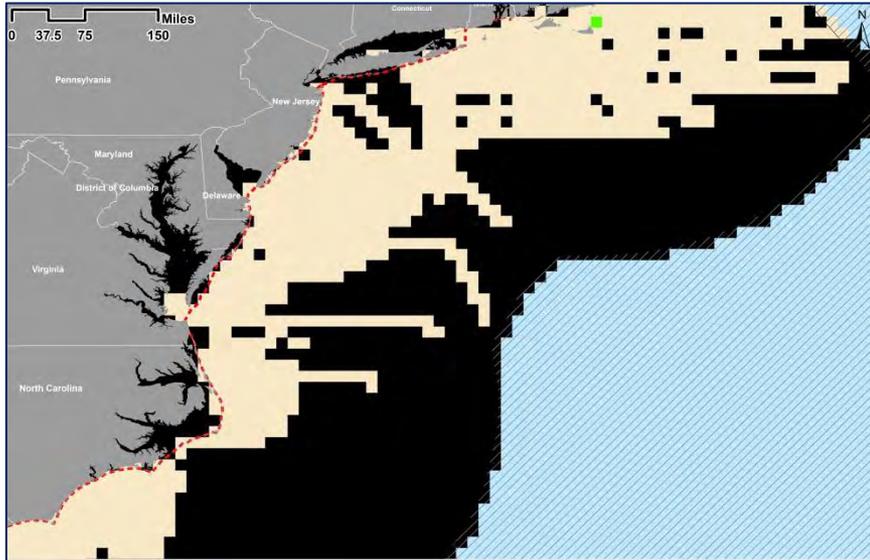


## Combined Right & Humpback Whale

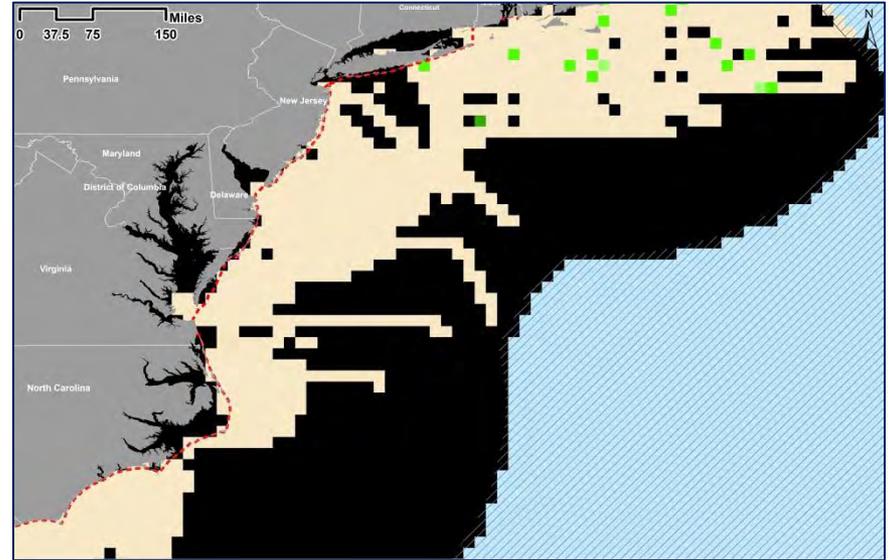


# MID-ATLANTIC - DECEMBER

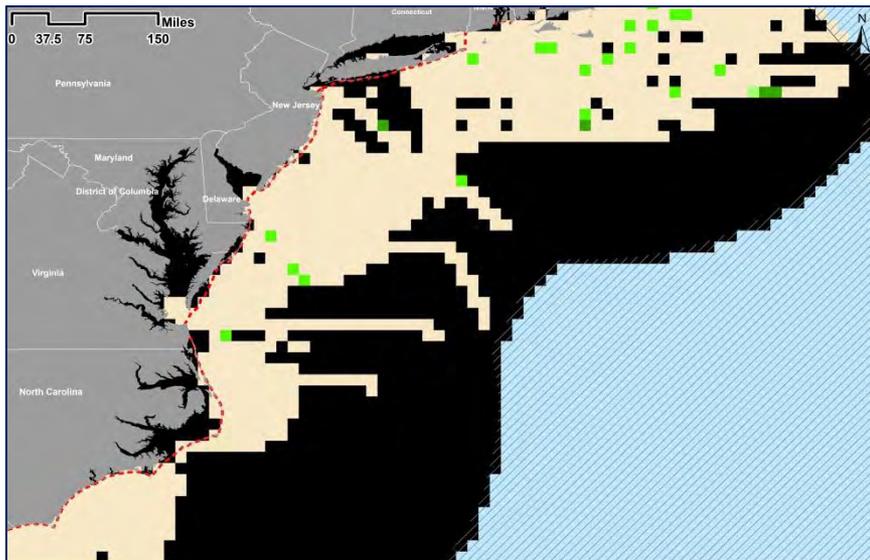
## Right Whale



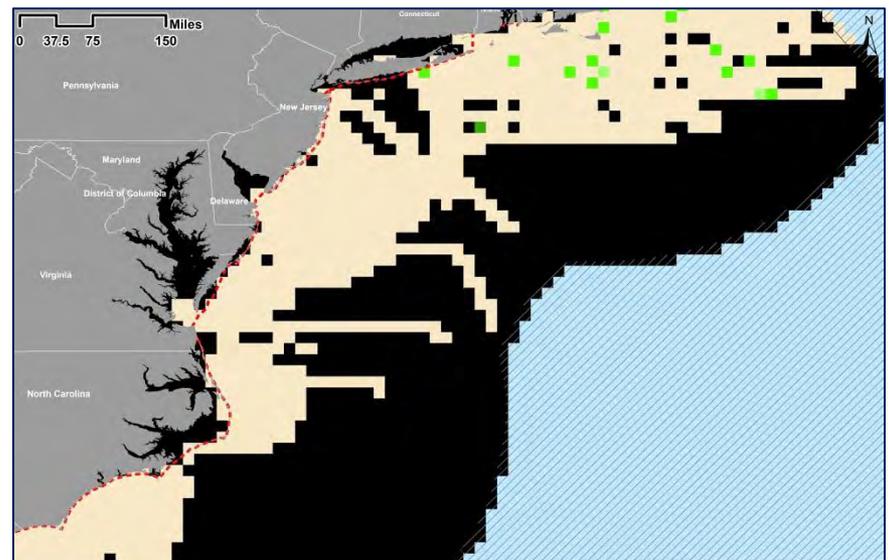
## Humpback Whale



## Fin Whale

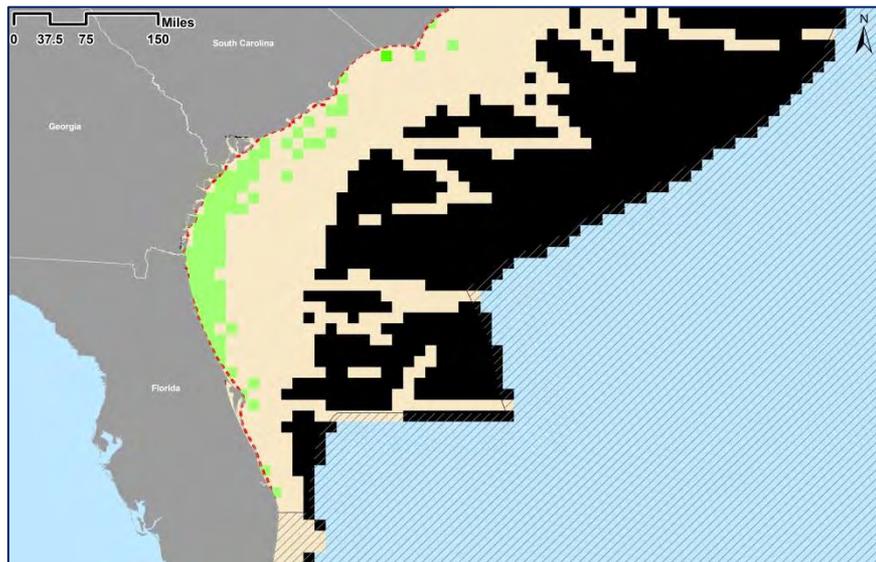


## Combined Right & Humpback Whale

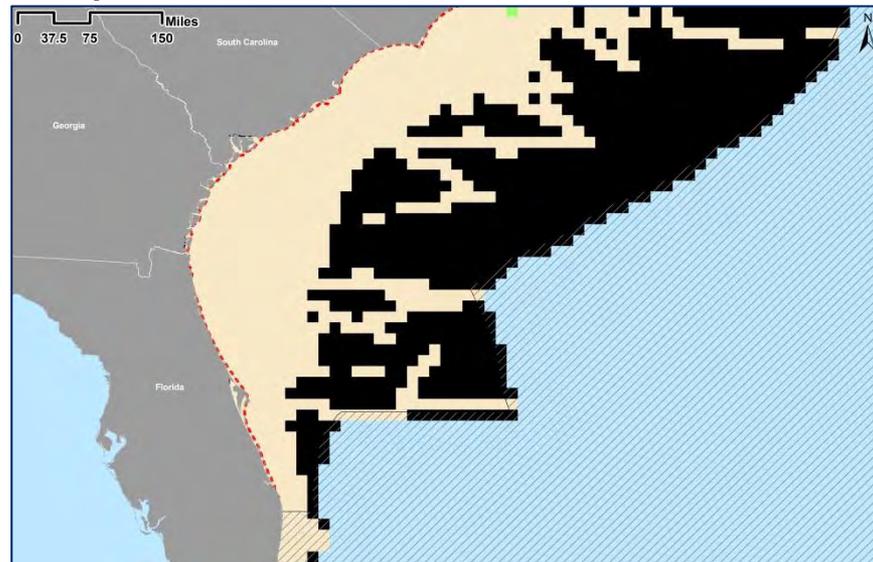


# SOUTHEAST - MONTHLY AVERAGE (NOVEMBER - APRIL)

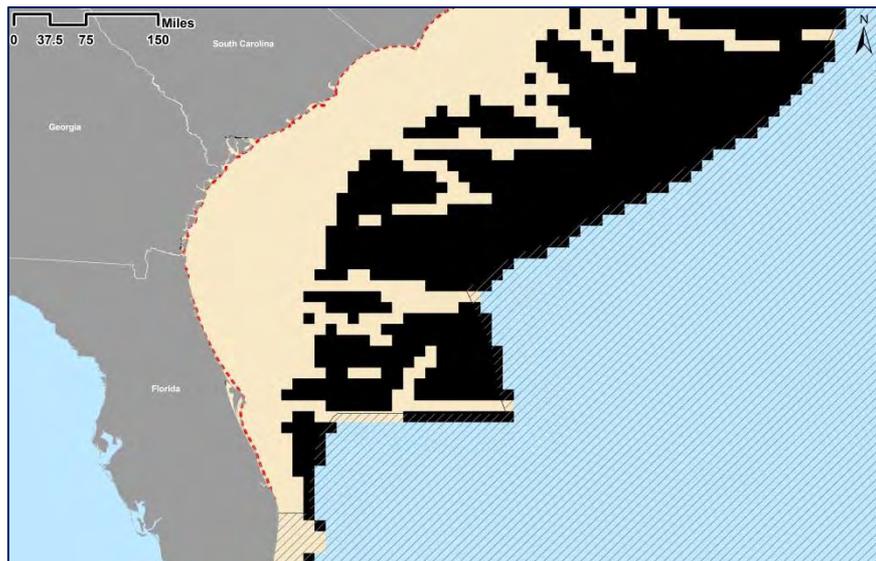
## Right Whale



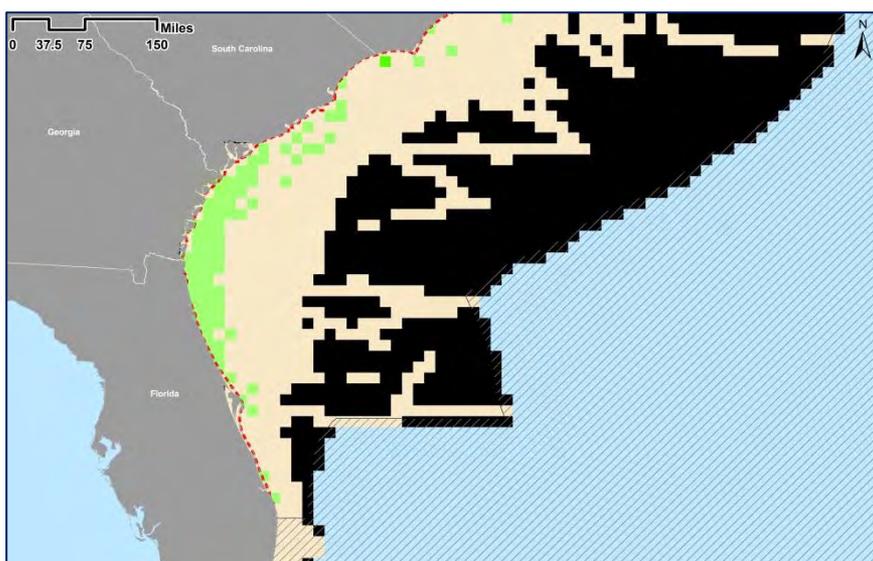
## Humpback Whale



## Fin Whale

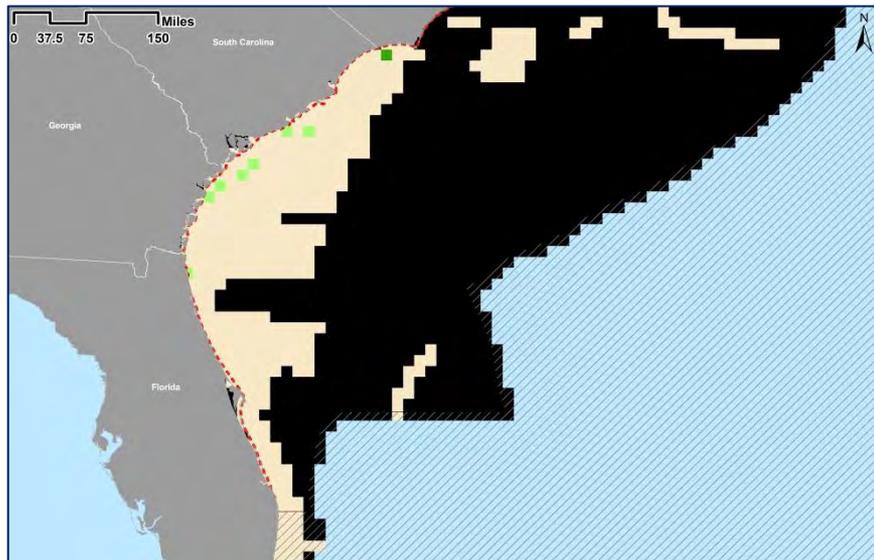


## Combined Right & Humpback Whale

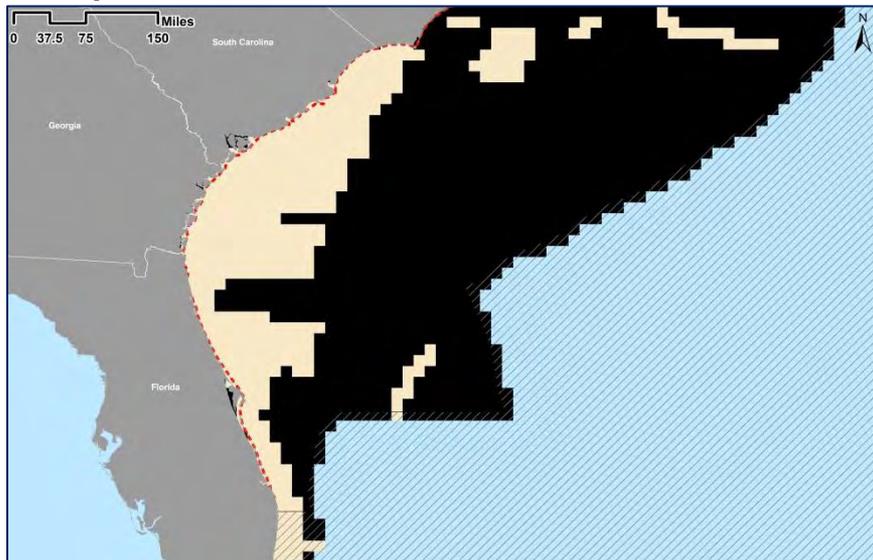


# SOUTHEAST - NOVEMBER

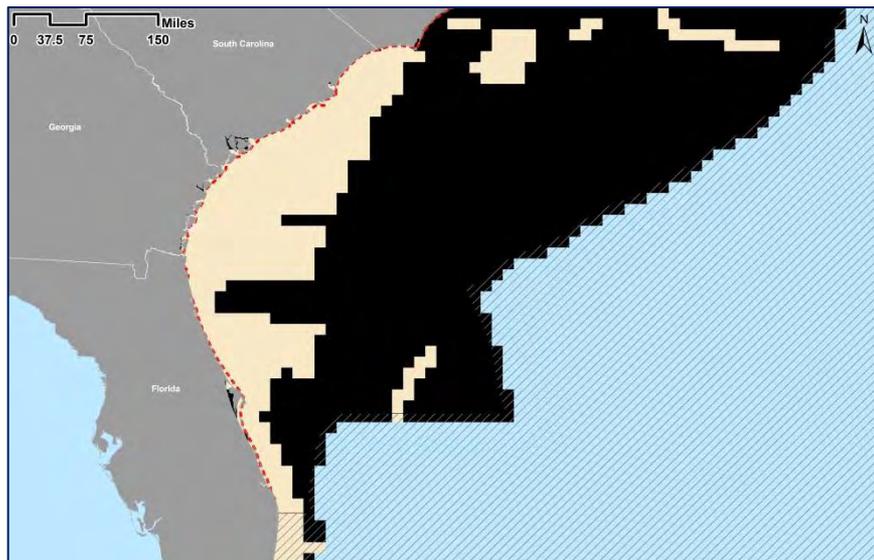
## Right Whale



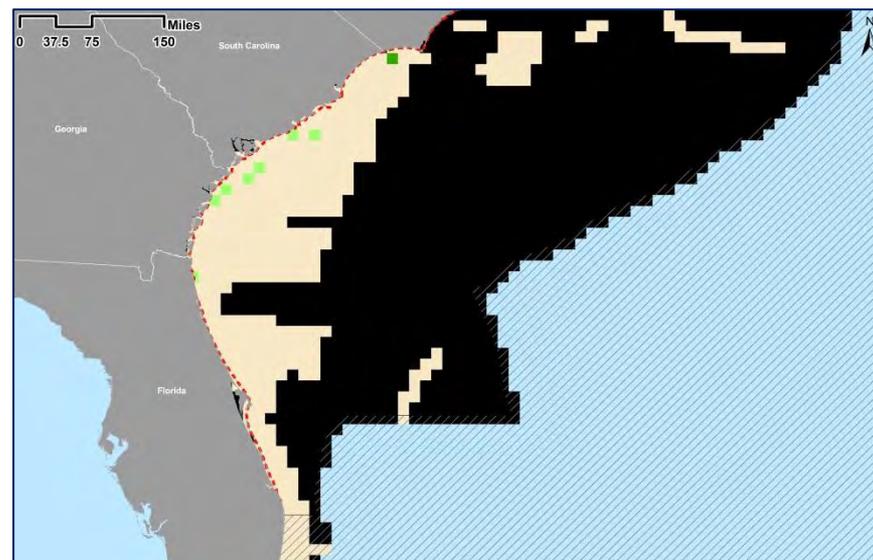
## Humpback Whale



## Fin Whale

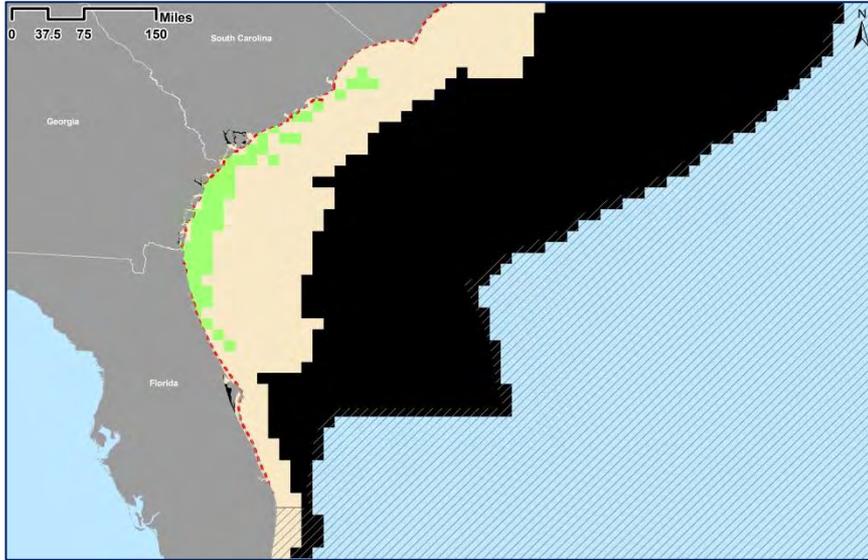


## Combined Right & Humpback Whale

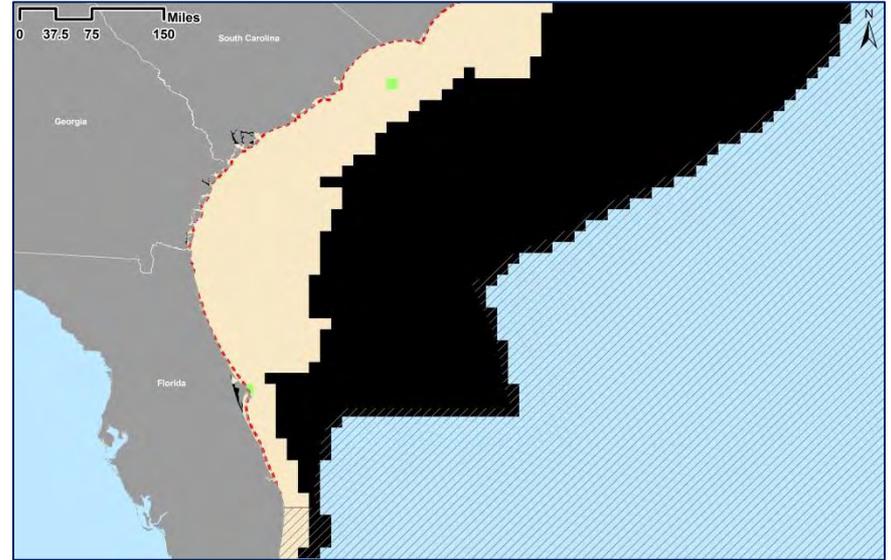


# SOUTHEAST - DECEMBER

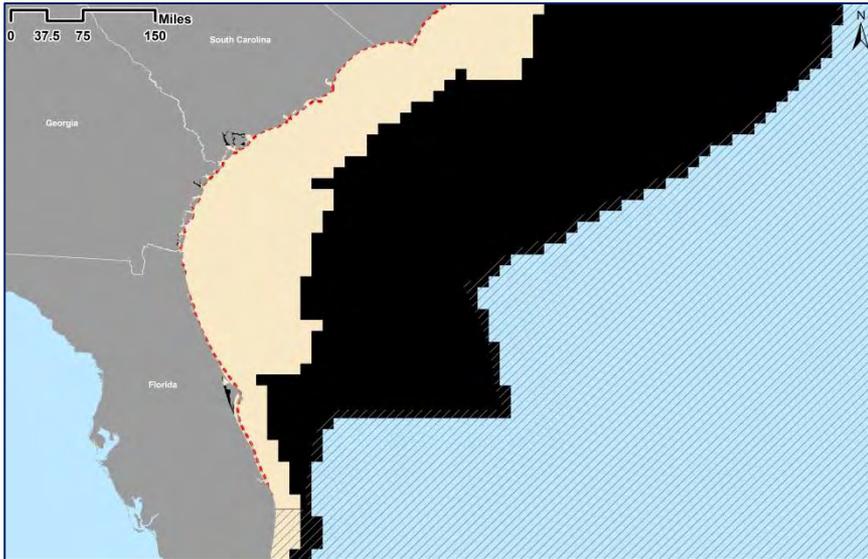
## Right Whale



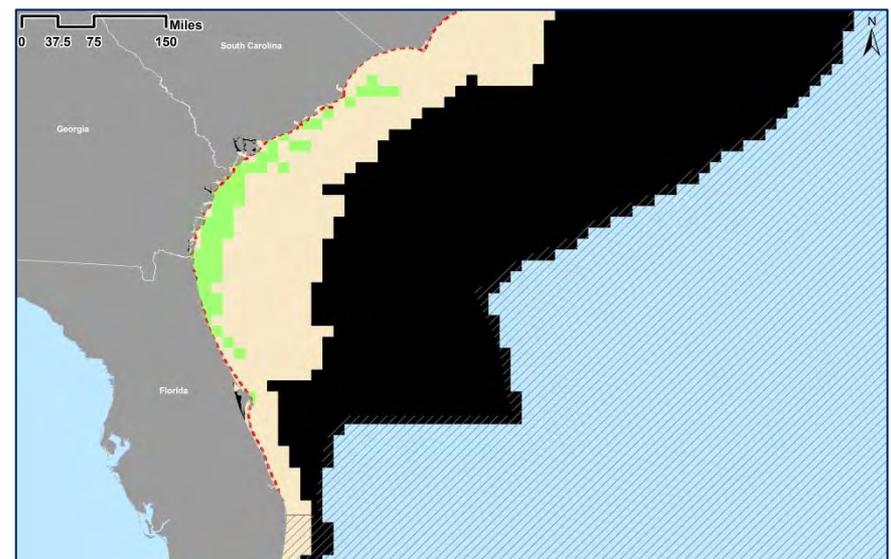
## Humpback Whale



## Fin Whale

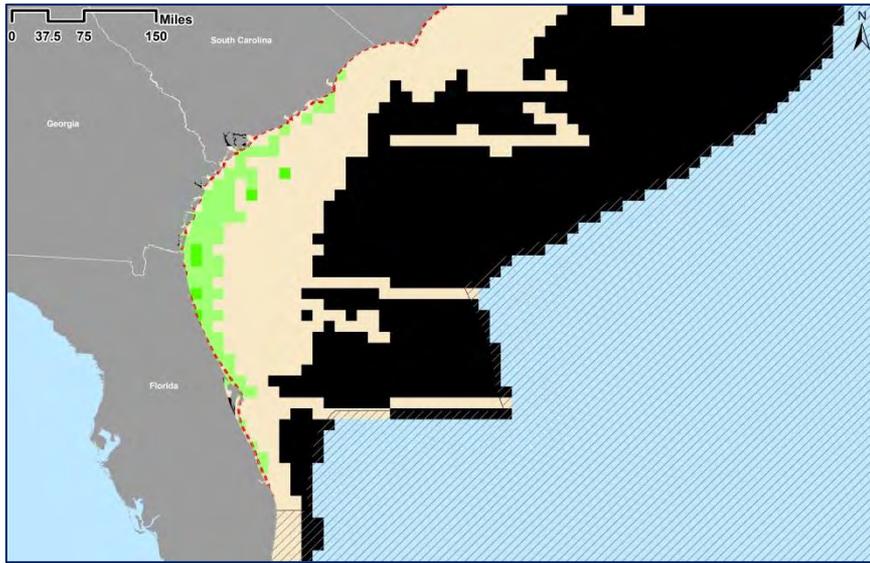


## Combined Right & Humpback Whale

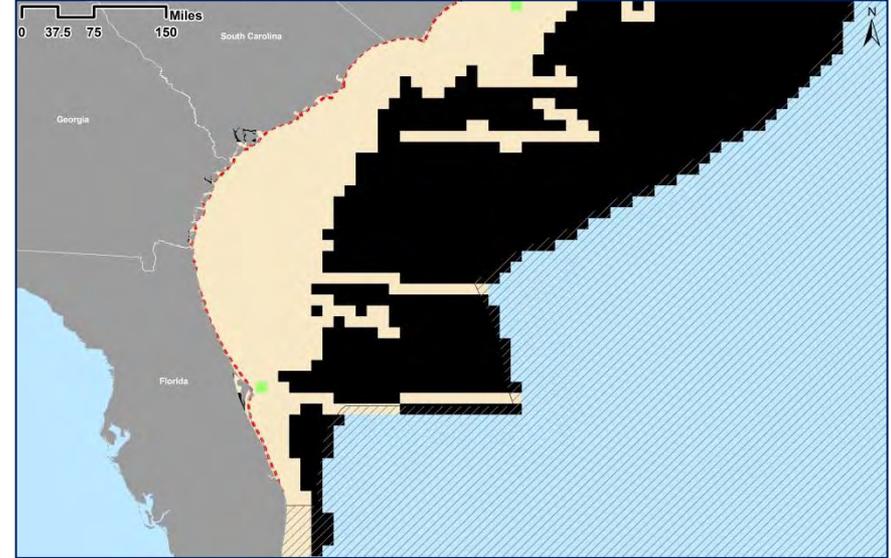


# SOUTHEAST - JANUARY

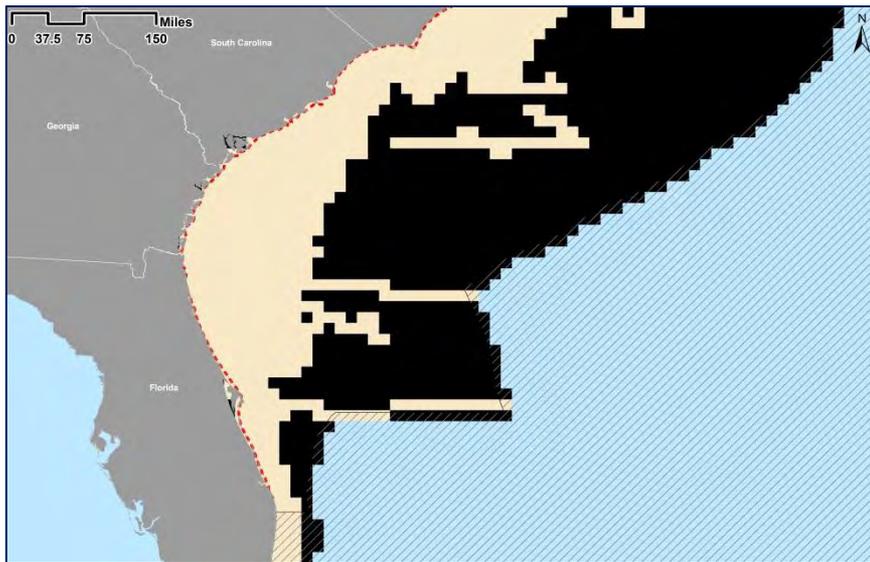
## Right Whale



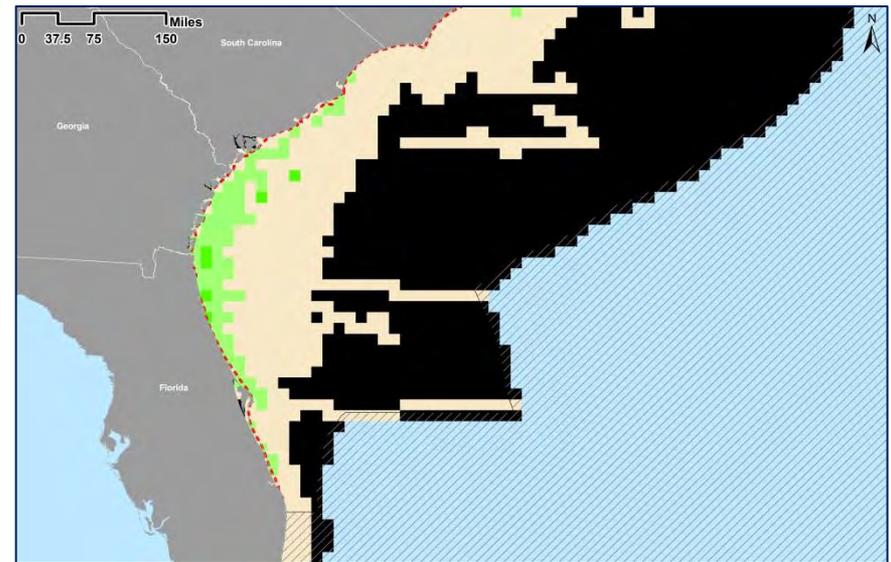
## Humpback Whale



## Fin Whale

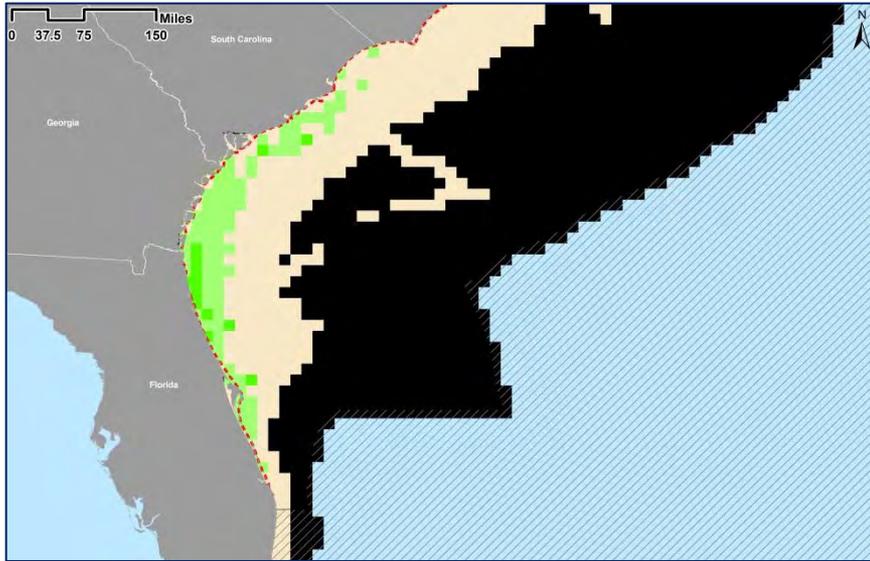


## Combined Right & Humpback Whale

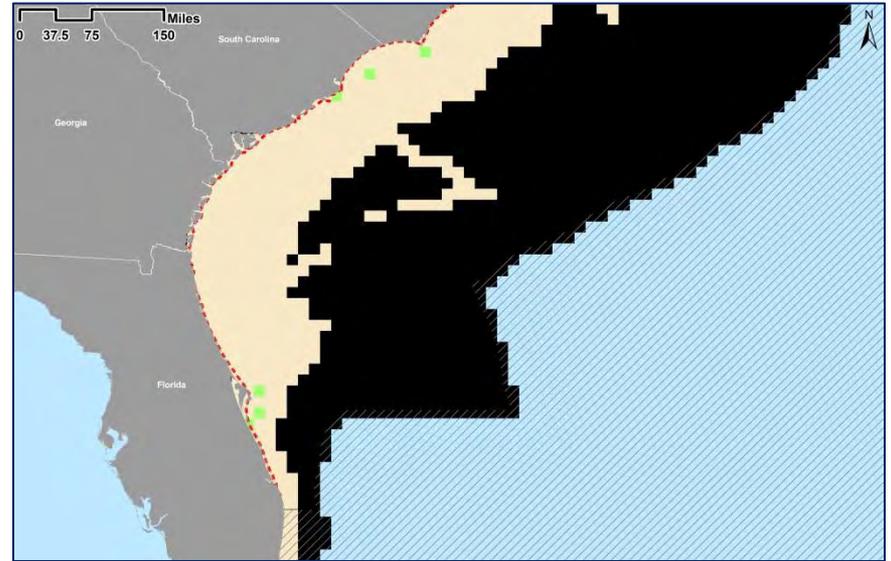


# SOUTHEAST - FEBRUARY

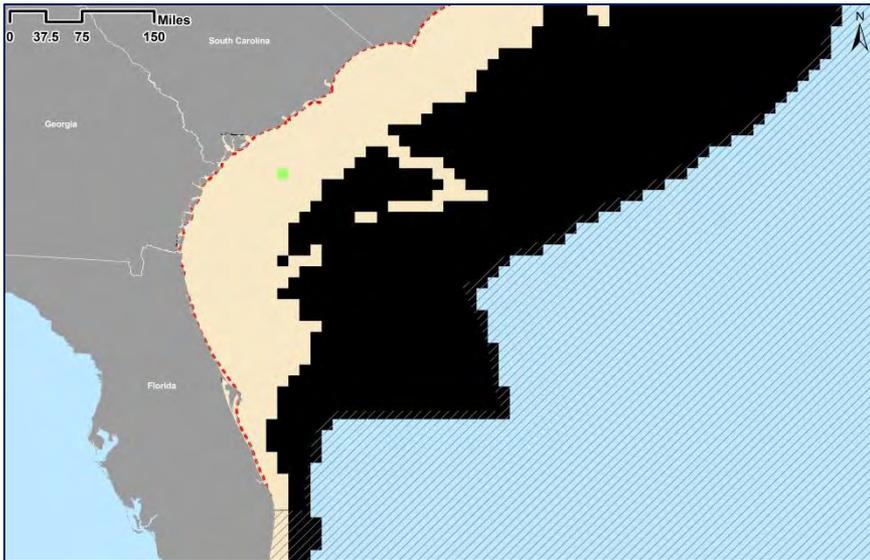
## Right Whale



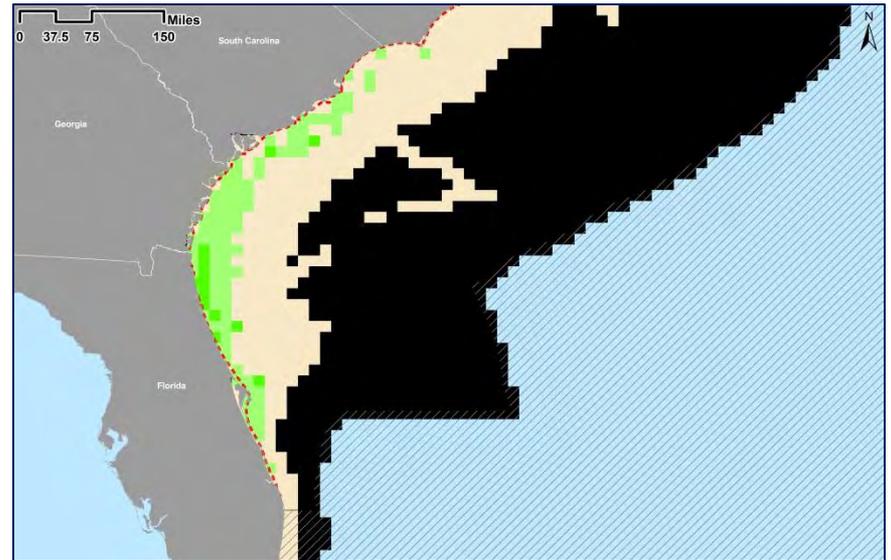
## Humpback Whale



## Fin Whale

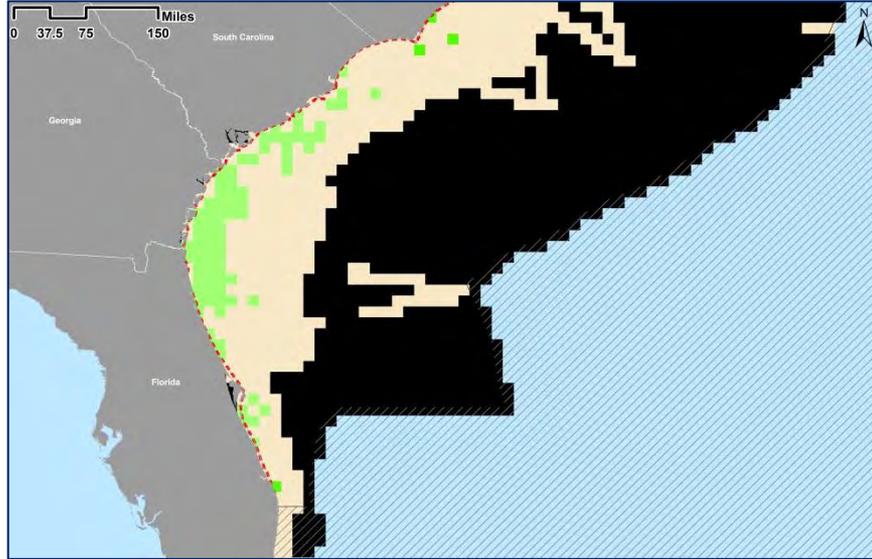


## Combined Right & Humpback Whale

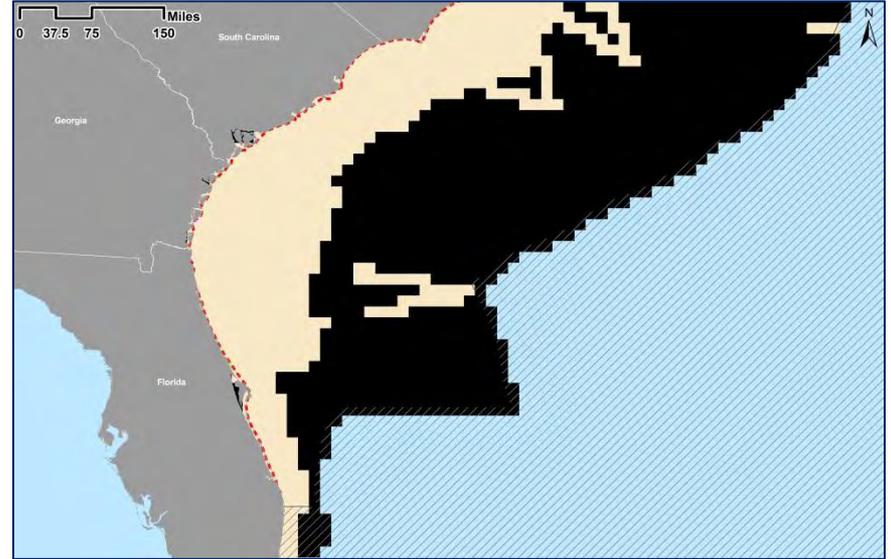


# SOUTHEAST - MARCH

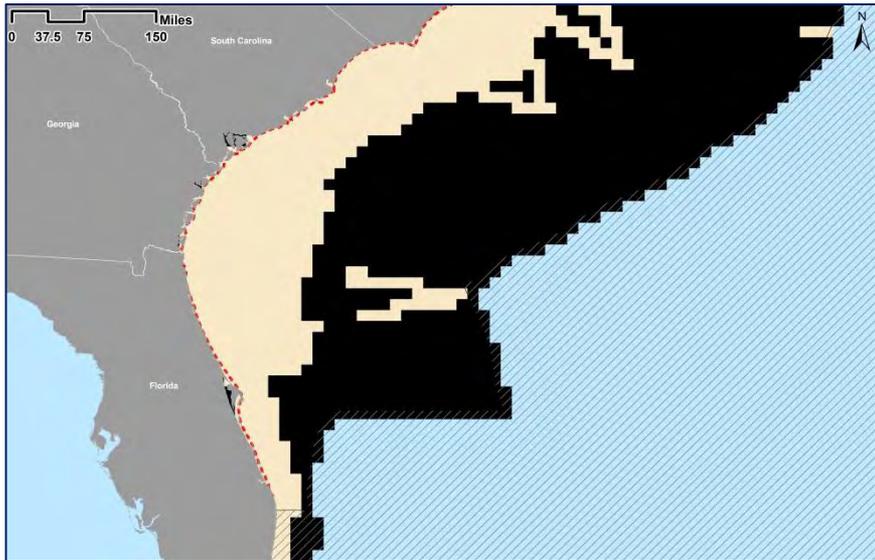
## Right Whale



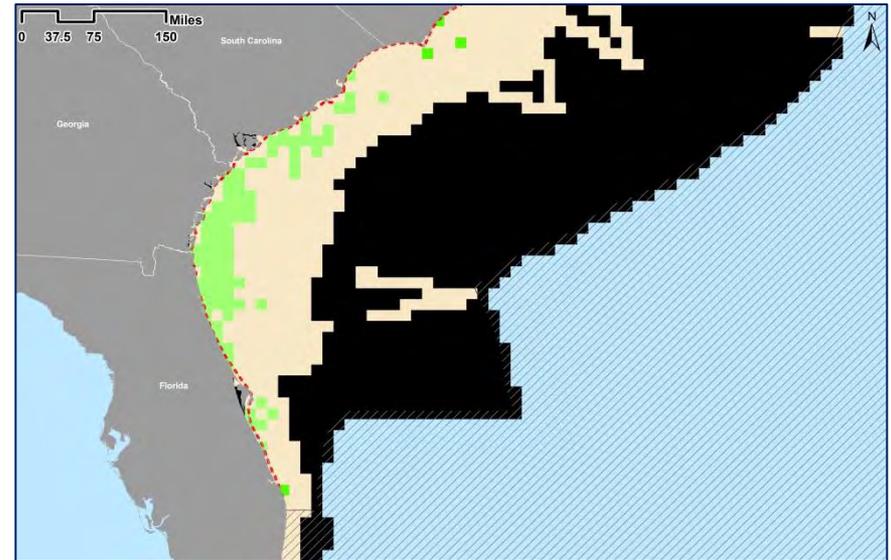
## Humpback Whale



## Fin Whale

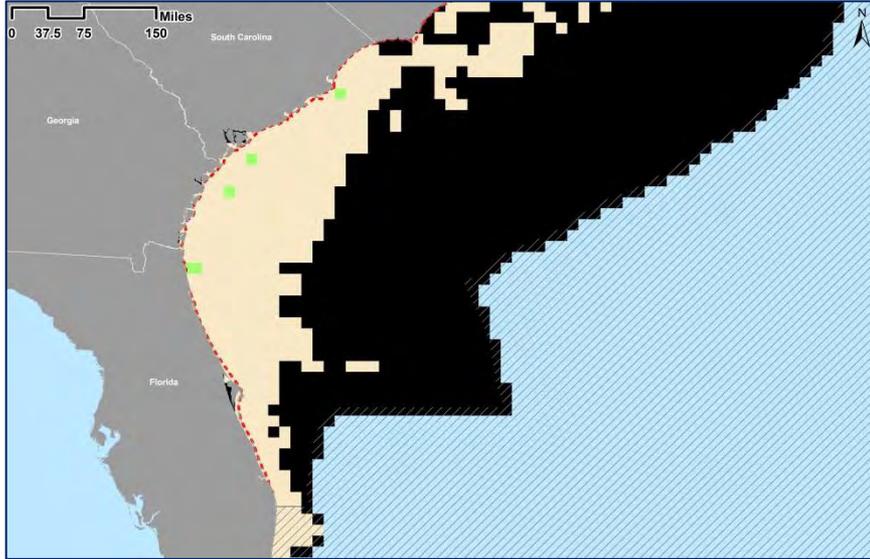


## Combined Right & Humpback Whale

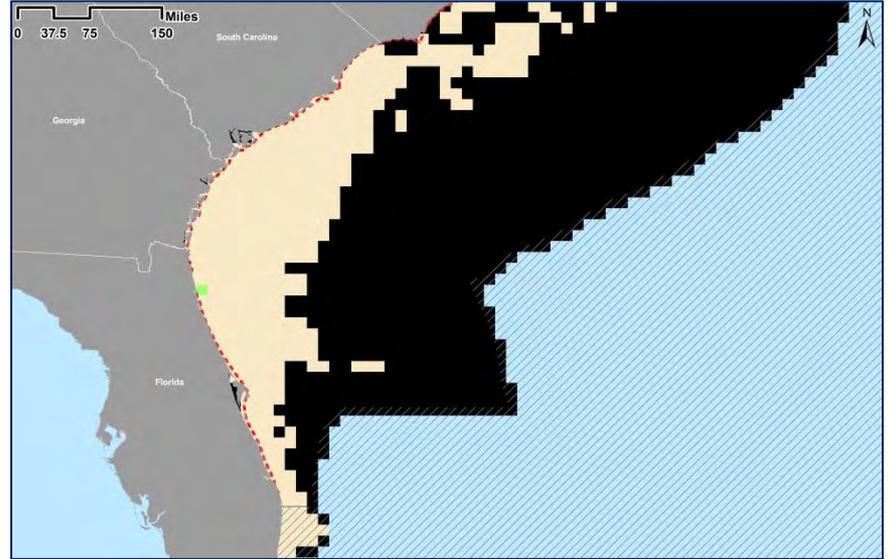


# SOUTHEAST - APRIL

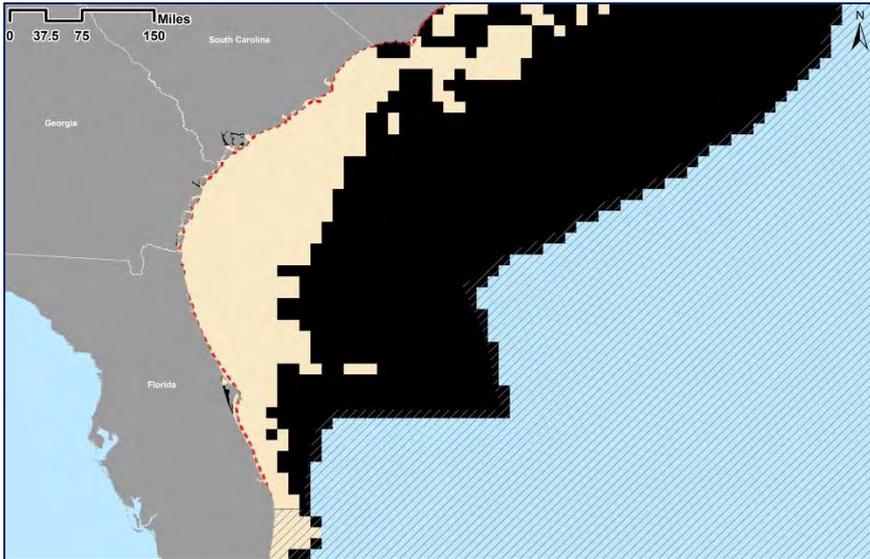
## Right Whale



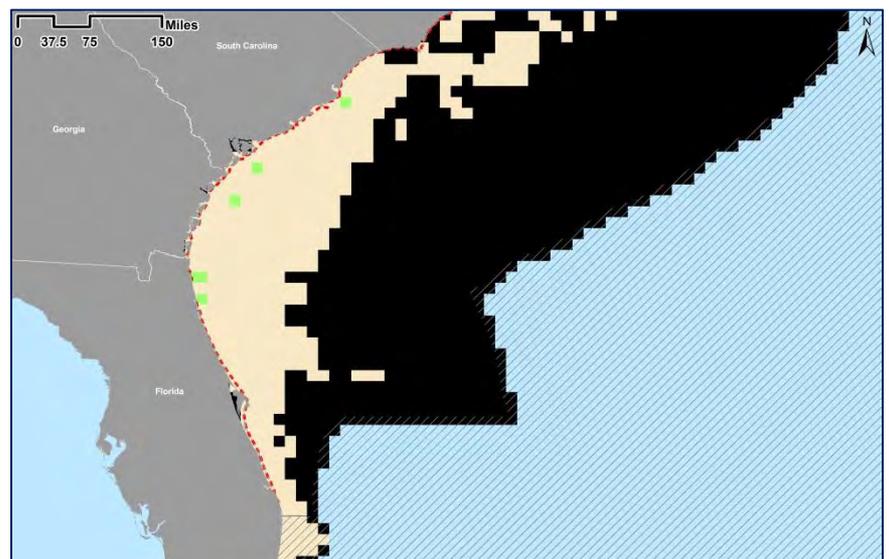
## Humpback Whale



## Fin Whale



## Combined Right & Humpback Whale



**APPENDIX C**

**ANALYSIS OF THE SENSITIVITY OF CO-  
OCCURRENCE SCORES TO THE USE OF ADJUSTED  
SPUE DATA**

## INTRODUCTION

The Vertical Line model develops co-occurrence scores by relying upon data on sightings of right and humpback whales per unit of survey effort (SPUE). The use of effort-corrected sightings data is necessary to characterize the likely distribution of whales within the waters that are subject to the ALWTRP. The dataset, however, is not comprehensive, adding uncertainty to the analysis of baseline co-occurrence scores. This uncertainty is related to two specific issues:

1. Inclusion of SPUE values of “0” that are based on very low levels of survey effort; and
2. The absence of SPUE values (and therefore, co-occurrence values) in areas where effort-adjusted survey data are unavailable.

Members of the Atlantic Large Whale Take Reduction Team (ALWTRT) have expressed concern about these issues and suggested a variety of methods to address them, including a detailed proposal submitted by Dr. Robert Kenney.<sup>1</sup> Dr. Kenney’s proposal focuses on the use of opportunistic sightings data to redefine SPUE values of zero when those values are based on relatively little survey effort. NMFS has developed a modified version of this approach and extended it to address both of the issues noted above. This appendix describes the steps employed to develop adjusted sightings values and presents the results of the analysis.

## ANALYTIC BOUNDARIES AND PARAMETERS

The approach described in this appendix has been applied to a limited geographic area and at a particular spatial resolution. These parameters are described below.

## GEOGRAPHIC EXTENT OF APPLICATION

The adjustment of sightings values has been limited to waters within the ALWTRP’s Northeast region. In addition, Narragansett Bay has been excluded from the analysis, based on the understanding that this area is unlikely to comprise important habitat for right or humpback whales.<sup>2</sup> SPUE-based scores assigned to cells within Narragansett Bay are left unchanged regardless of whether the value is zero or undefined.

## RESOLUTION OF ANALYSIS

The approach employed to develop adjusted sightings values is consistent with the general design of the Vertical Line Model. Specifically:

- Adjusted sightings values are developed for each month, based on multiple years of opportunistic sightings data;
- Adjusted values are developed and assigned at the same spatial resolution as SPUE scores (i.e., 10-minute by 10-minute grid cells);
- Adjusted sightings values are independently developed for both right and humpback whales.<sup>3</sup>

---

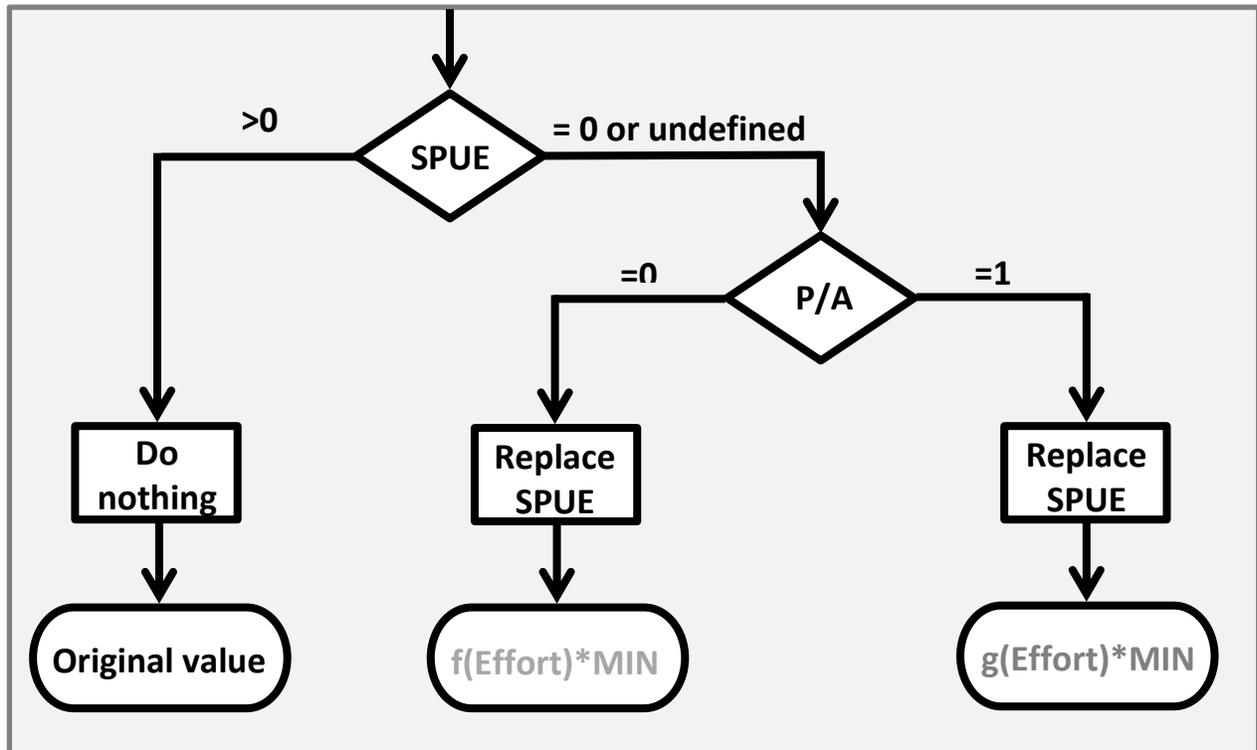
<sup>1</sup> Robert D. Kenney, Ph.D., University of Rhode Island Graduate School of Oceanography, “Estimating Minimum SPUE Values for Right and Humpback Whales in Northeast Areas with Low Survey Effort: An Analysis Completed for the Atlantic Large Whale Take Reduction Team,” January 31, 2012.

<sup>2</sup> Email communication with Dr. Robert Kenney, University of Rhode Island, July 27, 2012.

<sup>3</sup> The adjusted sightings value for the two species combined is the sum of the adjusted values assigned to the individual species.

**ADJUSTED SIGHTINGS VALUES FOR AREAS WITH LIMITED SURVEY EFFORT**

The approach employed to redefine sightings values in cells with limited or no survey effort mirrors closely the approach described in Dr. Kenney’s January 2012 proposal, with some minor revisions. The steps of the analysis are described below, as well as the justification for the approach selected for each step. Exhibit C-1 presents a flow chart that summarizes these steps.

**EXHIBIT C-1. OVERVIEW OF ANALYTIC APPROACH****STEP 1. ISOLATE ZERO AND UNDEFINED VALUES**

In the first step of the analysis, records for which the SPUE value is greater than zero (in which case the original value will be retained) are separated from records for which the value is zero or undefined (in which case the value will be retained or redefined based on the steps described below). This is not to say that a value greater than zero is inherently more reliable than a zero value that is based on the same level of survey effort. Rather, the approach is based on the premise that the ultimate goal of the exercise is to redefine some reasonable, minimal SPUE value for areas and months in which the reported SPUE value is zero or undefined, but there is reason to believe that this value is not representative of the likely distribution of whales. Retaining a zero or undefined value in these instances could cause the model to understate potential co-occurrence.

## STEP 2. APPLY PRESENCE/ABSENCE INDICATOR

Opportunistic sightings data provide additional evidence of the potential for whales to be present in areas where systematic surveys have not identified them. Available opportunistic data are used in conjunction with data on survey effort to determine an adjusted sightings value.

### Preparation and Sources

Data identifying opportunistic sightings of right and humpback whales were retrieved from the North Atlantic Right Whale Consortium (NARWC) Sightings and Survey Database.<sup>4</sup> Each record specifies the date of the sighting, the species sighted, the location (i.e., latitude and longitude), and the certainty of the identification. The records date from the 1800s but are extremely sparse until 1966.

Opportunistic data are used to assign a “Presence/Absence” (P/A) score to each cell by month and species. For a given month and species, if an acceptable record identifies a whale sighting, a P/A score of “1” is assigned. If the available records indicate no sightings, a P/A score of “0” is assigned. For this analysis:

- Only available records from 1966 or later are used; and
- Only records that designate the reliability of the sighting as “sure,” “probable,” or “not recorded” are retained; records of “possible” sightings are omitted.<sup>5</sup>

### Application

The remainder of the analysis applies different treatments to those areas (i.e., cells) in which the opportunistic data confirm that whales have been observed, as opposed to those where no sightings have been documented. Thus, in this step, those cells with a P/A score of “1” are separated from those with a P/A score of “0.” Due to known biases associated with the opportunistic sightings data, NMFS believes it would be inappropriate to apply any greater degree of significance to them than as a simple indicator of the documented presence of whales.

## STEP 3. DEFINE MINIMUM SPUE VALUES

Adjusted sightings scores are based on two factors: an assumed minimum SPUE value (MIN SPUE) that is based on reported non-zero SPUE values for a particular species, as defined in this step, and a multiplier that will be defined in Step 4. There are numerous options for defining a minimum value to be applied to each species, including:

- Use of the annual minimum (non-zero) SPUE value reported for the species in Northeast waters;
- Use of monthly minimum values;
- Use of seasonal minimum values; or
- Other permutations.

---

<sup>4</sup> The NARWC data and User Guide are available at <http://gsosun1.gso.uri.edu/~rkenney/DATABASE/>.

<sup>5</sup> Retaining records for which the reliability of the sighting was not recorded expands the dataset to include the use of NMFS aerial survey records.

For purposes of this analysis, NMFS employs a hybrid approach that adjusts for potentially significant variations in seasonal minimum values. Specifically:

- For right whales, the analysis employs the spring minimum value for the spring and the annual minimum value for the winter, summer, and fall;<sup>6</sup>
- For humpback whales, the analysis employs the winter minimum value for the winter and the spring minimum value for the spring, summer and fall.<sup>7</sup>

These minima are shown in Exhibit C-2.

#### EXHIBIT C-2. NORTHEAST SPUE MINIMA BY SPECIES

	MINIMUM SPUE VALUES REPORTED		MINIMUM SPUE VALUES EMPLOYED IN ANALYSIS	
	RIGHT	HUMPBACK	RIGHT	HUMPBACK
Winter	0.24	0.12	0.24	0.12
Spring	0.73	0.23	0.73	0.23
Summer	0.28	1.40	0.24	0.23
Fall	3.11	1.65	0.24	0.23

#### STEP 4. APPLY FUNCTIONS TO DETERMINE ADJUSTED SIGHTINGS MULTIPLIER

In the final step of the process, a multiplier is applied to the minimum values specified above (MIN SPUE) to calculate the final adjusted sightings value. As Exhibit C-3 illustrates, the magnitude of the multiplier is a function of the P/A score and the survey effort in the cell. When the P/A score for a species is “0” (i.e., when the opportunistic data indicate no sightings of the species within the month and area of interest), the multiplier applied is defined by function f; when the P/A score for a species is “1” (i.e., when the opportunistic data indicate at least one sighting of the species within the month and area of interest), the multiplier applied is defined by function g. In each case, the maximum and minimum multipliers are determined by the P/A score. Specifically:

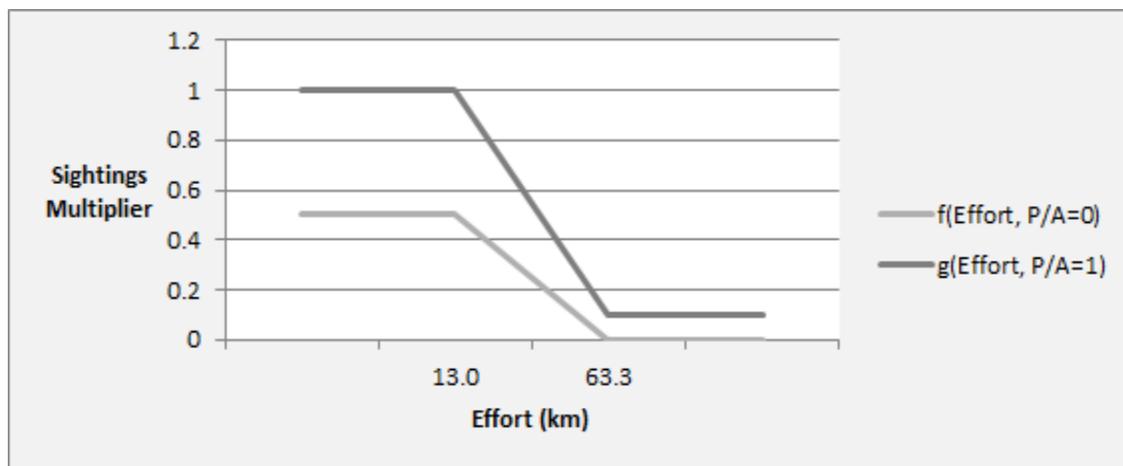
- When  $P/A = 0$ , the maximum multiplier applied to MIN SPUE is 0.5; the minimum multiplier is 0.
- When  $P/A = 1$ ; the maximum multiplier applied to MIN SPUE is 1; the minimum multiplier is 0.1.

<sup>6</sup> For this analysis, as in the Vertical Line Model, the seasons are defined as follows: Winter, January-March; Spring, April-June; Summer, July-September; Fall, October-December.

<sup>7</sup> This approach is consistent with Dr. Kenney’s recommendation in an email dated 7/27/2012.

In both cases, the maximum multiplier is applied whenever the survey effort for the area and month in question is less than 13 kilometers, a distance that in the Northeast corresponds roughly to one latitudinal transit of a 10-minute grid cell. Conversely, the minimum multiplier is applied whenever the survey effort for the area and month in question is greater than or equal to 63.3 km, which is the median level of survey effort per cell in the Northeast across all months. When the survey effort for the area and month in question is between these two values, the multiplier applied to MIN SPUE is defined by function  $f$  when  $P/A = 0$ , and function  $g$  when  $P/A = 1.8$ . The underlying assumption is that the greater the survey effort associated with a reported SPUE value of zero, the greater the likelihood that the reported value is representative of the actual distribution of the species (i.e., the greater the likelihood that the “true” value is zero or very close to zero). This is particularly the case when no opportunistic sightings have been reported.

#### EXHIBIT C-3. FUNCTIONS EMPLOYED IN DEVELOPING ADJUSTED SIGHTINGS VALUES



#### EFFECT ON SIGHTINGS AND CO-OCCURRENCE SCORES

The full results of the analysis are presented in the attachments that follow. Attachment C-1 shows the impact of the analysis on the combined sightings score for right whales and humpback whales in Northeast waters, while Attachment C-2 shows the corresponding impact on baseline co-occurrence scores. As intended, the analysis increases sightings scores in areas and months that have been the subject of little or no systematic survey effort. The overall effect is to eliminate all undefined cells, with the exception of those within Narragansett Bay, and to retain zero values only in cells where (1) whales have not been sighted after substantial survey effort and (2) opportunistic sightings have not been recorded. All other cells that had undefined or zero SPUE values have been replaced with minimum values that vary based on the extent of survey effort within the cell and whether records of opportunistic sightings exist. This in turn increases co-occurrence scores in areas where vertical line is present. This is particularly noticeable in areas of Maine state waters landward of the ALWTRP exemption line, where there is a relatively high concentration of vertical line.

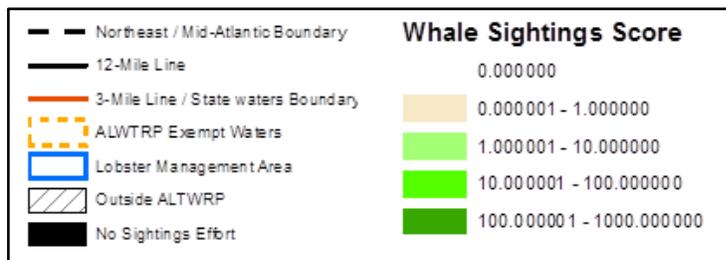
<sup>8</sup> Expressed in slope-intercept form, these equations are approximately:  $f(\text{Effort}, P/A=0) = -0.01 \cdot \text{Effort} + 0.63$  and  $g(\text{Effort}, P/A=1) = -0.018 \cdot \text{Effort} + 1.234$ .

