The National Environmental Policy Act (NEPA) requires that an environmental impact statement for a proposed Federal action evaluate the impacts of the action with respect to the human environment, including its biological, economic, and social components. This chapter addresses the first of these dimensions, evaluating the impact of potential modifications to the Atlantic Large Whale Take Reduction Plan (ALWTRP) on the biological environment.[1] Of foremost concern to this evaluation is the direct effect of the potential regulations on the likelihood that North Atlantic right whales, humpback whales, and fin whales – all of which are federally listed endangered species – will be killed or seriously injured as a result of entanglement in commercial fishing gear. It is also necessary, however, to consider whether new regulations could indirectly affect these species by exposing them to different risks or by altering the habitat upon which they depend. In addition, it is important to consider the potential effect that changes in ALWTRP regulations might have on other aspects of the marine environment.

The discussion that follows presents an evaluation of these impacts. It focuses first on the use of NMFS' co-occurrence model to help characterize baseline conditions and the impact of alternative management measures (Section 5.1). It then evaluates the direct and indirect effects of revised ALWTRP regulations on Atlantic large whales, comparing the potential impacts of each of the regulatory alternatives under consideration, including NMFS' preferred alternative (Section 5.2). Finally, the chapter discusses other potential impacts on marine resources – including impacts on other protected species, directed catch, bycatch, and essential fish habitat – and compares the alternatives with respect to these impacts (Section 5.3).[2] The chapter is organized as follows:

- Section 5.1.1 gives a brief overview of the co-occurrence model;
- Section 5.1.2 highlights the key limitations of the model;
- Section 5.1.3 describes the results of a recent peer review of the model;

[1] Chapters 6 and 7 evaluate impacts on the economic and social environment, respectively.

[2] In this context, directed catch refers to the catch of species that are the target of commercial fishing effort. Bycatch refers to fish that are harvested but not sold or kept for personal use, including fish that are released because they are not profitable to sell (economic discards) and fish that are released due to catch limits (regulatory discards).

- Section 5.2.1 describes the potential direct and indirect effects of new gear modification and setting requirements on Atlantic large whales;

- Section 5.2.2 discusses the potential direct and indirect effects of changes to restricted times and areas on Atlantic large whales;

- Section 5.2.3 summarizes and compares the regulatory alternatives' potential impacts on Atlantic large whales;

- Section 5.3.1 discusses the potential impacts of the regulatory alternatives on other protected species;

- Section 5.3.2 describes the potential impacts of the regulatory alternatives on essential fish habitat;

- Section 5.3.3 discusses the potential impacts of the regulatory alternatives on directed catch and bycatch; and

- Section 5.3.4 summarizes and compares the potential effects of the regulatory alternatives on marine resources other than Atlantic large whales.

## 5.1 Evaluating Impacts Through the Use of NMFS' Co-Occurrence Model

### 5.1.1 Overview

NMFS' evaluation of the impact of potential regulatory changes on whale entanglement risks is largely qualitative. This approach is necessary because models that would enable NMFS to conduct a rigorous quantitative assessment of such risks are currently unavailable; however, efforts to gain a better understanding of the factors that contribute to entanglement risks are underway. In particular, NMFS has invested for a number of years in the development of a model designed to address the following types of questions:

- Where and how do the fisheries that are subject to the requirements of the ALWTRP operate?

- Where are concentrations of fishing line the greatest?

- Do whales frequent areas with high concentrations of fishing line?

Through the integration of information on fishing activity and gear configurations, this model characterizes geographic and temporal variations in fishing effort and the distribution of fishing line in waters subject to the ALWTRP. The model also incorporates information on whale sightings per unit of survey effort (SPUE) and identifies areas and times at which whales and commercial fishing gear are likely to co-occur. The model's final product is a set of indicators that provide information on factors that contribute to the risk of entanglement at various

locations and at different points in time. These indicators, in particular the number of vertical lines in an area and the area's co-occurrence score, assume to be related to the relative risk of entanglement in different locations. They also provide a basis for comparing the impact of alternative management measures on the potential for entanglements to occur. Readers interested in additional information on the model's structure, data, assumptions, and methods should consult its documentation, which is available for review on the ALWTRP website (http://www.nero.noaa.gov/Protected/whaletrp/index.html).

Exhibits 5-1 through 5-3 present maps illustrating the co-occurrence model's estimate of baseline co-occurrence scores for waters in the Northeast, Mid-Atlantic, and Southeast regions; the areas with the highest scores are those for which the data indicate more frequent sightings of whales and relatively high concentrations of vertical line. The scores shown represent the average for the period specified, based upon monthly data for activity in all fisheries subject to the ALWTRP and sightings of the two species at greatest risk due to interactions with commercial fishing gear: right and humpback whales. Appendix 5-A provides more detailed information, presenting maps of co-occurrence scores on a monthly basis; the ALWTRT used these maps to identify times and locations of high co-occurrence and to guide the development of proposals to reduce the risk of entanglement in particular areas. Implementing the measures specified under Alternatives 2 through 6 (Draft and Preferred) would result in a reduction in the co-occurrence score in these areas.

**Exhibit 5-1**

**CO-OCCURRENCE OF VERTICAL LINES AND RIGHT/HUMPBACK WHALE SPUE: NORTHEAST REGION – BASELINE ANNUAL AVERAGE**

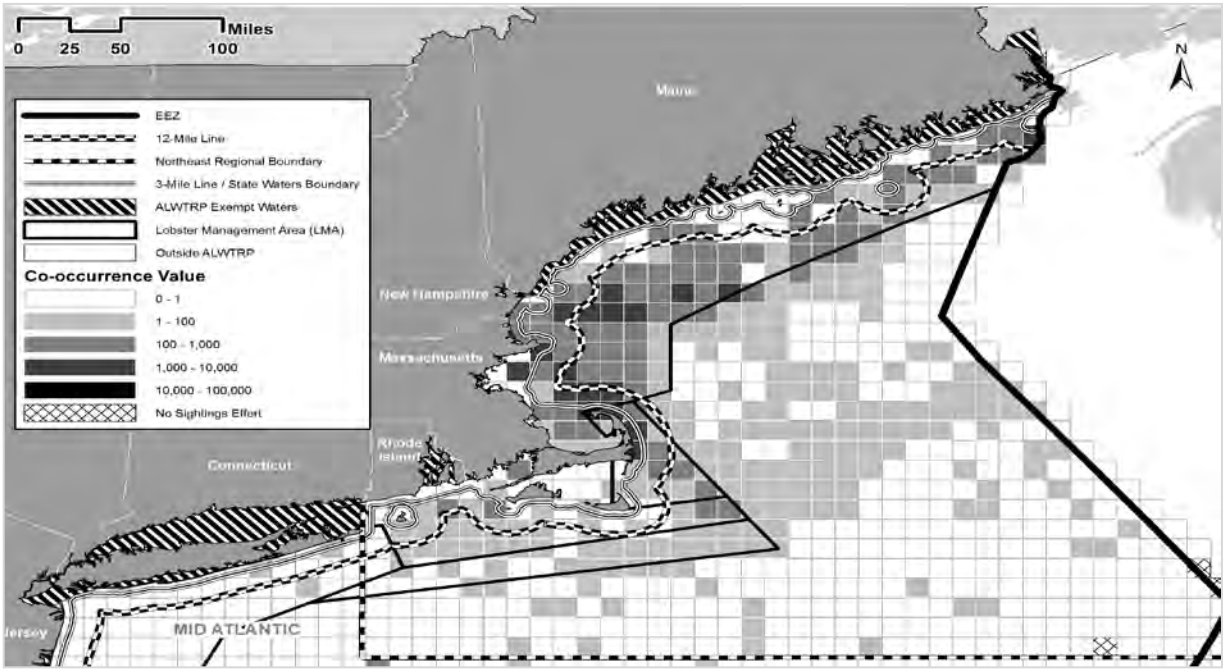


**Exhibit 5-2**

**CO-OCCURRENCE OF VERTICAL LINES AND RIGHT/HUMPBACK WHALE SPUE: MID-ATLANTIC REGION – BASELINE ANNUAL AVERAGE**

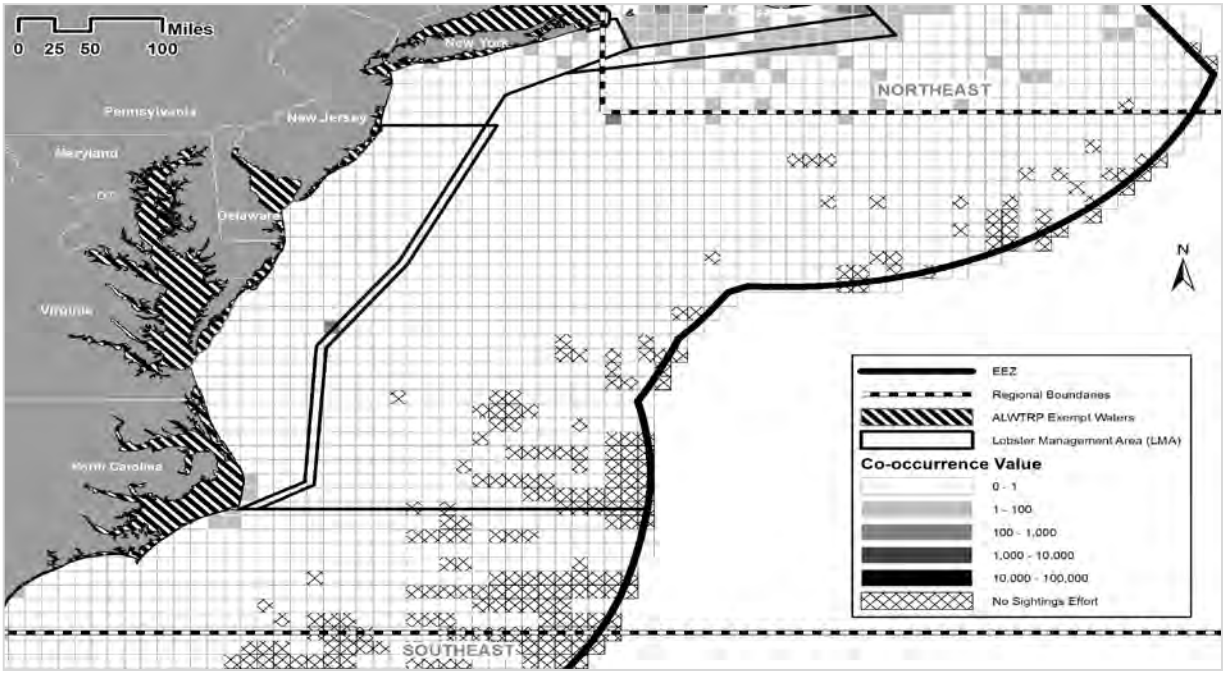
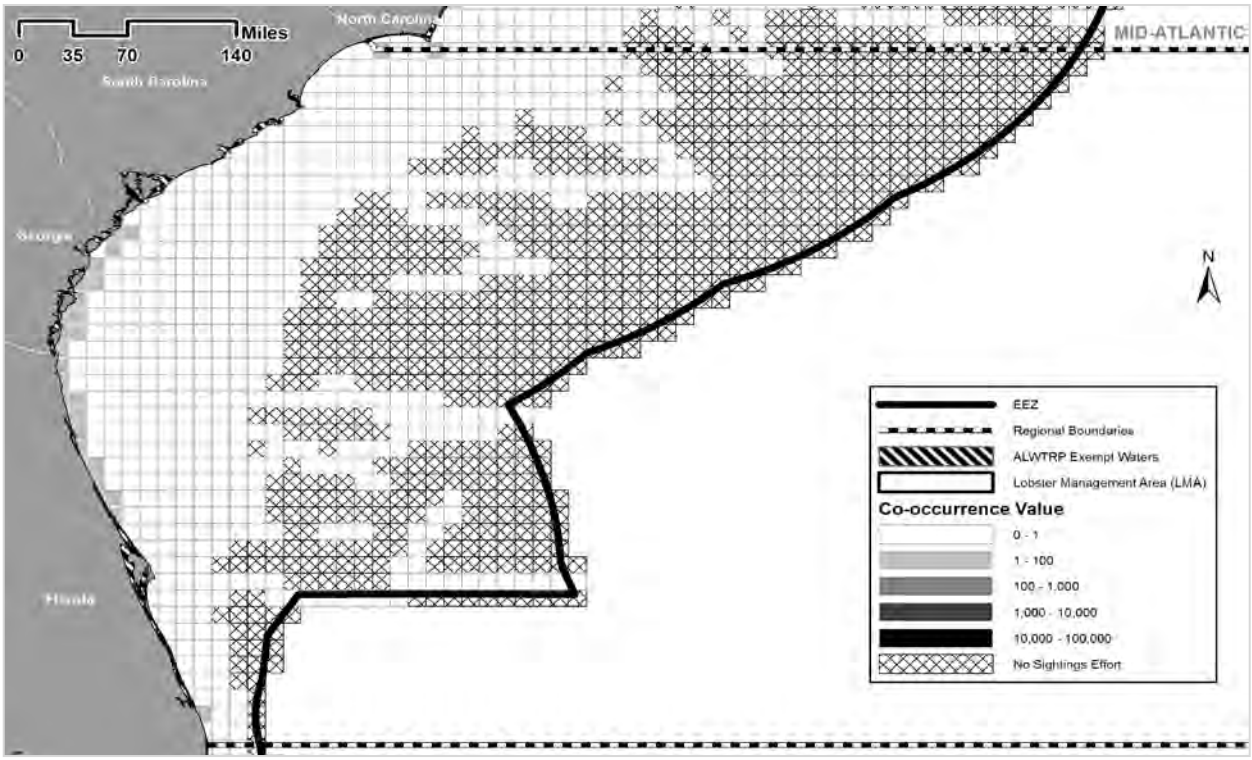



**Exhibit 5-3**

**CO-OCCURRENCE OF VERTICAL LINES AND RIGHT/HUMPBACK WHALE SPUE: SOUTHEAST REGION – BASELINE AVERAGE NOVEMBER THROUGH APRIL**



### 5.1.2 Limitations and Uncertainties

It is important to emphasize that the co-occurrence model does not directly measure entanglement risks. It neither provides a basis for estimating the frequency with which entanglements may occur nor does it provide a basis for estimating the probability that an entanglement will result in a serious injury or death. The risk of serious injury or mortality due to entanglements is likely to be a function of many factors. For example, the *probability* that an entanglement will occur may depend on the amount of gear deployed in a particular area, the number of whales that are present, whether the gear is actively tended, the behavior in which a whale is engaged when gear is encountered (e.g., whether the whale is feeding), or other factors. Similarly, the risk of injury or death *in the event of an entanglement* may depend on the characteristics of the whale involved (species, size, age, health, etc.), the nature of the gear (e.g., whether the gear incorporates weak links designed to help a whale free itself), human intervention (e.g., the feasibility or success of disentanglement efforts), or other variables. The interrelationships among these factors are not fully understood, and the data needed to provide a more complete characterization of risk are not available. If we make the reasonable assumption that the co-occurrence of many whales and many vertical lines produces a greater likelihood of an entanglement then, the co-occurrence model provides *relative indicators* of the potential for entanglements to occur in different areas and *relative indicators* of the effect that new regulatory requirements may have on the potential for an entanglement to occur. These indicators do not measure entanglement risks or changes in entanglement risks; however, they provide a relative sense of risks in different areas, as well as insight to the potential impact of alternative regulatory requirements on those risks.

In addition to the limitations noted above, the quality of the information the co-occurrence model provides is constrained by limitations in the data it employs. Because the data that drive the model were derived from disparate sources, including fishing reports, survey data, and expert judgment, it is not possible to quantify the uncertainty in the model's output. Nonetheless, it is important to recognize several key sources of uncertainty. These include:

- **Data on fishing activity and gear configurations in state waters vary in specificity and quality.** NMFS worked directly with state marine resource officials to develop defensible modeling assumptions for vessels fishing exclusively in state waters. For some states, key activity and gear configuration parameters are estimated based on reporting data (e.g., logbook data) furnished by fishermen in accordance with state requirements. For others, surveys are the primary source of this information. In some cases, these surveys are one-time efforts, while others are administered annually (e.g., recall surveys). Finally, for some states, the characterization of fishing activity is based upon the professional judgment of state fisheries experts. In several cases, the data are taken from a mix of sources (e.g., surveys and best professional judgment).

- **Federal lobster permits currently impose no trip reporting requirements.** Unlike Federal permits for other commercial fisheries, Federal lobster permits do not require their holders to report the location

of fishing activity; as a result, information on the location of trips taken by vessels that hold Federal lobster permits is limited to those that also hold permits for other fisheries (these vessels must report the location of all fishing activity). In the absence of better data, the model assumes that the activity of lobster vessels that are not required to file trip reports is distributed evenly throughout the Lobster Management Areas (LMAs) in which they are permitted to fish. This approach, which is detailed in the model's formal documentation, is a source of uncertainty, particularly in LMA 1, where the majority of non-reporting vessels operate.

- **SPUE data provide a limited basis for characterizing the distribution of whales.** The model relies on effort normalized (or adjusted) sightings data to characterize the recent historic (past 20 years) distribution of whales within the waters that are subject to the ALWTRP. Effort adjustments did not take into account that sightings data were from many platforms with differing levels of detectability. The dataset is not comprehensive coastwide, adding uncertainty to the analysis of both baseline co-occurrence scores and the impact of alternative management measures. In particular, uncertainty arises from the inclusion of SPUE values in areas with very low survey effort, and the absence of SPUE values (and therefore, co-occurrence values) in areas where effort-adjusted survey data are unavailable. In addition, other sources of information (e.g., acoustic data) indicate that both right whales and humpback whales may be present in places and at times at which no sightings have been recorded. Thus, the SPUE data are both an incomplete and imprecise indicator of the distribution of whales.

- **The geographic precision of the model's presentation of co-occurrence scores may be overstated.** Co-occurrence scores were generated from effort adjusted whale sightings information and estimates of vertical line in the water. The co-occurrence scores are assigned on a discrete basis to individual grid cells; this may imply a higher degree of geographic precision in characterizing the potential for an entanglement than the underlying data warrant.

The model's documentation (http://www.nero.noaa.gov/protected/whaletrp/eis2013/index.html) provides additional information on these issues. In light of the limitations noted above, NMFS relies on a qualitative assessment of the impact of alternative management measures on entanglement risks. Evaluation of the impact of different regulatory alternatives on the scores provided by the co-occurrence model is provided as a supplement to this assessment.

### 5.1.3 Peer Review

Before employing the co-occurrence model to assist in evaluating the impact of alternative management measures, NMFS sought a review of the model from the Center for Independent Experts (CIE). Three CIE reviewers with expertise in spatial analysis, scenario

modeling, marine mammal behavior, and fisheries management conducted an independent and impartial review of the model's documentation. Their findings are available on the ALWTRP website (http://www.nero.noaa.gov/Protected/whaletrp/index.html).

Although each of the peer reviewers noted the need to clarify some aspects of the model's documentation, the findings of the review overall were favorable. The reviewers indicated that the treatment of the data currently incorporated into the model was reasonable. They also provided ideas for improving the model as more information becomes available. In particular, the reviewers encouraged NMFS to continue to work with its state partners to improve the quality of the information available on gear use in fisheries subject to the ALWTRP. They also encouraged a more rigorous attempt to evaluate the sensitivity of the model's findings to the limitations in the SPUE data. In response to the latter concern, NMFS developed an analysis that examines the sensitivity of baseline co-occurrence scores to alternative assumptions about the presence of whales in areas for which SPUE data are not available or may be too limited to be reliable. Appendix 5-B presents the results of this analysis.

In addition to these findings, one reviewer suggested that the co-occurrence model be compared to other approaches or models as a way to attempt to validate the results. The only such model of which NMFS is aware is one being developed by Keene State College, Woods Hole Oceanographic Institution, New England Aquarium, and the Maine Lobstermen's Association (MLA). Although the MLA model was not fully vetted through the ALWTRT, its developers have shared information on it with NMFS. The model attempts to estimate the risk of whale encounters (as opposed to co-occurrence) as a function of fishing effort, whale activity, and bathymetry. While this model may be useful in the future, it currently focuses upon conditions in Maine waters and does not provide sufficient geographic coverage to evaluate baseline conditions or the impact of management measures in other areas subject to the ALWTRP. In contrast, NMFS' co-occurrence model is coastwide in scope and has been vetted through the ALWTRT on numerous occasions; its development has been heavily influenced by Team member's knowledge.[3] In light of these considerations, NMFS did not make use of the MLA model when developing the regulatory alternatives considered in this EIS. It is possible, however, that other stakeholders used their knowledge of this model when submitting management proposals.

[3] Since its development began in 2005, the co-occurrence model has undergone numerous updates and revisions, many of which reflect the guidance and assistance of the ALWTRT. The Team's input on the methods and data the model employs was sought during a series of presentations provided to the TRT. These presentations also served to provide the Team with regular progress reports on the model's development. Members of the TRT provided the information the model employs on fishing activity and gear configurations within state waters and also provided updated information on sightings of endangered whales. For a timeline detailing the model development process, including presentations to the TRT, see the model's formal documentation, which is available for review on the ALWTRP website (http://www.nero.noaa.gov/Protected/whaletrp/index.html).

## 5.2 Impacts to Atlantic Large Whales

The primary threat that commercial fishing poses to Atlantic large whales is the risk of incidental entanglement in commercial fishing gear. As noted in Chapter 2, such entanglement can cause serious injury or death. The regulatory changes under consideration are designed to reduce harm to large whales by reducing the likelihood of entanglement and/or reducing the severity of an entanglement should one occur. NMFS seeks to achieve these objectives through a combination of two general measures:

- gear modification and setting requirements; and
- restrictions on fishing activity at specified locations and times.

The discussion below examines the impact of these measures on whale entanglement risks, beginning with an evaluation of specific gear modification requirements and then turning to an assessment of other restrictions.[4] It is important to note that the No Action Alternative (Alternative 1) would not achieve the objectives listed above. If Alternative 1 were chosen, there would likely be additional incidents of serious injury and mortality to large whales due to entanglement in commercial fishing gear, rather than a reduction in these interactions. With no action, we would continue to have similar numbers of lethal and non-lethal takes of right and humpback whales in violation of both the MMPA and ESA.

### 5.2.1 Impacts of Gear Modification Requirements

The gear modification requirements under consideration fall generally into four categories: buoy line requirements, weak link and breaking strength requirements, set restrictions and gear marking requirements. The discussion below examines the impact of each of these measures on whale entanglement risks.[5]

#### 5.2.1.1 Buoy Line Requirements

Like groundline, buoy line (i.e., line that is directly connected from a flotation device to gillnet or trap/pot gear) has been identified as a potential entanglement threat to Atlantic large whales.[6] Exhibit 5-4 provides an estimate of the average number of buoy lines deployed by fisheries subject to the ALWTRP in any given month. The majority of the lines are found in the

[4] The ALWTRP is designed to reduce the risk of serious injury and mortality of strategic stocks of North Atlantic right, humpback, and fin whales as a result of interactions with commercial fishing gear. Although it is not listed as endangered or threatened under the Endangered Species Act, the minke whale (*Balaenoptera acutorostrata*) is protected under the Marine Mammal Protection Act. Due to similarities in distribution, feeding behavior, and other characteristics, minke whales are believed to benefit from ALWTRP measures in much the same manner as the species the plan is designed to protect. Thus, the discussion of impacts to Atlantic large whales applies to minke whales as well as to North Atlantic right whales, humpback whales, and fin whales.

[5] For additional detail on which gear requirements apply to which vessels under existing regulations (i.e., Alternative 1, No Action), see Chapter 2. For similar details regarding Alternatives 2 through 6(Draft and Preferred), see Chapter 3.

[6] "Endline" and “vertical line” are alternative terms for buoy line.

Northeast, specifically within the lobster trap/pot industry. The buoy line requirements only impact trap/pot gear. The decision to focus on trap/pot gear is explained in Chapter 3.

**Exhibit 5-4**

**NUMBER OF VERTICAL LINES DEPLOYED BY FISHERIES SUBJECT TO THE ALWTRP: MONTHLY AVERAGE**

| GEAR TYPE | COASTWIDE | NORTHEAST |
|---|---|---|
| Lobster Trap/Pot | 224,457 | 220,330 |
| Other Trap/Pot | 7,905 | 5,630 |
| Gillnet | 1,501 | 615 |

Alternatives 2 through 6 (Draft and Preferred) incorporate several provisions pertaining to buoy lines that may reduce the frequency or severity of whale entanglements relative to Alternative 1. These provisions restrict the number of trap/pot buoy lines that fishermen can employ, based on the area in which they fish and the distance to shore. Under Alternative 1, the amount of vertical line in the water would remain unchanged, and the potential for entanglements would not be reduced. Alternatives 2 through 6 (Draft and Preferred) require some minimum number of traps per trawl and prohibit the use of singles in the Northeast region; these provisions would result in a decrease in the number of vertical lines in the water. Alternative 6 (Preferred) requirements differ slightly from Alternative 6 (Draft). As a result of public comment in some waters those fishing closer to shore or around islands can continue to fish using traditional practices. Alternatives 2 through 6 (Draft and Preferred) also propose to require a maximum breaking strength of vertical line in the Southeast region as well as keeping this vertical line free from objects. The following discussion examines the potential direct and indirect effects of these provisions.

*Direct effects:*

As an additional measure of protection, the alternatives analyzed would in several cases institute restrictions designed to reduce the number of buoy lines that fishermen employ. For example, Alternatives 2 through 6 (Draft and Preferred) would limit the number of lines in the Northeast by prohibiting single traps/pots and requiring fishermen to increase the number of traps per trawl set based on area and distance to shore. In some areas (mainly inshore and nearshore waters), this may represent a change from how they currently fish. In Federal waters and offshore, larger trawls are currently fished so this requirement may not affect these vessels to the same extent as smaller inshore vessels. The current requirement of one endline for trawls less than or equal to five traps remains in place. Due to safety concerns and the potential to increase the risk of gear loss, larger trawls would not be required to have one endline.

In an average month, roughly 227,000 total trap/pot vertical lines are deployed in the Northeast. The restrictions on the number of buoy lines in the Northeast region when combined with other restrictions (closures) would result in estimated reductions of 30 to 38% of endlines depending on the Alternative (Exhibit 5-5). The difference in the requirements in Alternative 6 (Preferred) does not result in a substantial change from what was previously analyzed in Alternative 6 (Draft) as evident in Exhibit 5-5. This reduction in vertical lines results in a

reduction of the potential risk of entanglement through reducing the likelihood that whales and gear would co-occur in the same area at the same time. This reduction is depicted in the reduction of co-occurrence score of roughly 36 to 42% depending on the Alternative (Exhibit 5-6). All measures combined would result in a 29 to 36% reduction coastwide and a 36 to 42% reduction in co-occurrence coastwide. NMFS believes the requirement to 'trawl up' would result in a decrease in the risk of entanglement to large whales.

**Exhibit 5-5**

**ANNUAL REDUCTION IN NUMBER OF VERTICAL LINES COMPARED TO NO ACTION**

| ALTERNATIVE | COASTWIDE* | COASTWIDE** | NORTHEAST* | NORTHEAST** |
|---|---|---|---|---|
| 2 | 35.3% | -- | 36.7% | -- |
| 3 | 29.7% | 29.6% | 30.9% | 30.8% |
| 4 | 36.5% | 35.4% | 38% | 36.8% |
| 5 | 31% | 29.7% | 32.1% | 30.9% |
| 6 (Draft) | 29.1% | 28.5% | 30.3% | 29.6% |
| 6 (Preferred) | 29% | 28.3% | 30.1% | 29.5% |

* Assumes 100% suspension of fishing in closure areas
** Assumes displacement from closure areas

**Exhibit 5-6**

**ANNUAL REDUCTION IN CO-OCCURRENCE COMPARED TO NO ACTION**

| ALTERNATIVE | COASTWIDE* | COASTWIDE** | NORTHEAST* | NORTHEAST** |
|---|---|---|---|---|
| 2 | 35.8% | -- | 36.1% | -- |
| 3 | 37.4% | 37.2% | 37.7% | 37.4% |
| 4 | 40.5% | 38.7% | 40.8% | 39% |
| 5 | 41.7% | 39.7% | 42% | 40% |
| 6 (Draft) | 38% | 37.4% | 38.2% | 37.7% |
| 6 (Preferred) | 37.9% | 37.4% | 38.2% | 37.7% |

* Assumes 100% suspension of fishing in closure areas
** Assumes displacement from closure areas

In the Southeast, Alternatives 2-6 (Draft and Preferred) would require a restriction on the breaking strength of buoylines depending on where you fish. In Florida state waters, the breaking strength of line may be no more than 1,500 lbs. In Georgia and South Carolina, the breaking strength of line may be no more than 2,200 lbs.

Knowlton et al. (2011) reported that age plays a role in a right whale's ability to break free of rope and that adults may be better able to break free from ropes of lower breaking strength than ropes of greater breaking strength. ALWTRT members broadly supported a maximum rope breaking strength of 1,500 pounds in the Florida blue crab fishery provided the rope currently used by the fishery in Northeast Florida (No. 8 Osprey line) is tested and does not

exceed a 1,500 pound breaking strength. NMFS tested No. 8 Osprey line and found it to have less than 1,500 pound breaking strength[7].

Through scoping meetings and state fishery representatives, NMFS learned that most fishermen in Georgia and South Carolina use No. 8 or No. 10 Osprey line as vertical lines in their blue crab trap/pot gear configurations. NMFS tested No. 10 Osprey line and found it to have less than 2,200 pound breaking strength. Although the ALWTRT did not consider a maximum breaking strength for vertical lines off GA or SC, NMFS believes that the combination of limited right whale occurrence in GA and SC state waters and the proposed 2,200 pound breaking strength requirement will sufficiently protect right whales because there is a low probability of interaction between whales and gear and this measure prevents the use of vertical lines with greater breaking strength. Therefore, requiring 1,500 lbs and 2,200 lbs of breaking strength line off Northeast Florida and Georgia/South Carolina, respectively, will likely protect right whales while not impacting blue crab fishermen who have traditionally fished in these areas.

Also in the Southeast, all buoy lines must be made from sinking line, free of objects, and single trap/pots would be required. This differs from what is proposed in the Northeast to account for differences in right whale life history stage and environmental factors between the two regions.

The core right whale calving area located within the Southeast U.S. is of particular conservation concern due to the presence of neophyte calves and reproducing females. Small neonate calves are weak swimmers and lack physical and behavioral developments that increase buoyancy (Thomas and Taber 1984) – all traits that likely contribute to a whale's ability to survive an interaction with fishery gear. Reproducing females are the most valuable demographic unit of the right whale population. Right whale mother/calf pairs meander about in the Southeast U.S. for several weeks, resulting in increased exposure to potential fishing gear. These observations are supported by FWC/FWRI aerial survey data (FWC/FWRI 2012). In contrast, NMFS' understanding is that most right whales use the Mid-Atlantic as a migratory corridor. That is, whales travel through the area, but likely do not linger for weeks or months at a time like they do in other habitats. For example, models developed by Schick et al. (2009) suggest an average time of 21-24 days for right whales to travel from Jacksonville, Florida to Long Island, New York (approximate linear distance of 900 miles). Trawls are heavier, and gear configurations are more complex than single traps. Consequently, neophyte calves would be more likely to survive an interaction with a single trap than with a trawl which is made up of multiple traps.

An increase in blue crab fishing efforts was observed in Northeast Florida state waters during the 2011/2012 calving season (FWC unpub. data). Gear was inspected and found to be rigged in various and unusual ways including: weights placed mid-line, floats placed mid-line (likely to comply with line marking requirements), and other various configurations (knots, splices, various lengths tied together, etc.) of polypropylene line. Many of the rigging configurations had not been observed or anticipated previously. Line through the mouth of a baleen whale is thought to be one of the more frequent forms of entanglement (Knowlton &

[7] Personal Communication, John Kenney, NOAA Fisheries, NERO, May-July 2012.

Kraus 2001). Gear that is splice-free, knot-free, and/or free of attachments may be more likely to slide through the whale's baleen *freeing* the animal rather than become lodged in the mouth or elsewhere creating a serious injury or mortality risk. In contrast, line that is knotted or has attachments can more easily entangle as well as increase the complexity of the entanglement, and thus, decreasing the likelihood that the whale can free itself. NMFS believes the proposed requirement of fishing with one continuous piece of line will reduce risk to right whales by eliminating configurations that clutter the vertical line with objects that may impede the line from sliding through small spaces between a whale's baleen.

*Indirect effects:*

The indirect effects of the requirements described above depend upon whether they would result in an increase in gear loss, with a resulting increase in the risk that whales may become entangled in ghost gear. In 2012, Maine DMR developed and implemented a project designed, in part, to assess the impacts of longer trawls on catch in the lobster fishery. Maine DMR asked participants to record whether they lost gear while hauling. Overall, the sample of gear loss incidents in the project is too small to draw reliable conclusions about how trawling influences gear loss. In 2010 and 2011, the Massachusetts DMF completed a comprehensive study of gear loss and "ghost" fishing (i.e., impacts from lost or derelict gear). Overall, these data indicate that rather than exacerbating gear loss, trawling requirements may reduce the amount of gear lost and thereby yield an economic benefit to affected fishermen. It is unclear whether the buoy line restrictions described above would lead to an overall increase in gear loss. Available data assessing how trawling requirements could affect gear loss are inconclusive. These changes could help to reduce the potential for whales to become entangled in lost gear.

#### 5.2.1.2 Weak Link Requirements

The ALWTRP requires the use of weak links with breaking strengths of 600 to 1,500 lbs depending on management area. Compared to Alternative 1 (No Action), Alternatives 2-6 (Draft and Preferred) propose to decrease the required breaking strength of weak links in Florida state waters. This would reduce the likelihood that interactions between whales and commercial fishing gear will result in entanglements that cause serious injury or mortality. Alternative 1 would maintain the status quo, and the potential for entanglements to result in serious injury and mortality would not be decreased. There is no difference in requirements from Alternative 6 (Draft) and Alternative 6 (Preferred). The following discussion further explores the potential direct and indirect effects of these standards.

*Direct effects:*

Weak link requirements are designed to reduce the number of interactions between whales and commercial fishing gear that result in a serious entanglement.[8] Currently, the

[8] NMFS has worked with several gear manufacturers to develop weak links for the lobster trap/pot and gillnet fisheries (NMFS, 2002). The specifications of breaking strengths incorporated in Alternatives 2 through 6 (Draft and Preferred) are based upon data collected by the NMFA Gear Research Team that measured the loads

breaking strength of weak links in Florida state waters is 600 lbs. Alternatives 2-6 (Draft and Preferred) propose to reduce this breaking strength requirement to 200 lbs.

As previously noted, buoy lines have been identified as a source of entanglement risk. The requirement to weaken the strength of weak links in buoy lines is specifically designed to reduce entanglements and serious injury due to entanglements in and around the mouth as a result of interactions with buoy lines and surface systems. In such a case, the theory of operation is that the forward motion of the whale will pull the buoy line through the whale's mouth until the buoy and weak link impinge against the baleen. At this point, the combination of the whale's momentum and the weight of the gear on the lower end of the buoy line or drag created by towing gear will cause the load to increase until the weak link parts, allowing the buoy and weak link to detach from the line and remain outside the whale's mouth. The bitter end of the buoy line would then continue to be pulled through the baleen until it exits the whale's mouth. Adding a weak link on all devices attached to the buoy line increases the likelihood that a line sliding through a whale's mouth will break away quickly at the buoy before the whale begins to thrash and become more entangled.[9]

Right whale mother/calf pairs in the calving area are most often sighted in water depths of 10 to 20 m (Keller et al. 2012). The greatest co-occurrence of trap/pot gear and right whales occurs off the Northeast Florida shoreline. Florida state waters are deeper and can be greater than 10 m deep within 1/3 of a mile off the beach, whereas Georgia and South Carolina state oceanic waters are generally less than 10 m deep (please reference NOAA nautical charts). Therefore, neophyte calf and reproducing female interactions with trap pot gear are a greater risk in Florida state waters than in Georgia or South Carolina state waters.

Requiring weak links in Florida state waters of the Southeast U.S. Restricted Area North is a measure designed to help mitigate the risk in an area where there is a high co-occurrence of right whales and blue crab trap/pot gear. The blue crab fishery is the primary commercial trap/pot fishery active in Florida state waters of the Southeast U.S. Restricted Area North. Weak links with less than 600 lb breaking strength are already used by Northeast Florida blue crab fishermen (August 23, 2011 Scoping Meeting Comments, Jacksonville, FL). The ALWTRT broadly supported 100 pound weak link breaking strength for the blue crab fishery off Florida, pending results of breaking strength tests of weak links currently used by the fishery (2012 ALWTRT Meeting Key Outcomes Memorandum). Breaking strength tests of weak link rigs that could be used in North Florida revealed breaking strength to be between 131.5 lbs to 167.6 lbs.[10] Based on these tests, NMFS is proposing weak links with 200 lb breaking strength for Florida state waters. Although this measure primarily affects blue crab fishermen, it will be applied to all affected ALWTRT trap/pot fisheries in the Florida state waters of the Southeast U.S.

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exerted on buoy systems. This data was collected over the course of several years of at-sea testing from Maine to North Carolina in both inshore and offshore fisheries.

[9] There have been three documented entanglement cases in which the gear recovered included weak links attached to buoys. This includes two events (one in 2002, the other in 2003) in which weak links were recovered that had not released. In both of these cases the buoy line wrapped around the whale's tail stock, a situation that the weak link in the line was not designed to address. A third event involved a weak link placed directly under the surface system. In this case, the weak link did release, allowing the whale to swim free of the anchoring gear. A disentanglement team later removed the gear that remained with the whale.

[10] Personal Communication, John Kenney, NOAA Fisheries, NERO, August 2012.

Restricted Area North. This allows for enforceability ease because it eliminates potential confusion of differentiating between blue crab trap/pot gear and Atlantic mixed species trap/pot gear.

*Indirect effects:*

Gear research indicates that the installation of weak links is unlikely to increase the rate of gear loss, and thus, is unlikely to increase the risk that whales could become entangled in ghost gear. Several weak link requirements have been implemented under previous ALWTRP initiatives, and the NMFS Gear Research Team reports that they have received few comments regarding problems with the failure of any of these devices. The NMFS Gear Research Team has conducted a series of research projects that measured the loads exerted on buoy systems when used in typical conditions at different locations (NMFS, 2002; NMFS, 2003). [11]

### 5.2.1.3 Set Restrictions Requirements

The potential regulatory changes resulting from Alternatives 2 through 6 (Draft and Preferred) include the requirement to haul trap/pot gear at the end of every trip in Federal waters within the Southeast Restricted Area North management area. Currently, the requirement is to haul gear once every 30 days. Under Alternative 1 (No Action), this 30 day requirement would remain in place, and there would not be a reduction of soak time that may result in a reduced risk of entanglement.

*Direct effects:*

The provisions noted above would contribute directly to the protection of Atlantic large whales. The restrictions are designed to reduce the risk of entanglement of large whales via reduced soak time for long soaking gear.

In Federal waters, the current status quo for black sea bass fishermen is to drop single pots near underground relief habitat and then retrieve them by the trips' end (typically within less than 24 hours)[12]. Furthermore, Southern black sea bass fishermen have not fished during the November through April time period since December 2009.

[11] In addition to the information provided above, the NMFS Gear Research Team notes the possibility that the use of weak links could reduce the amount of gear that is lost due to gear conflicts. For example, if snagged gear parts at a weak link, it is less likely to be dragged away from where it was originally set; this increases the chance that the gear will be recovered. This observation is supported by the experience of several Maine fishermen, who have reported that weak links on buoy systems allowed buoys to pop off when trawlers towed through their gear. Although weak links were not designed for such purposes, the fishermen involved believe that their presence in this case prevented their gear from being towed away and permanently lost. In these situations, the fishermen were able to recover all of their gear and avoid the creation of additional ghost gear.

[12] As defined in SAFMC South Atlantic Snapper Grouper Amendment 18A.

These changes would in large part codify current fishing practices. Nonetheless, this requirement could help to reduce entanglement risks, both by ensuring that current practices are adhered to and by guaranteeing that these practices do not change.

*Indirect effects:*

Any indirect effects associated with the above-noted restrictions are likely to be positive. In particular, because the restrictions prohibit affected fishermen from leaving their gear unattended while their vessels return to port, the restrictions may reduce gear loss, and thus, benefit large whales by reducing the risk of entanglement in ghost gear.

#### 5.2.1.4 Gear Marking

With the exception of Alternative 1 (No Action), all of the regulatory alternatives under consideration would establish new gear marking requirements. Alternatives 2 through 6 (Draft) include a common gear marking scheme that would result in the incorporation of approximately 1.1 million new marks into the gear subject to ALWTRP regulations. Alternative 6 (Preferred) would require approximately 393,000 new marks.

The gear marking provisions are designed to improve NMFS' ability to identify the gear involved in an entanglement. As discussed below, these provisions would have no immediate direct impact on entanglement risks. In the long run, however, they may help NMFS to target and improve its efforts to protect large whales.

*Direct effects:*

When compared to Alternative 1 (No Action), Alternatives 2 through 6 (Draft and Preferred) would strengthen most of the ALWTRP's current gear marking requirements. Currently the marking system only requires one mark. In place of the current standards, gillnet, lobster trap/pot, and other trap/pot vessels would be required to identify buoy lines with a mark equal to 12” in length and buoy lines must be marked three times (top, middle, bottom). This would result in larger and more frequent marks when compared to the No Action alternative. The No Action alternative would continue a gear marking system that is currently insufficient for identifying the origins of gear. A mark distinguishing state from Federal waters within the Southeast Restricted Area North would be also required. The remainder of the color schemes for the gear marking strategy would remain the same.

The regulatory provisions described above would have neither direct impact on the probability of whales becoming entangled in commercial fishing gear nor would they affect the severity of an entanglement should one occur. As noted below, however, potential changes in gear marking requirements could have an indirect effect on whale entanglement risks.

