7. Habitat - June 18 - 20, 2013
#14

New England Fishery Management Council
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MEMORANDUM

DATE:	June 1, 2013
TO:	Habitat Committee, Groundfish Committee
FROM:	Habitat Plan Development Team, Closed Area Technical Team
SUBJECT:	**A range of alternatives to meet the goals and objectives of Omnibus Essential Fish Habitat Amendment 2**

The Habitat Plan Development Team (PDT) and Closed Area Technical Team (CATT) convened jointly on May 29 and 30, 2013 to (1) review the work product of the May 17 Joint Committee meeting, (2) evaluate whether the range of options resulting from the Committee meeting meet major objectives of the amendment, and (3) generate draft alternatives that will meet the objectives of the amendment (see **Attachment 1**).

In evaluating the options, individually and in combination, relative to the objectives, the teams focused on the adverse effects minimization areas (AEMAs) and the juvenile groundfish habitat areas remaining after the Committee's motions. In particular, the teams evaluated the ability of the areas to meet two objectives defined by the Groundfish Committee and later approved by the full Council:

- Improved protection of critical groundfish habitats (Objective L), and
- Improved refuge for critical life history stages (Objective M).

These two objectives were evaluated in combination because the CATT operationalized these separate objectives to mean protection of age 0 and 1 juveniles as the critical life history stage, and areas where these young juveniles are concentrated as the critical groundfish habitats to protect. Other objectives were also discussed:

- Integrate and optimize measures to minimize the adverse impacts to EFH across all Council managed FMPs (Goal 6)
- Identify and implement mechanisms to protect, conserve, and enhance the EFH of those species managed by the Council to the extent practicable (Goal 4)

- Improved access to both the use and non-use benefits arising from closed area management across gear types, fisheries, and groups. These benefits may arise from areas designed to address the other three groundfish closed area objectives. (Objective N)

The teams discussed area management options, individually and in combination, on a sub-regional basis. This approach allows for an integrated view of individual area management options, while constraining the discussion to a sub-region defined by oceanographic and seabed conditions, mix of species present, and local fisheries. Specifically, the teams evaluated options relative to objectives within the western Gulf of Maine, eastern Gulf of Maine, central/offshore Gulf of Maine, Georges Bank, and the Great South Channel/Nantucket Shoals/southern New England regions. The eastern and central/offshore Gulf of Maine regions were combined for the purpose of developing alternatives. We recognize that there are environmental and fishery-related use patterns operating on finer spatial scales, and also that there is the potential for cumulative effects based on linkages between the regions.

After developing the consensus statements, the teams jointly developed sub-regional spatial management alternatives for juvenile groundfish habitat protection and adverse effects minimization. These alternatives include the Dedicated Habitat Research Areas (DHRA). The technical teams believe that each of the alternatives developed will meet the objectives of the amendment within that region. The technical teams endeavored to create alternatives that would improve upon No Action alternatives in meeting the key objectives of the amendment for each subregion. This memorandum includes qualifying statements developed by the PDT and CATT about which combinations of options would do a better job of addressing regional objectives. The teams have discussed whether it is necessary to include spatial management measures from each of the four regions in the final amendment in order to meet objectives. Although a consensus on this statement was not reached at the meeting, during subsequent correspondence most members agreed with this approach. Representative protection of the unique populations of fish and habitat types within the various regions seems sensible from an ecological perspective. Thus, we did not draft alternatives for no habitat management areas in a given region (i.e., removal of any existing habitat management areas and no designation of new areas).We will evaluate the linkages between habitat and groundfish protections across region in the draft Environmental Impact Statement.

Management measures for most of these areas would be a complete restriction on the use of mobile bottom-tending gears. The existing habitat management areas are managed in this way. The existing groundfish closed areas generally have mobile bottom tending gear restrictions as well, and thus are included as part of the No Action alternative for these juvenile groundfish/adverse effects minimization. More specifically, the current year round groundfish areas are managed as closed with various exemptions, an generally speaking, the use of gears capable of catching groundfish is restricted. Some of the new areas, specifically Georges Shoals, Great South Channel, and Nantucket Shoals, have been discussed as gear modified areas where mobile-bottom tending gears would be permitted, but bottom trawls would only be authorized if they are configured without ground cables (ground cables raised off the seabed with disks have also been discussed). The application of these management measures has been highlighted where recommended by the teams for inclusion in a particular alternative. In the GOM, the Ammen Rock area is a special-case subset of the Cashes Ledge area which would be designated as a closure to all fishing gear types managed by the Council. This relatively small area that focuses on the kelp habitats on the shallowest part of Cashes Ledge would only be designated in combination with a larger habitat area that more fully covering the ledge feature.

The following management measures are suggested for DHRAs:

- **Sanctuary Ecological Research Area II:** No Action restrictions throughout, meaning no mobile bottom tending gear, no demersal longlines, sink gillnets. Within reference area (Figure 1), additionally no party or charter recreational fishing.

- **Eastern Maine:** No mobile bottom tending gear; restrict use of other gears capable of catching groundfish.