## Attachment C-1

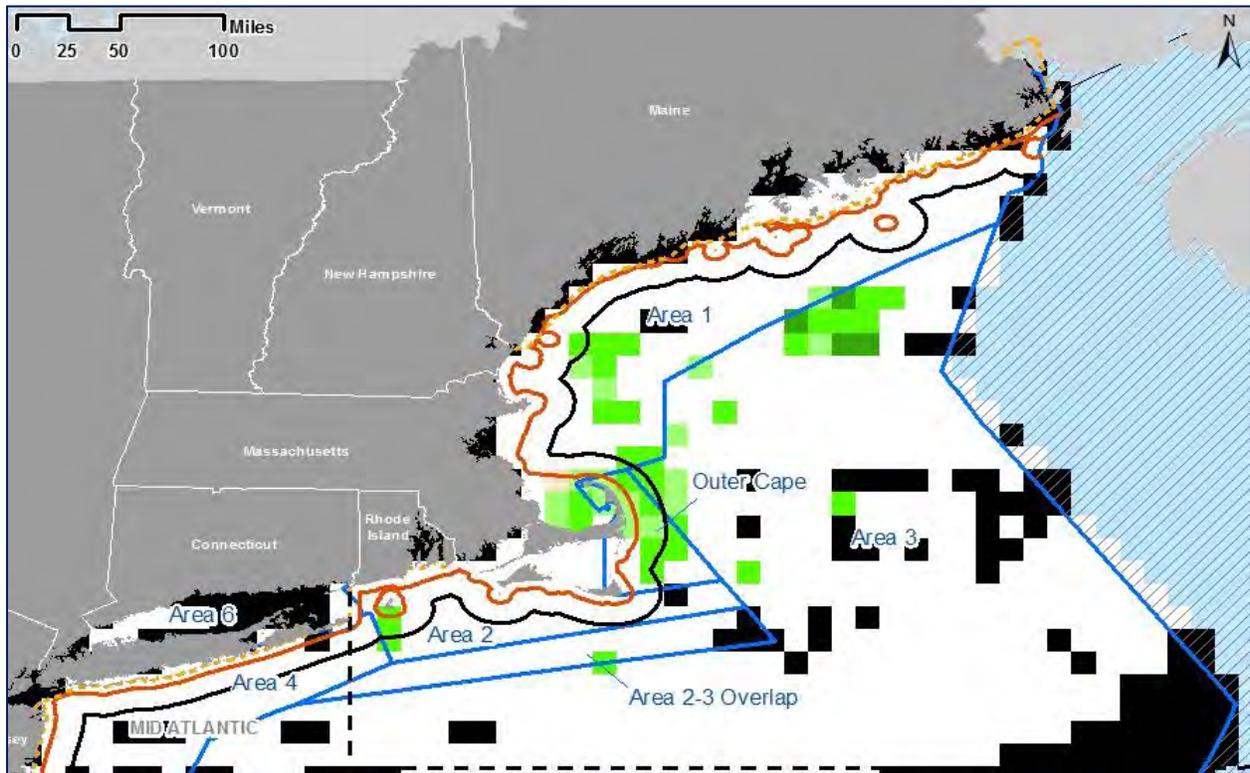
## NORTHEAST SIGHTINGS COMPARISON: COMBINED RIGHT/HUMPBACK WHALE

### INTRODUCTION

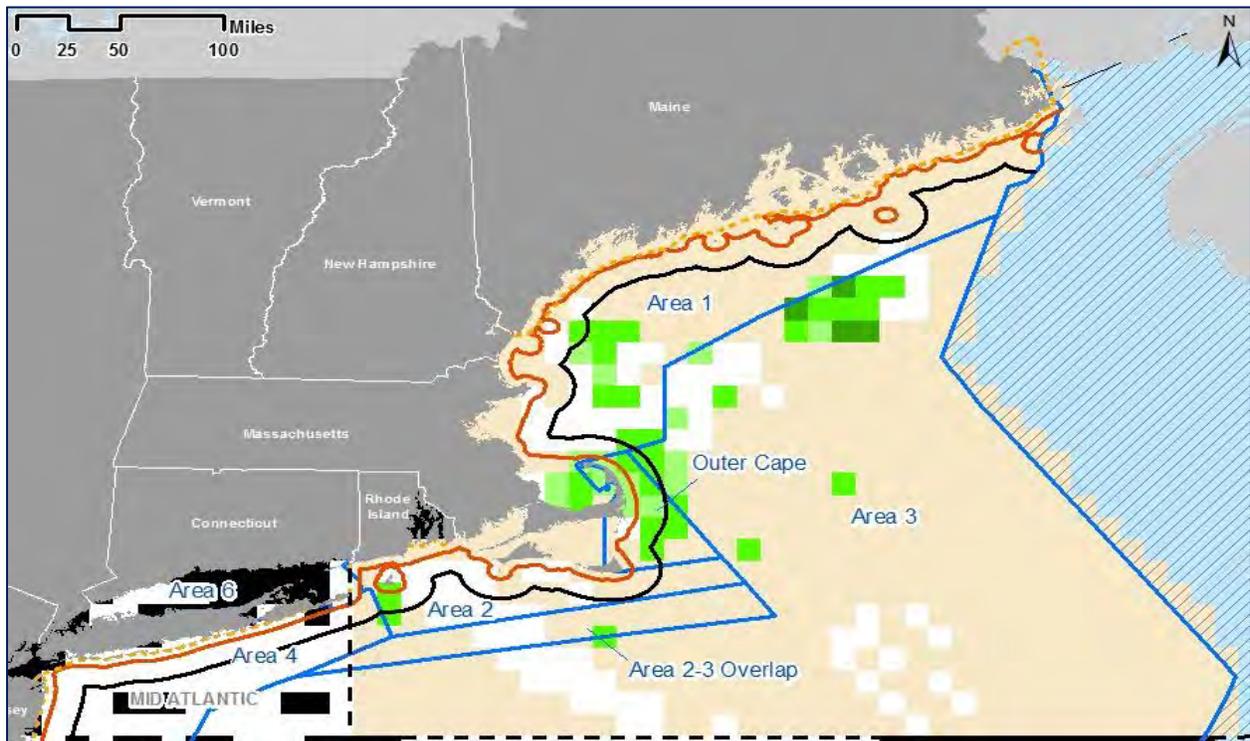
The maps contained in this attachment show the monthly distribution of right and humpback whales (combined) in Northeast waters, indexed to an annual maximum value of 1000. On each page, the first map displays sightings scores based upon reported SPUE values; the second map displays adjusted sightings scores (i.e. after the steps outlined in this appendix have been applied). The legend for these maps is shown below.