*Indirect effects:*

A critical issue in understanding the nature of large whale entanglements is obtaining information about the gear involved. Currently, gear removal from entangled animals provides the only reliable information about the nature of entanglements (Johnson et al., 2005). However, it is often difficult to connect the gear in which a whale is entangled with a particular fishery, because entangled whales often carry only a portion of the gear they have encountered and disentanglement efforts sometimes recover only some of the remaining gear. The gear marking requirements under consideration would help to generate information on the nature of the gear involved in an entanglement. In addition, these provisions would in some cases allow NMFS to identify the owner of the gear, and thus, allow the agency to gather additional information on where, when, and how the gear was set. By increasing scientific understanding of the nature of large whale entanglements, gear marking measures would allow NMFS, over time, to improve the effectiveness of the ALWTRP. Thus, these measures are expected to contribute indirectly to the preservation and restoration of whale stocks.

The ALWTRP's current gear marking requirements provide for a single four-inch mark on buoy lines midway in the water column. The bigger, more frequent marks would increase the chances of identifying fragments of line that may be visible on or recovered from an entangled whale.

### 5.2.2 Impacts from Changes to Restricted Times and Areas

In addition to gear modification requirements, the potential changes to the ALWTRP include a range of restrictions on the location and timing of fishing activity. The discussion below addresses the direct and indirect effects of the following provisions:

- Seasonal closures
- Addition of exempted waters in New Hampshire and buffers in Maine

#### 5.2.2.1 Seasonal Closures

Alternative 1 (No Action) and Alternative 2 do not propose additional closures and would instead maintain the status quo. Currently, two areas are closed to gillnet fishing, and one area is closed to trap/pot fishing. Maintaining the status quo would not result in a reduced risk of entanglement as the number of vertical lines in the water would remain the same. Alternatives 3-6 (Draft and Preferred) propose anywhere from 1 to 3 new closures. The proposed closures would affect all trap/pot gear. Alternative 3 proposes a closure in the Cape Cod Bay Restricted Area. Currently, this area is closed to gillnet fishing from January 1 to May 15. The proposed closure would include trap/pots from February 1 to April 30. Alternatives 4 and 5 replace the CCB closure proposed in Alternative 3 with a larger closure area that encompasses the Outer Cape and extends to the Great South Channel (Massachusetts Restricted Area #1). This closure would be in place from January 1 to April 30. Alternatives 4 and 5 close Massachusetts Restricted Area #1 and also include a seasonal closure of both Jeffreys Ledge and Jordan Basin.

Alternative 6 (Draft and Preferred) both propose a closure of Cape Cod Bay and the Outer Cape (Massachusetts Restricted Area #2) from January 1 to April 30.

*Direct effects:*

The effects of each closure vary, yet all would benefit whales. In some cases, however, the impacts of a closure are likely minor. The level of fishing effort varies as does the number of vessels affected by the closure. Closures were analyzed two ways. First, it was assumed that 100% of the vessels would suspend fishing (Exhibit 5-7). Second, it was assumed that some of the vessels would continue to fish (Exhibit 5-8). The true effect of these closures is most likely within the range of these two options.

**Exhibit 5-7**

**EFFECTS OF SEASONAL CLOSURES COMPARED TO NO ACTION**
**(Presuming 100% Suspend Fishing)**

| ALTERNATIVE | CLOSURE | TIME PERIOD | AVG # OF AFFECTED FTE VESSELS | AVG # OF LINES REMOVED |
|---|---|---|---|---|
| 3 | CCB Restricted Area | Feb. 1 - April 30 | 16 | 841 |
| 4 and 5 | Jeffreys Ledge | Oct. 1 - Jan. 31 | 69 | 15,262 |
| | Jordan Basin | Nov.1 - Jan.31 | 5 | |
| | Massachusetts Restricted Area #1 | Jan. 1 - April 30 | 110 | |
| 6 (Draft) | Massachusetts Restricted Area #2 | Jan. 1 - April 30 | 109 | 6,329 |
| 6 (Preferred) | Massachusetts Restricted Area #2 | Jan. 1 - April 30 | 109 | 6,329 |

**Exhibit 5-8**

**EFFECTS OF SEASONAL CLOSURES COMPARED TO NO ACTION**
**(Presuming Some Relocation)**

| ALTERNATIVE | CLOSURE | TIME PERIOD | % OF VESSELS THAT WOULD RELOCATE | AVG # OF LINES REMOVED |
|---|---|---|---|---|
| 3 | CCB Restricted Area | Feb. 1 - April 30 | 89.6 | 134 |
| 4 and 5 | Jeffreys Ledge | Oct. 1 - Jan. 31 | 100 | 6,627 – 7,107 |
| | Jordan Basin | Nov.1 - Jan.31 | 100 | |
| | Massachusetts Restricted Area #1 | Jan. 1 - April 30 | 84.2 | |
| 6 (Draft) | Massachusetts Restricted Area #2 | Jan. 1 - April 30 | 84.1 | 1,910 |
| 6 (Preferred) | Massachusetts Restricted Area #2 | Jan. 1 - April 30 | 84.1 | 1,910 |

The multiple closures proposed in the Alternative 4 and 5 result in the biggest conservation benefit to large whales. The percent change in co-occurrence (Exhibit 5-9 and 5-10) varies by alternative based on the number of closures in the alternative and if you assume displacement or suspension of fishing. In both cases, the closures and the proposed management measures under Alternative 5 result in the highest reduction in co-occurrence or risk of entanglement.

**Exhibit 5-9**

**ANNUAL REDUCTION IN CO-OCCURRENCE COMPARED TO NO ACTION (Presuming 100% Suspension)**

| ALTERNATIVE | COASTWIDE | NORTHEAST |
|---|---|---|
| 3 | 37.4% | 37.7% |
| 4 | 40.5% | 40.8% |
| 5 | 41.7% | 42% |
| 6 (Draft) | 38% | 38.2% |
| 6 (Preferred) | 37.9% | 38.2% |

**Exhibit 5-10**

**ANNUAL REDUCTION IN CO-OCCURRENCE COMPARED TO NO ACTION (Presuming Some Relocation)**

| ALTERNATIVE | COASTWIDE | NORTHEAST |
|---|---|---|
| 3 | 37.2% | 37.4% |
| 4 | 38.7% | 39% |
| 5 | 39.7% | 40% |
| 6 (Draft) | 37.4% | 37.7% |
| 6 (Preferred) | 37.4% | 37.7% |

*Indirect effects*:

The provisions noted above could have indirect beneficial effects on large whales by tempering the possible expansion of trap/pot fisheries. Any vessels entering into these fisheries would be subject to the seasonal closure of the restricted areas. The closures could have negative indirect benefits if effort is relocated just outside the closure area. This relocated effort may result in a wall of fishing gear, which would increase risk of entanglement in the area directly adjacent to the closed areas.

#### 5.2.2.2 Addition of Exempted Waters and Buffers

The ALWTRP currently exempts certain bays, harbors, inlets, and other coastal waters from the provisions of the plan (see Chapter 2). Alternative 6 (Preferred) would expand these areas to include an exemption from the minimum number of traps per trawl in New Hampshire state waters this differs from what was proposed under Alternative 6 (Draft). Alternative 6 (Draft) proposed to exempt New Hampshire state waters from all requirements in the ALWTRP. Alternative 6 (Preferred) would not relax current requirements. NMFS would continue to monitor all exempted areas and encourage New Hampshire to develop contingency plans in the event a large whale is sighted in state waters. New Hampshire has a coastline of eleven nautical miles which, because of state seaward boundaries narrows to less than eight nautical miles at its narrowest point. Located approximately seven miles off the New Hampshire seacoast are the Isles of Shoals. The majority of these islands are located in Maine state waters. New Hampshire has four harbors, one being a deep water port shared with Maine, which are all currently exempted waters. This potential change has been developed in response to a request from the New Hampshire state fishery management agency and is designed to ensure that the ALWTRP does not unnecessarily extend commercial fishing regulations to waters in which endangered or protected whales are at low risk from impacts due to entanglement (*e.g.* areas where large whales are not present). Those fishing in New Hampshire state waters would still be required to abide by all current requirements.

Alternative 6 (Preferred) would also establish quarter-mile buffer areas around three Maine islands: Matinicus Island, Ragged Island (located adjacent to Matinicus), and Monhegan Island. Vessels fishing in these areas would not be subject to minimum trawl length requirements. The rationale for the buffers, described further in Chapter 3, focuses on the likely absence of whales in close proximity to these islands and bottom conditions that favor the use of single traps. There is no buffer are proposed in any of the other Alternatives.

*Direct effects:*

The co-occurrence model does not indicate any monthly co-occurrence concerns with the exception of November within nearshore state waters. Other studies on right whale distribution (see Asaro, 2012) show right whales sightings near the shoreline, albeit not spatially or temporally co-occurring with fishing gear. During the month of November, effort within state waters is already being reduced due to part-time and limited commercial harvesters seasonally removing gear from state waters and Federal/state commercial and limited commercial harvesters are moving to Federal waters. The State of New Hampshire has already been very active in reducing the gear entanglement risk of large whales through current and past regulations and current fishing practices. The majority of the commercial fishing industry already practices multiple trap trawls with an average of 10 traps per trawl for commercial licensees, 6 trap trawls for limited commercial licensees, and 3 trap trawls for part time commercial licensees. The seasonality of the lobster fishery, which accounts for the largest number of vertical lines in state waters, is such that when large whales are present in state waters (according to the co-occurrence model) the number of vertical lines are diminishing as recreational, part-time commercial and limited commercial lobster harvesters are pulling gear out of the water for the winter season.

Those familiar with the Maine islands note that the quantity of gear likely to be set within the buffer areas is small. Experts at the Island Institute, a non-profit organization devoted to protecting Maine's remote island and coastal communities, indicate that only five to 10 lobstermen work the waters around Monhegan.[13] Likewise, only about 10 to 15 lobstermen fish the waters surrounding Matinicus and Ragged Islands. Those fishing closest to the islands (many of whom are nearing retirement or are young entrants learning the trade) tend to use smaller vessels and fewer traps, further reducing the quantity of gear in the water.[14]

These areas that would not be required to abide by the minimum number of traps per trawl requirement is an area in which whales are unlikely to be found, as suggested both by NMFS' review of the data and its current understanding of whale behavior, as well an area where whales are at low risk from impacts due to entanglement. Therefore, exempting this area from the minimum number of traps per trawl regulations is believed to be unlikely to have significant direct effects on endangered or protected whales.

*Indirect effects*:

Exempting certain areas from the minimum number of traps per trawl requirement may encourage some fishermen to shift their activity to those areas. If this were to result in a decrease in fishing activity in areas that whales are more likely to frequent, it would help to reduce entanglement risks.[15]

Improved targeting of ALWTRP regulations might also increase support for their implementation within the commercial fishing community. Fishermen are more likely to comply with restrictions on their operations when they understand that those restrictions serve a beneficial purpose. Requiring fishermen to comply with ALWTRP requirements where whales are unlikely to be encountered, can undermine belief in the need for the requirements and may ultimately undermine compliance with the plan in other areas. To the extent that the designation of exempted areas makes clear that ALWTRP regulations are designed to apply where entanglement risks are low, it may foster improved compliance, and thus indirectly assist in preserving and restoring endangered or protected whale species.

### 5.2.3 Comparison of Biological Impacts Across Regulatory Alternatives

The biological impacts described in the previous section vary across the regulatory alternatives. This section compares the direct and indirect biological impacts of each alternative. Where sufficient information is available, the alternatives are compared using quantitative criteria. The discussion is divided into two parts:

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[13] Personal communication with Nick Battista, Marine Programs Director, Island Institute, November 25, 2013.

[14] The waters around Monhegan Island are governed by a conservation agreement established by the Maine Department of Marine Resources and the Maine Legislature. The agreement limits fishing to 250 days from October to June and allows a maximum of 400 traps per vessel. Personal communication with Erin Summers, Maine Department of Marine Resources, January 13, 2014.

[15] It is also possible that fishermen who modify their gear to comply with ALWTRP requirements would use the same gear in exempted areas. To the extent this occurred, whales would experience a greater degree of protection than the regulations require.

- First, it describes the criteria used to compare the direct and indirect impacts of each regulatory provision;

- Second, it compares the direct and indirect impacts across regulatory alternatives.

#### 5.2.3.1 Comparison Criteria

As previously noted, the discussion of the biological impacts of new ALWTRP requirements on whale entanglement risks is largely qualitative. This approach is necessary because models that would enable NMFS to conduct a rigorous quantitative assessment of such risks are currently unavailable. In some instances, however, it is possible to develop quantitative indicators of the impact of alternative regulations by using change in vertical lines and co-occurrence as proxies as indicators of risk of entanglement.

Exhibit 5-11 summarizes the quantitative indicators developed to compare the biological impacts of the regulatory alternatives under consideration. As the exhibit shows, most of the indicators reflect changes in the number of vessels subject to ALWTRP requirements, changes in the number of vertical lines in the water or changes in co-occurrence score. These indicators do not measure biological changes in entanglement risks, but offer useful information on factors that likely, based on expert opinion, correlate with such risks.

The list of quantitative indicators does not address the impacts of the following provisions:

- changes to exempted waters

As previously noted, the impacts of these provisions under Alternatives 2 through 6 (Draft and Preferred) compared to Alternative 1 are expected to be similar. Because differences among the alternatives with respect to the impact of these provisions should be negligible, they are excluded from the analysis.

**Exhibit 5-11**

**RISK REDUCTION INDICATORS**

| Regulatory Provision | | Impact | Risk Reduction Indicator |
|---|---|---|---|
| **Major Gear Requirements** | | | |
| Buoy line | Increase number of traps per trawl. | Direct benefit to large whales by reducing the amount of buoy lines in water column | Additional vessels required to comply. Percent reduction in number of vertical lines and co-occurrence score |
| | Breaking strength | Increase ability of whales to break free of entanglement | |
| | Single buoy line provision | Reduce risk of entanglement of calves resulting in serious injury or mortality | |
| Weak links | Weaker weak links required on buoy lines in Florida state waters | Direct benefit to large whales specifically right whale calves by increasing the number of effective breaking points in fishing gear. | Number of buoy lines equipped with weaker weak links. |
| Set restrictions | Bring your gear back to shore at end of trip. | Direct benefit to large whales by reducing the interaction between large whales and untended fishing gear. | Additional vessels required to comply |
| Gear marking | Marking of buoy lines | Indirect benefit to large whales by increasing scientific understanding of the nature of large whale entanglements. | Number of new gear marks |
| **Changes to Restricted Times and Areas** | | | |
| Seasonal Closures | Closure in Jordan Basin (Nov. 1-Jan 31) | Direct benefit to large whales by decreasing the potential for interactions between large whales and fishing gear and increasing the area of protection afforded to large whales. | Additional vessels required to comply. Reduction in number of vertical lines and co-occurrence score |
| | Closure in Jeffreys Ledge (Oct. 1-Jan 31) | Direct benefit to large whales by decreasing the potential for interactions between large whales and fishing gear and increasing the area of protection afforded to large whales. | Additional vessels required to comply. Reduction in number of vertical lines and co-occurrence score |
| | Closure in Cape Cod Bay ( Feb. 1-April 30) | Direct benefit to large whales by decreasing the potential for interactions between large whales and fishing gear and increasing the area of protection afforded to large whales. | Additional vessels required to comply. Reduction in number of vertical lines and co-occurrence score |
| | Closure in Cape Cod Bay, Outer Cape and abutting Great South Channel: Massachusetts Restricted Area #1 (Jan. 1-April 30) | Direct benefit to large whales by decreasing the potential for interactions between large whales and fishing gear and increasing the area of protection afforded to large whales. | Additional vessels required to comply. Reduction in number of vertical lines and co-occurrence score |
| | Closure in Cape Cod Bay and Outer Cape: Massachusetts Restricted Area #2 (Jan. 1-April 30) | Direct benefit to large whales by decreasing the potential for interactions between large whales and fishing gear and increasing the area of protection afforded to large whales. | Additional vessels required to comply. Reduction in number of vertical lines and co-occurrence score |

Notes:
Closures would be in effect for all trap/pot gear.

#### 5.2.3.2 Comparison of Regulatory Alternatives

**Quantitative Risk Reduction Indicators**

Exhibits 5-12 and 5-13 compare the impacts of Alternatives 2 through 6 (Draft and Preferred) using a variety of indicators that are likely to correlate with reduced entanglement risk to Atlantic large whales. The analysis evaluates the impact of new ALWTRP requirements relative to the status quo — i.e., a baseline scenario that assumes no change in existing ALWTRP requirements. This baseline scenario is equivalent to Alternative 1 (No Action). As previously stated, it is important to note that the No Action Alternative (Alternative 1) would not achieve the objective of reducing harm to large whales by reducing the likelihood of entanglement and/or reducing the severity of an entanglement should one occur. If Alternative 1 were chosen, the current unacceptable rate of serious injury and mortality to large whales due to entanglement in commercial fishing gear would continue (or increase due to increasing whale populations), rather than be reduced. The Alternatives are similar in geographic range and requirements. The main difference among the Alternatives is the number of closures and minimum traps per trawl requirements; as such the impacts of each Alternative are quite similar.

The DEIS analyzed the impacts of Alternatives 2 through Alternative 6 (Draft). In response to public comment Alternative 6 (Draft) was modified as previously described and Alternative 6 (Preferred) was created. These modifications are within the range of previously analyzed effects and do not constitute a substantial changes from the DEIS. Alternative 6 (Preferred) results in a lower number of vessels affected by the proposed measures but the total percent reduction in number of vertical lines and co-occurrence remains similar.

Alternatives 3 through 6 (Draft and Preferred) proposed closures so the analysis was conducted two ways to account for the potential for two fishing industry responses to the closures—relocation or suspension of fishing. The responses have different implications for each Alternative, but for the most part the impact of each response is similar.

Depending on the size of these closures, up to 110 vessels may be impacted. The extent of the impact varies. In some cases, it is assumed that 100% of the vessels would relocate to fish in areas outside the closure areas. In other cases it is assumed that up to 84% of the boats would relocate. In all cases, there would be a change in the number of vertical lines in the area and thus, a change in co-occurrence and potential for risk reduction as a result of the closures.

The highest degree of protection in both scenarios results from Alternative 5 due to the combination of the strictest measures proposed in each of the alternatives as well as the most proposed closures. Alternative 6 (Preferred) is in the middle of the range of protection. Alternatively, the lowest degree of protection results from Alternative 2. Alternative 2 is the only Alternative that does not propose a closure; therefore, you would expect the impacts resulting from this Alternative to be less than the others. The least number of vessels are affected by implementing Alternative 6 (Preferred).

**Exhibit 5-12**

**COMPARISON OF IMPACTS BY ALTERNATIVE (assuming 100% suspend fishing): QUANTITATIVE RISK REDUCTION INDICATOR**

| | Regulatory Alternatives | | | | | |
|---|---|---|---|---|---|---|
| **Regulatory Provision** | **2** | **3** | **4** | **5** | **6 (Draft)** | **6 (Preferred)** |
| **Gear Requirements** | | | | | | |
| **Buoy Line** | | | | | | |
| *Increase number of traps per trawl* | | | | | | |
| Number of FTE Affected Vessels | 1,817 | 1,392 | 1,834 | 1,400 | 1,364 | 1,357 |
| *Breaking Strength* | | | | | | |
| Number of FTE Affected Vessels | 21 | 21 | 21 | 21 | 21 | 21 |
| *Single buoy line provision* | | | | | | |
| Number of FTE Affected Vessels | 21 | 21 | 21 | 21 | 21 | 21 |
| **Weak Link** | | | | | | |
| Number of buoy lines affected | 3,048 | 3,048 | 3,048 | 3,048 | 3,048 | 3,048 |
| **Set Restrictions** | | | | | | |
| Number of FTE Affected Vessels | 12 | 12 | 12 | 12 | 12 | 12 |
| **Gear Marking** | | | | | | |
| Number of new marks | 1.1 million | 1.1 million | 1.1 million | 1.1 million | 1.1 million | 393,295 |
| **Seasonal Closure** | | | | | | |
| **Closure in Jordan Basin (Nov. 1 – Jan. 31)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 5 | 5 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Jeffreys Ledge ( Oct.1 - Jan. 31)** | | | | | | |
| Number of Affected Vessels | 0 | 0 | 69 | 69 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Cape Cod Bay (Feb. 1 - Apr. 30)** | | | | | | |
| Number of Affected Vessels | 0 | 16 | 0 | 0 | 0 | 0 |
| # Reduction in VL | 0 | 841 | 0 | 0 | 0 | 0 |
| **Closure in Massachusetts Restricted Area #1 ( Jan. 1 - Apr. 30)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 110 | 110 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Massachusetts Restricted Area #2 ( Jan. 1 - Apr. 30)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 0 | 0 | 109 | 109 |
| # Reduction in VL | 0 | 0 | 0 | 0 | 6,329 | 6,329 |
| **Total % Reduction in VL** | 35.3 | 29.7 | 36.5 | 30.9 | 29.1 | 29 |
| **Total % Reduction in CO** | 35.8 | 37.4 | 40.5 | 41.7 | 38 | 37.9 |

Notes:

- The #Reduction of VL for Alternatives 4 and 5 is a combination of all the proposed closures.
- FTE Active Vessels stands for Full Term Equivalent vessel. Using Federal and state data sources, the model estimates the number of commercial fishing vessels that participate in each fishery. Depending on the location and fishery, the model employs a variety of methods to estimate the number of active vessels this differs from the number of permitted vessels.

Key:
0 = no change
VL= Vertical Line
CO= co-occurrence

**Exhibit 5-13**

**COMPARISON OF IMPACTS BY ALTERNATIVE (presuming some relocation): QUANTITATIVE RISK REDUCTION INDICATOR**

| | Regulatory Alternatives | | | | | |
|---|---|---|---|---|---|---|
| **Regulatory Provision** | **2** | **3** | **4** | **5** | **6 (Draft)** | **6 (Preferred)** |
| **Gear Requirements** | | | | | | |
| **Buoy Line** | | | | | | |
| *Increase number of traps per trawl* | | | | | | |
| Number of FTE Affected Vessels | 1,817 | 1,392 | 1,834 | 1,400 | 1,364 | 1,357 |
| *Breaking Strength* | | | | | | |
| Number of FTE Affected Vessels | 21 | 21 | 21 | 21 | 21 | 21 |
| *Single buoy line provision* | | | | | | |
| Number of FTE Affected Vessels | 21 | 21 | 21 | 21 | 21 | 21 |
| **Weak Link** | | | | | | |
| Number of buoy lines affected | 3,048 | 3,048 | 3,048 | 3,048 | 3,048 | 3,048 |
| **Set Restrictions** | | | | | | |
| Number of FTE Affected Vessels | 12 | 12 | 12 | 12 | 12 | 12 |
| **Gear Marking** | | | | | | |
| Number of new marks | 1.1 million | 1.1 million | 1.1 million | 1.1 million | 1.1 million | 393,295 |
| **Seasonal Closure** | | | | | | |
| **Closure in Jordan Basin (Nov. 1 – Jan. 31)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 5 | 5 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Jeffreys Ledge ( Oct.1 - Jan. 31)** | | | | | | |
| Number of Affected Vessels | 0 | 0 | 69 | 69 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Cape Cod Bay (Feb. 1 - Apr. 30)** | | | | | | |
| Number of Affected Vessels | 0 | 16 | 0 | 0 | 0 | |
| # Reduction in VL | 0 | 841 | 0 | 0 | 0 | 0 |
| **Closure in Massachusetts Restricted Area #1 ( Jan. 1 - Apr. 30)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 110 | 110 | 0 | 0 |
| # Reduction in VL | 0 | 0 | 15,262 | 15,262 | 0 | 0 |
| **Closure in Massachusetts Restricted Area #2 ( Jan. 1 - Apr. 30)** | | | | | | |
| Number of FTE Affected Vessels | 0 | 0 | 0 | 0 | 109 | 109 |
| # Reduction in VL | 0 | 0 | 0 | 0 | 6,329 | 6,329 |
| **Total % Reduction in VL** | 35.3 | 29.6 | 35.4 | 29.7 | 28.5 | 28.3 |
| **Total % Reduction in CO** | 35.8 | 37.2 | 38.7 | 39.7 | 37.4 | 37.4 |

Notes:

- The #Reduction of VL for Alternatives 4 and 5 is a combination of all the proposed closures.
- FTE Active Vessels stands for Full Term Equivalent vessel. Using Federal and state data sources, the model estimates the number of commercial fishing vessels that participate in each fishery. Depending on the location and fishery, the model employs a variety of methods to estimate the number of active vessels this differs from the number of permitted vessels.

Key:
0 = no change
VL= Vertical Line
CO= co-occurrence

## 5.3 OTHER IMPACTS

In addition to impacts on large whale species, changes to ALWTRP regulations may affect other aspects of the marine environment, including other protected species, essential fish habitat, and directed catch and bycatch in affected fisheries. The remainder of this chapter discusses these potential effects, which are summarized in Exhibit 5-14. As the exhibit indicates, there is no significant difference among Alternatives 2 through 6 (Draft and Preferred) compared to No Action with respect to impacts on essential fish habitat, directed catch, or bycatch; in each case, the impacts are expected to be minor. The alternatives differ, however, with respect to the ancillary benefits they would afford other protected species. As the following discussion explains, these differences stem from differences in the extent to which the alternatives would mandate gear modification requirements that could prove beneficial to potentially affected species of whales, porpoises, dolphins, seals, and sea turtles.

**Exhibit 5-14**

**IMPACTS OF REGULATORY ALTERNATIVES ON OTHER PROTECTED SPECIES, ESSENTIAL FISH HABITAT, DIRECTED CATCH, AND BYCATCH**

| Regulatory Alternative | Impacts on Other Protected Species | Impacts on Essential Fish Habitat | Impacts on Directed Catch and Bycatch |
|---|---|---|---|
| Alternative 1 (No Action) | • Less conservation benefit and no reduced risk of entanglement | • No additional impact to benthic habitats<br>• Impacts to essential fish habitat remain the same<br>• Would not receive potential positive effects to habitat as a result of proposed seasonal closures | • No additional impact to directed catch and bycatch<br>• Level of catch and bycatch remain the same |
| Alternative 2 | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of requirements would be realized in all regulated areas year-round. | • Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch. |

**Exhibit 5-14**

**IMPACTS OF REGULATORY ALTERNATIVES ON OTHER PROTECTED SPECIES, ESSENTIAL FISH HABITAT, DIRECTED CATCH, AND BYCATCH**

| Regulatory Alternative | Impacts on Other Protected Species | Impacts on Essential Fish Habitat | Impacts on Directed Catch and Bycatch |
|---|---|---|---|
| Alternative 3 | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of requirements would be realized year-round.<br>• Seasonal closure of Cape Cod Bay Restricted Area could provide limited ancillary benefits to sea turtles, sei whales, harbor porpoises, seals, and some pelagic delphinids that may be present when the closure is in effect.<br>• Expansion of exempted waters could increase entanglement risks in these areas for some other protected species, such as sea turtles. | • Potential increase in fishing pressure in exempted areas could have an adverse impact on the benthic environment.<br>• Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch.<br>• Seasonal closure of Cape Cod Bay Restricted Area should have minimal impact.<br>• Potential increase in fishing pressure in exempted areas could reduce directed catch in those areas. |

**Exhibit 5-14**

**IMPACTS OF REGULATORY ALTERNATIVES ON OTHER PROTECTED SPECIES, ESSENTIAL FISH HABITAT, DIRECTED CATCH, AND BYCATCH**

| Regulatory Alternative | Impacts on Other Protected Species | Impacts on Essential Fish Habitat | Impacts on Directed Catch and Bycatch |
|---|---|---|---|
| Alternative 4 | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of gear modification requirements would be realized year-round.<br>• Seasonal closures could provide limited ancillary benefits to sea turtles, sei whales, harbor porpoises, seals, and some pelagic delphinids that may be present when the closures are in effect. | • Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch.<br>• Seasonal closures should have minimal impact.<br>• Potential increase in fishing pressure in areas just outside the closure areas could reduce directed catch in those areas. |
| Alternative 5 | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of requirements would be realized year-round.<br>• Seasonal closures could provide limited ancillary benefits to sea turtles, sei whales, harbor porpoises, seals, and some pelagic delphinids that may be present when the closure is in effect.<br>• Expansion of exempted waters could increase entanglement risks in these areas for some other protected species, such as sea turtles. | • Potential increase in fishing pressure in exempted areas could have an adverse impact on the benthic environment.<br>• Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch.<br>• Seasonal closures should have minimal impact.<br>• Potential increase in fishing pressure in exempted areas and areas just outside the closure areas could reduce directed catch in those areas. |

**Exhibit 5-14**

**IMPACTS OF REGULATORY ALTERNATIVES ON OTHER PROTECTED SPECIES, ESSENTIAL FISH HABITAT, DIRECTED CATCH, AND BYCATCH**

| Regulatory Alternative | Impacts on Other Protected Species | Impacts on Essential Fish Habitat | Impacts on Directed Catch and Bycatch |
|---|---|---|---|
| Alternative 6 (Draft) | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of requirements would be realized year-round.<br>• Seasonal closures could provide limited ancillary benefits to sea turtles, sei whales, harbor porpoises, seals, and some pelagic delphinids that may be present when the closure is in effect.<br>• Expansion of exempted waters could increase entanglement risks in these areas for some other protected species, such as sea turtles. | • Potential increase in fishing pressure in exempted areas could have an adverse impact on the benthic environment.<br>• Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch.<br>• Seasonal closures should have minimal impact.<br>• Potential increase in fishing pressure in exempted areas and areas just outside the closure area could reduce directed catch in those areas. |

**Exhibit 5-14**

**IMPACTS OF REGULATORY ALTERNATIVES ON OTHER PROTECTED SPECIES, ESSENTIAL FISH HABITAT, DIRECTED CATCH, AND BYCATCH**

| Regulatory Alternative | Impacts on Other Protected Species | Impacts on Essential Fish Habitat | Impacts on Directed Catch and Bycatch |
|---|---|---|---|
| Alternative 6 (Preferred) | • Buoy line requirements could help directly reduce entanglement risks for sea turtles, whales, dolphins, porpoises, and seals; gear marking requirements could provide an indirect benefit. Weak link requirements may benefit blue, sei, and sperm whales, since these species would possess the size and strength for weak links to function properly. Benefits of requirements would be realized year-round.<br>• Seasonal closures could provide limited ancillary benefits to sea turtles, sei whales, harbor porpoises, seals, and some pelagic delphinids that may be present when the closure is in effect.<br>• Expansion of exempted waters could increase entanglement risks in these areas for some other protected species, such as sea turtles. | • Potential increase in fishing pressure in exempted areas could have an adverse impact on the benthic environment.<br>• Potential changes in gear loss rates associated with gear modification requirements could have an indirect negative effect on the benthic environment. | • Gear modification requirements are expected to have limited impact on directed catch or bycatch.<br>• Seasonal closures should have minimal impact.<br>• Potential increase in fishing pressure in exempted areas and areas just outside the closure area could reduce directed catch in those areas. |

### 5.3.1 Impacts to Other Protected Species

In addition to the large whales discussed in Section 5.1, other protected species in the waters subject to regulation under the ALWTRP can become entangled in commercial fishing gear. Some other protected species, such as the shortnose sturgeon, the Gulf of Maine distinct population segment of Atlantic salmon, roseate terns, and piping plovers, which are listed under the Endangered Species Act, also utilize waters potentially subject to ALWTRP requirements. These species, however, are minimally affected by the commercial fishing operations that are regulated under the ALWTRP. Hence, the biological impacts analysis does not address these species.

This section assesses the potential impact of modifications to the ALWTRP on other ESA listed species, and non-ESA listed marine mammals. The ESA listed species include Kemp's ridley, loggerhead, leatherback, green, and hawksbill sea turtles, as well as sperm, blue, and sei whales. Leatherback, Kemp's ridley, green (Florida and Pacific coast of Mexico breeding populations), and hawksbill turtles are listed as endangered under the Endangered Species Act, while loggerhead turtles are listed as threatened. Non-ESA listed marine mammals include harbor porpoises, coastal bottlenose dolphins, Atlantic white-sided dolphins, Risso's dolphins, pelagic delphinids (spotted dolphins, striped dolphins, pilot whales, offshore bottlenose dolphins, and common dolphins), and harbor, gray, and harp seals. Bottlenose dolphins (coastal stock), pilot whales, and common dolphins are considered neither endangered nor threatened but are afforded protection as strategic stocks under the Marine Mammal Protection Act.

NMFS believes that some of the other protected species whose ranges overlap with the fisheries managed by the ALWTRP may be potentially affected by the proposed changes outlined in this EIS. For Atlantic white-sided, spotted, striped, offshore bottlenose, and Risso's dolphins, and harbor, gray, and harp seals, the total fishery-related mortality and serious injury for potentially affected stocks are considered to be insignificant and approaching a zero mortality and serious injury rate.[16] However, as a precautionary approach, NMFS considers these species potentially affected due to the possible overlap between the fisheries regulated under the ALWTRP and the range of these species.

The Nova Scotian stock of sei whales occurs only in the Northeast and Mid-Atlantic (Waring et al., 2012); therefore, the potential ALWTRP effects related to these species are only discussed for these areas. Hawksbill sea turtles have a southerly distribution; therefore, the potential ALWTRP effects related to this species are only discussed for measures pertaining to the Southeast.

[16] As documented in the following U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment Reports for the Western North Atlantic (WNA) stock of each species: for striped and Atlantic spotted dolphins, Waring et al. (2000); for pantropical spotted and Risso's dolphins, Waring et al. (2002); for Atlantic white-sided and offshore bottlenose dolphins, harbor, gray, and harp seals (Gulf of Maine/Bay of Fundy stock), Waring et al. (2003).

#### 5.3.1.1 Buoy Line Requirements

In addition to the large whales discussed in Section 5.1, other protected species in the waters subject to regulation under the ALWTRP are known to become entangled in lobster, other trap/pot, and gillnet buoy lines (NMFS, 2001a; NMFS, 2001b; NMFS, 2001c; NMFS, 2001d).[17] In particular, NMFS receives several reports of leatherback entanglements in lobster trap/pot buoy lines every year. From 2002-2011, there were 133 reports of entangled leatherbacks from Maine to Virginia. Data collected by the Sea Turtle Stranding and Salvage Network (STSSN) and NMFS also indicate that whelk trap/pot gear has been involved in a number of reported leatherback entanglements in Massachusetts and New Jersey waters (NMFS unpublished data, 2001). Research suggests that leatherbacks may be attracted to buoys because they resemble jellyfish, which is one of the turtles' prey. Leatherbacks and loggerheads may also attempt to feed on the bivalves, algae, and gelatinous organisms that colonize buoys and ropes (NMFS, 2001a). Once a sea turtle becomes entangled, its mobility is impaired and its ability to feed may be hampered. Entangled turtles may eventually drown under the weight of the gear or if the trailing gear becomes lodged on rocks or ledges below the surface.

Alternative 1 (No Action) would not result in additional conservation gain for other protected species. As described previously, the regulatory changes proposed under Alternatives 2 through 6 (Preferred) include several provisions pertaining to buoy lines which are designed to reduce large whale entanglement risks. For example, while it is currently recommended that fishermen keep lines as knot free as possible, Alternatives 2 through 6 (Draft and Preferred) would require this in the Southeast. This could benefit other protected species, such as sea turtles, by reducing the likelihood that line would become lodged around appendages.

The Alternatives analyzed would also impose restrictions on the number of buoy lines that fishermen employ in the Northeast. Singles would be prohibited, and fishermen would be required to use trawls for 2 to 20 trap/pots. By helping to reduce the amount of buoy line in the water column, these measures would help to reduce the entanglement risks faced by other protected species, as well as large whales.

Although the commercial fisheries regulated under the ALWTRP may affect blue and sperm whales, there seems to be significant separation between the known feeding range of these species and primary fishing areas. In addition, Waring et al. (2012) indicate that the level of fishery interaction is insignificant and approaching a zero mortality and serious injury rate. Therefore, the gear used in the commercial fisheries regulated under the ALWTRP is not likely to adversely affect blue or sperm whales.

Due to similarities in distribution, feeding behavior, and other characteristics, sei whales are believed to benefit from ALWTRP measures in much the same manner as the large whale species the plan is designed to protect.

Bottlenose dolphins, harbor porpoises, Atlantic white-sided dolphins, pelagic delphinids (pilot whales, and spotted, striped, and common dolphins), and harbor, gray, and harp seals more

[17] With respect to other trap/pot fisheries, NMFS has documented the entanglement of sea turtles in buoy lines associated with whelk, crab, and black sea bass trap/pot gear.

commonly become ensnared in nets rather than lines; however, marine mammals could become entangled in buoy line, and any reduction in the amount of line in the water column should decrease the risk of entanglement for these species.

#### 5.3.1.2 Weak Link Requirements

Alternative 1 (No Action) would maintain status quo of weak link requirements and not reduce the potential for a serious injury or mortality to occur after an entanglement. As described previously, provisions in Alternatives 2 through 6 (Draft and Preferred) require the incorporation of weaker weak links on trap/pot gear in the Southeast Region. This requirement is designed to reduce the likelihood that interactions between whales and commercial fishing gear will result in entanglements that cause serious injury or death.

These provisions, which are specifically designed to reduce the risk of serious injury or mortality to large whales, are likely to have a beneficial effect for other protected species of similar size and strength. For example, in the unlikely event of an entanglement, blue, sei, and sperm whales may benefit from the weak link requirements, because they would possess the size and strength necessary for the weak links to function properly. Decreasing the strength of the current weak links will benefit smaller animals, including bottlenose dolphins, harbor porpoises, Atlantic white-sided dolphins, pelagic delphinids (pilot whales, and spotted, striped, and common dolphins), harbor, gray and harp seals, and sea turtles, that otherwise may have lacked the strength to break weak links as strong as those that are currently required under the ALWTRP.

#### 5.3.1.3 Set Restrictions Requirements

The No Action Alternative would maintain the status quo. Fishermen are currently required to bring their gear back to shore every 30 days. The potential regulatory changes under analysis in Alternatives 2 through 6 (Draft and Preferred) include requiring trap/pot fishermen fishing in the Federal waters of Southeast US Restricted Area North to bring their gear back to shore at the conclusion of each trip.

The provisions proposed under Alternatives 2 through 6 (Draft and Preferred) could help to reduce entanglement risks for other protected species. This requirement may help to reduce instances in which failure to tend gear contributes to the entanglement of other protected species. The No Action alternative would not reduce the risk of entanglement of other protected species.

As previously stated, the implementation of this requirement would offer ancillary benefits of varying degree to other protected species, depending on their presence in the affected area and the alternative implemented.

#### 5.3.1.4 Gear Marking Requirements

With the exception of Alternative 1 (No Action), all of the regulatory alternatives under consideration would impose new gear marking requirements. Alternative 1 would maintain the current gear marking scheme that is currently inadequate for identifying the gear related to entanglements. Alternatives 2 through 6 (Draft) include a common gear marking scheme that would result in the incorporation of approximately 1.1 million new marks into the gear subject to ALWTRP regulations. Alternative 6 (Preferred) would incorporate approximately 393,295 new marks. As with whales, these requirements would have neither direct impact on the probability of other protected species becoming entangled in commercial fishing gear nor would they affect the severity of an entanglement should one occur. Nonetheless, the gear marking requirements under consideration would help to generate information on the nature of the gear involved in an entanglement of any protected species. In addition, these provisions would in some cases allow NMFS to identify the owner of the gear, and thus, allow the agency to gather additional information on where, when, and how the gear was set. By increasing scientific understanding of the nature of entanglements, the gear marking measures would allow NMFS, over time, to improve the effectiveness of programs designed to reduce the entanglement risks faced by other protected species. Thus, these measures could contribute indirectly to the preservation and restoration of the other potentially-affected protected species.

#### 5.3.1.5 Seasonal Closures

Under the No Action Alternative and Alternative 2, the number of closures currently in place would remain the same. There would be no additional conservation benefit to other protected species as a result of Alternatives 1 or 2. Under Alternatives 3 through 6 (Draft and Preferred) a number of trap/pot fishery closures are under consideration. The closure of Jordan Basin would be from November 1-January 31. Jeffreys Ledge would be closed from October 1-January 31. Three different potential closures of Cape Cod Bay Restricted Area and surrounding areas were analyzed. Under Alternative 3, the area would be closed from February 1-April 30. Under Alternatives 4 and 5, the area would be expanded to include the Outer Cape and abuts the Great South Channel (Massachusetts Restricted Area #1). This closure would be in place from January 1-April 30. Under Alternative 6 (Draft and Preferred), the Cape Cod Bay closure would include the Outer Cape and would be in effect from January 1-April 30 (Massachusetts Restricted Area #2).

The closures described above could have a beneficial impact on sea turtles, but such benefits are likely to be limited. Leatherback, loggerhead, and Kemp's ridley sea turtles generally do not appear in the Cape Cod Bay Restricted Area or Gulf of Maine until June, when the closures are no longer in effect. Green sea turtles use the Gulf of Maine as a summer habitat so the closures would have minimal impact on them as well. As a result, the benefits of prohibiting such activity are likely to be minor, except to the extent that the prohibition prevents the possible future expansion of driftnet, anchored float gillnet, or other trap/pot fisheries into this area.

The closures described above could have a beneficial impact on blue, sei, and sperm whales, but such benefits are likely to be limited. Blue and sperm whales are typically not

reported in either the Cape Cod Bay Restricted Area or the Massachusetts Restricted Areas. Blue whales are most frequently sighted in the waters off eastern Canada, with the majority of recent records from the Gulf of St. Lawrence (Sears et al., 1987). At most, the blue whale is considered an occasional visitor in the U.S. Atlantic EEZ, which may represent the southern limit of its feeding range. The waters in which it has been sighted, however, are still well north of the Restricted Areas identified by the ALWTRP (CETAP, 1982; Wenzel et al., 1988). Similarly, the distribution of sperm whales in the U.S. Atlantic EEZ occurs on the edge of the continental shelf, over the continental slope, and into mid-ocean (Waring et al., 2007). Given the distinct offshore distribution of this species, sperm whales are unlikely to benefit from fishery closures in Cape Cod Bay or the area connecting to the Great South Channel.