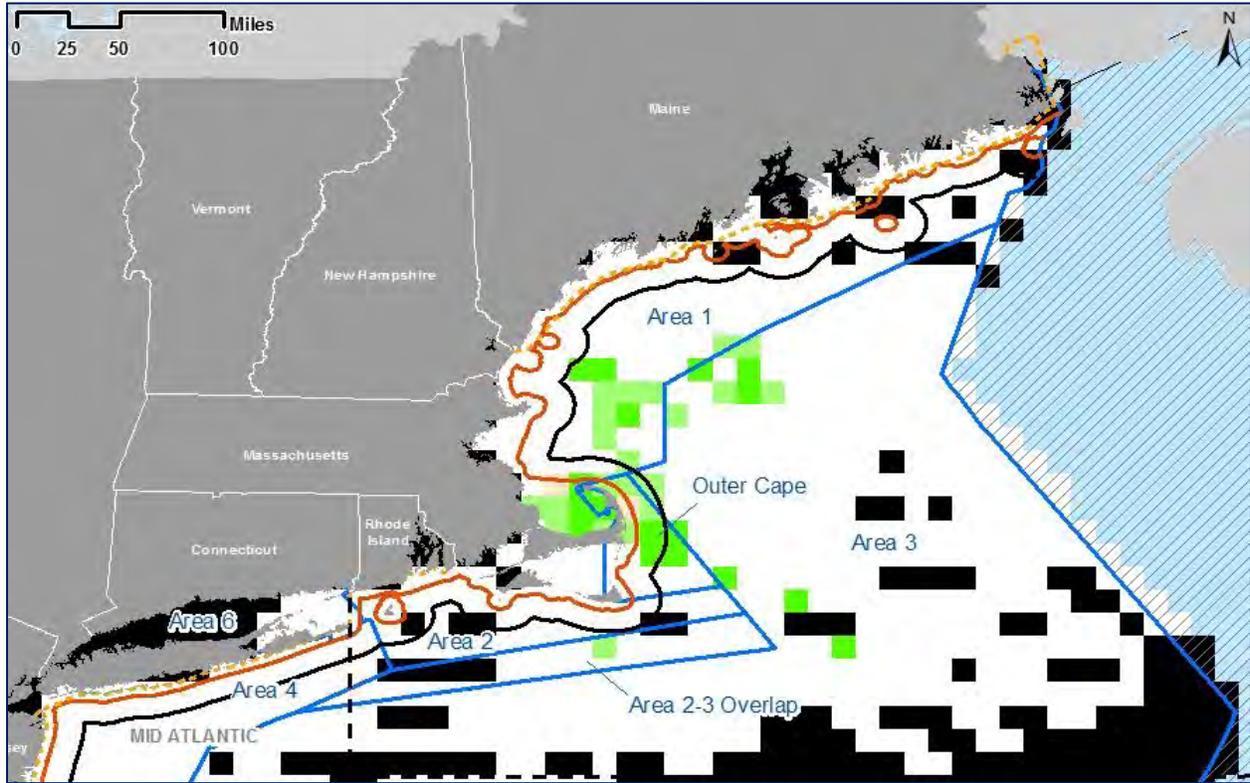
**JANUARY - SPUE**



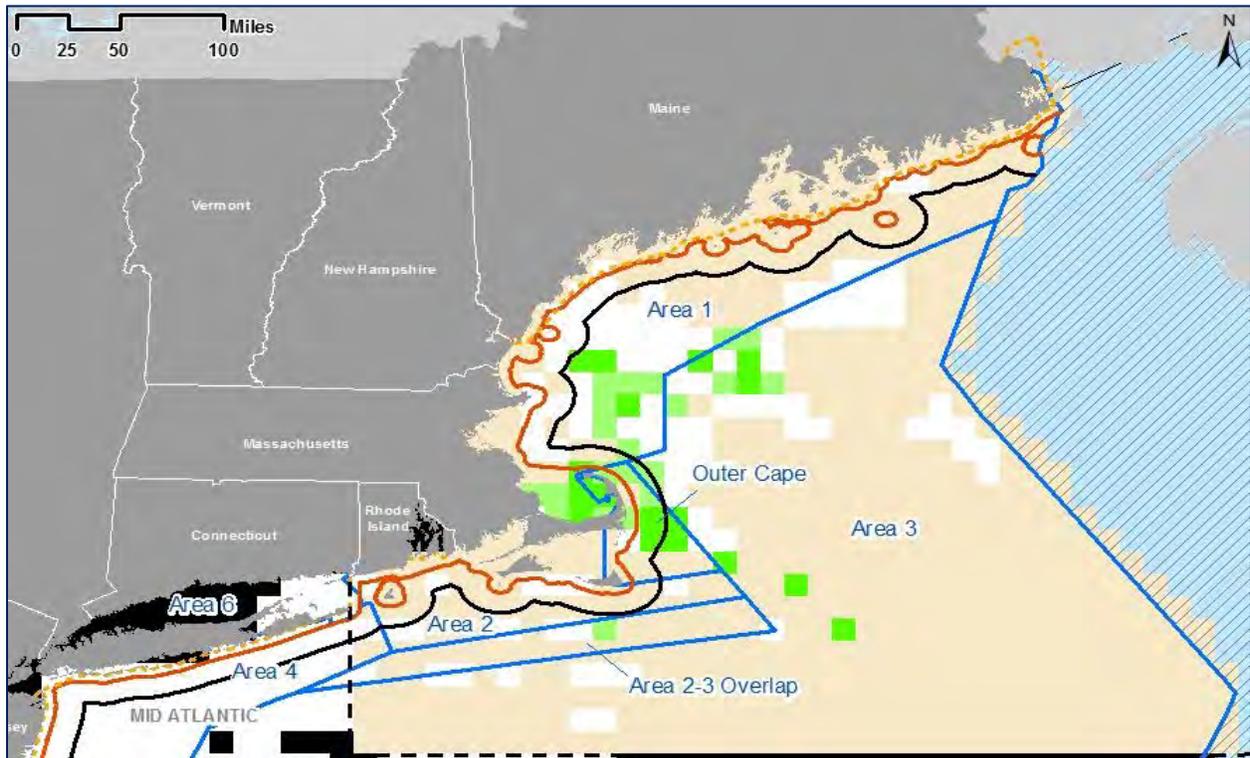
**JANUARY – ADJUSTED SIGHTINGS**



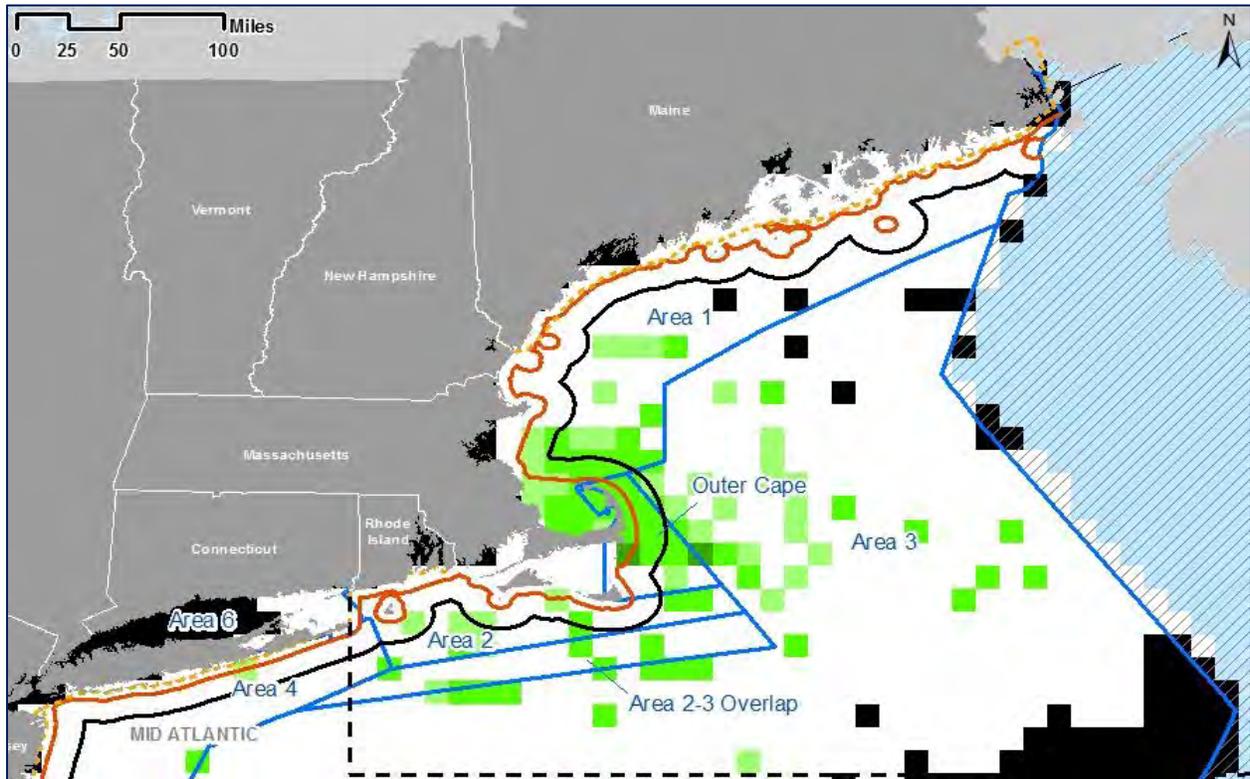
**FEBRUARY – SPUE**



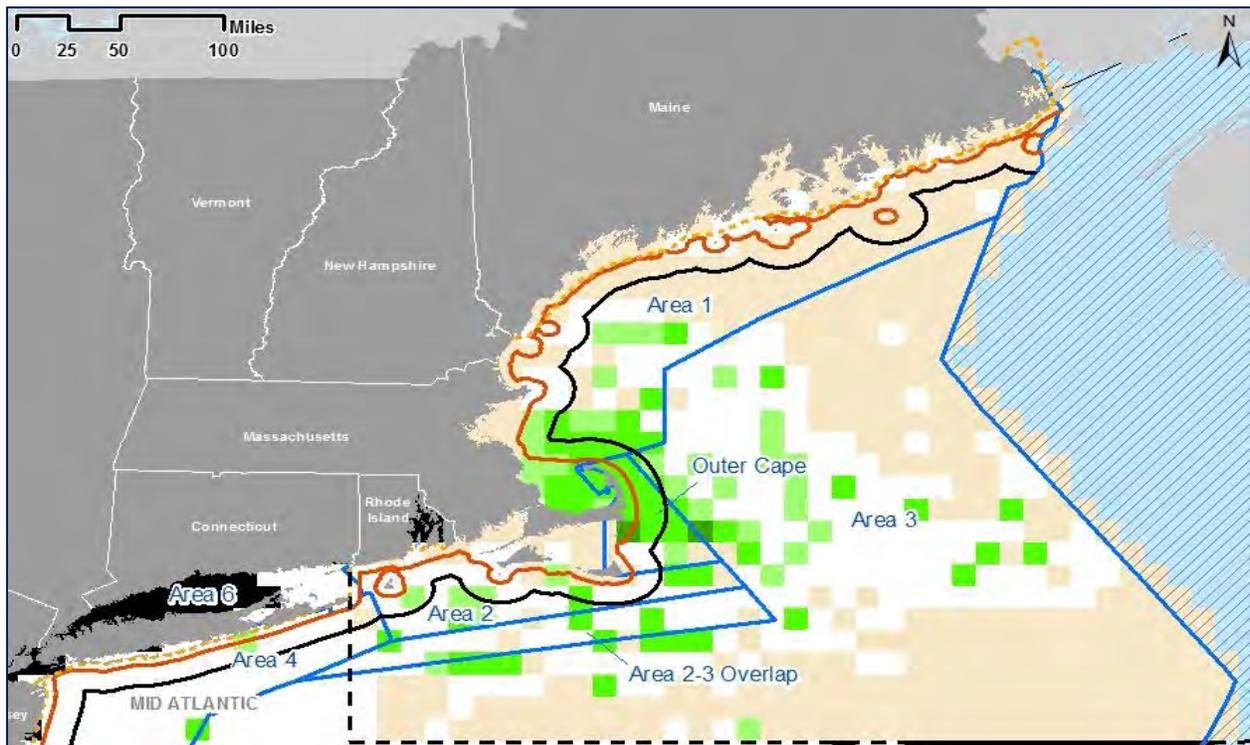
**FEBRUARY – ADJUSTED SIGHTINGS**



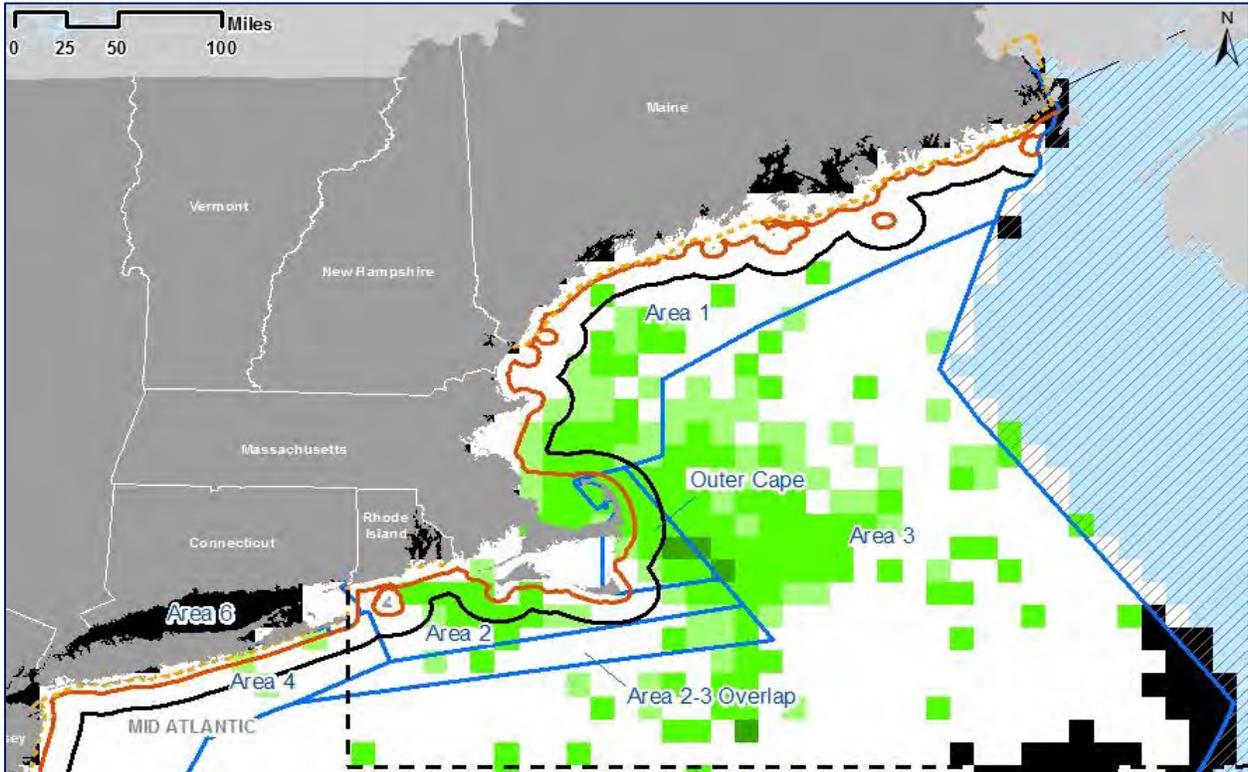
**MARCH – SPUE**



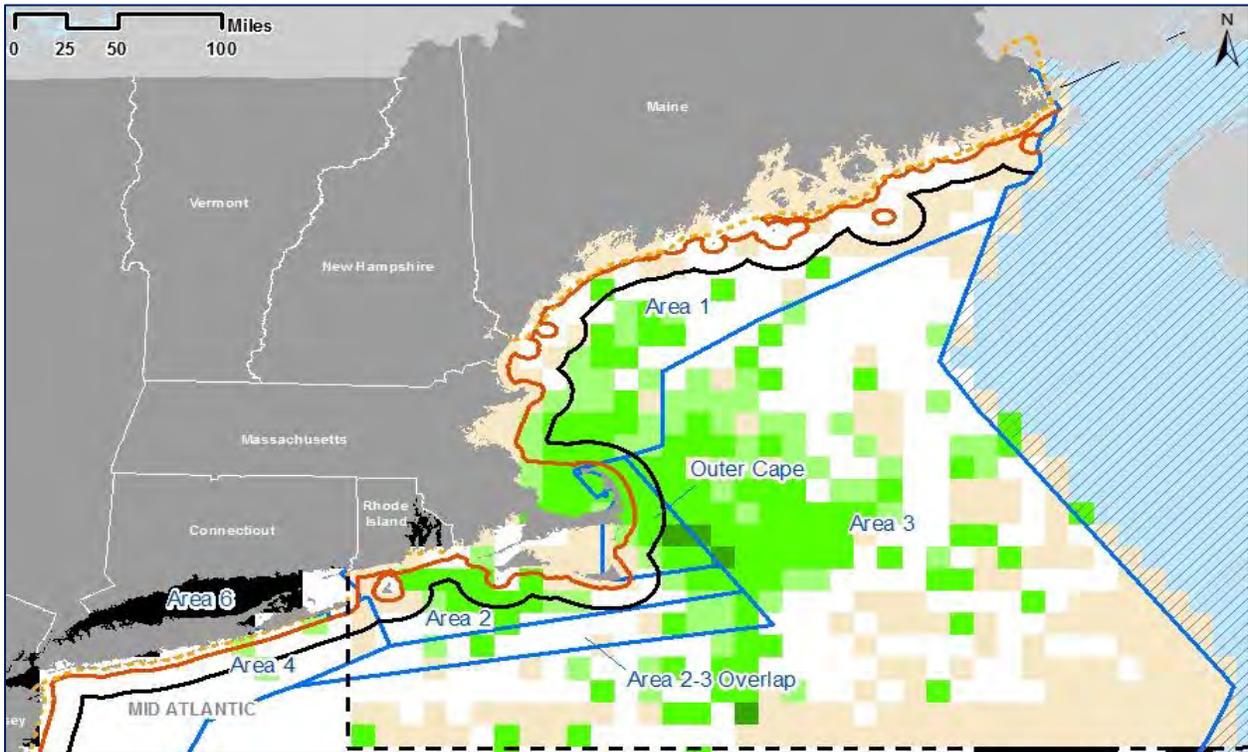
**MARCH – ADJUSTED SIGHTINGS**



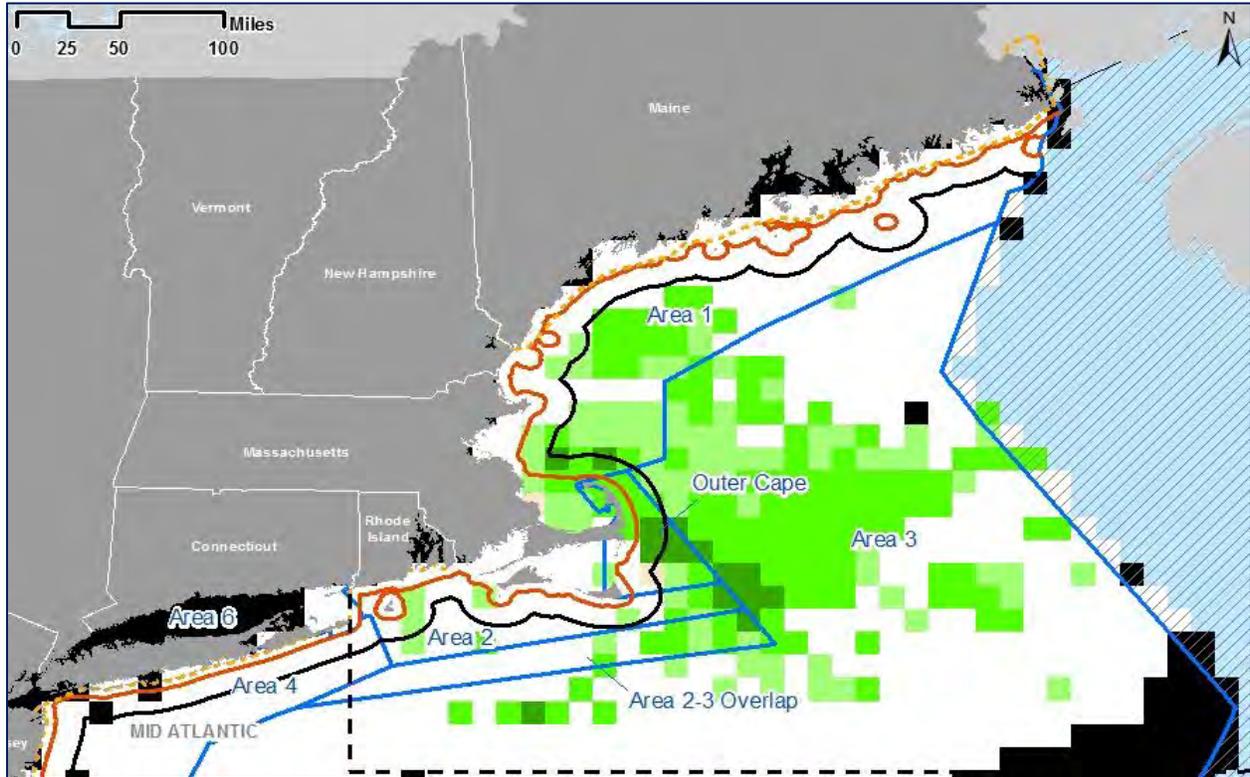
APRIL – SPUE



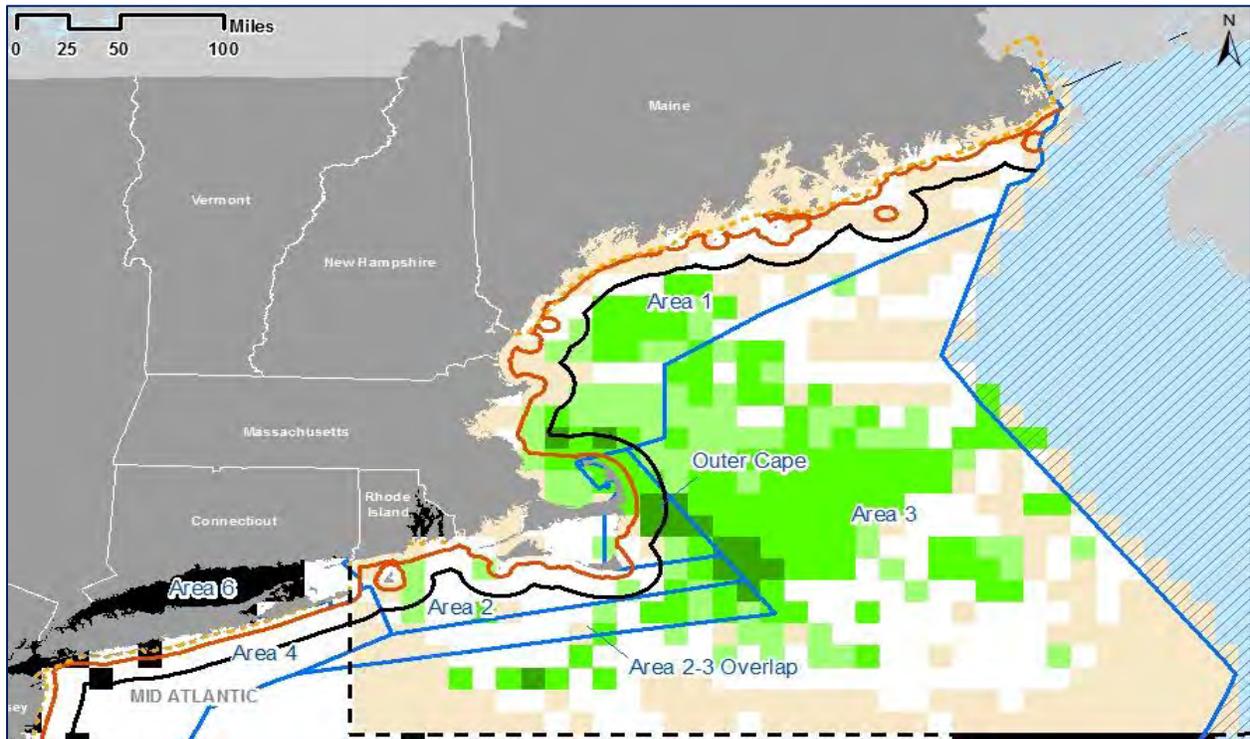
APRIL – ADJUSTED SIGHTINGS



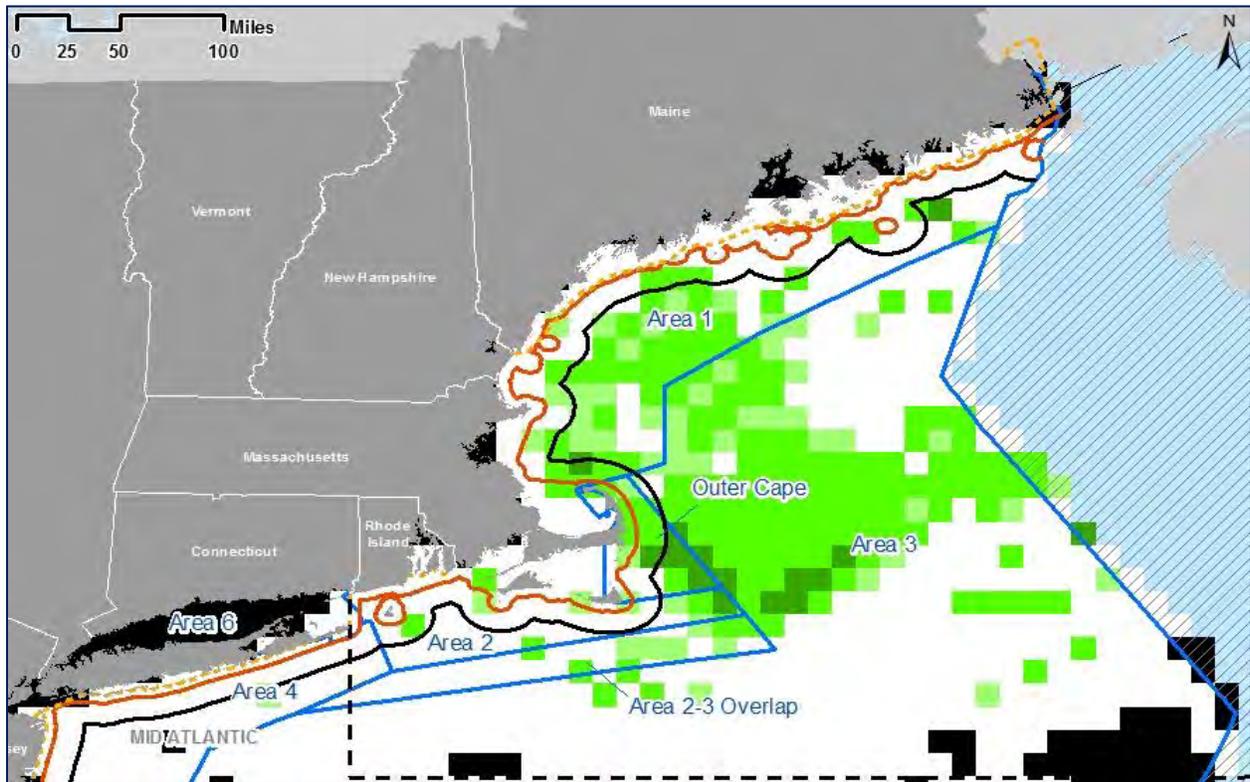
MAY – SPUE



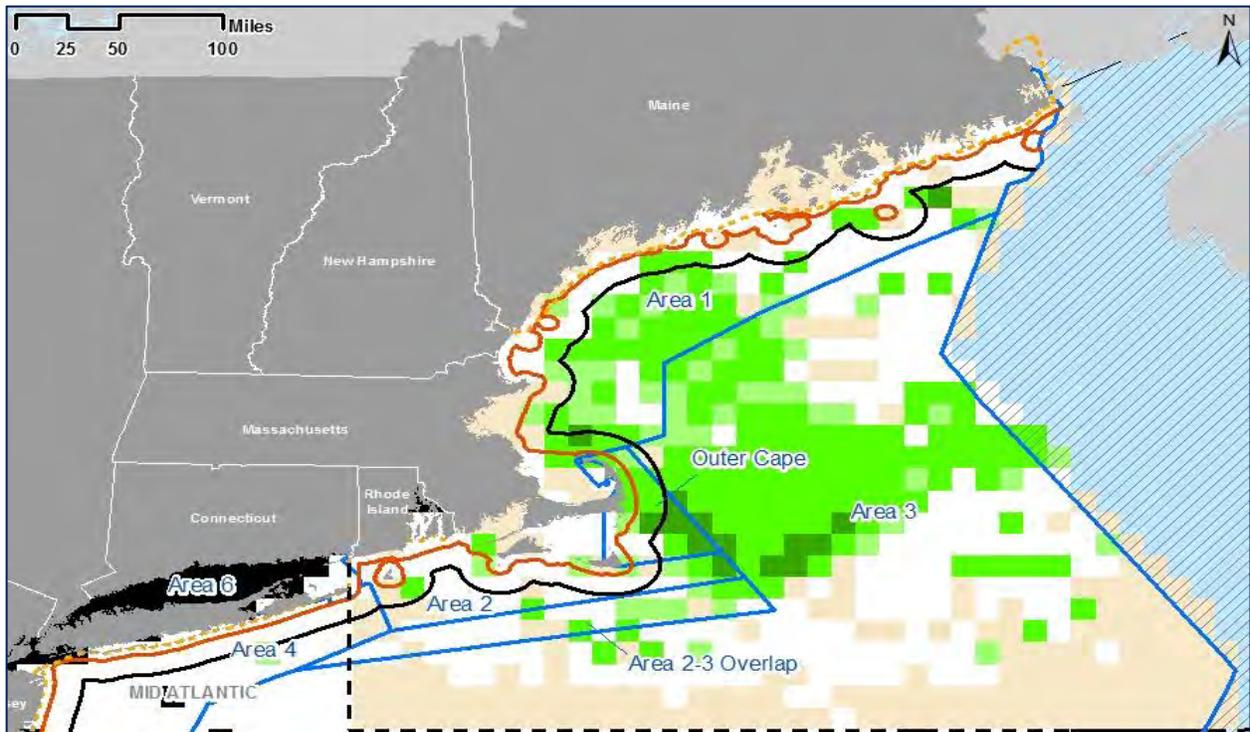
MAY – ADJUSTED SIGHTINGS



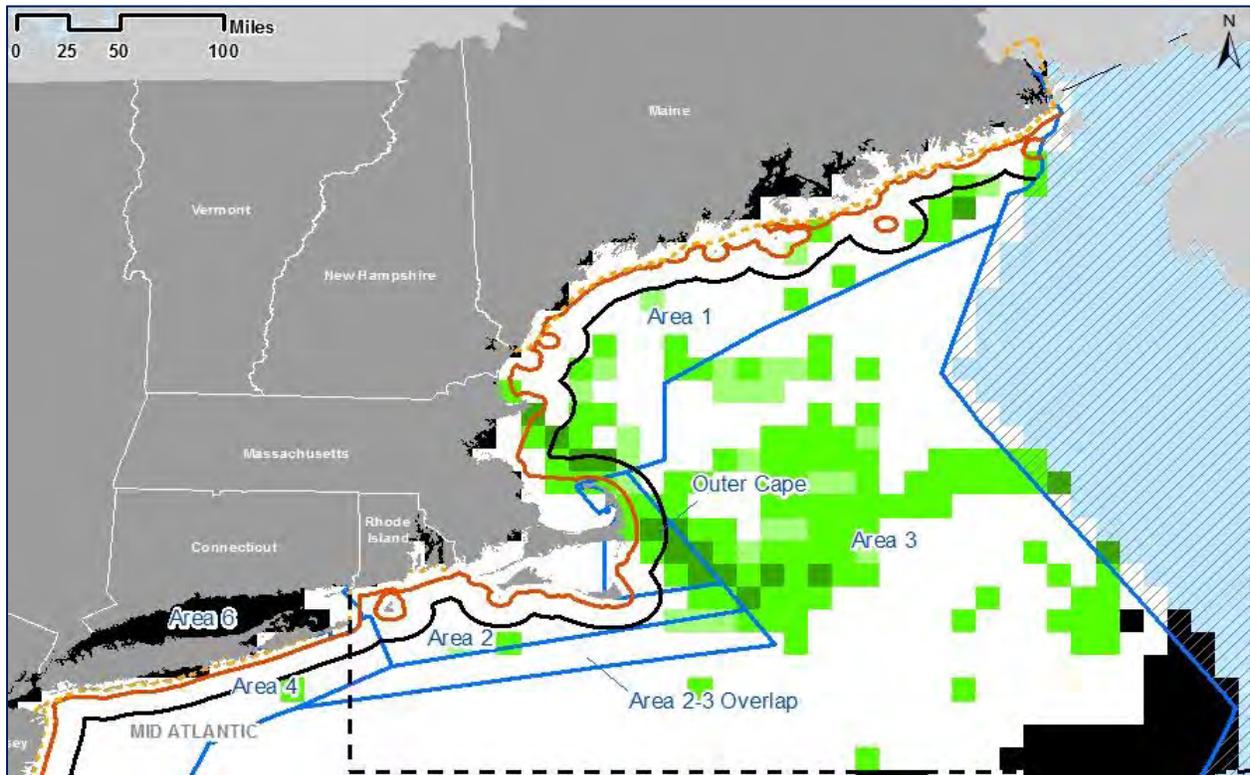
**JUNE – SPUE**



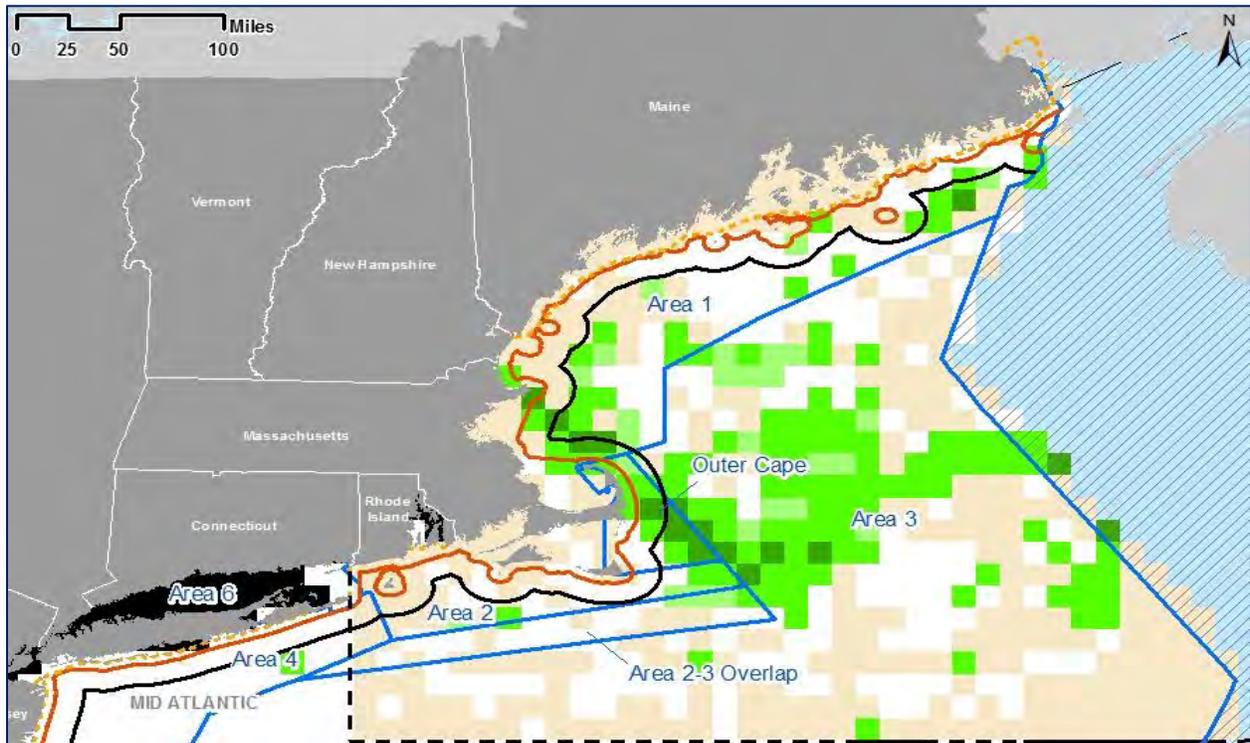
**JUNE – ADJUSTED SIGHTINGS**



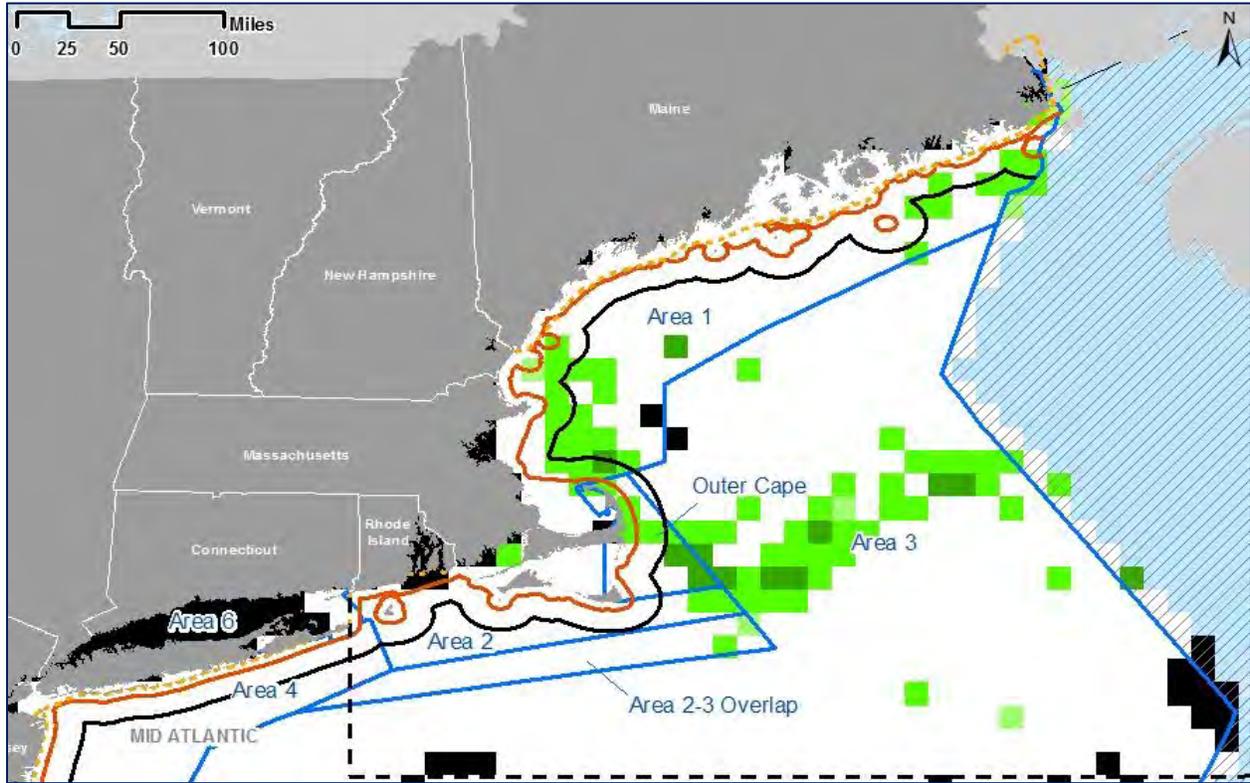
**JULY – SPUE**



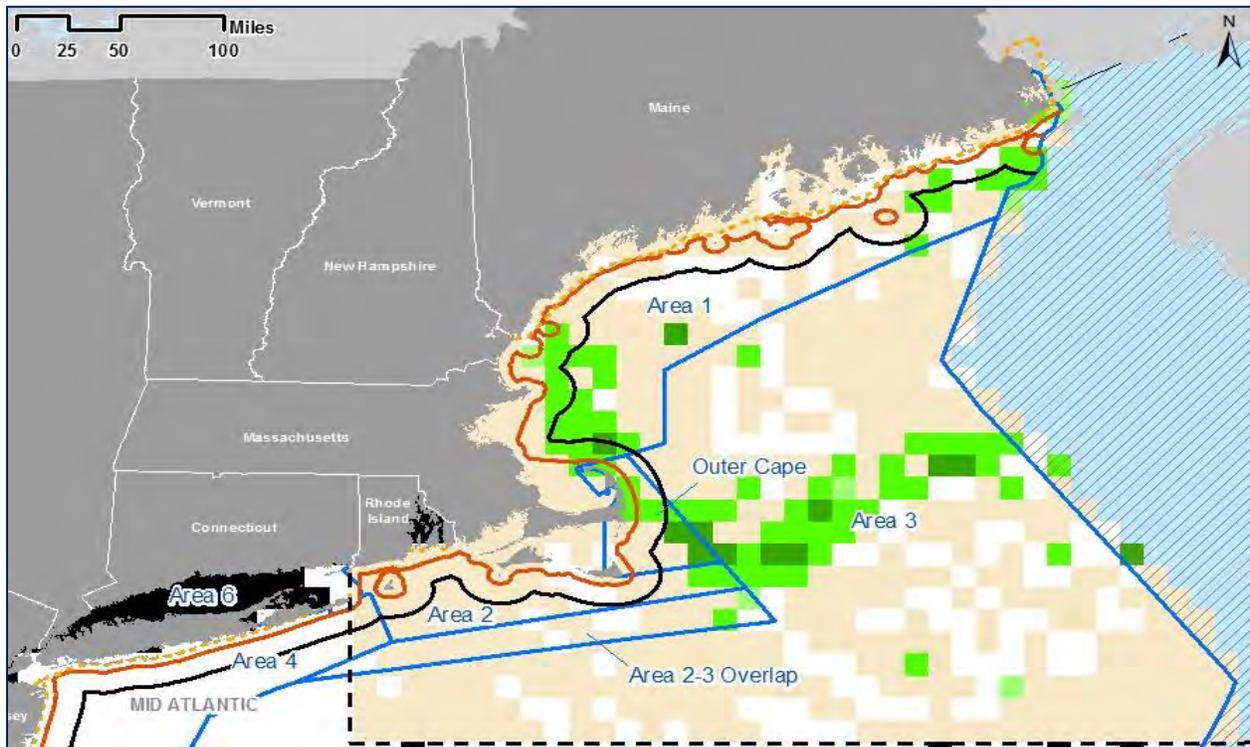
**JULY – ADJUSTED SIGHTINGS**



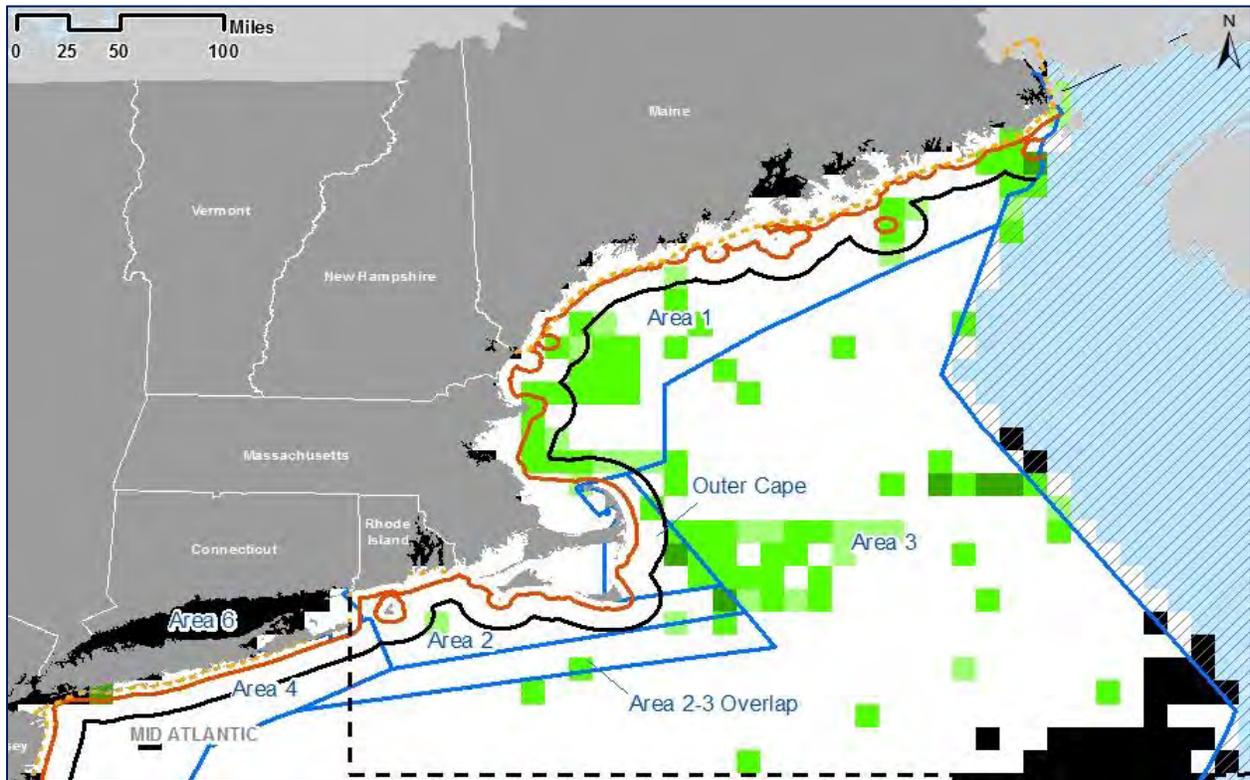
**AUGUST – SPUE**



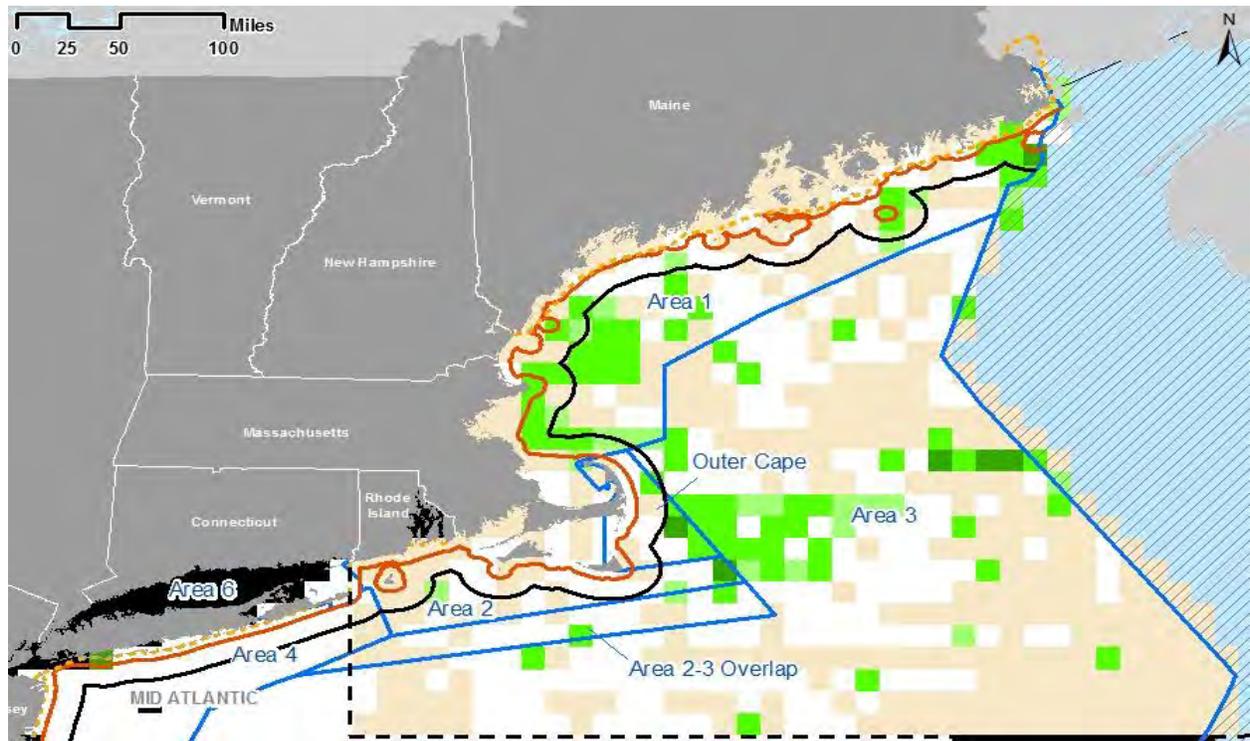
**AUGUST – ADJUSTED SIGHTINGS**



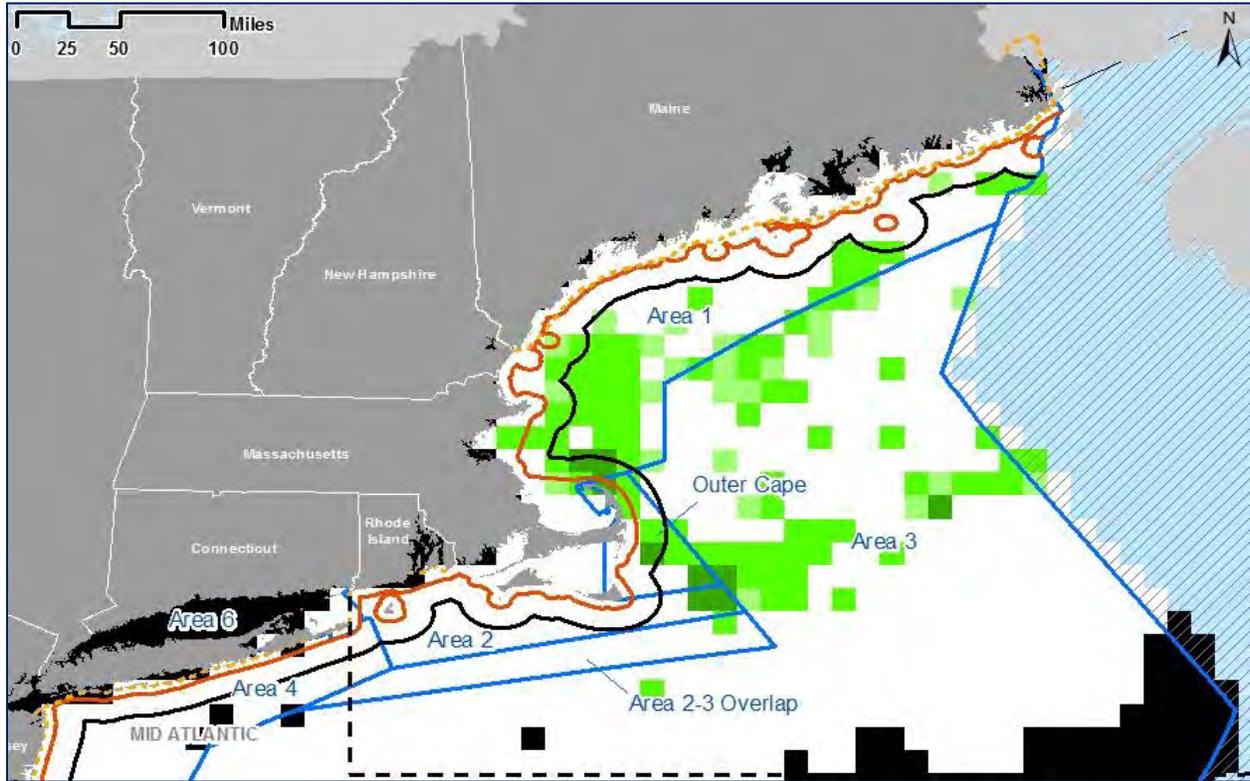
SEPTEMBER – SPUE



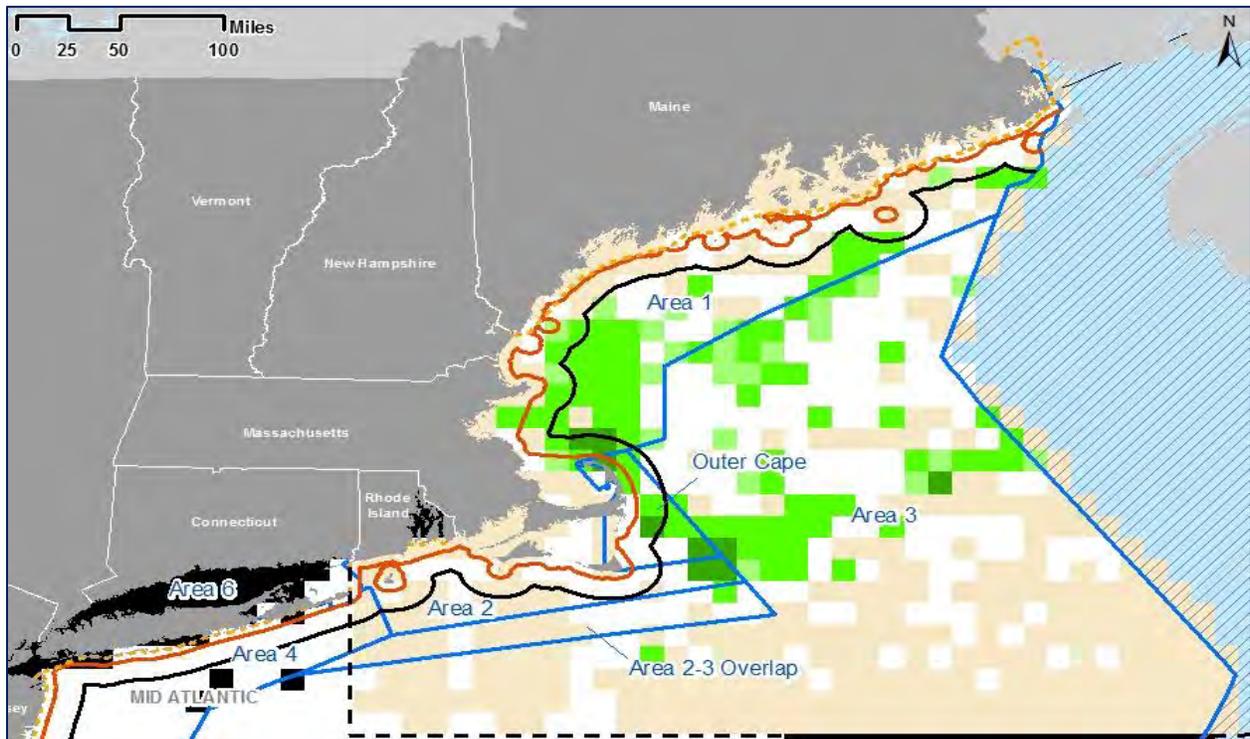
SEPTEMBER – ADJUSTED SIGHTINGS



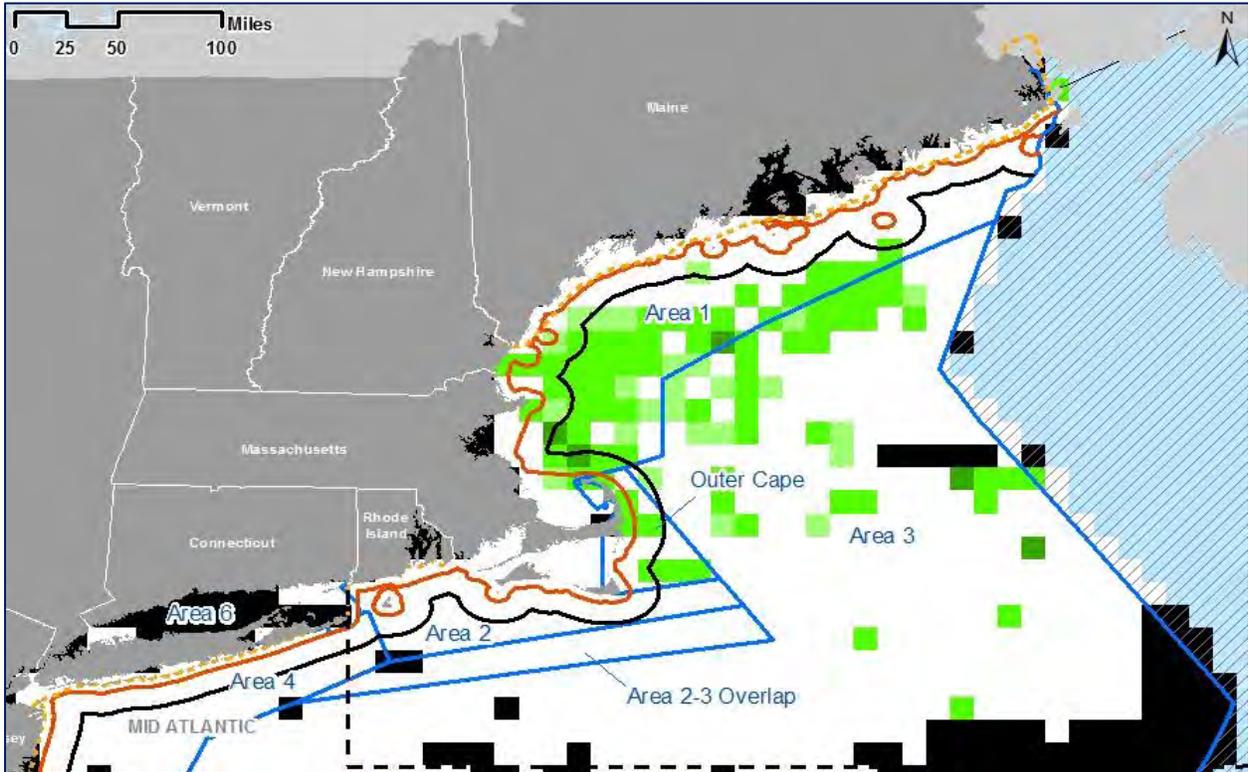
**OCTOBER – SPUE**



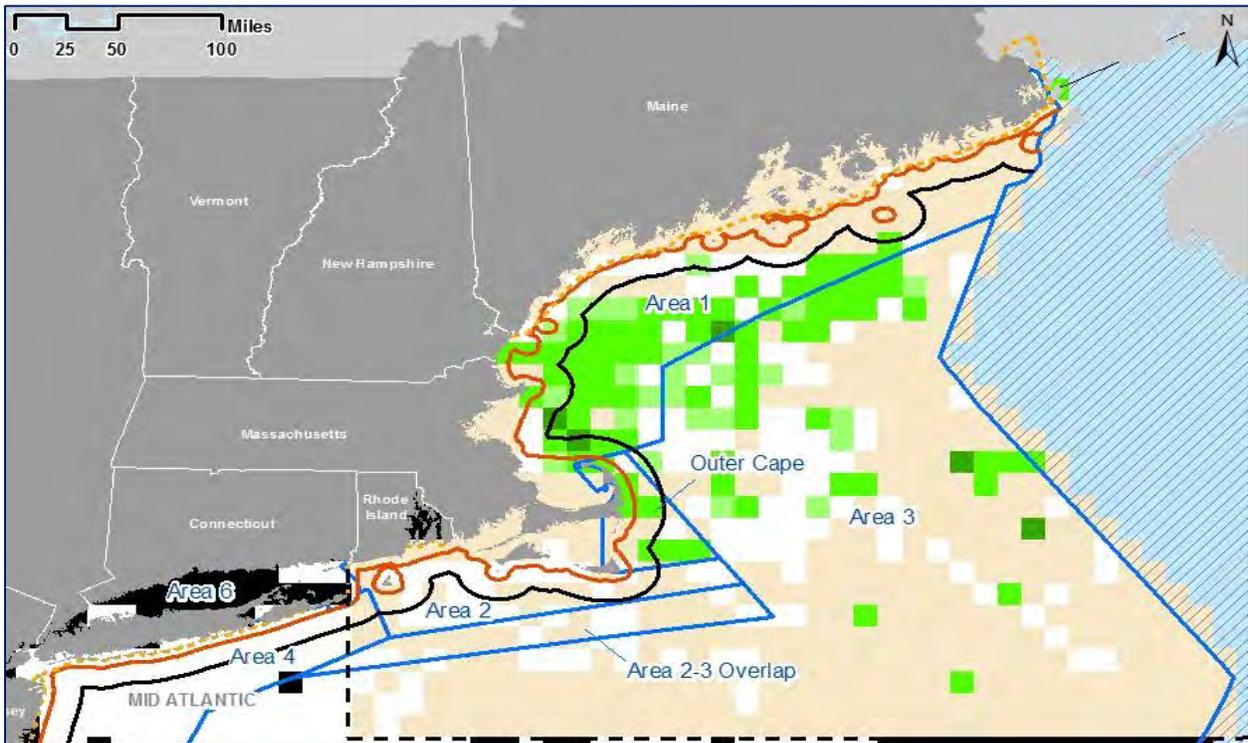
**OCTOBER – ADJUSTED SIGHTINGS**



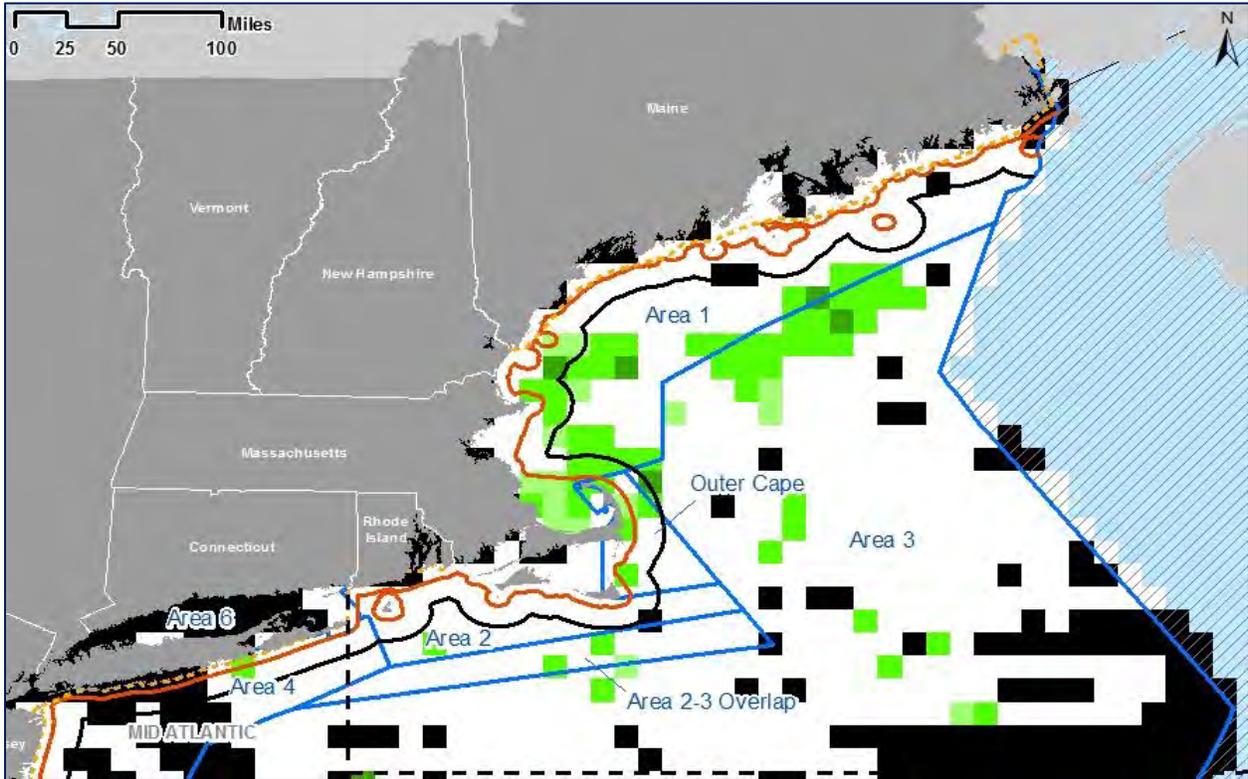
**NOVEMBER – SPUE**



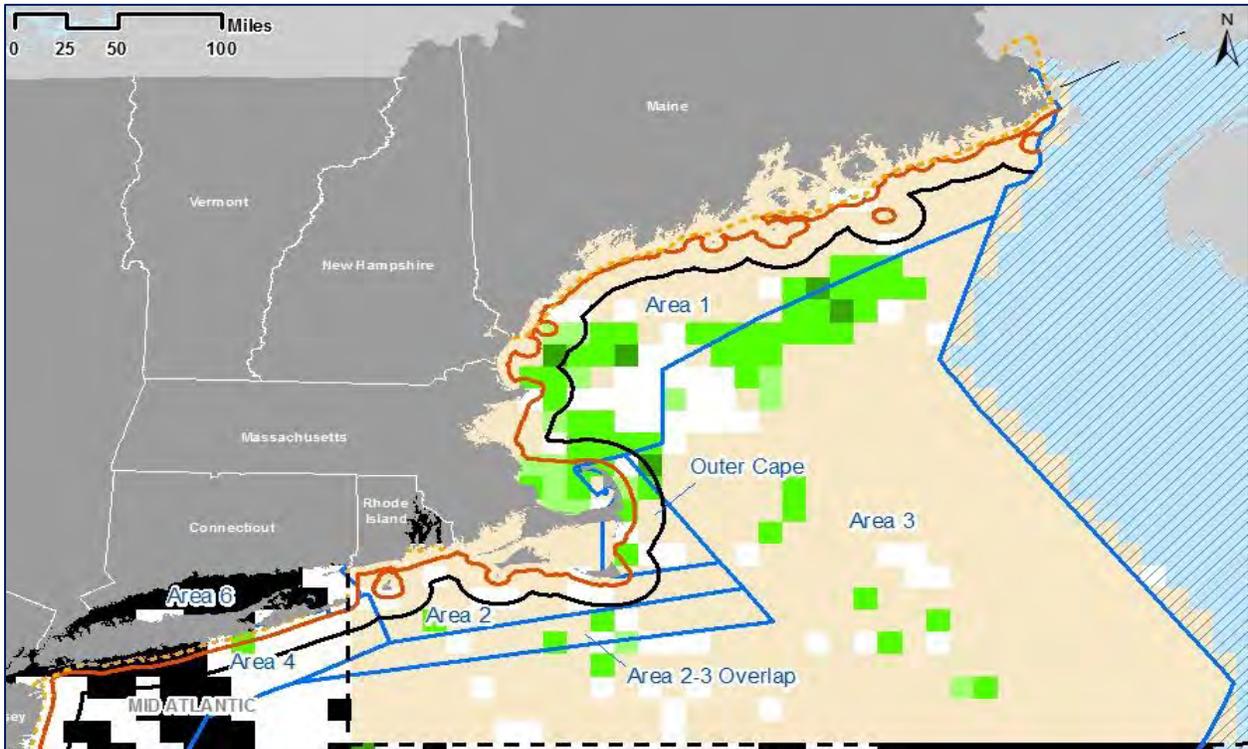
**NOVEMBER – ADJUSTED SIGHTINGS**



**DECEMBER – SPUE**



**DECEMBER – ADJUSTED SIGHTINGS**

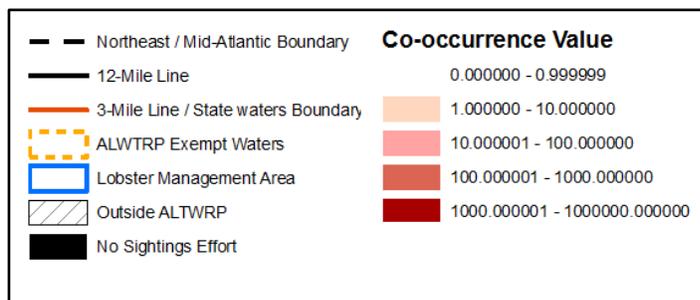


## ATTACHMENT C-2

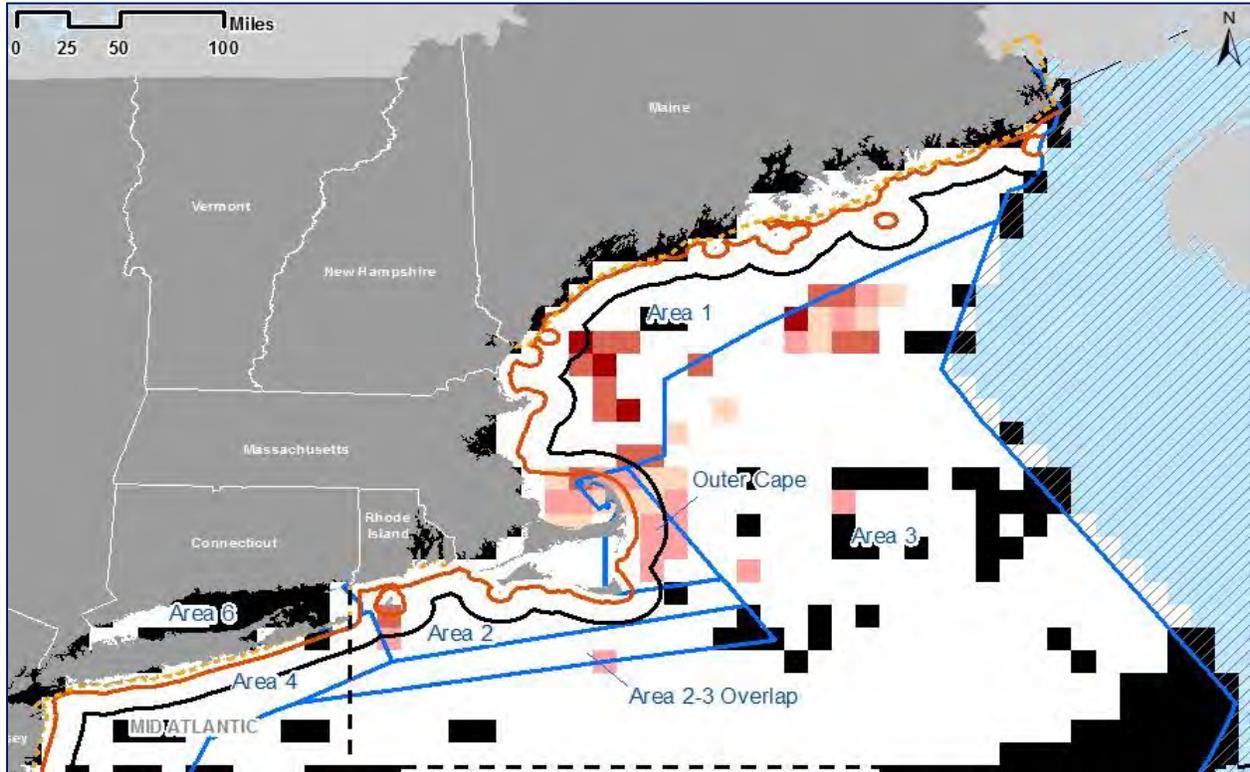
NORTHEAST BASELINE CO-OCCURRENCE COMPARISON: COMBINED  
RIGHT/HUMPBACK WHALE

## INTRODUCTION

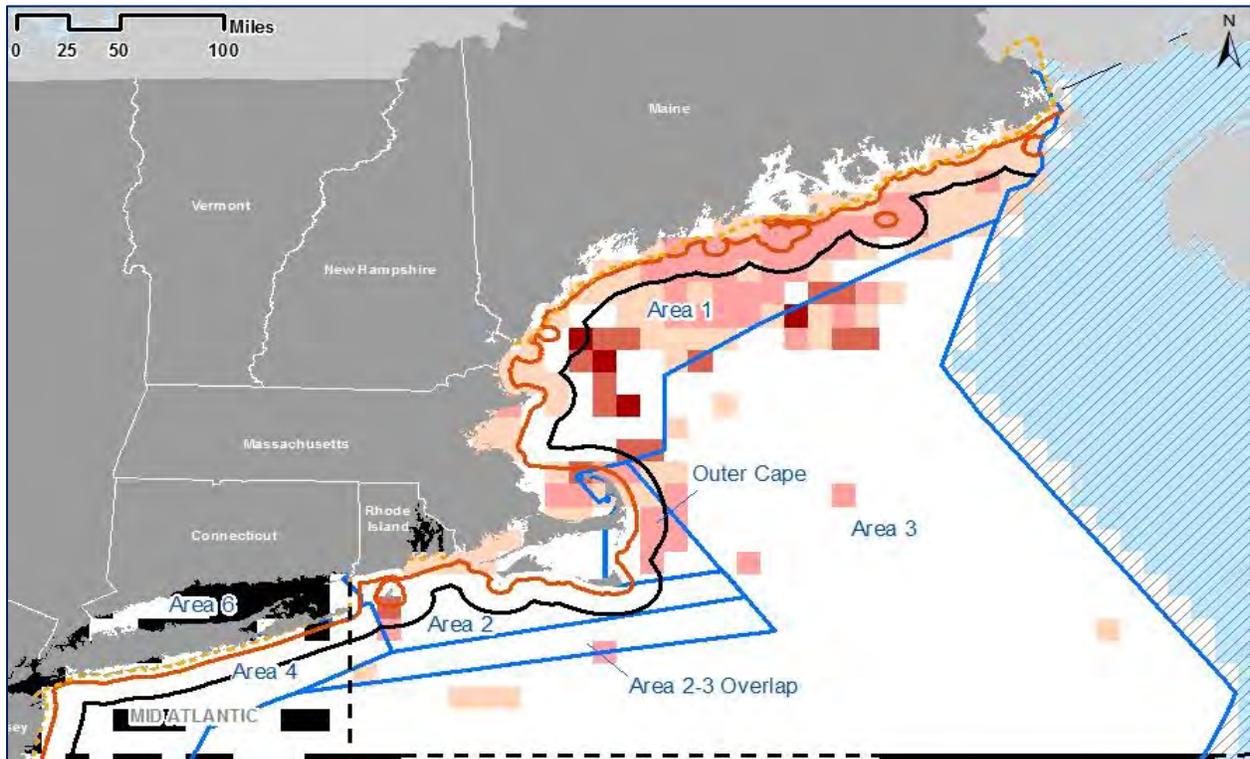
The maps contained in this attachment show monthly baseline co-occurrence scores for right/humpback whales combined in Northeast waters. On each page, the first map displays co-occurrence scores based on reported SPUE values; the second map displays co-occurrence scores based on adjusted sightings values (i.e. after the steps outlined in this memo have been applied). The legend for these maps is shown below.



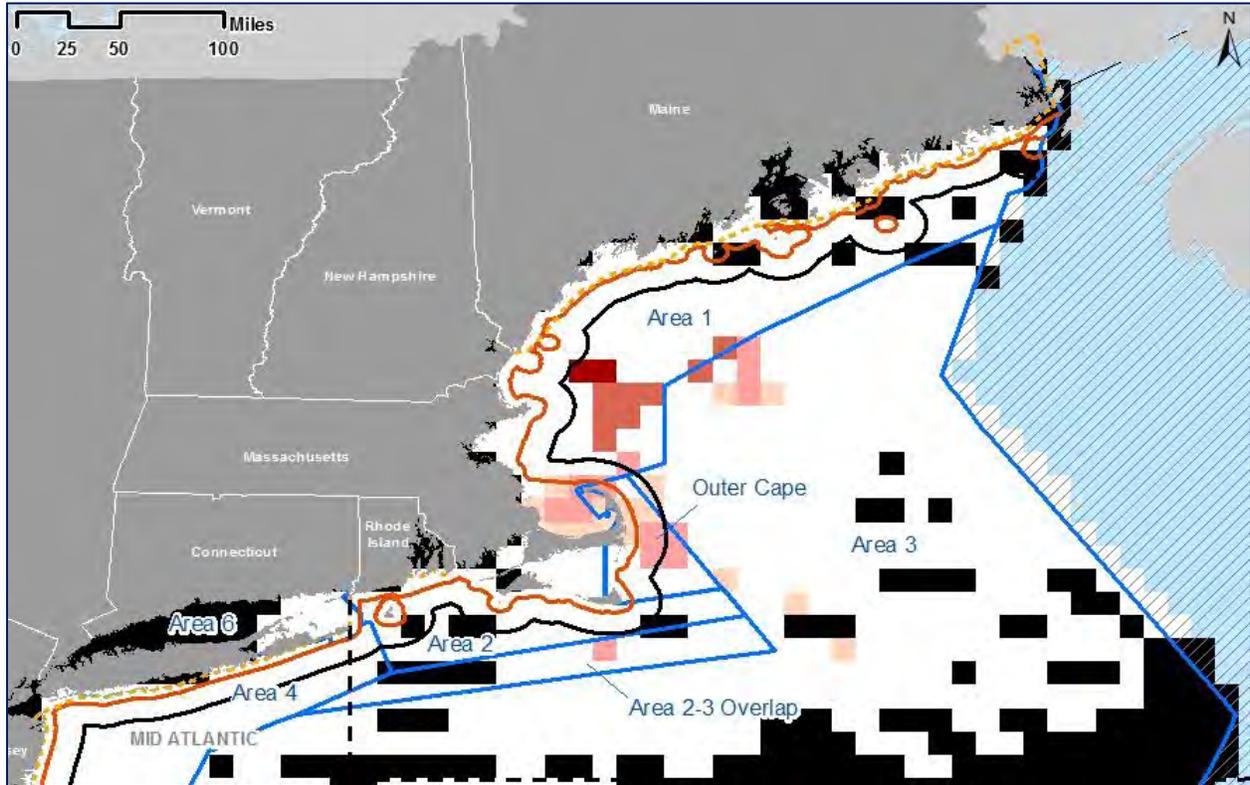
**JANUARY – CO-OCCURRENCE BASED ON SPUE**



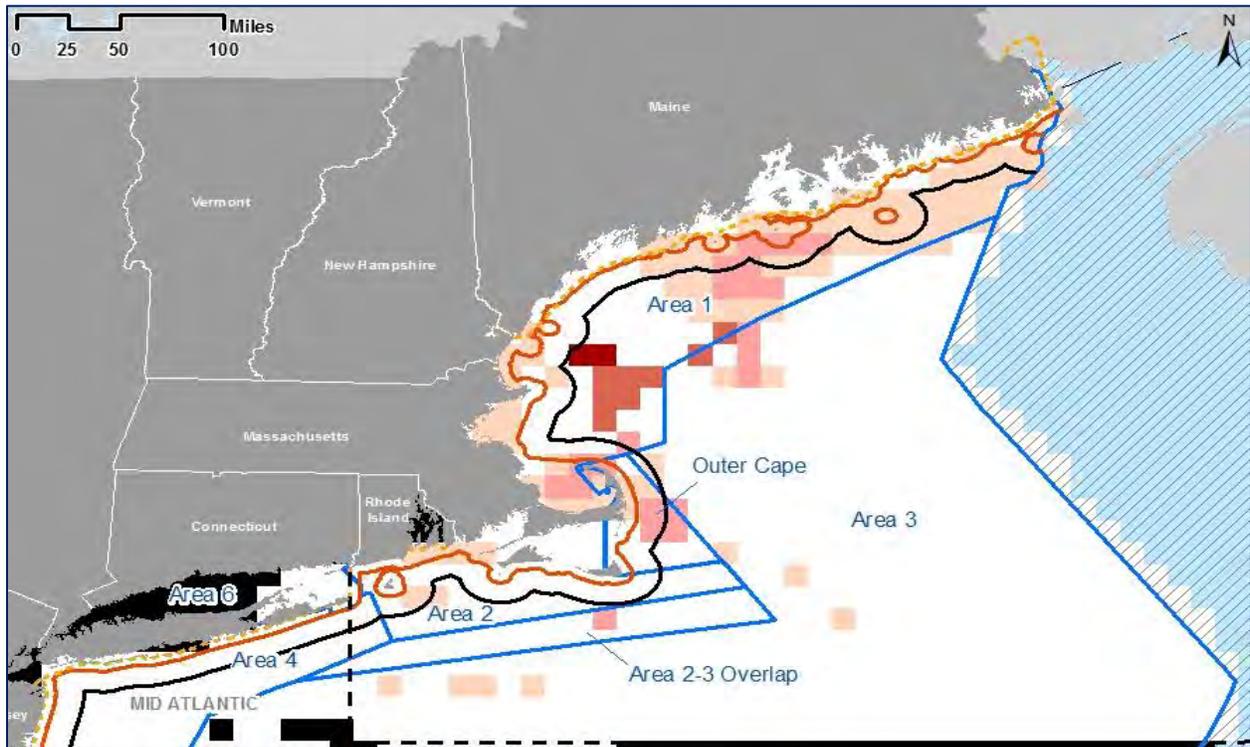
**JANUARY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



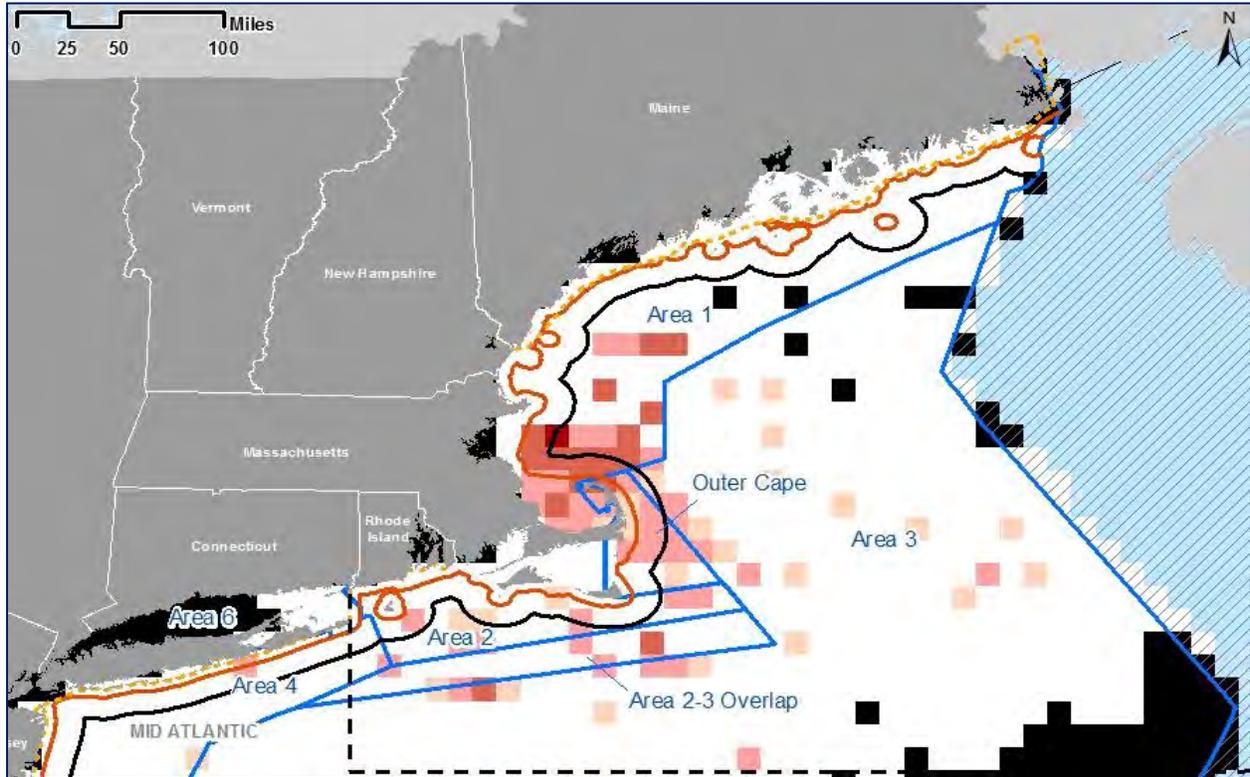
**FEBRUARY – CO-OCCURRENCE BASED ON SPUE**



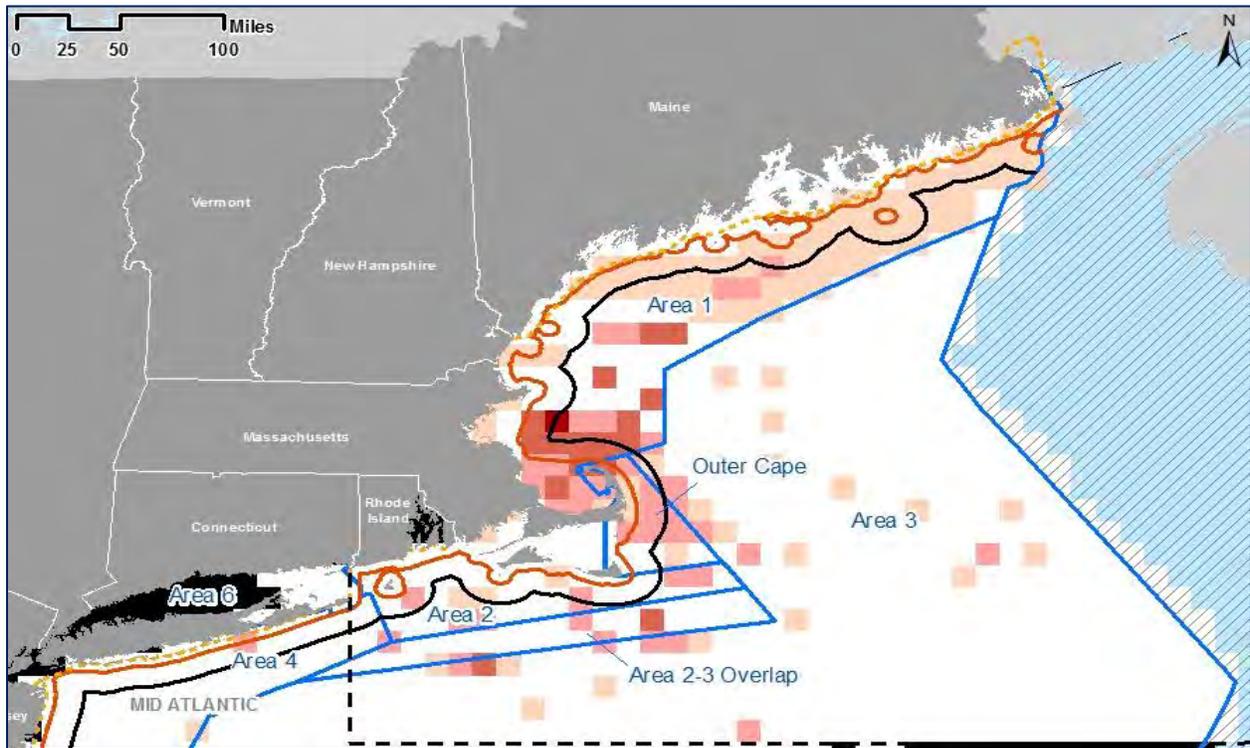
**FEBRUARY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



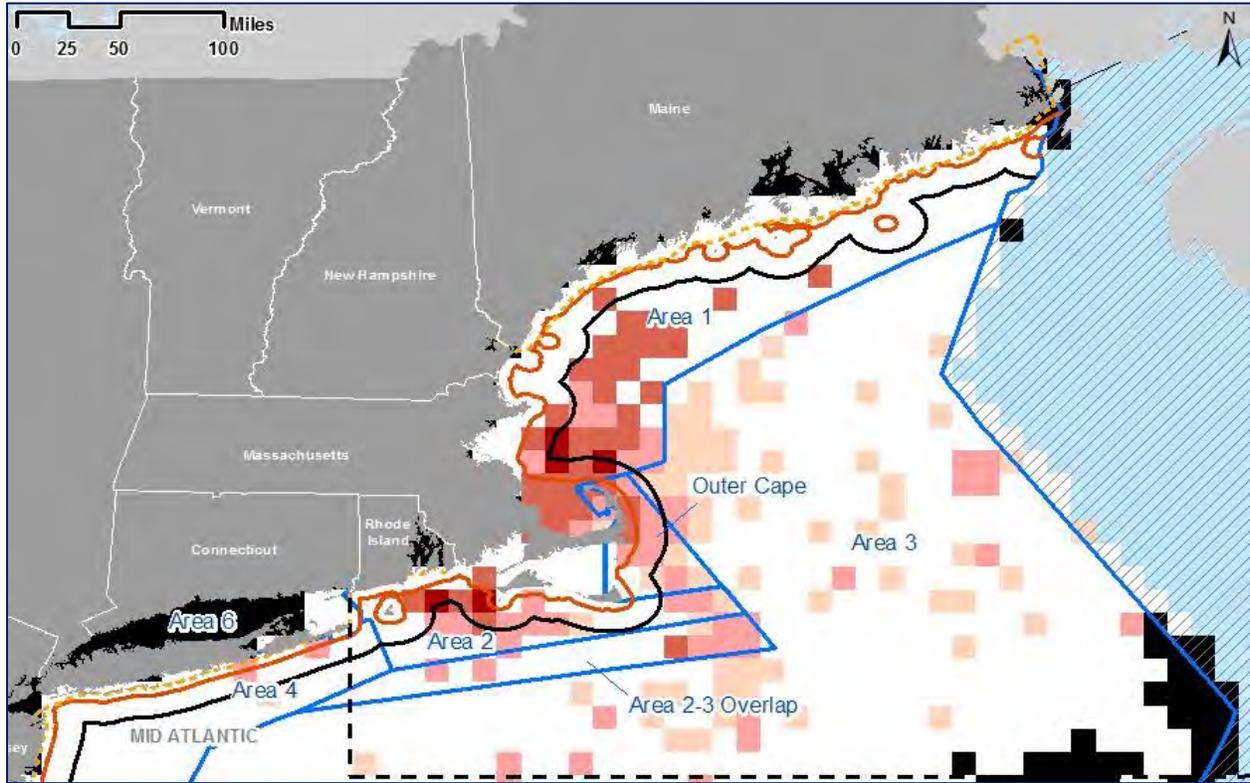
**MARCH – CO-OCCURRENCE BASED ON SPUE**



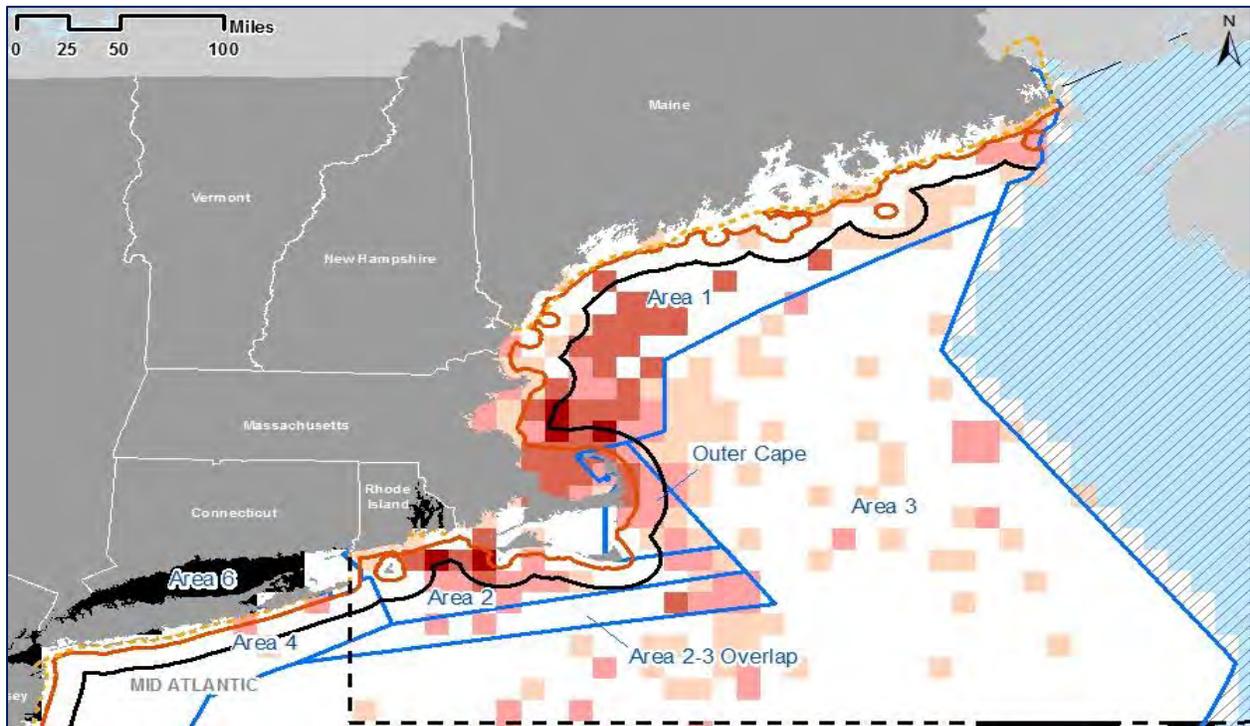
**MARCH – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



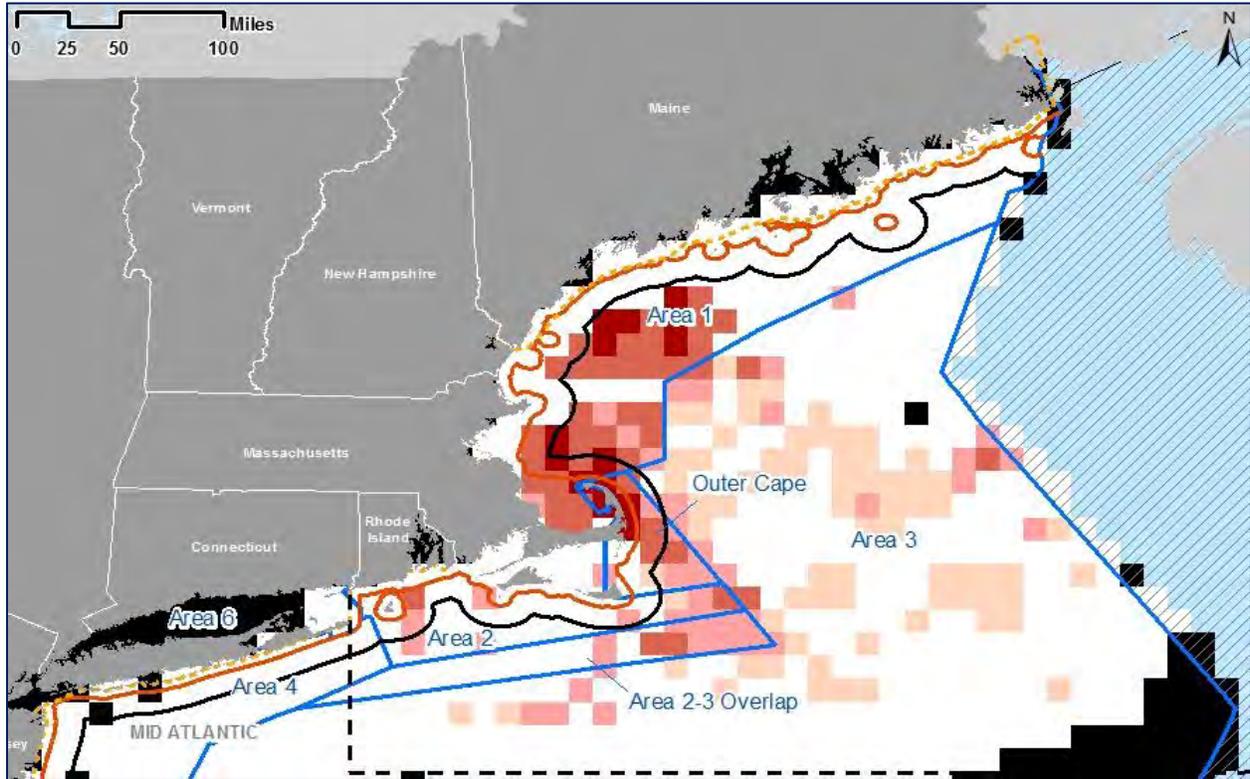
**APRIL – CO-OCCURRENCE BASED ON SPUE**



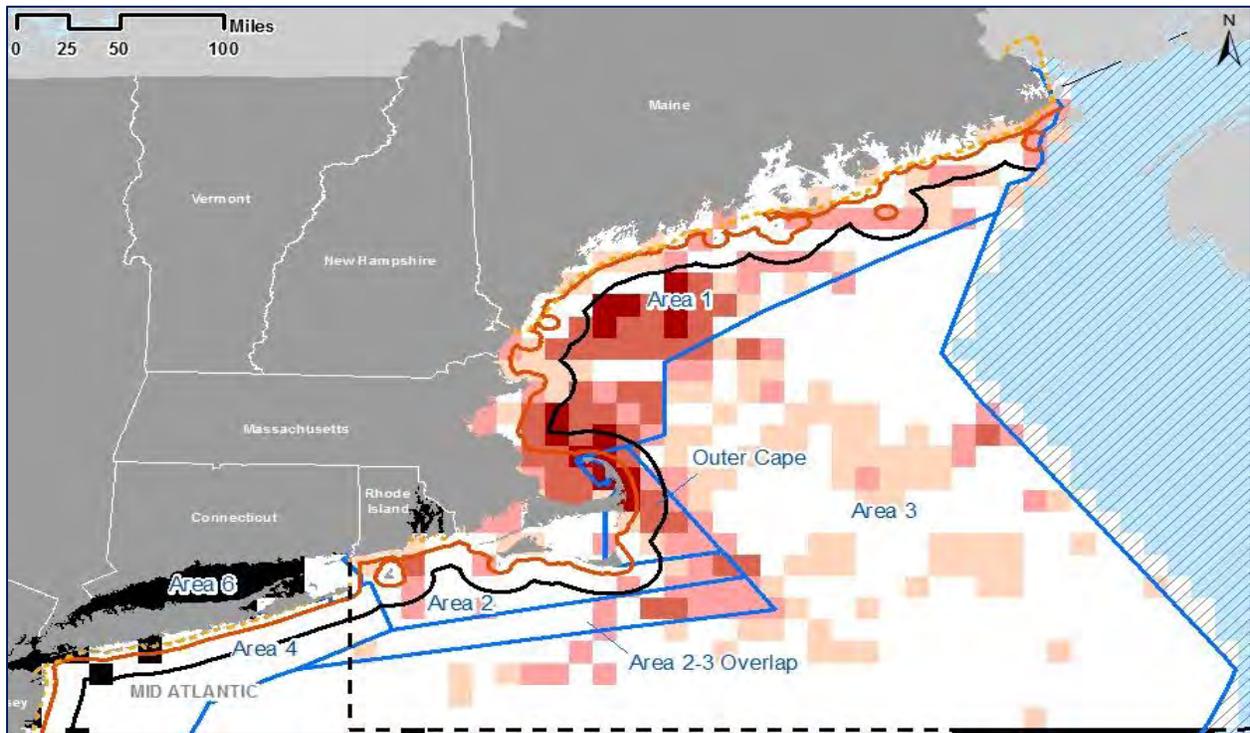
**APRIL – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



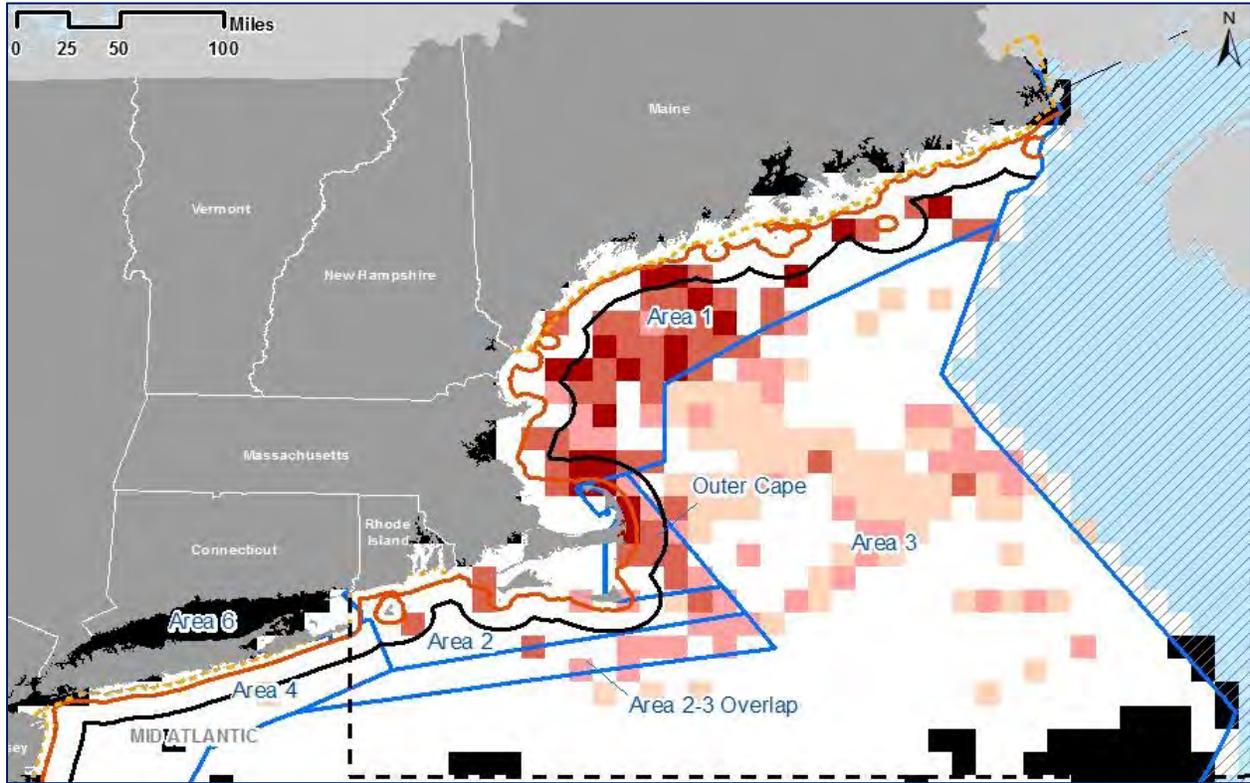
**MAY – CO-OCCURRENCE BASED ON SPUE**



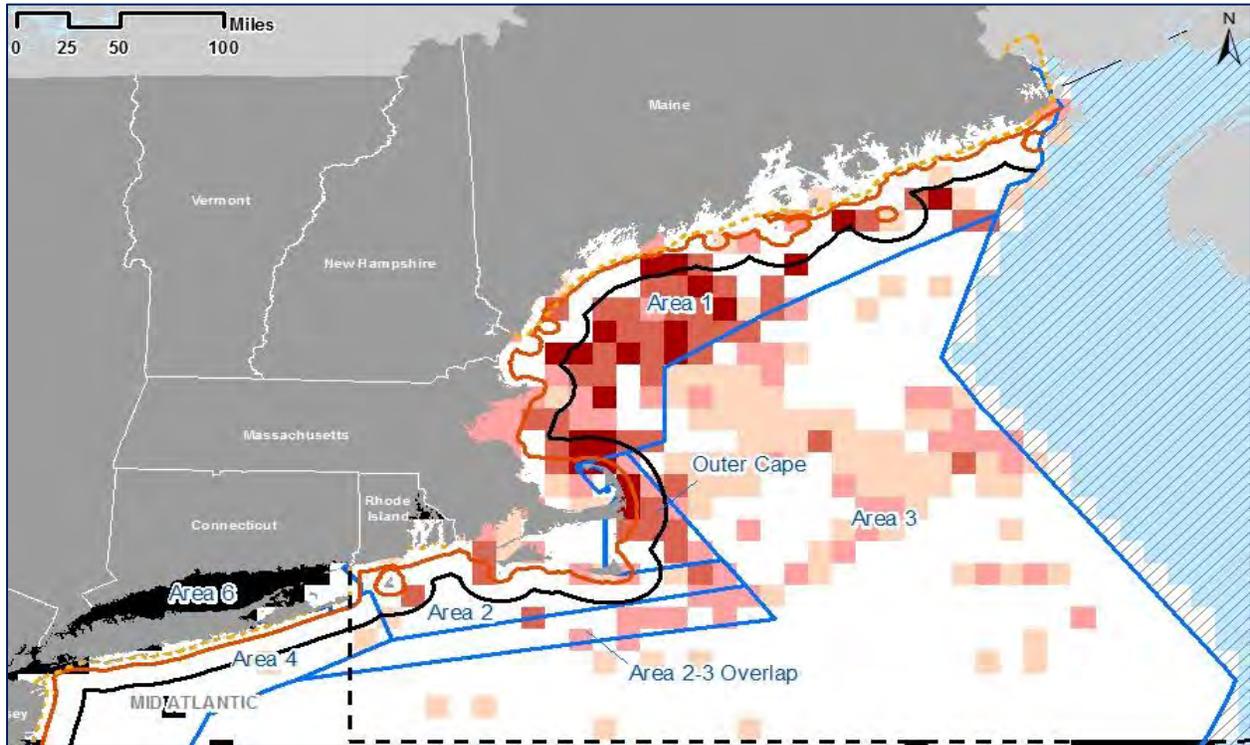
**MAY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



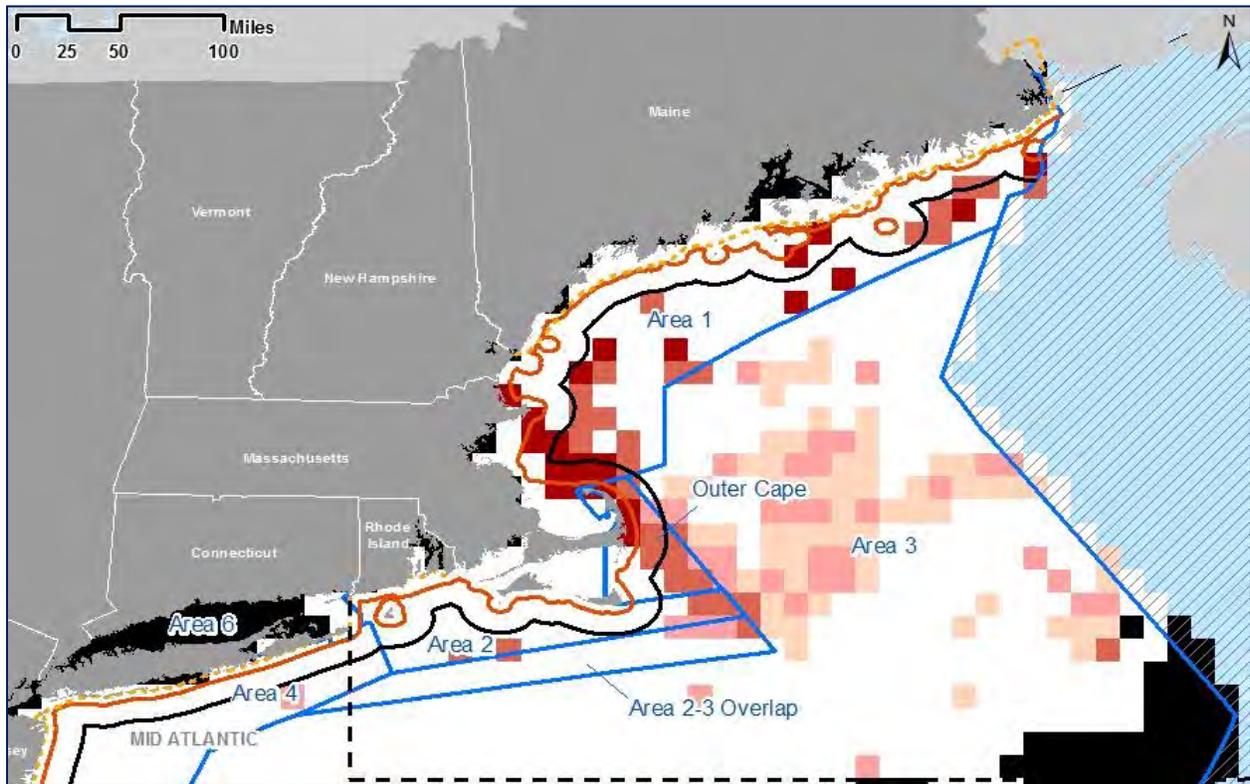
**JUNE – CO-OCCURRENCE BASED ON SPUE**



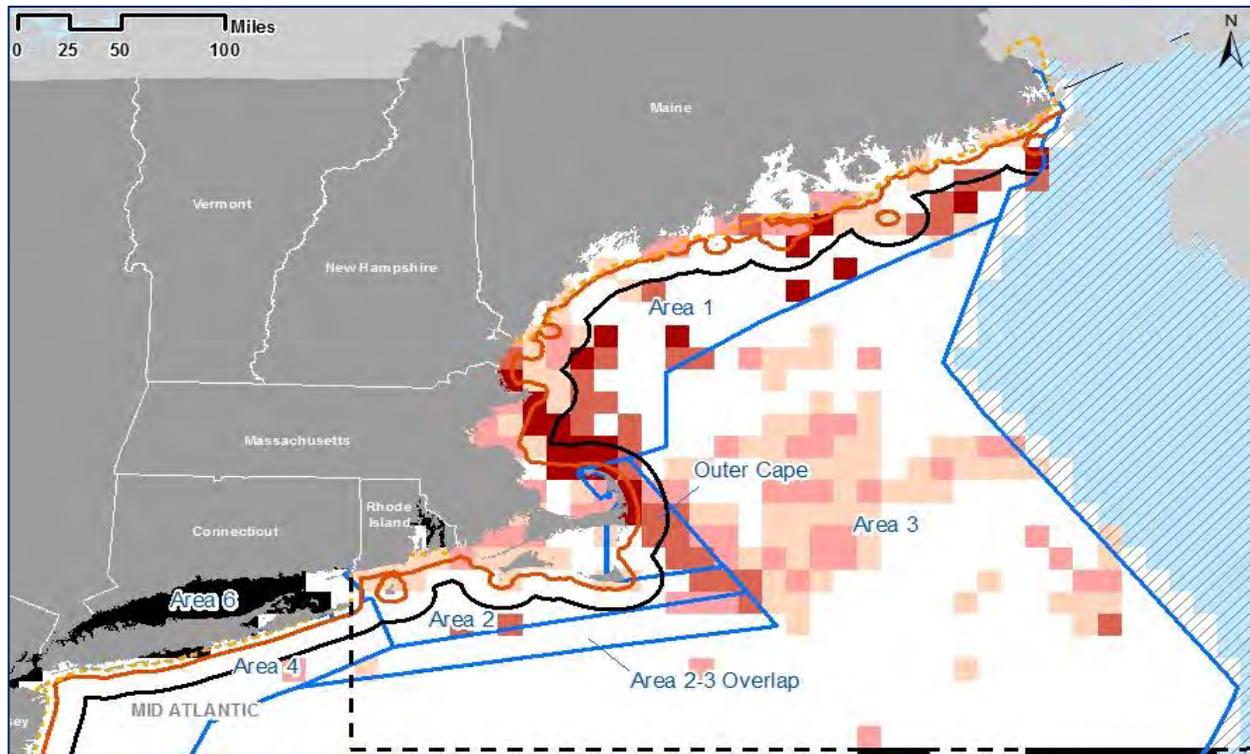
**JUNE – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



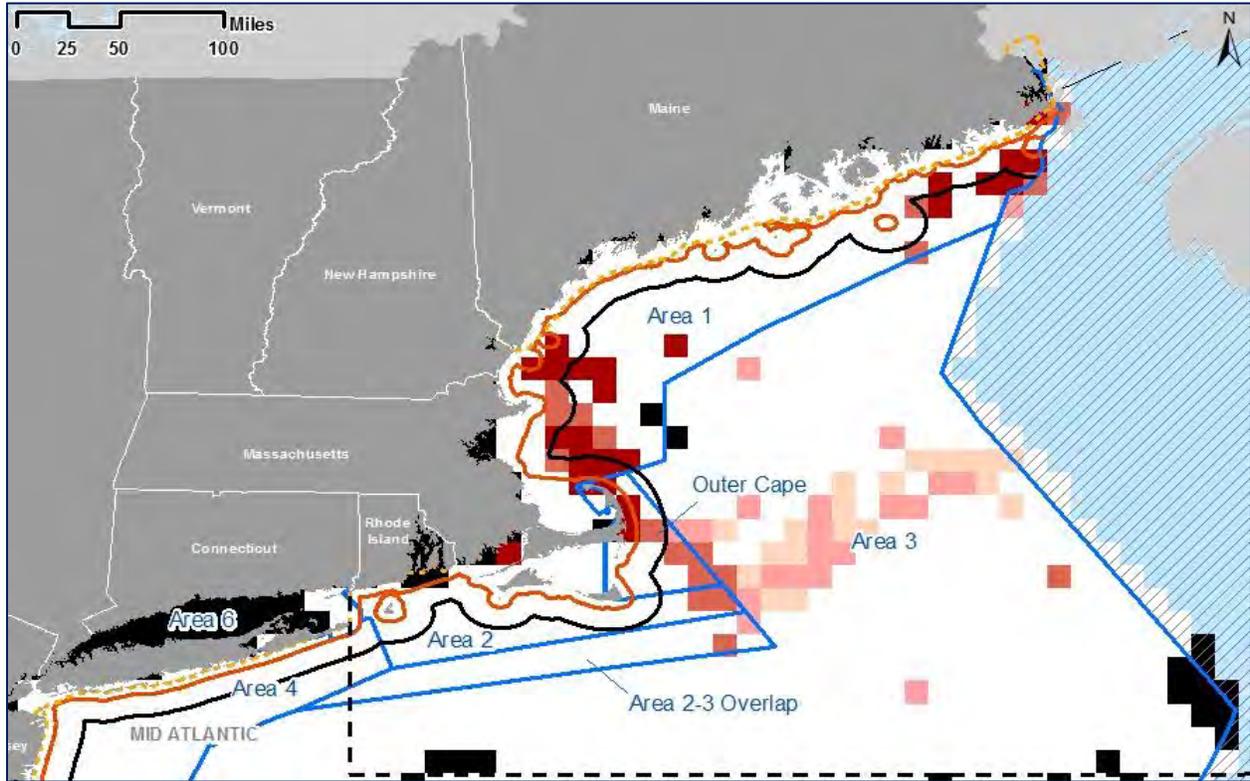
**JULY – CO-OCCURRENCE BASED ON SPUE**



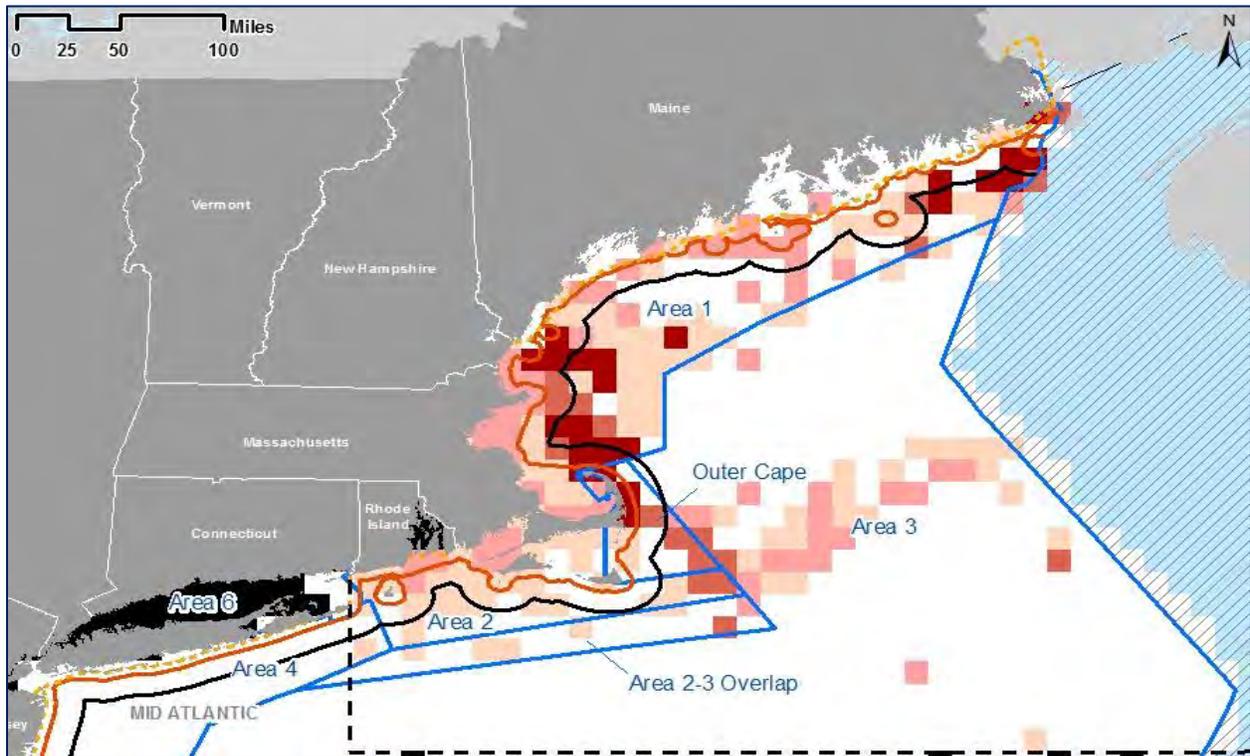
**JULY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



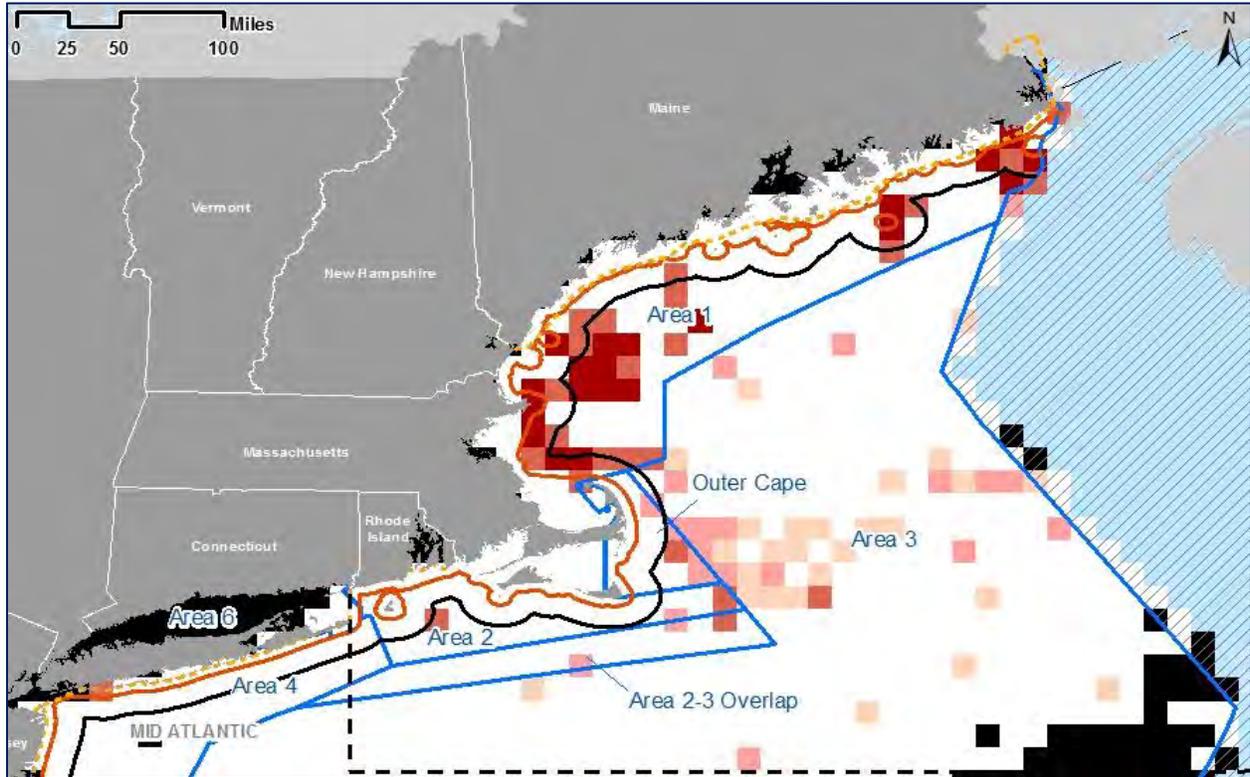
**AUGUST – CO-OCCURRENCE BASED ON SPUE**



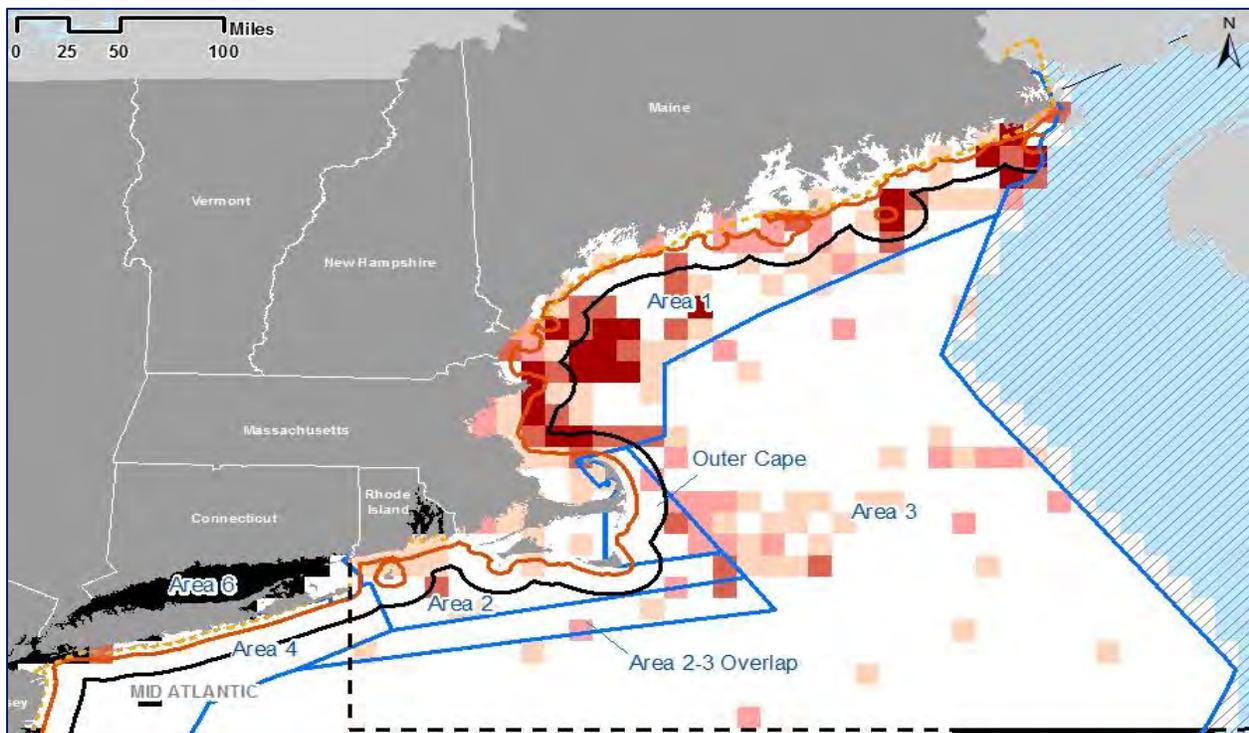
**AUGUST – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



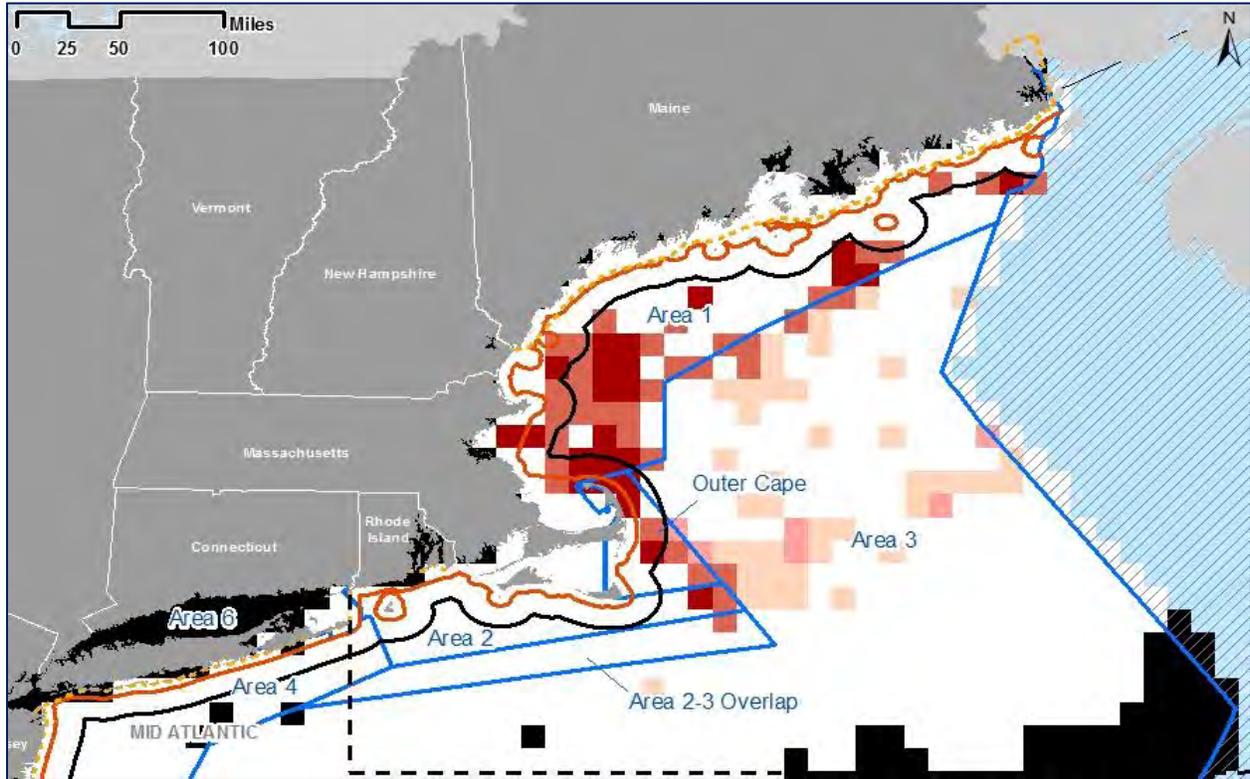
**SEPTEMBER – CO-OCCURRENCE BASED ON SPUE**



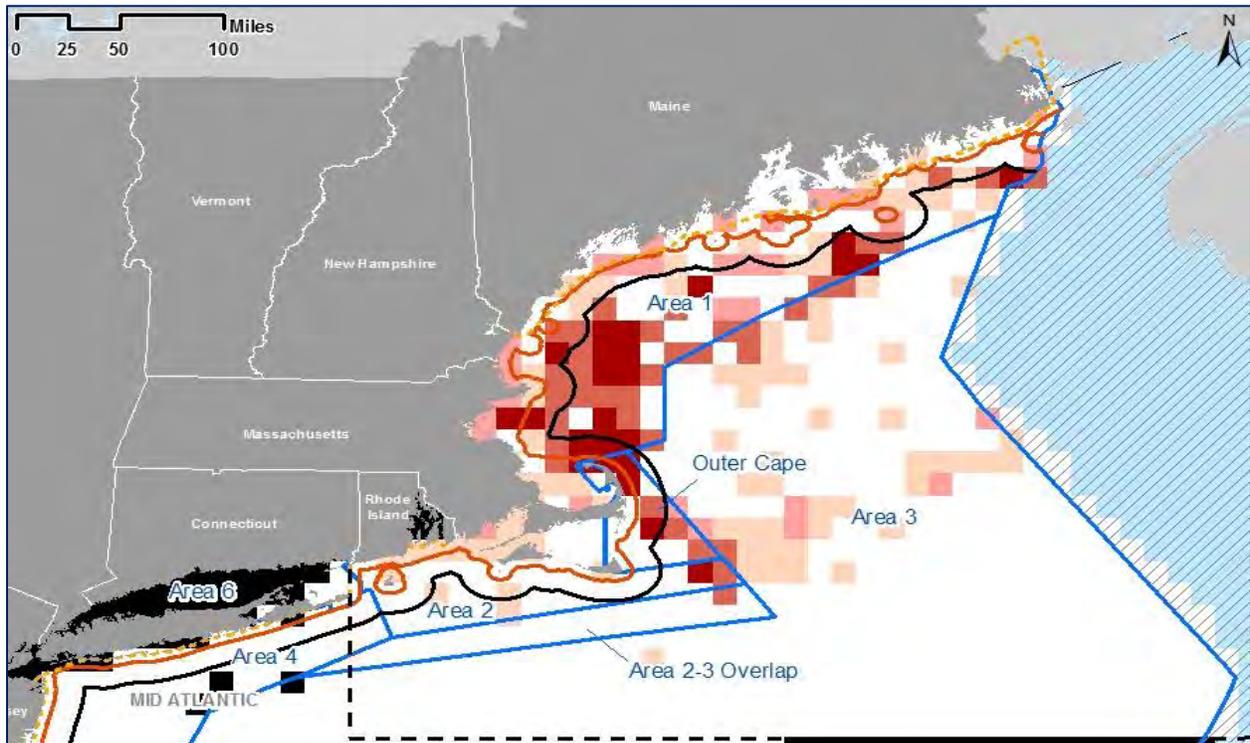
**SEPTEMBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



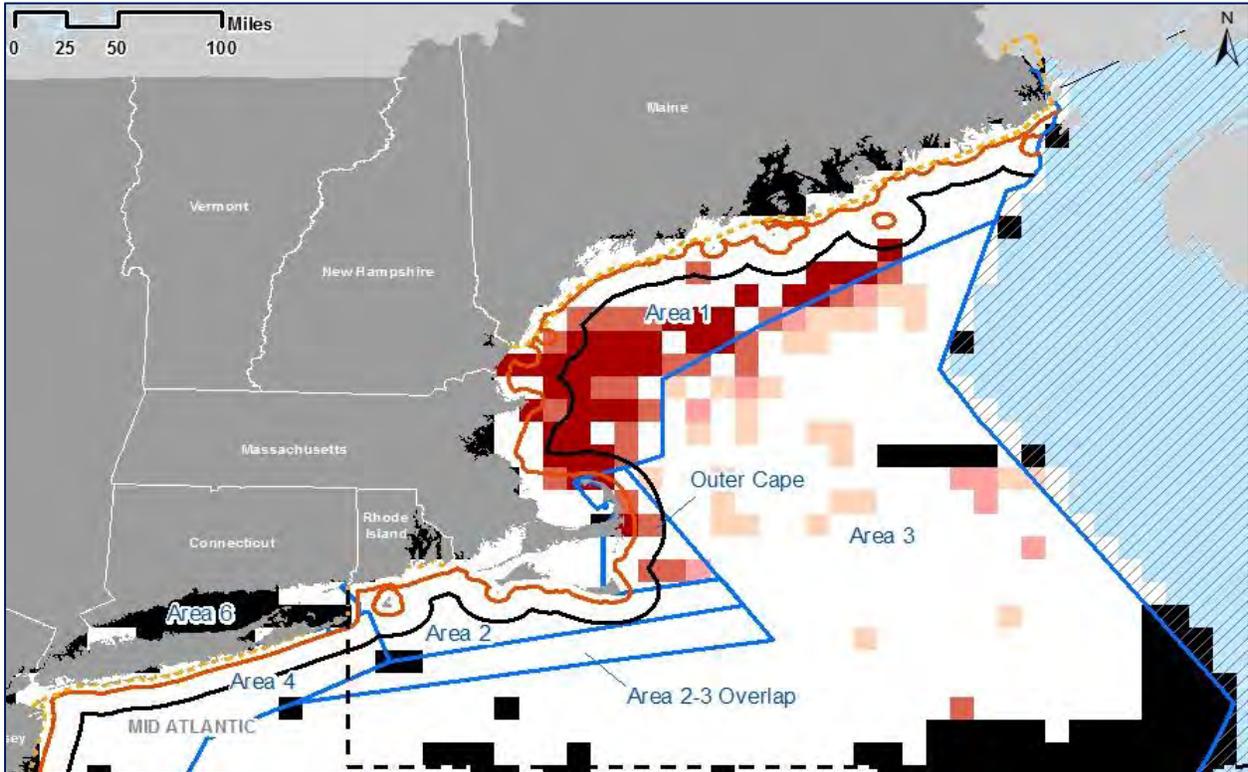
**OCTOBER – CO-OCCURRENCE BASED ON SPUE**



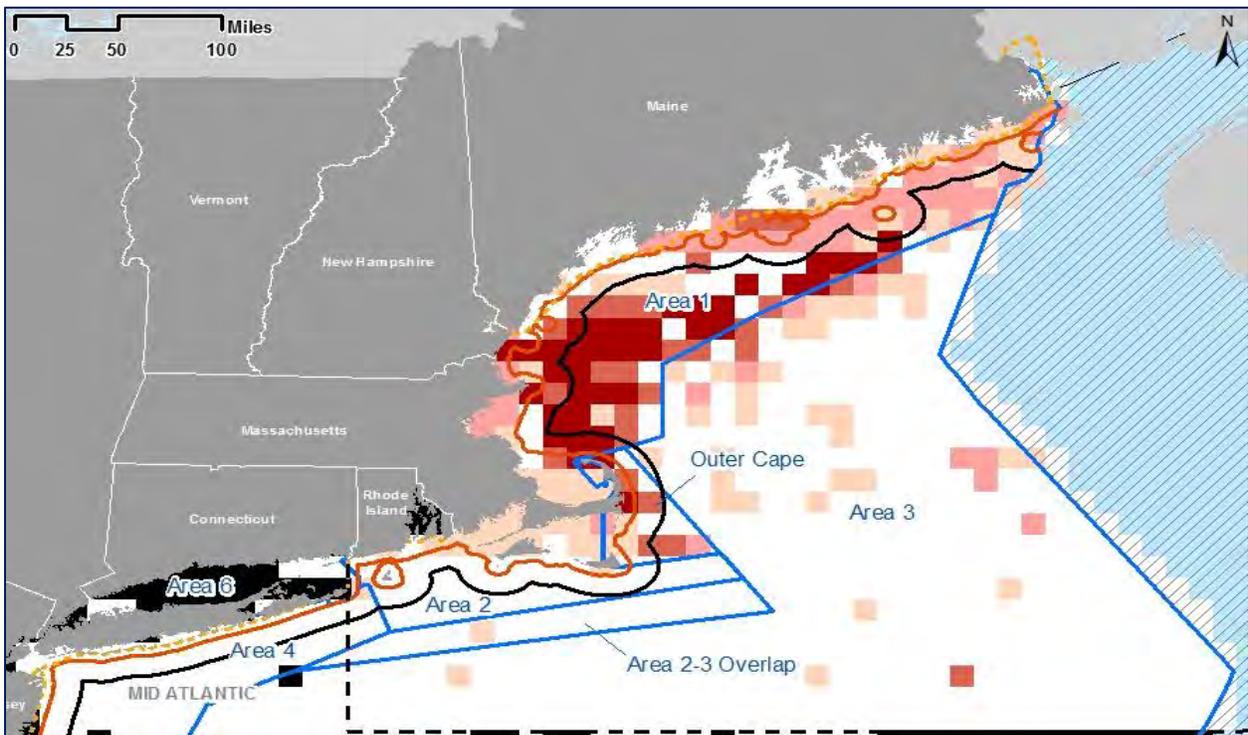
**OCTOBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



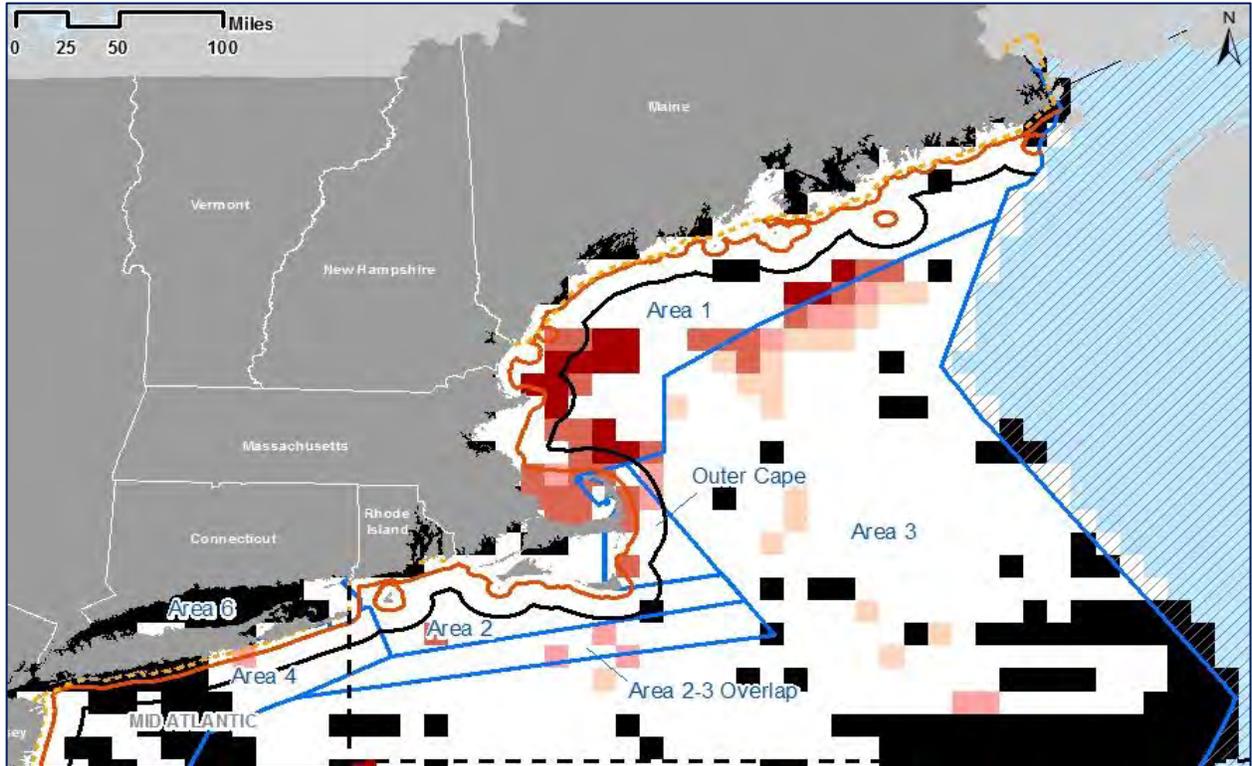
**NOVEMBER – CO-OCCURRENCE BASED ON SPUE**



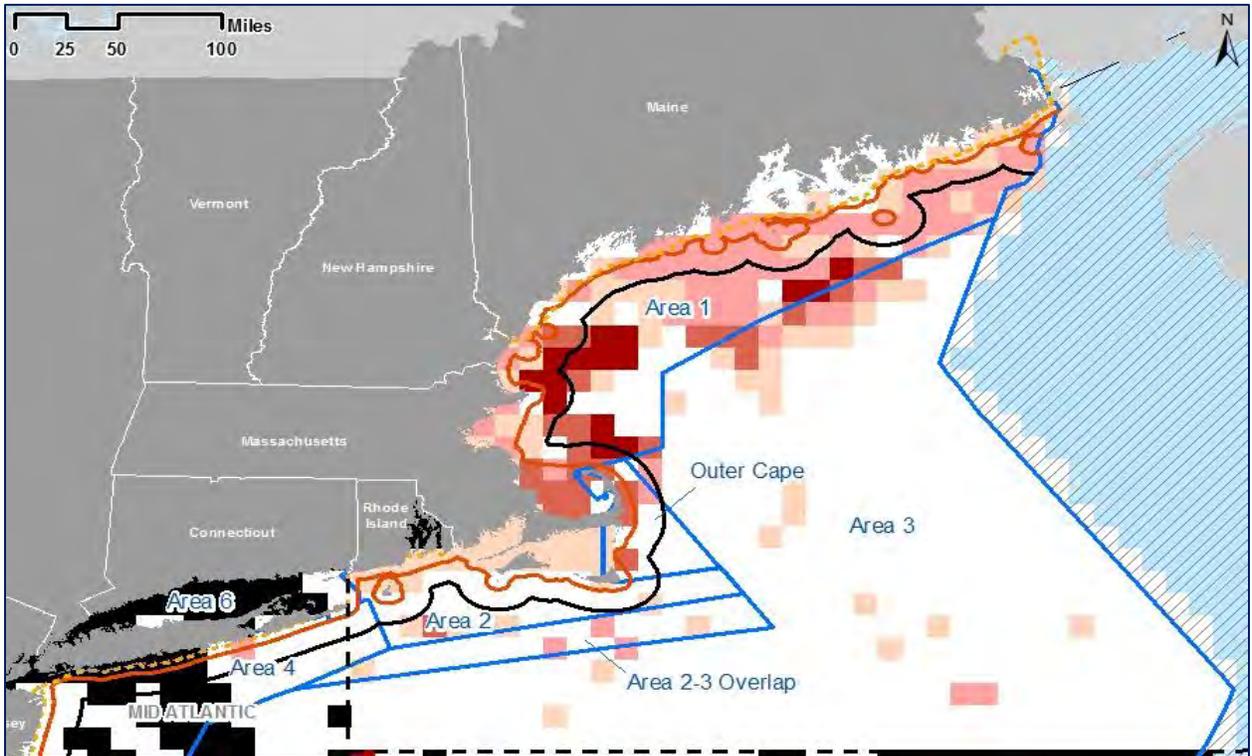
**NOVEMBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



**DECEMBER – CO-OCCURRENCE BASED ON SPUE**



**DECEMBER- CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS**



**APPENDIX D**

**2010/2011 BASELINE RESULTS: NUMBER OF ACTIVE VESSELS**

Appendix D provides the model’s 2010/2011 baseline estimates of the number of vessels actively engaged in fisheries subject to the requirements of the Atlantic Large Whale Take Reduction Plan (ALWTRP). Exhibit D-1 presents the estimated number of vessels by month and region. Exhibit D-2 presents maps that illustrate the distribution of vessel activity by month within the Northeast and Mid-Atlantic regions. The exhibit also includes maps indicating the monthly average distribution of activity within these regions. The legend for these maps is shown below.

As indicated in Exhibit D-1, the vast majority of vessel activity in the Southeast region occurs in exempt waters, close to shore. Presenting this activity on the model’s 10-minute spatial grid can be misleading, as it suggests significantly more activity in waters seaward of the ALWTRP exemption line than is actually the case. Moreover, the activity that occurs seaward of the exemption line is so limited that maps illustrating the location of this activity would violate the “rule of three,” which prohibits the disclosure of data on fishing activity in situations involving fewer than three vessels. In light of these considerations, the appendix does not provide maps illustrating the distribution of vessel activity in the Southeast.

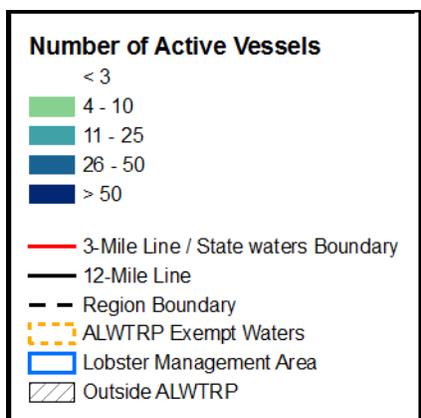


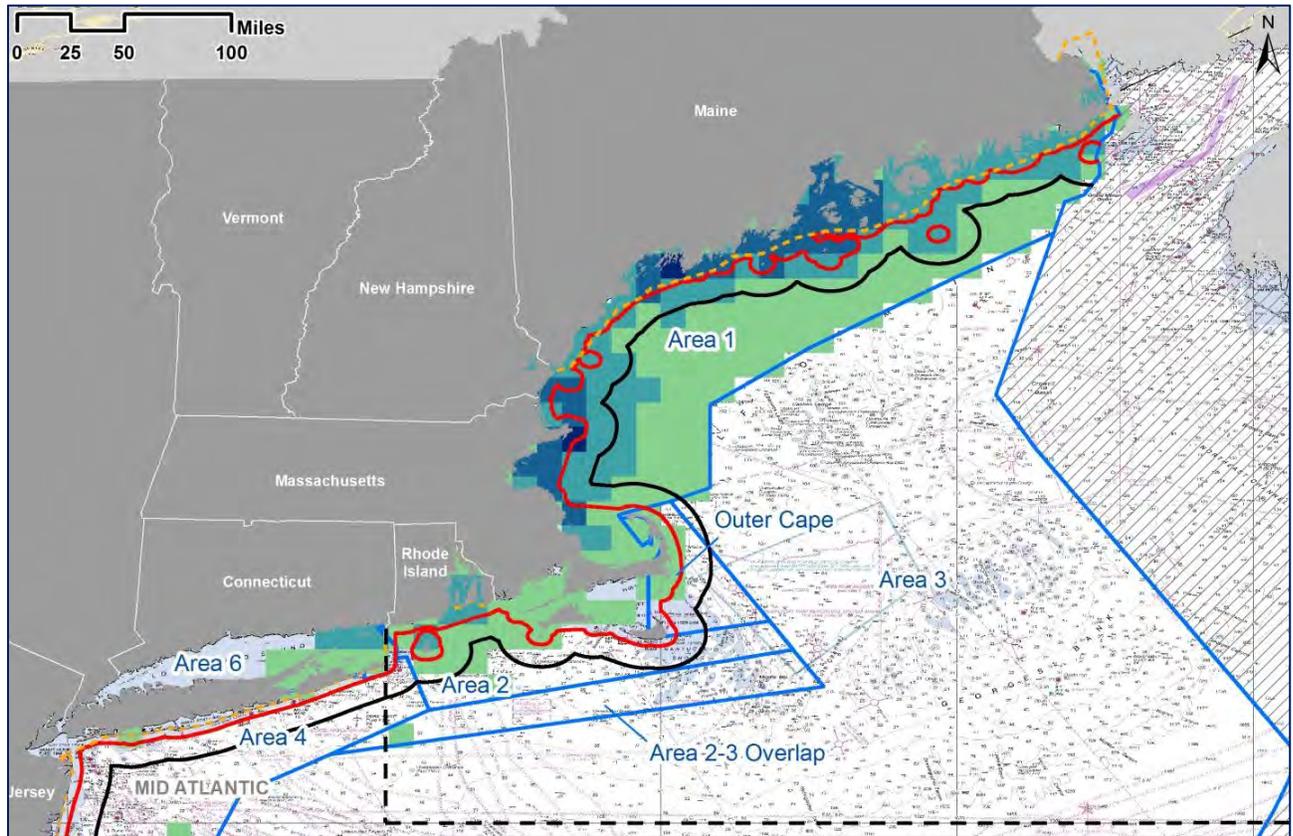
EXHIBIT D-1. 2010/2011 BASELINE NUMBER OF ACTIVE VESSELS

REGION	WATERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE
Northeast	Exempt Waters	245	126	148	236	683	1,355	2,135	2,260	2,078	1,881	1,411	665	1,102
	Non-Exempt Waters	1,399	1,034	990	1,267	1,916	2,555	3,133	3,211	3,018	2,811	2,536	1,963	2,153
	Subtotal	1,645	1,160	1,138	1,503	2,599	3,910	5,268	5,471	5,096	4,692	3,947	2,627	3,255
Mid-Atlantic	Exempt Waters	487	312	717	1,780	2,185	1,949	1,973	1,917	1,853	1,623	1,174	838	1,401
	Non-Exempt Waters	230	167	189	197	196	183	144	123	145	164	248	253	187
	Subtotal	717	479	907	1,978	2,381	2,132	2,118	2,040	1,998	1,787	1,421	1,091	1,587
Southeast	Exempt Waters	193	184	219	287	295	271	278	271	252	241	243	227	247
	Non-Exempt Waters	35	32	33	18	17	34	20	14	25	23	15	17	24
	Subtotal	228	216	252	305	312	305	297	285	277	264	258	244	270
Total	Exempt Waters	926	623	1,085	2,303	3,164	3,575	4,386	4,447	4,182	3,745	2,828	1,730	2,749
	Non-Exempt Waters	1,664	1,232	1,212	1,483	2,128	2,773	3,297	3,349	3,189	2,998	2,799	2,232	2,363
Grand Total		2,589	1,854	2,297	3,785	5,292	6,348	7,682	7,796	7,371	6,744	5,627	3,962	5,112

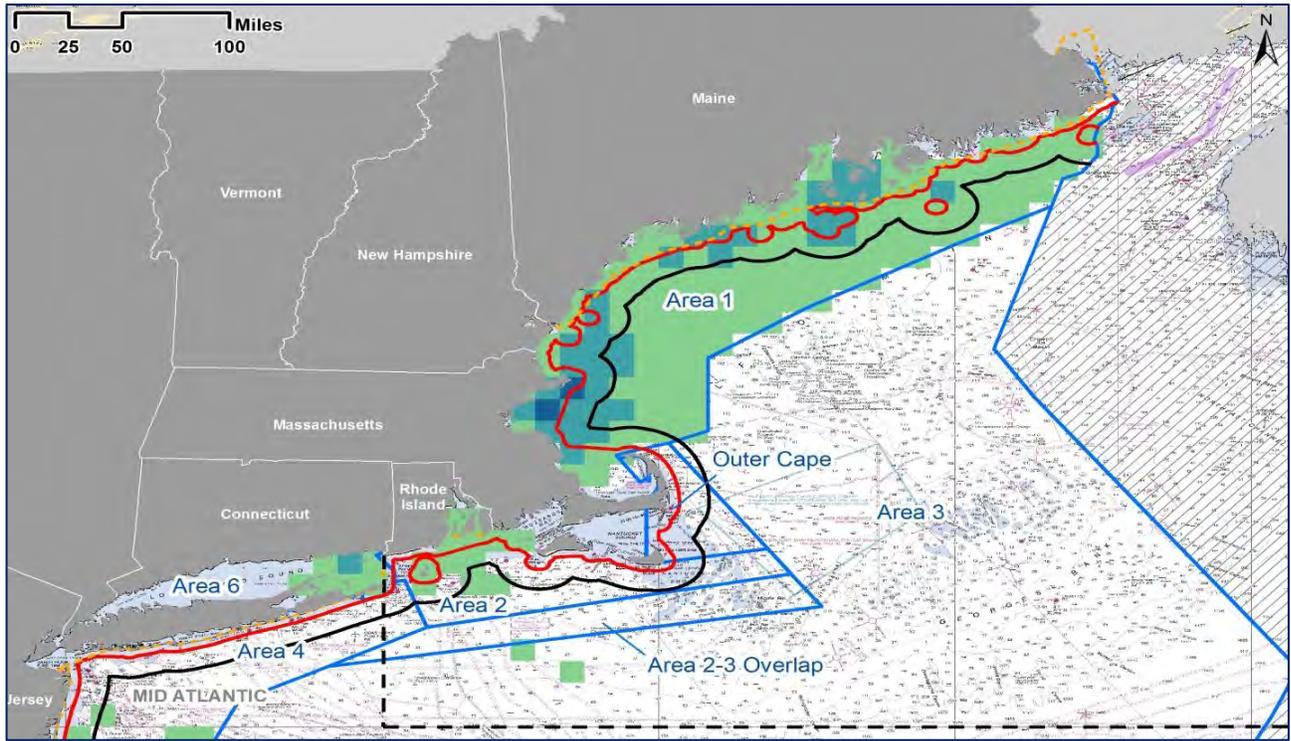
EXHIBIT D-2.