In contrast, sei whales may benefit from the fishery closures described above. Although sei whales are often found in the deeper waters that characterize the edge of the continental shelf (Hain et al., 1985), NMFS aerial surveys found substantial numbers of sei whales south of Nantucket in the spring of 2001. The general offshore pattern of sei whale distribution is sometimes disrupted during episodic incursions into more shallow and inshore waters (Waring et al., 2003). In addition, sei whales (like right whales) are largely planktivorous, primarily feeding on euphausiids and copepods; this has resulted in reports of sei whales in more inshore locations, such as the Great South Channel (in 1987 and 1989) and Stellwagen Bank (in 1986) (Waring et al., 2003). Therefore, sei whales may benefit from the fishery closures in Cape Cod Bay and the area connecting to the Great South Channel during their periodic incursions into these waters.

For reasons similar to those discussed for blue and sperm whales, the closures described above are likely to offer limited benefits to harbor porpoises, Atlantic white-sided dolphins, pelagic delphinids, bottlenose dolphins, and harbor, gray, and harp seals. The western North Atlantic coastal migratory stock of bottlenose dolphins is generally distributed south of Long Island; thus, fishery closures are unlikely to have a significant impact on entanglement risks for this species. Harbor porpoises, Atlantic white-sided dolphins, and pelagic delphinids, however, are more common in New England waters. To the extent that fishery closures help to reduce overall fishing effort (rather than simply divert it to other areas where these species may also be present), entanglement risks to these species may be reduced.

#### 5.3.1.6 Addition of Exempted Waters

As previously noted, the ALWTRP currently exempts certain bays, harbors, inlets, and other coastal waters from the provisions of the plan (see Chapter 2).

Expanding exempted areas as described above under Alternatives 3, 4, and 6 (Draft and Preferred) would primarily affect lobster trap/pot vessels that are currently subject to the ALWTRP requirements for Northern Inshore State Trap/Pot Waters. Under Alternative 6 (Draft) fishing in New Hampshire state waters would be exempted from the all the ALWTRP requirements. Under the preferred alternative (Alternative 6 Preferred) those fishing in New Hampshire state waters and in the buffer waters surrounding certain Maine Islands would be not be required to fish with a minimum number of traps per trawl. They would not be exempted from the gear marking requirements or current requirements. The requirements currently in place in these areas are as follows:

- Compliance with the Universal Requirements
  - No buoy line floating at the surface.
  - No wet storage of gear
  - Fishermen are encouraged, but not required, to maintain knot-free buoy lines.
- Trap/pot surface buoys to be marked to identify the vessel or fishery.
- Buoy lines to be marked with one 4-inch red mark midway along the buoy line.
- All buoys, floatation devices and/or weights must be attached to the buoy line with a weak link having a breaking strength of no greater than 600 lbs.
- All groundlines must be made of sinking line.

Blue, sei, and sperm whales are not expected to be affected by the change in exempted waters these species are not known to occur in these areas. Likewise maintaining the status quo under Alternatives 1,2, and 4 would not affect blue, sei, or sperm whales either. As previously discussed, several of these requirements (e.g., weak link provisions) are unlikely to provide any ancillary benefit to smaller protected species, such as sea turtles, bottlenose dolphins, Atlantic white-sided dolphins, Risso's dolphins, pelagic delphinids, harbor porpoises, or harbor, gray and harp seals; however, increasing trawl size could afford such benefits. Thus, relative to the status quo, relieving previously regulated vessels from these ALWTRP requirements could have an adverse impact on other protected species that may occur in newly-exempted waters. The potential for adverse effects may be greatest for sea turtles. Loggerhead and Kemp's ridley turtles prefer inshore waters and embayments for foraging on crustaceans and mollusks (NMFS, 2001b). Leatherbacks may also swim into shallow waters if there is an abundance of jellyfish nearshore.

Depending on the season, 10 to 220 active vessels fish in New Hampshire state waters. Roughly 25% of these vessels fish in already exempt waters. Thus, the expansion of exempted waters in this state would likely affect a relatively large number of vessels, which in turn could have an adverse impact on other protected species, particularly leatherbacks. Alternatively, there are only 20-25 fishermen fishing in the waters surrounding Matinicus Island, Monhegan Island, and Ragged Island. There currently is no evidence of interactions between Kemp's ridleys or green turtles and lobster trap/pot gear, and very limited information about interactions between loggerheads and lobster trap/pot gear.

From 2002 to 2013, there were no confirmed records of a leatherback entanglement in NH waters and four in waters near the Maine islands. The four confirmed animals were

disentangled and released alive, therefore the likelihood of adverse impacts on leatherbacks is minimal.

### 5.3.2 Impacts to Essential Fish Habitat

As noted in Chapter 4, using the types of fixed fishing gear regulated under the ALWTRP (i.e., traps/pots and anchored gillnets) can affect essential fish habitat primarily through the gear's impacts on the benthic environment. Such impacts generally arise as a result of contact between fishing gear and the sea floor, especially during the setting and retrieval of the gear. In some cases, bottom contact can alter the physical structure of the seabed, injure or kill benthic organisms, alter the structure and productivity of the benthic community, contribute to the suspension of sediments, and cause changes in the chemical composition of the water column overlying affected sediments. However, the habitat impacts of mobile, bottom-tending gear are much more severe than the impacts attributed to fixed, bottom-tending gear (see Section 4.4.4.1).

The regulatory alternatives under consideration are likely to have no more than a temporary or minimally adverse impact on the benthic environment (see Section 5.2.2.2). The regulatory provisions with the greatest potential to affect benthic habitat are those that may influence contact between ALWTRP-regulated gear and the sea floor. As discussed below, the provisions of interest are those pertaining to exempted waters and to buoy line and weak link requirements.

#### 5.3.2.1 Exempted and Buffer Waters

As described above, Alternatives 3,5, and 6 (Draft) would exempt New Hampshire state waters from the requirements under the ALWTRP. Alternative 6 (Preferred) would exempt New Hampshire state waters and buffer waters surrounding certain Maine islands from the minimum number of traps per trawl requirement. These changes, coupled with an increase in regulatory requirements in other areas, might create an incentive for fishermen to relocate their effort to exempted waters. If this were to occur, it would increase stress on the benthic environment in these areas.[18] Any relocation of effort, however, is likely to be limited by other factors, including the already crowded conditions in inshore and nearshore waters and the conflicts between fishermen that could arise if those who attempted to relocate their effort were perceived as encroaching on territory unofficially claimed by others. As a result, any adverse impact on essential fish habitat in exempted waters is likely to be limited. Under Alternatives 1, 2, and 4 the waters would not be exempt, so there would be no additional impacts to essential fish habitat.

#### 5.3.2.2 Buoy Line Requirements

With the exception of Alternative 1 (No Action), all of the regulatory alternatives under consideration would require increasing the number of traps per trawl fished in the Northeast

[18] This change presumably would be offset by a decrease in fishing pressure in other areas, with potentially beneficial implications for benthic habitat in these areas.

region. This increase in trawl length under Alternatives 2 through 6 (Draft and Preferred) may in turn increase the use of sinking groundline. This would not be the case with Alternative 1 and as such there would be no additional impact to benthic habitat as a result of Alternative 1. The use of such line increases the line's contact with the sea floor, creating the potential for adverse impacts on benthic habitat. Such impacts, however, are not expected to be more than minimal or temporary in nature. The expected impacts of sinking groundline on benthic habitat would occur primarily when trawl lines of pots are hauled to the surface. During this process, the line may snag on bottom features and organisms as it is dragged across the bottom. Current knowledge suggests that trap/pot fishermen minimize the distance at which gear is drawn across the sea floor when hauling in their gear, as this contact causes abrasion of the protective coating on the traps themselves. Hence, fishermen position their vessels above their gear, pulling sets up through the water column instead of across the sea floor. This practice minimizes the adverse impact of sinking groundline on benthic habitat. Furthermore, the amount of bottom area that would be disturbed by sinking groundline, and the frequency of disturbance in the exact same area from repeated contact with sinking groundline, would be very small, allowing enough time for recovery of benthic communities that would potentially be affected. Therefore, any adverse impacts associated with the increased use of sinking groundline would be temporary as well as minimal.

In contrast, in an effort to reduce damage to sensitive habitats, single trap/pots are preferable in the Southeast. The Southeast U.S. has many more coastal habitats that include live bottom and corals; in particular, there are ample amounts of live bottom off the coast of Northeast Florida[19]. Traps set in multiple trap trawls can damage live bottom more than single traps. Groundlines may drag across the bottom, potentially shearing off living organisms most important in providing topographic complexity (Barnette 2001). Furthermore, the area swept by the groundline is orders of magnitude greater than the cumulative area of the traps themselves (Barnette 2001). It is estimated that hauling in a single trap results in 30% more damage to the substrate than setting the trap itself (Appledorn et al 2000); thus, hauling in multiple traps would further increase the extent of the habitat than a single pot.

#### 5.3.2.3 Weak Link Requirements

The use of weaker weak links, as required by regulatory Alternatives 2 through 6 (Draft and Preferred), is unlikely to have a significant impact on essential fish habitat. Currently, weak links are also required under Alternative 1. It is possible that weak links could benefit essential fish habitat by reducing the likelihood that an entangled whale would drag gear over sensitive areas. Instead, the weak link is expected to break, releasing the gear. To the extent this occurs, potential damage to the marine environment could be avoided.

[19] See http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html for maps showing the location of live bottom and coral.

### 5.3.3 Impacts to Directed Catch and Bycatch

Like other regulations on commercial fishing, changes in ALWTRP requirements could have an impact on directed catch and bycatch in affected fisheries. Directed catch refers to the catch of species targeted by the fisheries currently or potentially subject to ALWTRP requirements (see list of affected fisheries in Chapter 4.2). Under the Magnuson-Stevens Fishery Conservation and Management Act, bycatch is defined as the harvest of fish that are not sold or kept for personal use, including economic and regulatory discards.

As described below, potential changes to the ALWTRP are unlikely to have a significant impact on directed catch or bycatch. The discussion is divided into three parts:

- Impacts associated with major gear modification requirements;
- Impacts associated with seasonal closures; and
- Impacts associated with changes to exempted waters.

#### 5.3.3.1 Major Gear Modification Requirements

None of the major gear modification requirements specified under Alternatives 2 through 6 (Draft and Preferred) are likely to have a significant impact on directed catch or bycatch. Alternative 1 does not require additional gear modifications above and beyond what is currently required; therefore, there would be no impacts to directed catch or bycatch as a result of Alternative 1. The NMFS Gear Research Team reports that no significant changes in catch have been observed by or reported to them for any of the gear modifications currently required under the ALWTRP. The gear modification requirements envisioned under Alternatives 2 through 6 (Preferred) primarily involve increasing the number of traps per trawl or codifying current practices (singles in the Southeast). A vessel may experience catch changes but these impacts may diminish over time as fishermen adapt to new gear configurations and learn to fish longer trawls more efficiently. Nonetheless, it is important to recognize that changes in gear configuration could have an overall adverse impact on directed catch or bycatch at first. The magnitude of these impacts is uncertain.

#### 5.3.3.2 Seasonal Closures

It is possible that the seasonal closures proposed in Alternatives 3 through 6 (Draft and Preferred) would experience a reduction in catch. If the vessels chose to suspend fishing then their catch level would be affected during the months of the closure. If the vessels chose to relocate fishing effort outside the closure area, there is the possibility that the catch level could be reduced relative to that in the preferred fishing location inside the closure area. Catch reductions could occur due to numerous reasons including unfamiliarity with the new location, competition, or lower productivity of the grounds. Alternative 1 does not require additional closures above and beyond what is currently required; therefore, there would be no impacts to directed catch or bycatch as a result of Alternative 1.

#### 5.3.3.3 Addition of Exempted and Buffer Waters

Alternatives 1, 2, and 4 do not require changing the current exempted waters; therefore, there would be no impacts to directed catch or bycatch as a result. As discussed above, Alternatives 3, 5, and 6 (Draft and Preferred) would expand the waters that would be exempted from some or all of the ALWTRP requirements with the exception of the gear marking requirements. If vessels relocated their effort to exempted areas to avoid the costs of complying with ALWTRP requirements, more directed catch and bycatch in these waters could occur. As a result of this increased fishing pressure, stocks of both targeted and bycatch species in these waters could be adversely affected.

### 5.3.4 Summary of Impacts

Alternative 1 (No Action) would not result in additional conservation benefits to other protected species. There are no additional impacts to essential fish habitat and directed catch and bycatch as Alternative 1 maintains the status quo.

As the discussion above suggests, there is no significant difference among Alternatives 2 through 6 (Draft and Preferred) with respect to impacts on other protected species, essential fish habitat, directed catch, or bycatch; in each case, the impact is expected to be minimal. All the Alternatives (with the exception of Alternative 1) include some form of gear modifications and some level of increased traps per trawl. The main differences among these alternatives stem from differences in the extent to which they would close certain areas to fishing during certain times of the year. Other protected species would indirectly benefit from the measures put in place to protect the species covered under the ALWTRP.

With the exception of Alternatives 1, 2, and 4, the regulatory alternatives under consideration would expand the area of coastal waters that would be exempted from ALWTRP requirements. This change would relieve previously regulated vessels from ALWTRP requirements, and thus could have an adverse impact on other protected species relative to the status quo. The practical impact of the potential change in exempted waters is unclear, since data on the number of vessels that currently fish in exempted waters are unavailable. Expansion of exempted waters in certain areas (e.g., New Hampshire) could affect a relatively small number of vessels; however, the impact on other protected species would depend upon the gear modifications that such vessels have already implemented but would no longer be required to maintain. If these vessels have relied primarily upon weak links to comply with ALWTRP requirements – as seems likely – the impact of removing these requirements is likely to be negligible. Conversely, if these vessels have met ALWTRP standards by switching to sinking groundline, the impact of exempting them from these standards could be greater.[20]

[20] The discussion above focuses on the impacts of expanding exempted waters assuming that a significant number of fishermen might choose to fish exclusively within those waters, and thus avoid the need to comply with ALWTRP requirements. It is possible that fishermen would choose to modify their gear to comply with ALWTRP requirements in non-exempt waters and would use the same gear in exempt areas. To the extent this occurred, the potential for any adverse impact on other protected species would be reduced.

For the most part, impacts on other protected species, essential fish habitat, directed catch, or bycatch as a result of the proposed measures are expected to be minimal or be seasonal as is the case with the proposed closures.

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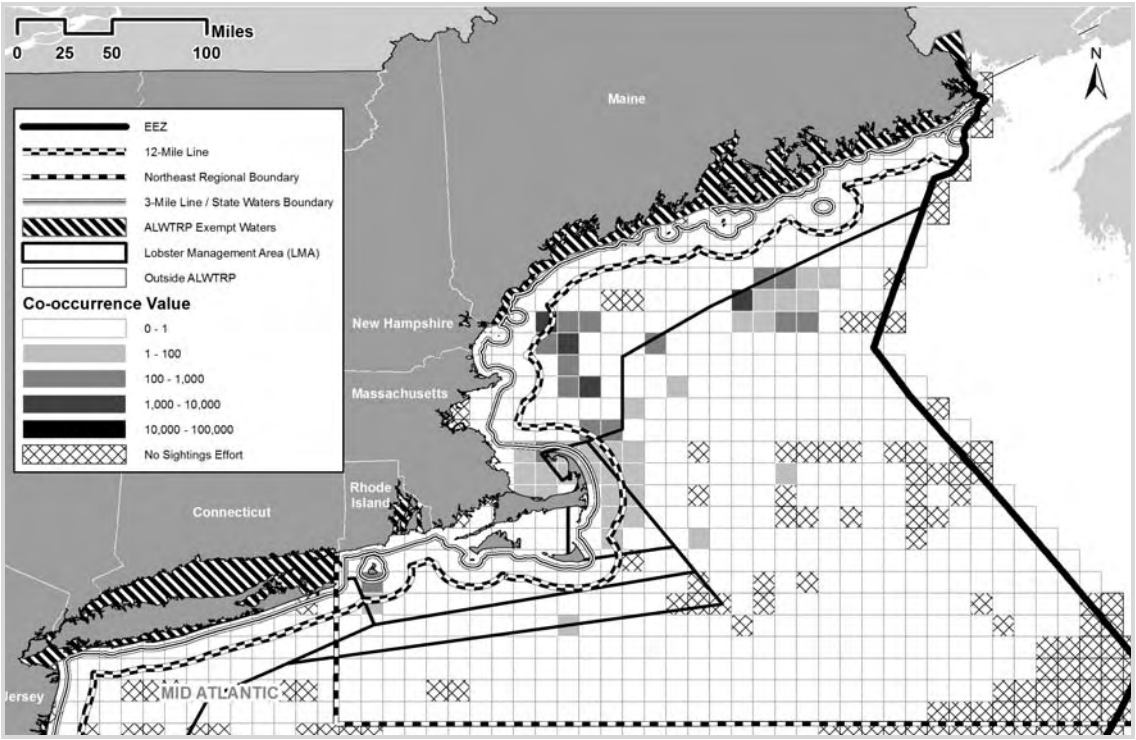
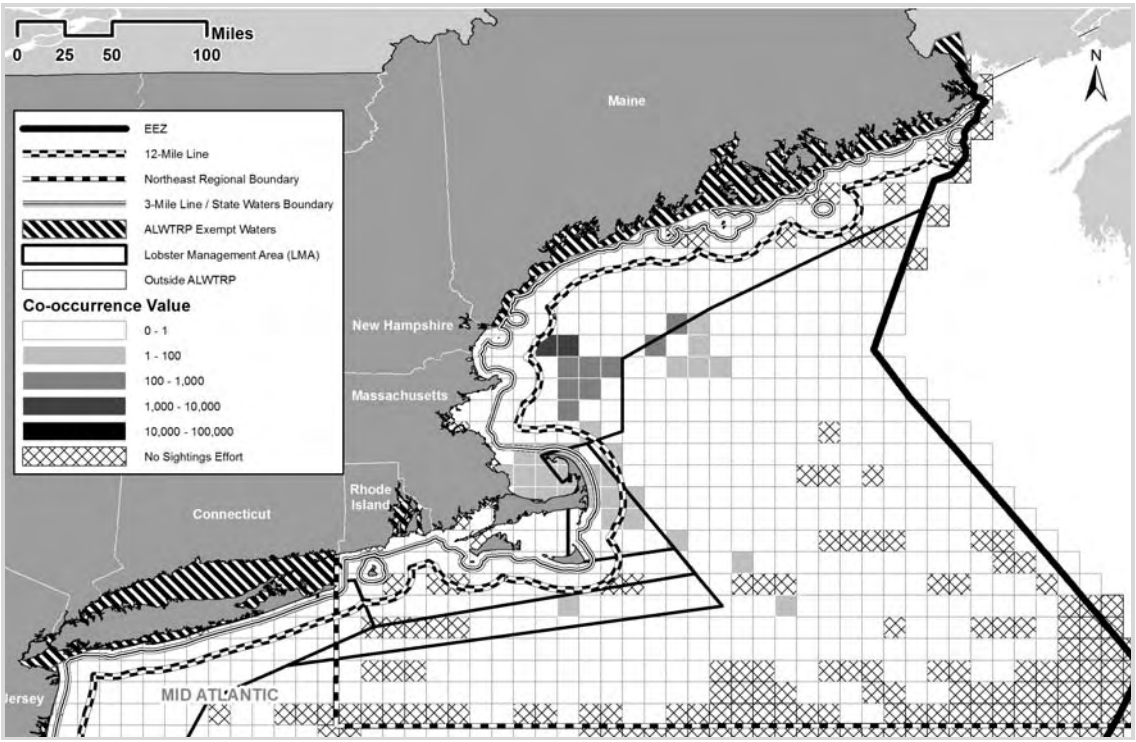
# Appendix 5-A

## CO-OCCURRENCE OF VERTICAL LINES AND RIGHT/HUMPBACK WHALE SPUE BASELINE MONTHLY VALUES

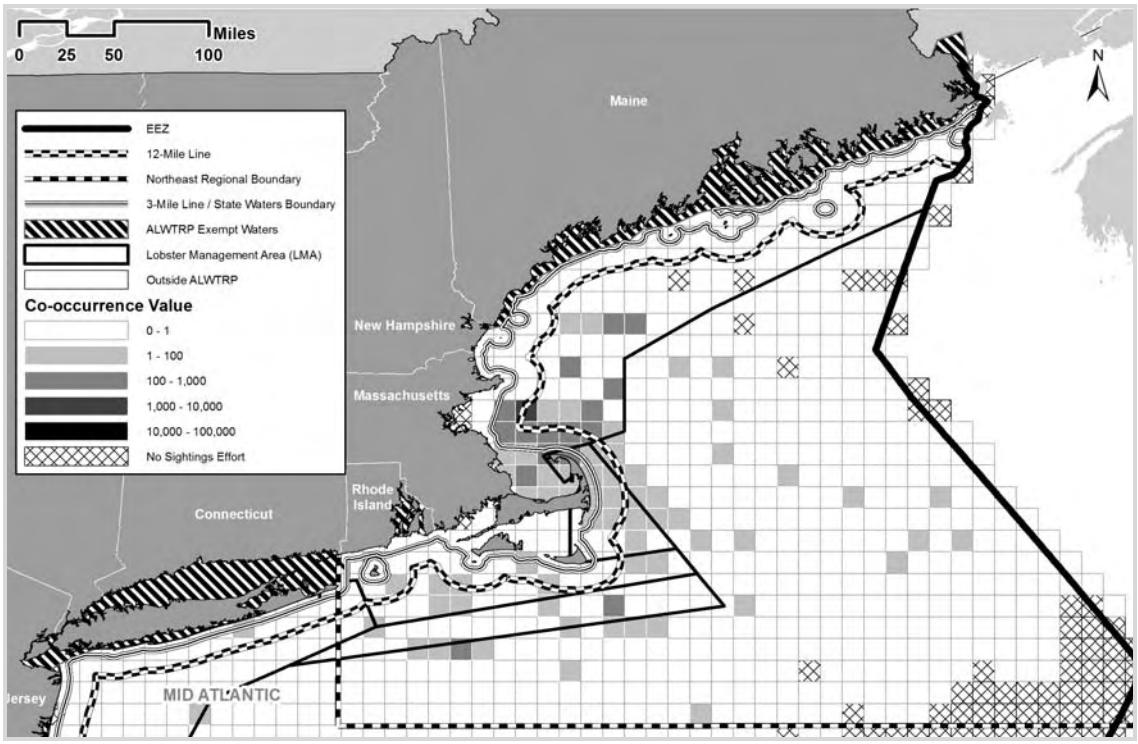
**Northeast – January**



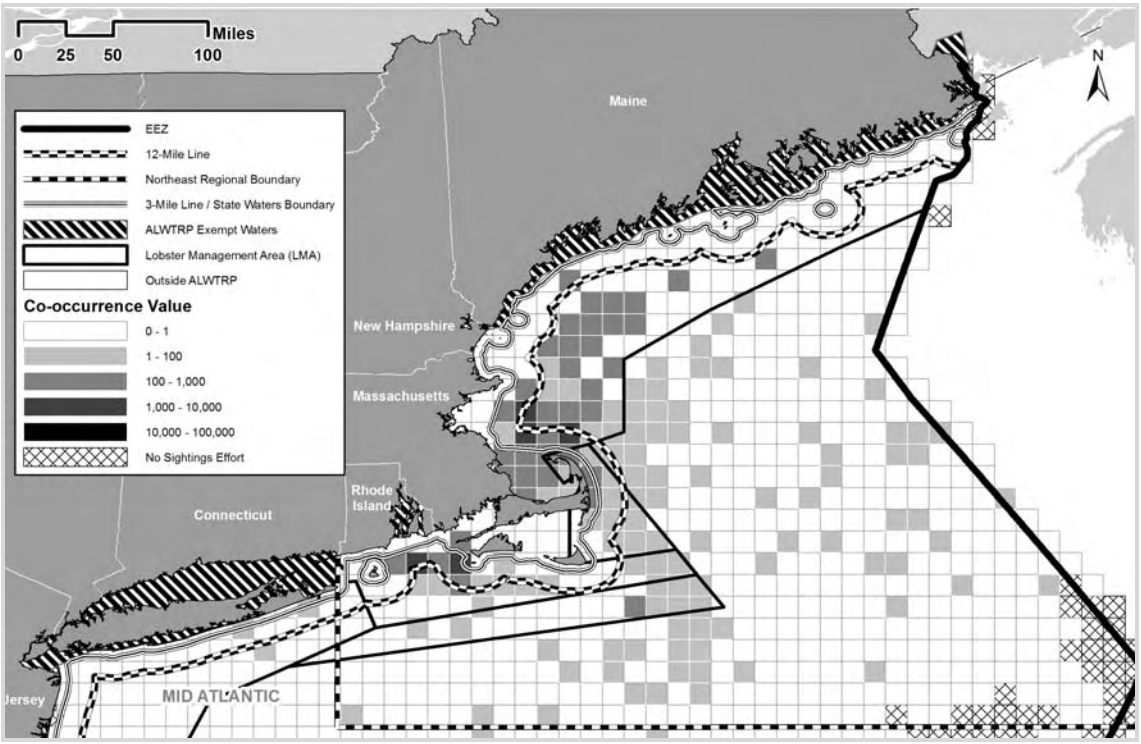

**Northeast – February**



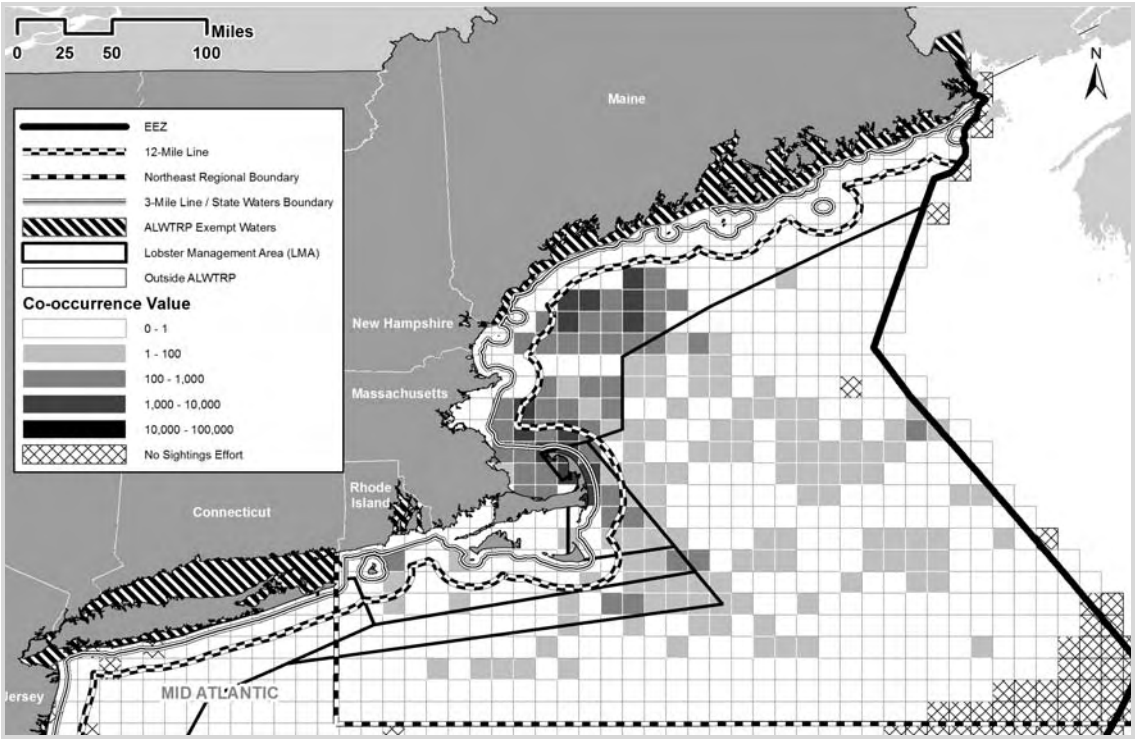
**Northeast – March**



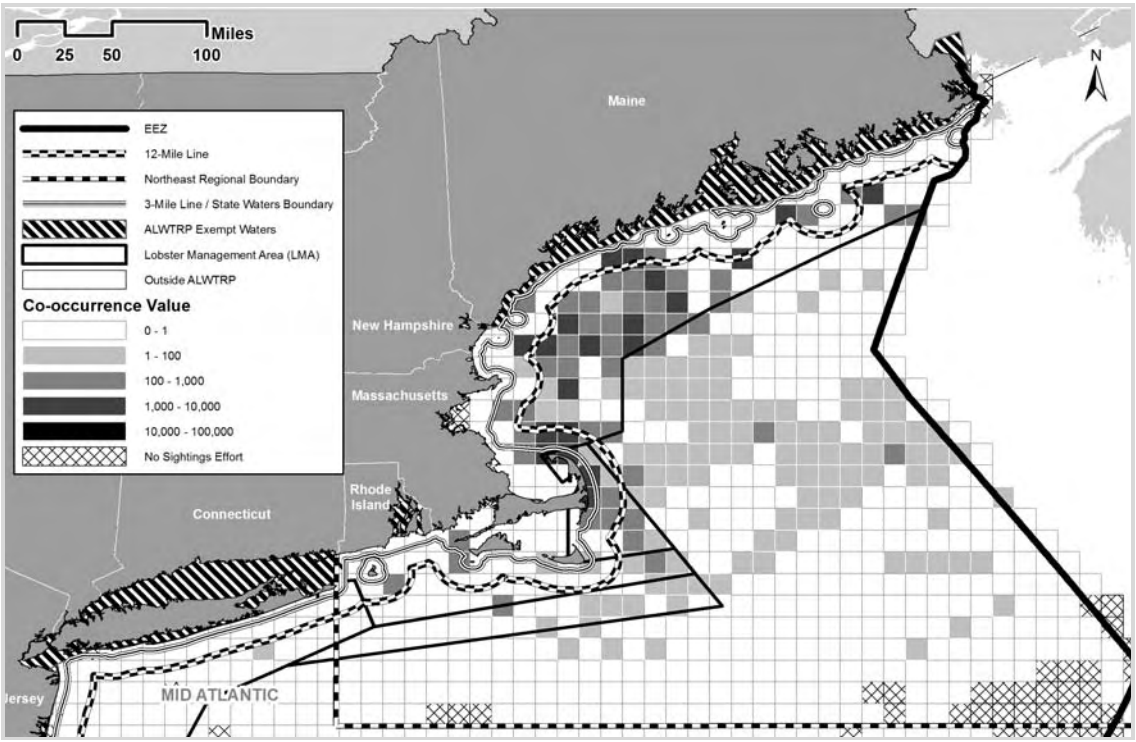

**Northeast – April**



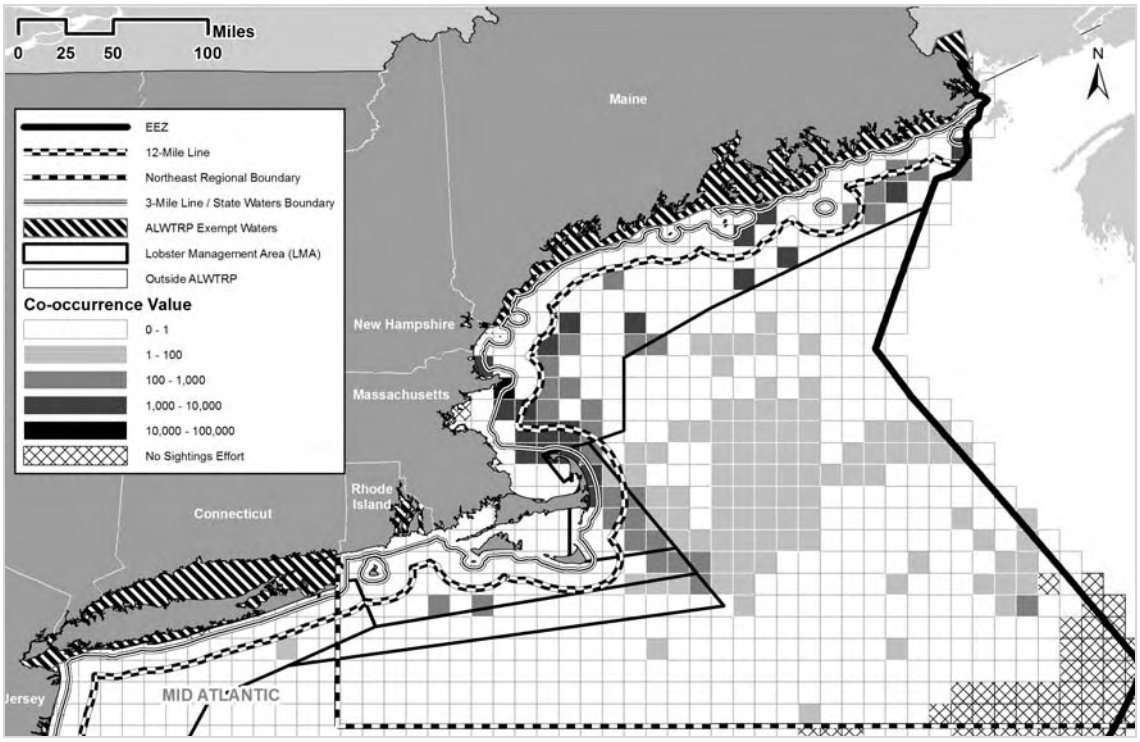
**Northeast – May**



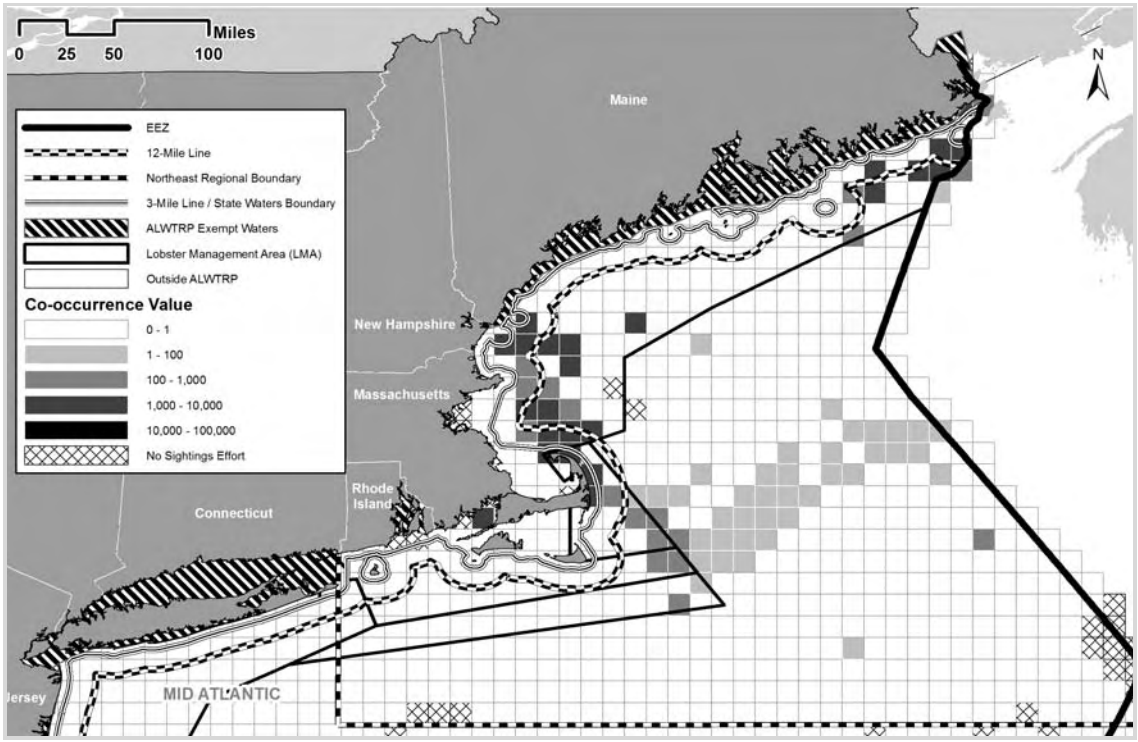

**Northeast – June**



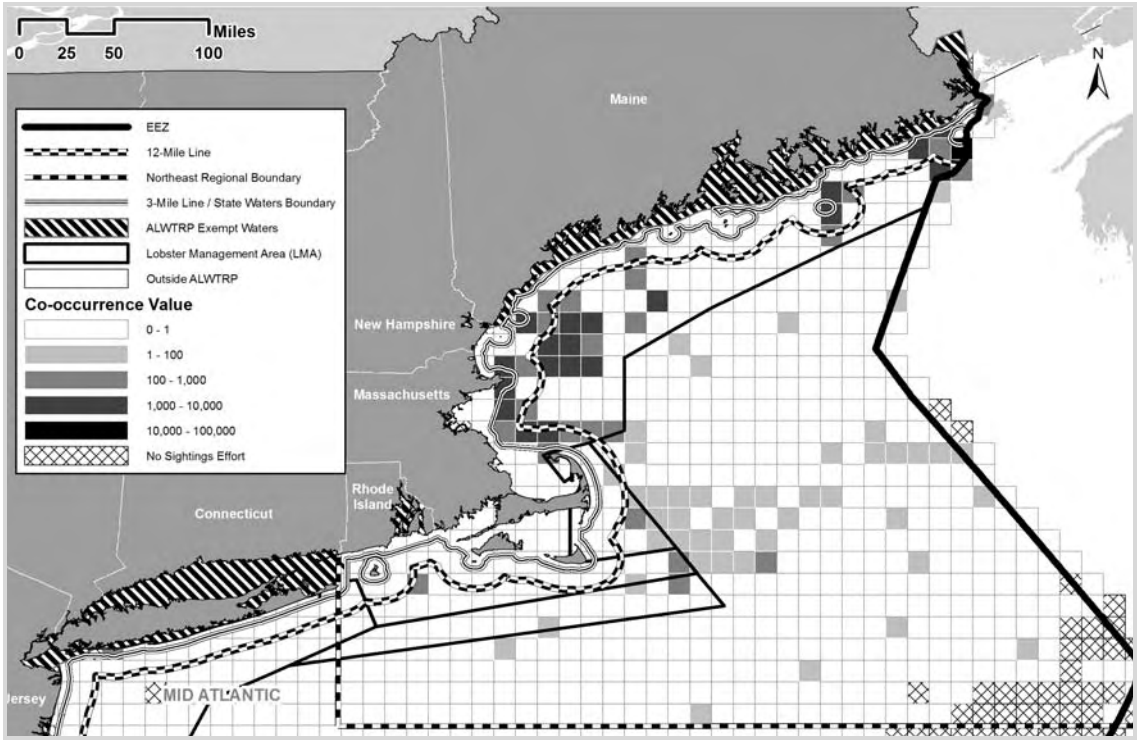
**Northeast – July**



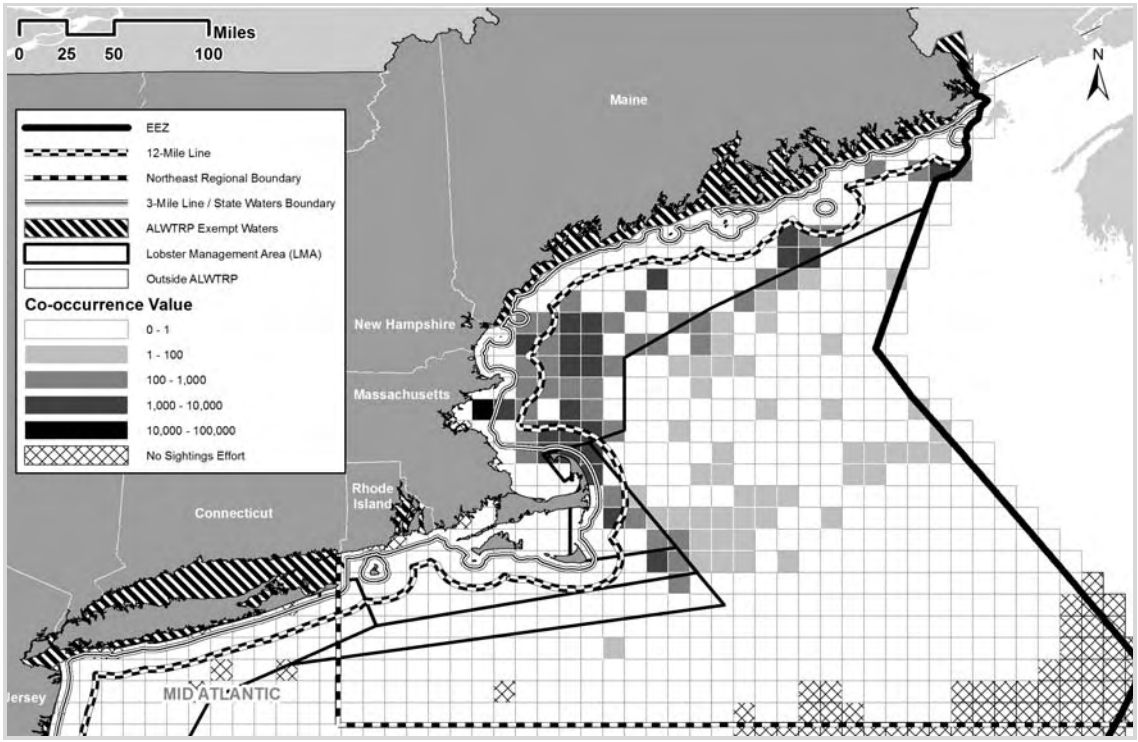

**Northeast – August**



**Northeast – September**




**Northeast – October**



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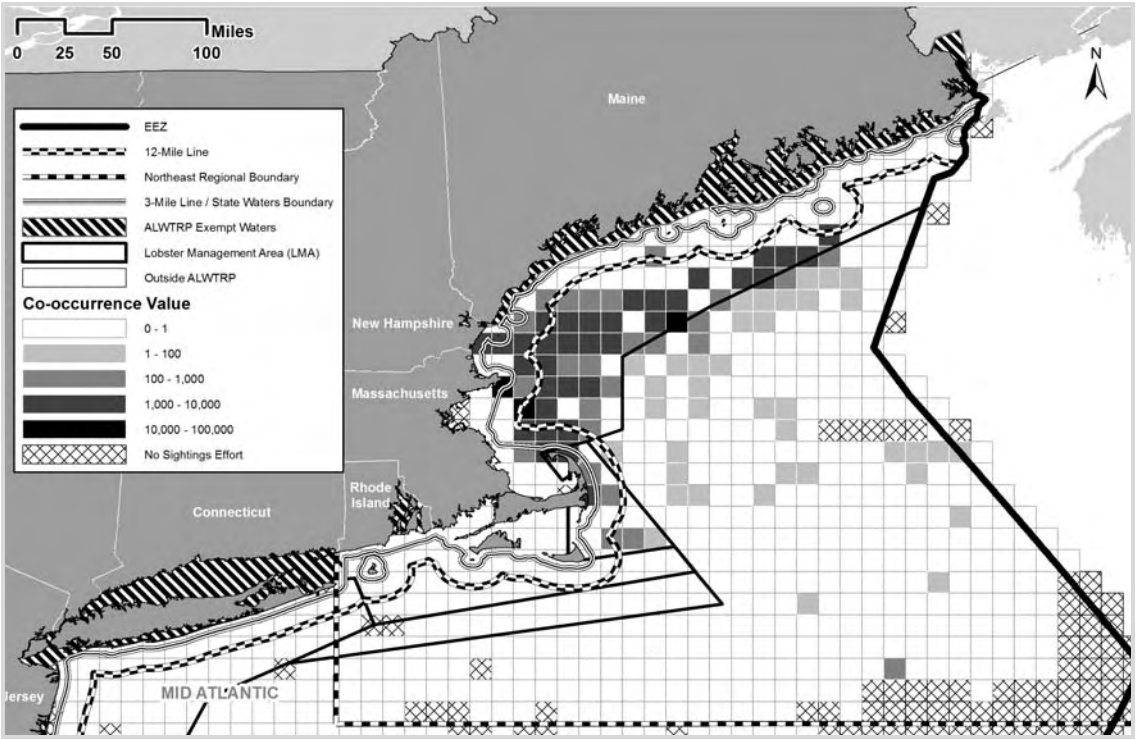


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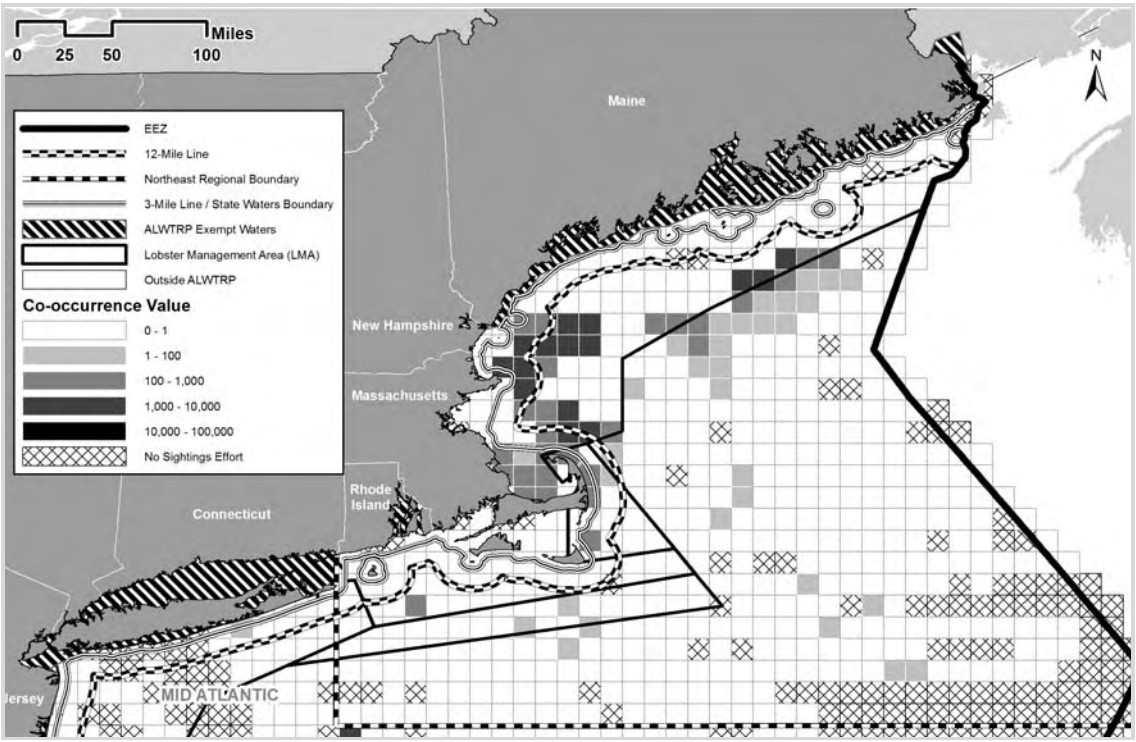
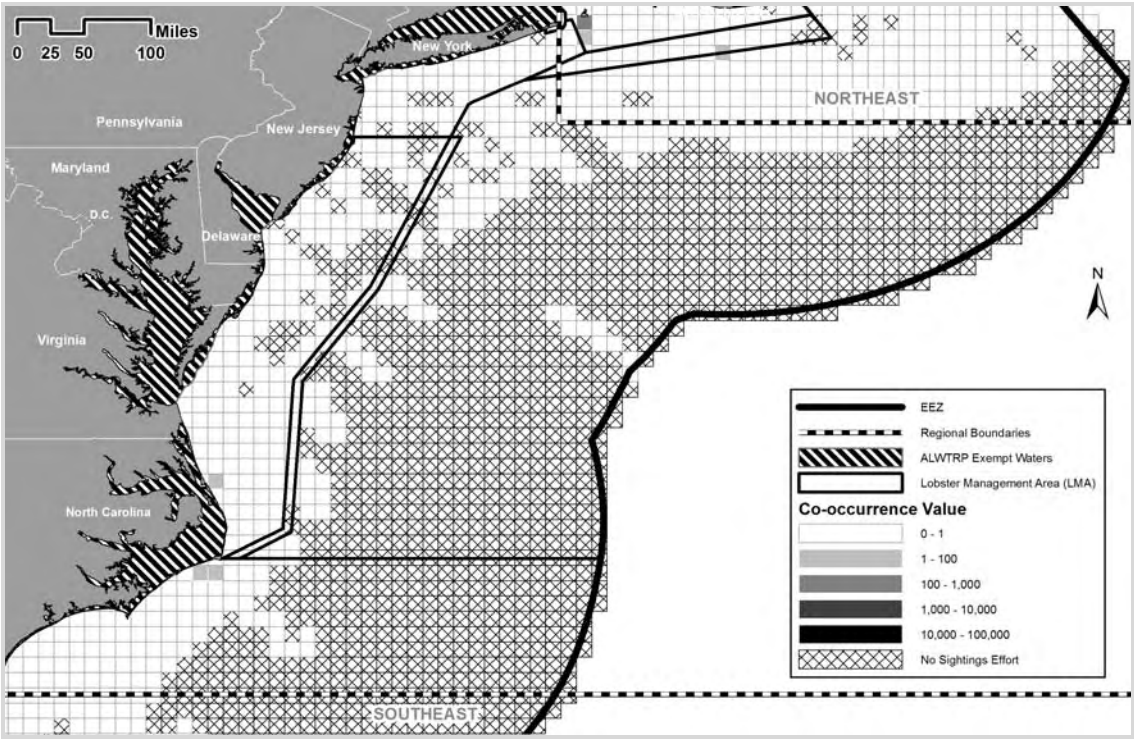


**Mid-Atlantic – January**

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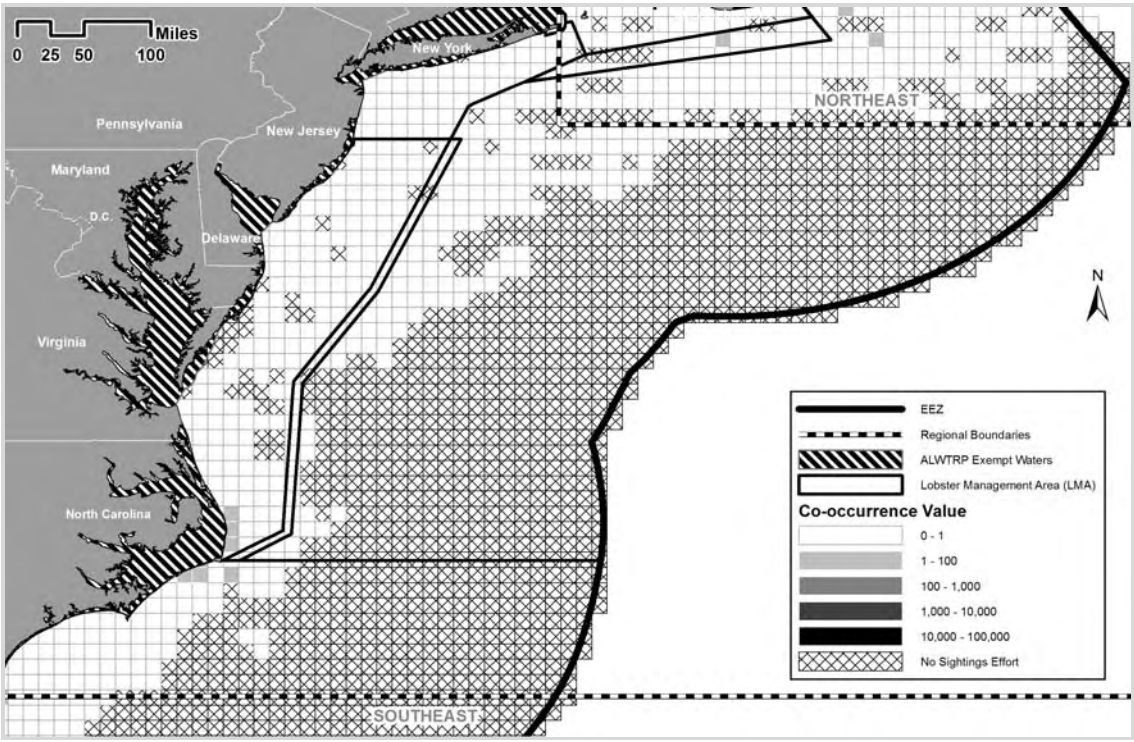
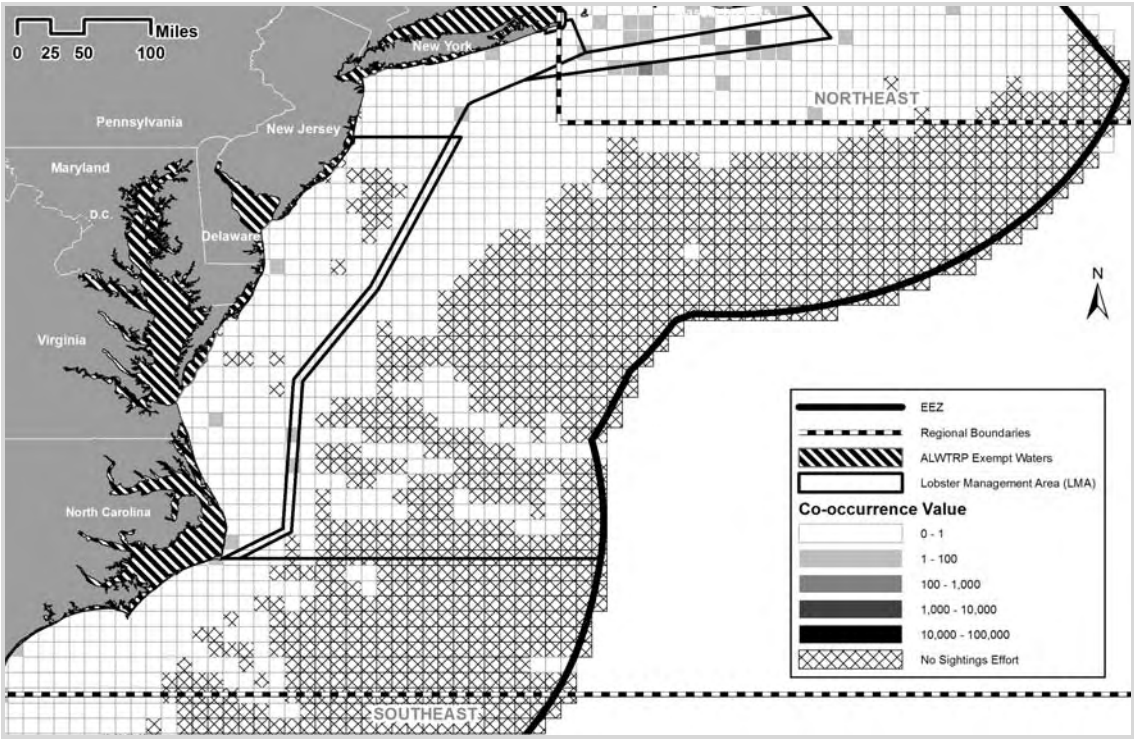


**Mid-Atlantic – March**

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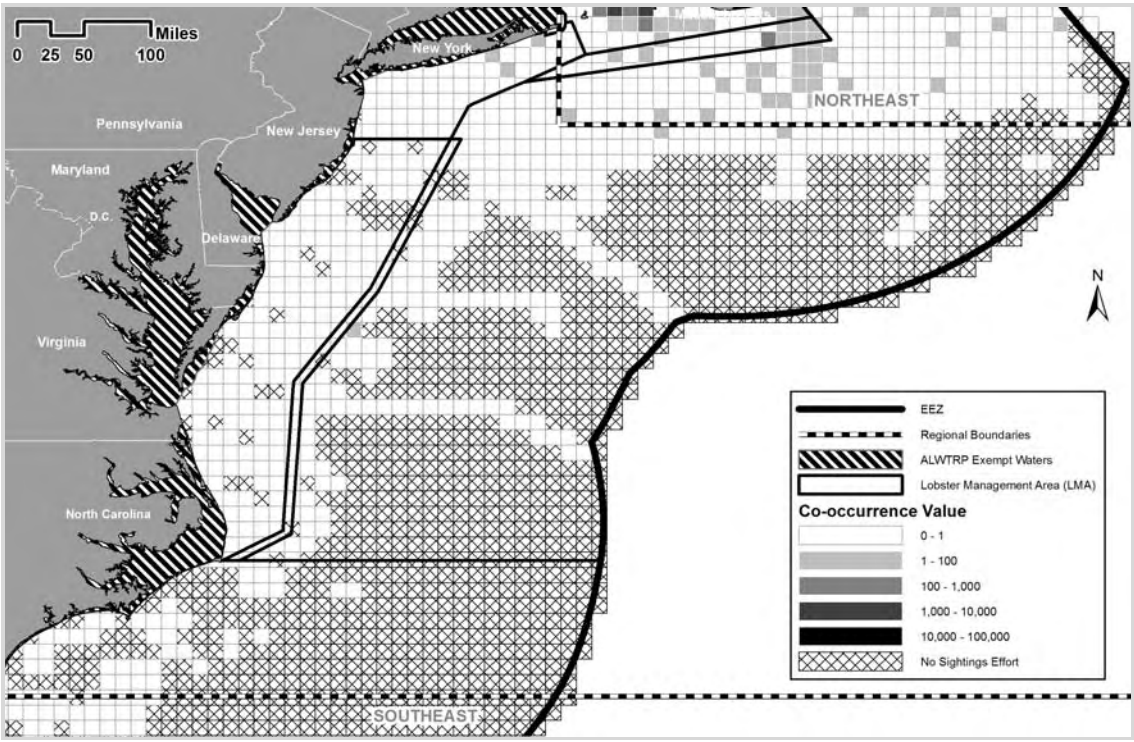

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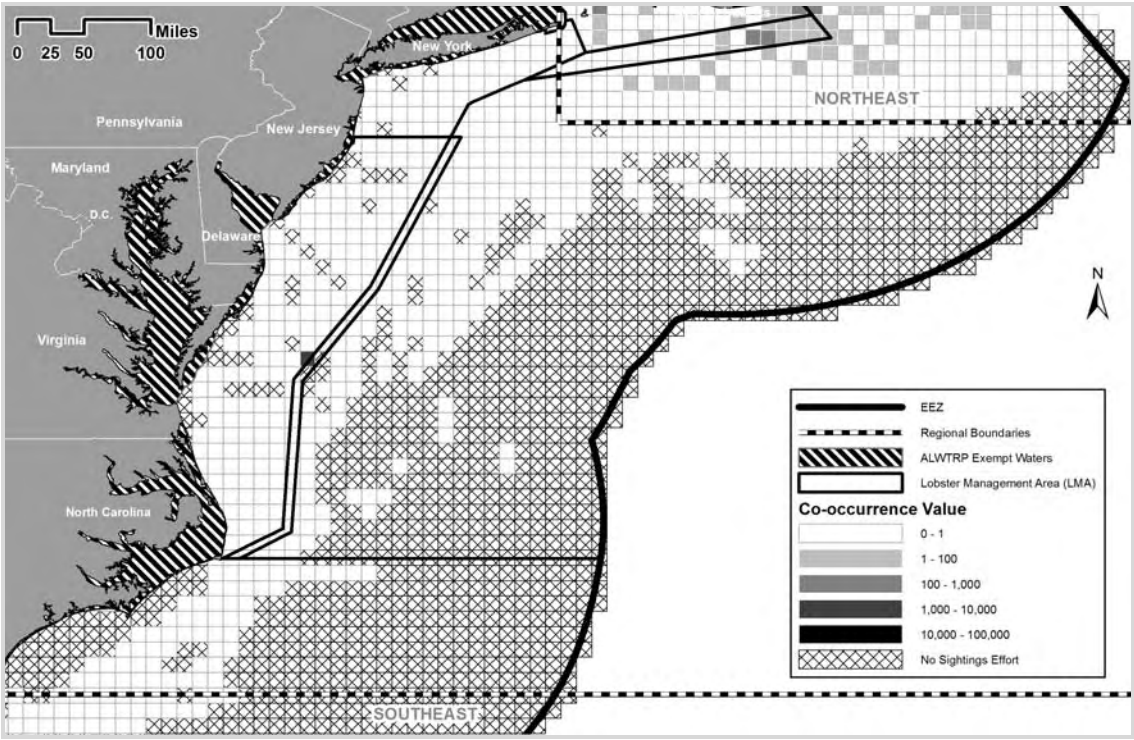
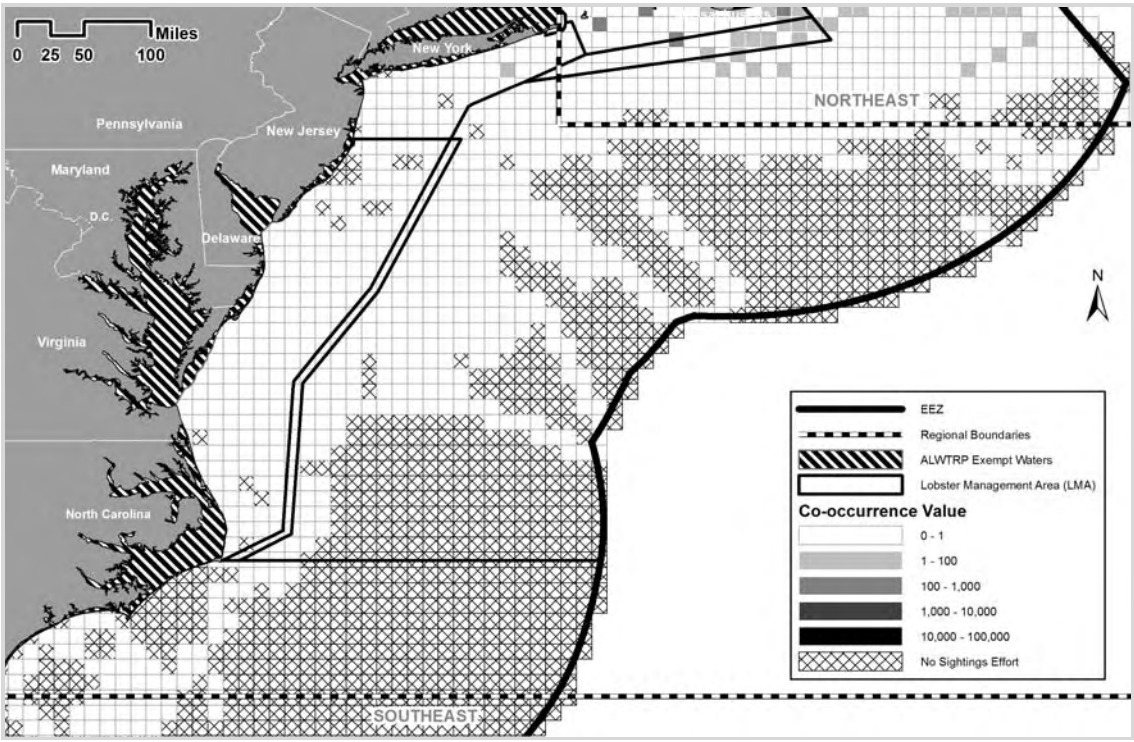



**Mid-Atlantic – June**



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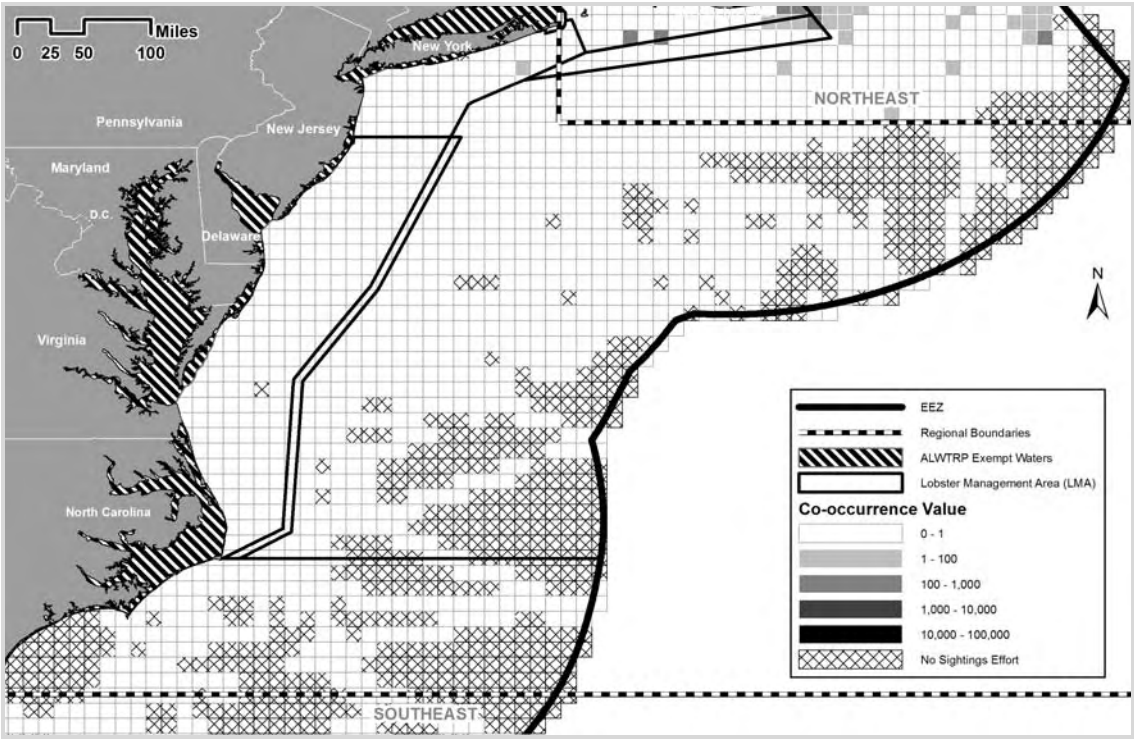


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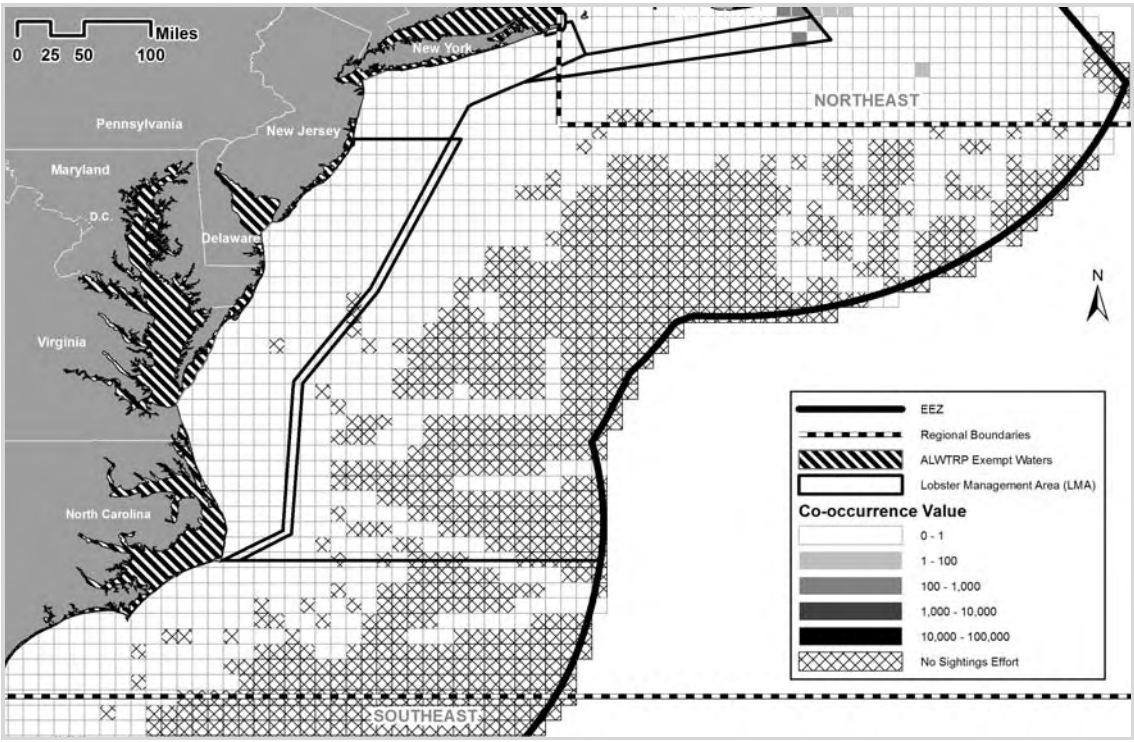

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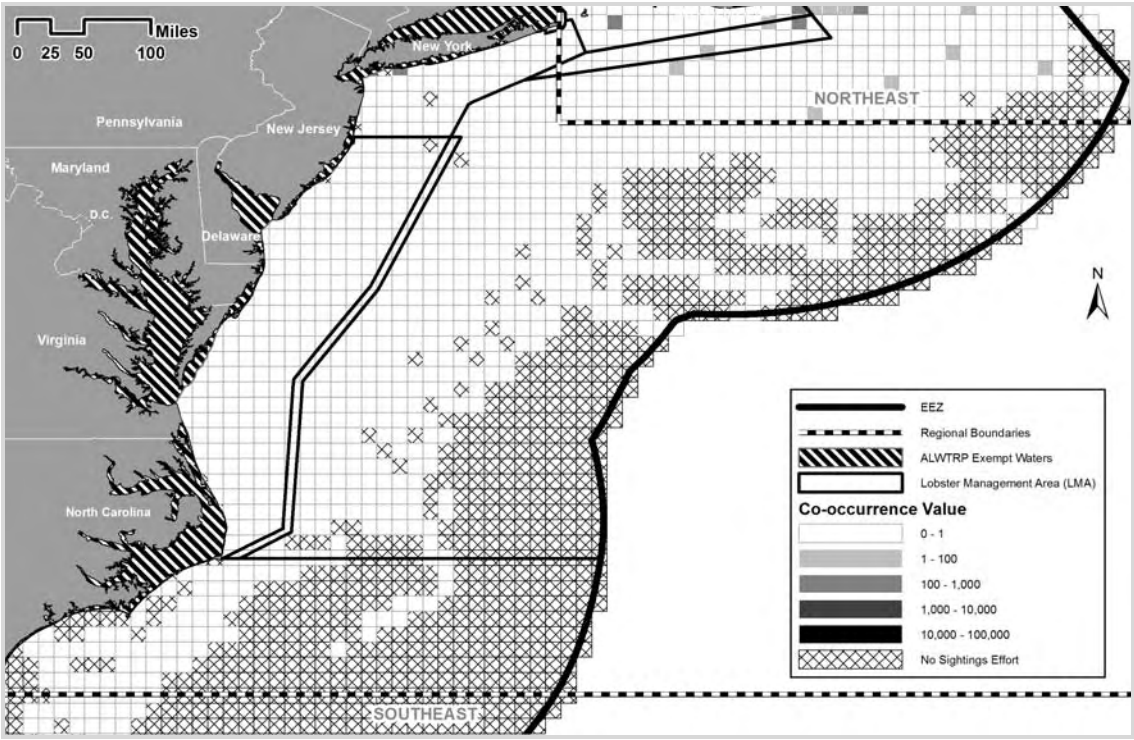


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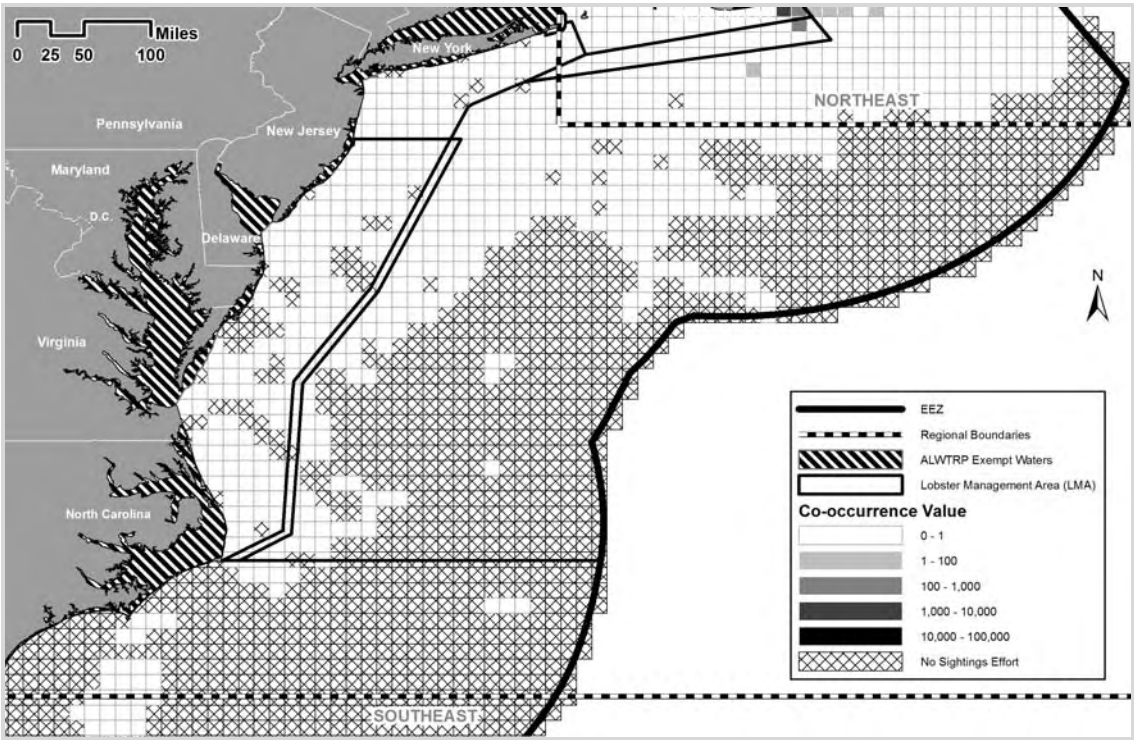

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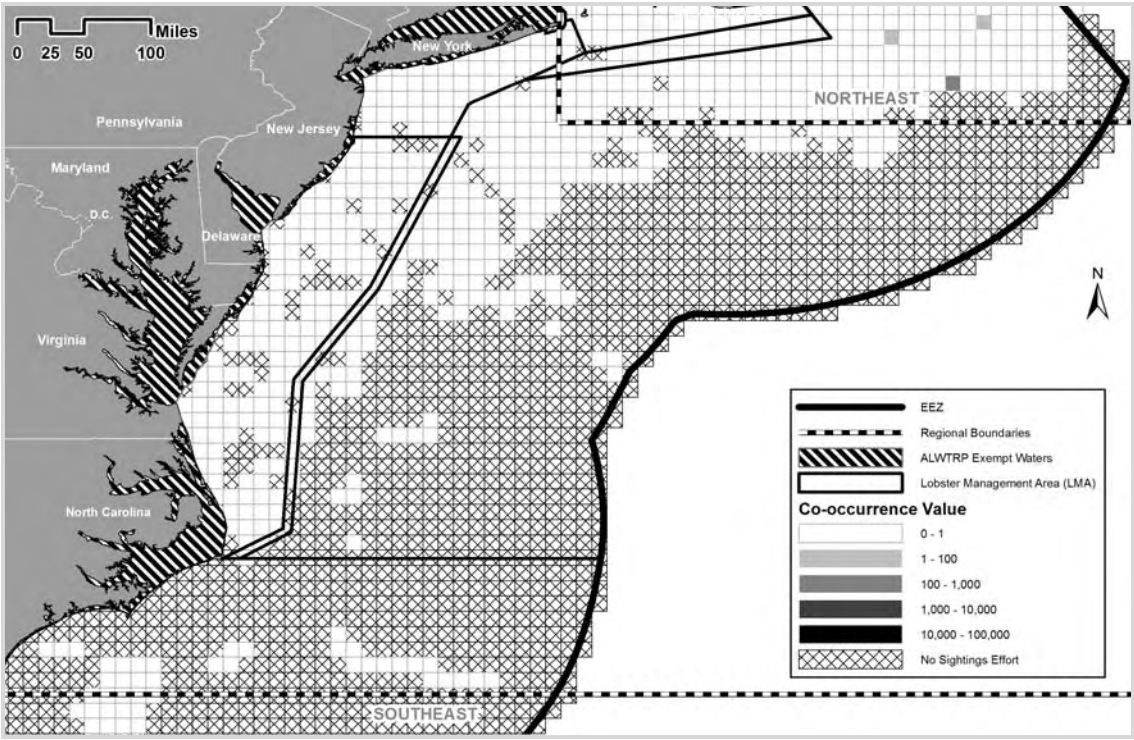


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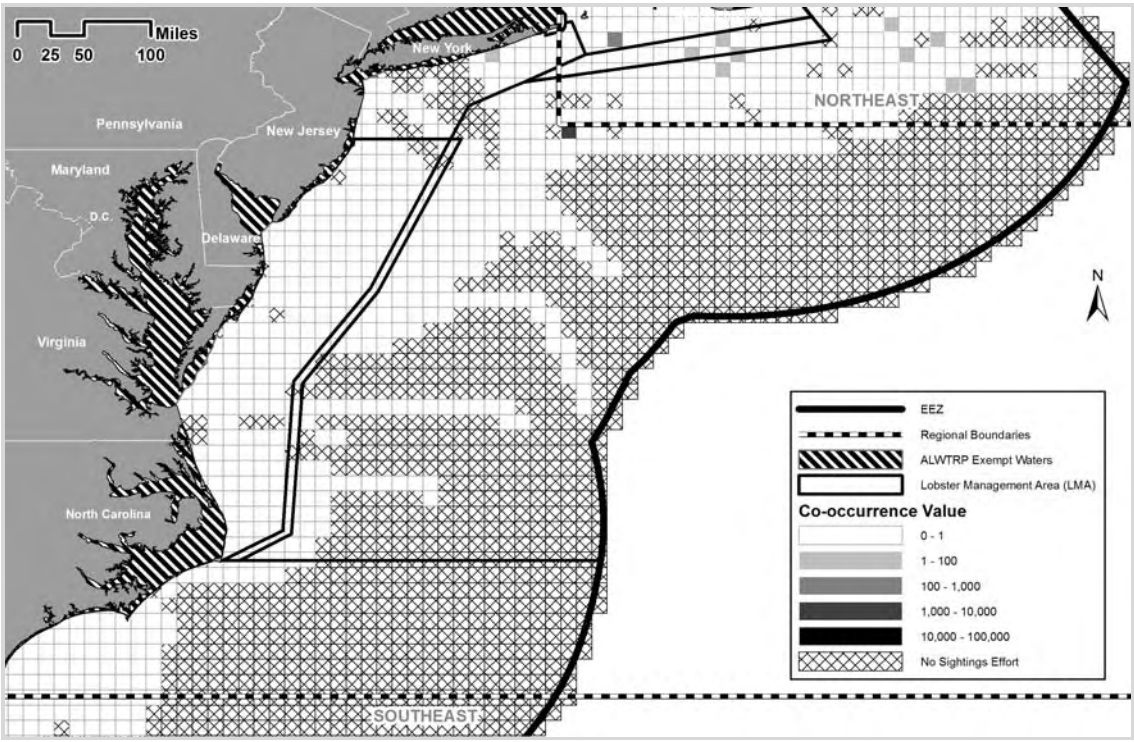
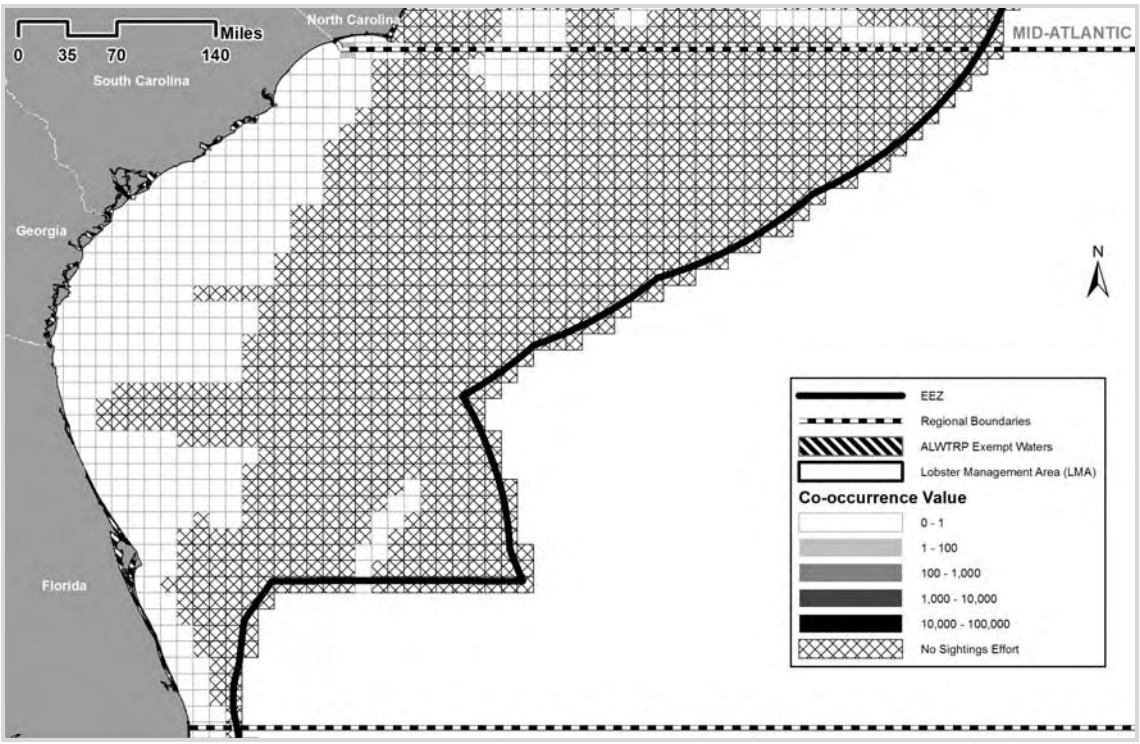
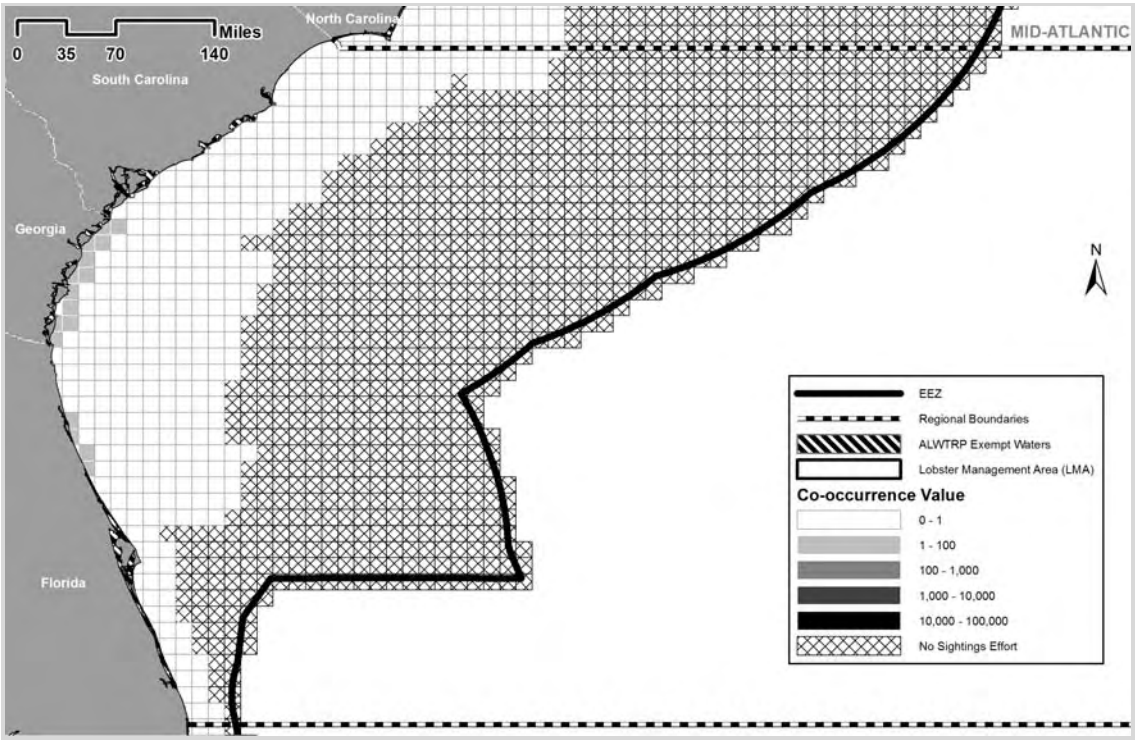