NORTHEAST

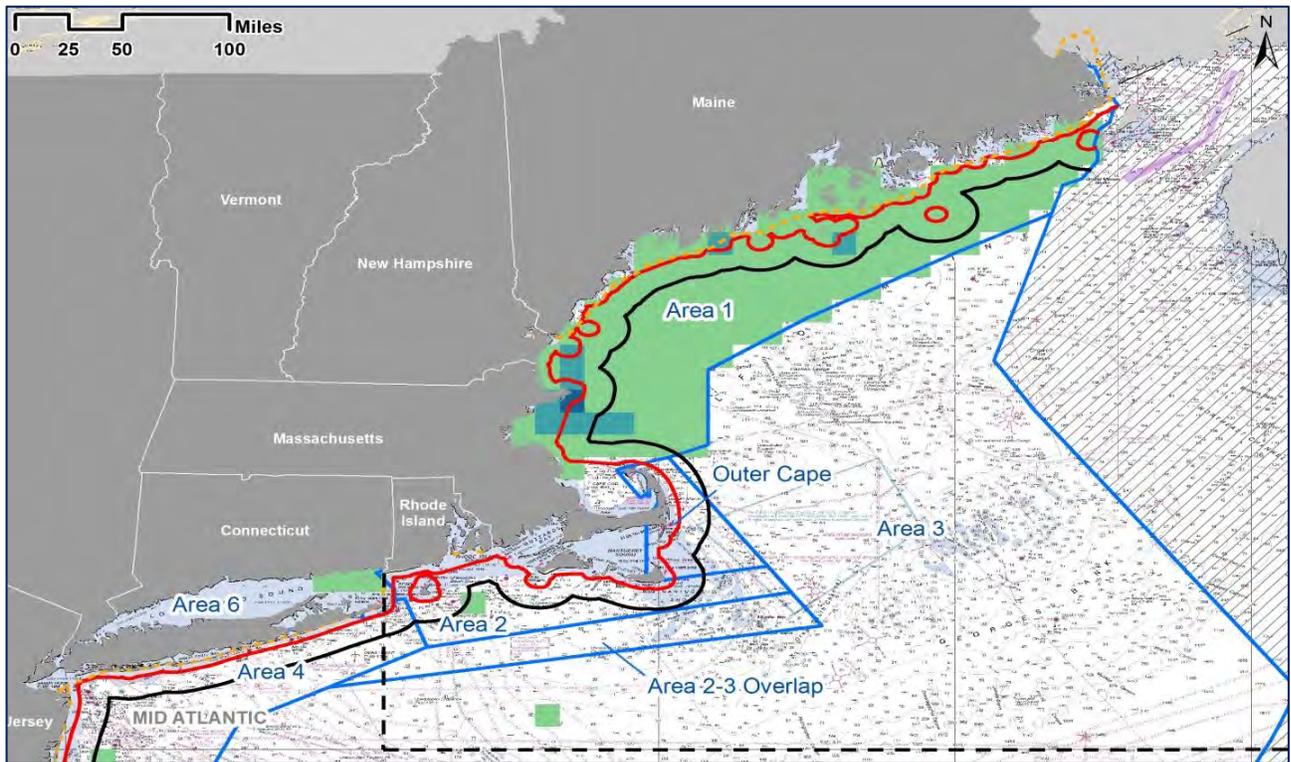
ACTIVE VESSELS – MONTHLY AVERAGE



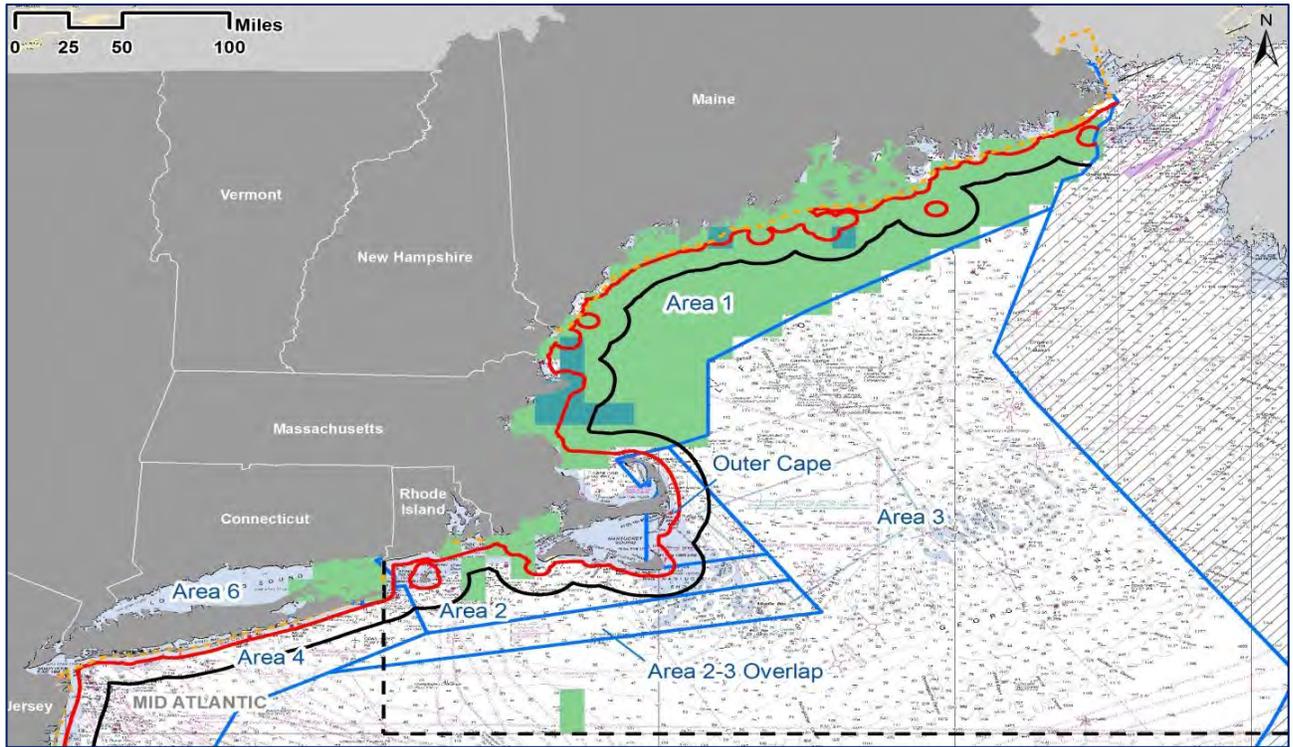
**ACTIVE VESSELS – JANUARY**



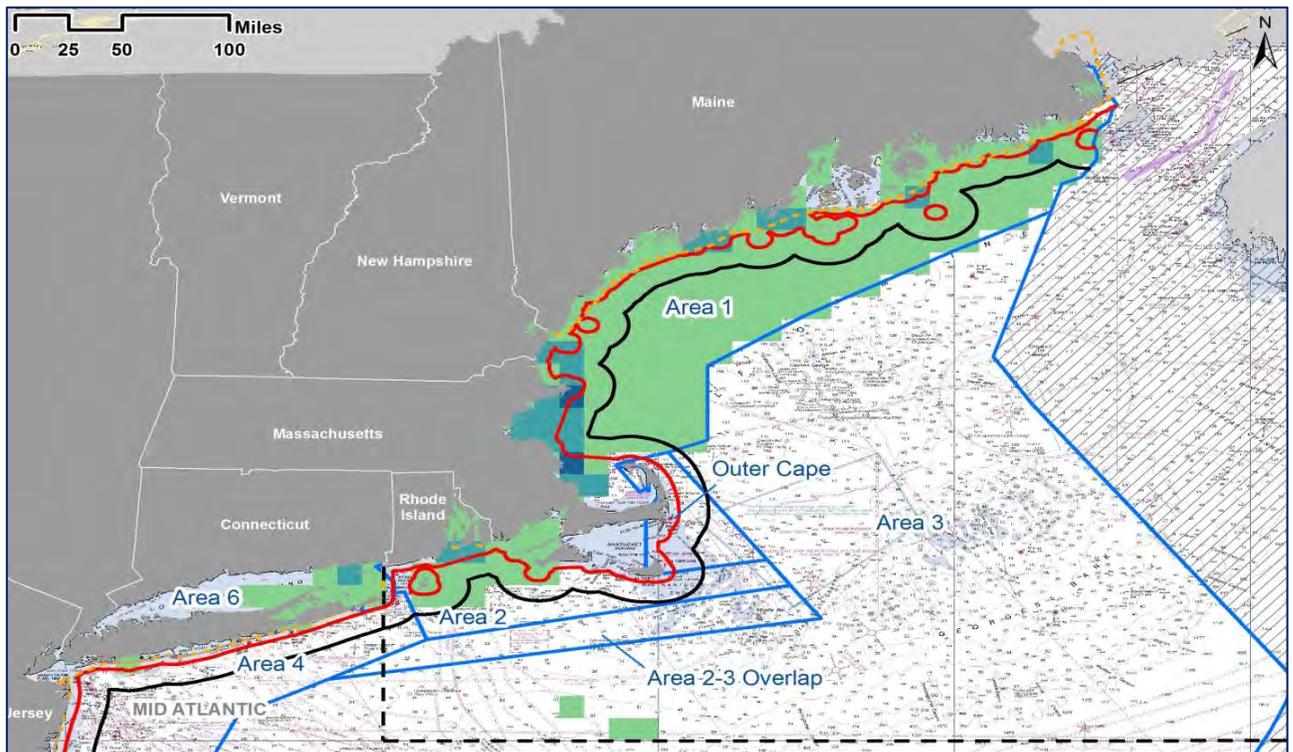
**ACTIVE VESSELS – FEBRUARY**



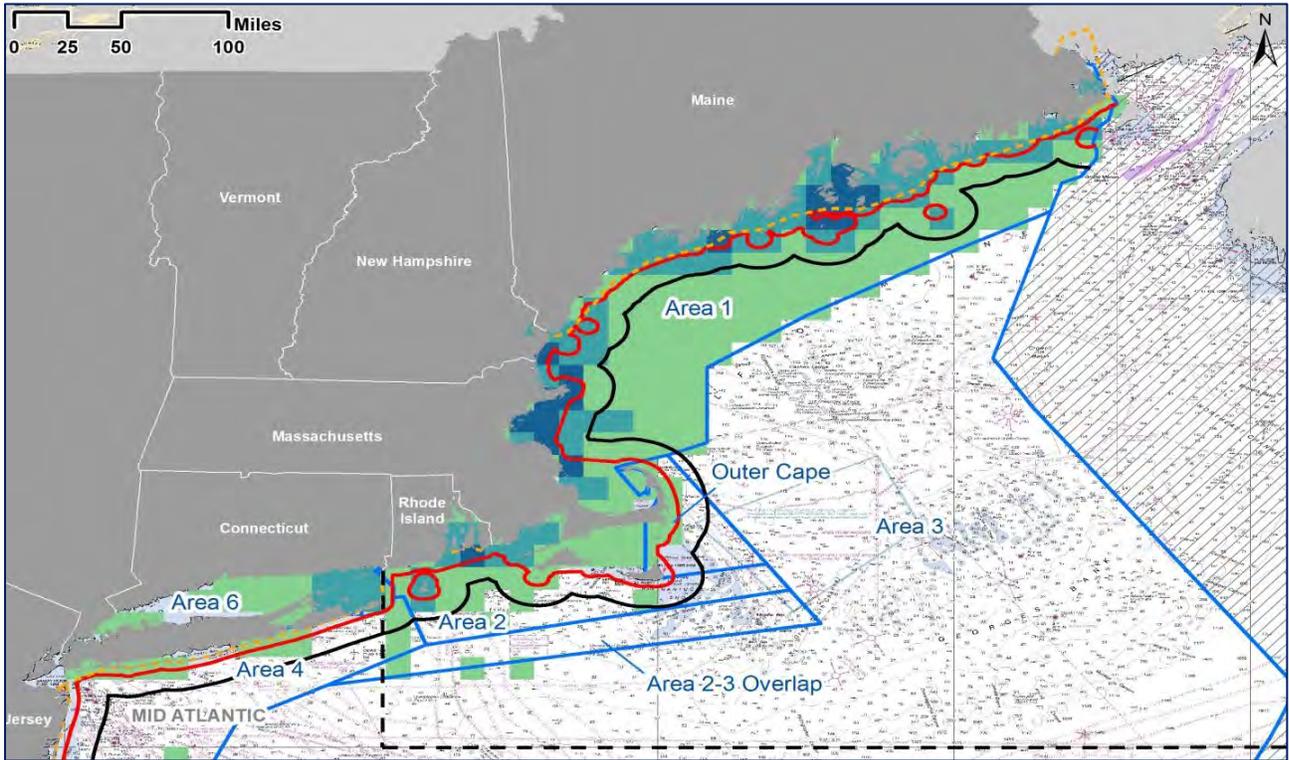
**ACTIVE VESSELS – MARCH**



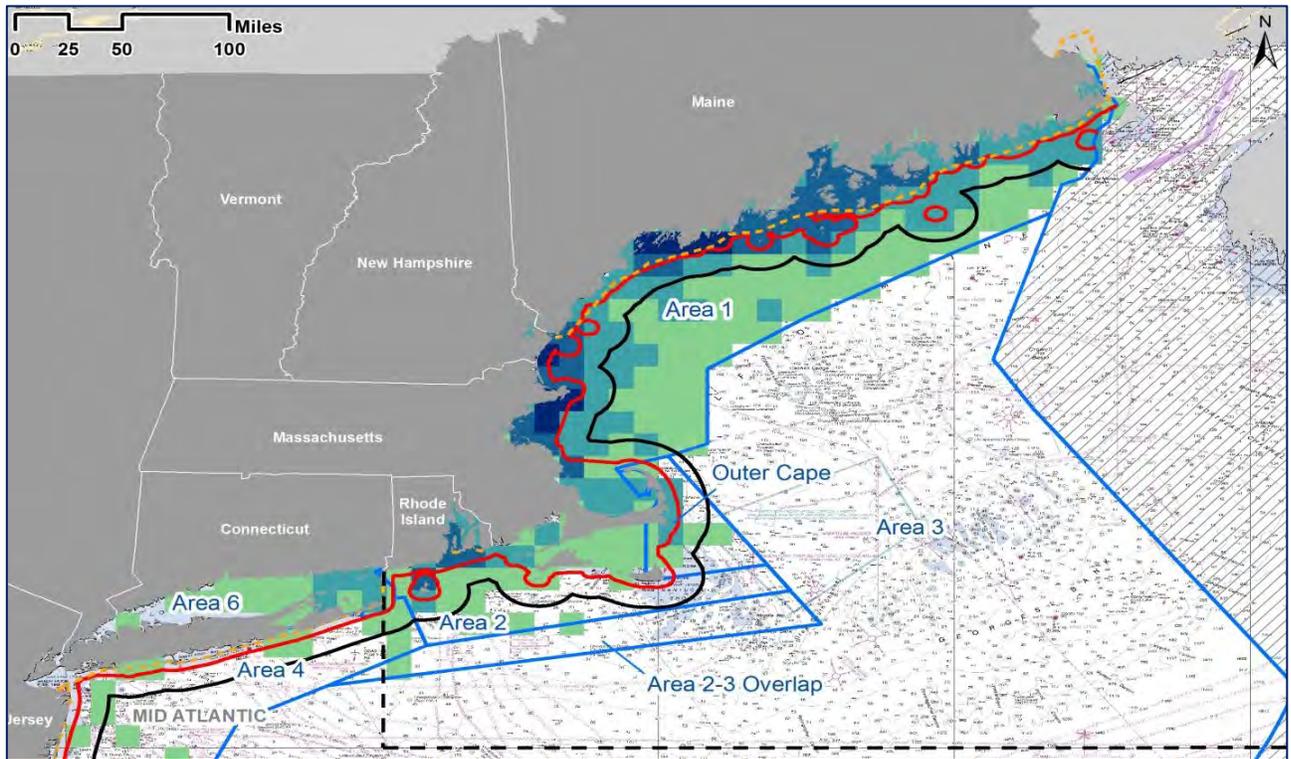
**ACTIVE VESSELS – APRIL**



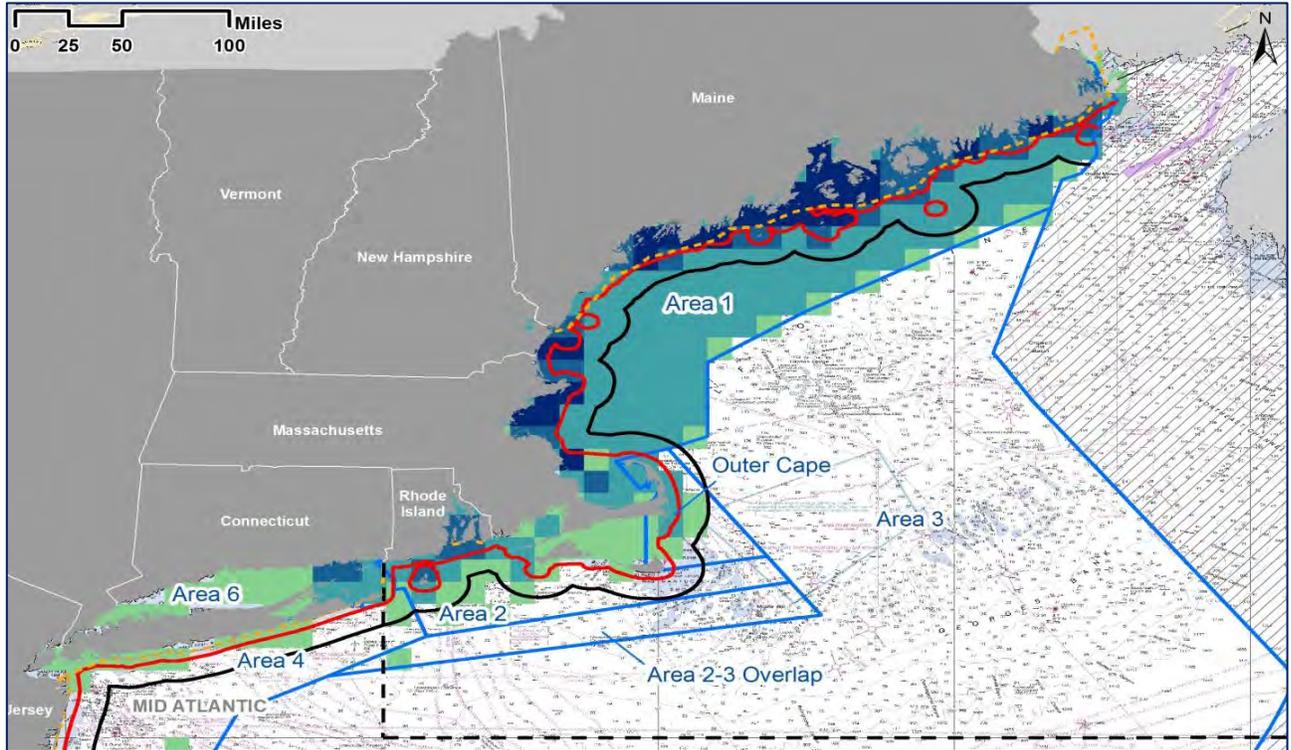
**ACTIVE VESSELS – MAY**



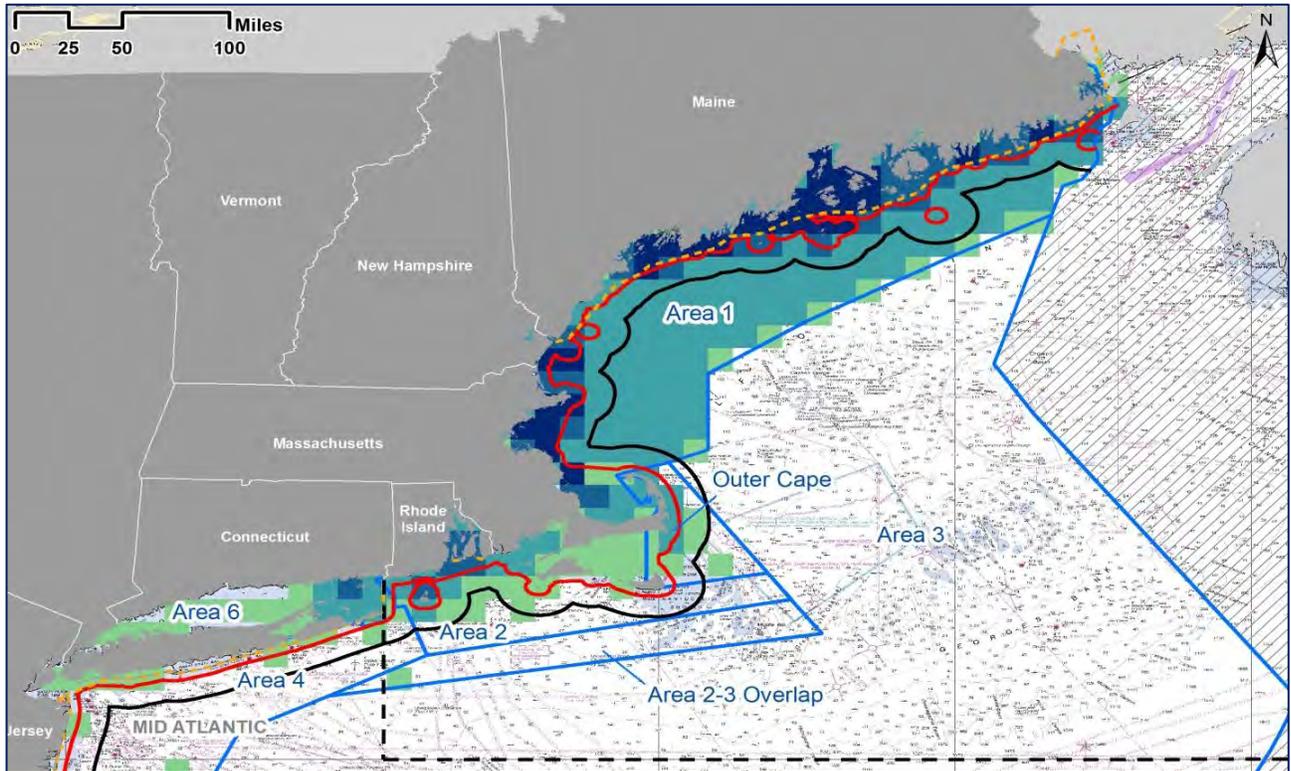
**ACTIVE VESSELS – JUNE**



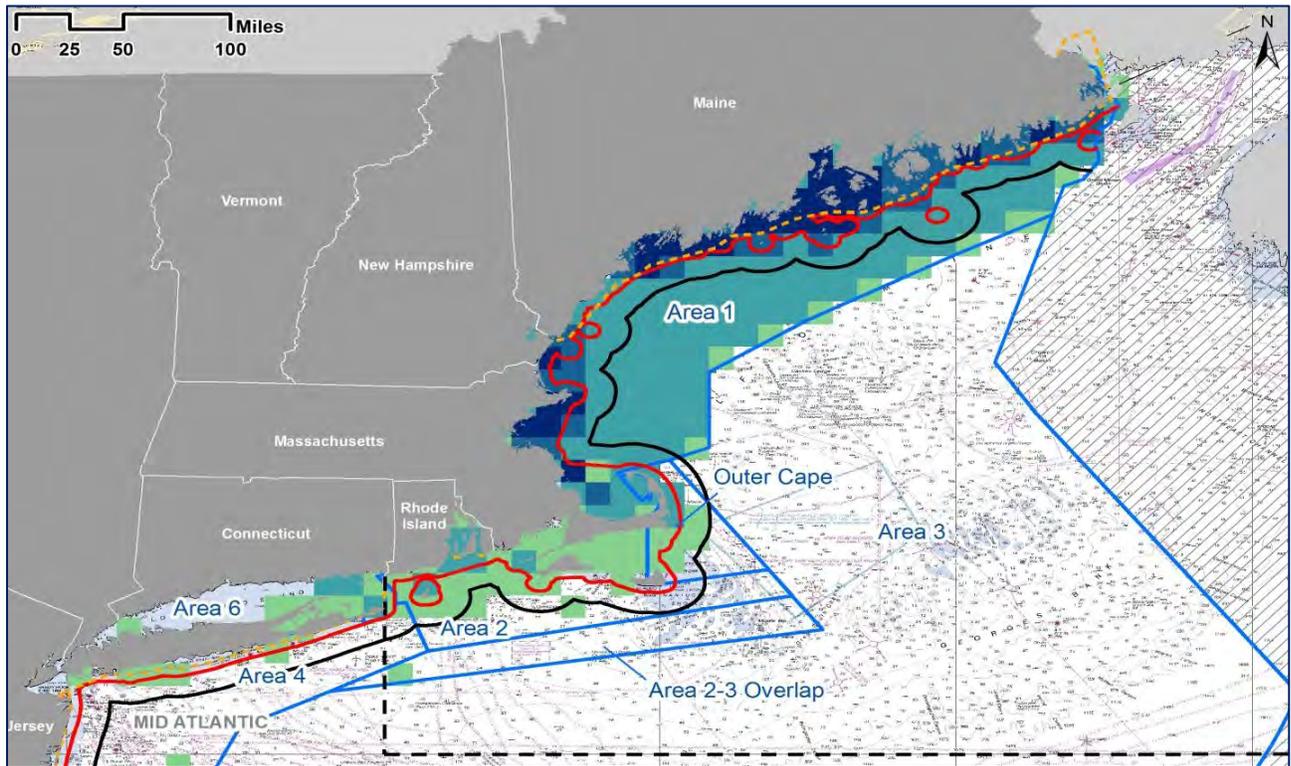
**ACTIVE VESSELS – JULY**



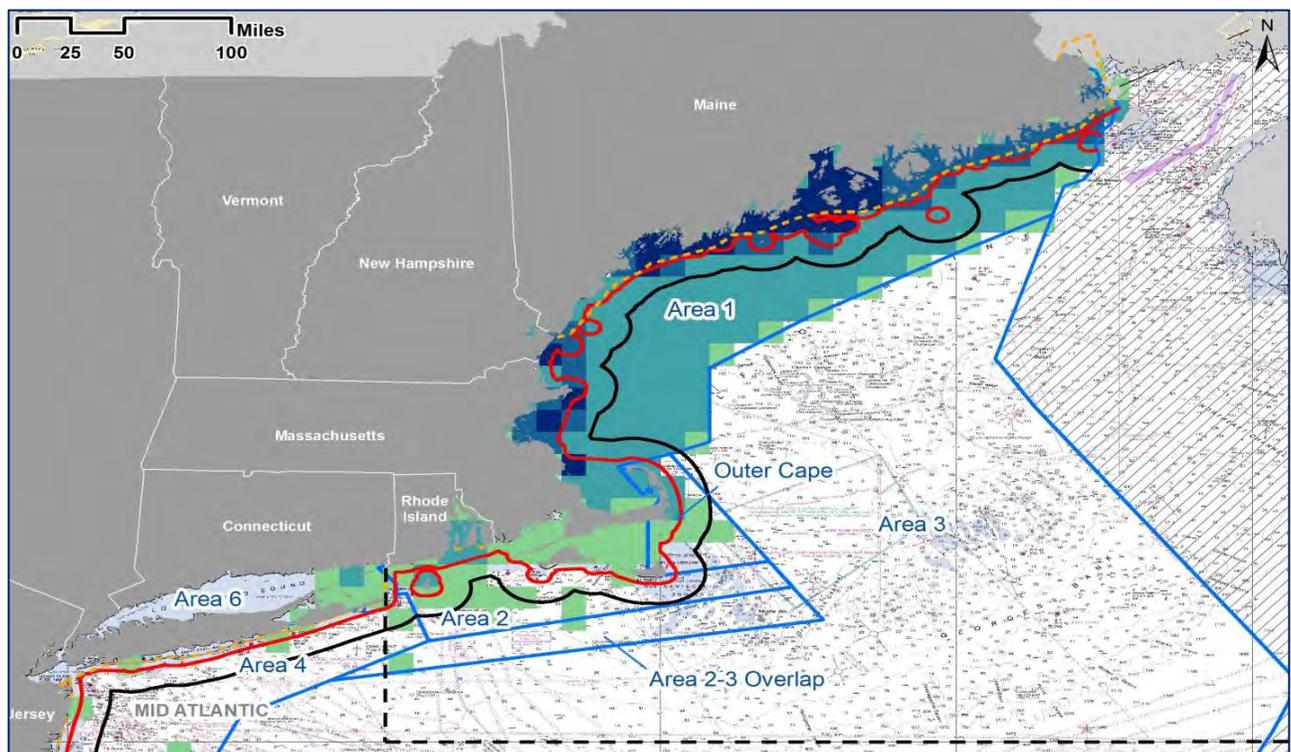
**ACTIVE VESSELS – AUGUST**



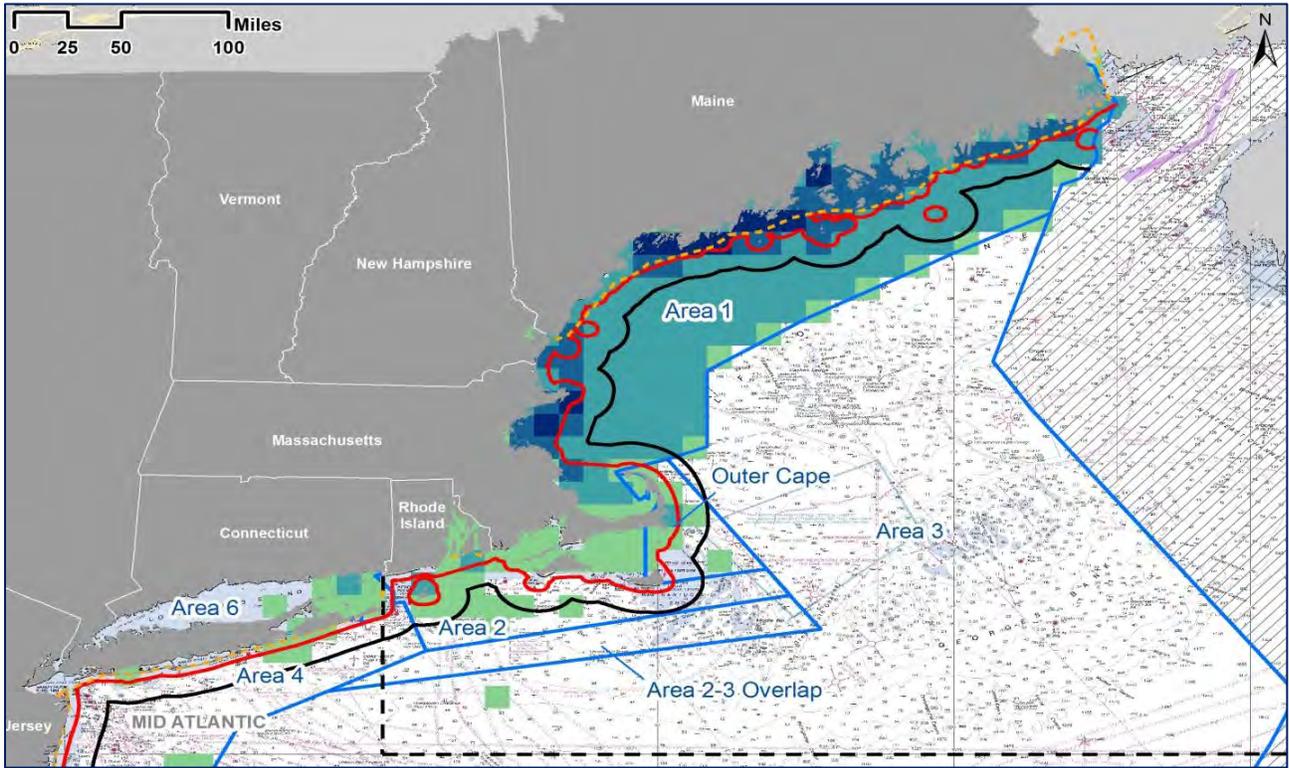
**ACTIVE VESSELS – SEPTEMBER**



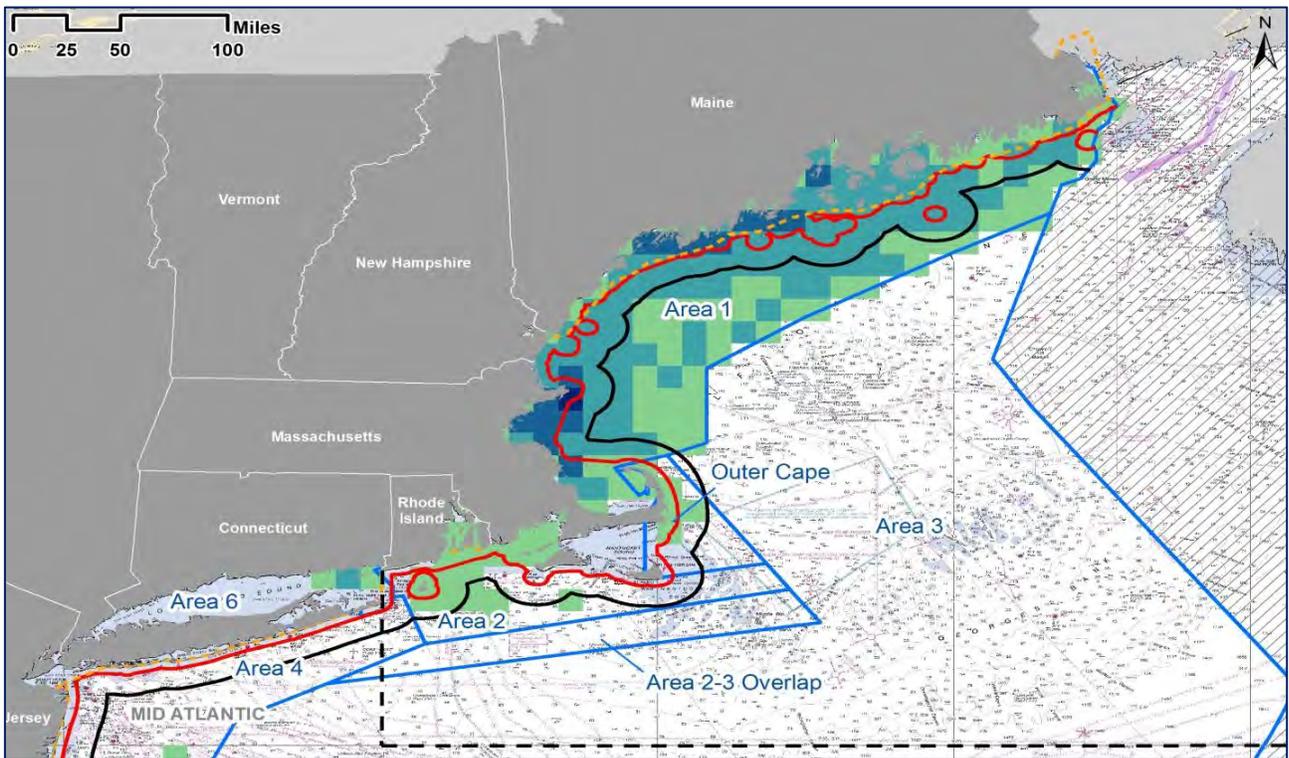
**ACTIVE VESSELS – OCTOBER**



**ACTIVE VESSELS – NOVEMBER**

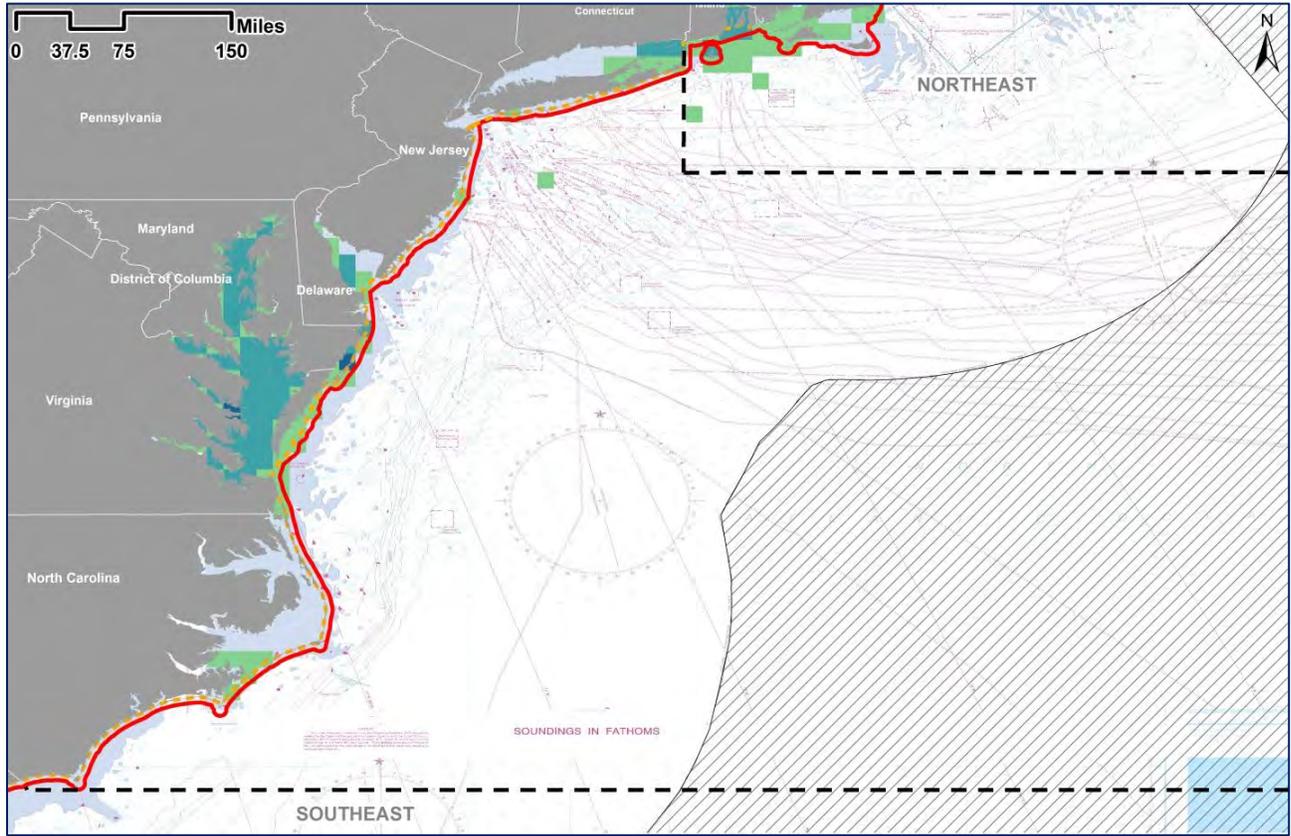


**ACTIVE VESSELS – DECEMBER**

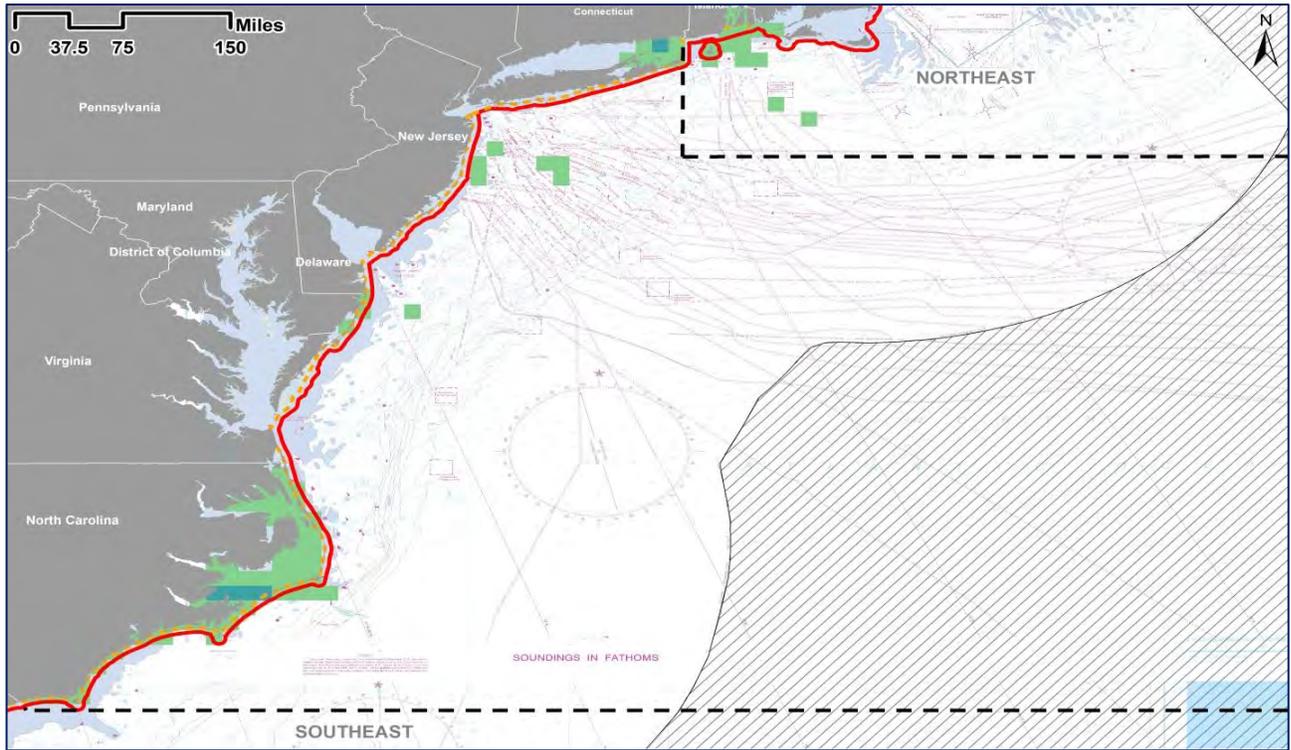


MID-ATLANTIC

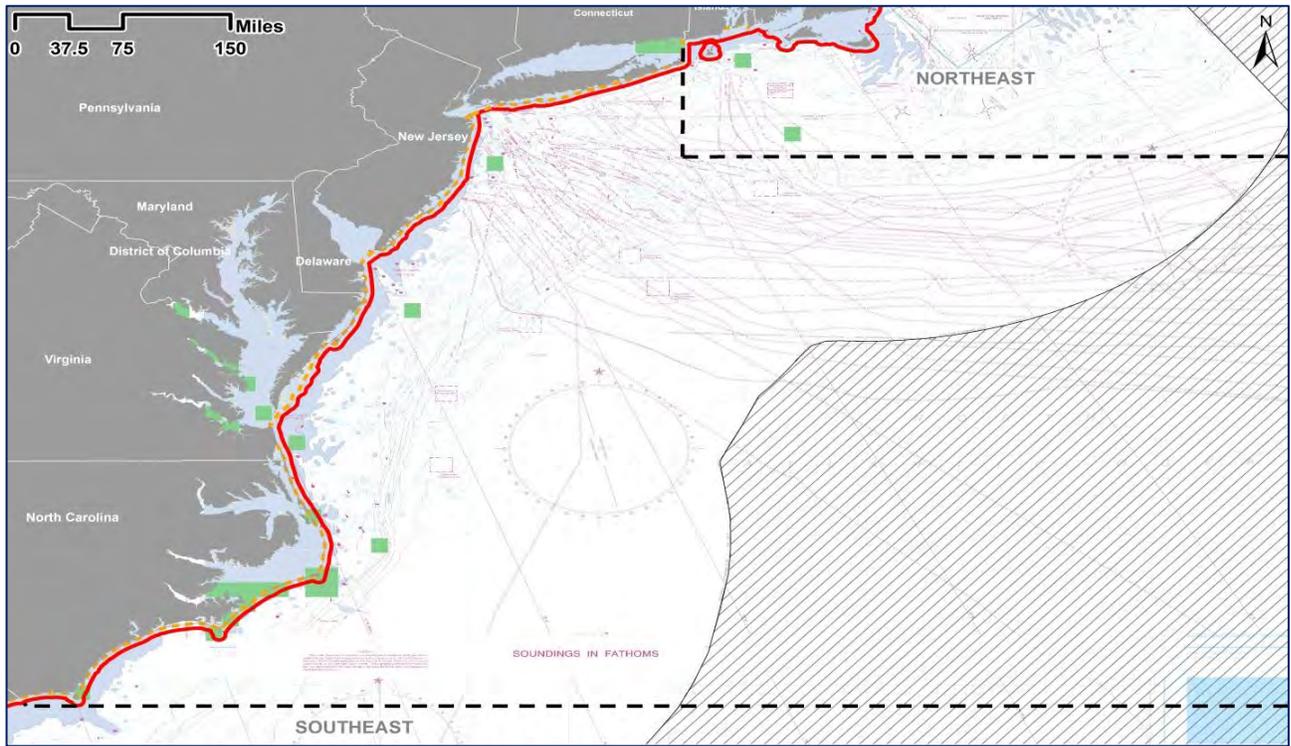
ACTIVE VESSELS – MONTHLY AVERAGE



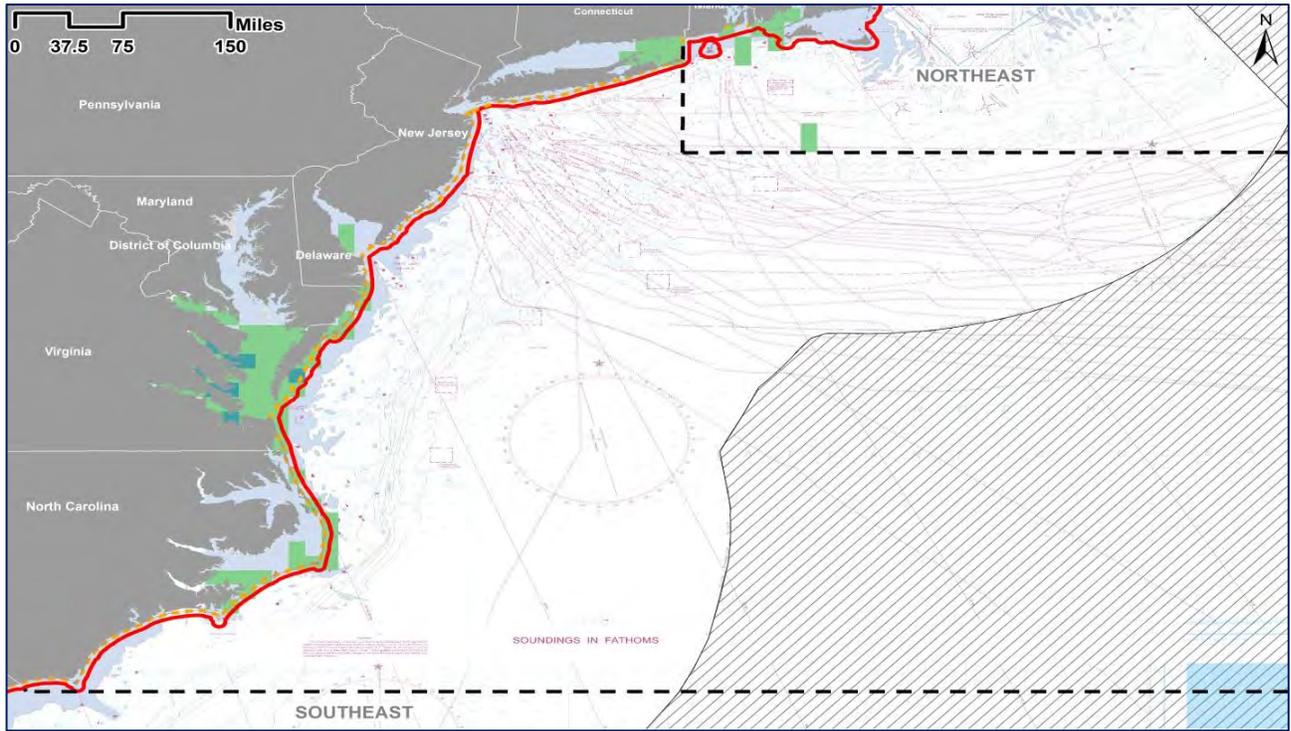
**ACTIVE VESSELS – JANUARY**



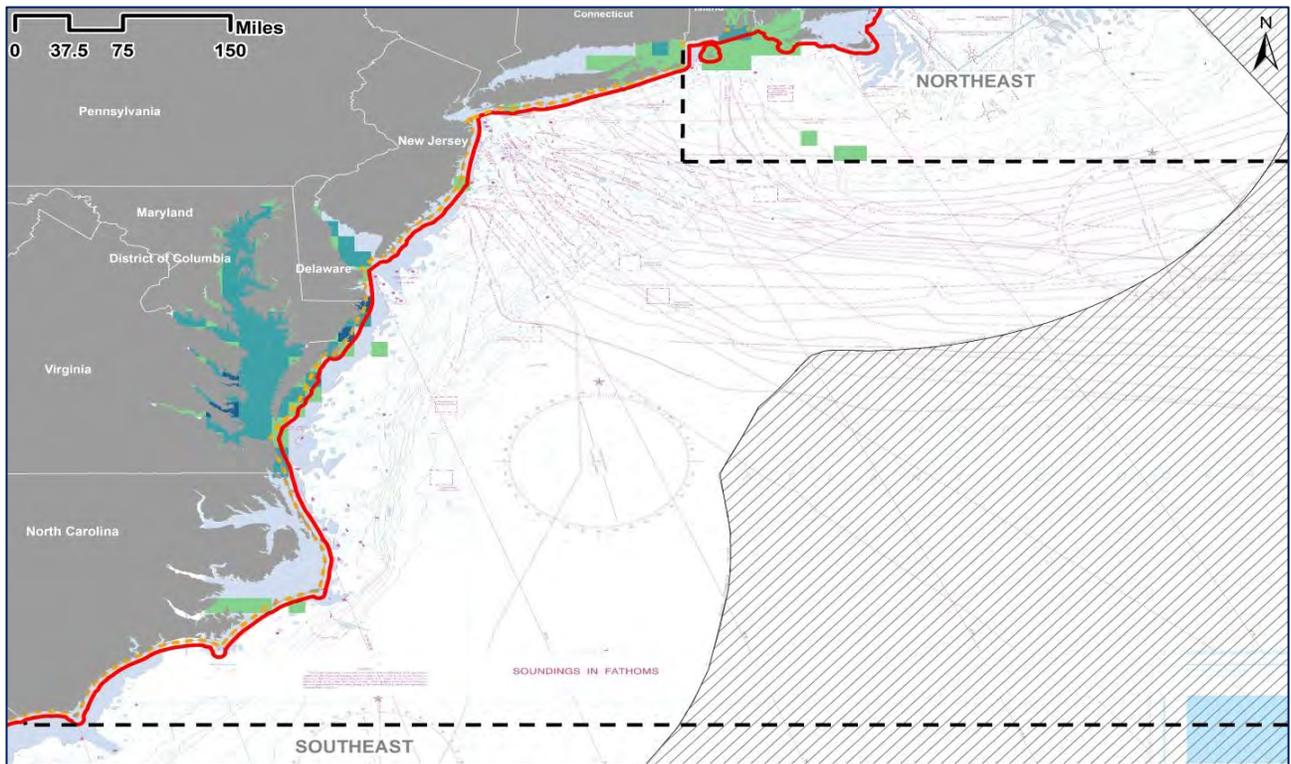
**ACTIVE VESSELS – FEBRUARY**



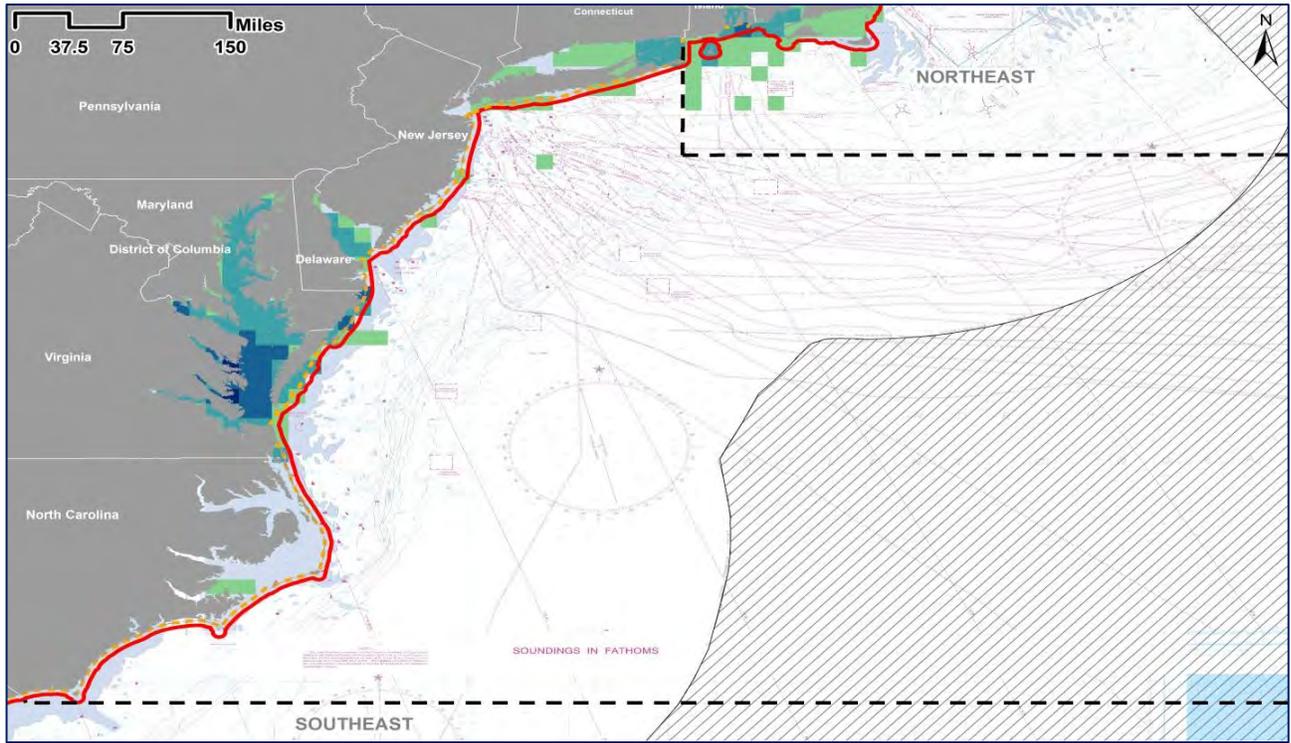
**ACTIVE VESSELS – MARCH**



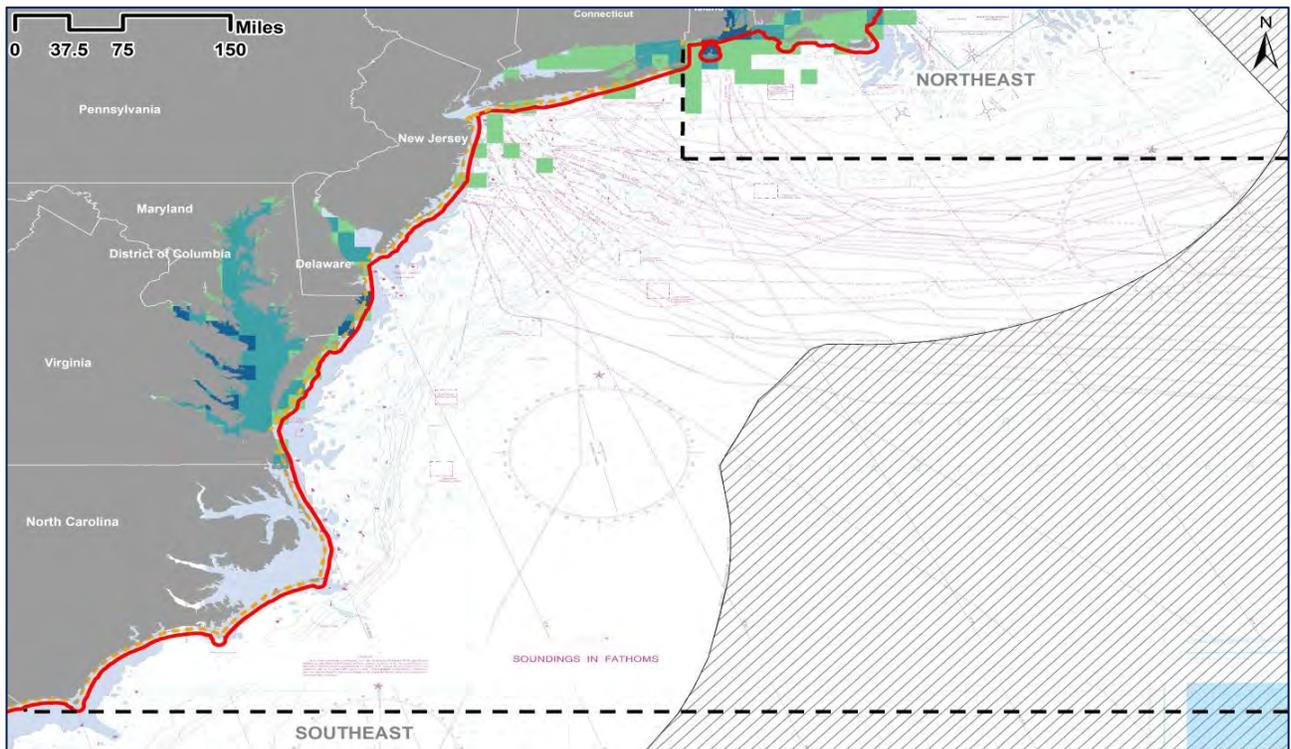
**ACTIVE VESSELS – APRIL**



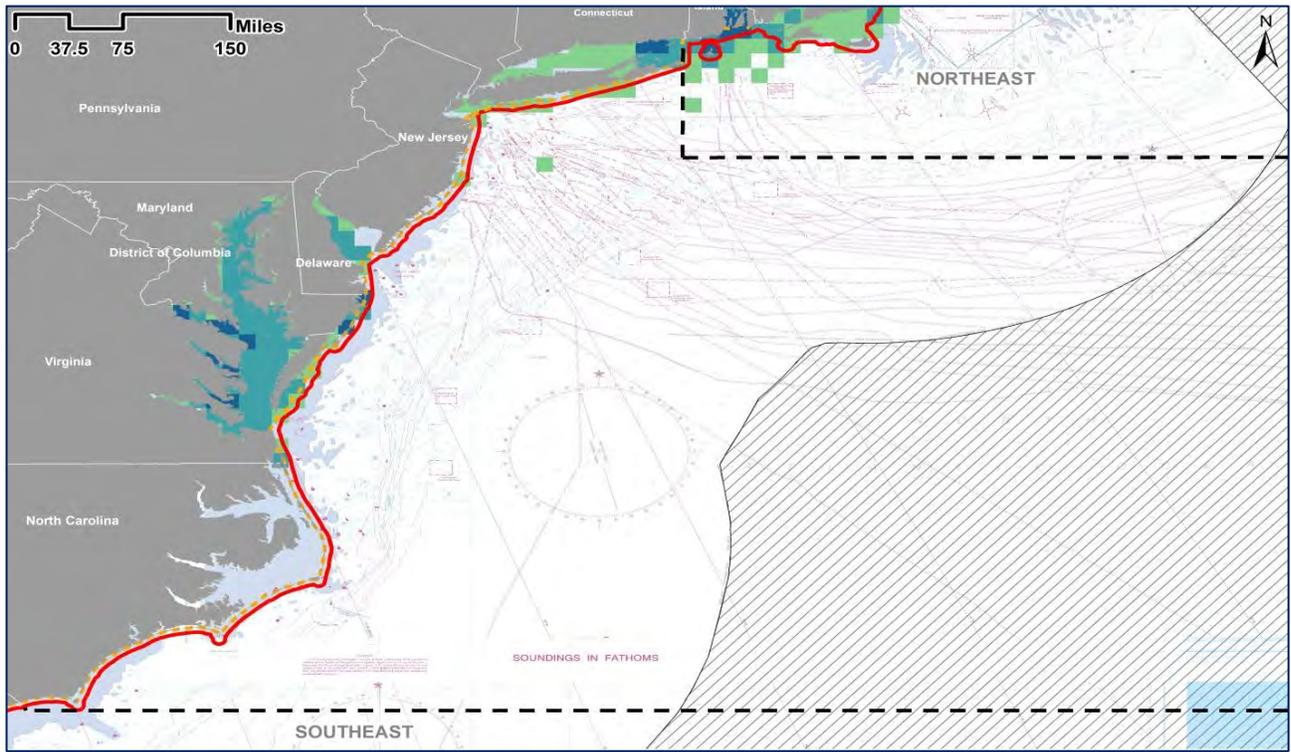
**ACTIVE VESSELS – MAY**



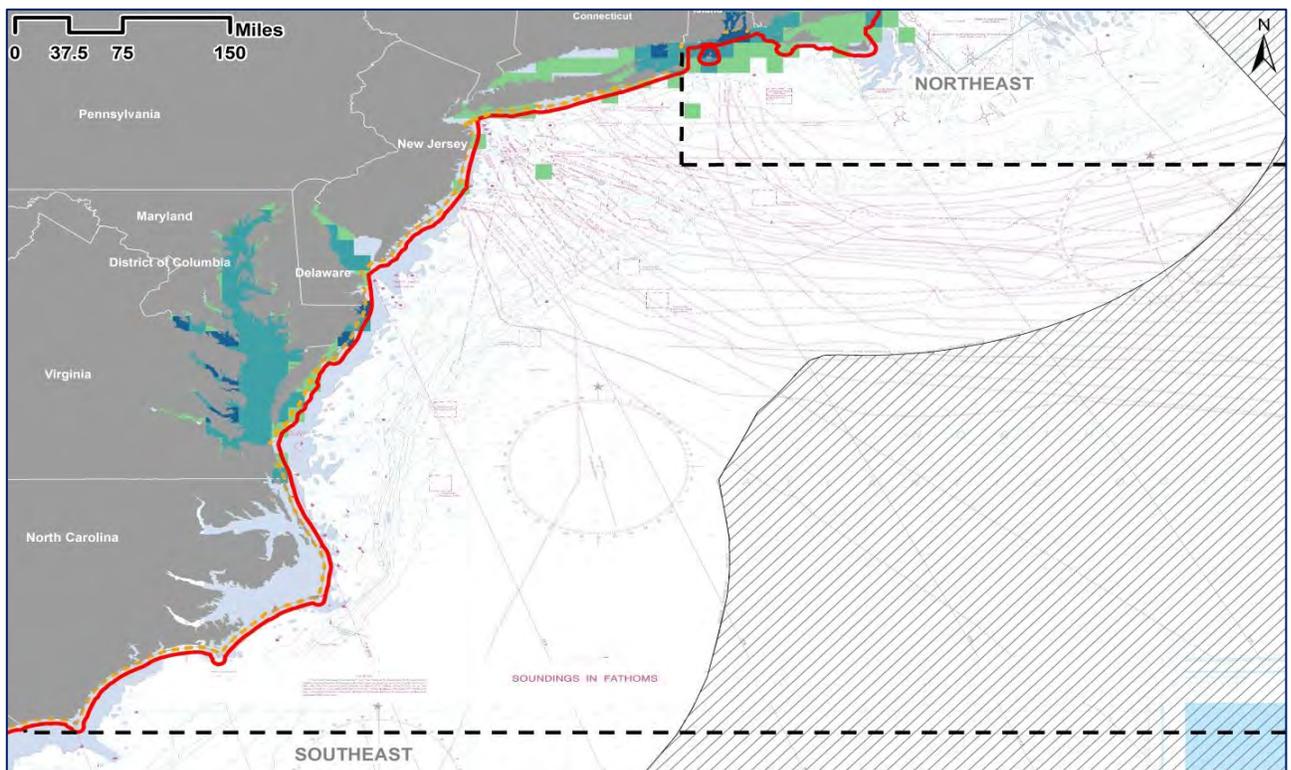
**ACTIVE VESSELS – JUNE**



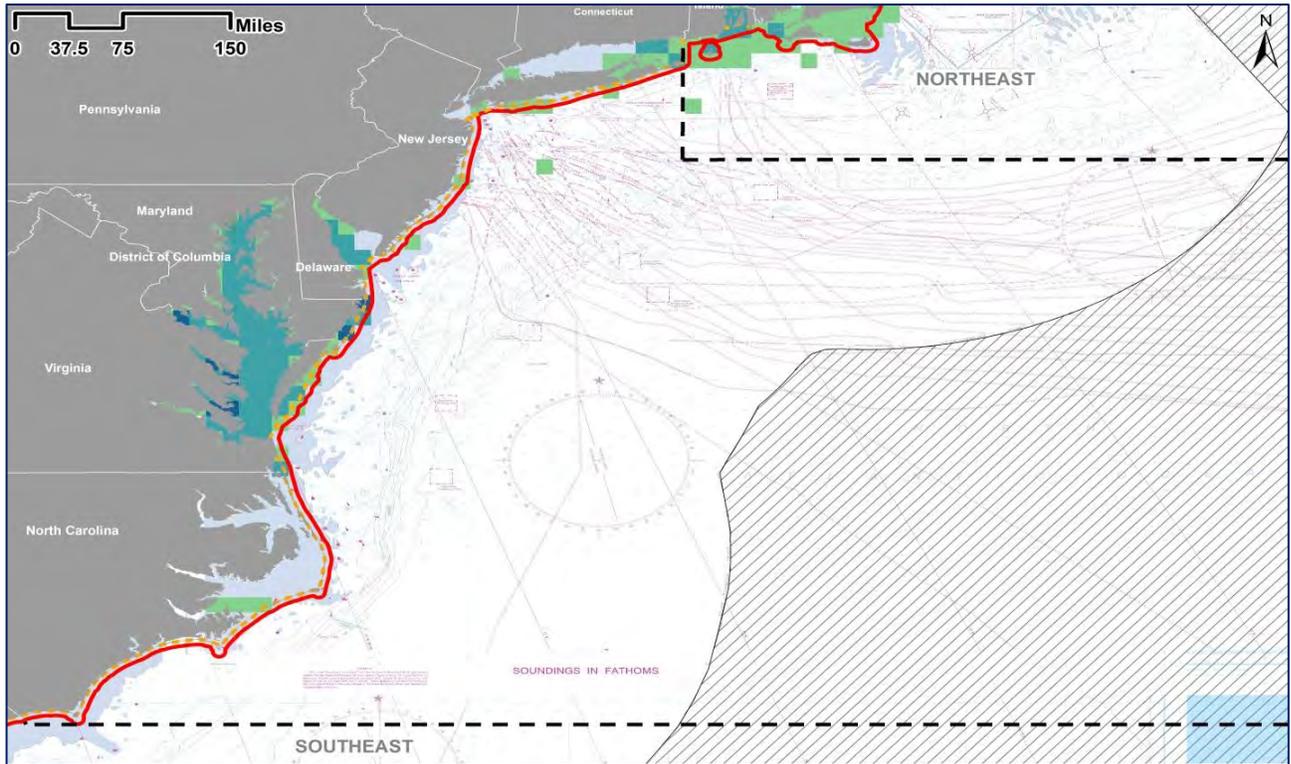
**ACTIVE VESSELS – JULY**



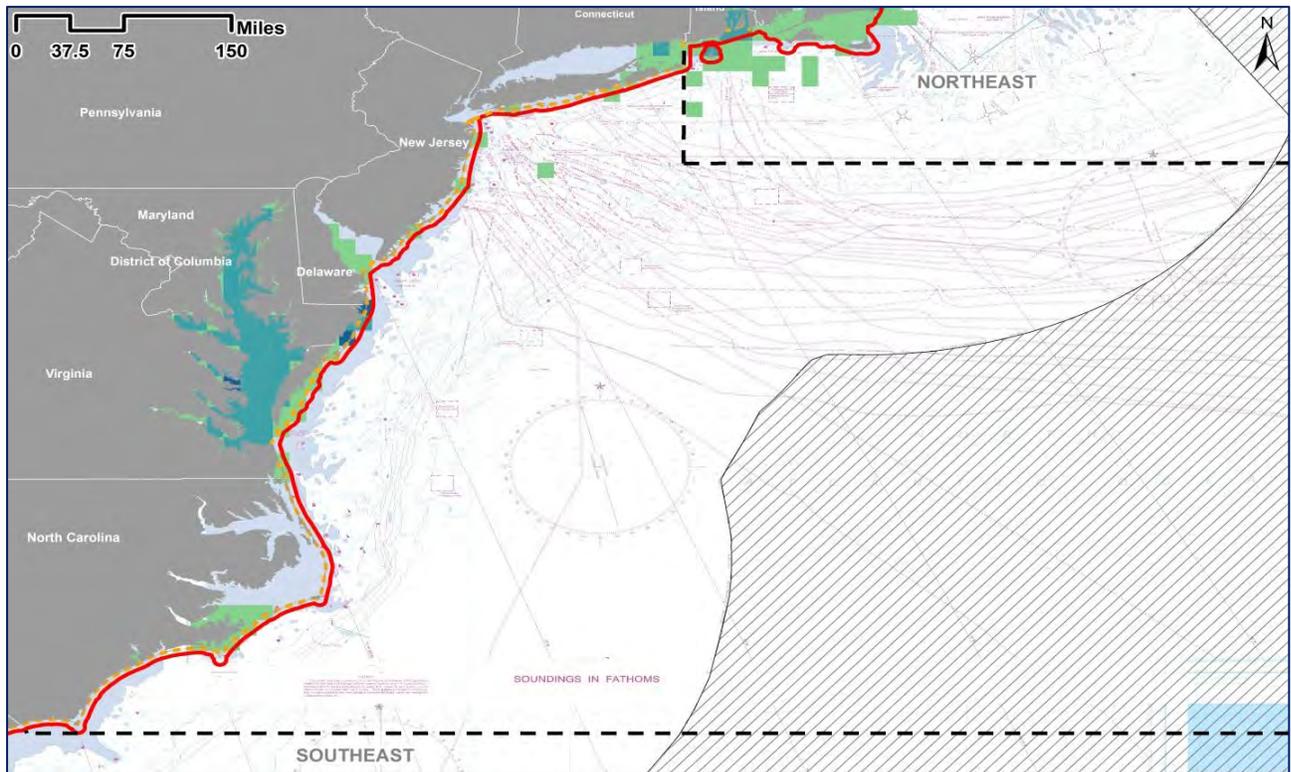
**ACTIVE VESSELS – AUGUST**



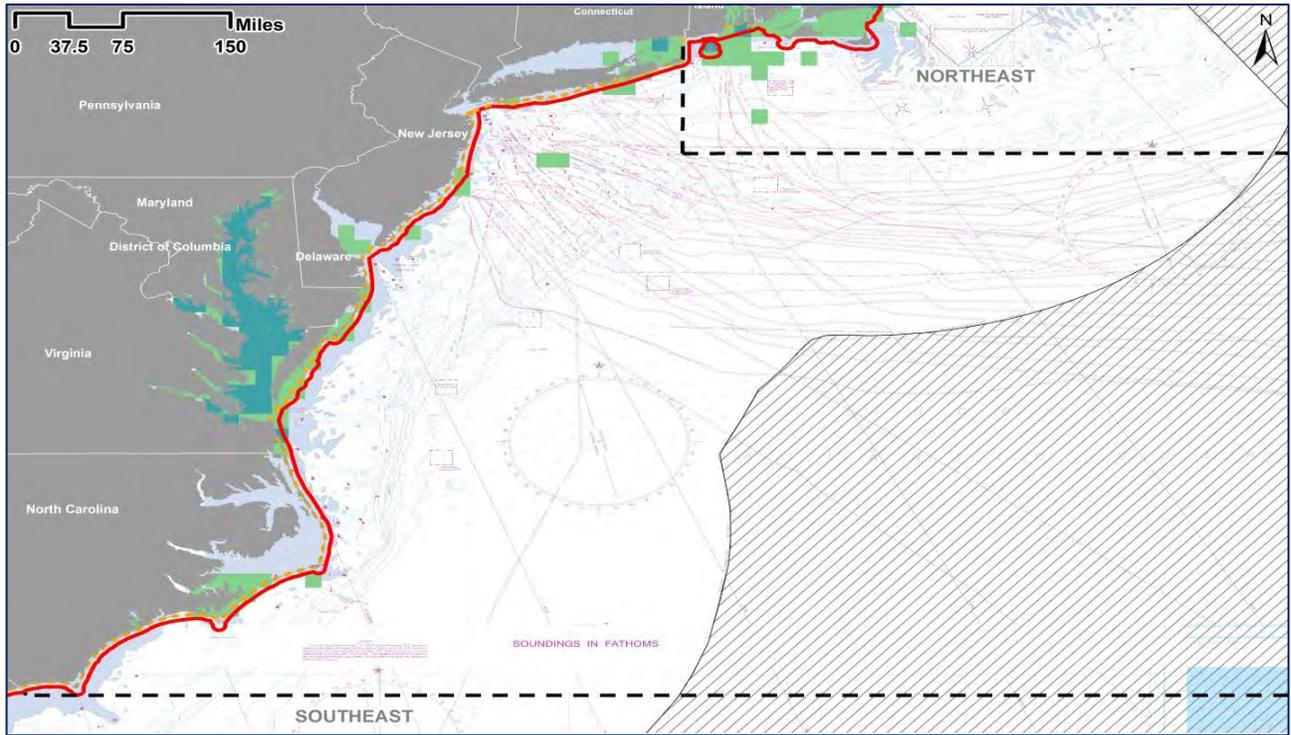
**ACTIVE VESSELS – SEPTEMBER**



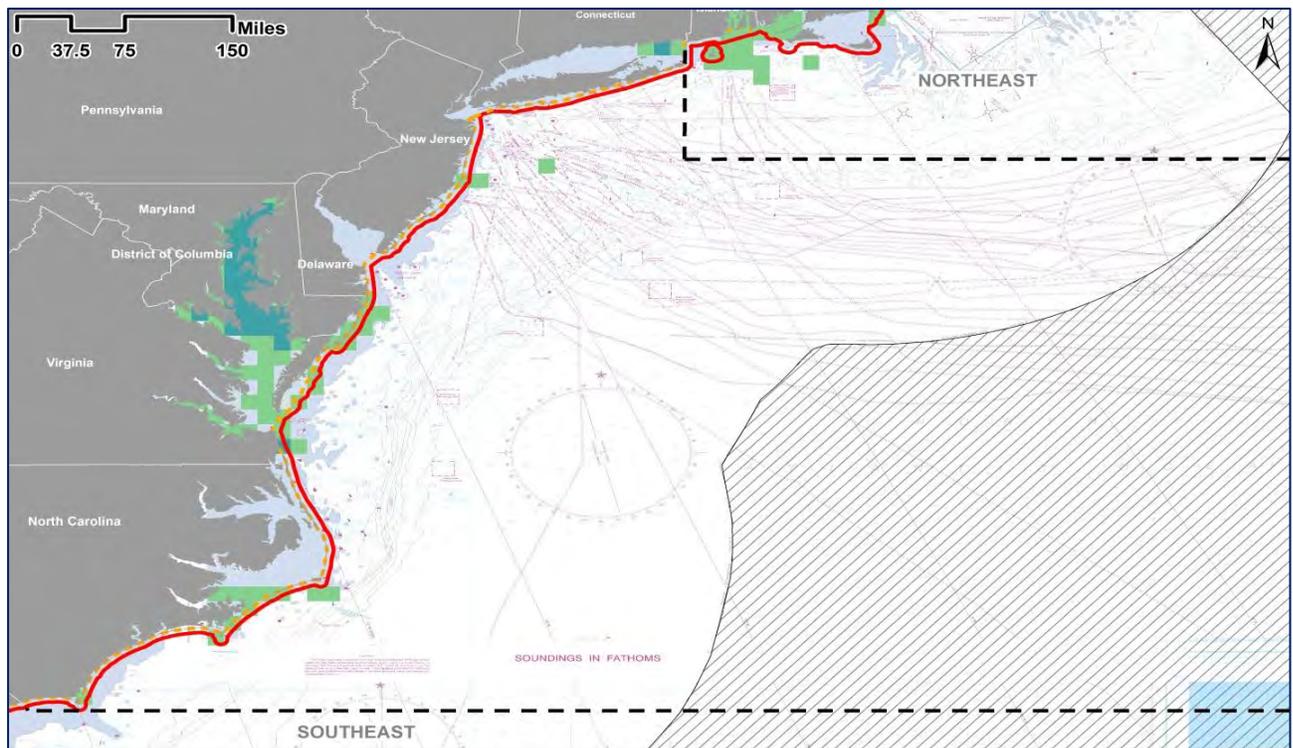
**ACTIVE VESSELS – OCTOBER**



**ACTIVE VESSELS – NOVEMBER**



**ACTIVE VESSELS – DECEMBER**



**APPENDIX E**  
**MODEL VESSEL REGIONS**

Appendix E identifies the regions for which the Vertical Line Model specifies model vessels. As the keys that follow indicate, each region is assigned a unique identification number. To determine the location of each region, match the numbers shown on the maps to those provided in the key.

**Map Key:**

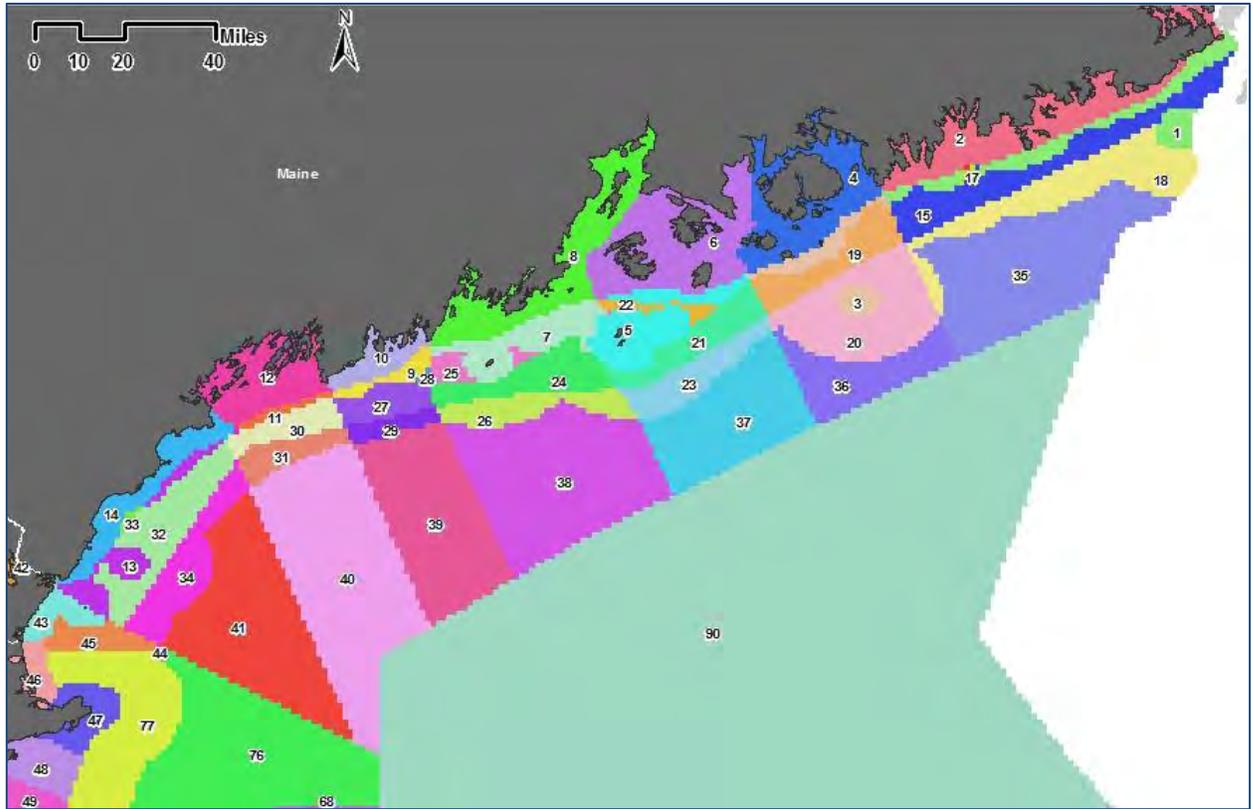
MAP ID	REGION NAME	STATE / FEDERAL
<b>NORTHEAST</b>		
1	Maine State Zone A	State
2	Maine State Zone A Exempt	State
3	Maine State Zone B	State
4	Maine State Zone B Exempt	State
5	Maine State Zone C	State
6	Maine State Zone C Exempt	State
7	Maine State Zone D	State
8	Maine State Zone D Exempt	State
9	Maine State Zone E	State
10	Maine State Zone E Exempt	State
11	Maine State Zone F	State
12	Maine State Zone F Exempt	State
13	Maine State Zone G	State
14	Maine State Zone G Exempt	State
15	Maine Nearshore Zone A 3-6 Miles	Federal
16	Maine Nearshore Zone A 3-6 Miles Exempt	Federal
17	Maine Nearshore Zone A 3-6 Miles Pocket	Federal
18	Maine Nearshore Zone A 6-12 Miles	Federal
19	Maine Nearshore Zone B 3-6 Miles	Federal
20	Maine Nearshore Zone B 6-12 Miles	Federal
21	Maine Nearshore Zone C 3-6 Miles	Federal
22	Maine Nearshore Zone C 3-6 Miles Pocket	Federal
23	Maine Nearshore Zone C 6-12 Miles	Federal
24	Maine Nearshore Zone D 3-6 Miles	Federal
25	Maine Nearshore Zone D 3-6 Miles Pocket	Federal
26	Maine Nearshore Zone D 6-12 Miles	Federal
27	Maine Nearshore Zone E 3-6 Miles	Federal
28	Maine Nearshore Zone E 3-6 Miles Pocket	Federal
29	Maine Nearshore Zone E 6-12 Miles	Federal
30	Maine Nearshore Zone F 3-6 Miles	Federal
31	Maine Nearshore Zone F 6-12 Miles	Federal
32	Maine Nearshore Zone G 3-6 Miles	Federal
33	Maine Nearshore Zone G 3-6 Miles Exempt	Federal
34	Maine Nearshore Zone G 6-12 Miles	Federal
35	Maine Nearshore A +12 Miles	Federal
36	Maine Nearshore B +12 Miles	Federal
37	Maine Nearshore C +12 Miles	Federal

MAP ID	REGION NAME	STATE / FEDERAL
38	Maine Nearshore D +12 Miles	Federal
39	Maine Nearshore E +12 Miles	Federal
40	Maine Nearshore F +12 Miles	Federal
41	Maine Nearshore G +12 Miles	Federal
42	NH Exempt	State
43	NH Non-Exempt	State
44	Other LMA 1 (12+) Nearshore	Federal
45	Other LMA 1 (3-12) Nearshore	Federal
46	Mass State Area 1	State
47	Mass State Area 2	State
48	Mass State Area 3	State
49	Mass State Area 4	State
50	Mass State Area 5	State
51	Mass State Area 6	State
52	Mass State Area 7 - LMA 1 (0 -3)	State
53	Mass State Area 7 - LMA 1/OC (0-3)	State
54	Mass State Area 8 - LMA 1 (0-3)	State
55	Mass State Area 8 - LMA 1/OC (0-3)	State
56	Mass State Area 8 - LMA OC (0-3)	State
57	Mass State Area 9	State
58	Mass State Area 10 - LMA 2 (0-3)	State
59	Mass State Area 10 - LMA OC (0-3)	State
60	Mass State Area 11 - LMA 2 (0-3)	State
61	Mass State Area 11 - LMA OC (0-3)	State
62	Mass State Area 12	State
63	Mass State Area 13	State
64	Mass State Area 14	State
65	Mass Nearshore Area 16 - LMA 2 (12+)	Federal
66	Mass Nearshore Area 16 - LMA 2 (3-12)	Federal
67	Mass Nearshore Area 16 - LMA 2/3 (12+)	Federal
68	Mass Nearshore Area 18 - LMA 1 (12+)	Federal
69	Mass Nearshore Area 18 - LMA 1 (3-12)	Federal
70	Mass Nearshore Area 18 - LMA 2 (12+)	Federal
71	Mass Nearshore Area 18 - LMA 2 (3-12)	Federal
72	Mass Nearshore Area 18 - LMA 2/3 (12+)	Federal
73	Mass Nearshore Area 18 - LMA 3 (3-12)	Federal
74	Mass Nearshore Area 18 - LMA OC (12+)	Federal
75	Mass Nearshore Area 18 - LMA OC (3-12)	Federal
76	Mass Nearshore Area 19 - LMA 1 (12+)	Federal
77	Mass Nearshore Area 19 - LMA 1 (3-12)	Federal
78	Mass Nearshore Area 19 - LMA OC (3-12)	Federal
79	RI 539	State
80	RI 539 Exempt	State

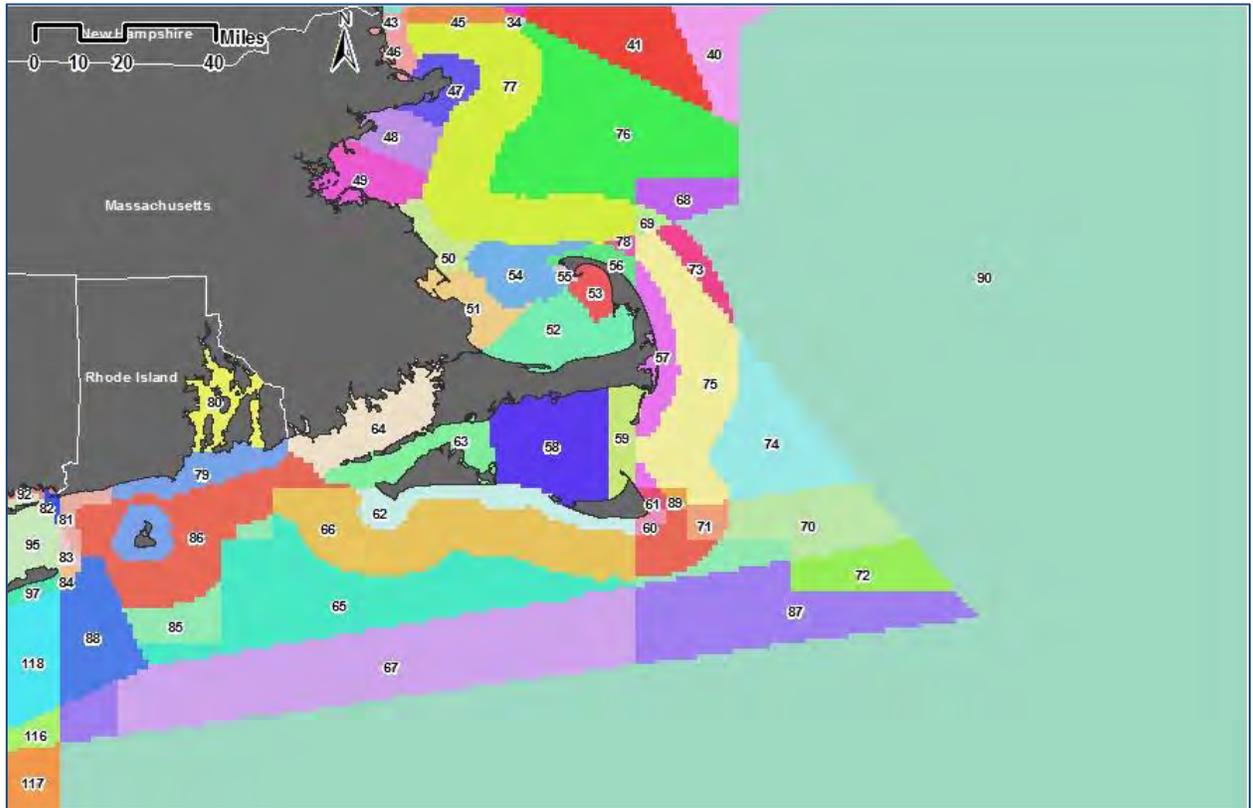
MAP ID	REGION NAME	STATE / FEDERAL
81	RI 611	State
82	RI 611 Exempt	State
83	NY Long Island Sound East Non-Exempt (NE)	State
84	NY South of Long Island Non-Exempt LMA 4 (NE)	State
85	Other LMA 2 (12+) Nearshore	Federal
86	Other LMA 2 (3-12) Nearshore	Federal
87	Other LMA 2/3 (12+) Nearshore	Federal
88	Other LMA 4 Northeast (12+) Nearshore	Federal
89	Other LMA OC (3-12) Nearshore	Federal
90	Other LMA 3 (12+) Offshore	Federal
<b>MID-ATLANTIC</b>		
91	CT Long Island Sound Central	State
92	CT Long Island Sound East	State
93	CT Long Island Sound West	State
94	NY Long Island Sound Central	State
95	NY Long Island Sound East Exempt	State
96	NY Long Island Sound West	State
97	NY South of Long Island Non-Exempt (Mid-Atlantic)	State
98	NY South of Long Island Exempt	State
99	NJ Exempt	State
100	NJ Non-exempt	State
101	DE Atlantic Ocean	State
102	DE Delaware Bay	State
103	DE Inland Bays	State
104	MD Atlantic Ocean	State
105	MD Chesapeake Bay Exempt	State
106	MD Coastal Bays Exempt	State
107	VA Atlantic Ocean System 1	State
108	VA Chesapeake Bay System 4	State
109	VA James River System 5	State
110	VA Miscellaneous Seaside Codes System 3	State
111	VA Other Chesapeake Bay Tribs System 9	State
112	VA Potomac River System 8	State
113	VA Rappahannock River System 7	State
114	VA Seaside Eastern Shore System 2	State
115	VA York River System 6	State
116	LMA 2/3 Overlap Mid-Atlantic Nearshore	Federal
117	LMA 3 Mid-Atlantic Offshore	Federal
118	LMA 4 Mid-Atlantic Nearshore	Federal
119	LMA 5 Mid-Atlantic Nearshore	Federal
120	NC North of Cape Hatteras Exempt	State
121	NC North of Cape Hatteras Non-Exempt	State
122	NC South of Cape Hatteras Exempt	State

MAP ID	REGION NAME	STATE / FEDERAL
123	NC South of Cape Hatteras Non-Exempt	State
124	Outside LMA 3 Mid-Atlantic Offshore	Federal
125	Outside LMA 5 Mid-Atlantic Nearshore	Federal
<b>SOUTHEAST</b>		
126	SC Exempt	State
127	SC Non-Exempt	State
128	GA Non-Exempt	State
129	FL Jacksonville (722) Exempt	State
130	FL Jacksonville (722) Non-Exempt	State
131	FL St. Augustine (728) Exempt	State
132	FL St. Augustine (728) Non-Exempt	State
133	FL Cape Canaveral (732) Exempt	State
134	FL Cape Canaveral (732) Non-Exempt	State
135	FL Fort Pierce (736) Exempt	State
136	FL Fort Pierce (736) Non-Exempt	State
137	FL West Palm Beach (741) Exempt	State
138	FL West Palm Beach (741) Non-Exempt	State
139	South Atlantic Nearshore	Federal
140	South Atlantic Offshore	Federal

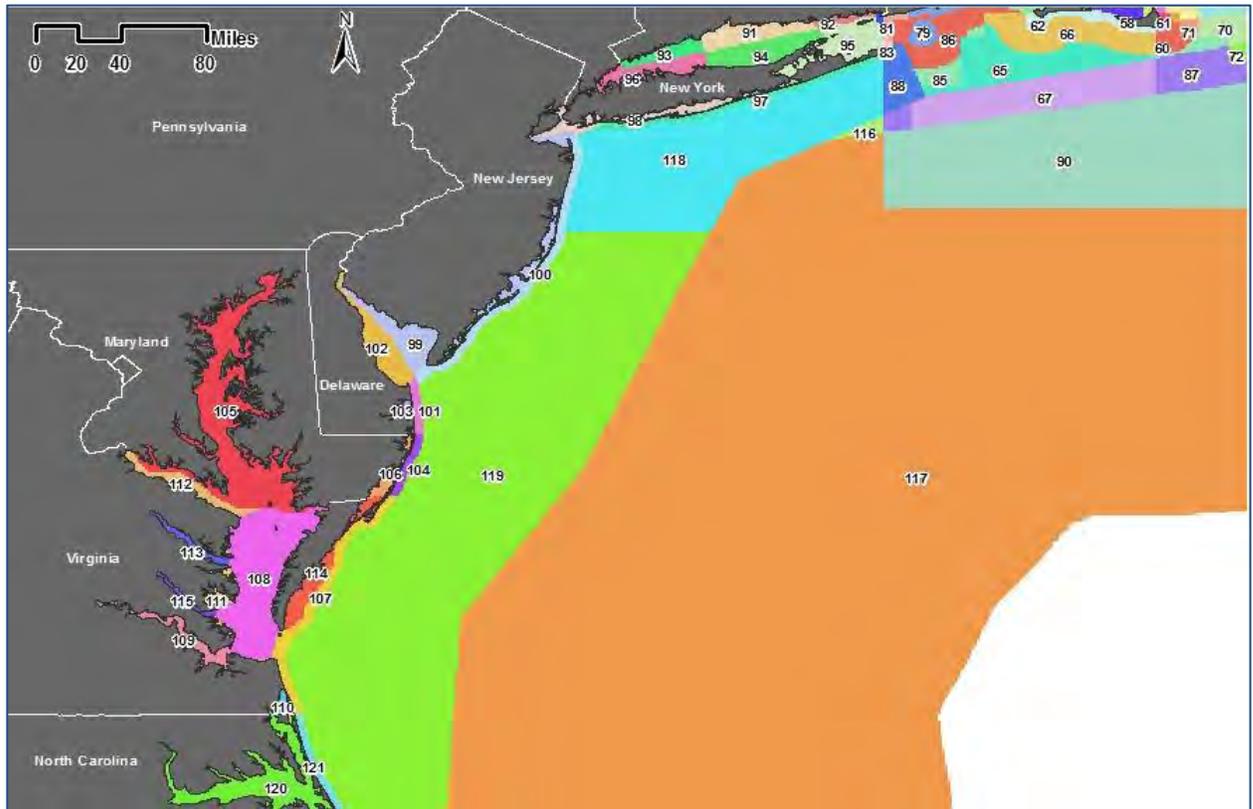
**NORTHEAST - 1**



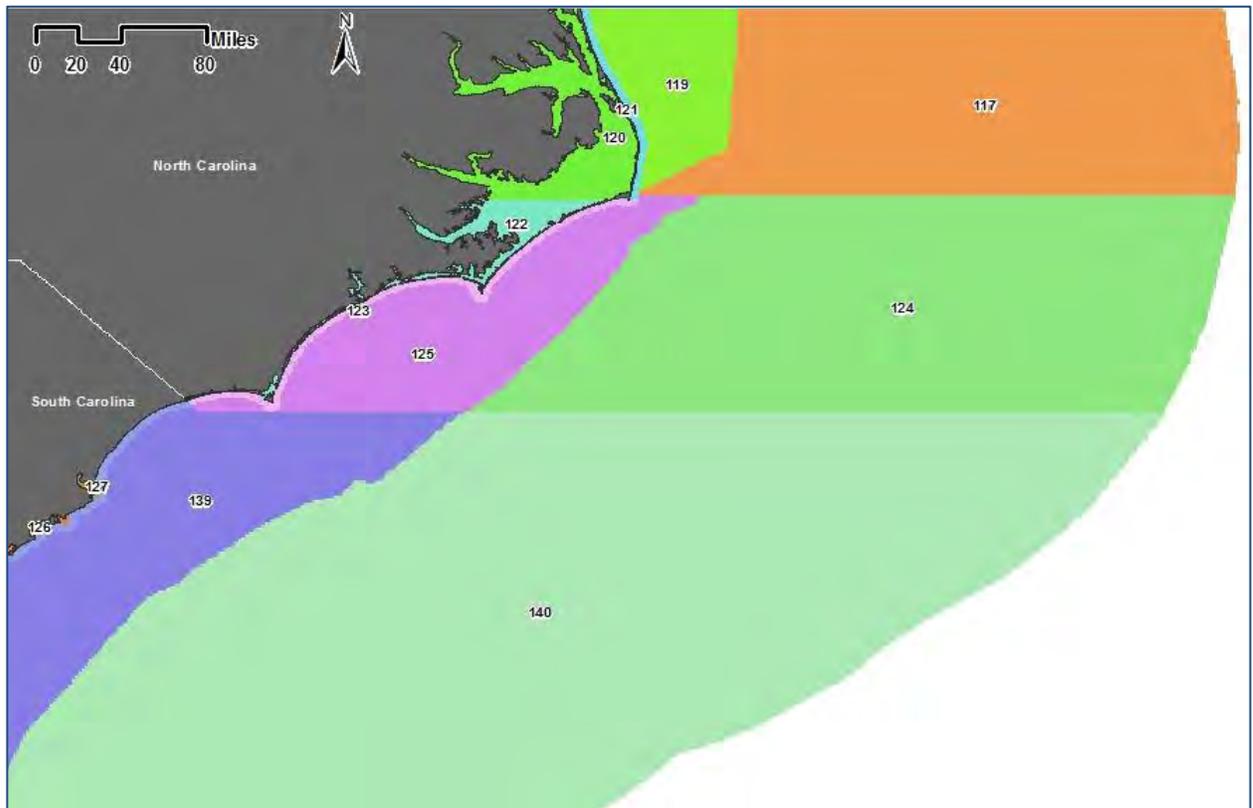
**NORTHEAST - 2**



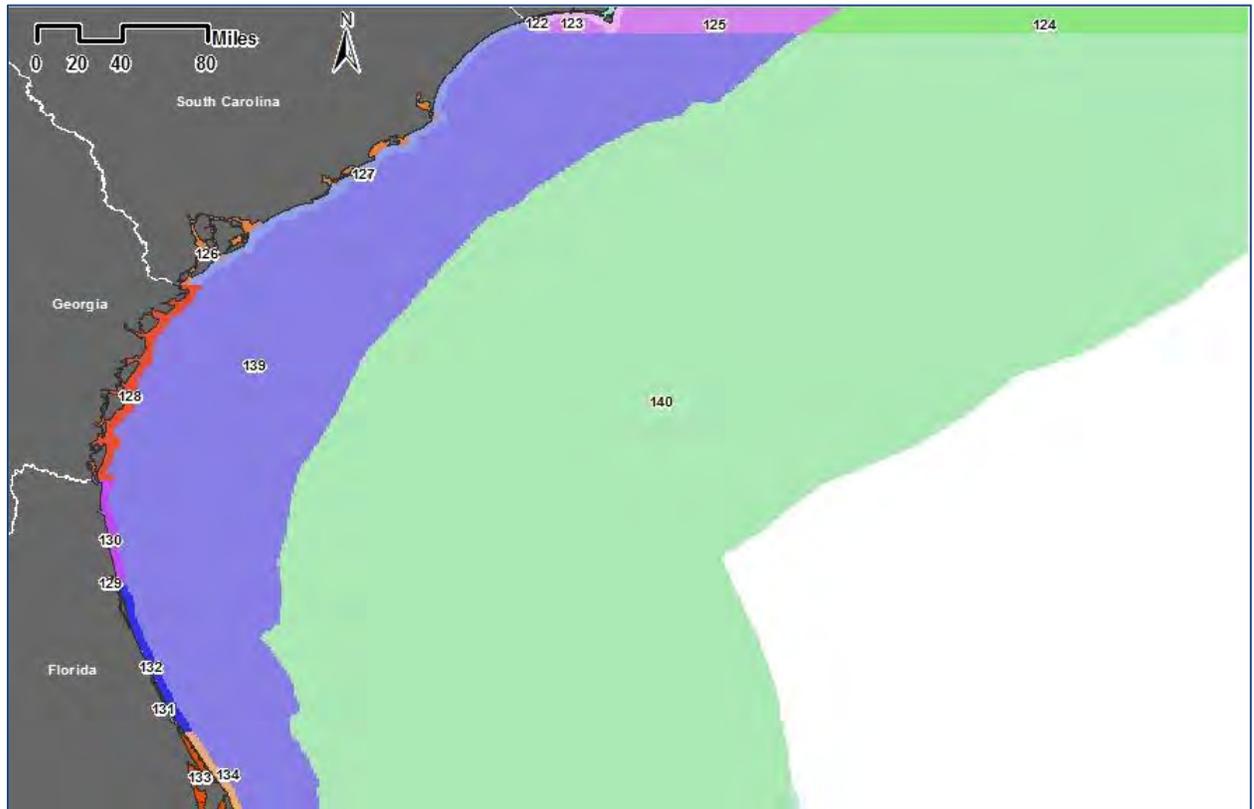
MID-ATLANTIC - 1



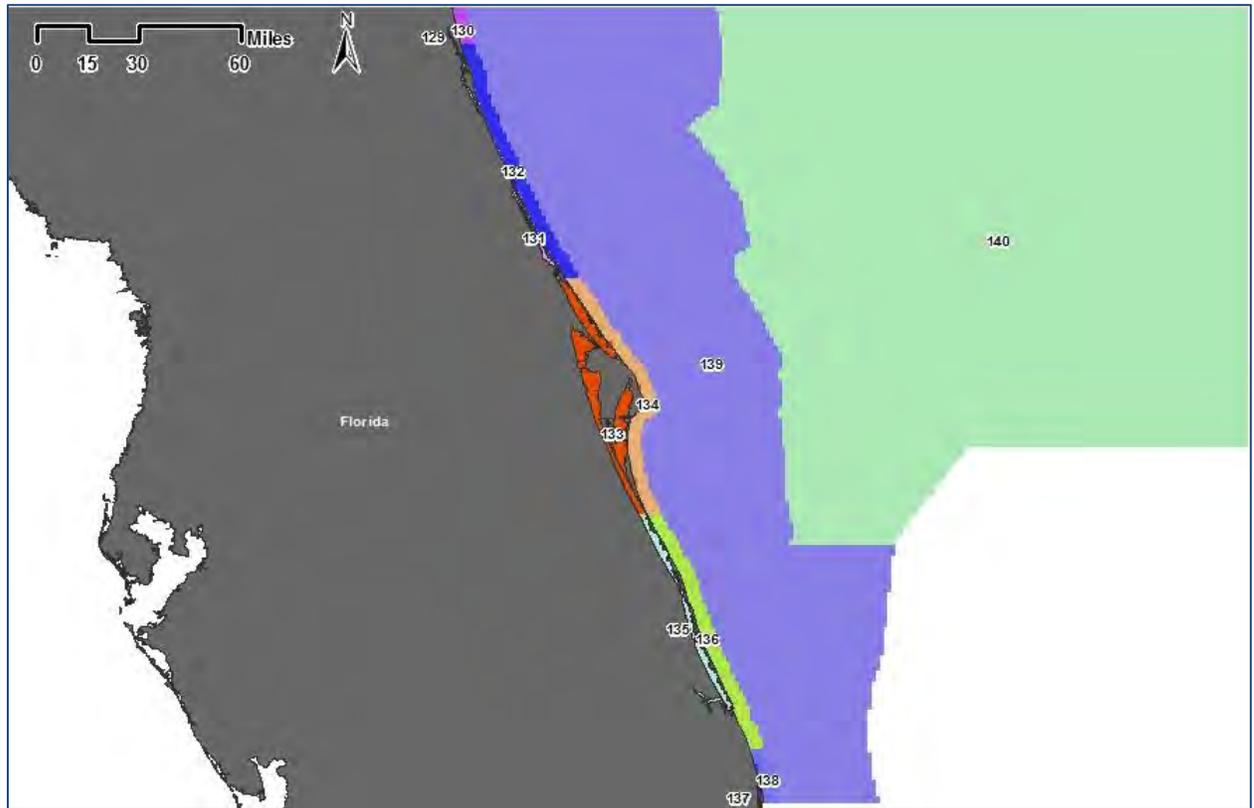
MID-ATLANTIC - 2



**SOUTHEAST - 1**



**SOUTHEAST - 2**

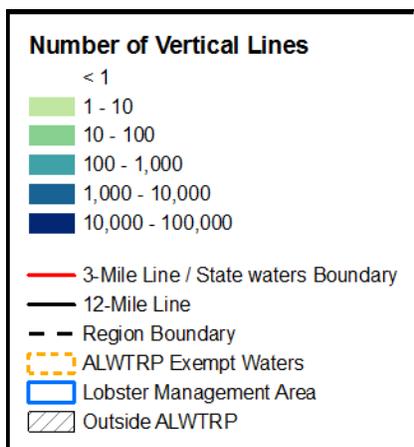


**APPENDIX F**

**2010/2011 BASELINE RESULTS: NUMBER OF VERTICAL LINES**

Appendix F provides the model’s 2010/2011 baseline estimates of the number of vertical lines deployed by fisheries subject to the requirements of the Atlantic Large Whale Take Reduction Plan (ALWTRP). Exhibit F-1 presents the estimated number of vertical lines by month and region. Exhibit F-2 presents maps that illustrate the distribution of vertical line. The maps are grouped by region. For the Northeast and Mid-Atlantic regions, maps are presented for each month of the year; maps illustrating the 12-month average number of lines within each 10-minute grid cell are also included. For the Southeast region, maps are presented for November through April (the period during which members of the species the ALWTRP is designed to protect are most likely to be present); the map illustrating the average distribution of vertical line in the Southeast reflects commercial fishing activity during the November through April period. The legend for these maps is shown below.

As indicated in Appendix D, the vast majority of commercial fishing activity in the Southeast occurs in exempt waters, very close to shore. Presenting the number of vertical lines associated with this activity on the model’s 10-minute spatial grid can be misleading, as it suggests that more line is deployed in waters seaward of the ALWTRP exemption line than is actually the case. To avoid confusion and misrepresentation, the Atlantic Large Whale Take Reduction Team (ALWTRT) requested that maps of vertical line use in the Southeast focus solely on activity seaward of the exemption line. The maps presented here comply with that request.



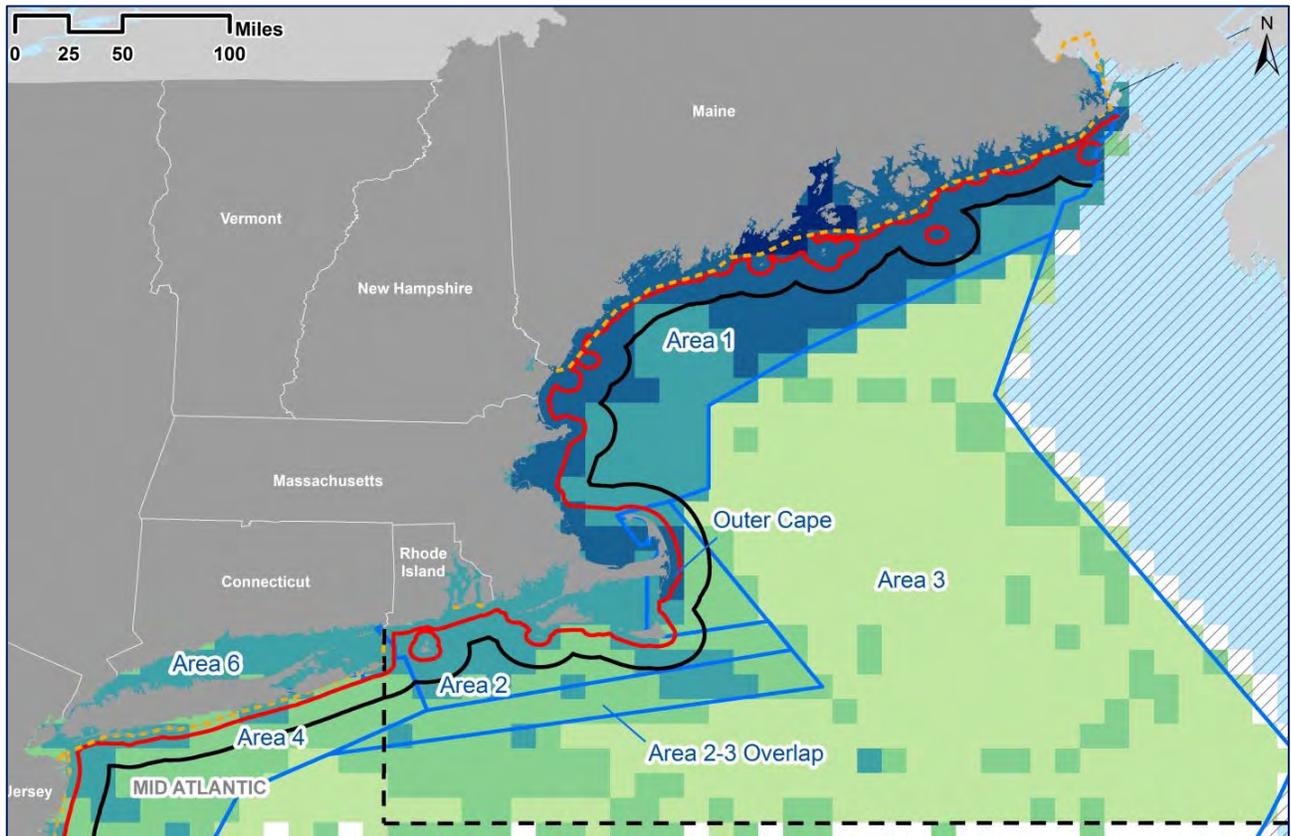
## EXHIBIT F-1. 2010/2011 BASELINE NUMBER OF VERTICAL LINES

REGION	WATERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE
Northeast	Exempt Waters	36,501	17,871	22,101	37,242	130,334	306,682	589,259	636,077	557,956	463,556	308,478	125,663	269,310
	Non-Exempt Waters	134,917	98,449	92,980	111,815	185,208	261,951	355,528	353,127	329,975	309,337	280,208	205,405	226,575
	Subtotal	171,417	116,319	115,081	149,057	315,542	568,633	944,787	989,204	887,931	772,893	588,687	331,068	495,885
Mid-Atlantic	Exempt Waters	14,270	10,985	50,905	321,431	390,298	362,191	364,640	353,872	328,569	288,596	228,144	177,519	240,952
	Non-Exempt Waters	7,282	4,001	4,066	6,042	8,848	8,826	7,237	6,379	6,428	7,732	9,912	9,733	7,207
	Subtotal	21,553	14,986	54,972	327,473	399,147	371,017	371,876	360,251	334,997	296,328	238,055	187,252	248,159
Southeast	Exempt Waters	28,823	28,799	34,208	42,144	44,926	42,479	43,178	39,190	37,916	36,497	36,252	33,135	37,295
	Non-Exempt Waters	3,499	2,686	3,414	1,370	1,366	1,944	1,338	1,700	1,079	881	929	1,831	1,837
	Subtotal	32,322	31,485	37,622	43,514	46,292	44,422	44,516	40,890	38,995	37,378	37,181	34,966	39,132
Total	Exempt Waters	79,594	57,654	107,214	400,817	565,559	711,352	997,077	1,029,138	924,441	788,649	572,874	336,316	547,557
	Non-Exempt Waters	145,698	105,136	100,461	119,228	195,422	272,721	364,103	361,206	337,482	317,950	291,049	216,969	235,619
<b>Grand Total</b>		<b>225,289</b>	<b>225,292</b>	<b>162,790</b>	<b>207,675</b>	<b>520,045</b>	<b>760,981</b>	<b>984,072</b>	<b>1,361,180</b>	<b>1,390,344</b>	<b>1,261,923</b>	<b>1,106,599</b>	<b>863,923</b>	<b>553,285</b>

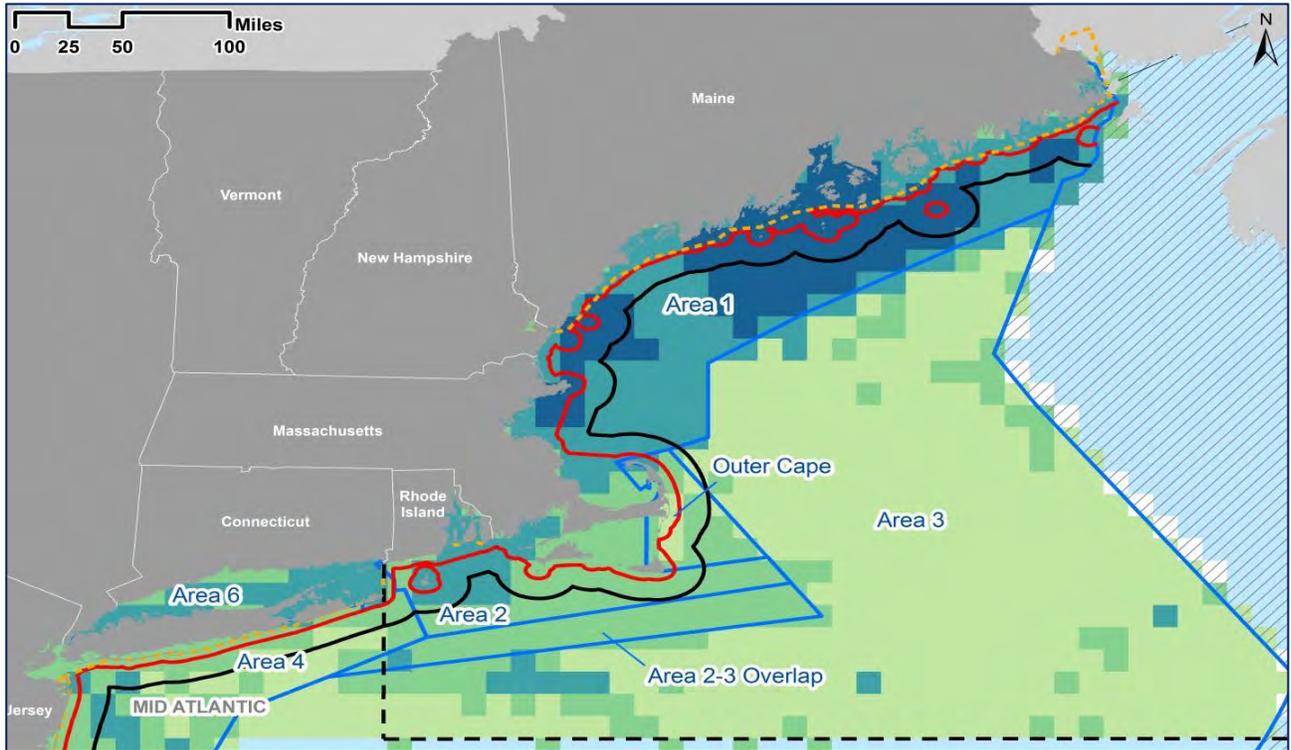
EXHIBIT F-2.