**Southeast–November**




**Southeast–December**



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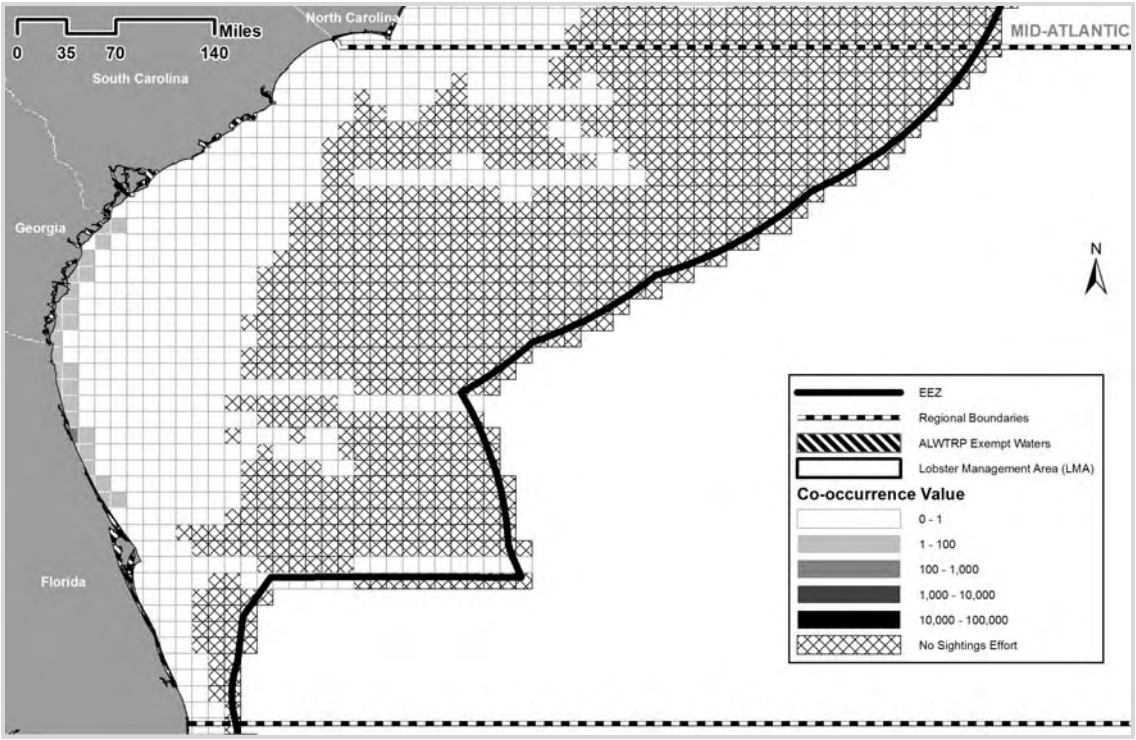


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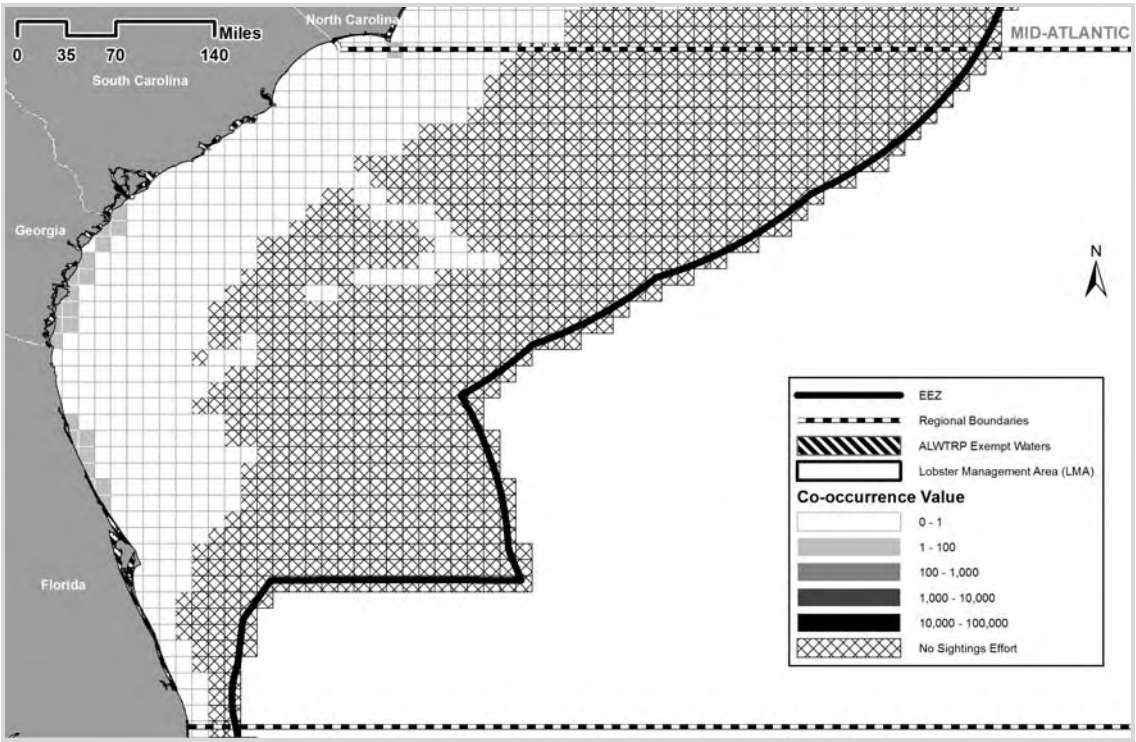

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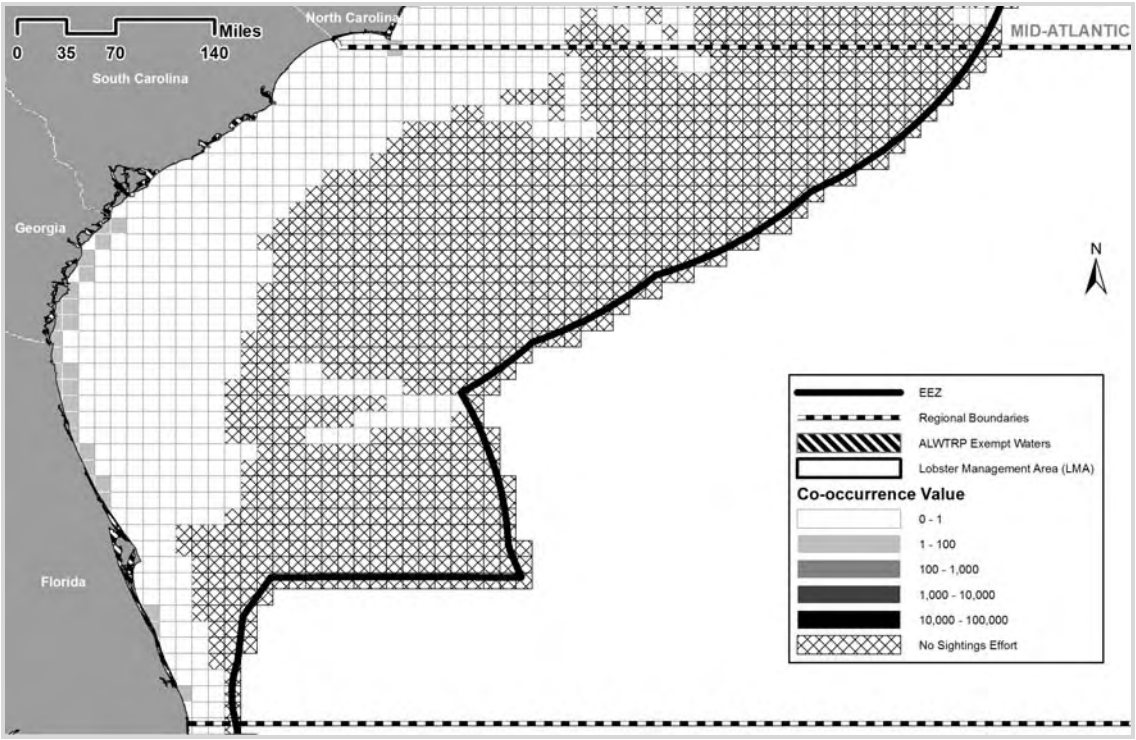


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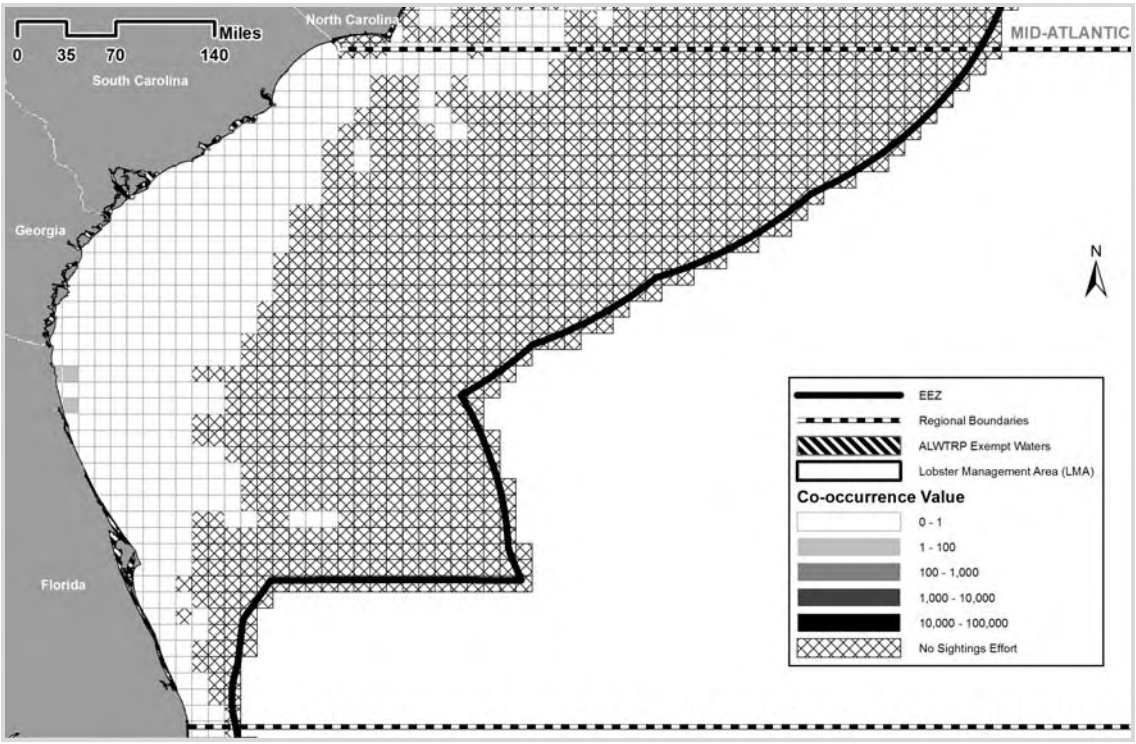

# Appendix 5-B

## SENSITIVITY OF THE CO-OCCURRENCE ANALYSIS TO THE USE OF ADJUSTED WHALE SIGHTINGS VALUES

## INTRODUCTION

The analysis presented in Chapter 5 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 both baseline co-occurrence scores and the impact of alternative management measures. 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.[1] 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, extended it to address both of the issues noted above, and employed the approach to investigate how the use of adjusted sightings data would influence evaluation of the potential impact of vertical line management measures. 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.[2] 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:

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[1] 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.

[2] Email communication with Dr. Robert Kenney, University of Rhode Island, July 27, 2012.

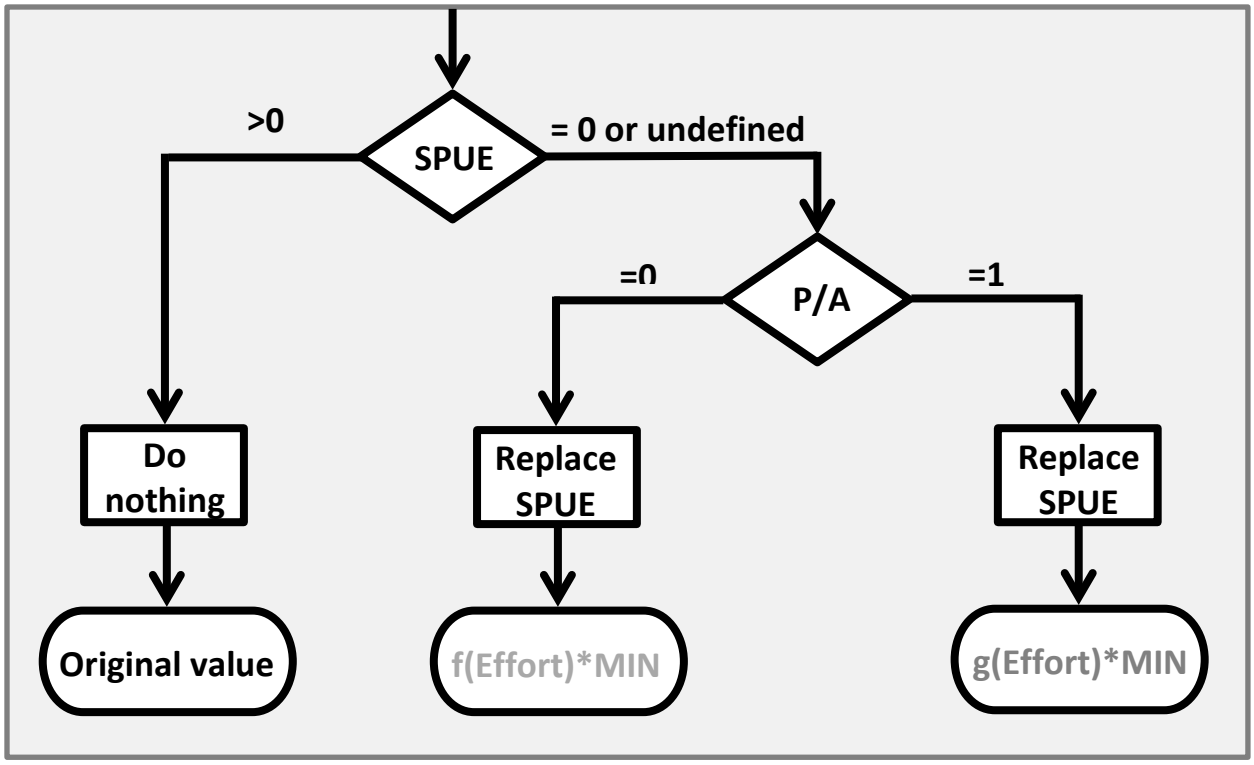
- Adjusted sightings values are developed for each month, based on multiple years of opportunistic sightings data;
- Adjusted values are developed and assigned at the same spatial resolution as SPUE scores (i.e., 10-minute by 10-minute grid cells);
- Adjusted sightings values are independently developed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

## 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 5B-1 presents a flow chart that summarizes these steps.

**Exhibit 5B-1**

**OVERVIEW OF ANALYTIC APPROACH**




[3] The adjusted sightings value for the two species combined is the sum of the adjusted values assigned to the individual species.

**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.[4] 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.[5]

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

[5] Retaining records for which the reliability of the sighting was not recorded expands the dataset to include the use of NMFS aerial survey records.

**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.

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;[6]
- For humpback whales, the analysis employs the winter minimum value for the winter and the spring minimum value for the spring, summer and fall.[7]

These minima are shown in Exhibit 5B-2.

[6] 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.

[7] This approach is consistent with Dr. Kenney's recommendation in an email dated 7/27/2012.

**Exhibit 5B-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 5B-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.

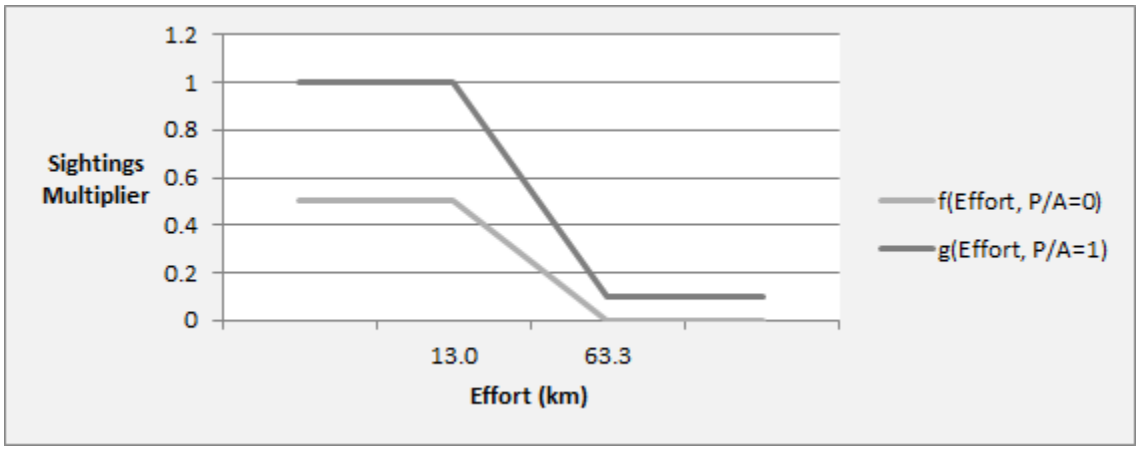
- When P/A = 1; the maximum multiplier applied to MIN SPUE is 1; the minimum multiplier is 0.1.

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.

[8] Expressed in slope-intercept form, these equations are approximately: f(Effort, P/A=0) = -0.01*Effort + 0.63 and g(Effort, P/A=1) = -0.018*Effort + 1.234.

**Exhibit 5B-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 5B-1 shows the impact of the analysis on the combined sightings score for right whales and humpback whales in Northeast waters, while Attachment 5B-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 Narragannsett 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.

Attachment 5B-3 summarizes the impact of the adjusted sightings values on the evaluation of the regulatory alternatives that NMFS is considering. The attachment includes three tables, all of which show (a) the impact of each alternative on co-occurrence in waters that are subject to the ALWTRP *seaward of the exemption line for the sinking groundline requirement*; and (b) the impact of each alternative on co-occurrence in all waters subject to the ALWTRP, *including those that are exempt from the sinking groundline requirements*. As the tables indicate, the use of adjusted sightings values tempers the impact of each management measure on the co-occurrence score. The effect is relatively minor when exempt waters are excluded from the analysis. In this case, the use of adjusted sightings values reduces the estimated impact of each measure on the annual co-occurrence score by no more than 0.3

percent. The impact is greater, however, when exempt waters are included in the analysis, with the net effect, on an annual basis, ranging between 1.6 and 1.9 percent (see Table 5B-3).

As the tables indicate, the use of adjusted sightings values has a similar impact on the estimated effectiveness of Alternatives 2 through 6. As a result, the use of these values rather than the SPUE values employed in the main analysis has no effect on the relative ranking of the alternatives with respect to their impact on co-occurrence. Under all cases considered, Alternative 5 has the greatest estimated impact on co-occurrence, followed in order by Alternative 4, Alternative 6 (Draft) and Alternative 6 (Preferred), Alternative 3, and Alternative 2.

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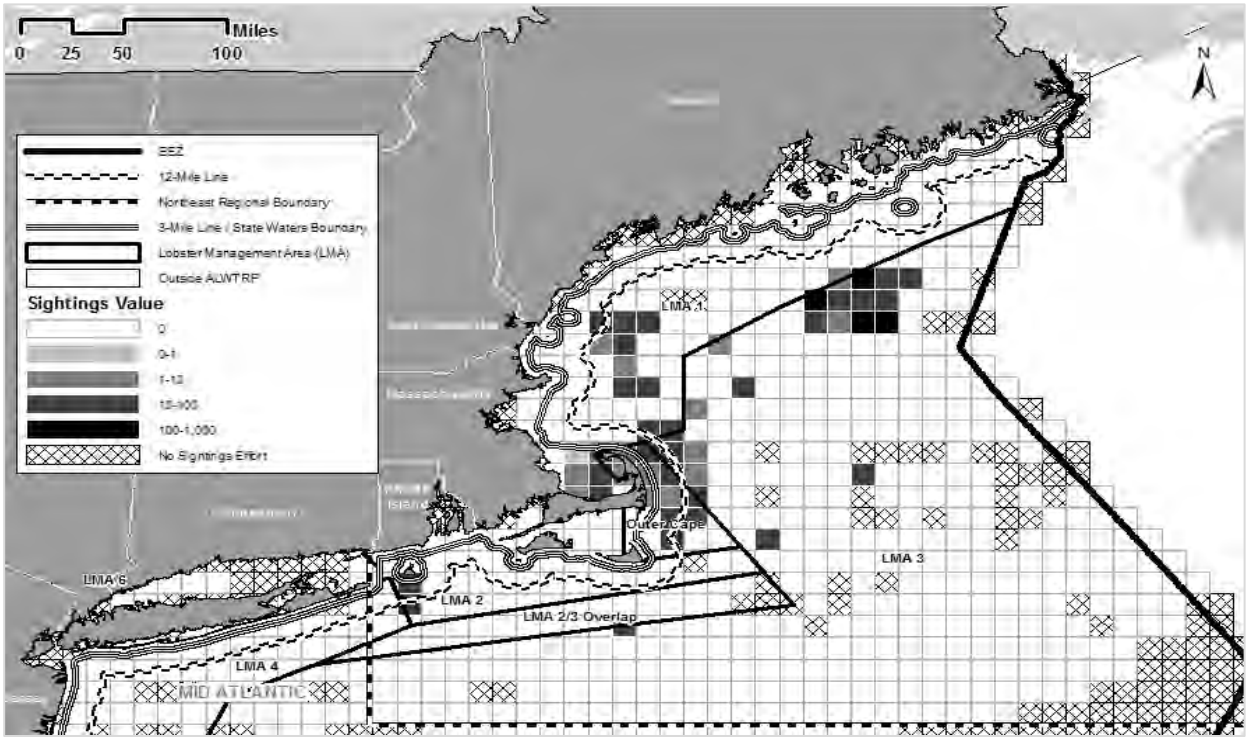
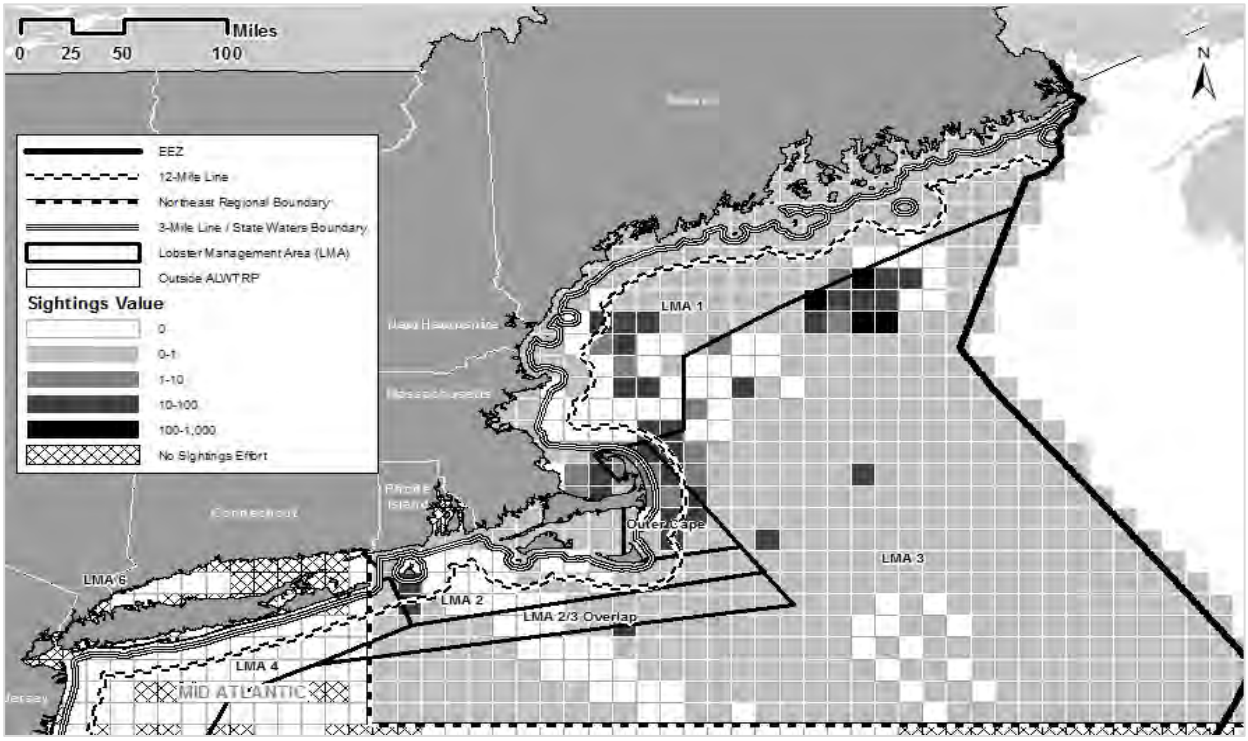
## Attachment 5B-1

## NORTHEAST SIGHTINGS COMPARISON: COMBINED RIGHT/HUMPBACK WHALE

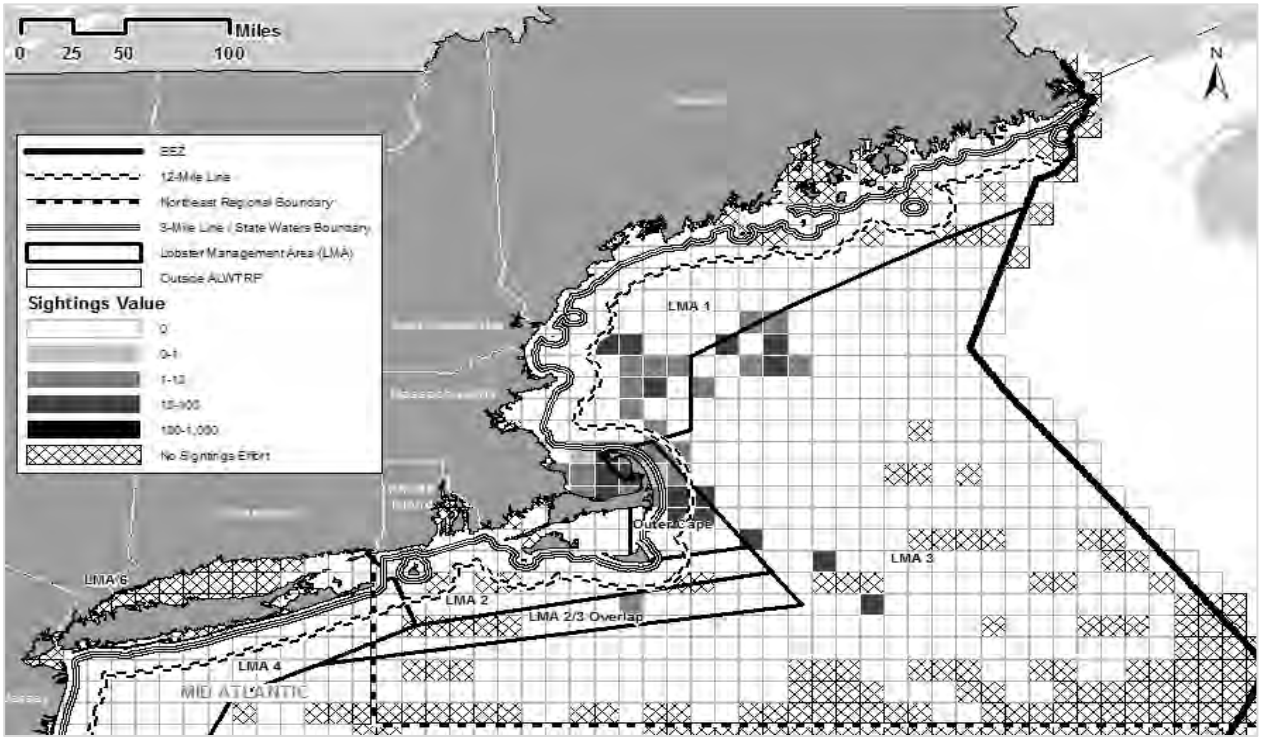
## JANUARY - SPUE



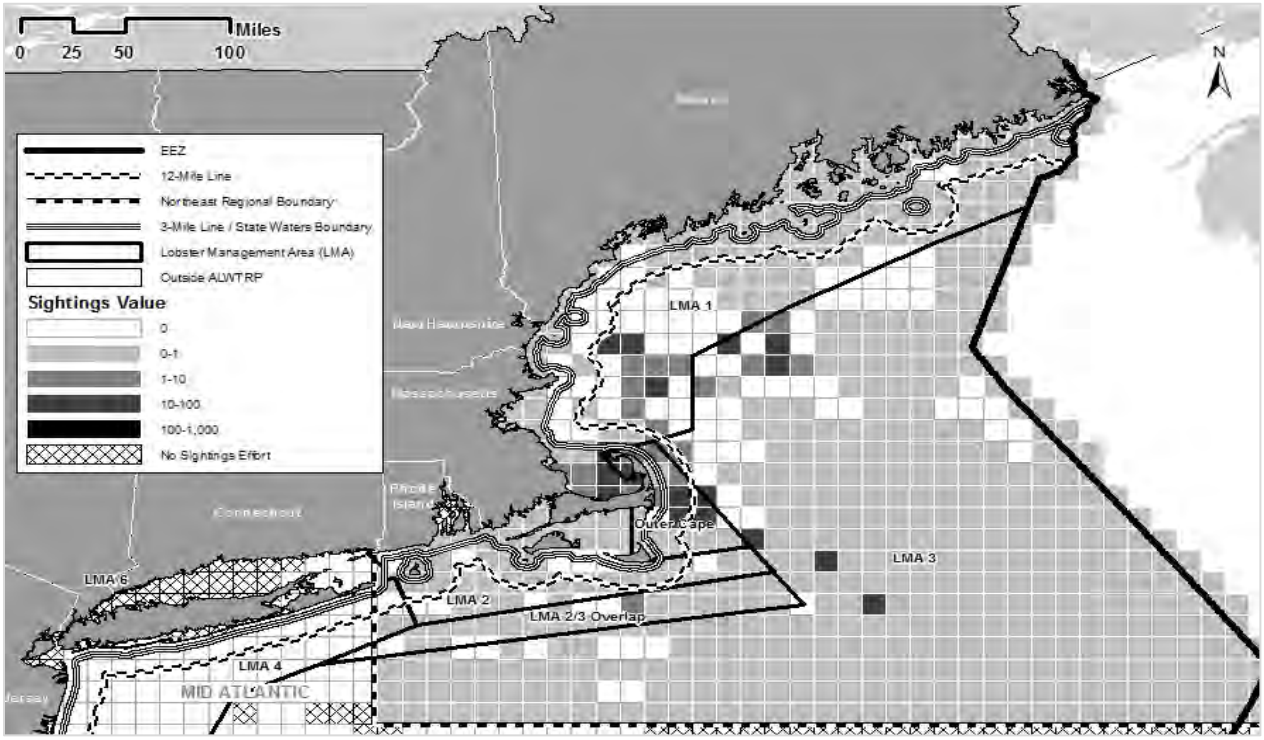

## JANUARY – ADJUSTED SIGHTINGS



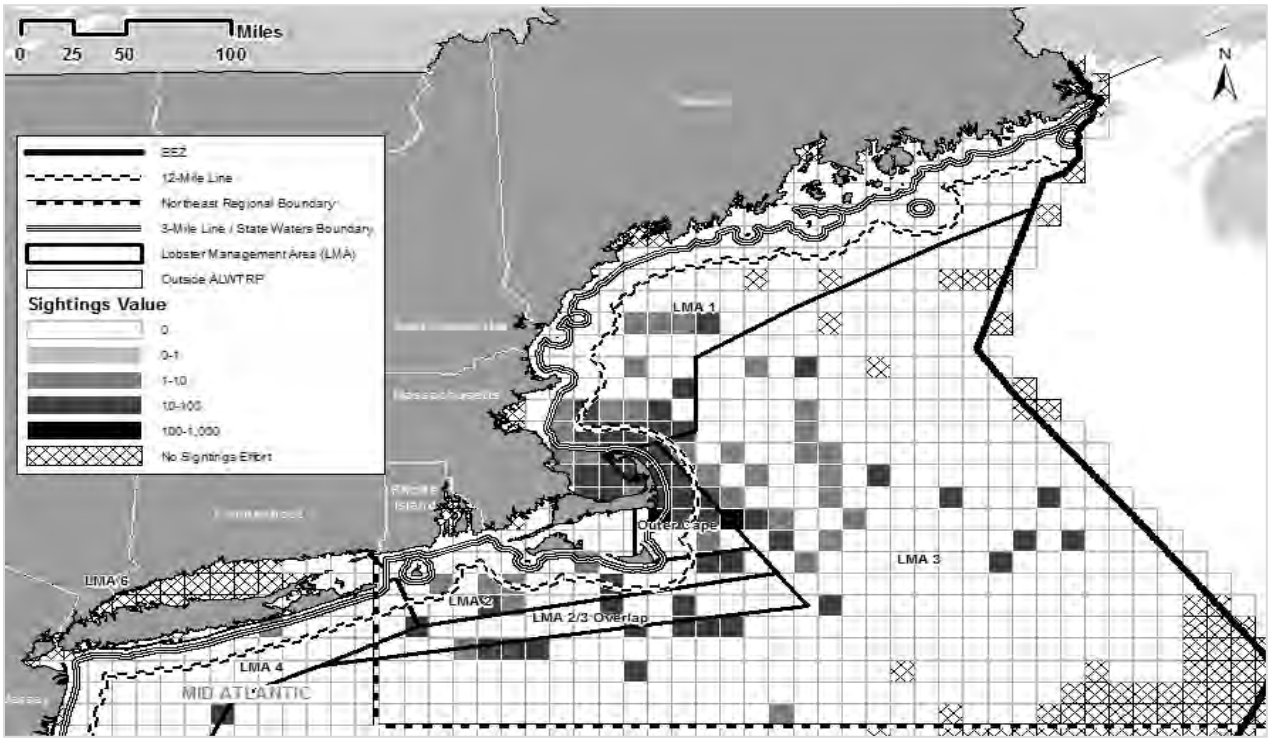
## FEBRUARY – SPUE



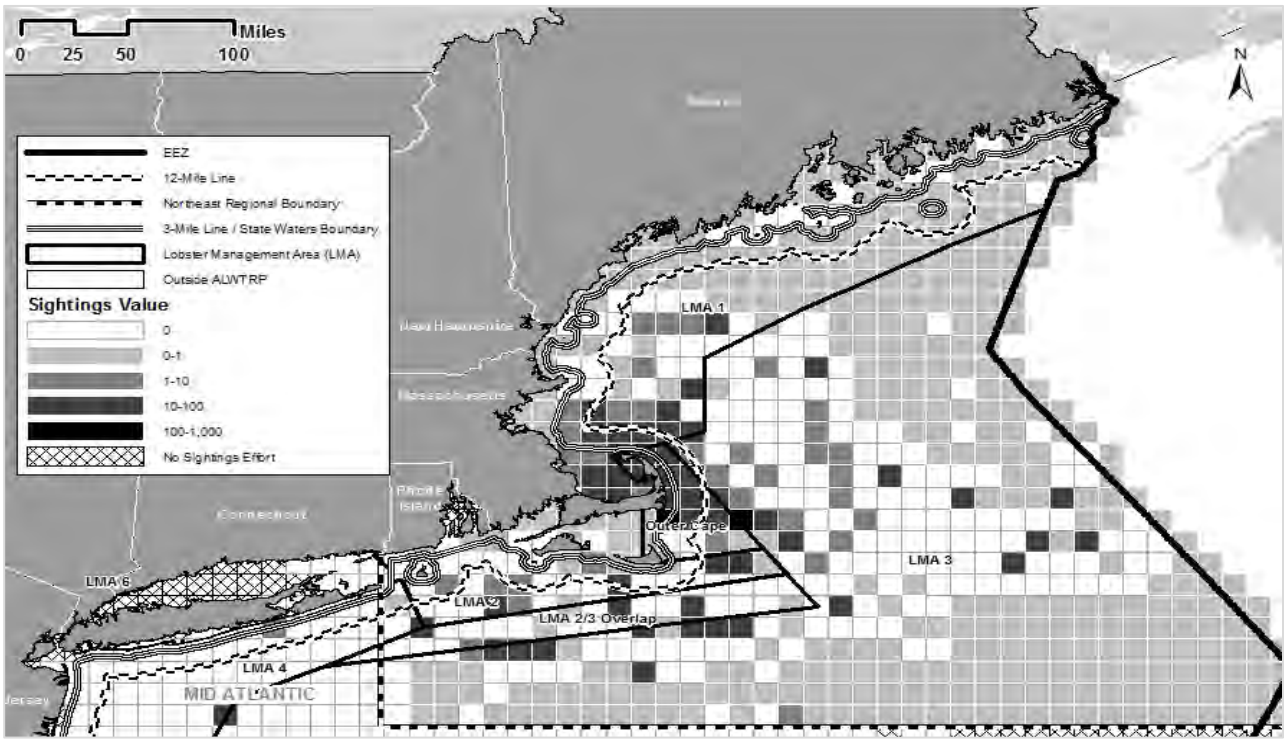

## FEBRUARY – ADJUSTED SIGHTINGS



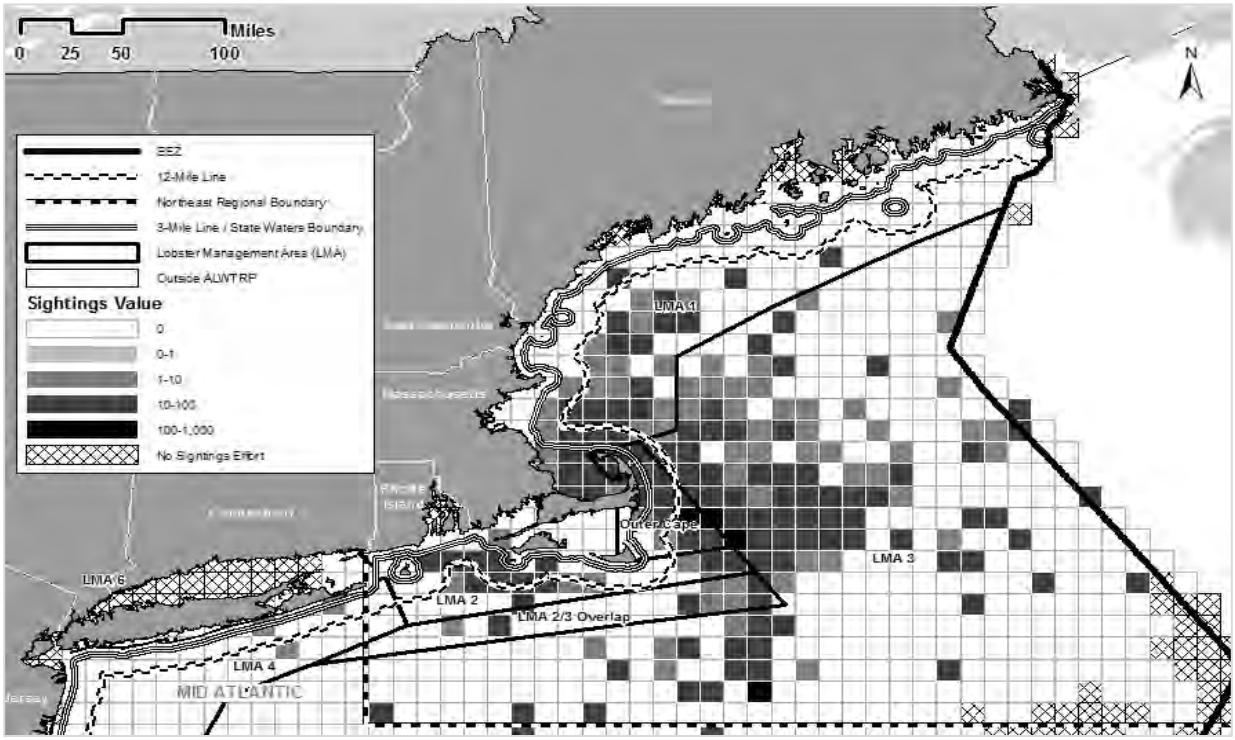
## MARCH – SPUE



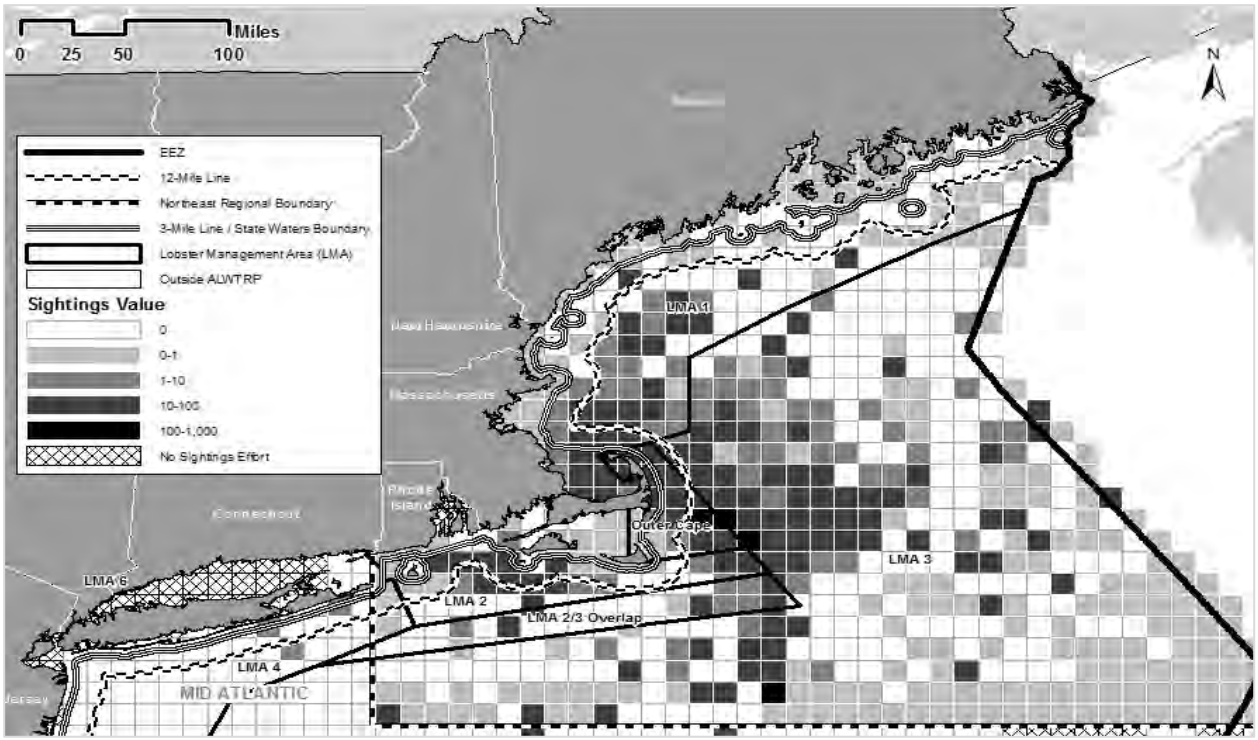

## MARCH – ADJUSTED SIGHTINGS



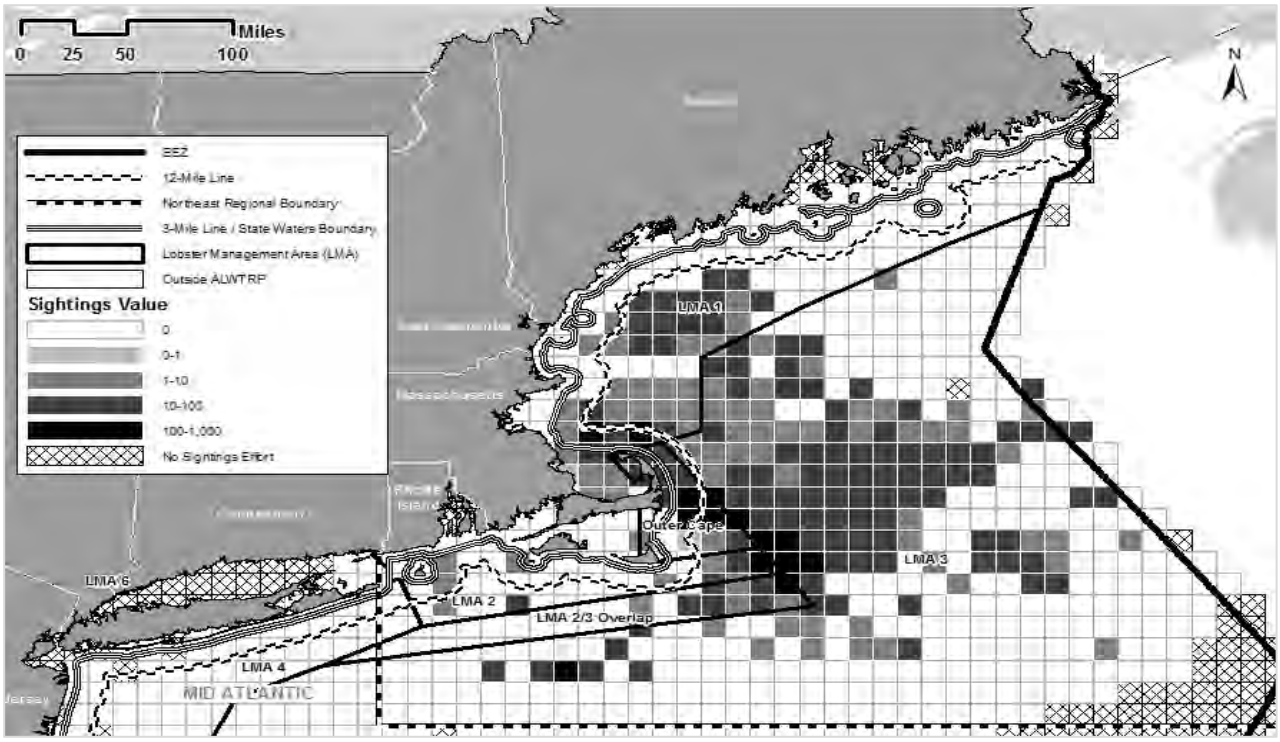
## APRIL – SPUE



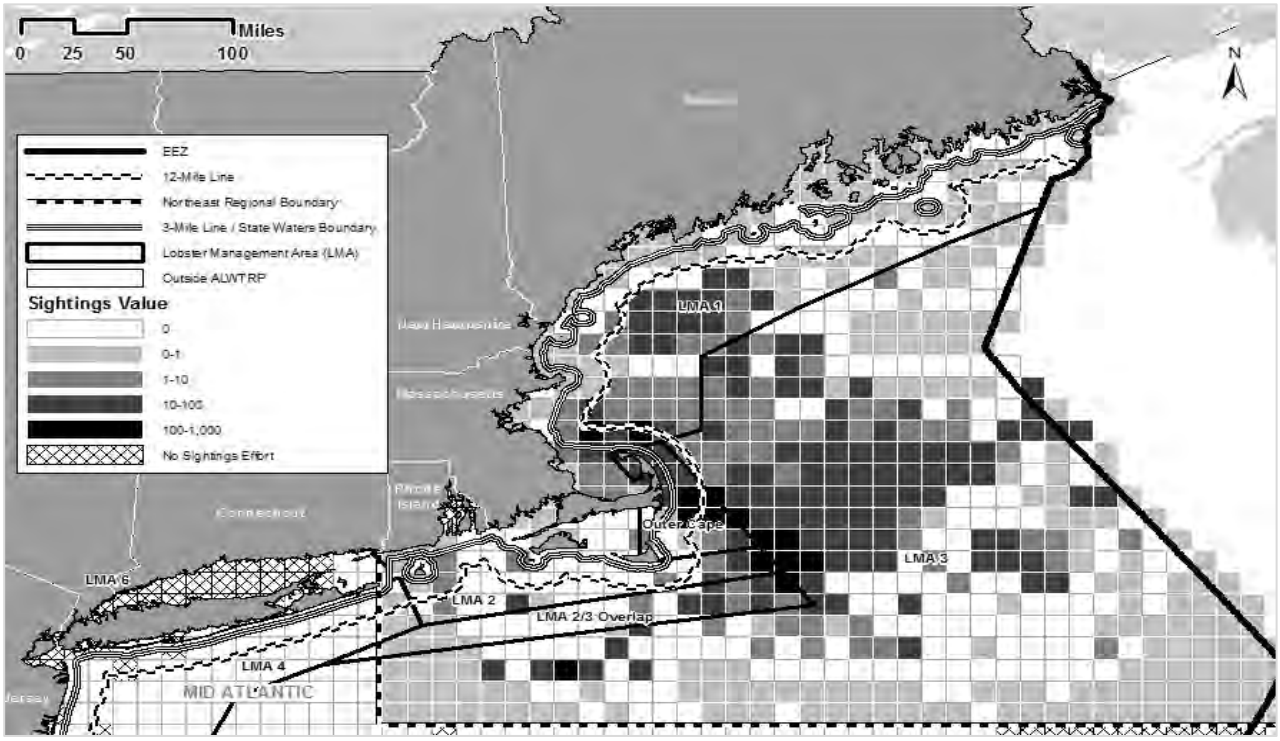

## APRIL – ADJUSTED SIGHTINGS



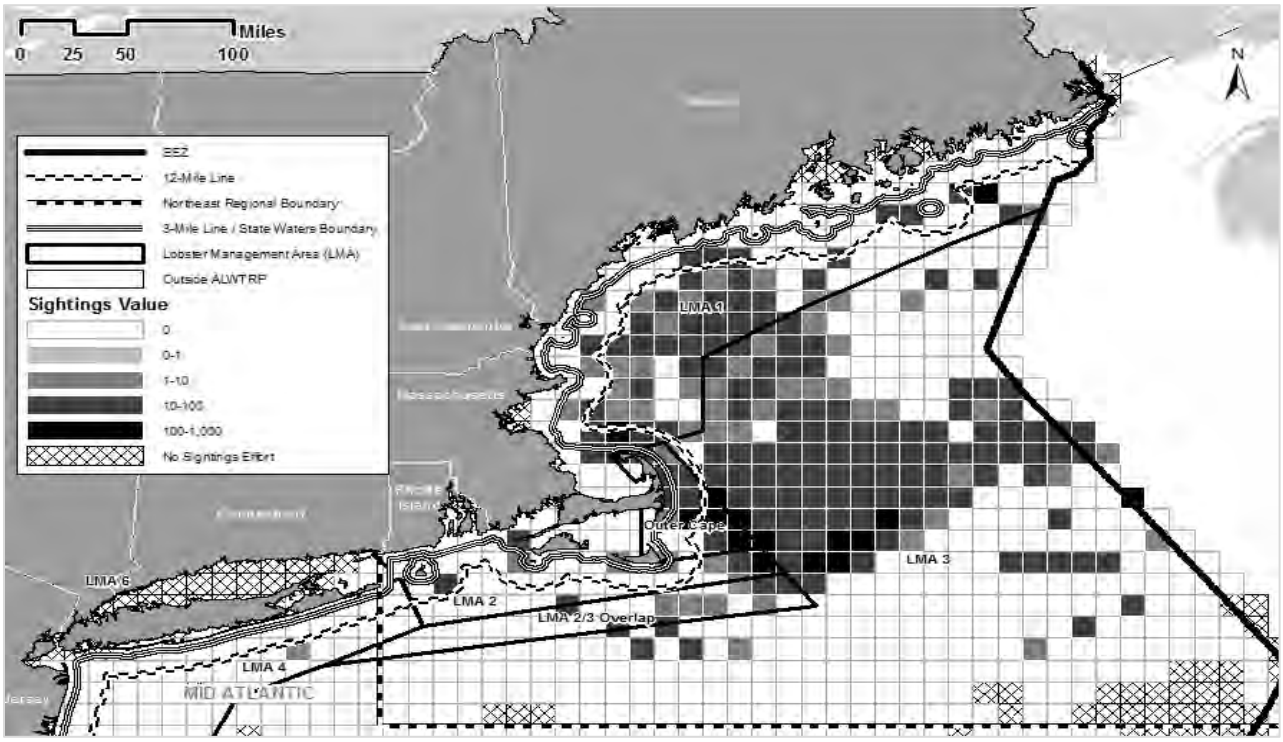
## MAY – SPUE



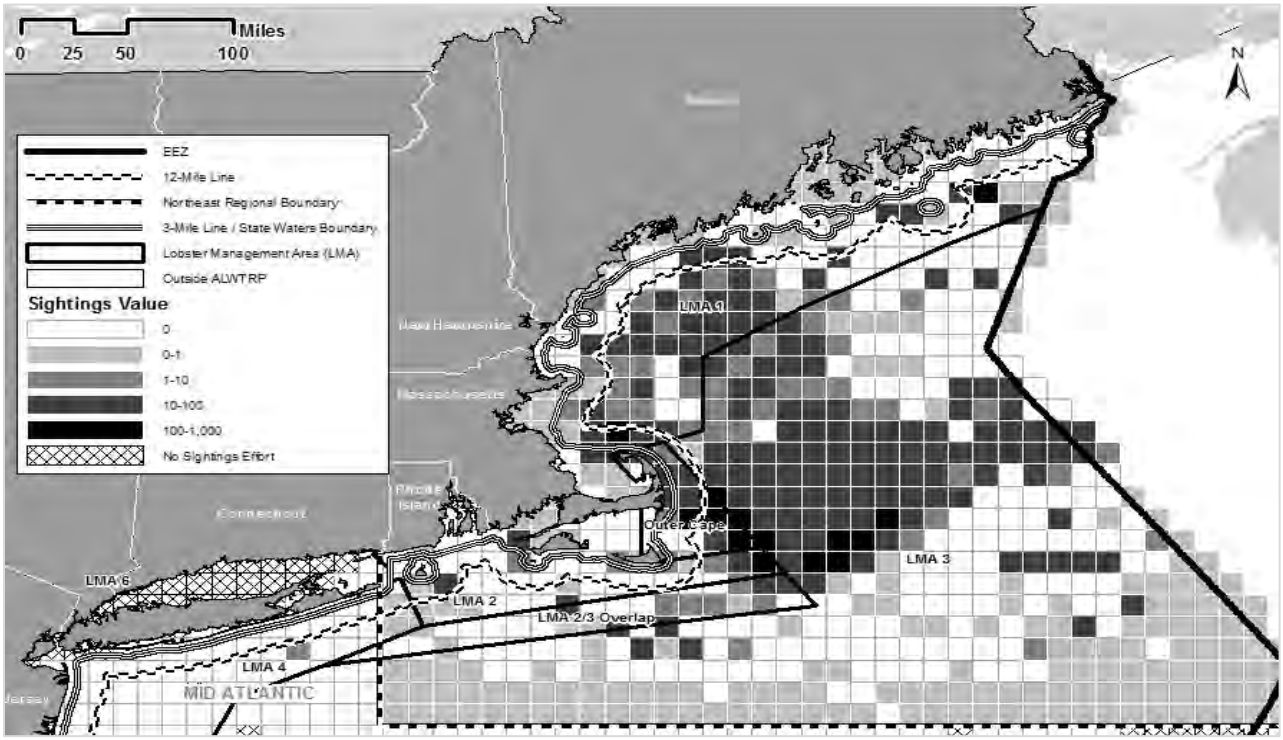

## MAY – ADJUSTED SIGHTINGS



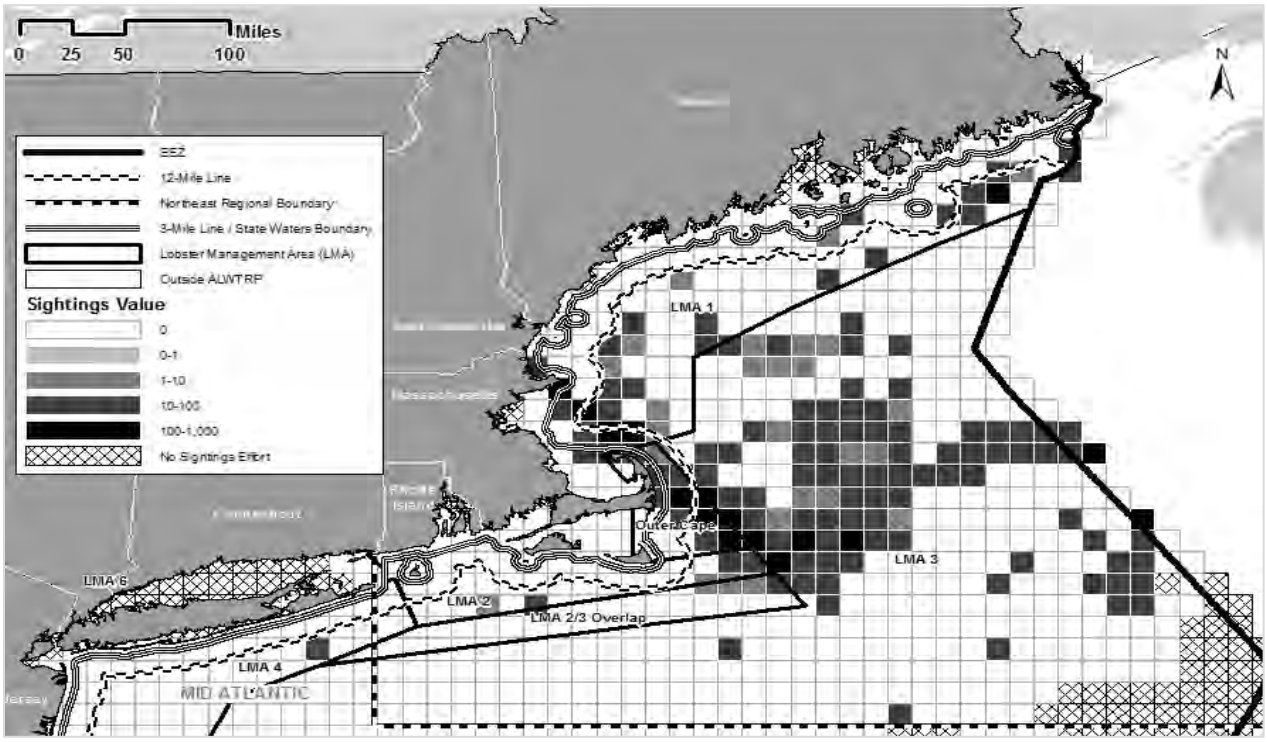
## JUNE – SPUE



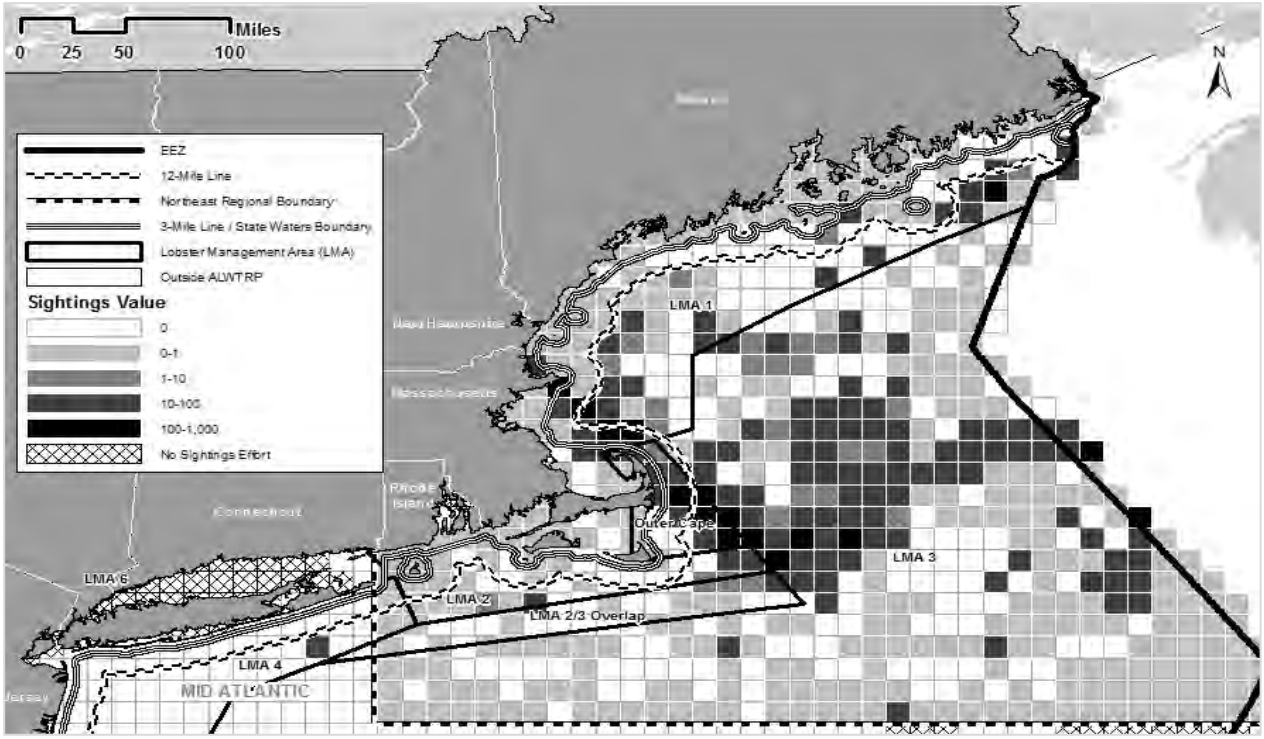

## JUNE – ADJUSTED SIGHTINGS



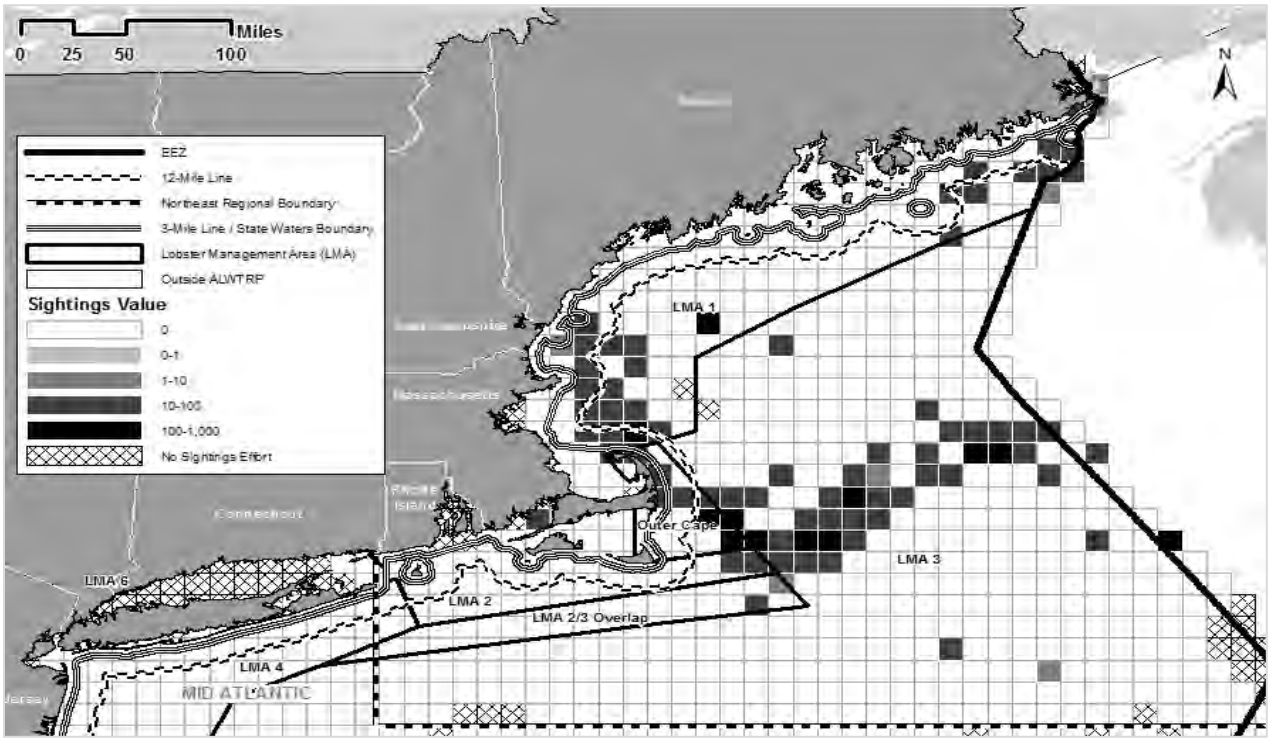
## JULY – SPUE



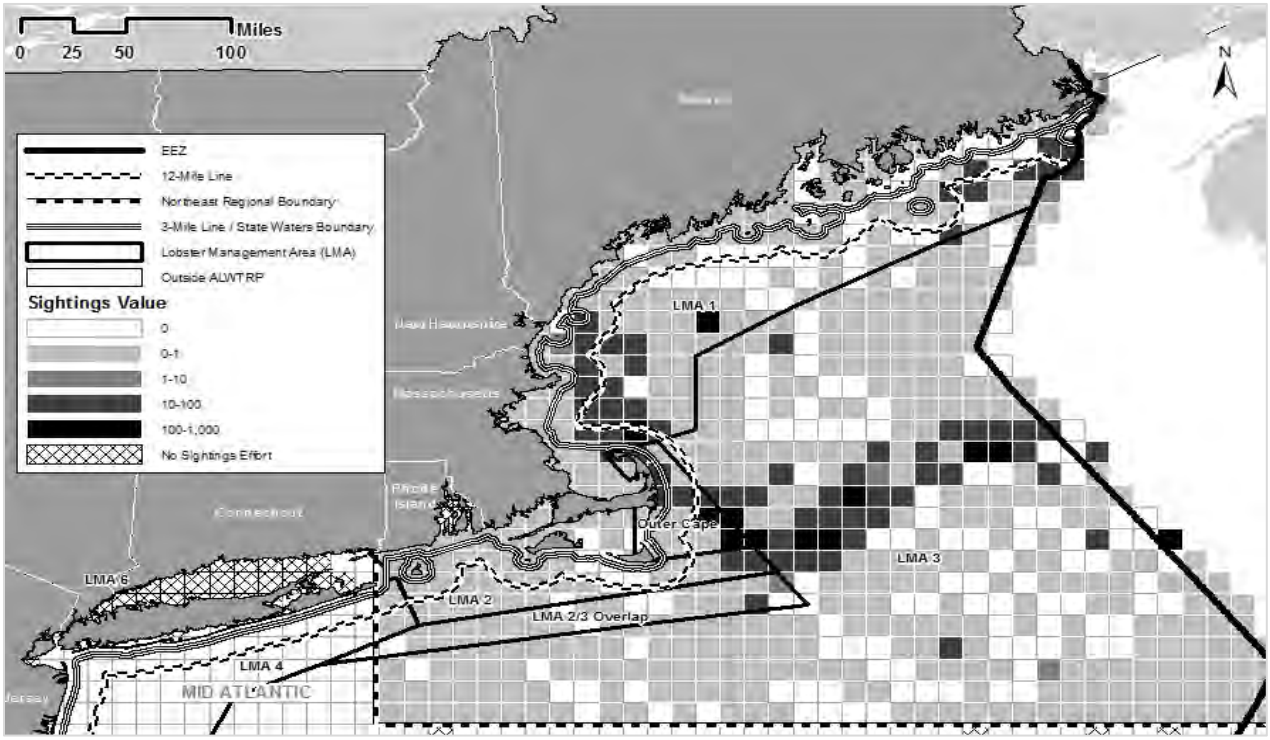

## JULY – ADJUSTED SIGHTINGS



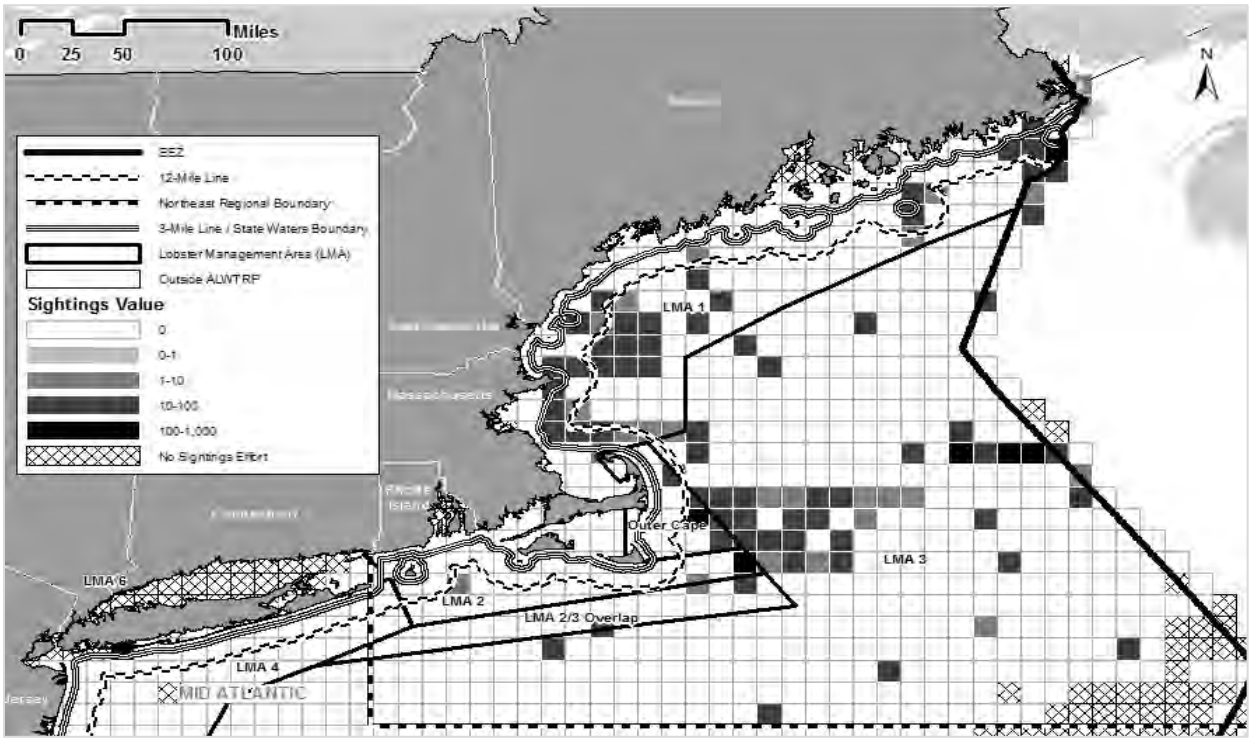