NORTHEAST:

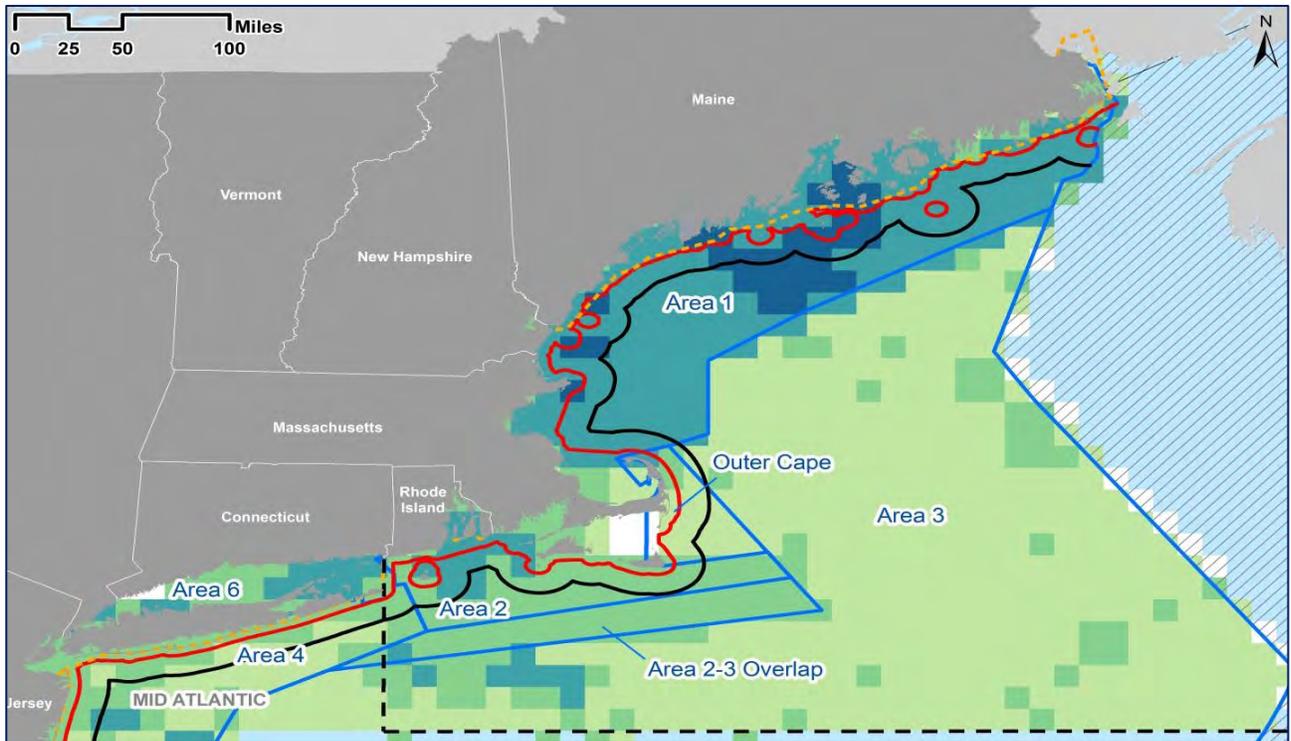
VERTICAL LINE – MONTHLY AVERAGE



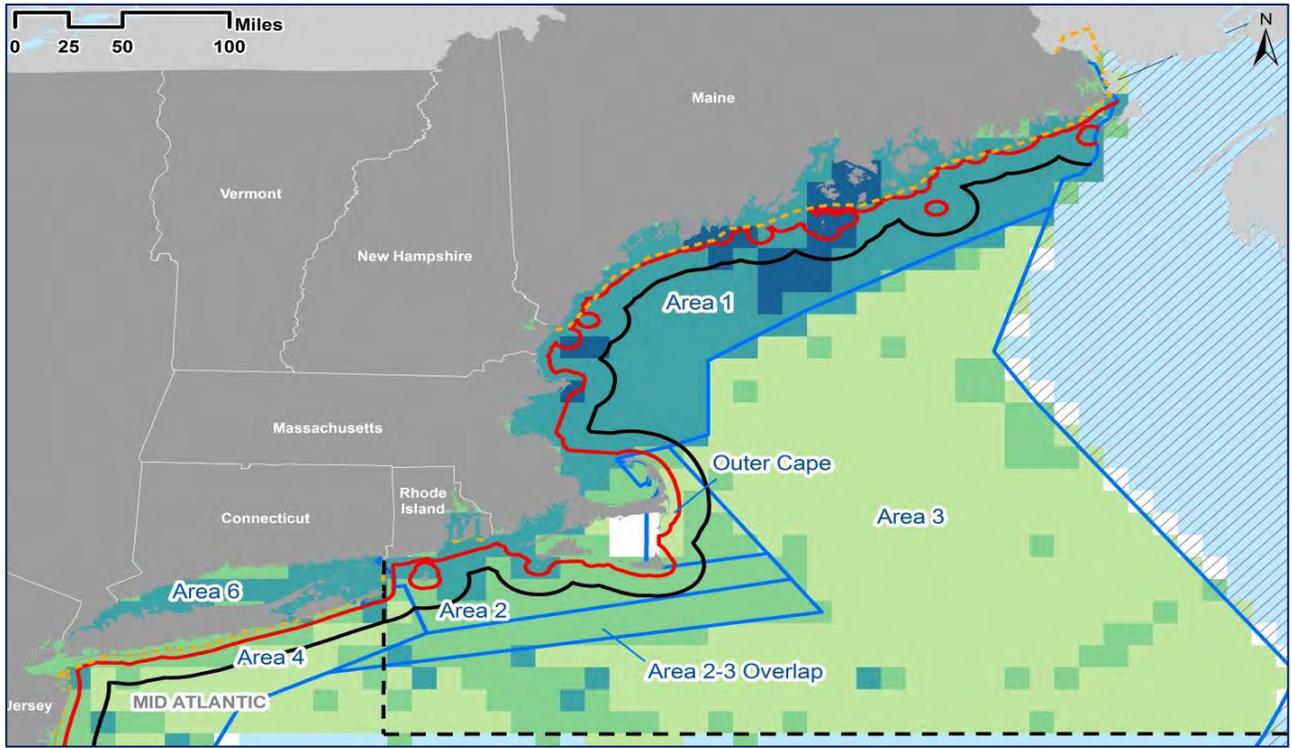
**VERTICAL LINE – JANUARY**



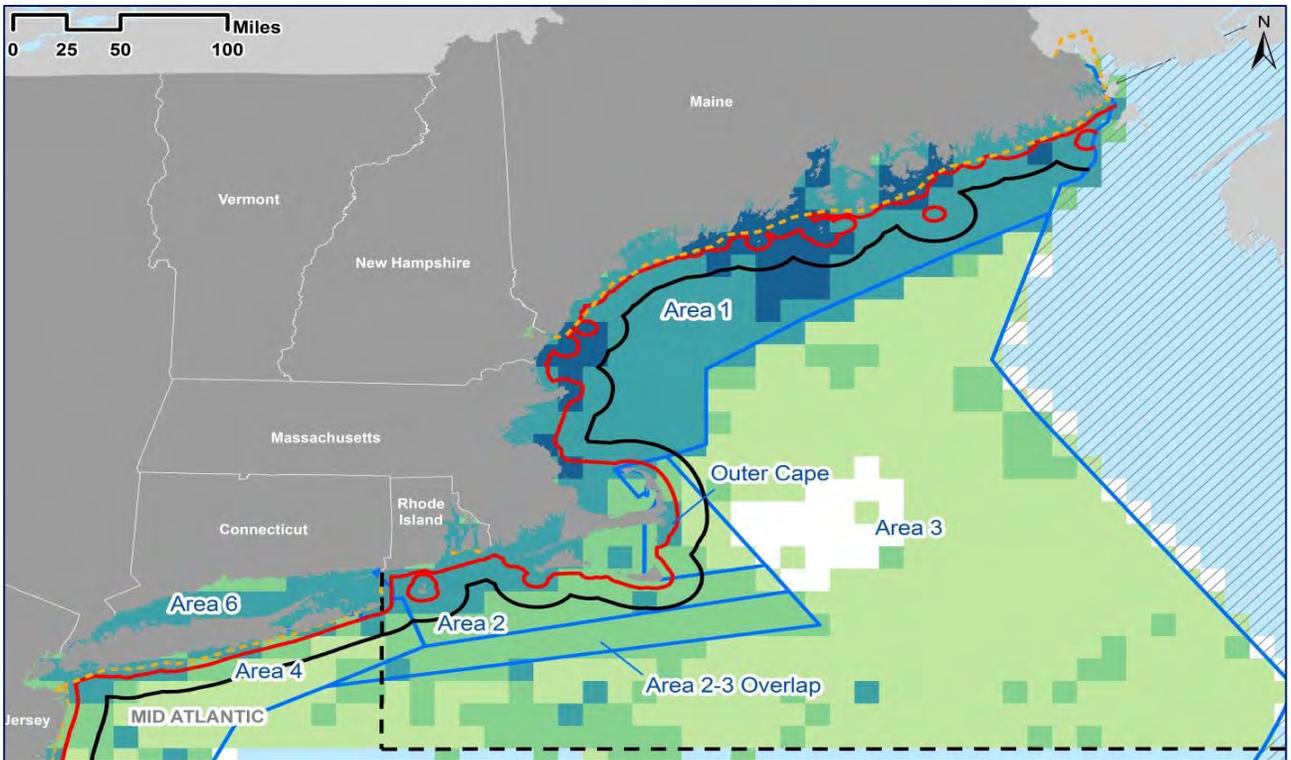
**VERTICAL LINE – FEBRUARY**



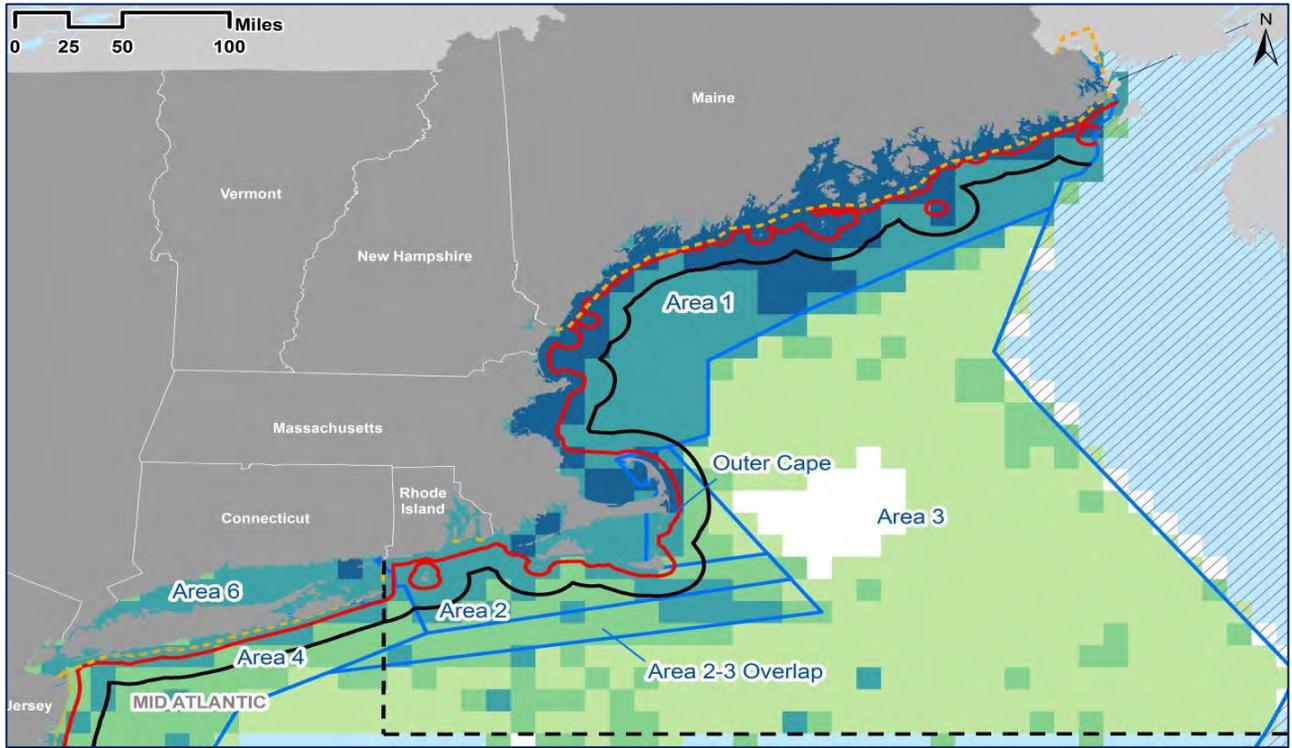
**VERTICAL LINE – MARCH**



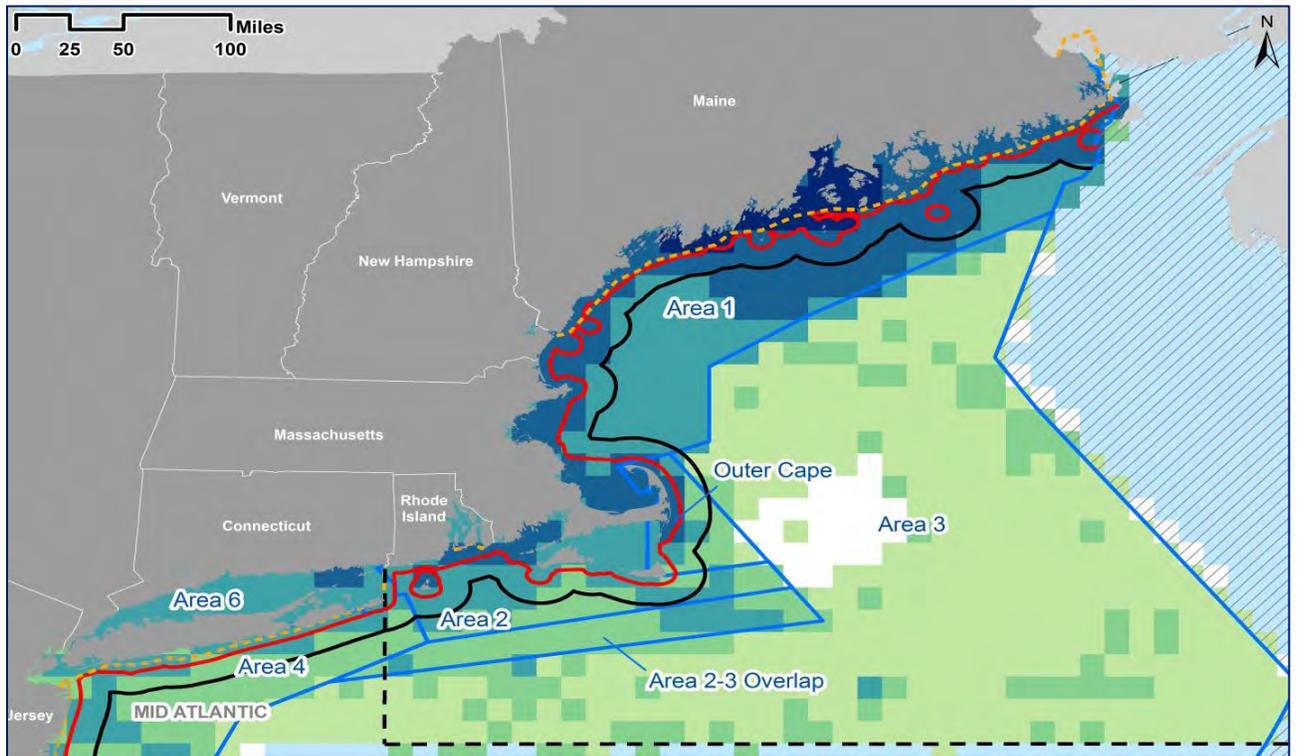
**VERTICAL LINE – APRIL**



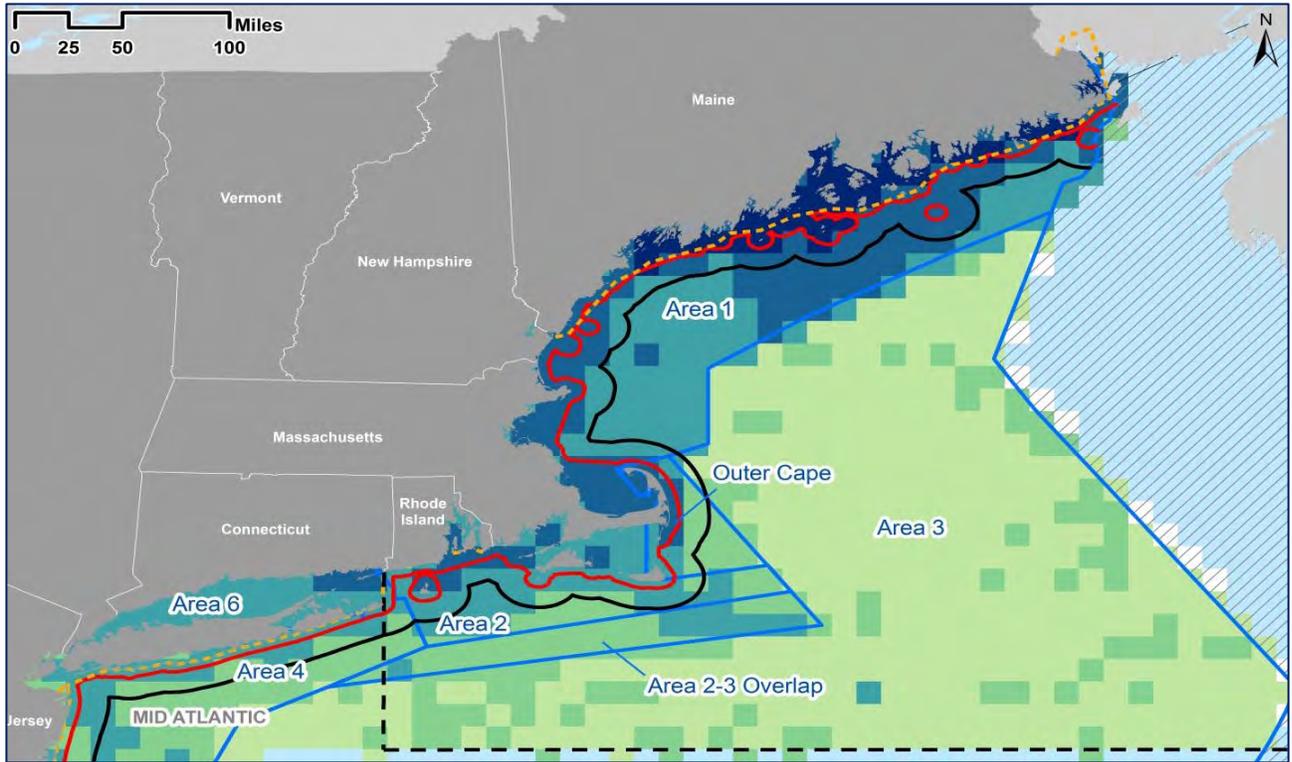
VERTICAL LINE – MAY



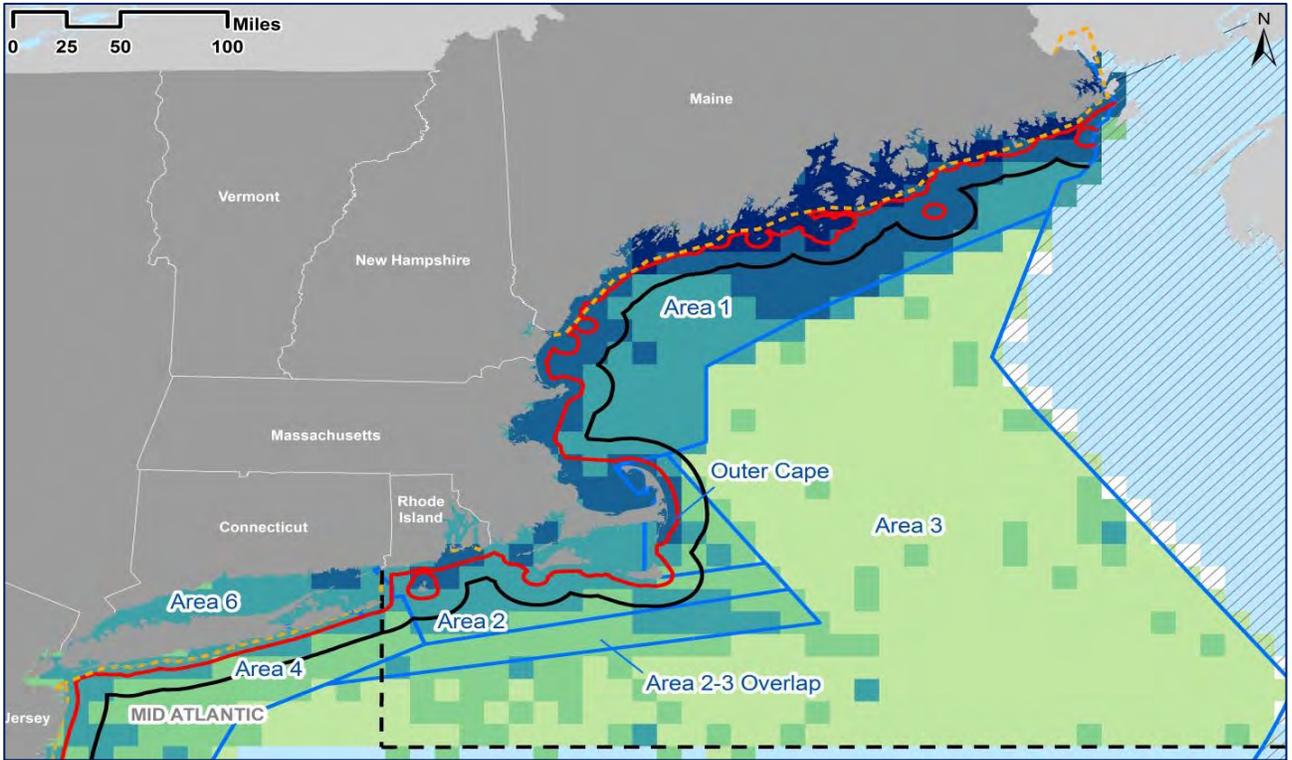
VERTICAL LINE – JUNE



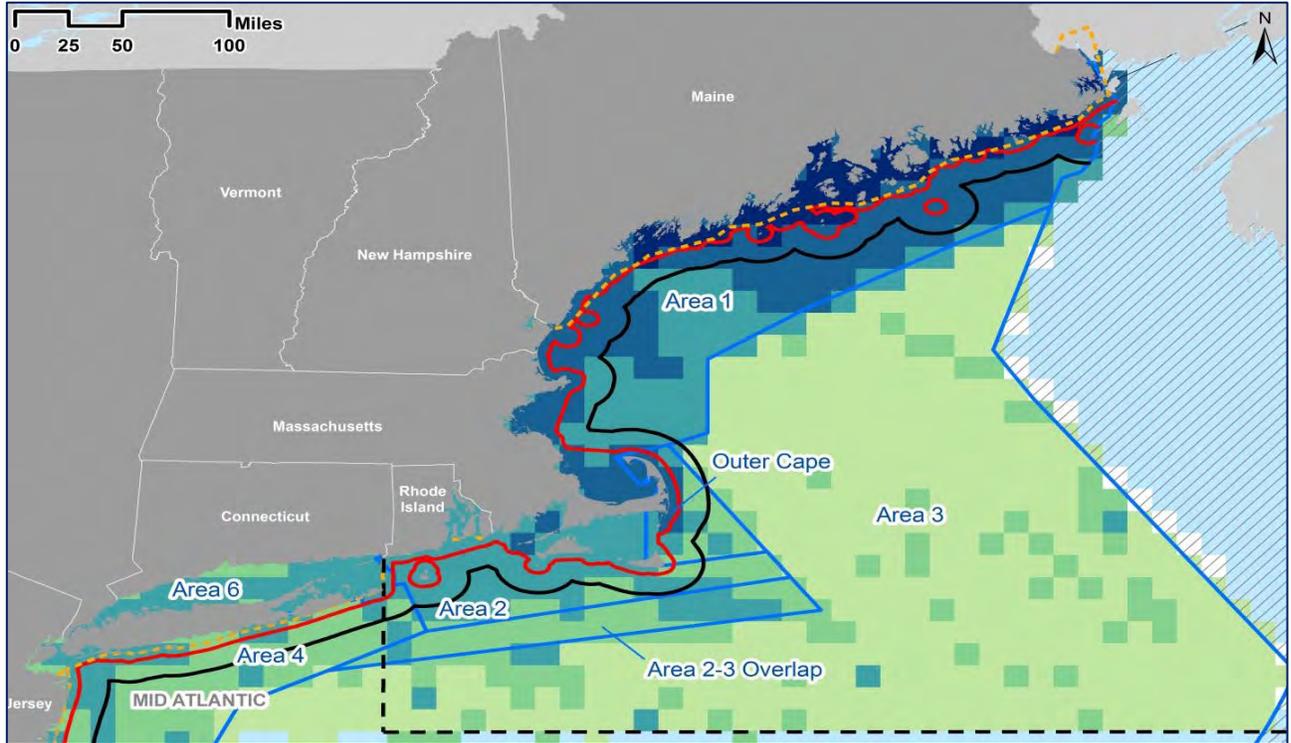
**VERTICAL LINE – JULY**



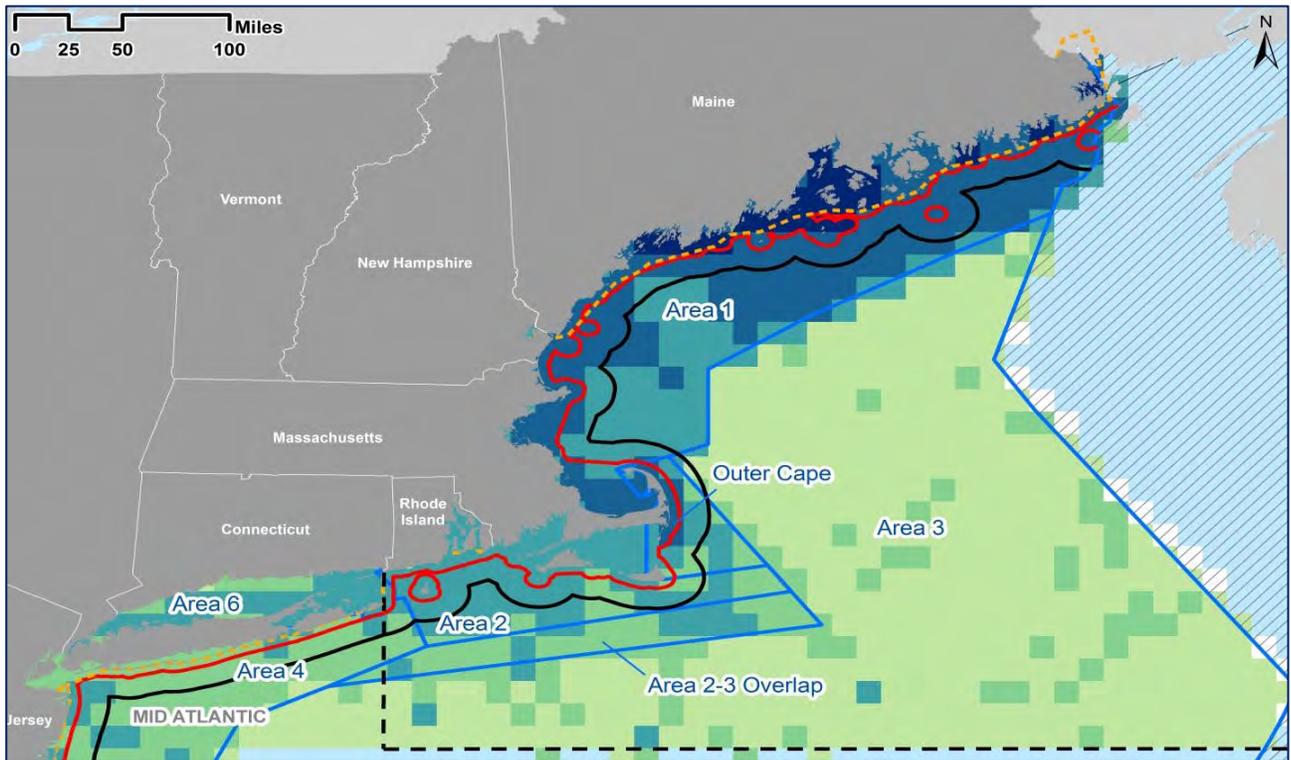
**VERTICAL LINE – AUGUST**



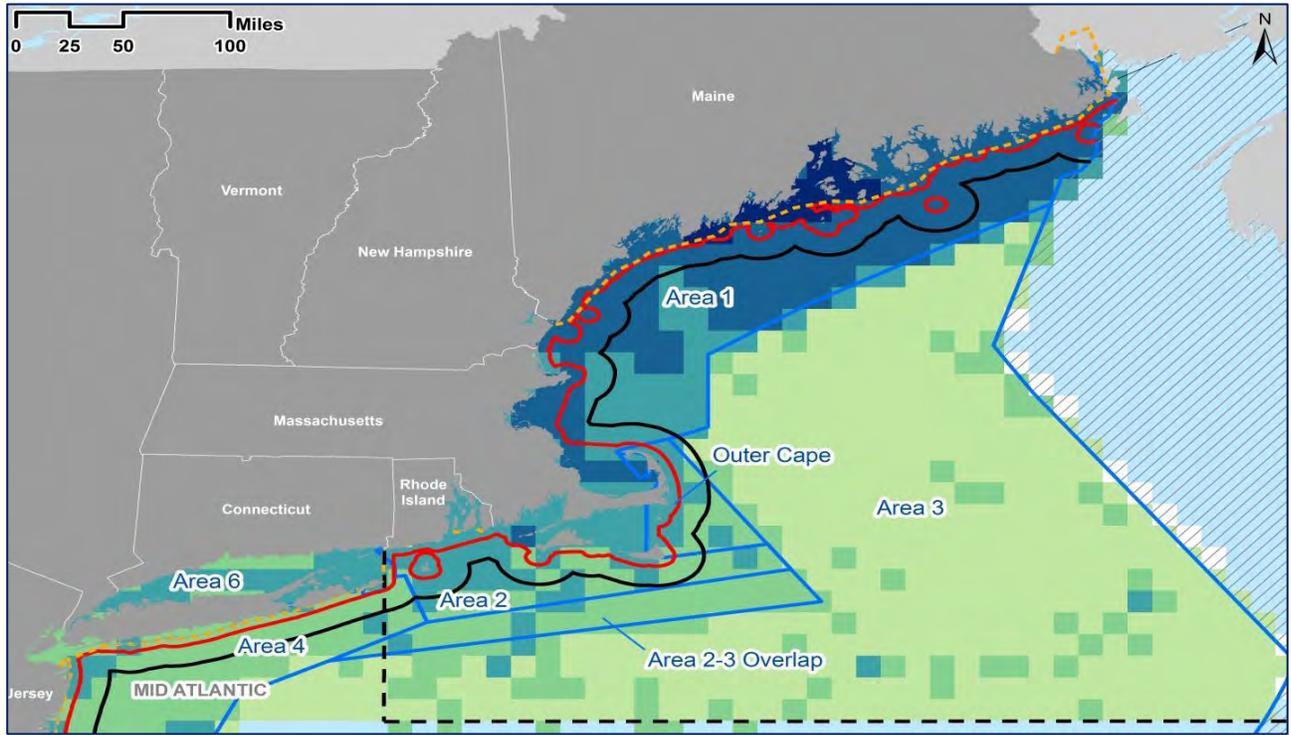
**VERTICAL LINE – SEPTEMBER**



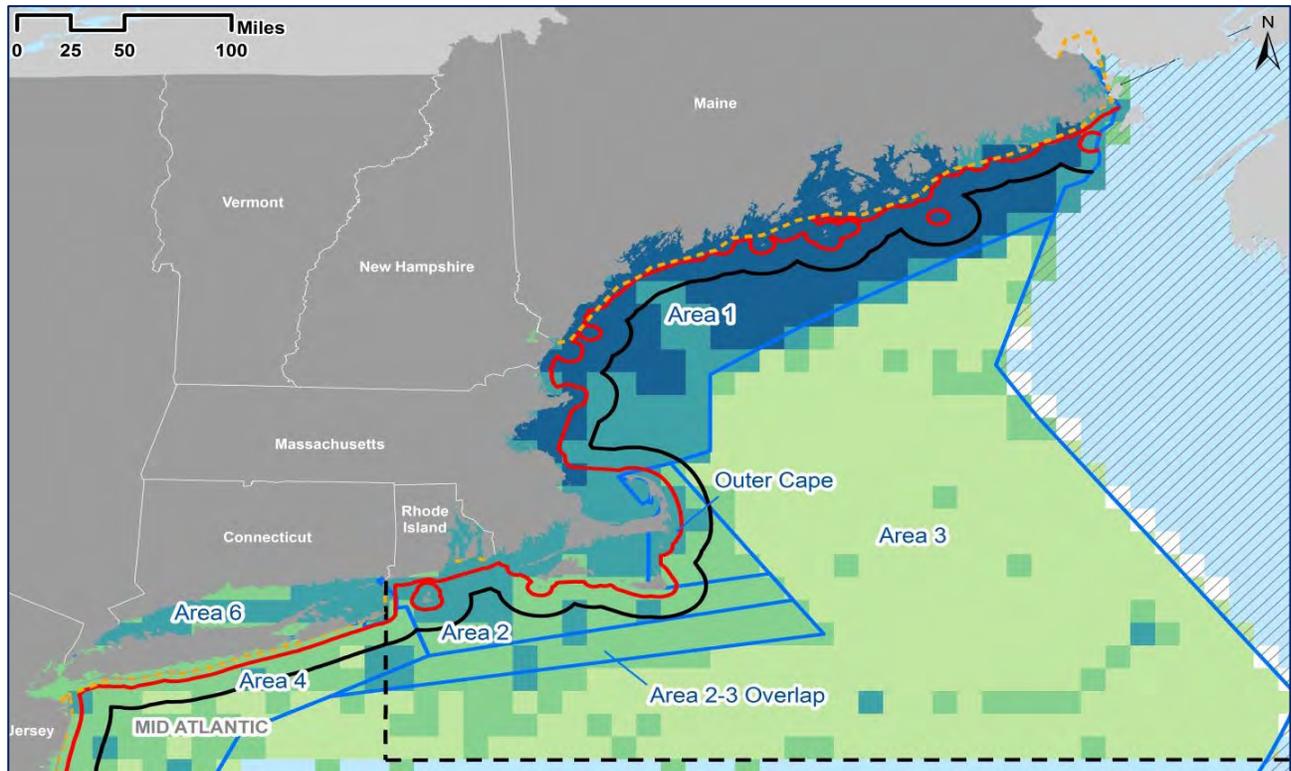
**VERTICAL LINE – OCTOBER**



**VERTICAL LINE – NOVEMBER**

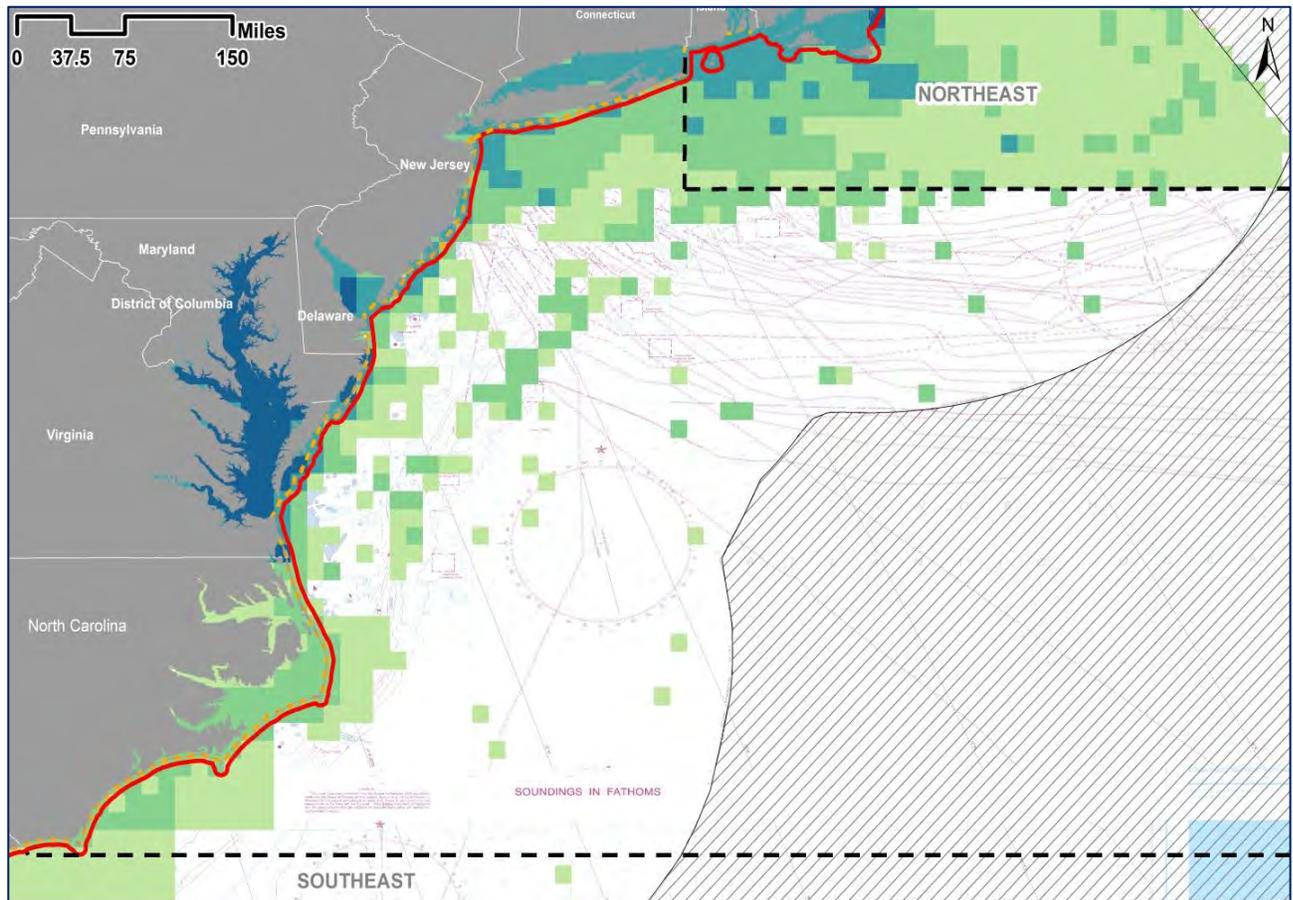


**VERTICAL LINE – DECEMBER**

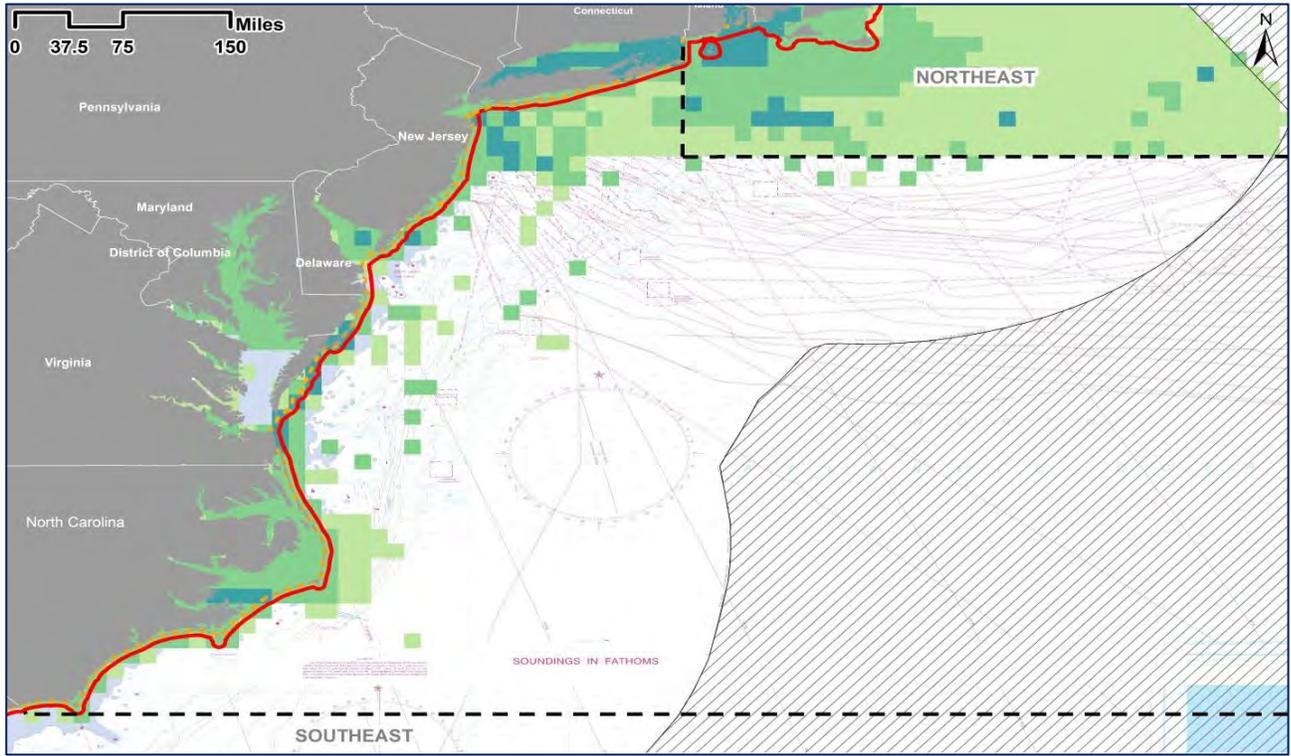


**MID-ATLANTIC:**

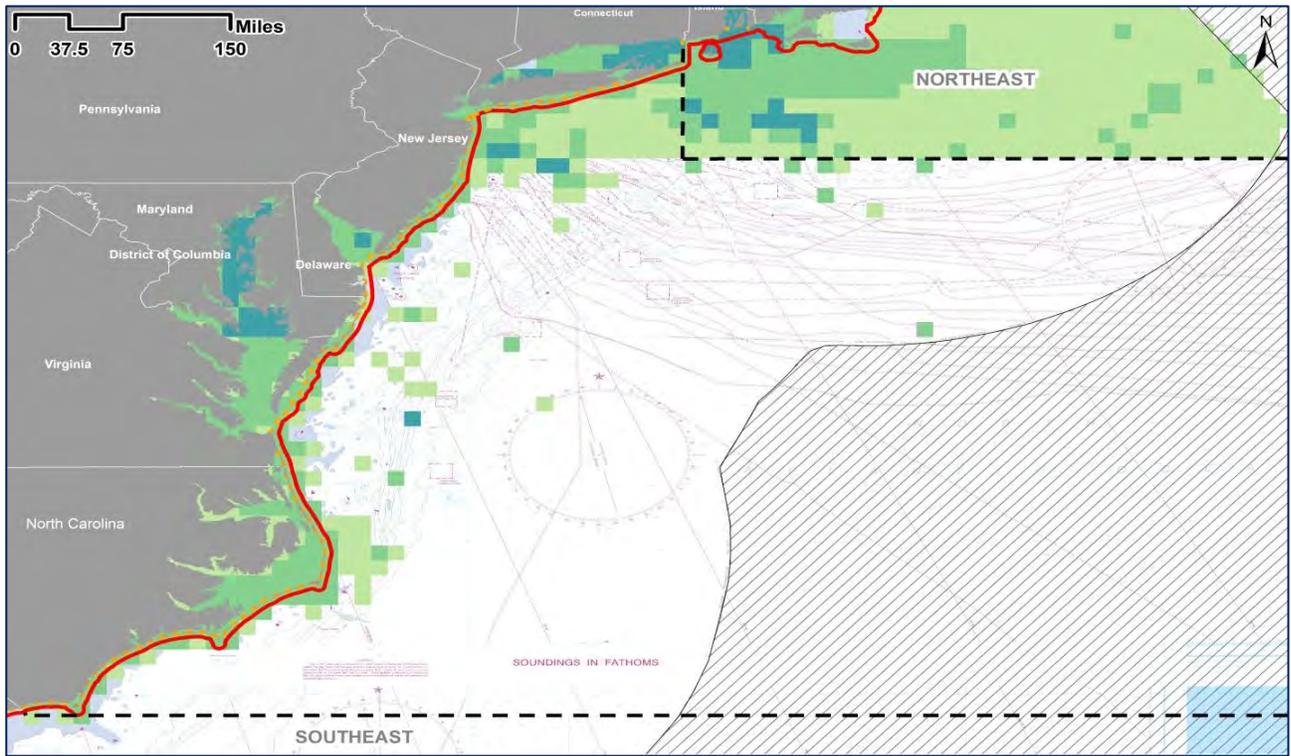
**VERTICAL LINE – MONTHLY AVERAGE**



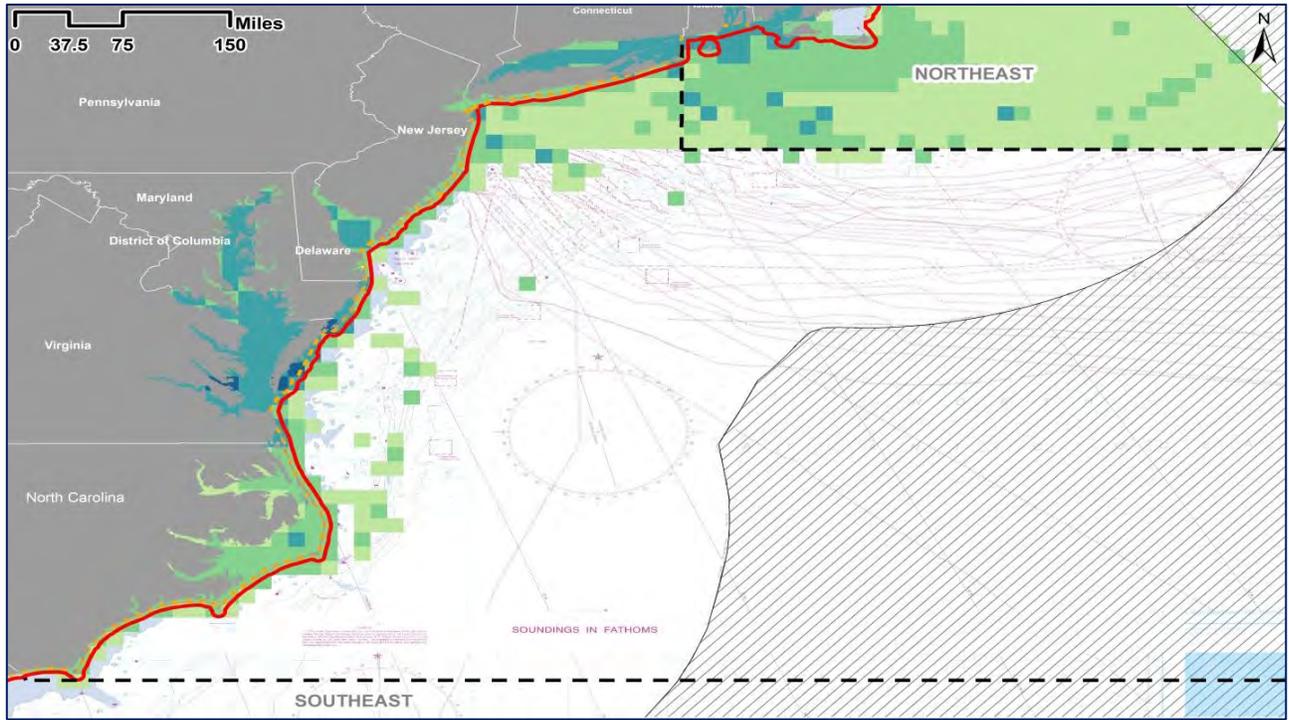
**VERTICAL LINE – JANUARY**



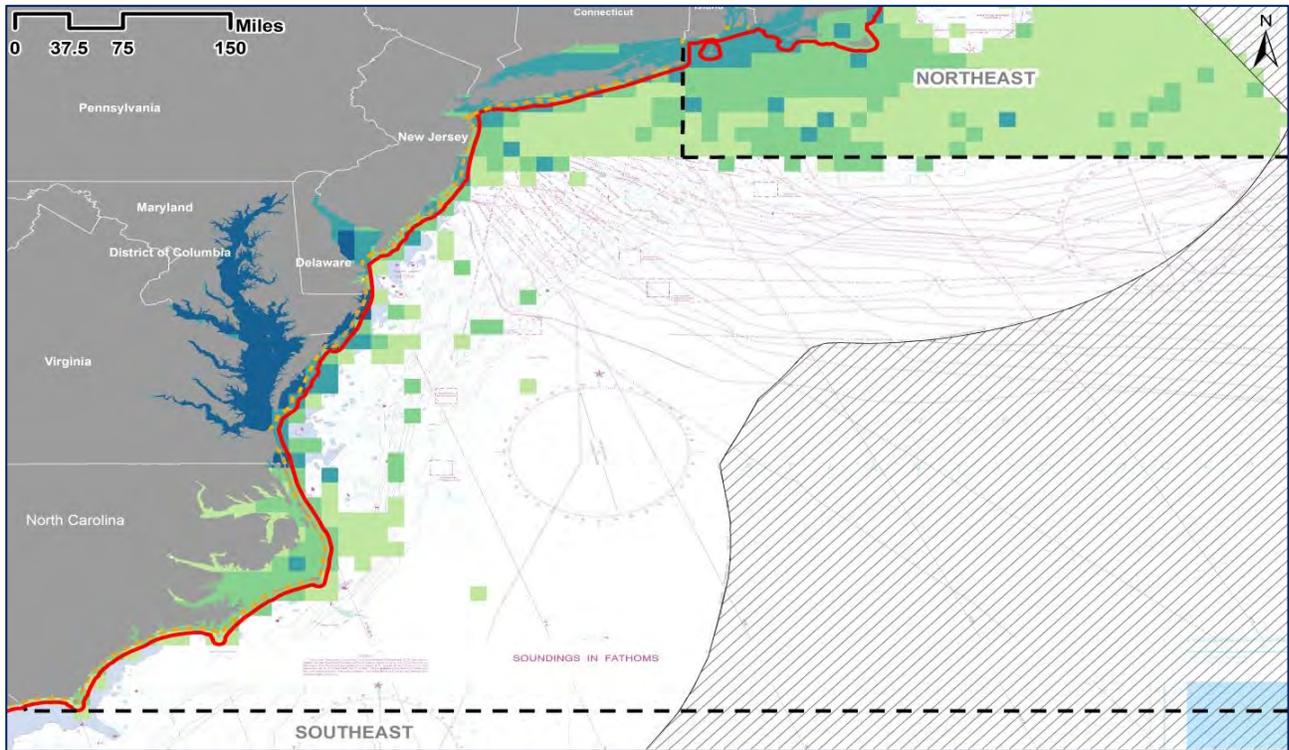
**VERTICAL LINE – FEBRUARY**



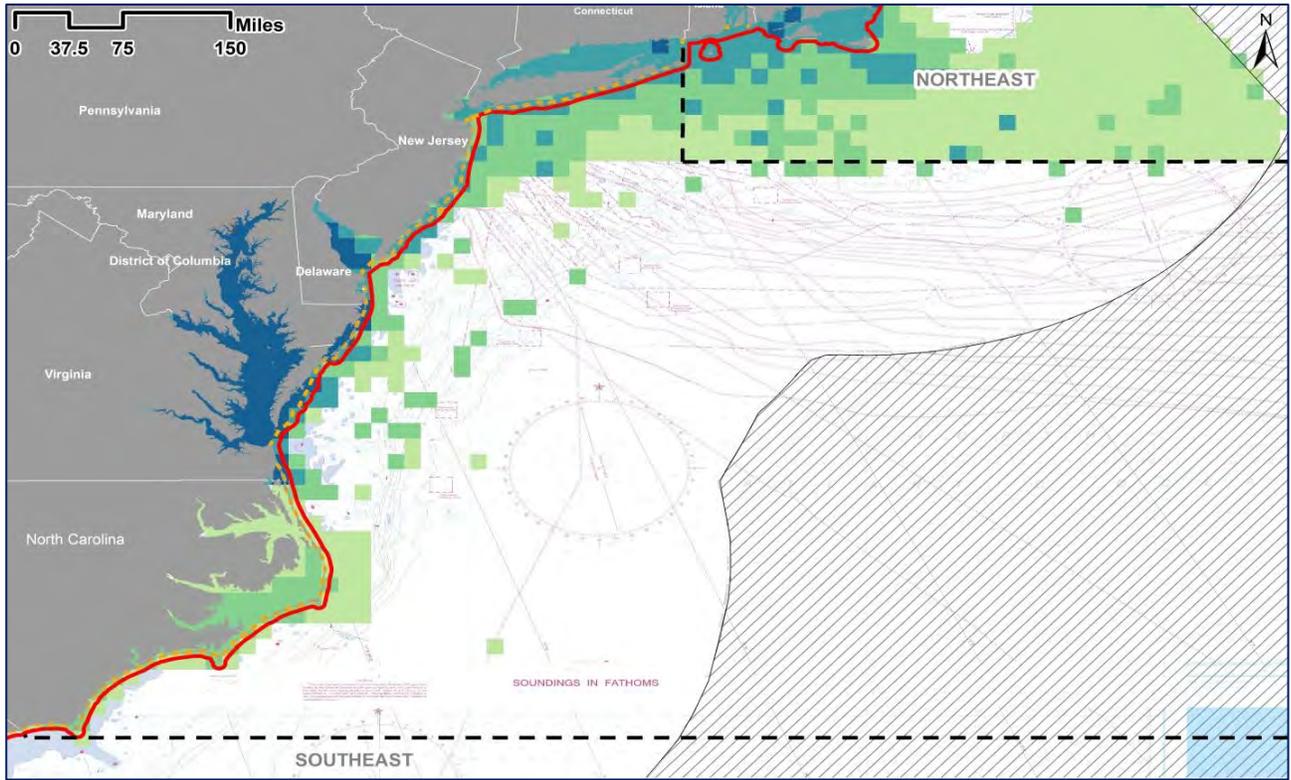
**VERTICAL LINE – MARCH**



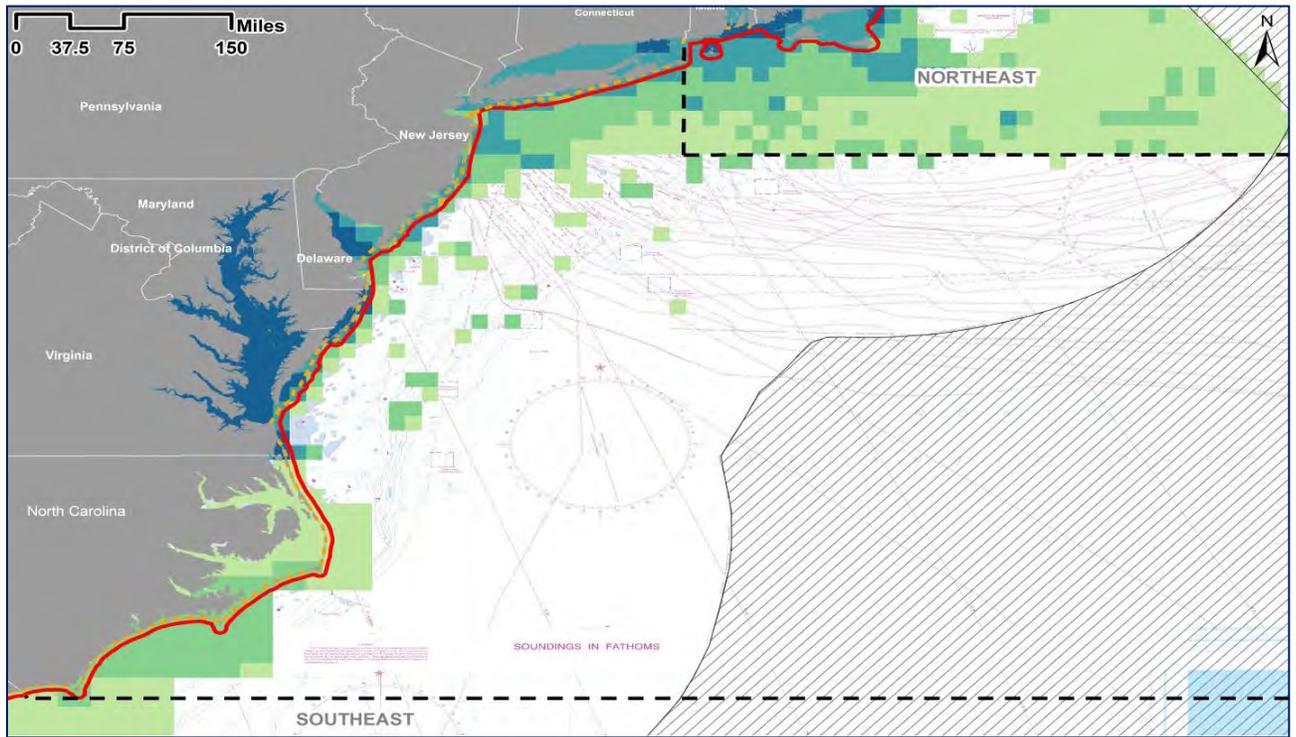
**VERTICAL LINE – APRIL**



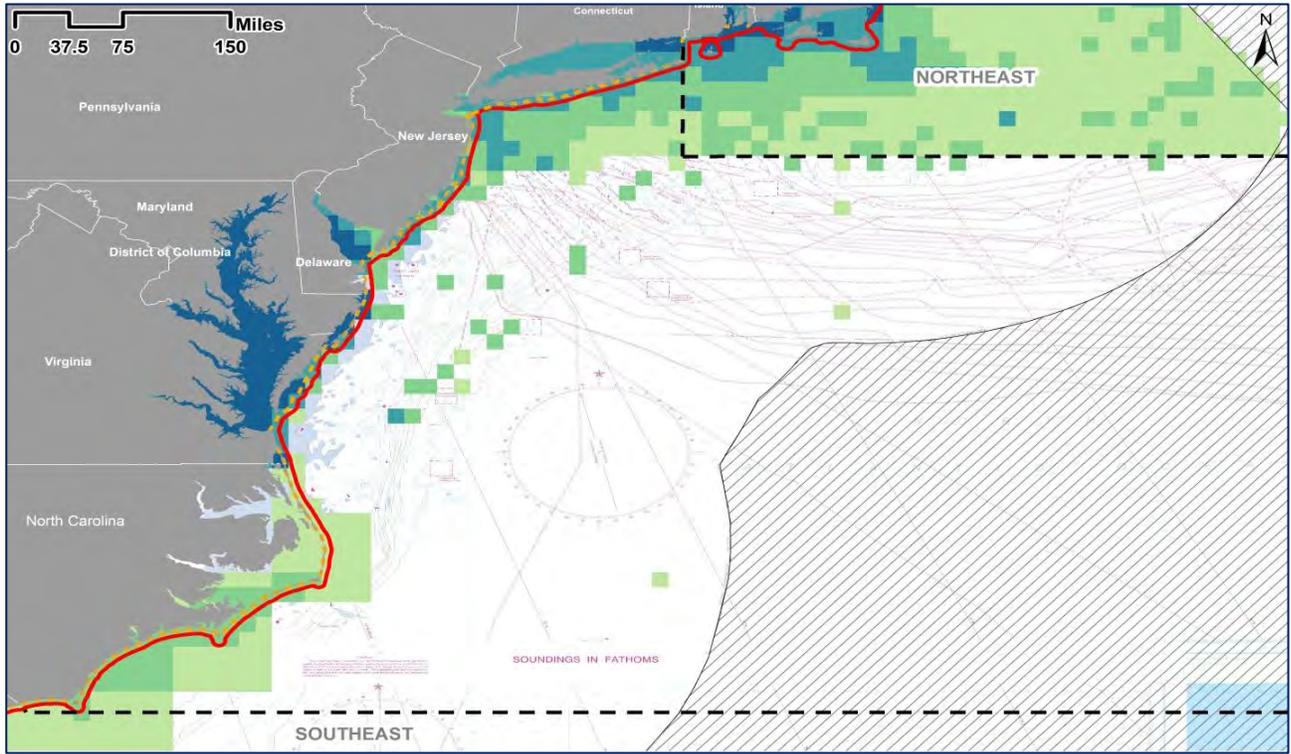
**VERTICAL LINE – MAY**



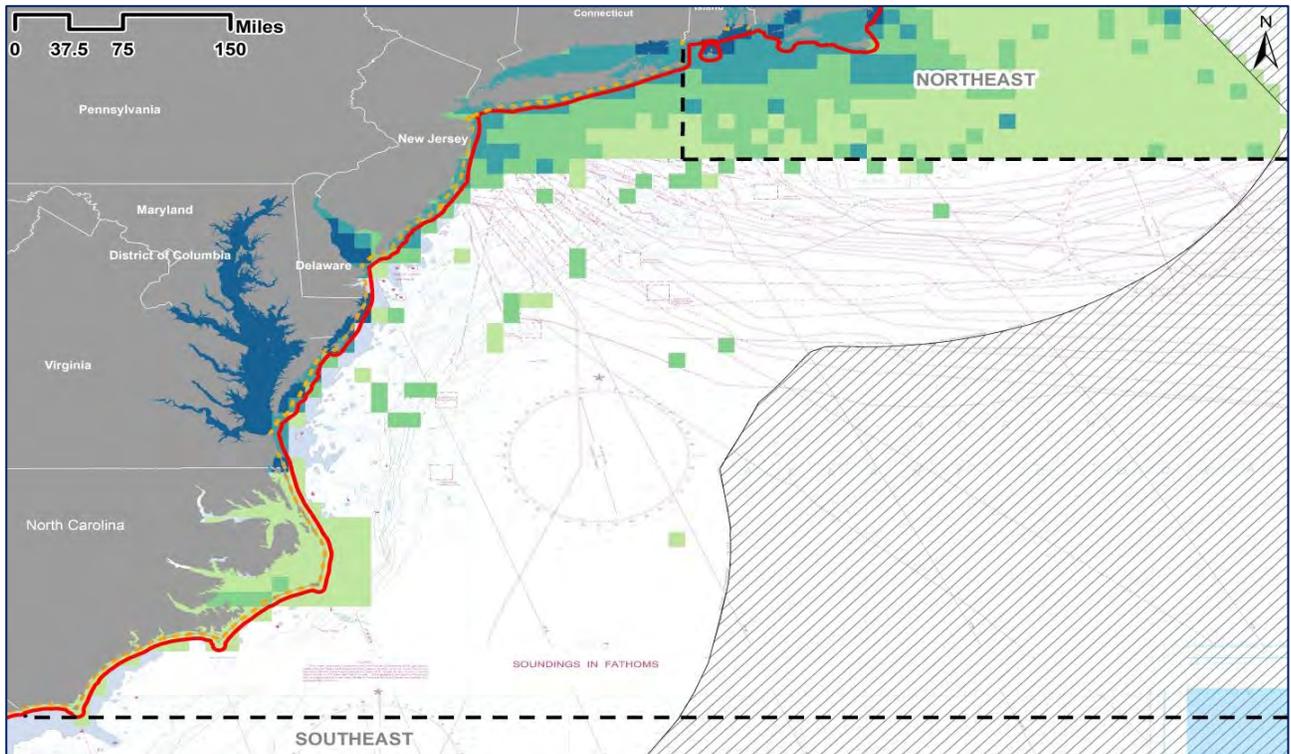
**VERTICAL LINE – JUNE**



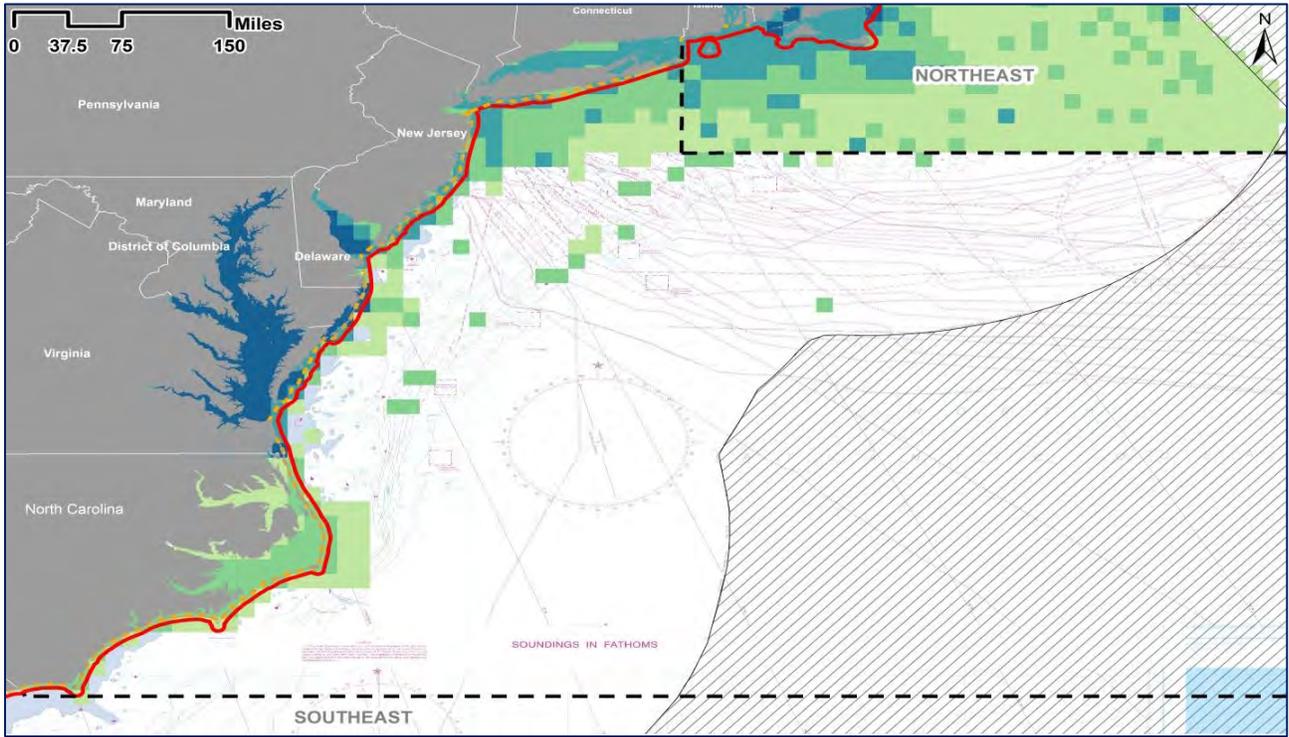
**VERTICAL LINE – JULY**



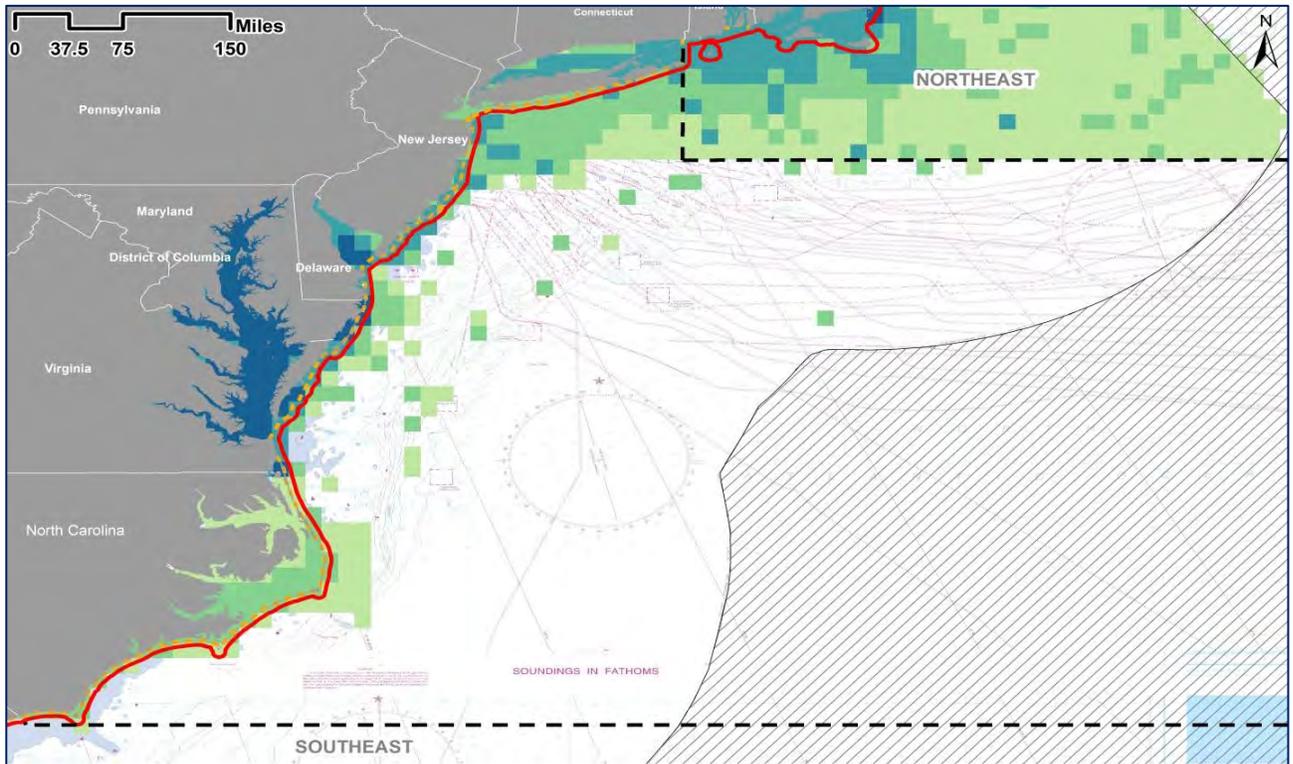
**VERTICAL LINE – AUGUST**



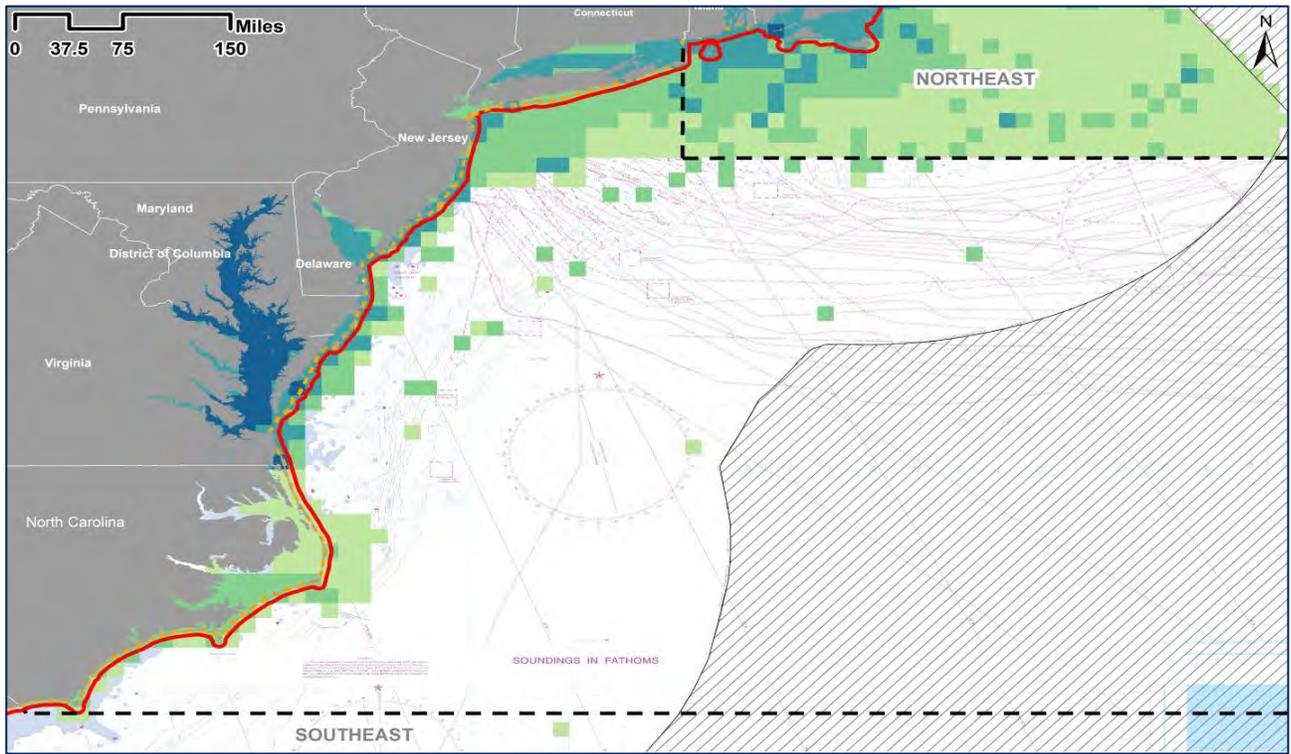
**VERTICAL LINE – SEPTEMBER**



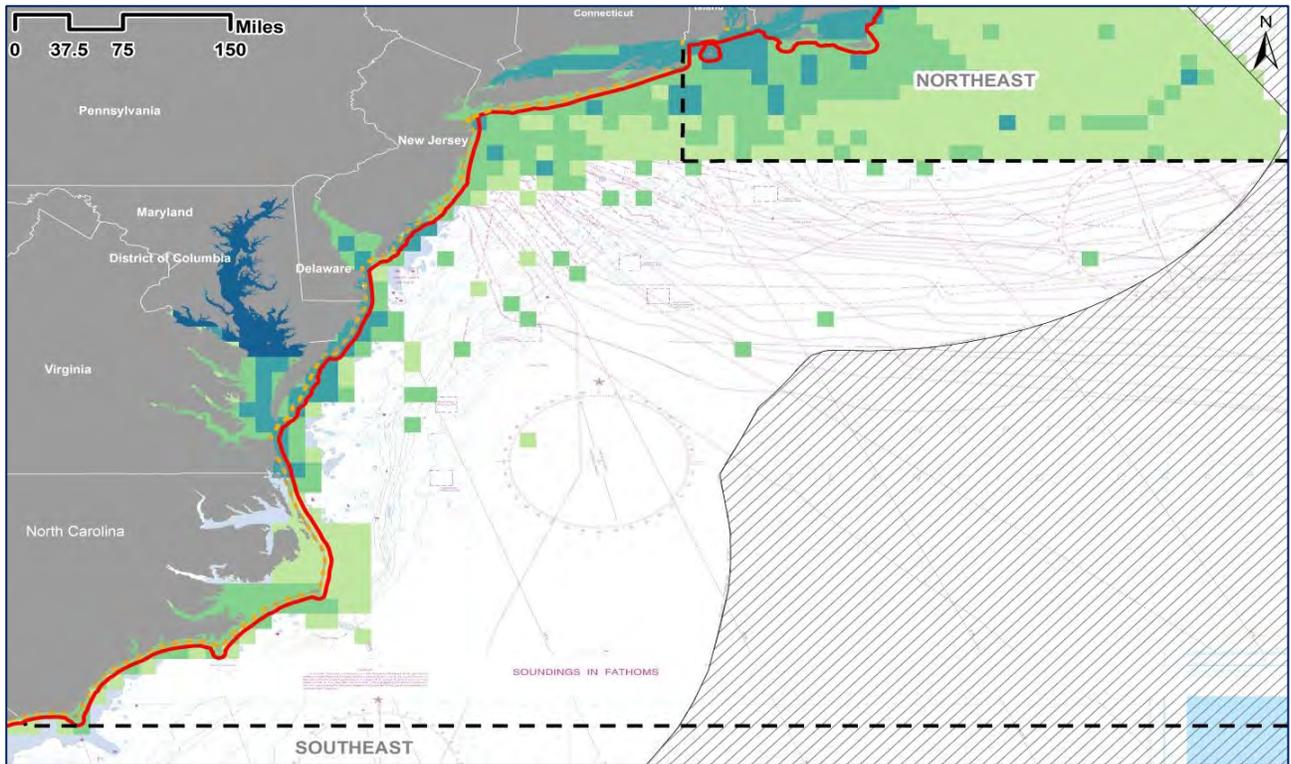
**VERTICAL LINE – OCTOBER**



**VERTICAL LINE – NOVEMBER**

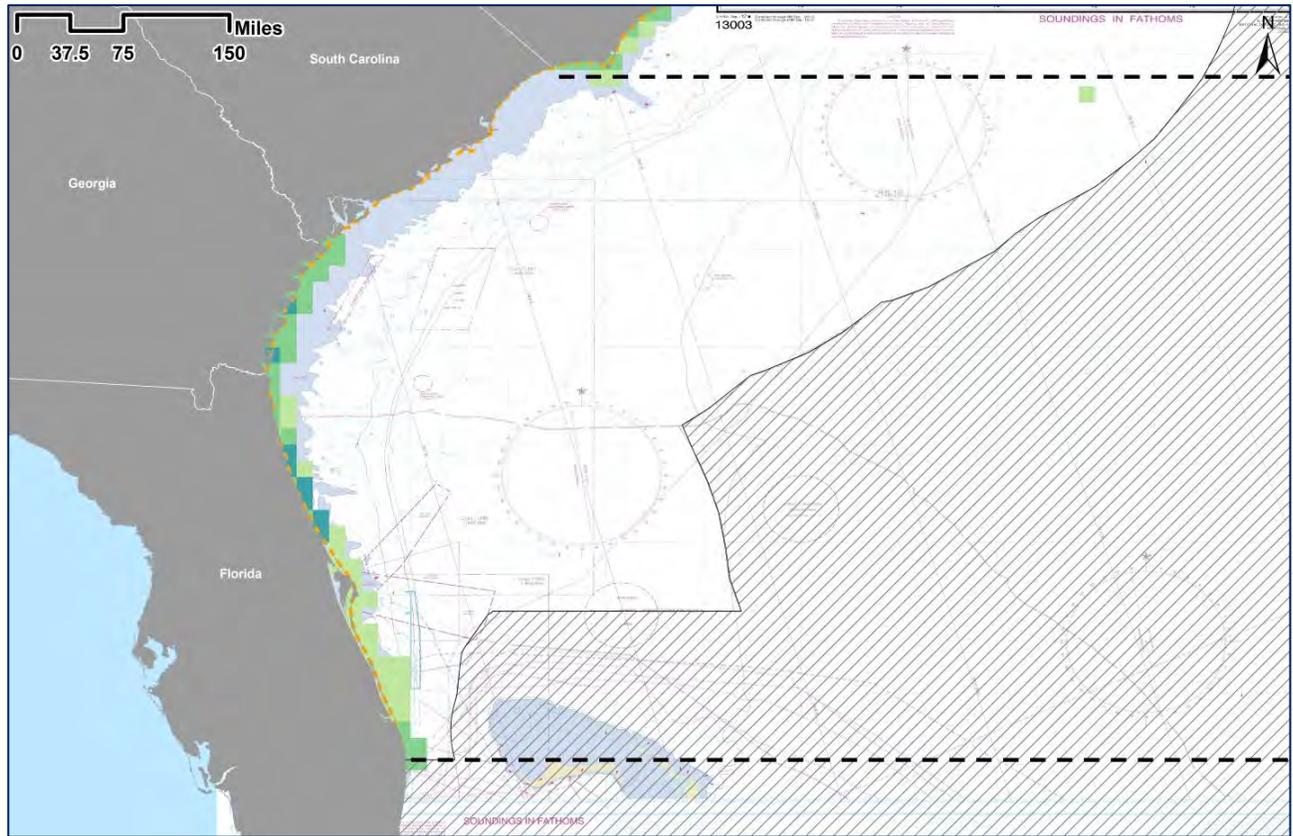


**VERTICAL LINE – DECEMBER**

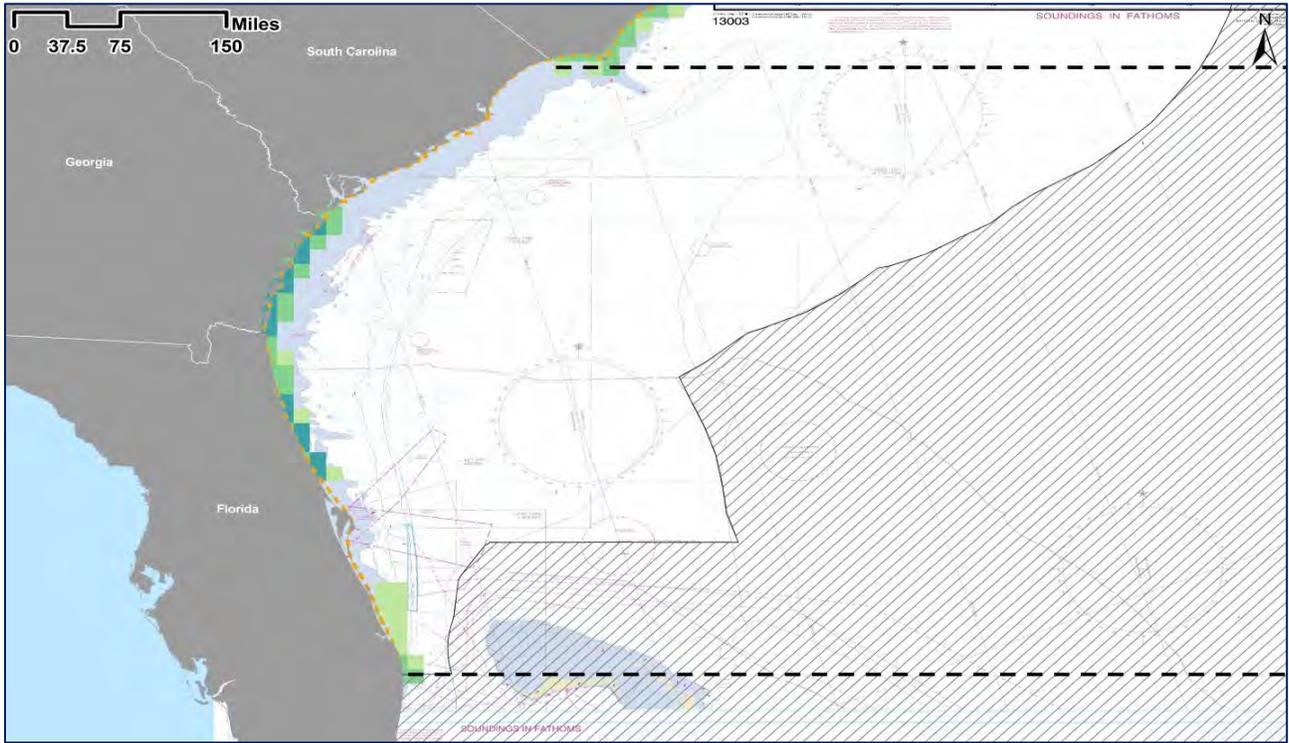


**SOUTHEAST:**

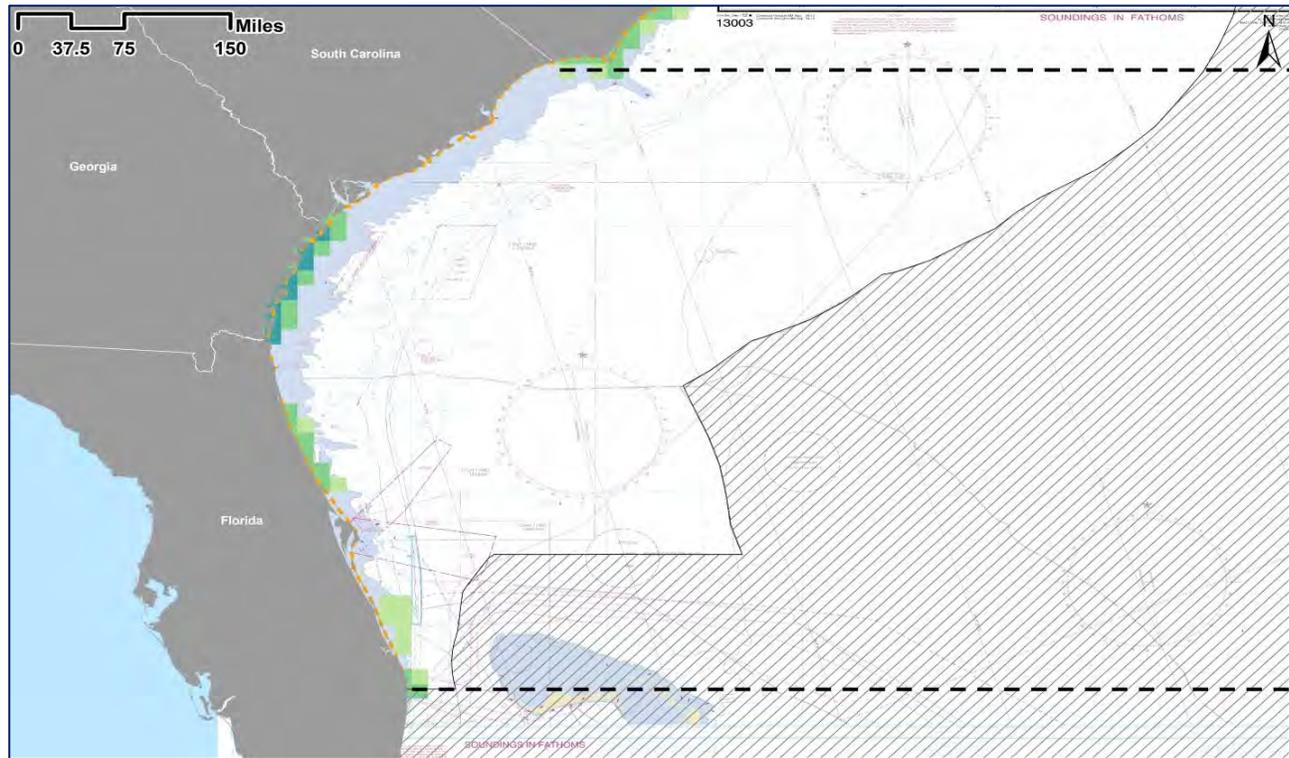
**VERTICAL LINE – MONTHLY AVERAGE (NOVEMBER – APRIL)**



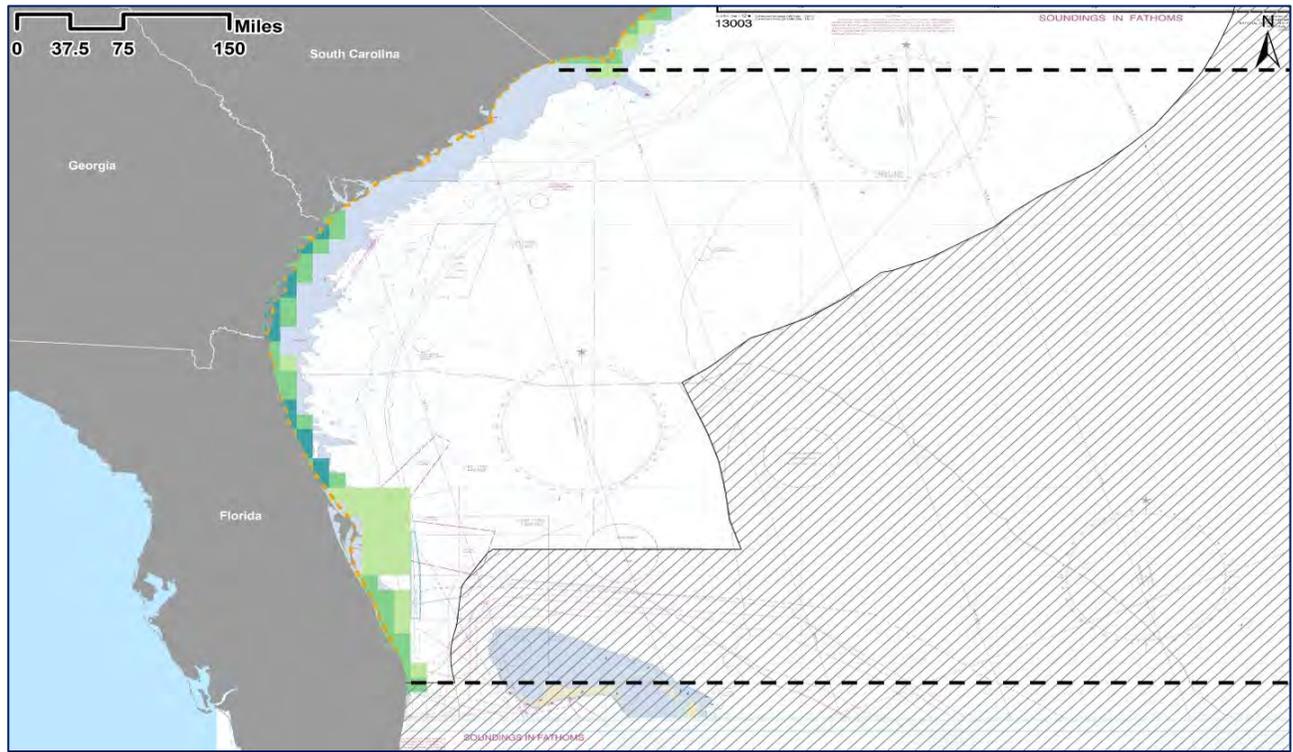
**VERTICAL LINE – JANUARY**



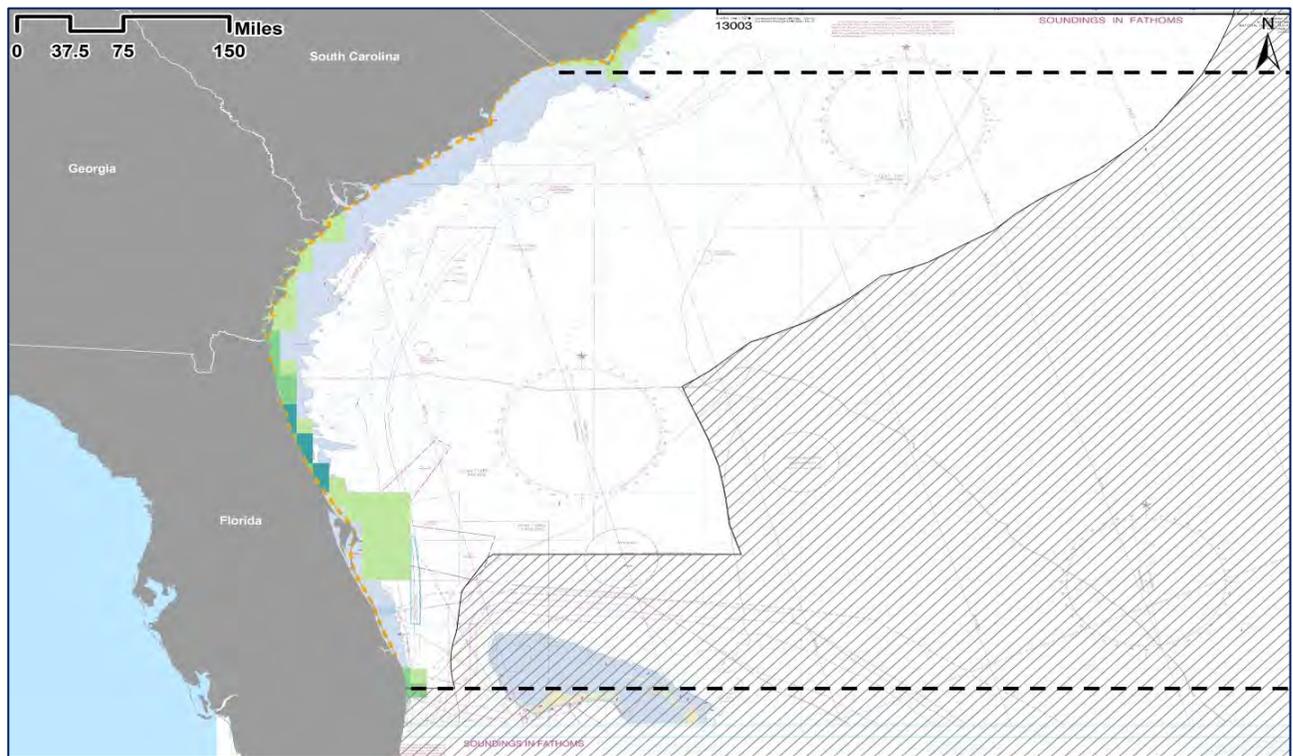
**VERTICAL LINE – FEBRUARY**



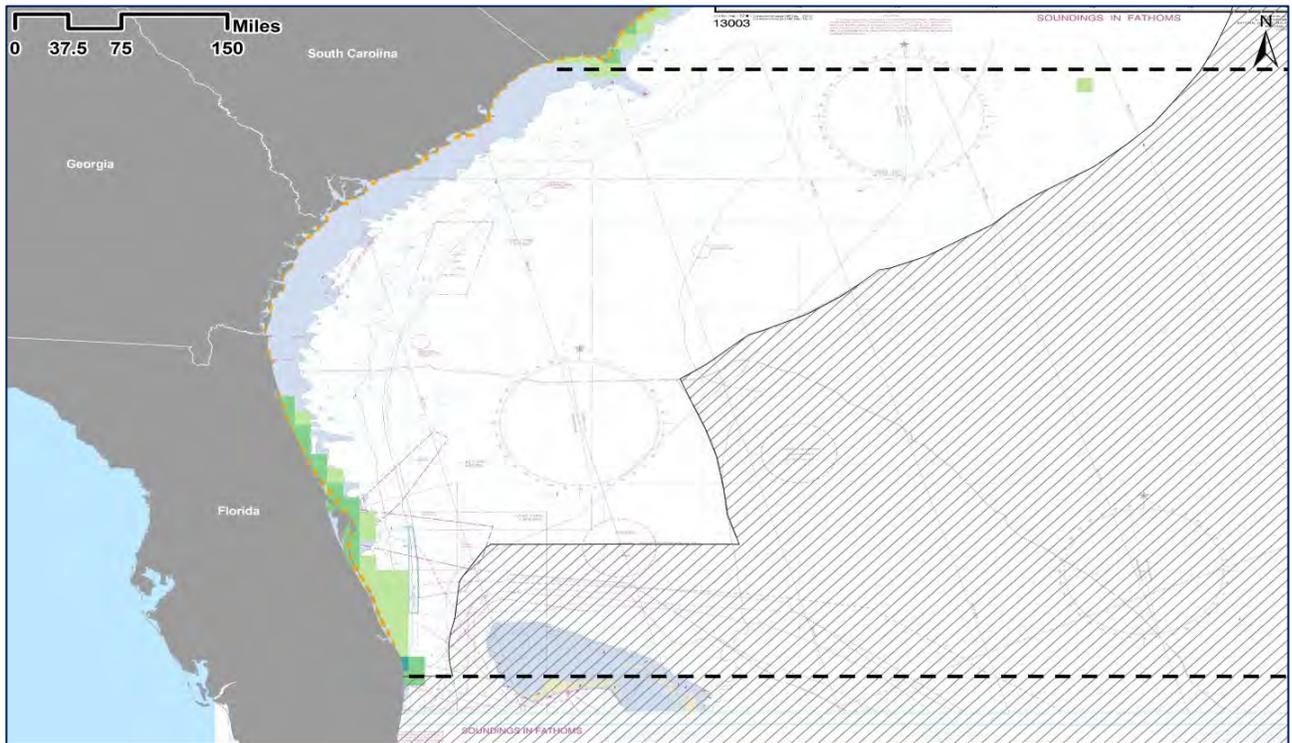
**VERTICAL LINE – MARCH**



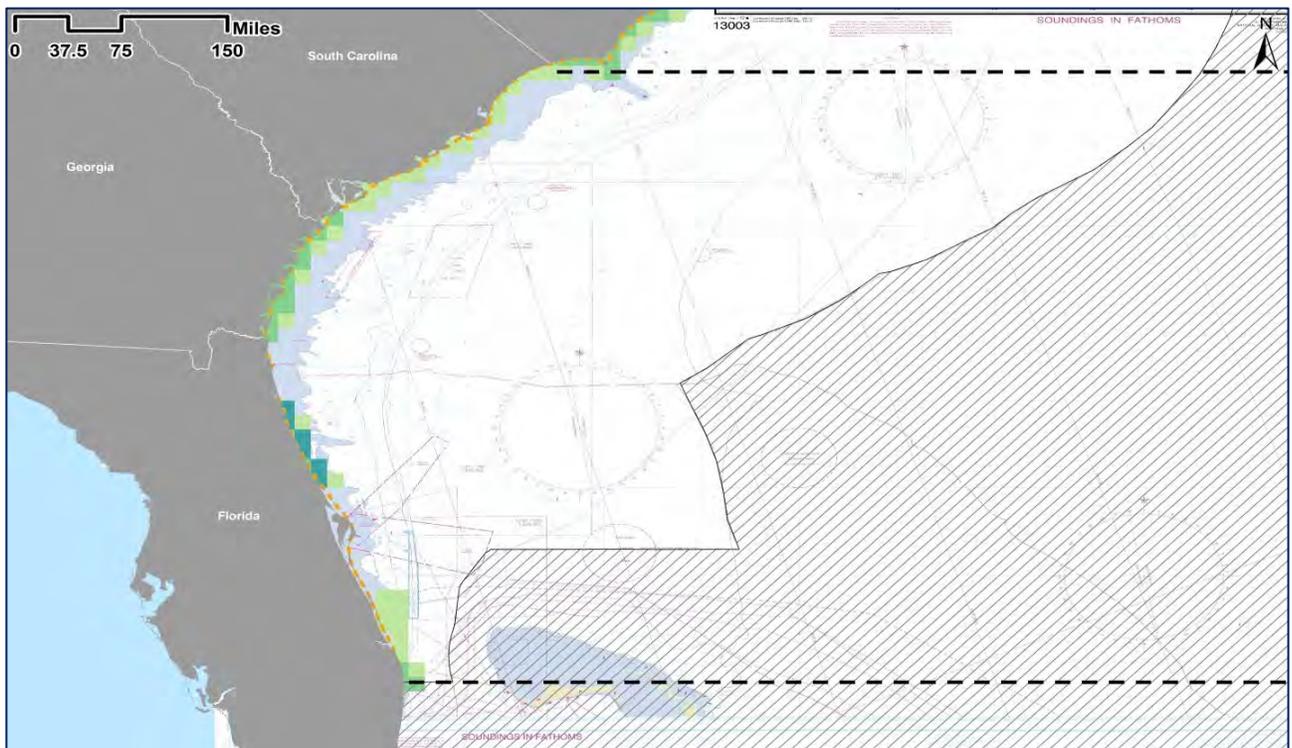
**VERTICAL LINE – APRIL**



**VERTICAL LINE – NOVEMBER**



**VERTICAL LINE – DECEMBER**



**APPENDIX G**

**2010/2011 BASELINE RESULTS: CO-OCCURANCE OF  
VERTICAL LINES AND COMBINED RIGHT/HUMPBACK WHALE SPUE**