## AUGUST – SPUE



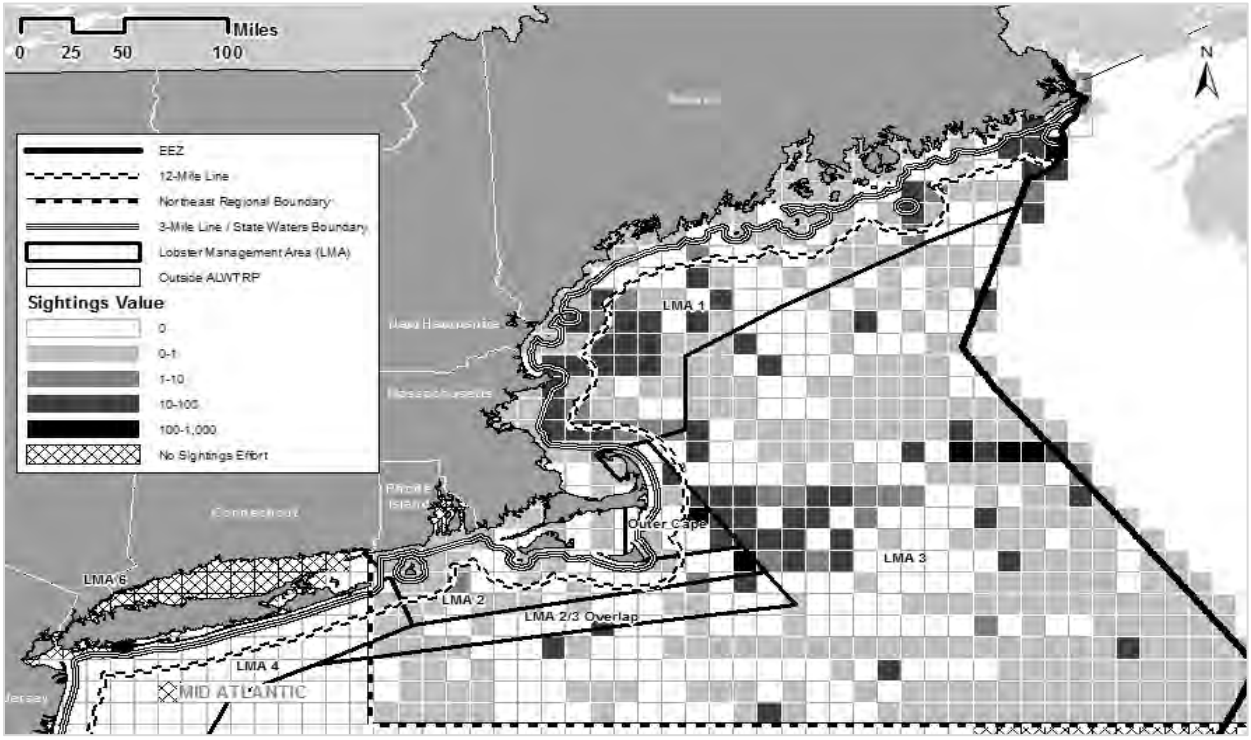

## AUGUST – ADJUSTED SIGHTINGS



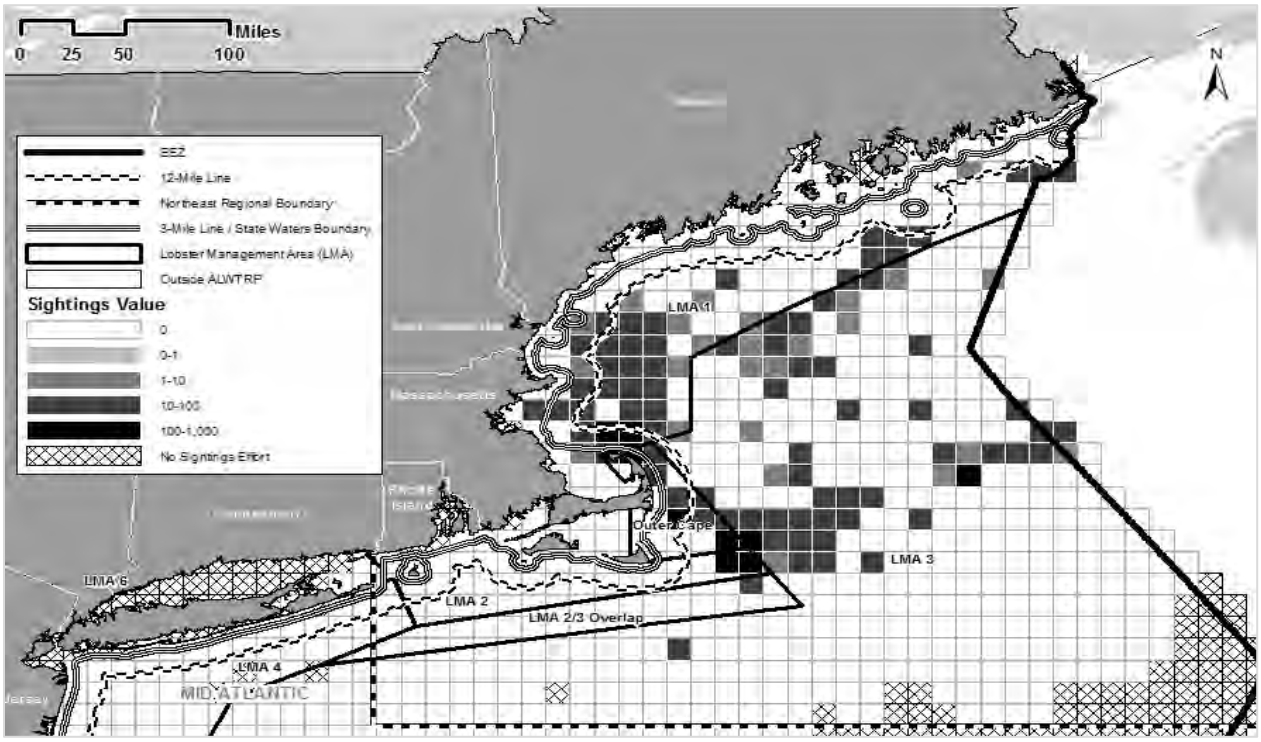
## SEPTEMBER – SPUE



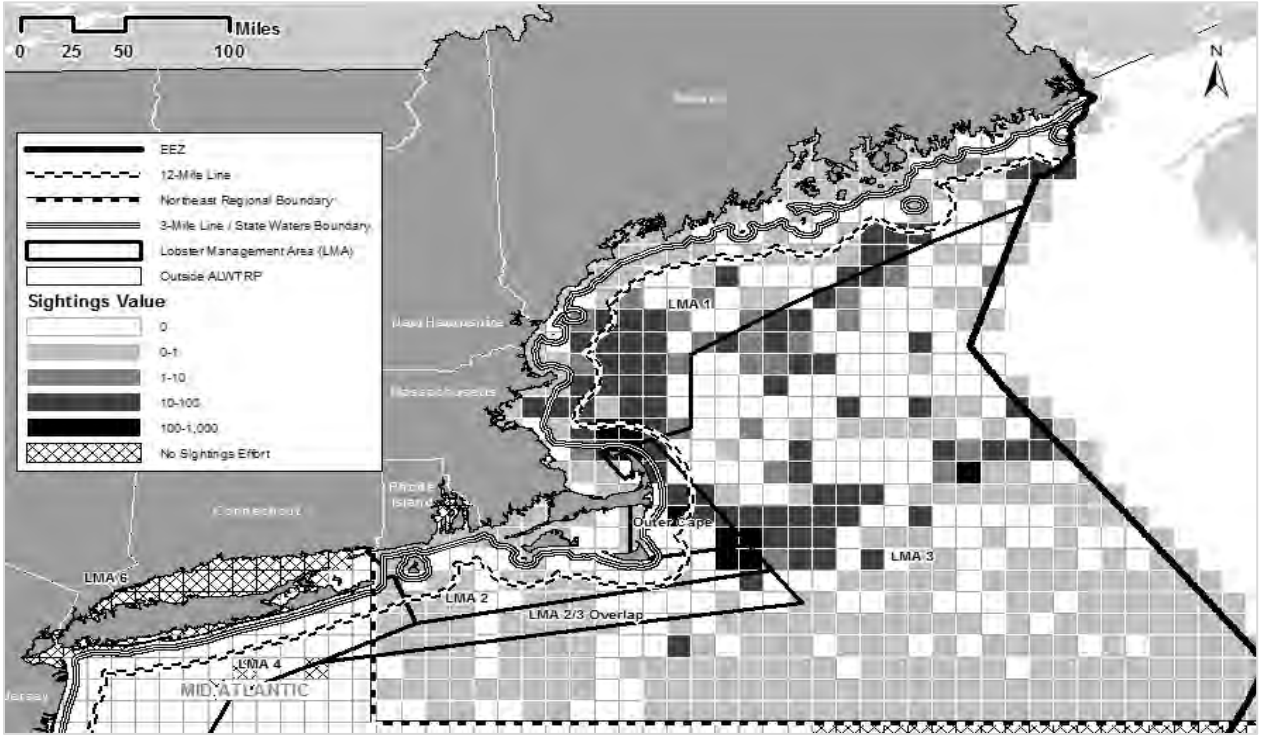

## SEPTEMBER – ADJUSTED SIGHTINGS



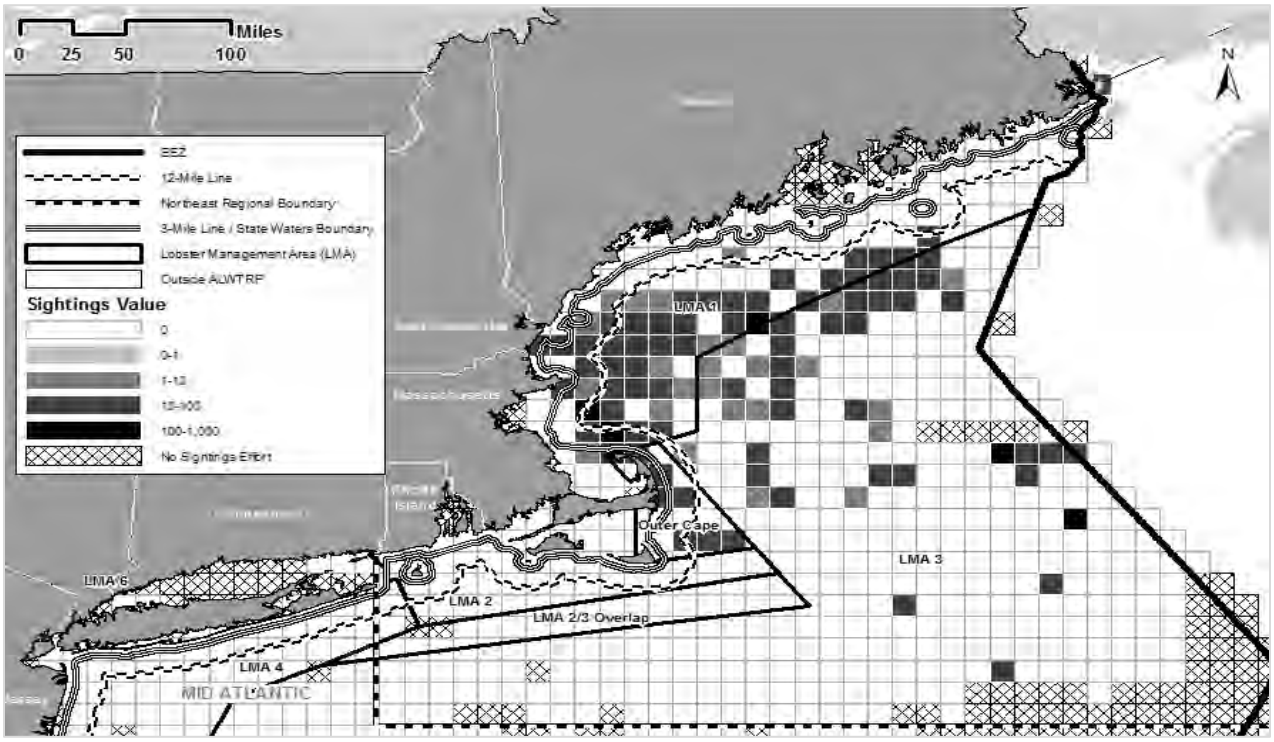
## OCTOBER – SPUE



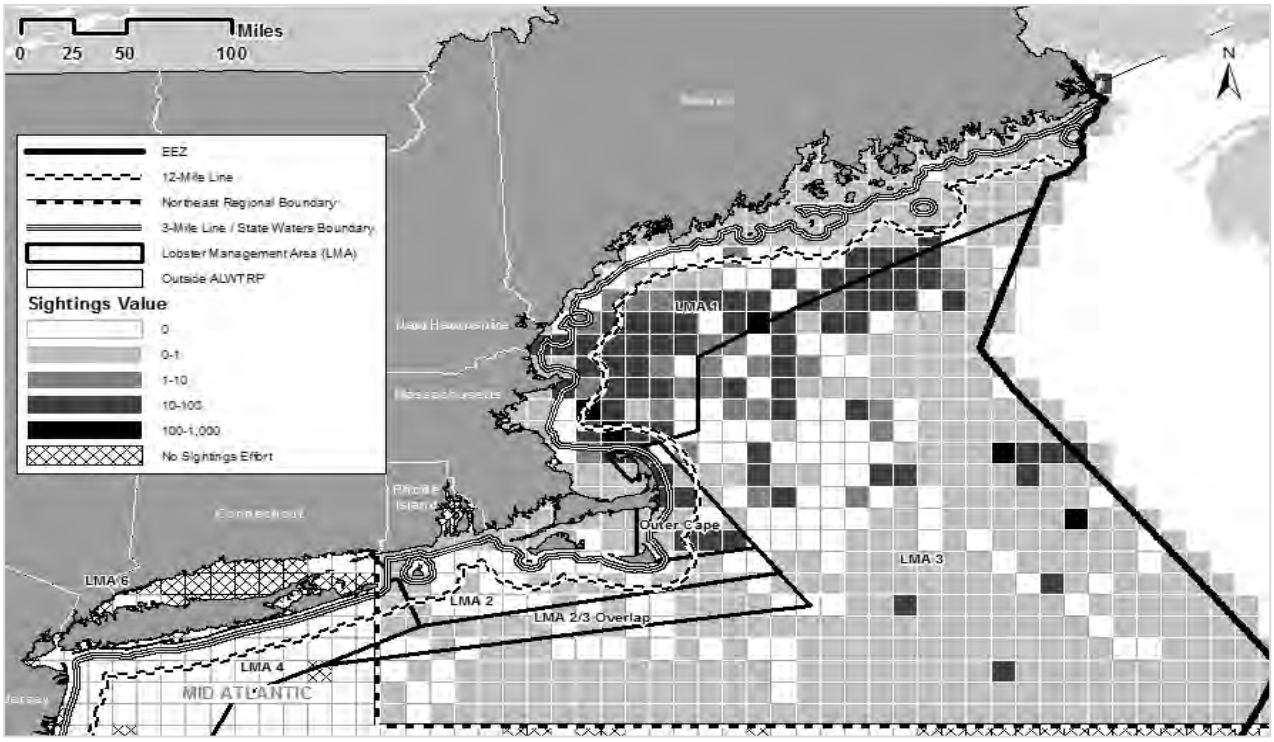

## OCTOBER – ADJUSTED SIGHTINGS



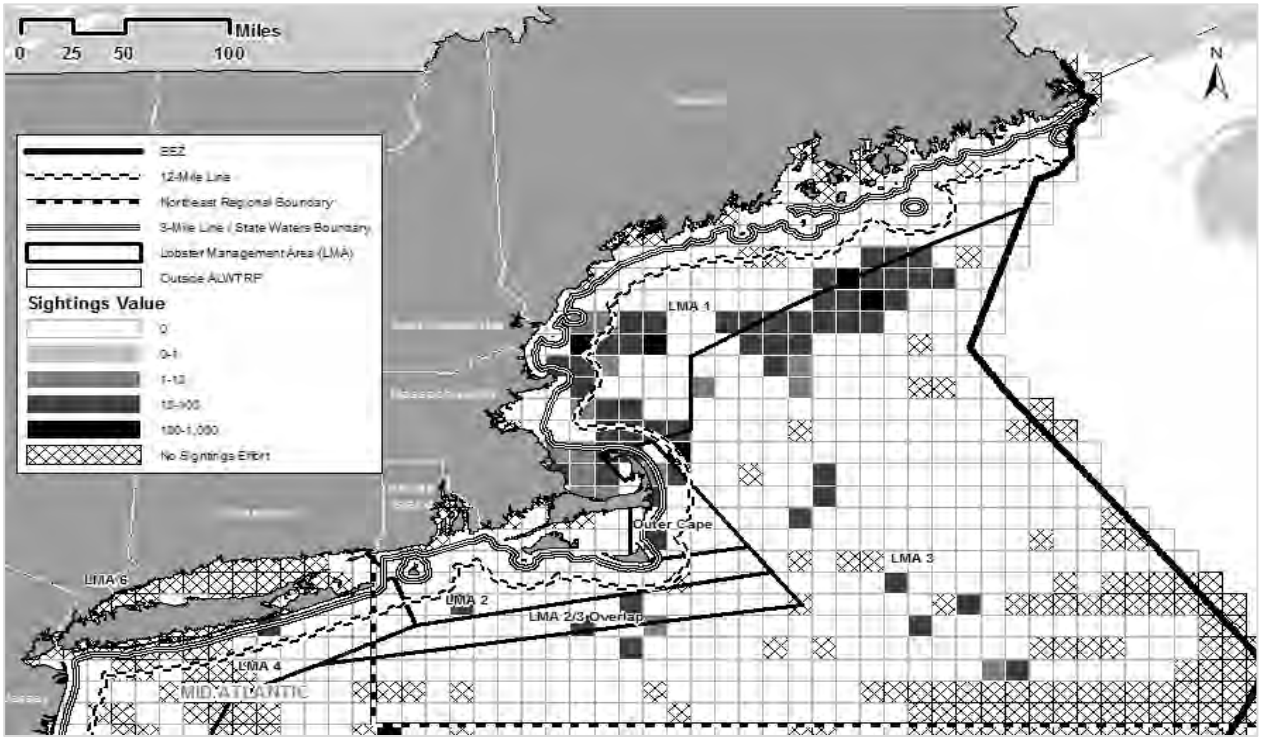
## NOVEMBER – SPUE



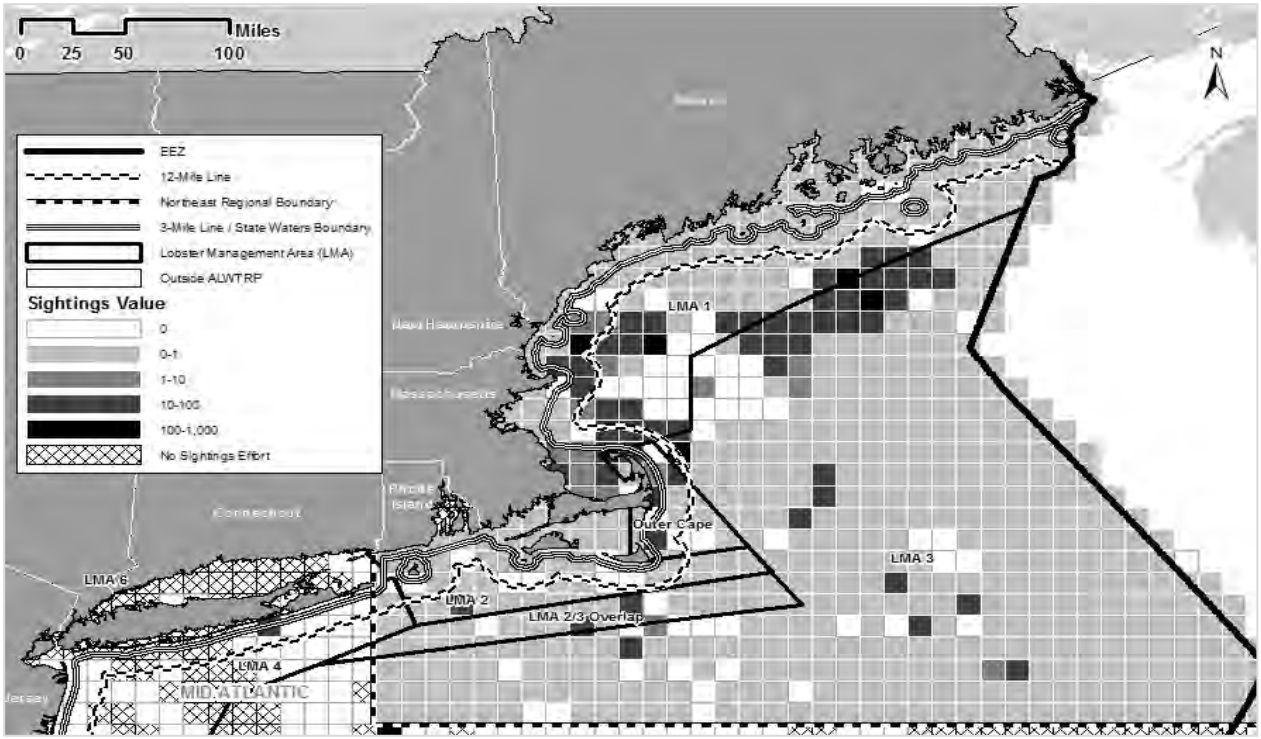

## NOVEMBER – ADJUSTED SIGHTINGS



## DECEMBER – SPUE



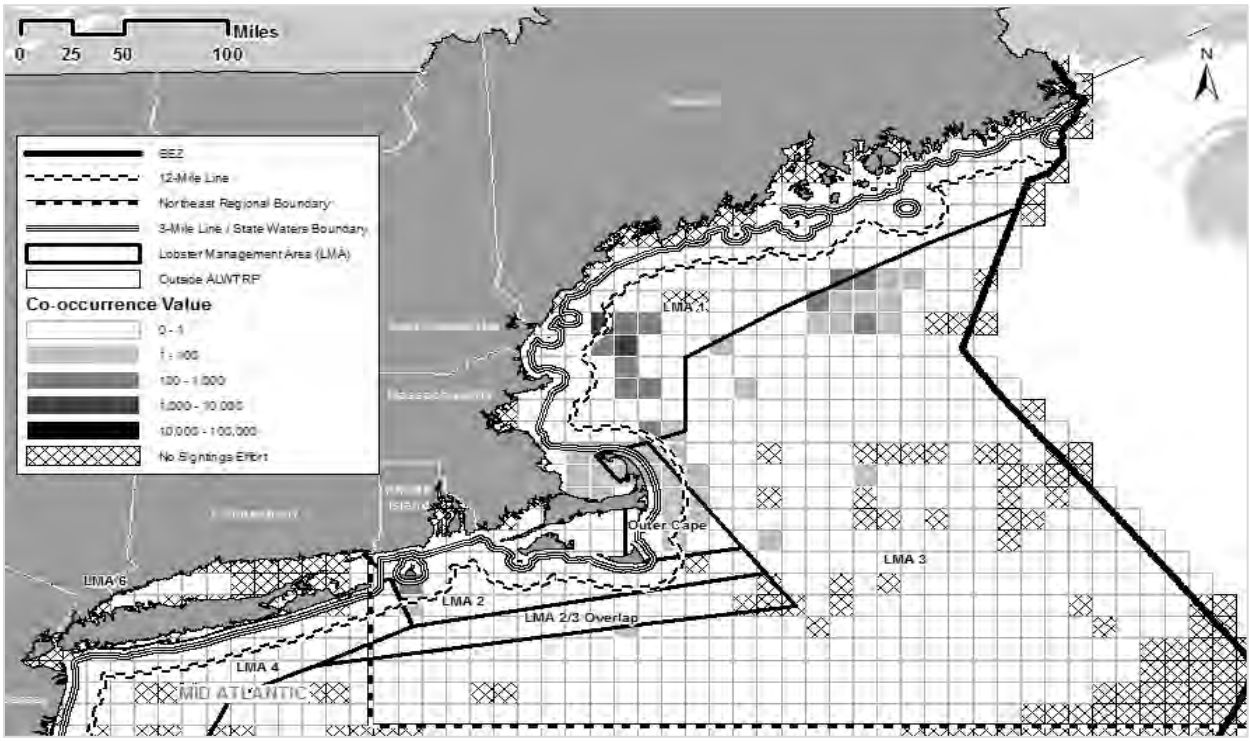

## DECEMBER – ADJUSTED SIGHTINGS



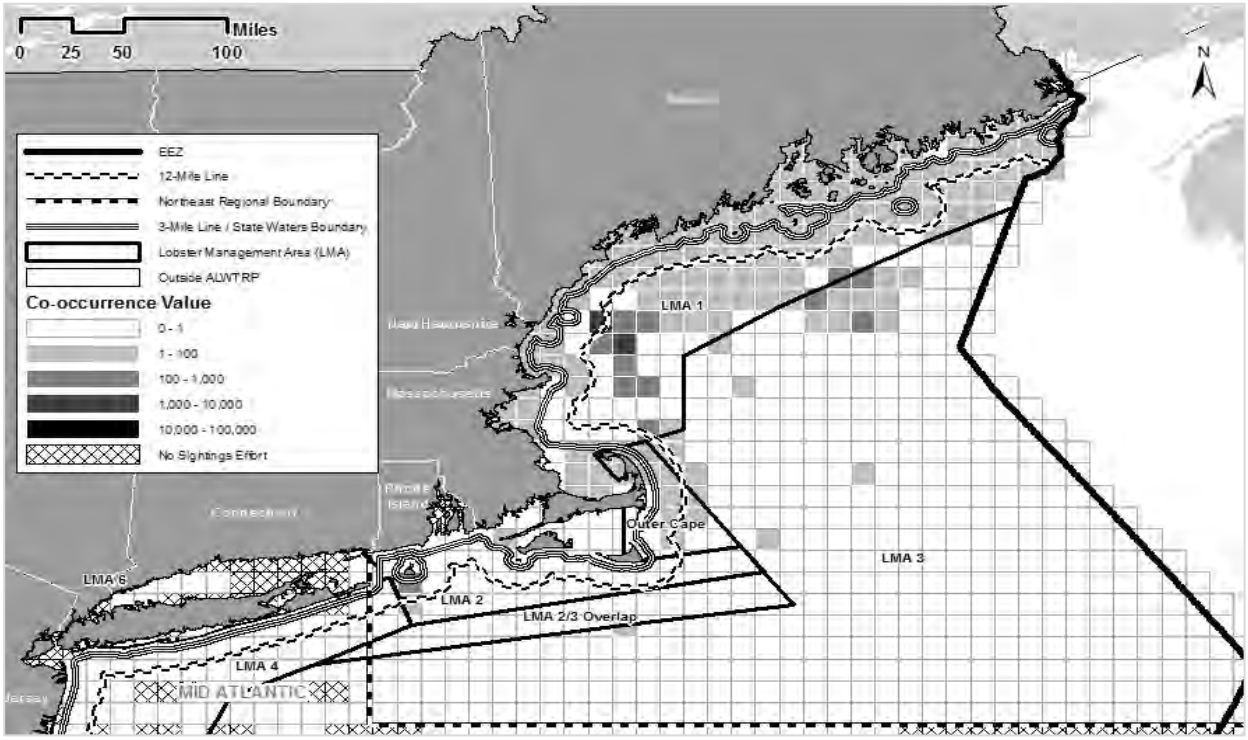
# ATTACHMENT 5B-2

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

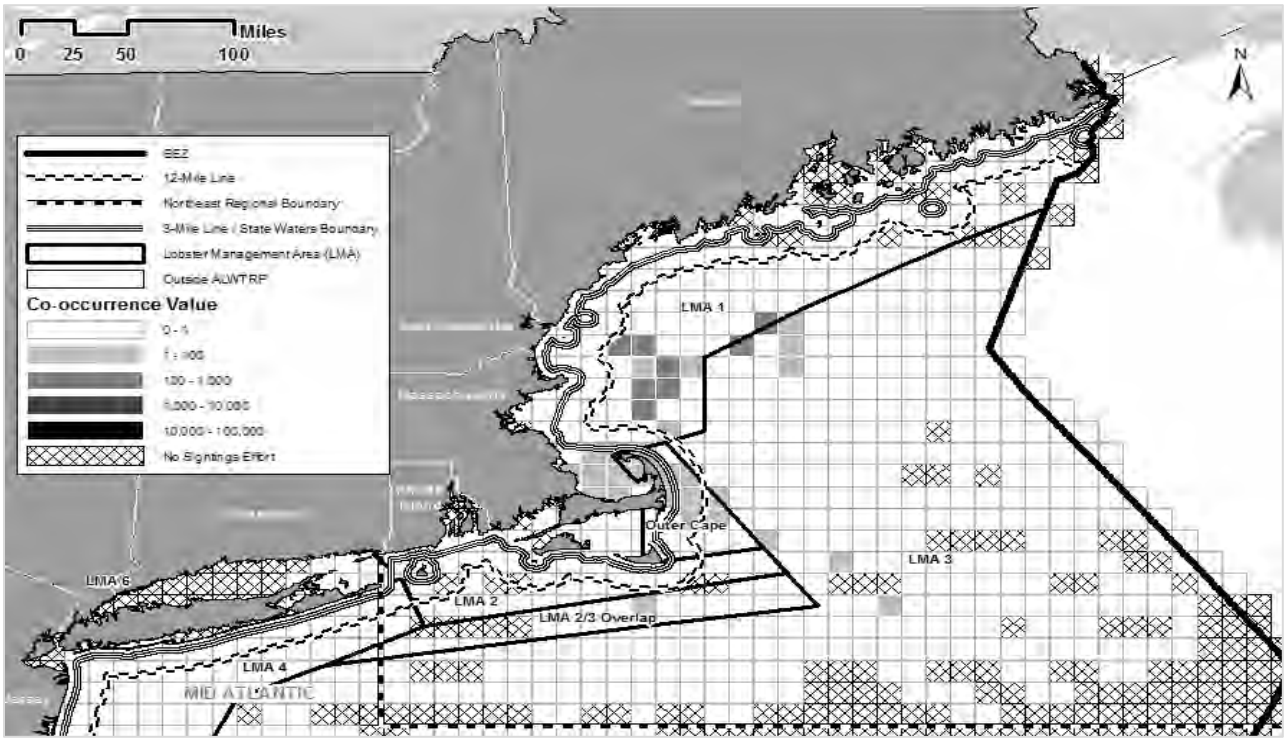
## JANUARY – CO-OCCURRENCE BASED ON SPUE



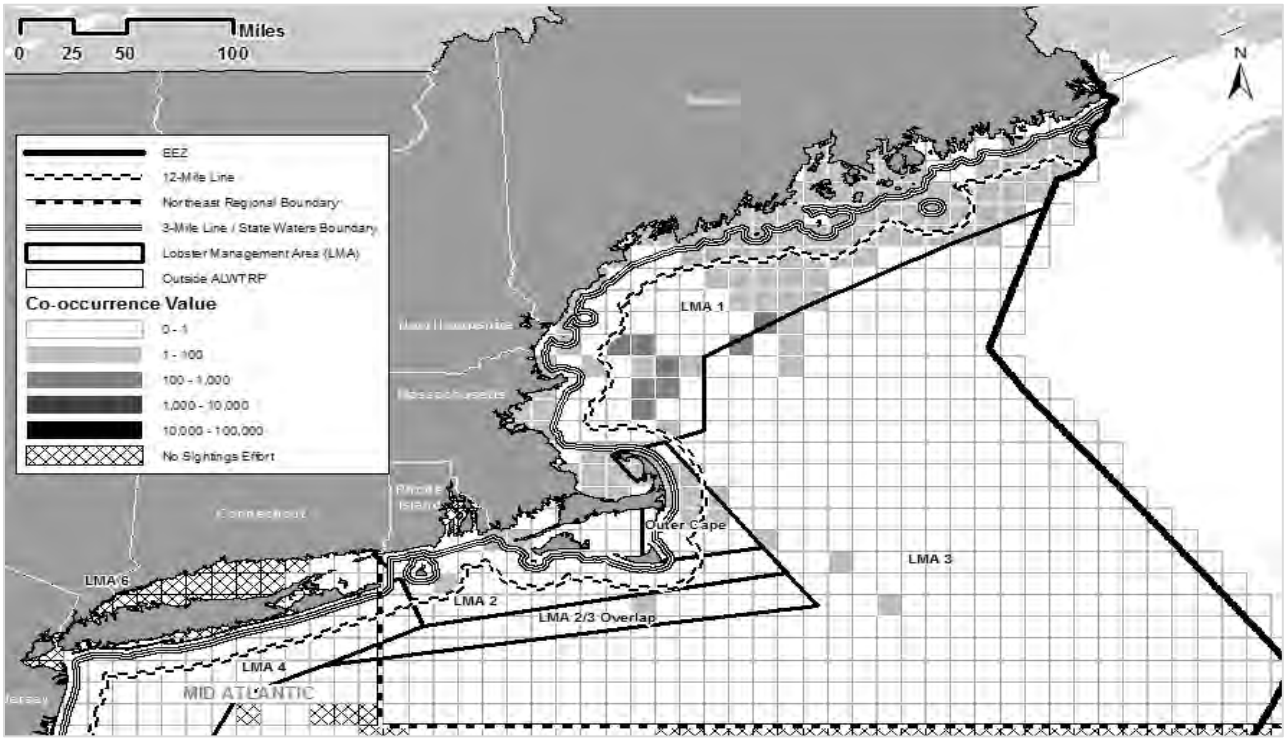

## JANUARY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



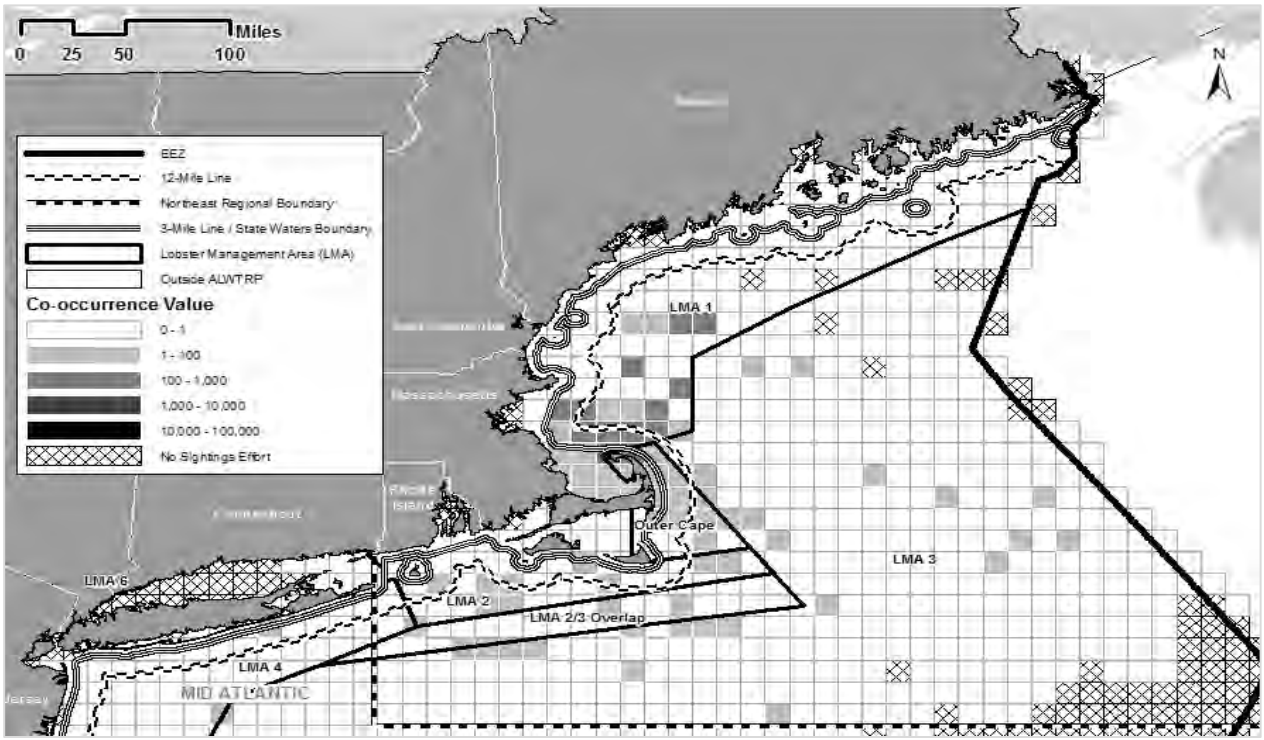
## FEBRUARY – CO-OCCURRENCE BASED ON SPUE