Appendix G illustrates the model’s 2010/2011 baseline co-occurrence scores for right and humpback whales, combined. Exhibit G-1 presents maps that illustrate the distribution of co-occurrence scores by month. The maps are grouped by region. For the Northeast and Mid-Atlantic regions, maps are presented for each month of the year; maps illustrating the 12-month average co-occurrence score for each 10-minute grid cell are also included. For the Southeast region, maps are presented for November through April (the period during which members of the species the ALWTRP is designed to protect are most likely to be present); the map illustrating average co-occurrence scores in the Southeast focuses on this period. The legend for these maps is shown below.

As indicated in Appendix D, the vast majority of commercial fishing activity in the Southeast occurs in exempt waters, very close to shore. Including this activity in the calculation of co-occurrence scores in the Southeast can be misleading, as it suggests a greater potential for interaction between whales and vertical line than is likely to be the case. To avoid confusion and misrepresentation, the Atlantic Large Whale Take Reduction Team (ALWTRT) requested that co-occurrence scores in the Southeast be calculated solely on the basis of vertical line in waters seaward of the exemption line. The maps presented here comply with that request.

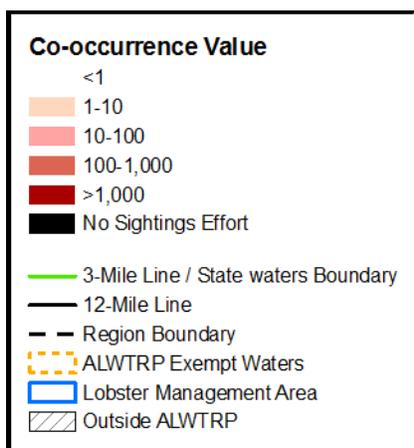
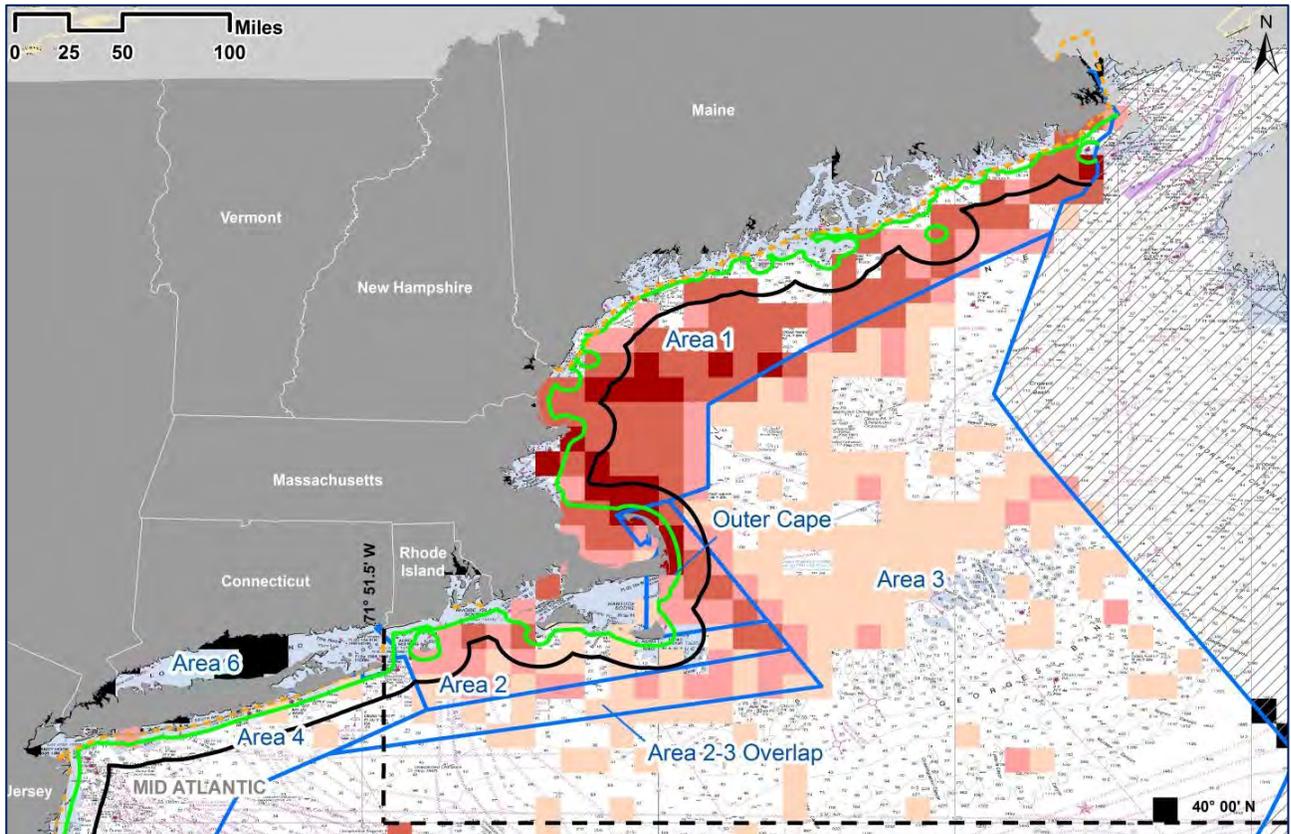


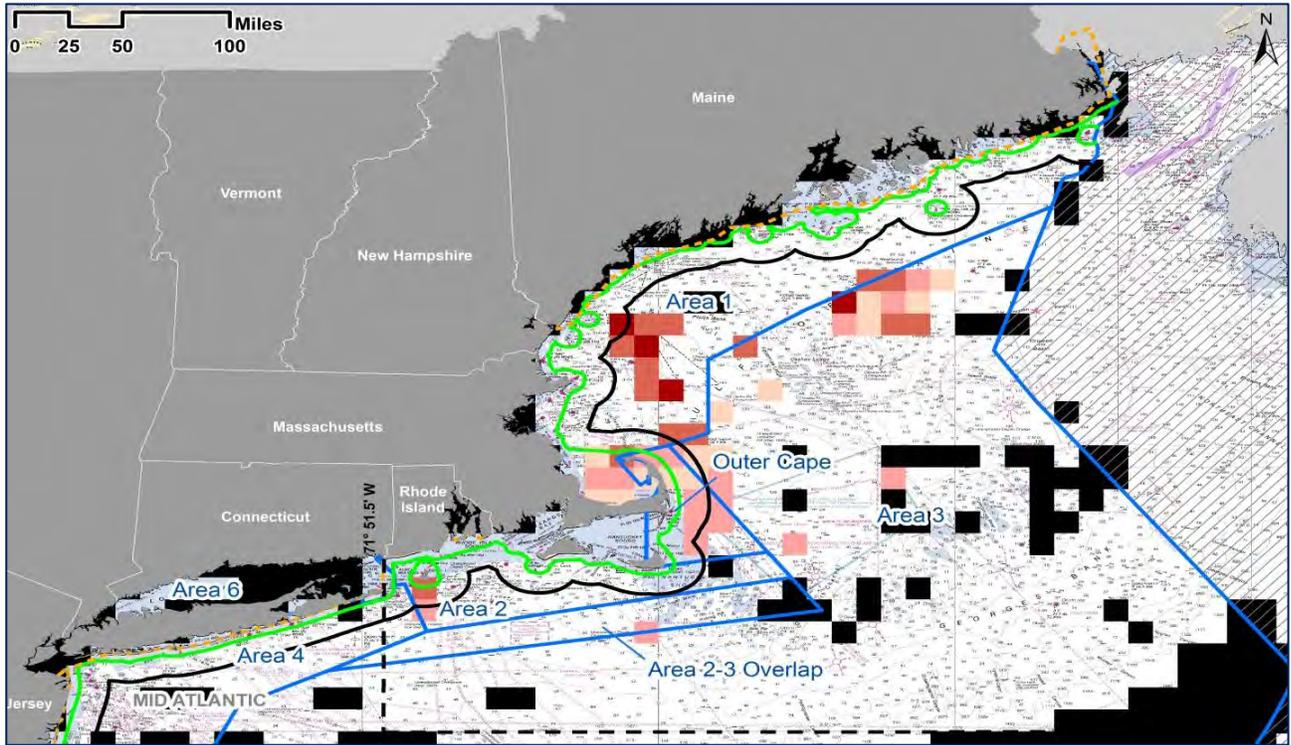
EXHIBIT G-1.

**NORTHEAST:**

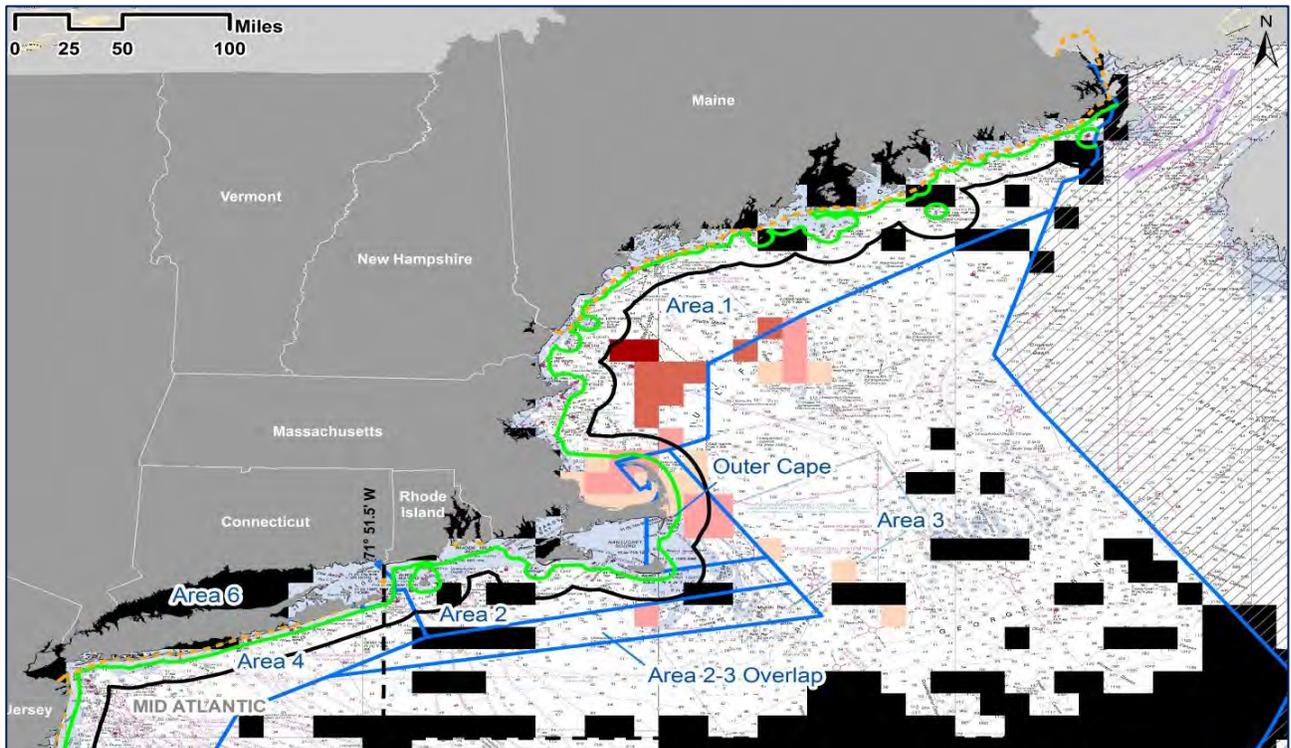
**CO-OCCURRENCE SCORE – MONTHLY AVERAGE (RIGHT & HUMPBACK WHALES, COMBINED)**



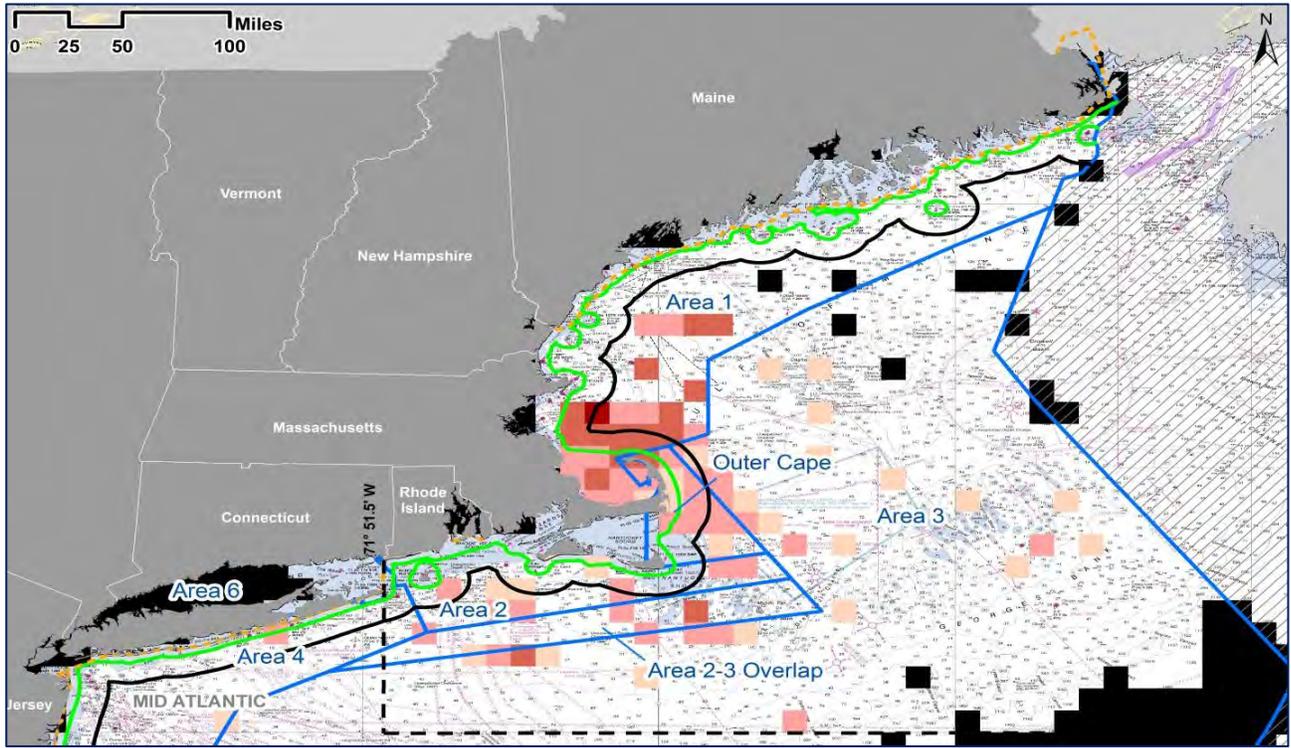
**CO-OCCURRENCE SCORE – JANUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



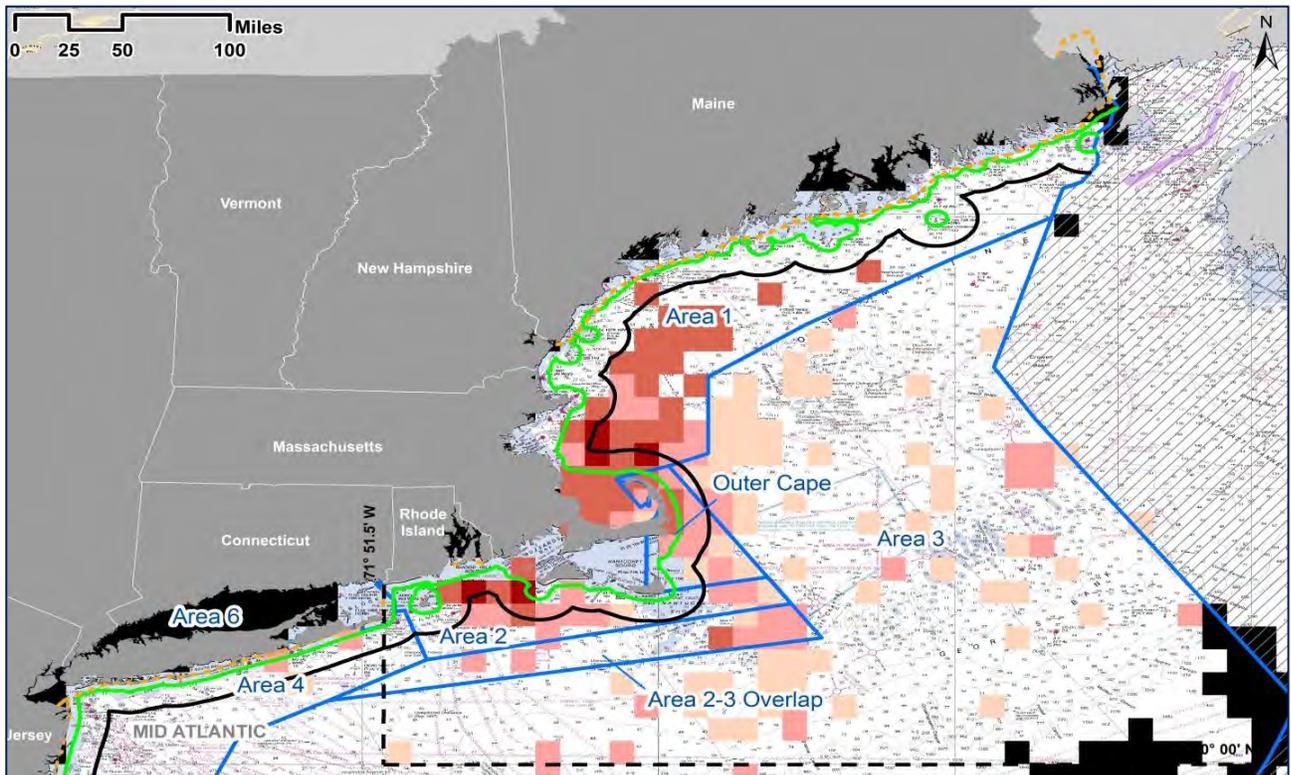
**CO-OCCURRENCE SCORE – FEBRUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



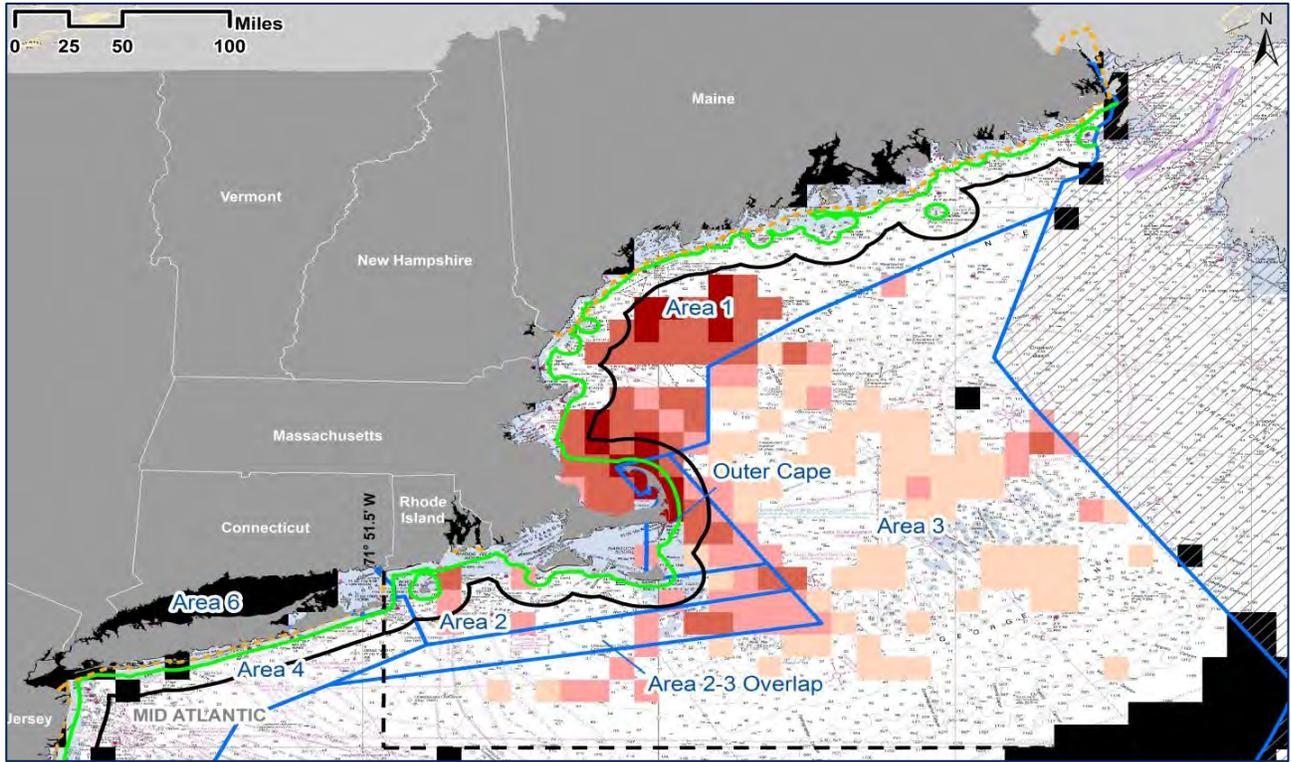
**CO-OCCURRENCE SCORE – MARCH (RIGHT & HUMPBACK WHALES, COMBINED)**



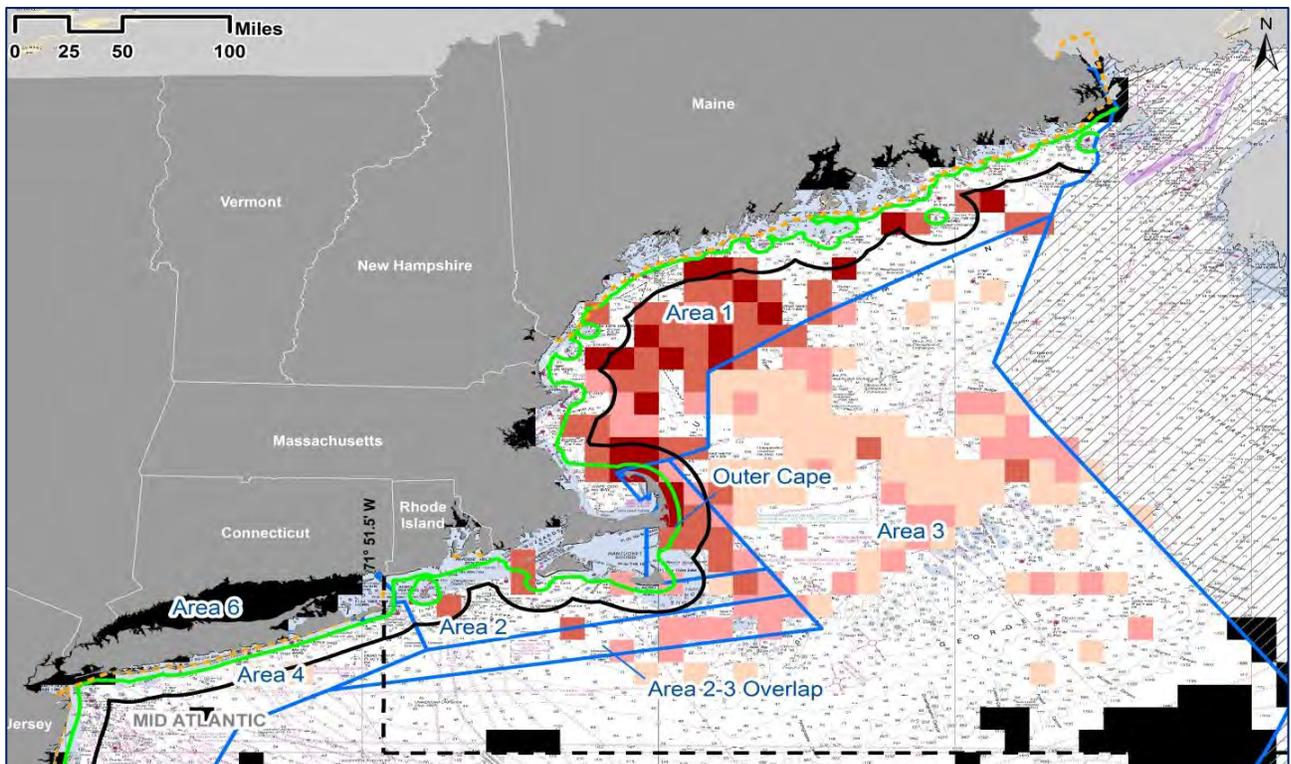
**CO-OCCURRENCE SCORE – APRIL (RIGHT & HUMPBACK WHALES, COMBINED)**



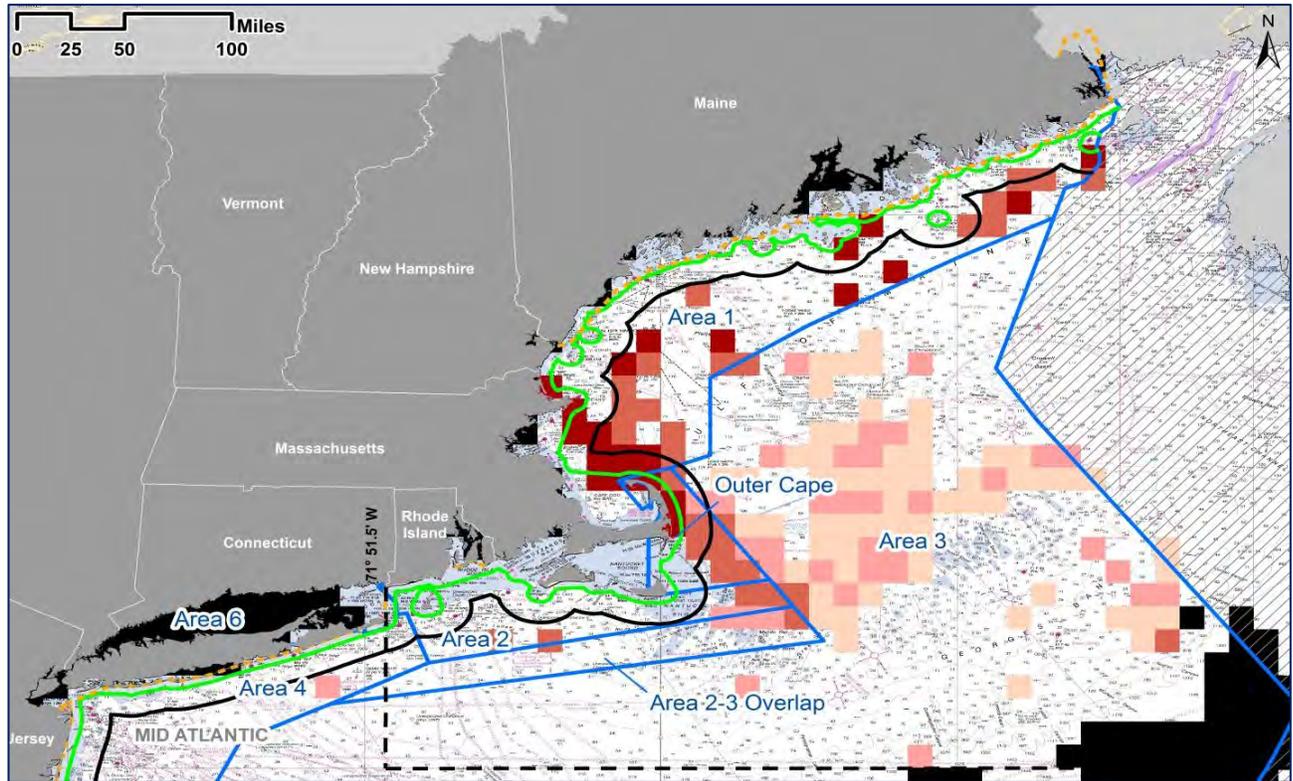
**CO-OCCURRENCE SCORE – MAY (RIGHT & HUMPBACK WHALES, COMBINED)**



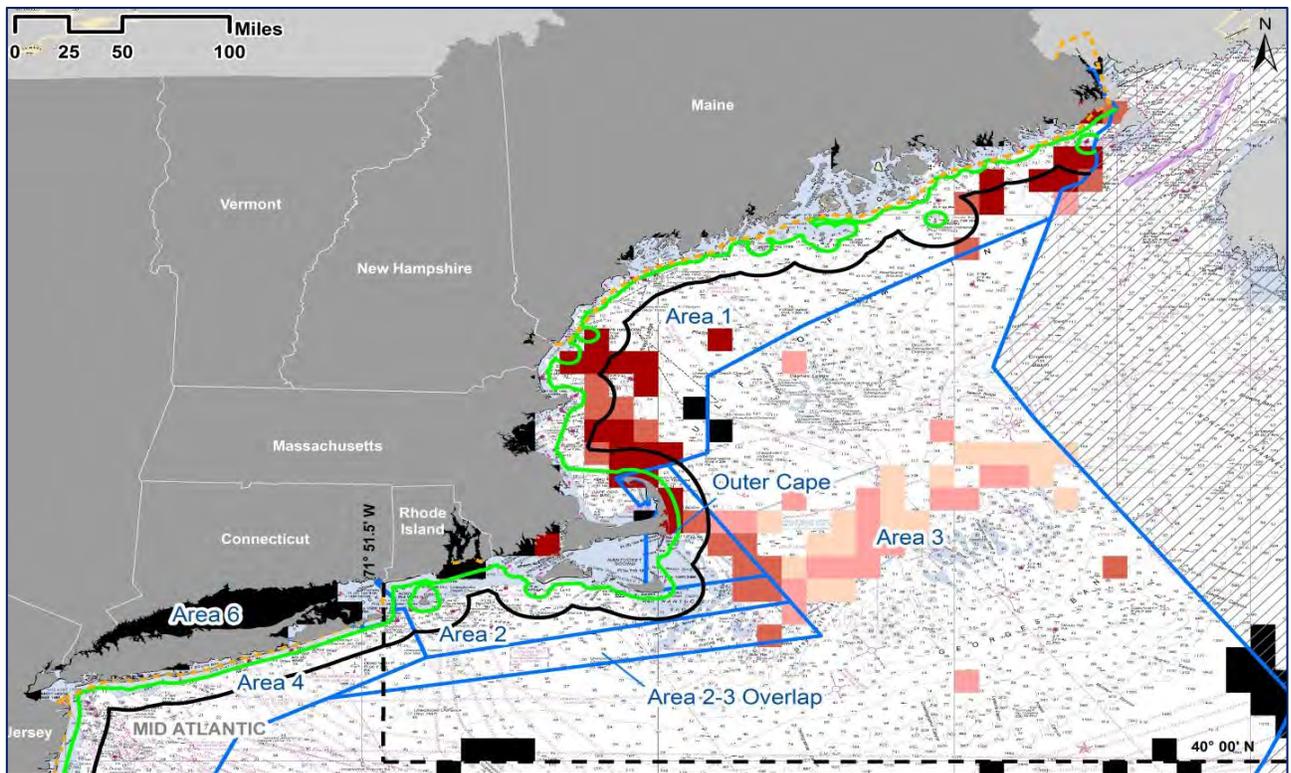
**CO-OCCURRENCE SCORE – JUNE (RIGHT & HUMPBACK WHALES, COMBINED)**



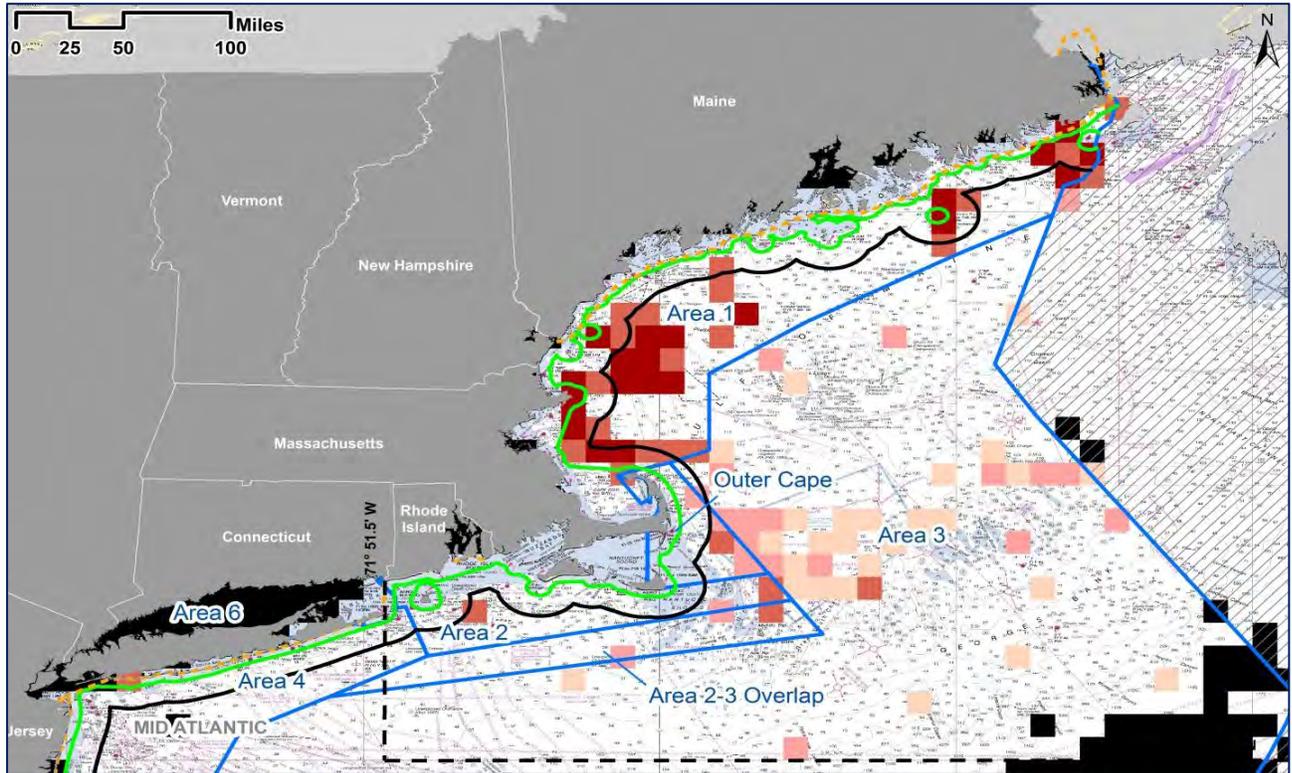
**CO-OCCURRENCE SCORE – JULY (RIGHT & HUMPBACK WHALES, COMBINED)**



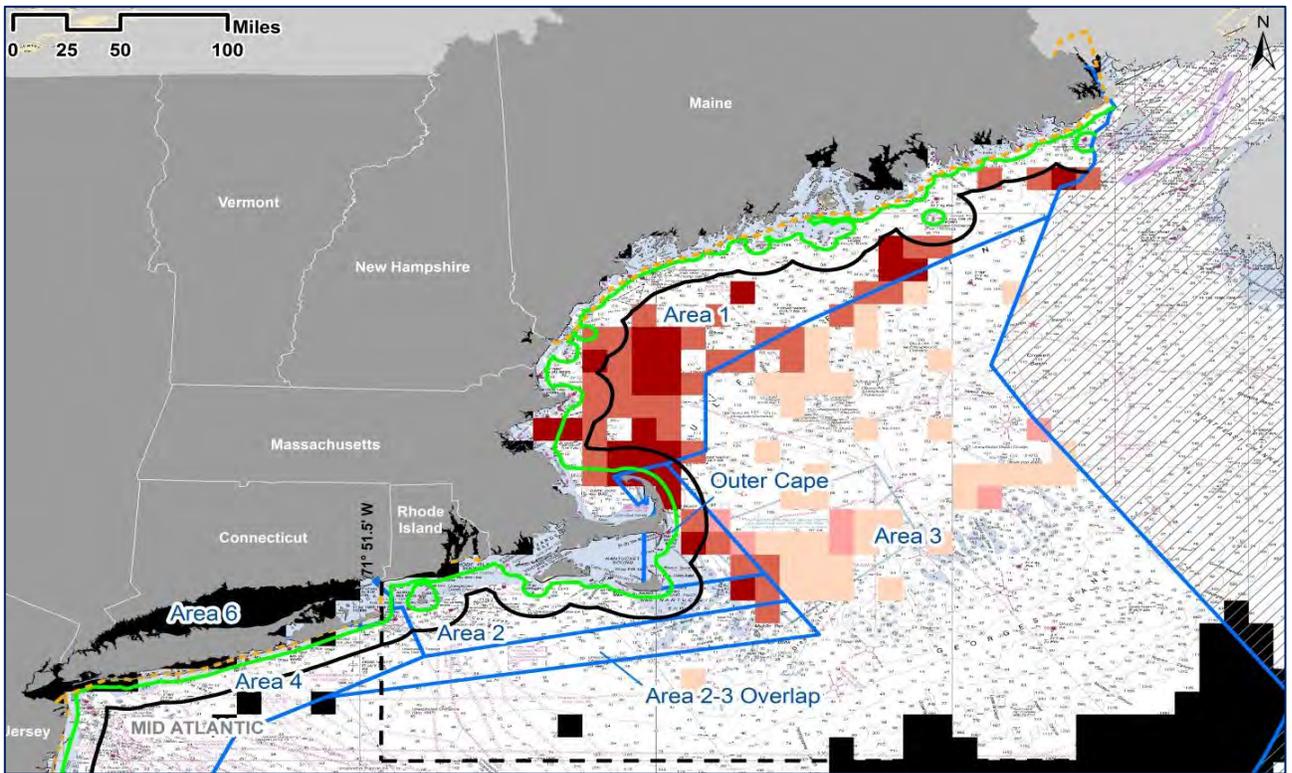
**CO-OCCURRENCE SCORE – AUGUST (RIGHT & HUMPBACK WHALES, COMBINED)**



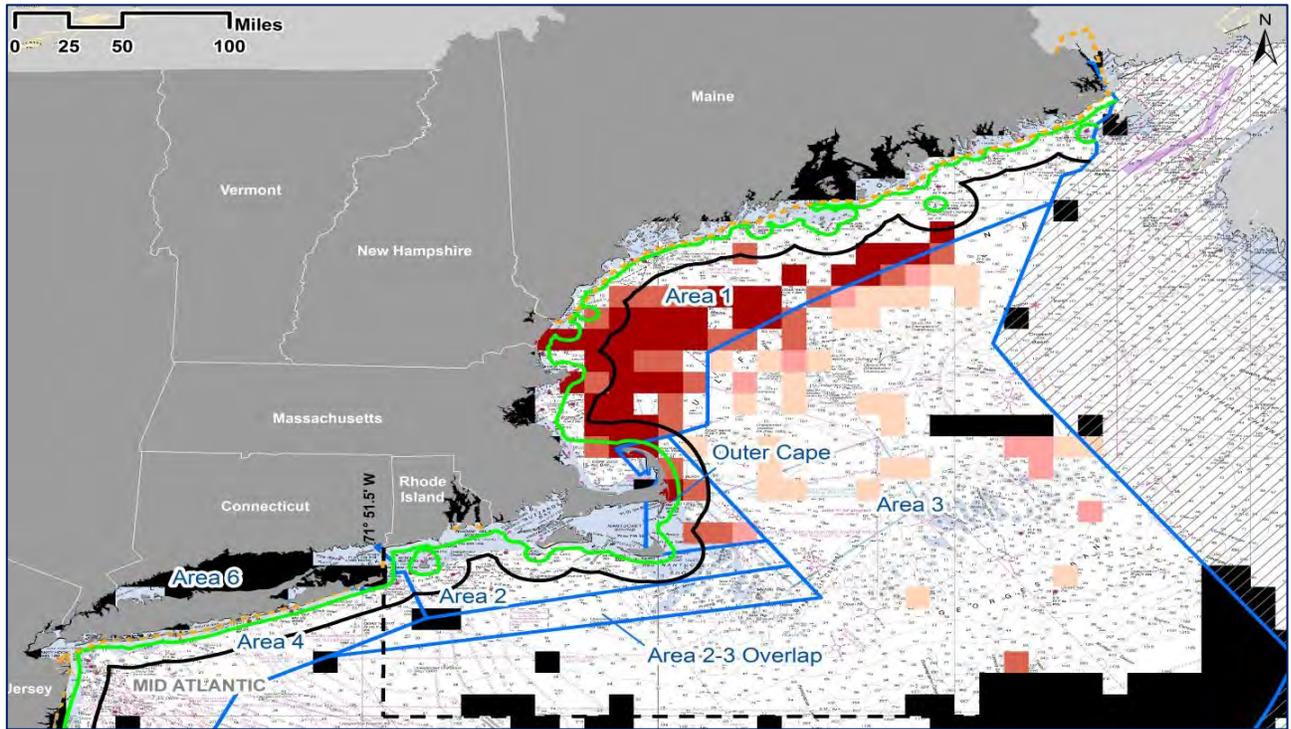
**CO-OCCURRENCE SCORE – SEPTEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**