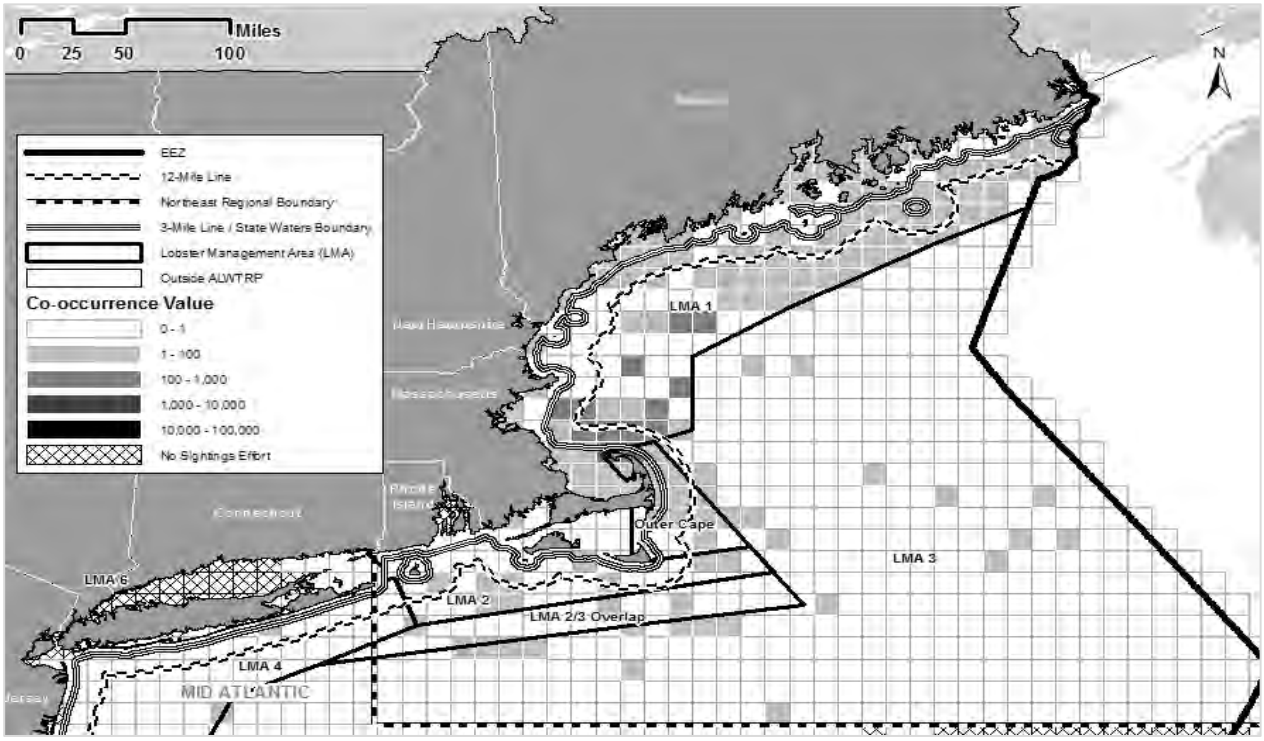

## FEBRUARY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



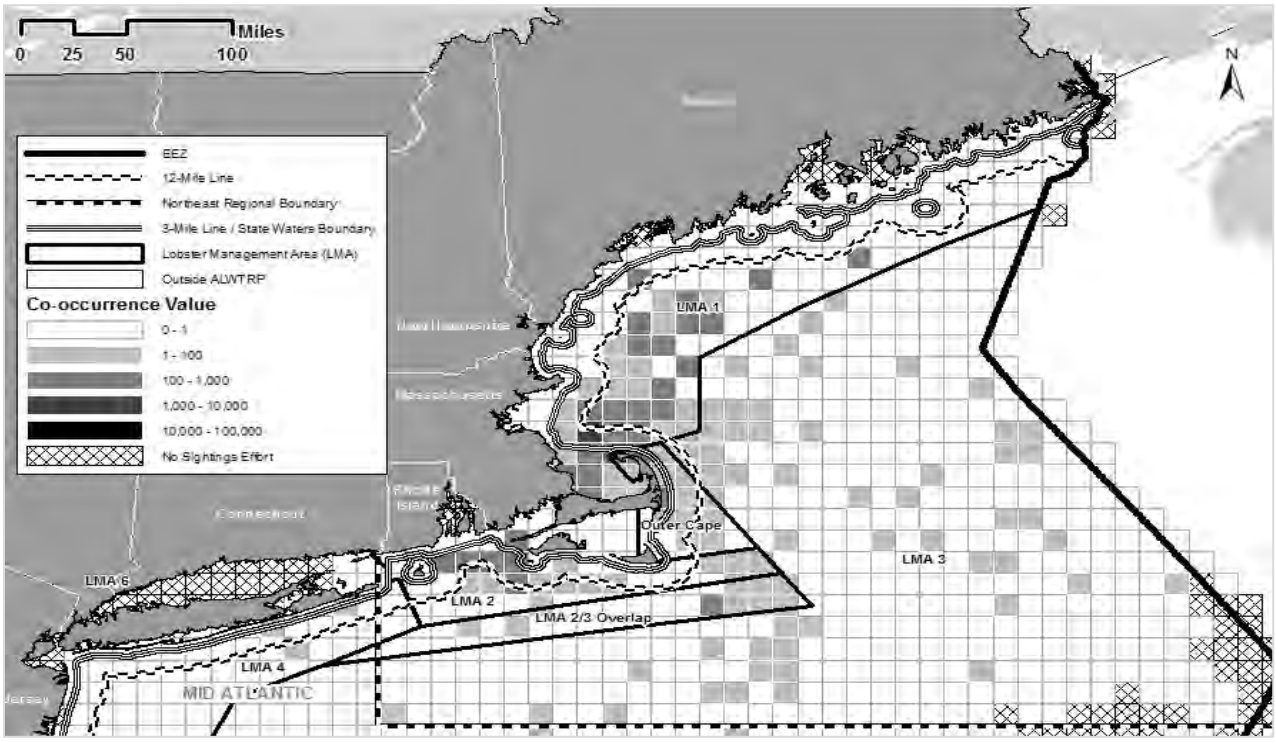
## MARCH – CO-OCCURRENCE BASED ON SPUE



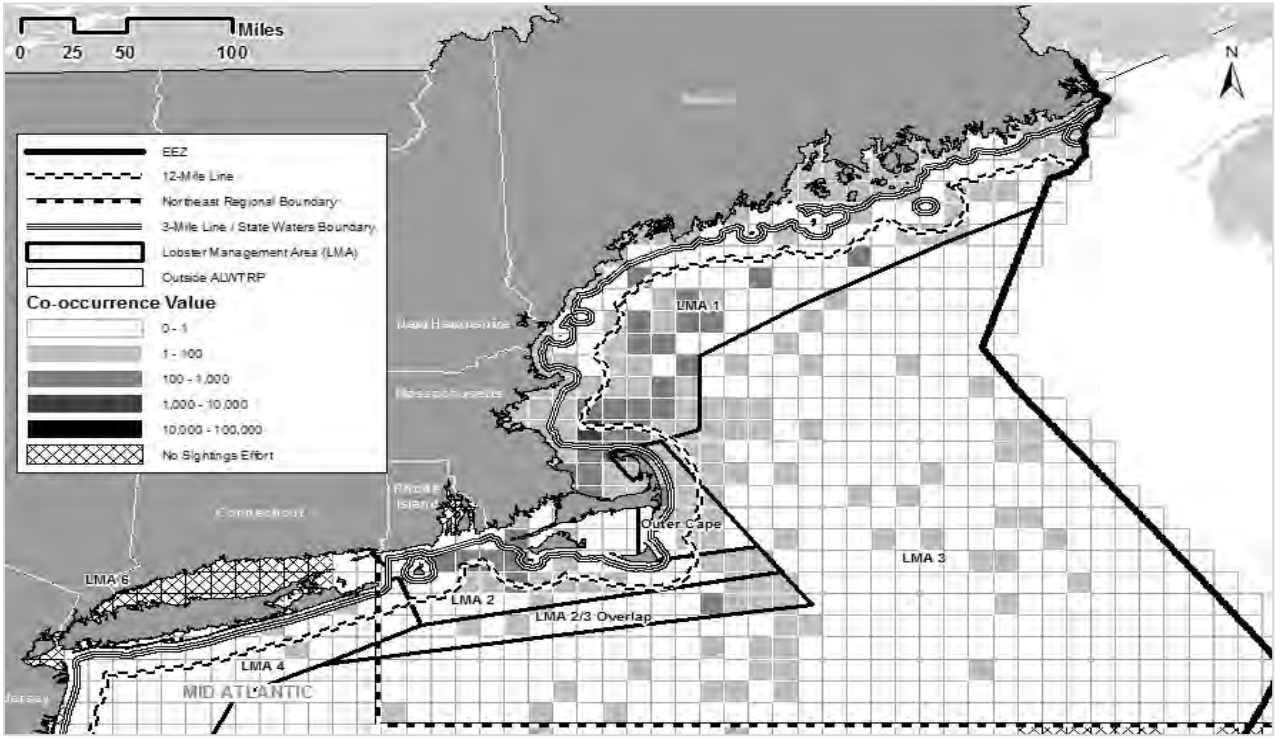

## MARCH – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



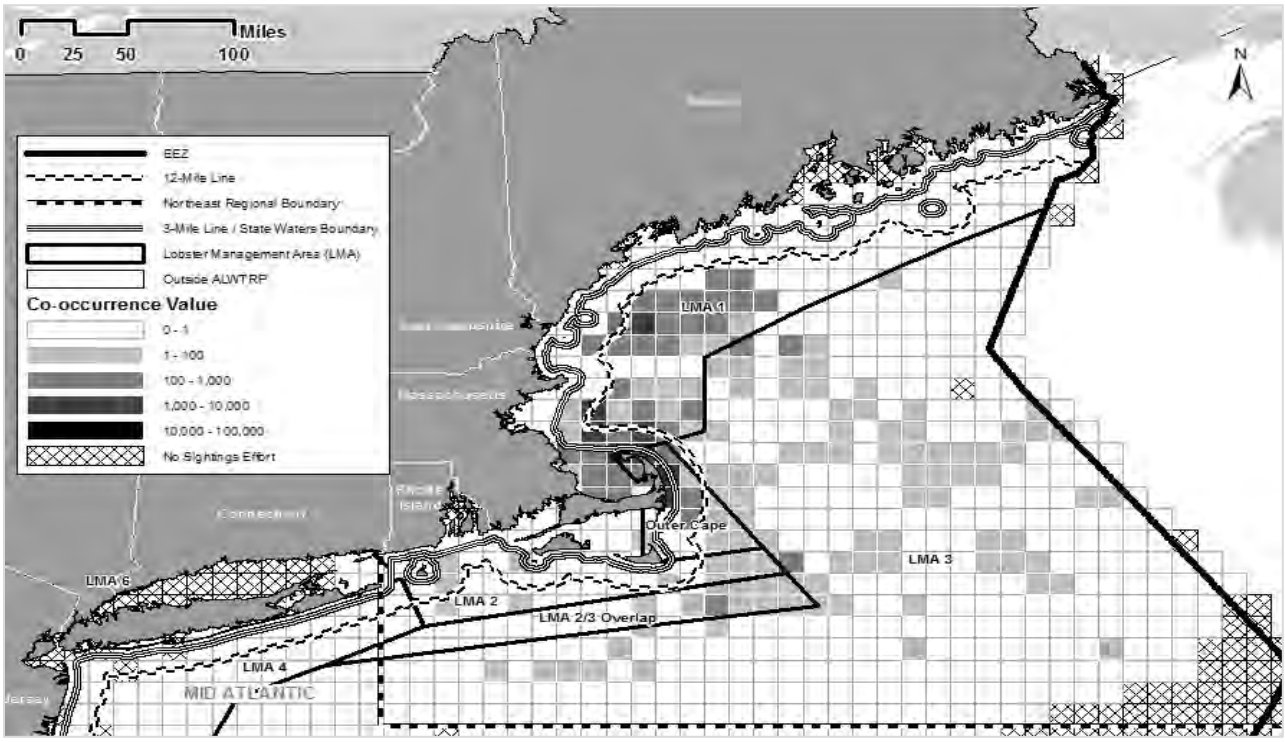
## APRIL – CO-OCCURRENCE BASED ON SPUE



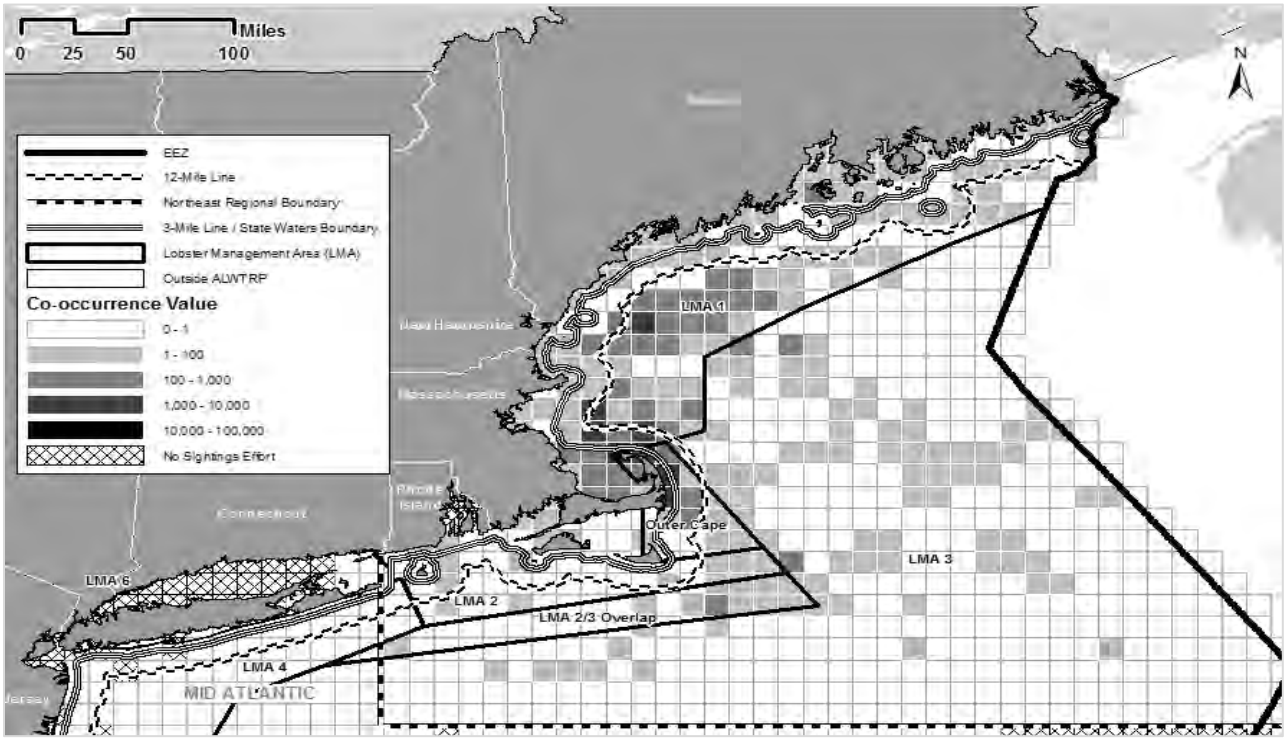

## APRIL – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



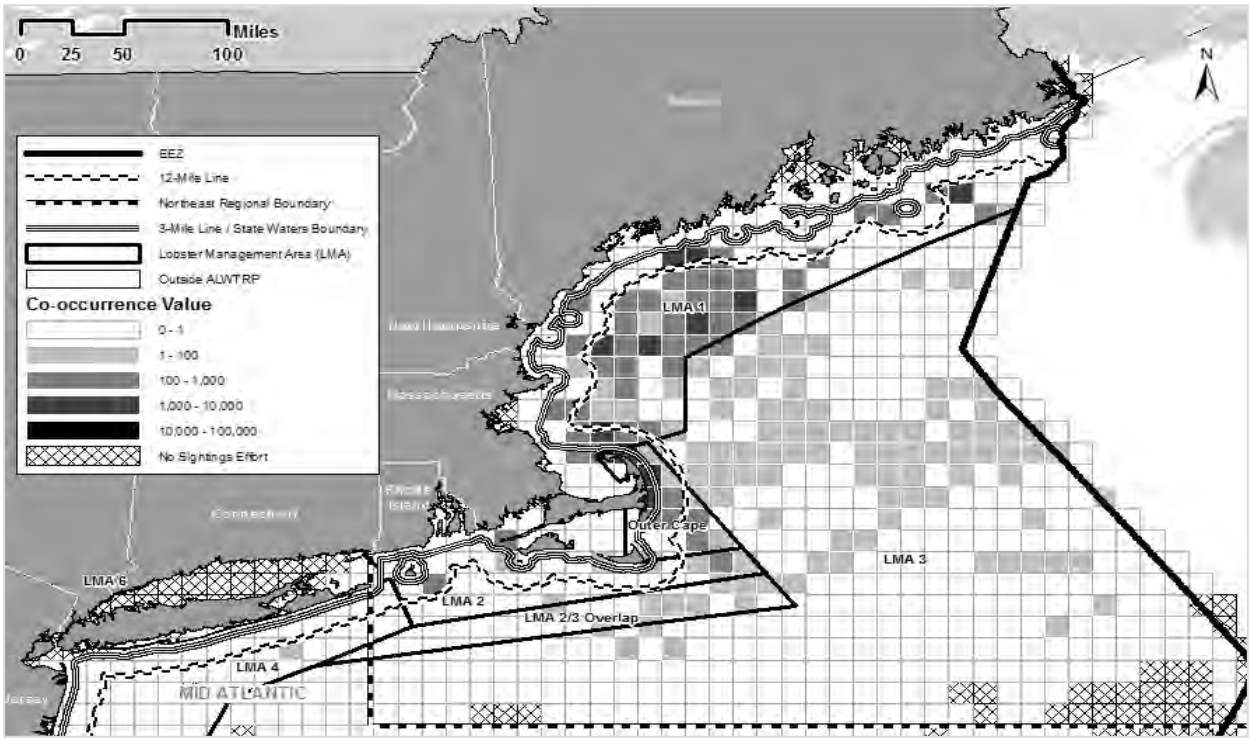
## MAY – CO-OCCURRENCE BASED ON SPUE



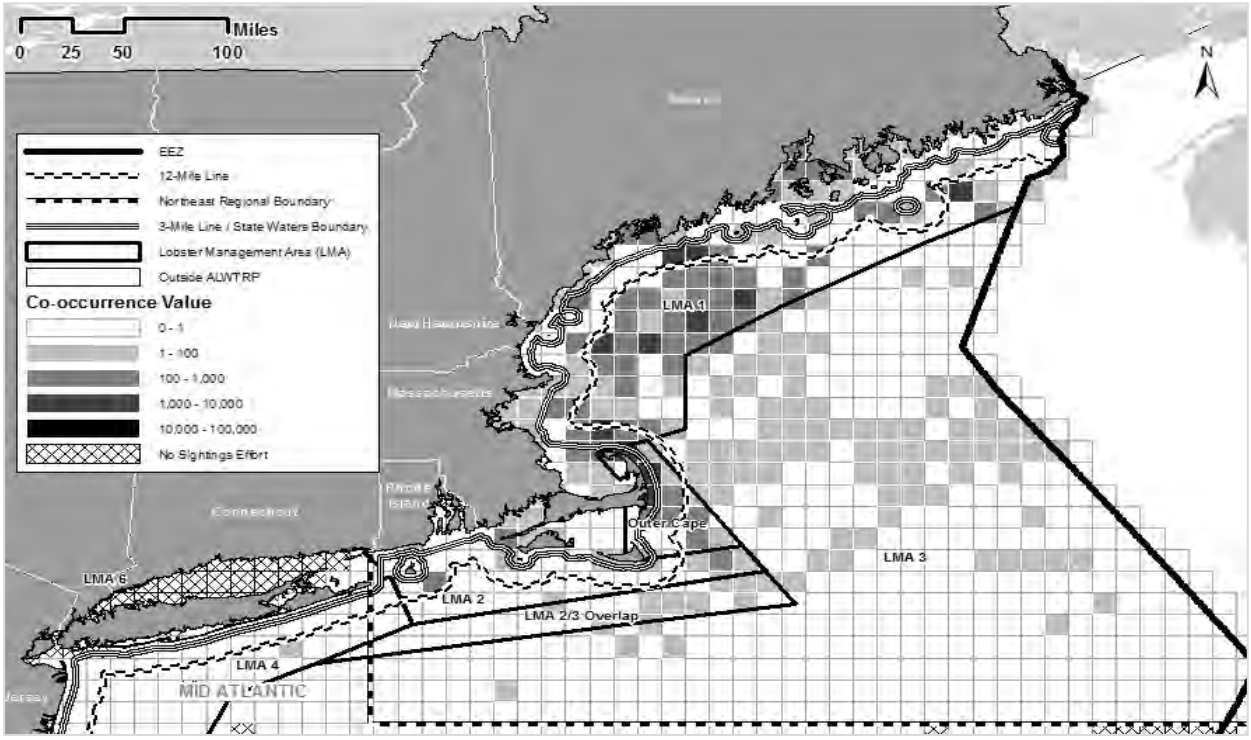

## MAY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



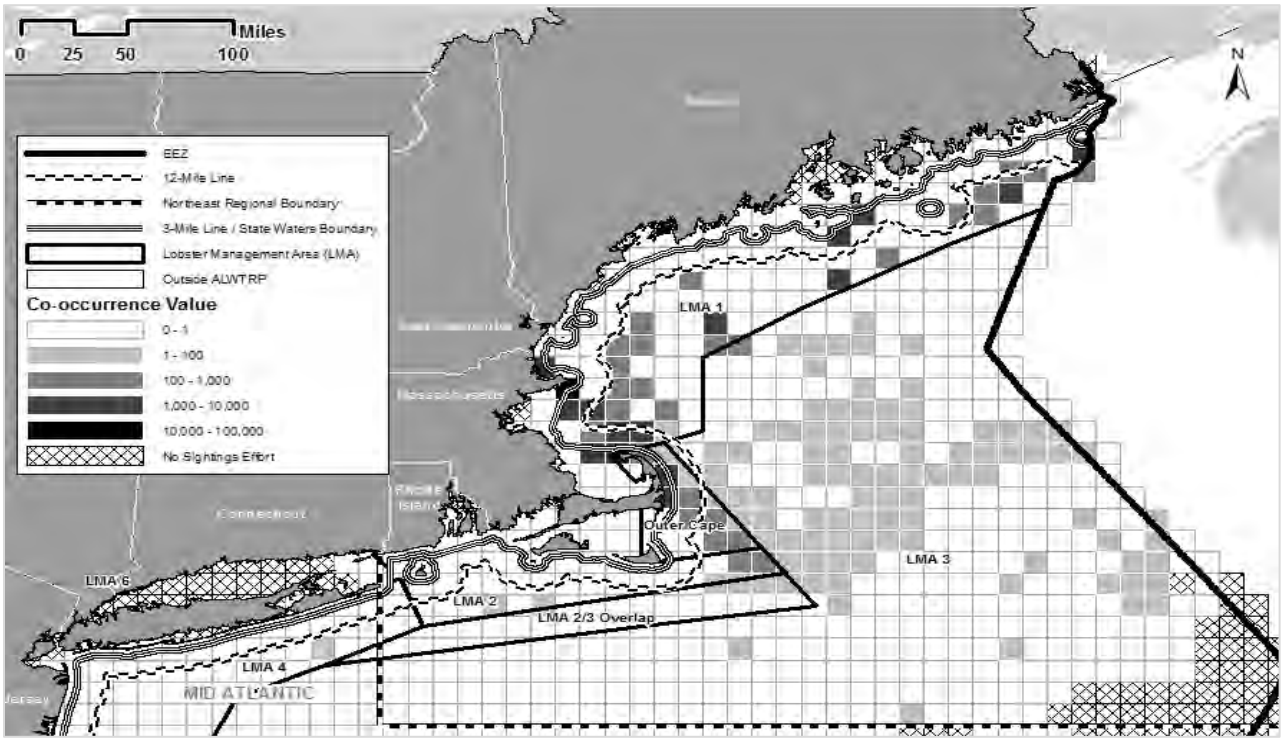
## JUNE – CO-OCCURRENCE BASED ON SPUE



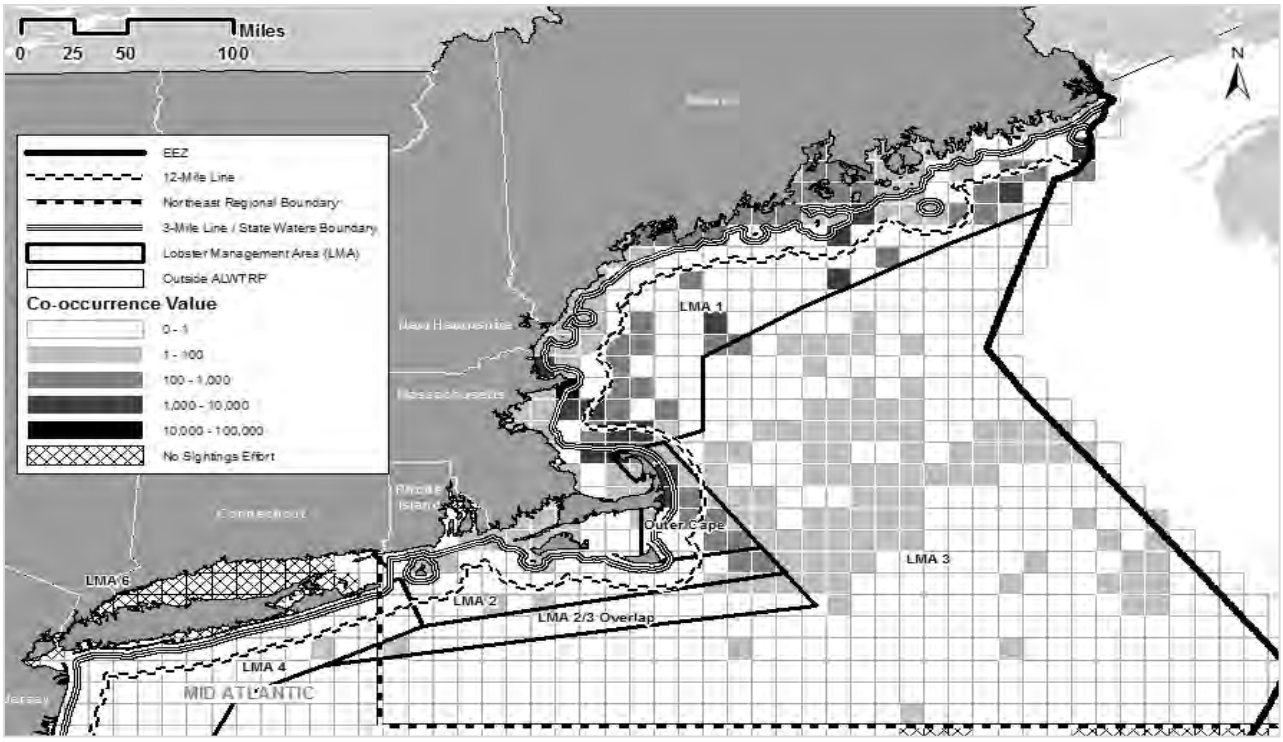

## JUNE – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



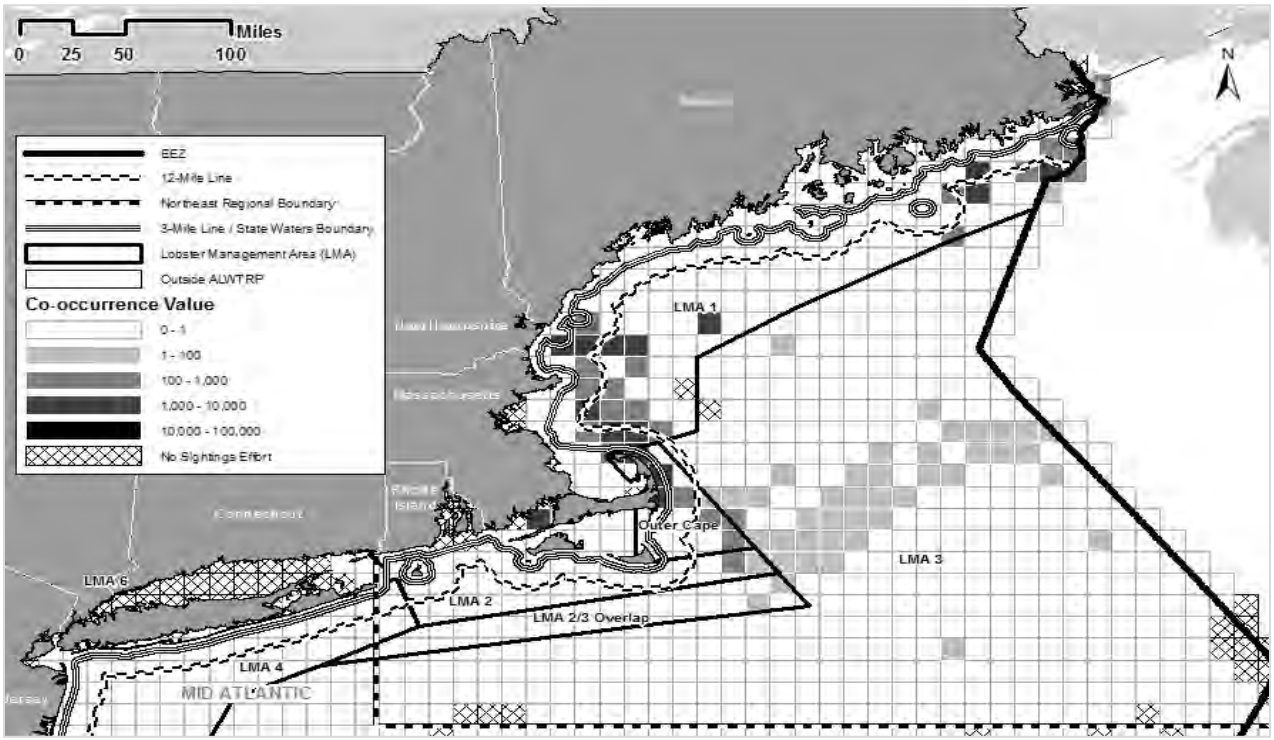
## JULY – CO-OCCURRENCE BASED ON SPUE



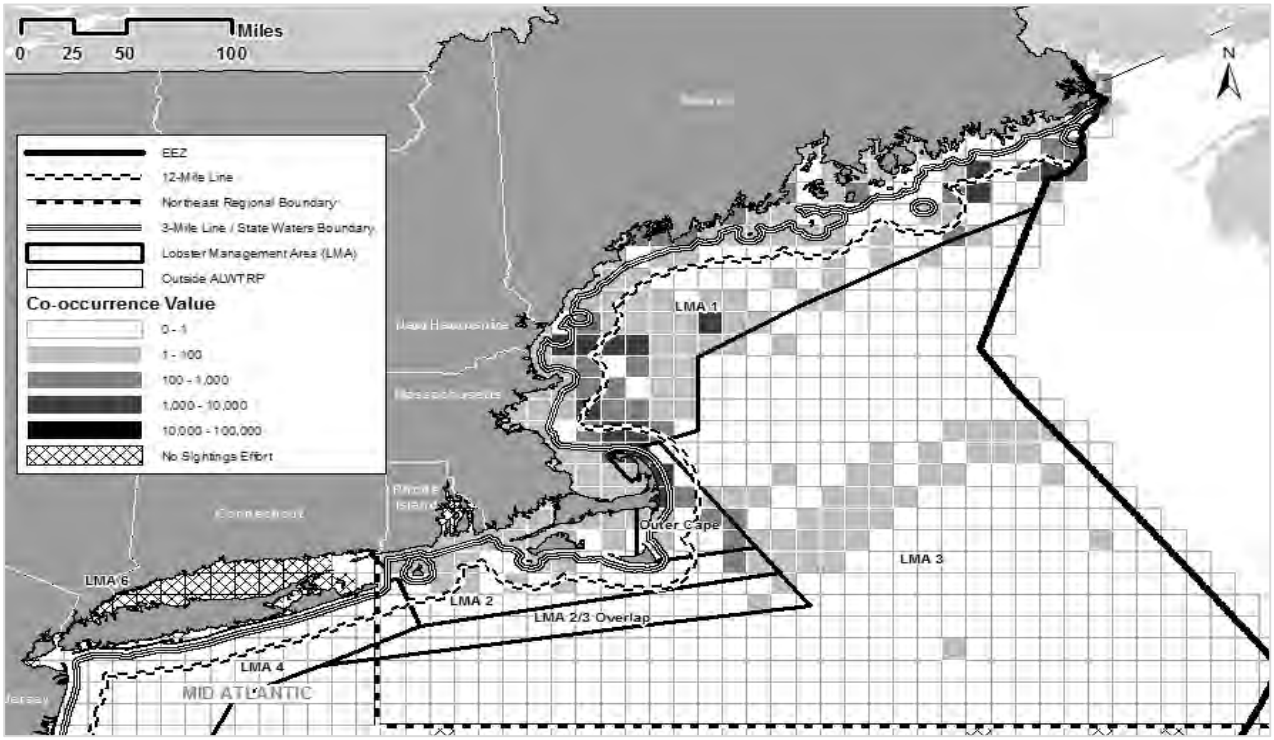

## JULY – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



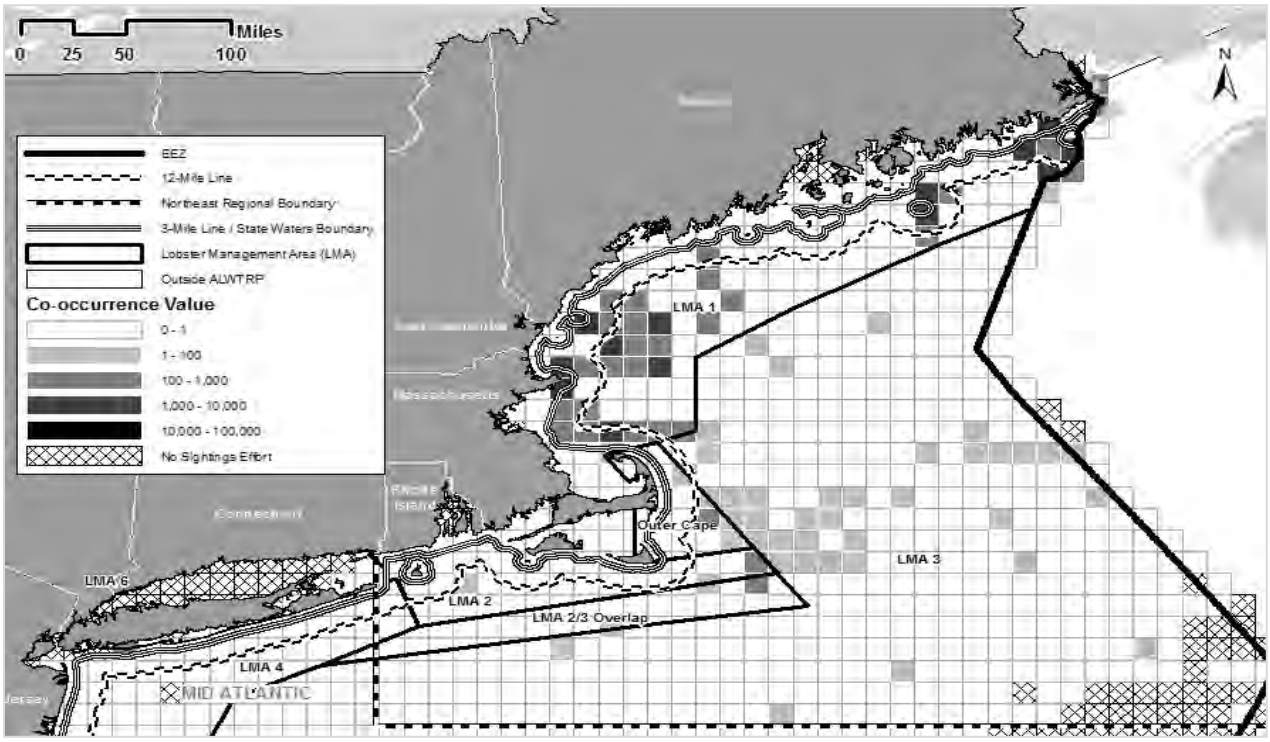
## AUGUST – CO-OCCURRENCE BASED ON SPUE



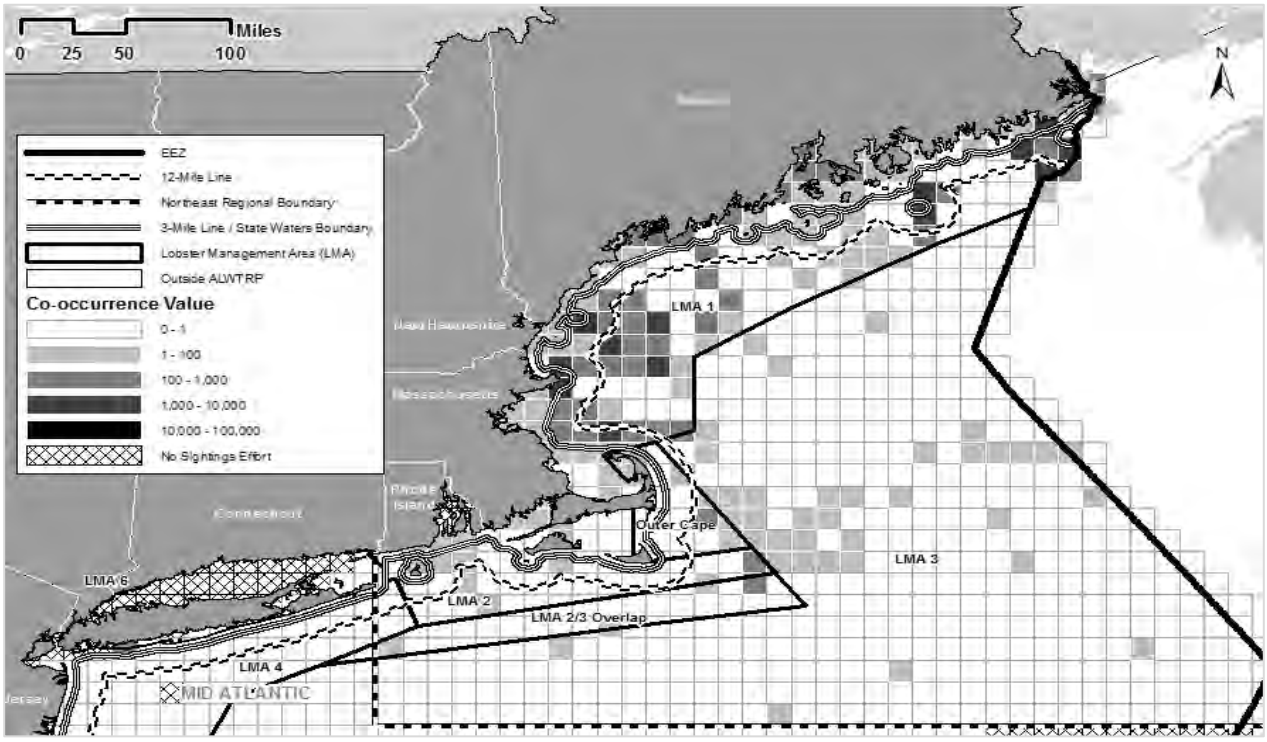

## AUGUST – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



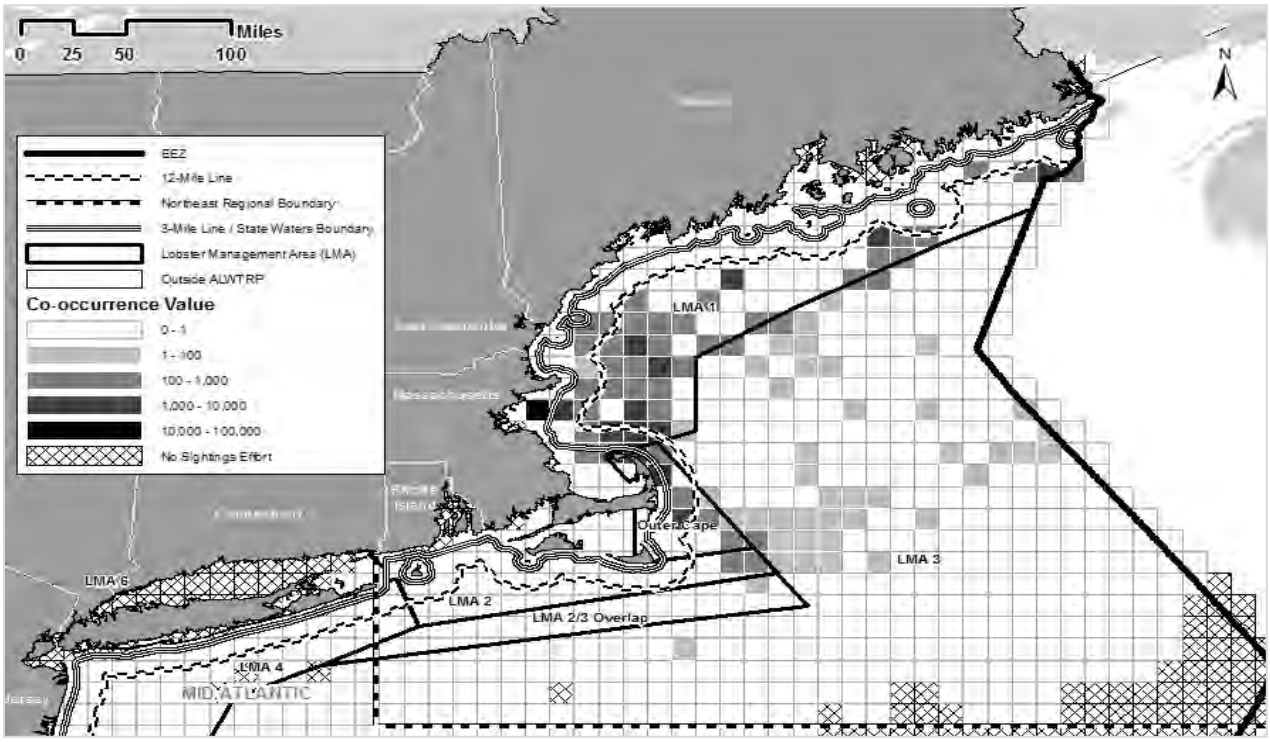
## SEPTEMBER – CO-OCCURRENCE BASED ON SPUE



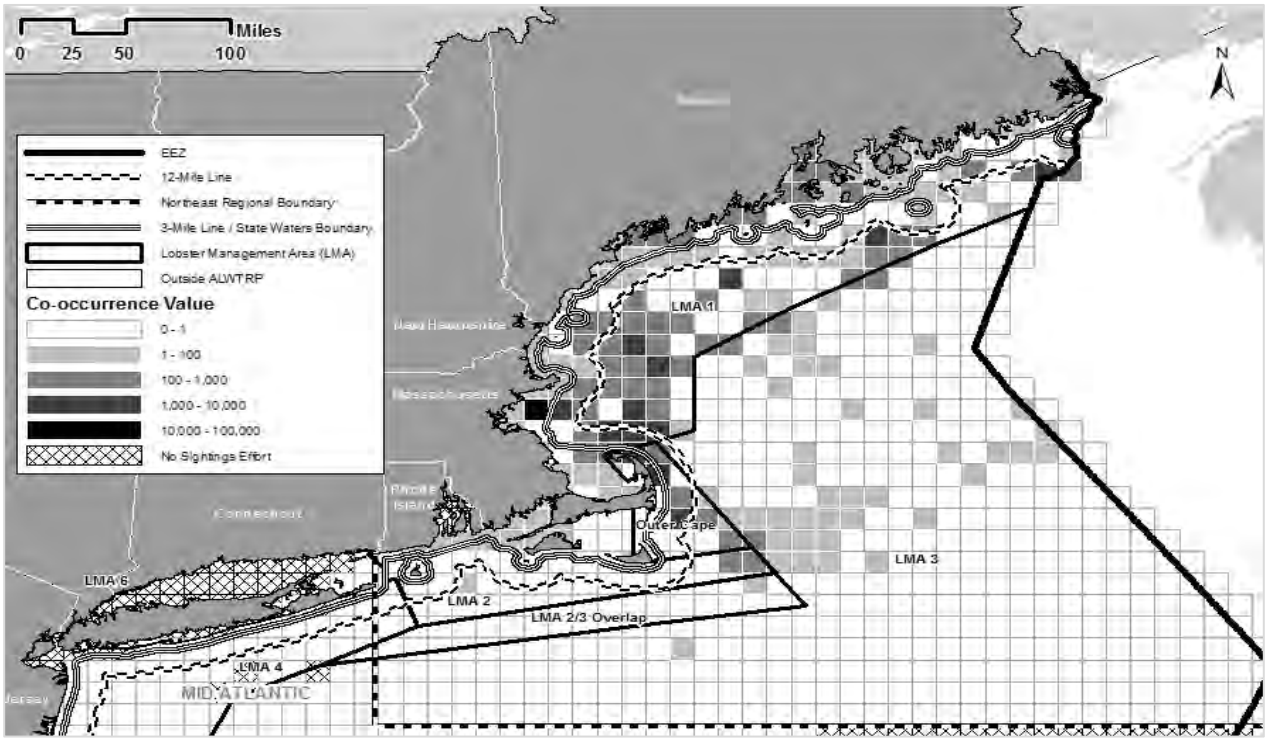

## SEPTEMBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



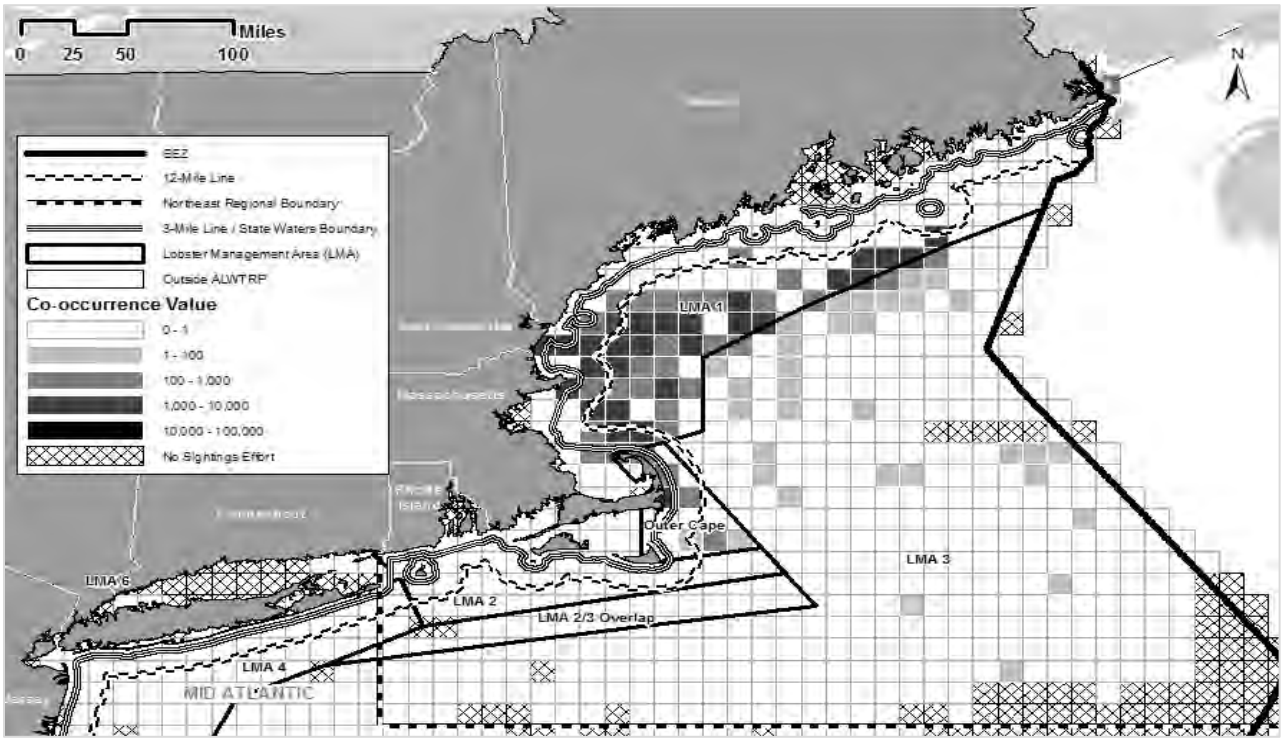
## OCTOBER – CO-OCCURRENCE BASED ON SPUE



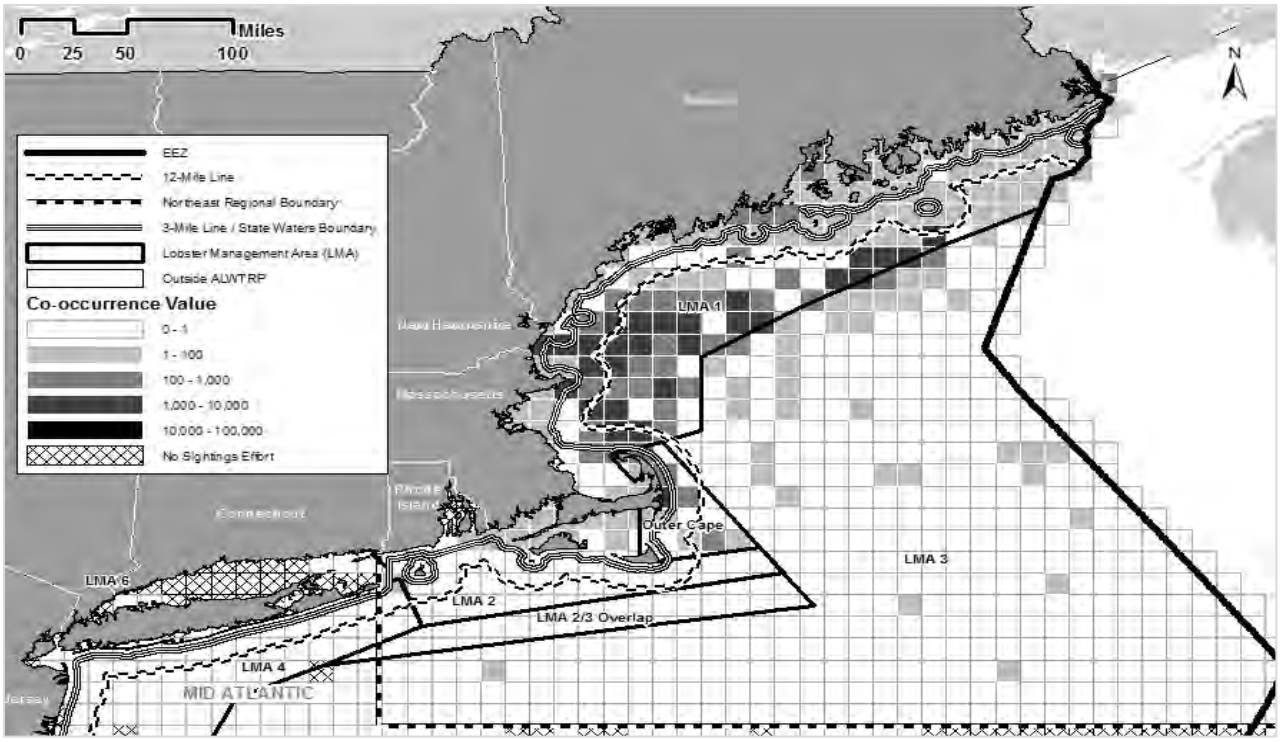

## OCTOBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



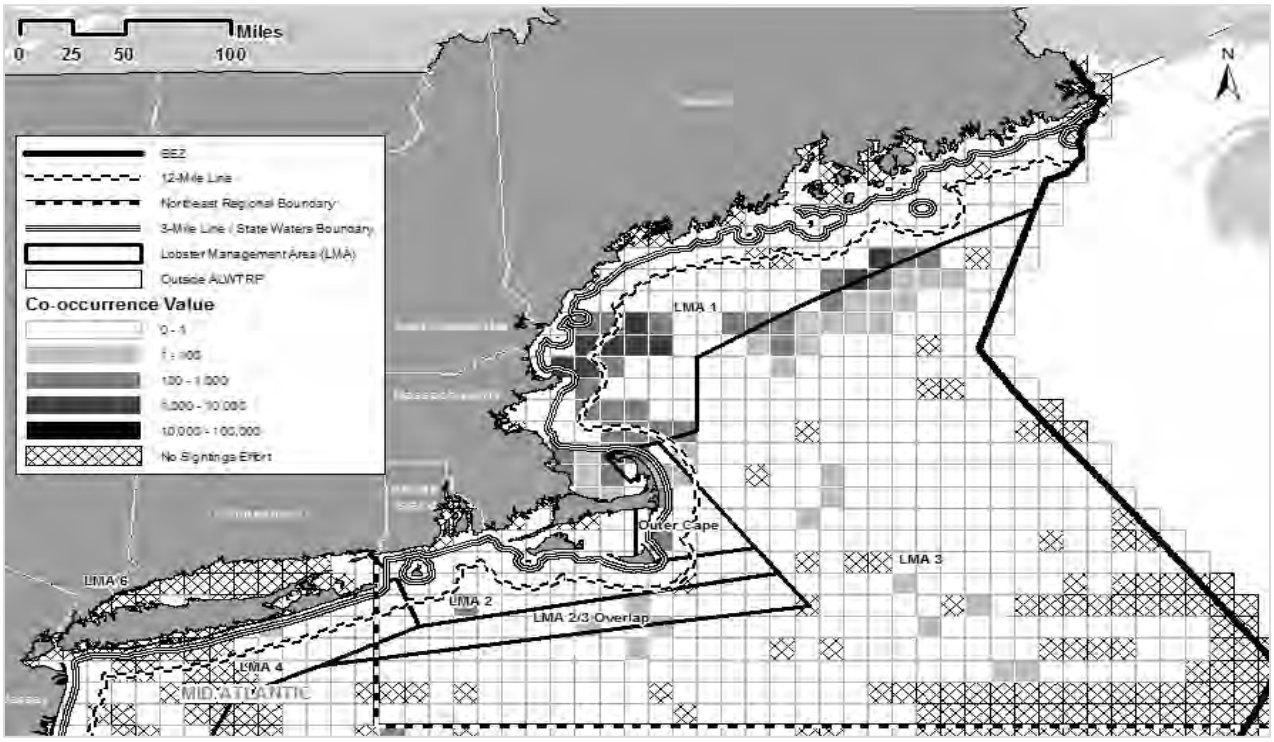
## NOVEMBER – CO-OCCURRENCE BASED ON SPUE



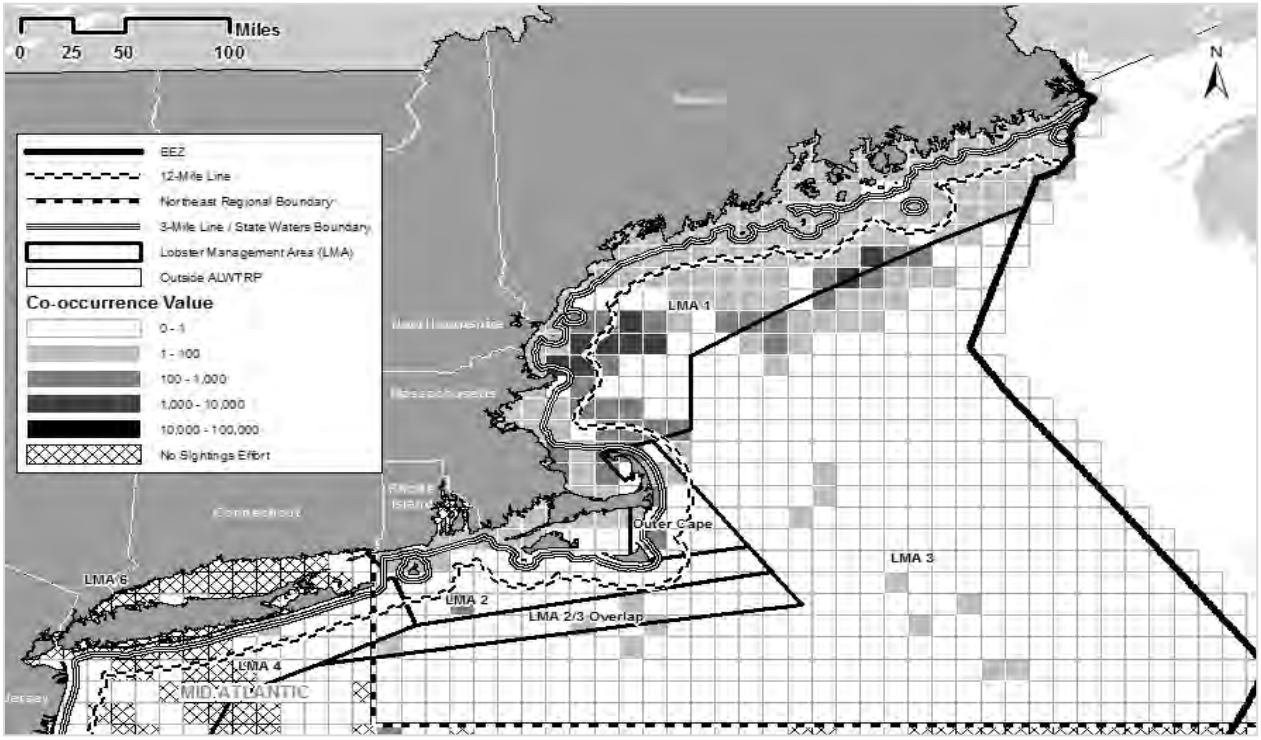

## NOVEMBER – CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



## DECEMBER – CO-OCCURRENCE BASED ON SPUE




## DECEMBER- CO-OCCURRENCE BASED ON ADJUSTED SIGHTINGS



# ATTACHMENT 5B-3

# IMPACT OF REGULATORY ALTERNATIVES ON COASTWIDE CO-OCCURRENCE SCORES: COMBINED RIGHT/HUMPBACK WHALE

## Table 5B-1

## ANALYSIS BASED ON ORIGINAL SPUE VALUES

| Alternative | Impact of Alternatives on Annual Co-Occurrence Score (Percent Change from Baseline) | | | |
|---|---|---|---|---|
| | Non-Exempt Waters | | All Waters | |
| | Lower Bound Scenario | Upper Bound Scenario | Lower Bound Scenario | Upper Bound Scenario |
| Alternative 2 | -35.8% | -35.8% | -34.2% | -34.2% |
| Alternative 3 | -37.4% | -37.2% | -35.7% | -35.4% |
| Alternative 4 | -40.5% | -38.7% | -38.6% | -36.9% |
| Alternative 5 | -41.7% | -39.7% | -39.7% | -37.9% |
| Alternative 6 (Draft) | -38.0% | -37.4% | -36.2% | -35.7% |
| Alternative 6 (Preferred) | -37.9% | -37.4% | -36.2% | -35.7% |

## Table 5B-2

## ANALYSIS BASED ON ADJUSTED SIGHTINGS VALUES

| Alternative | Impact of Alternatives on Annual Co-Occurrence Score (Percent Change from Baseline) | | | |
|---|---|---|---|---|
| | Non-Exempt Waters | | All Waters | |
| | Lower Bound Scenario | Upper Bound Scenario | Lower Bound Scenario | Upper Bound Scenario |
| Alternative 2 | -35.6% | -35.6% | -32.6% | -32.6% |
| Alternative 3 | -37.1% | -36.9% | -34.0% | -33.7% |
| Alternative 4 | -40.3% | -38.5% | -36.9% | -35.2% |
| Alternative 5 | -41.4% | -39.4% | -37.8% | -36.1% |
| Alternative 6 (Draft) | -37.7% | -37.2% | -34.5% | -34.0% |
| Alternative 6 (Preferred) | -37.7% | -37.2% | -34.5% | -34.0% |

## Table 5B-3

## NET EFFECT OF USING ADJUSTED SIGHTINGS VALUES

| Alternative | Net Impact on Annual Co-Occurrence Score Achieved by Each Regulatory Alternative | | | |
|---|---|---|---|---|
| | Non-Exempt Waters | | All Waters | |
| | Lower Bound Scenario | Upper Bound Scenario | Lower Bound Scenario | Upper Bound Scenario |
| Alternative 2 | +0.2% | +0.2% | +1.6% | +1.6% |
| Alternative 3 | +0.3% | +0.3% | +1.7% | +1.7% |
| Alternative 4 | +0.2% | +0.2% | +1.8% | +1.7% |
| Alternative 5 | +0.3% | +0.3% | +1.9% | +1.8% |
| Alternative 6 (Draft) | +0.2% | +0.2% | +1.7% | +1.6% |
| Alternative 6 (Preferred) | +0.2% | +0.2% | +1.7% | +1.6% |

Note: Apparent discrepancies between the figures shown in Tables 5B-1 and 5B-2 and the net effect shown in Table 5B-3 are due to rounding in the display of values.