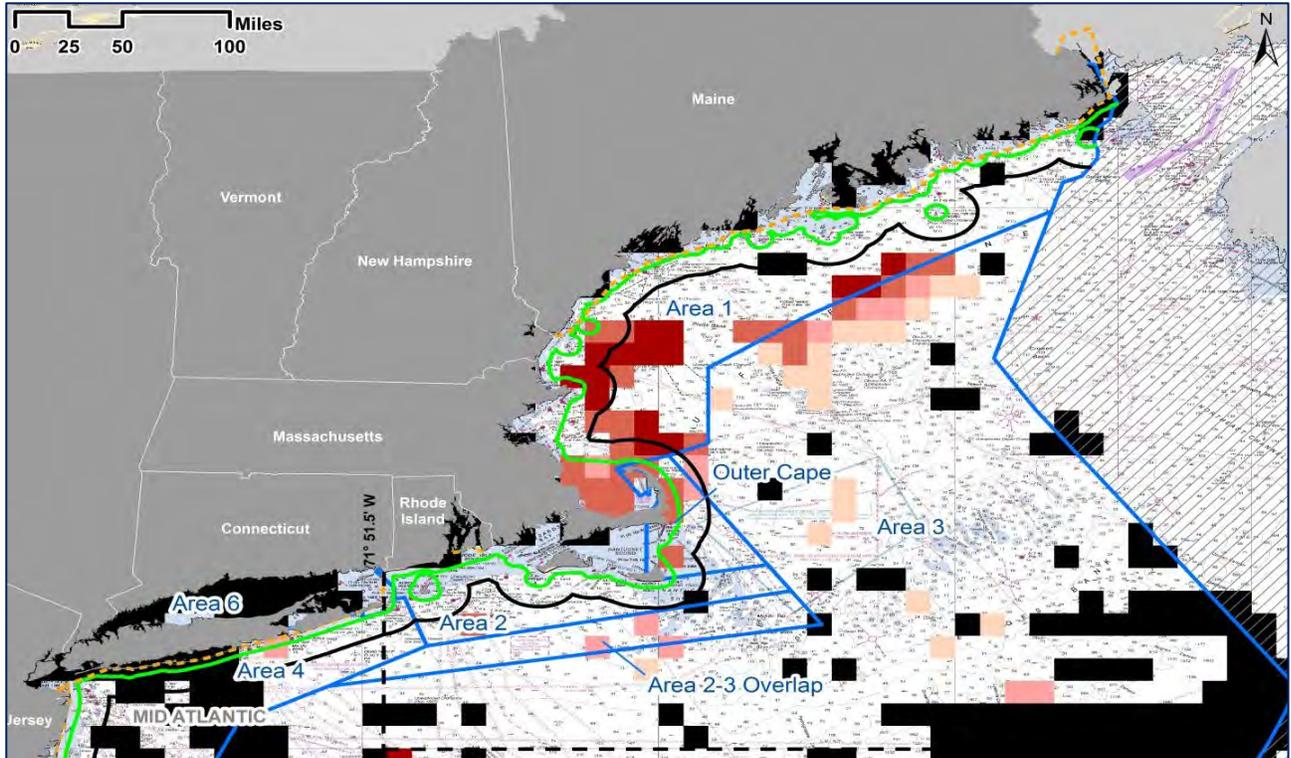
**CO-OCCURRENCE SCORE – OCTOBER (RIGHT & HUMPBACK WHALES, COMBINED)**



**CO-OCCURRENCE SCORE – NOVEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**

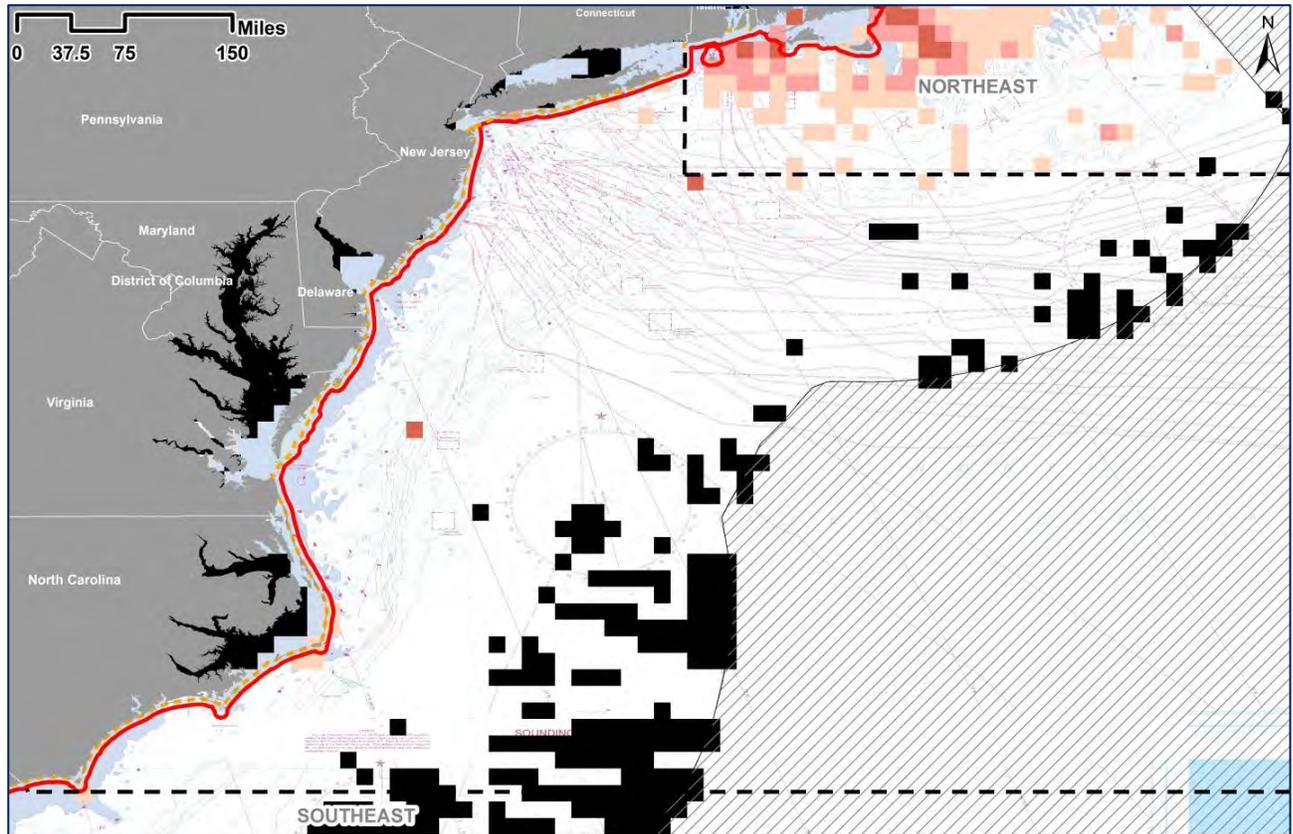


**CO-OCCURRENCE SCORE – DECEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**

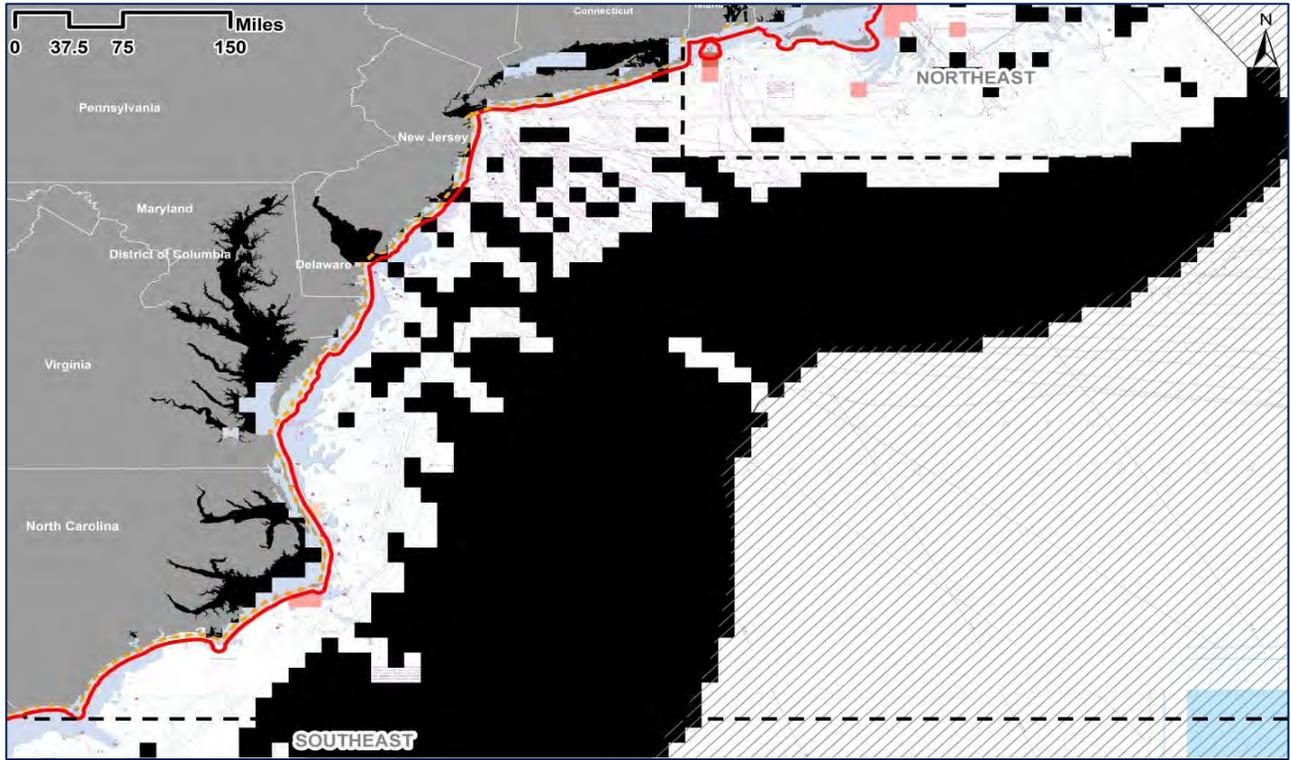


**MID-ATLANTIC:**

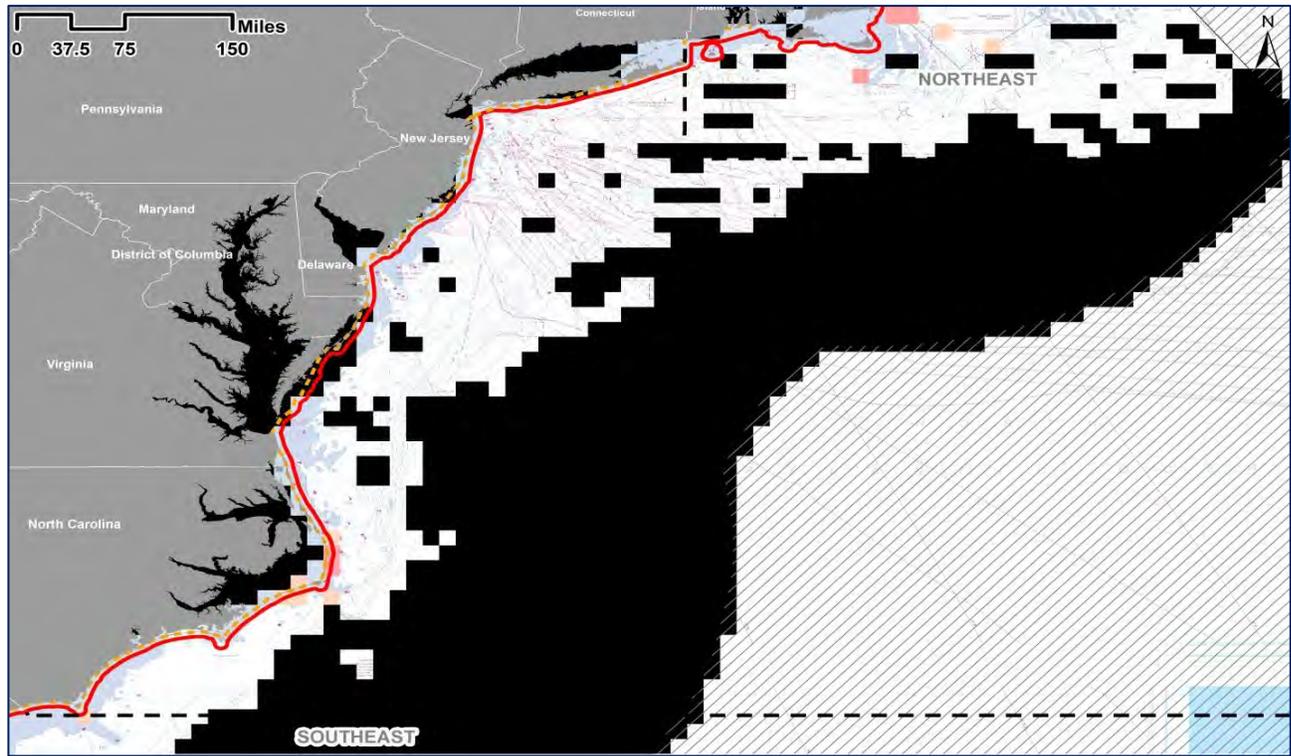
**CO-OCCURRENCE SCORE – MONTHLY AVERAGE (RIGHT & HUMPBACK WHALES, COMBINED)**



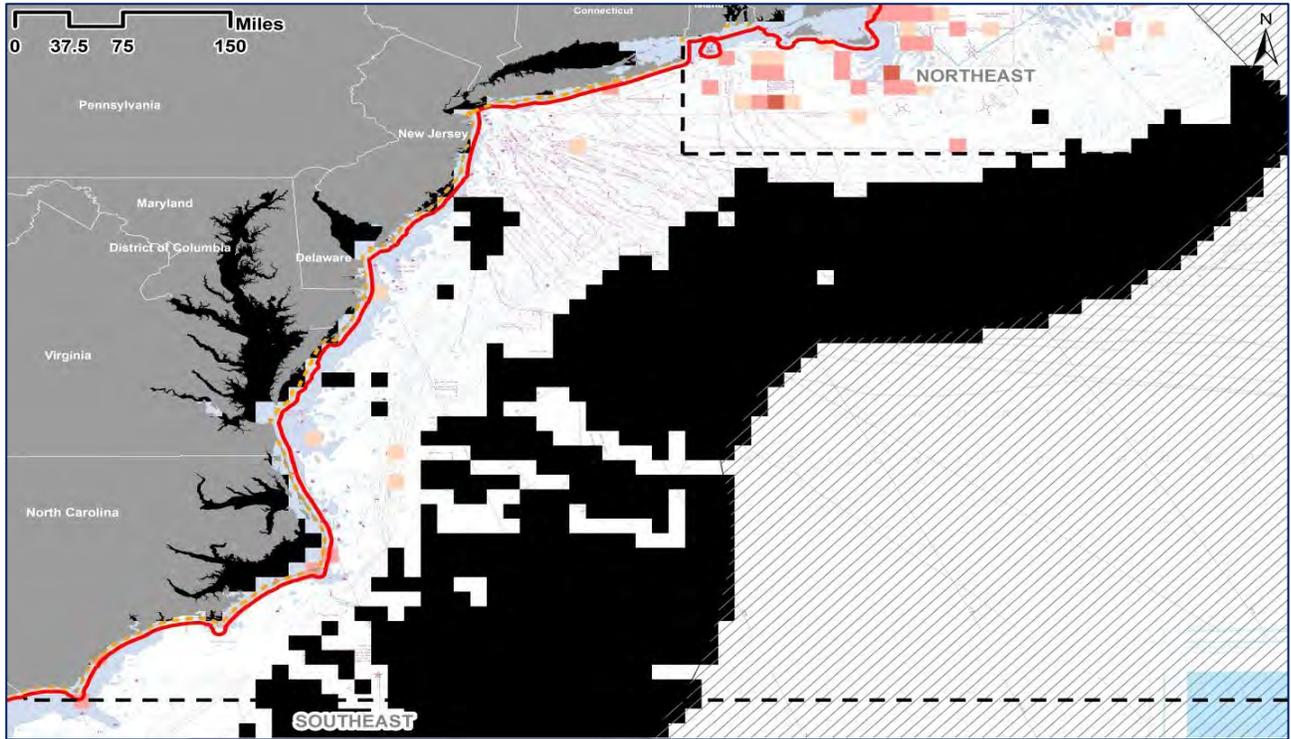
**CO-OCCURRENCE SCORE – JANUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



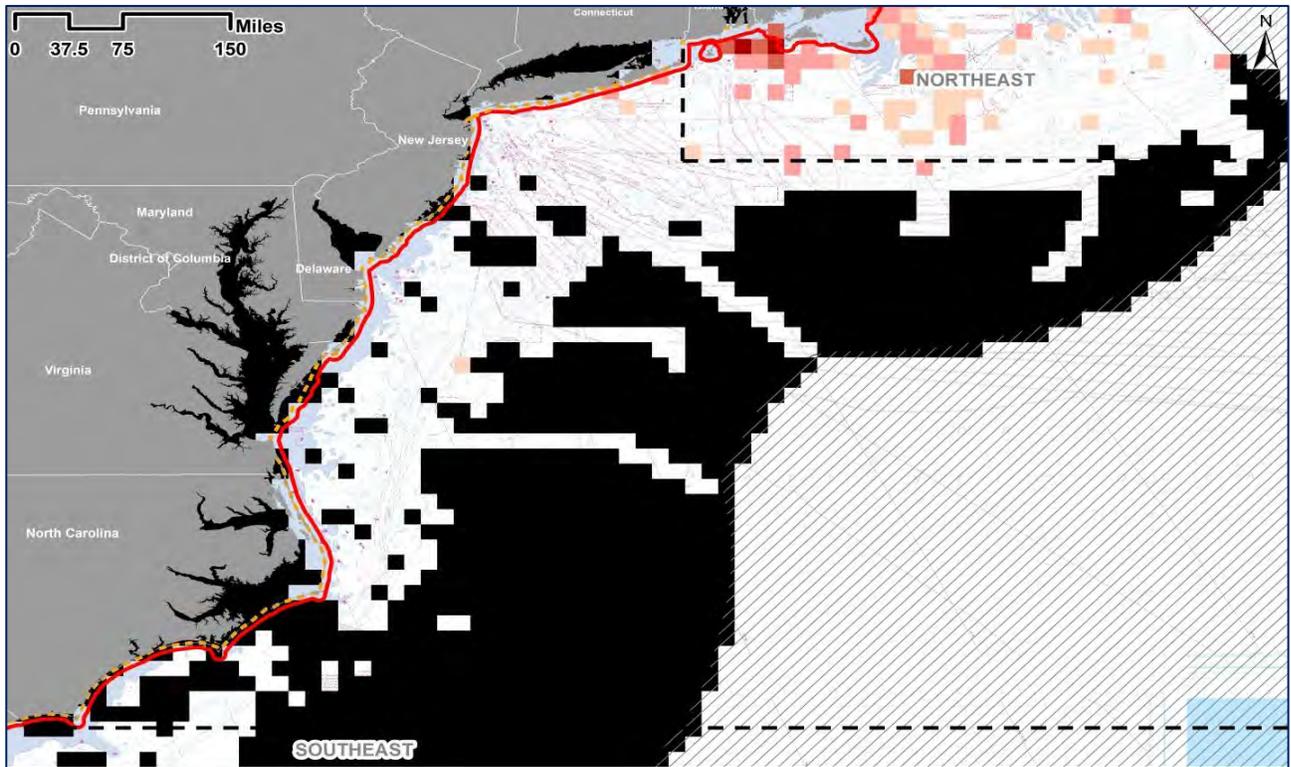
**CO-OCCURRENCE SCORE – FEBRUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



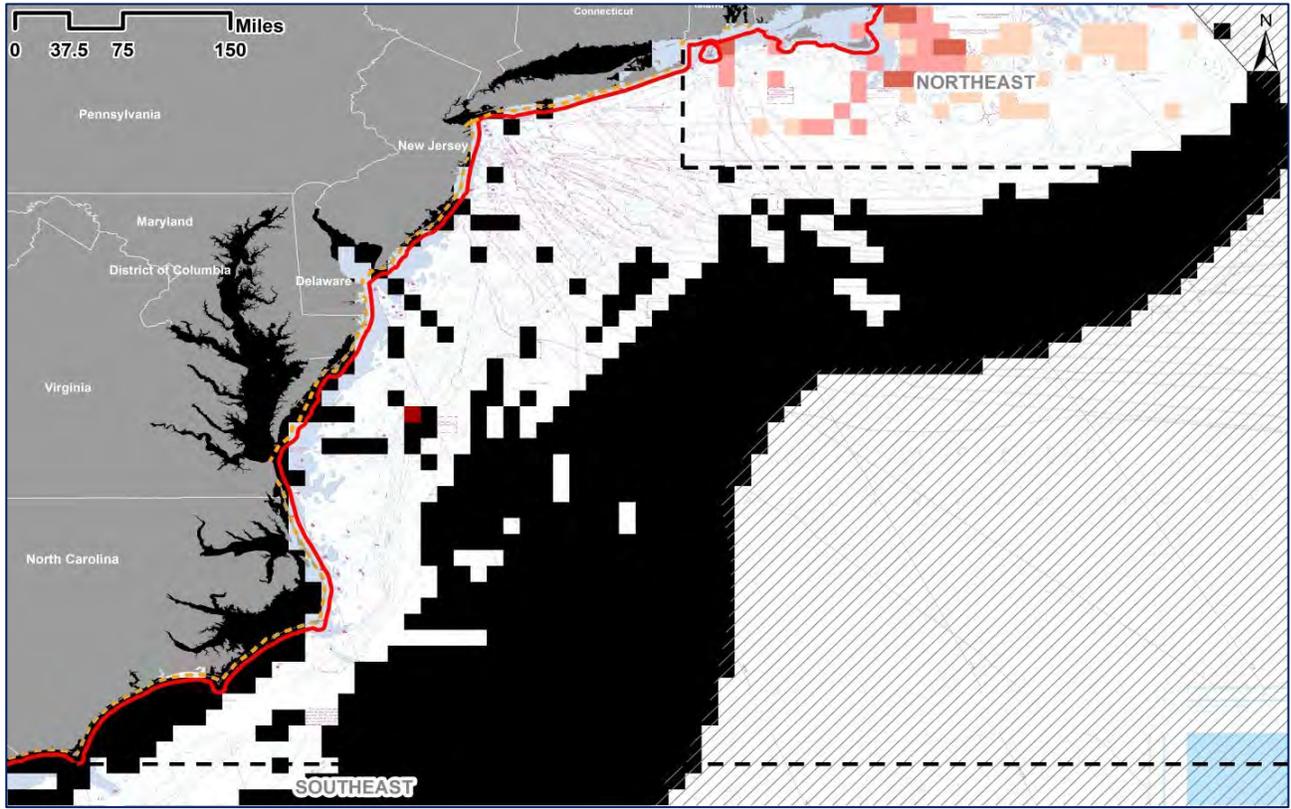
**CO-OCCURRENCE SCORE – MARCH (RIGHT & HUMPBACK WHALES, COMBINED)**



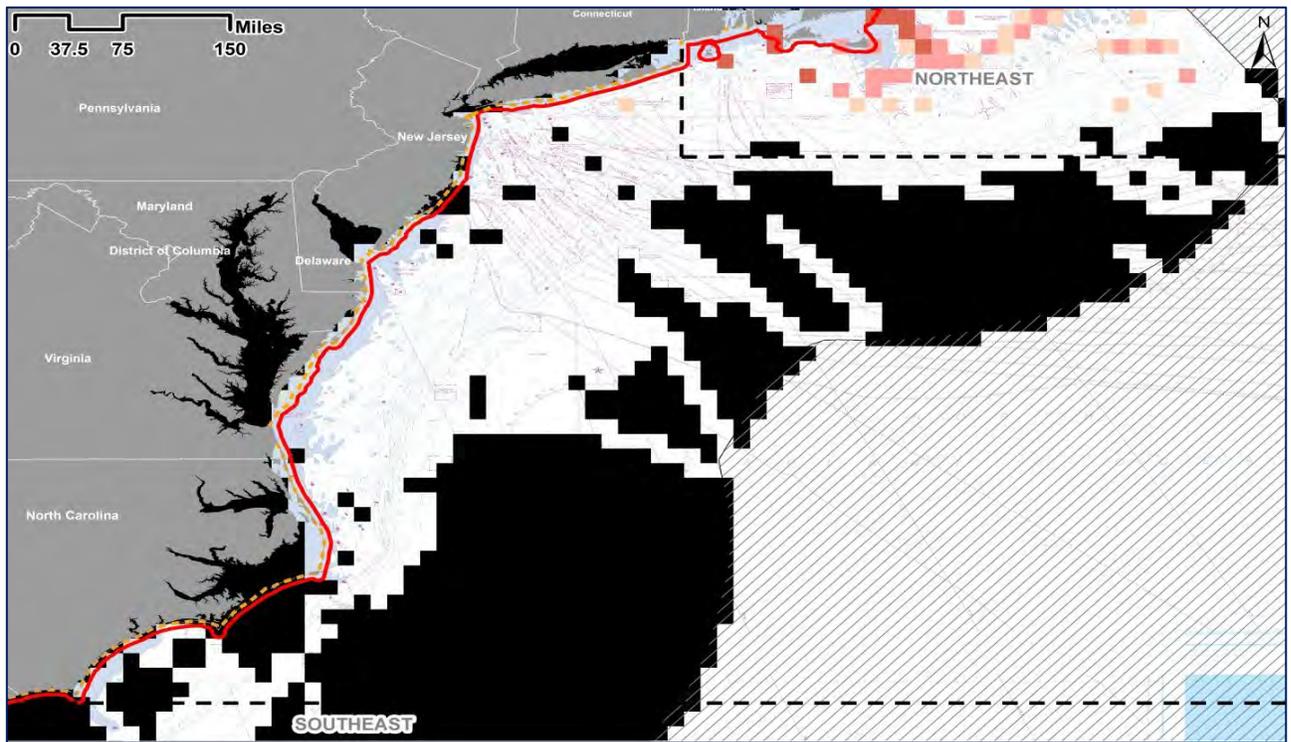
**CO-OCCURRENCE SCORE – APRIL (RIGHT & HUMPBACK WHALES, COMBINED)**



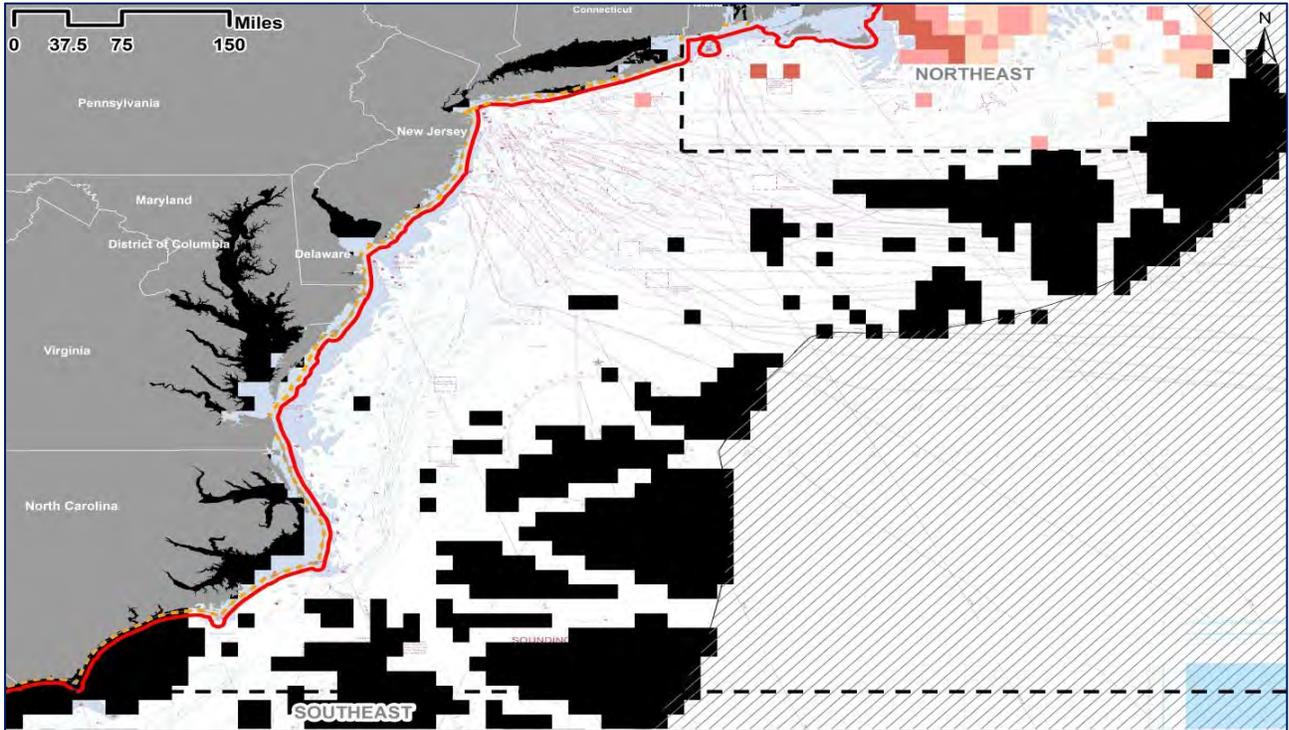
**CO-OCCURRENCE SCORE – MAY (RIGHT & HUMPBACK WHALES, COMBINED)**



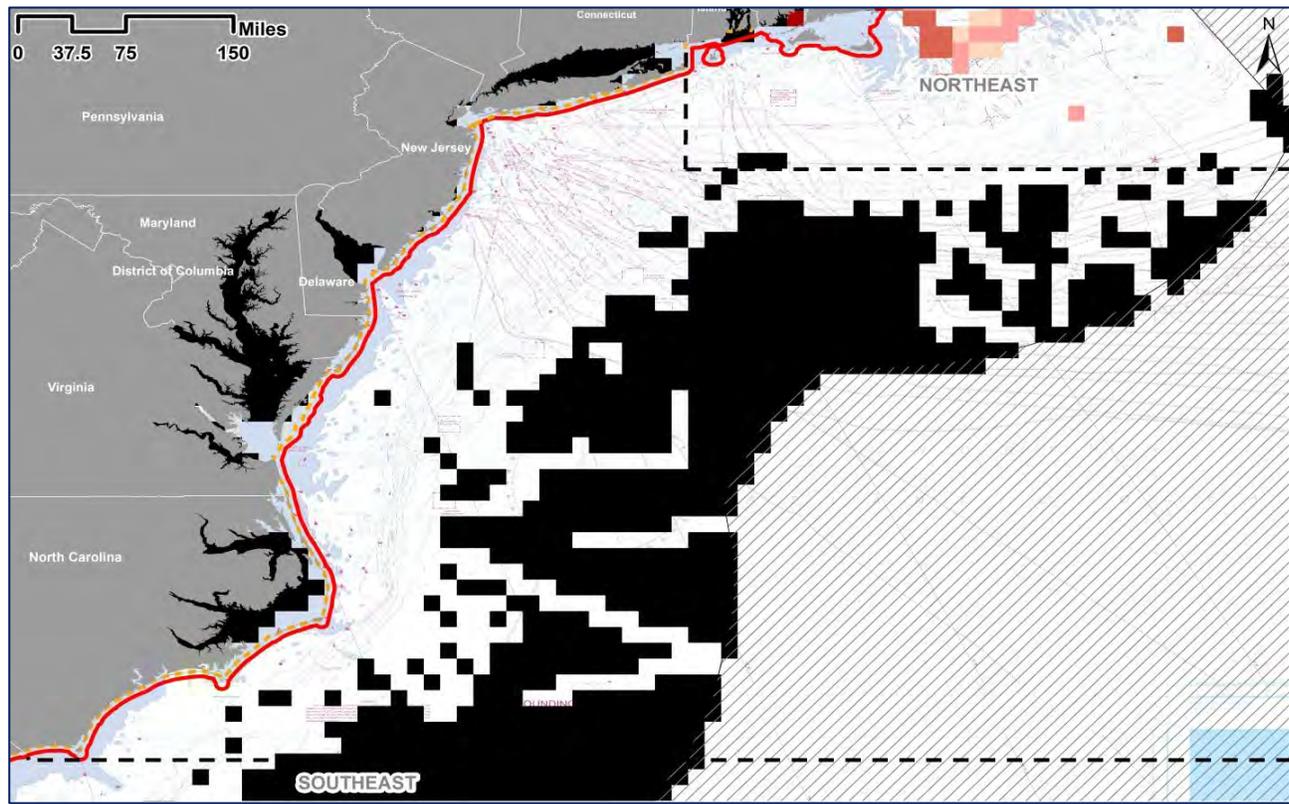
**CO-OCCURRENCE SCORE – JUNE (RIGHT & HUMPBACK WHALES, COMBINED)**



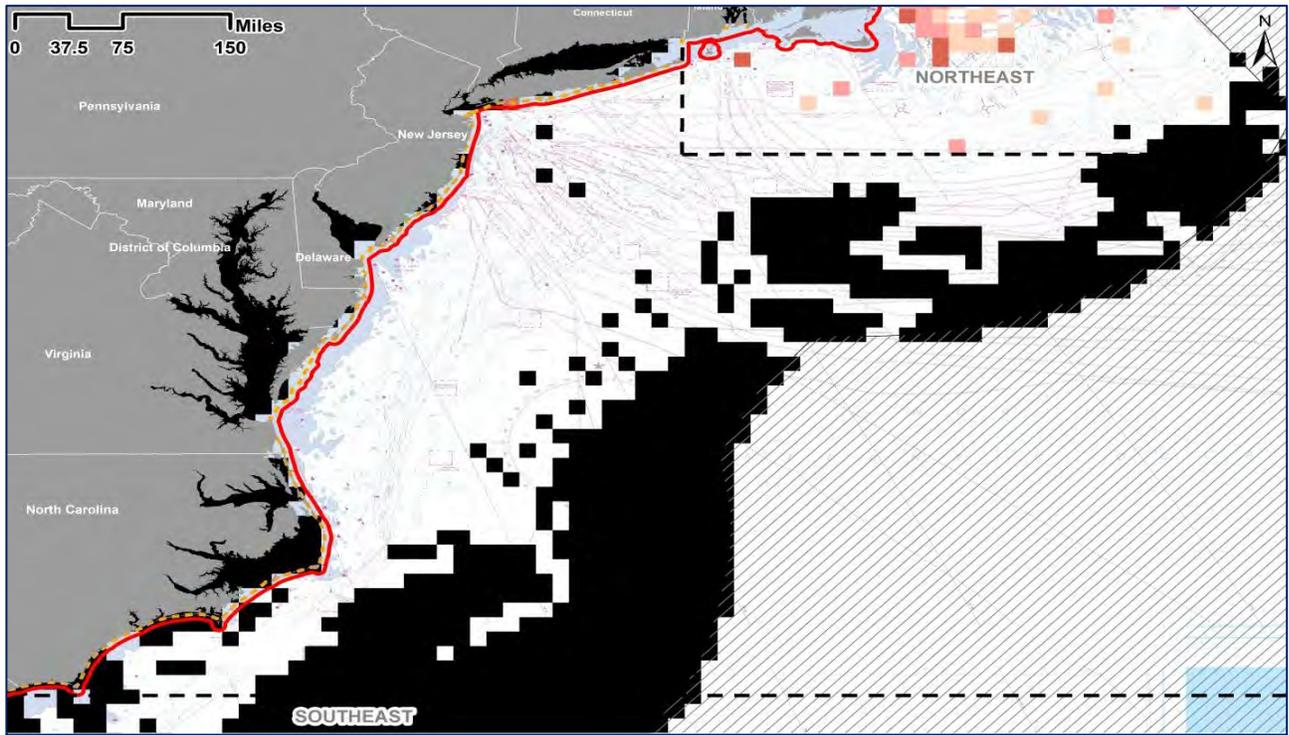
**CO-OCCURRENCE SCORE – JULY (RIGHT & HUMPBACK WHALES, COMBINED)**



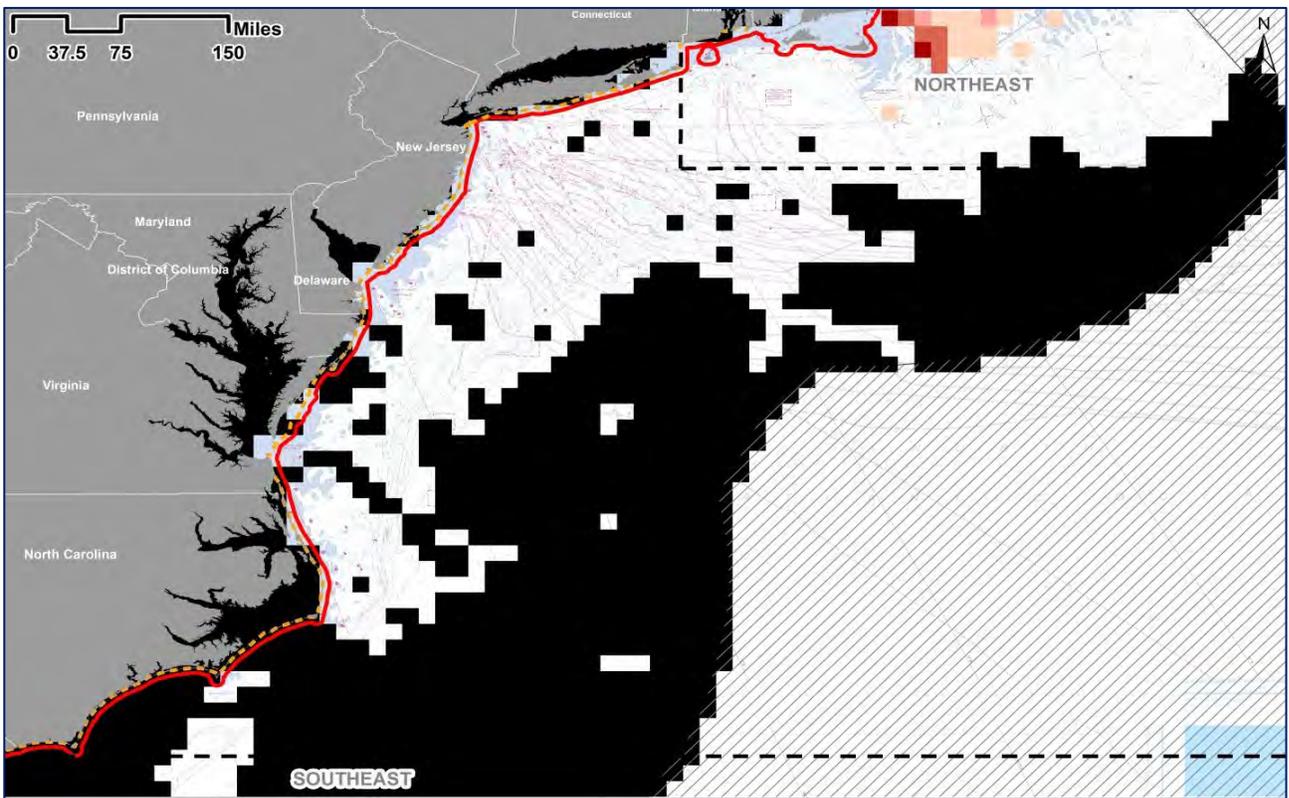
**CO-OCCURRENCE SCORE – AUGUST (RIGHT & HUMPBACK WHALES, COMBINED)**



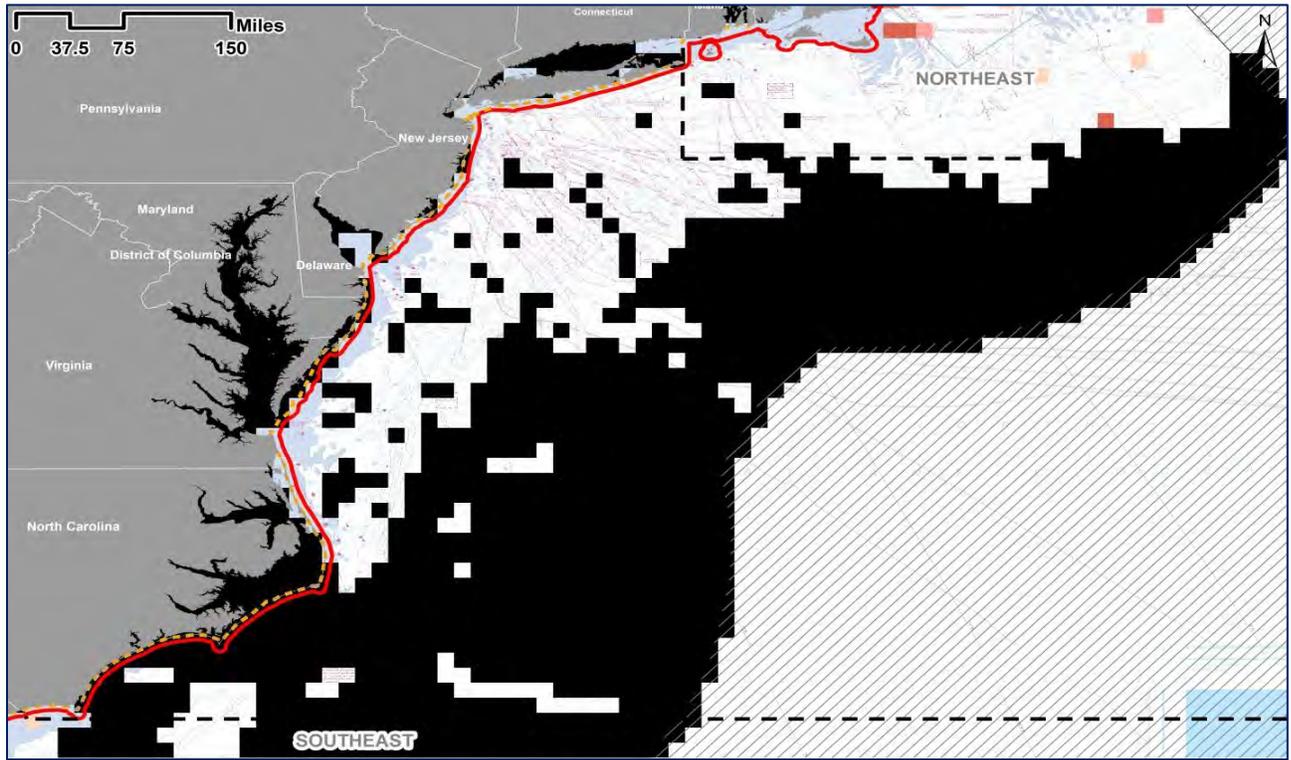
**CO-OCCURRENCE SCORE – SEPTEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**



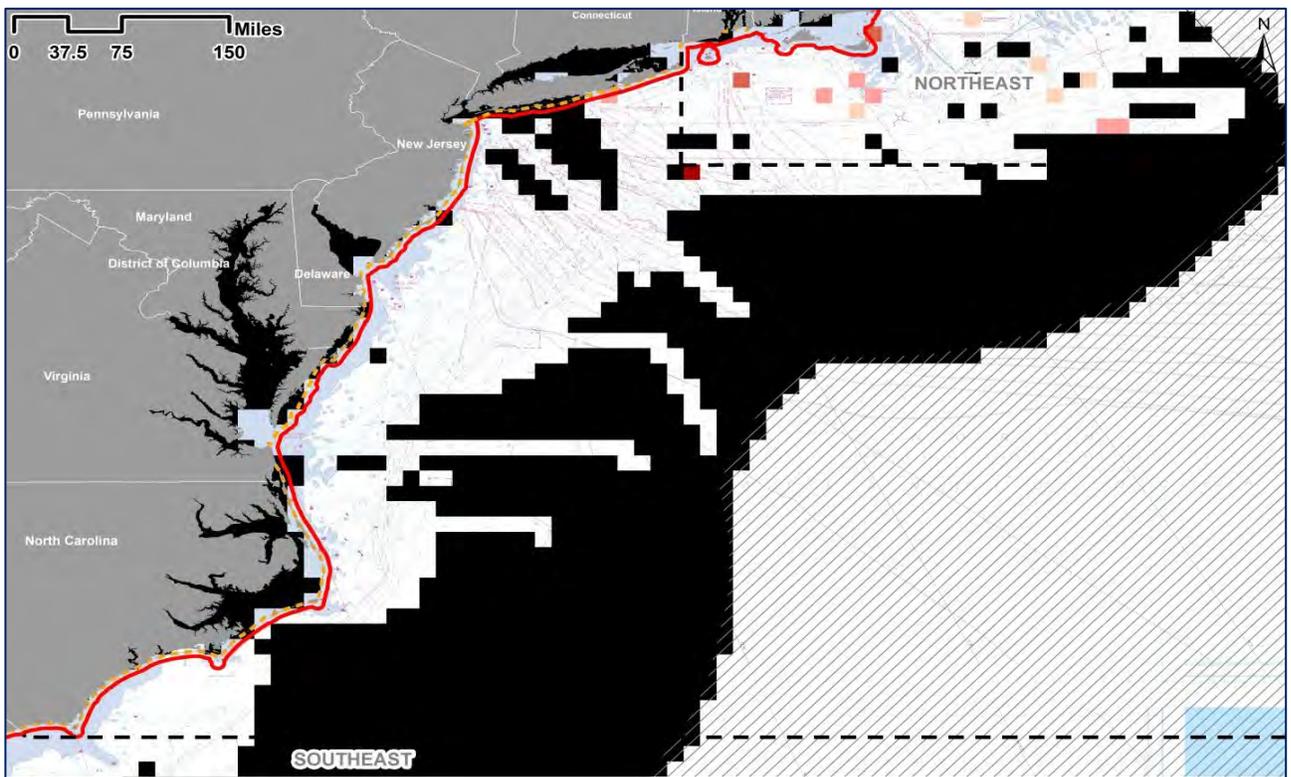
**CO-OCCURRENCE SCORE – OCTOBER (RIGHT & HUMPBACK WHALES, COMBINED)**



**CO-OCCURRENCE SCORE – NOVEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**

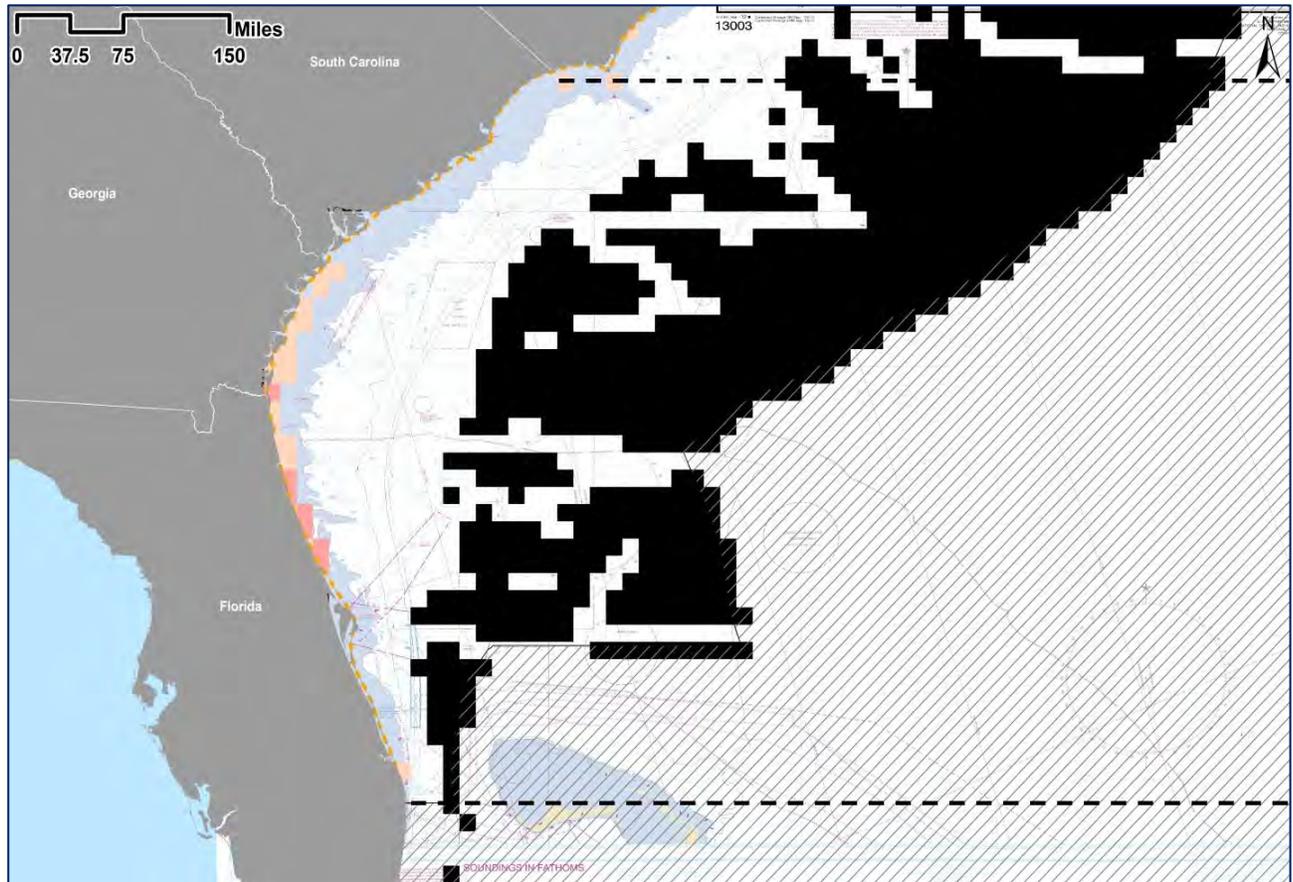


**CO-OCCURRENCE SCORE – DECEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**

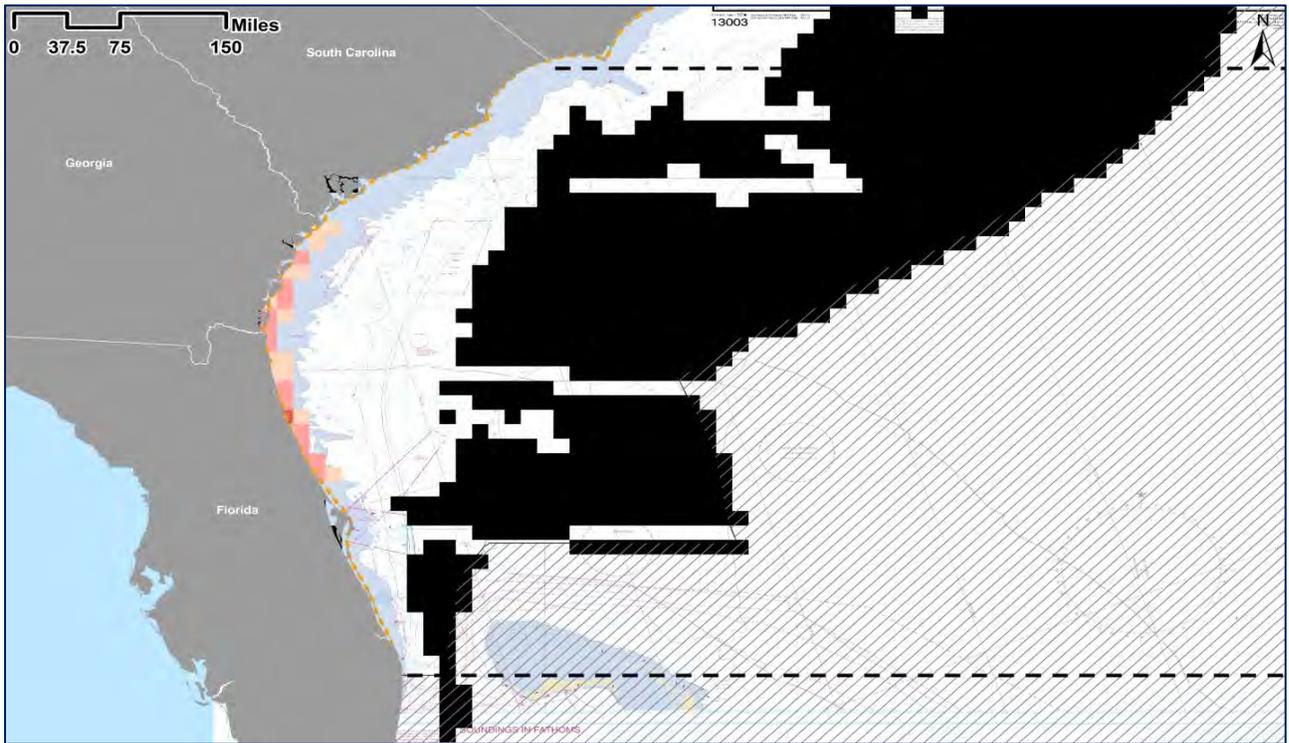


**SOUTHEAST:**

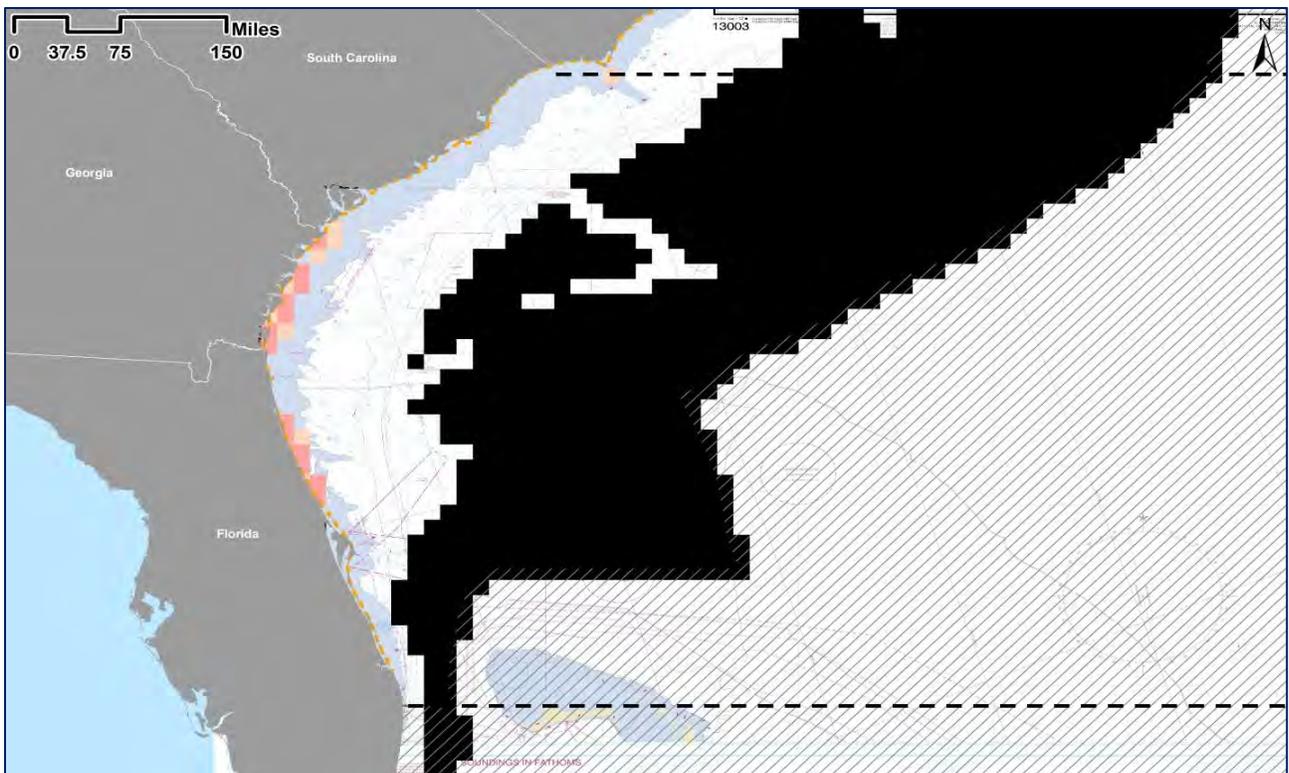
**CO-OCCURRENCE SCORE – MONTHLY AVERAGE (NOVEMBER – APRIL, RIGHT & HUMPBACK WHALES, COMBINED)**



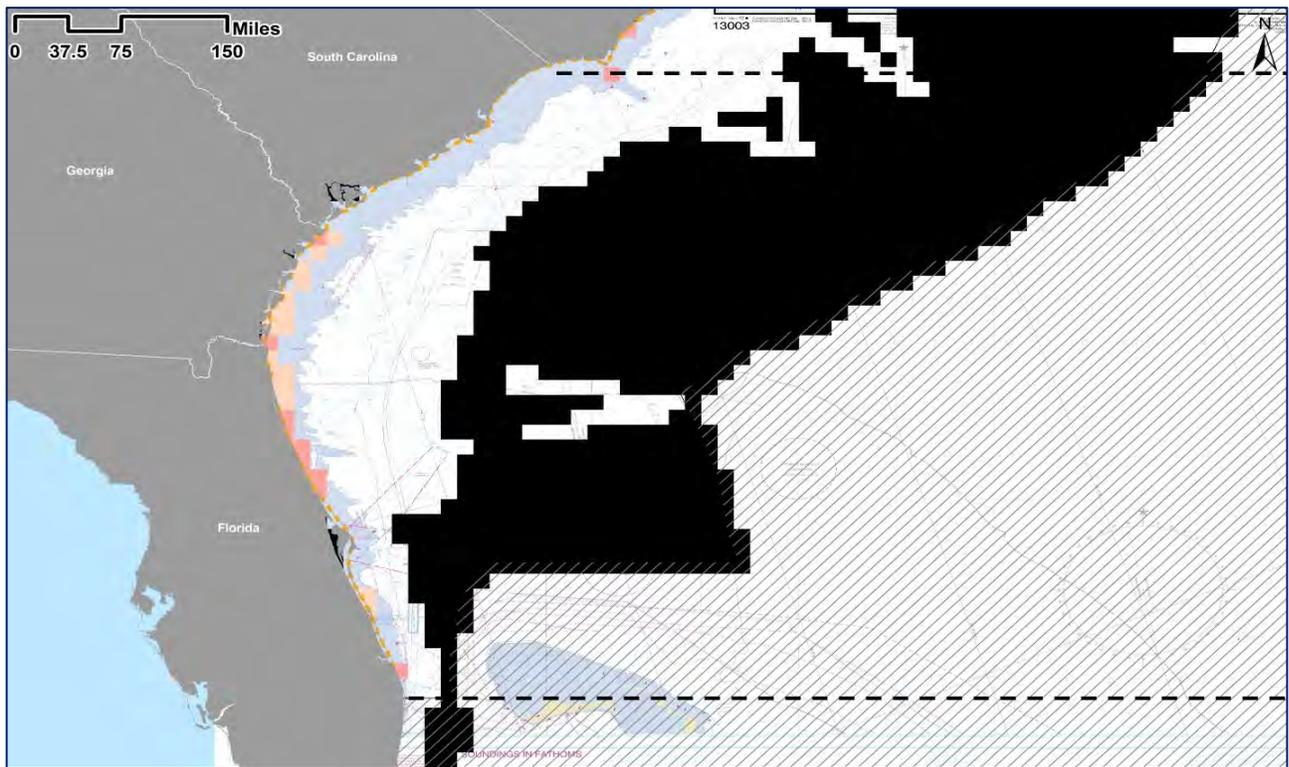
**CO-OCCURRENCE SCORE – JANUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



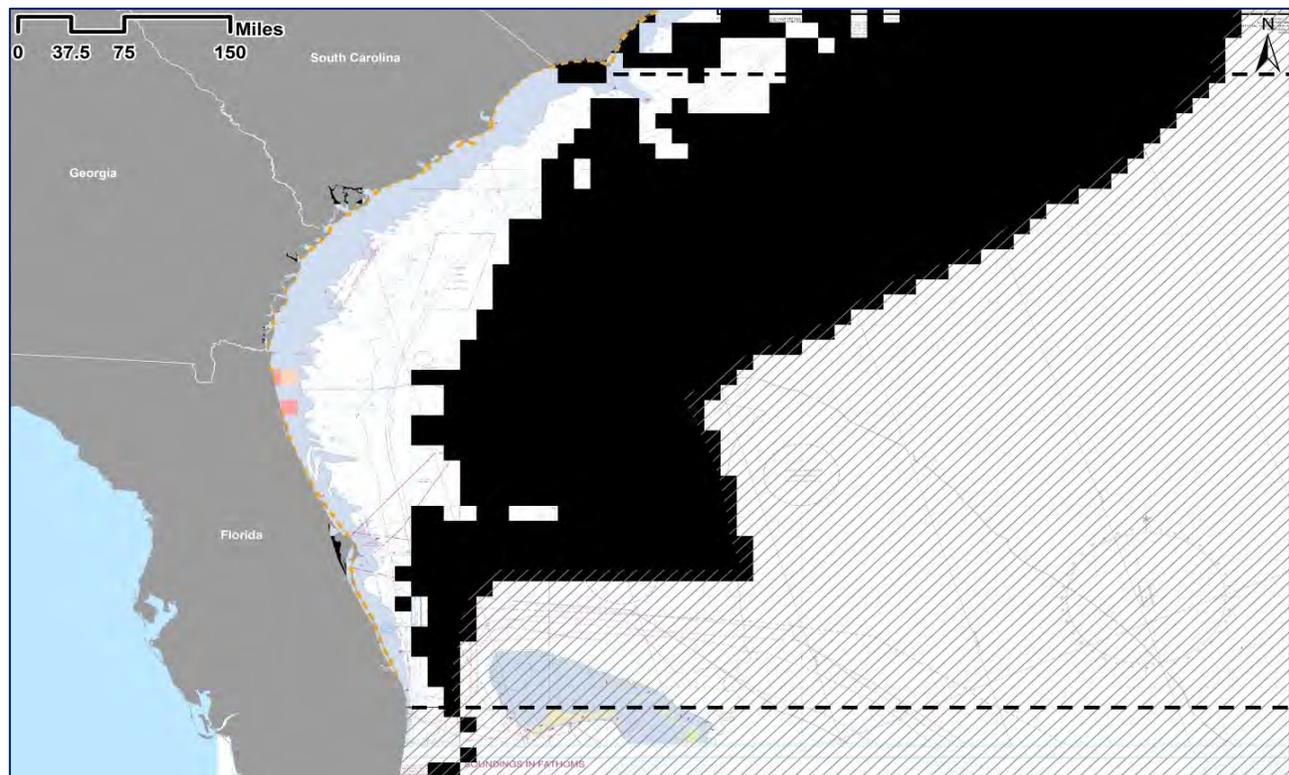
**CO-OCCURRENCE SCORE – FEBRUARY (RIGHT & HUMPBACK WHALES, COMBINED)**



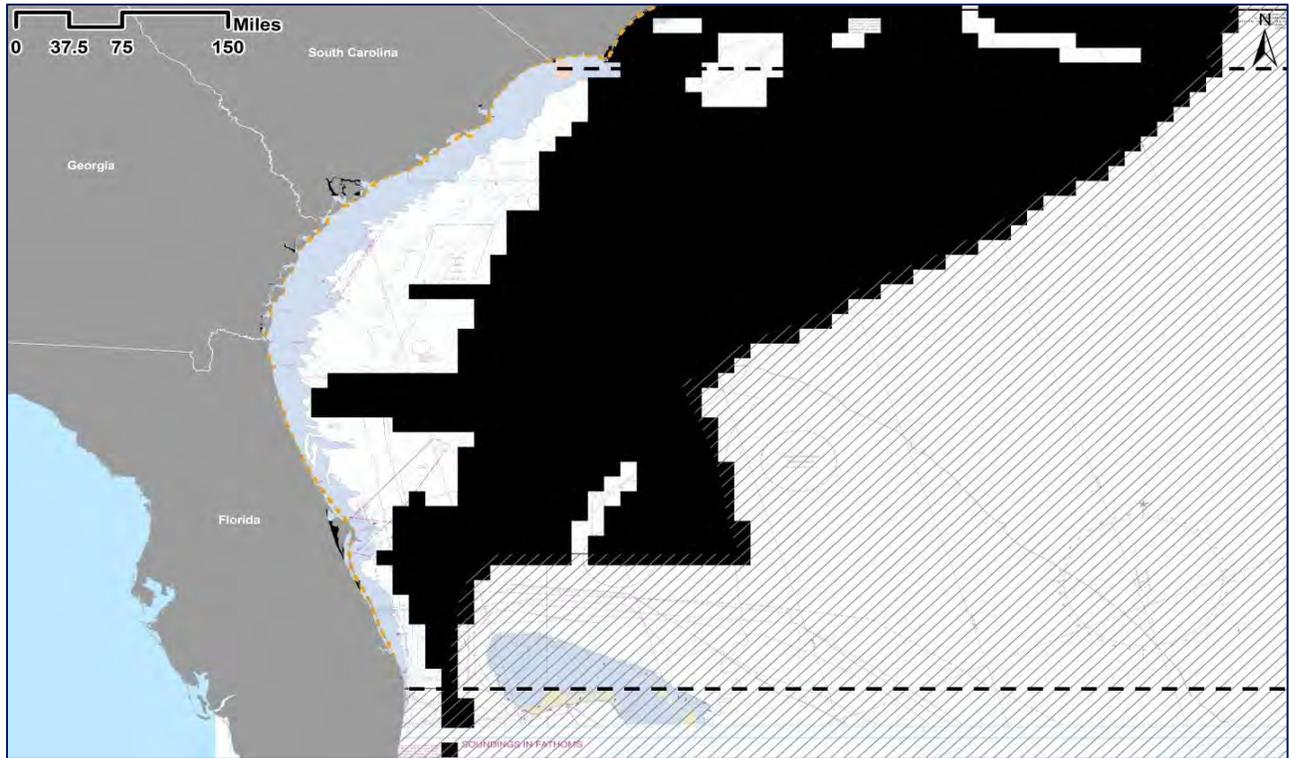
**CO-OCCURRENCE SCORE – MARCH (RIGHT & HUMPBACK WHALES, COMBINED)**



**CO-OCCURRENCE SCORE – APRIL (RIGHT & HUMPBACK WHALES, COMBINED)**



**CO-OCCURRENCE SCORE – NOVEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**



**CO-OCCURRENCE SCORE – DECEMBER (RIGHT & HUMPBACK WHALES, COMBINED)**