- **Georges Bank:** No mobile bottom tending gear.

While spawning adults are recognized as a critical life stage, given the Committee's motion regarding spawning closures, the technical meeting focused on the juvenile groundfish areas. The No Action and alternative spawning measures proposed by the Committee are described briefly at the end of this document, including monthly maps. The approved spawning protection objective is:

- Improved groundfish spawning protection; including protection of localized spawning contingents or sub-populations of stocks (Objective K)

Western Gulf of Maine

In the **western Gulf of Maine region**, the Stellwagen, SERAII, and Jeffreys Ledge AEMAs, and the no action WGOM habitat and groundfish areas in combination (Map 1) would only marginally improve protection of habitats associated with critical life stages (age 0 and 1 juveniles). This assessment is based on an analysis of the hotspot distribution for juvenile large mesh groundfish and the vulnerability of the underlying substrate. There are juvenile hotspots for some species in within these areas, and the larger no-action areas contain a greater diversity of species than the smaller, newly-modified areas. Importantly, however, with regard to juvenile cod only (a species of critical importance), the above areas in combination do not meet the objective to improve protection for their juvenile habitats.

The addition of a portion of the Bigelow Bight area to the existing proposals would meet the objective of improving protection for juvenile groundfish habitats and seafloor habitats vulnerable to the adverse effects of fishing. The southern part of the Bigelow Bight area contains juvenile cod and haddock hotspots, lying adjacent and offshore of NH state waters which are closed to trawling on a year round basis. The northern part of the Bigelow Bight area overlaps with an identified cod and haddock spawning area, and also coincides with observed concentrations of catches of juvenile cod by the fishery. Juvenile cod hotspots also occur in Massachusetts Bay. (See **Attachment 2** which summarizes the approach taken to identify these critical locations and associated management areas.)

Issues discussed:

- Aggregations of juveniles occur primarily in state and federal waters shoreward of Stellwagen, SERA II, Jeffreys Ledge, and the no action WGOM habitat and groundfish areas. Allowing fishing effort in these more inshore areas, while maintaining closures further offshore, may be shifting impacts on precisely those juveniles and their associated habitats that are in need of protection. We recognize that the 12-inch roller gear

restriction in effect throughout this area likely tempers this concern as it influences the ability to tow trawl gear over complex seabed habitat types.

Possible alternatives for juvenile groundfish habitat and adverse effects minimization in western Gulf of Maine region:

- **Alternative 1 (No Action):** WGOM habitat and WGOM groundfish areas
- **Alternative 2:** Bigelow Bight juvenile groundfish habitat area as modified, Sanctuary Ecological Research Area II (SERA II) as an adverse effects minimization area, and SERA II as a DHRA
- **Alternative 3:** Bigelow Bight juvenile groundfish habitat area as modified, Jeffreys Ledge and Stellwagen as adverse effects minimization areas, and SERA II as a DHRA
- **Alternative 4:** Smaller, southern subset of the Bigelow Bight juvenile groundfish habitat area, the SERA II adverse effects minimization area with a western extension to include additional groundfish, particularly cod, hotspots, and SERA II as a DHRA
- **Alternative 5:** Smaller, southern subset of the Bigelow Bight juvenile groundfish habitat area, Jeffreys Ledge and Stellwagen adverse effects minimization areas, and SERA II as a DHRA
- **Alternative 6:** No Action WGOM habitat area, extension of this area to include additional groundfish, particularly cod, hotspots, and SERA II as a DHRA

Eastern/central Gulf of Maine

In the **eastern GOM region,** the Jeffreys Bank (No Action or modification), Toothaker Ridge, Eastern Maine and Machias areas in some combination would improve protection of habitats associated with critical life stages (age 0 and 1 juveniles). This assessment is based on an analysis of the hotspot distribution for juvenile large mesh groundfish and the vulnerability of the underlying substrate.

Issues discussed:

- Within this region, cod, haddock, and halibut hotspots are only found within the Machias area.
- Combining Eastern Maine, Machias, and some combination of Toothaker Ridge and Jeffreys Bank would best meet these objectives.
- Due to the present cod stock condition, survey catches of juvenile cod may not reflect the full distribution of suitable habitats in the region. Additional areas may be occupied as populations rebuild. See Attachment 3 for current and historic cod distribution maps.

In the **central GOM region**, the Platts Bank, Cashes Ledge habitat (modified), Ammen Rock, and Fippennies Ledge areas would improve protection of habitats associated with critical life stages (age 0 and 1 juveniles) relative to the current Cashes Ledge habitat area, but would not improve protection relative to the larger Cashes Ledge groundfish area (Map 2). This assessment

is based on an analysis of the hotspot distribution for juvenile large mesh groundfish and the vulnerability of the underlying substrate.

Issues discussed:

- Shallow, complex habitats on top of Platts, Fippennies, and Cashes are poorly sampled by the NMFS trawl surveys. It is difficult to estimate benefits to cod and other species because of this sampling issue.

- Habitat areas alone have partial overlap with weighted juvenile hotspot distribution, and may have benefits for cod.

- Juvenile cod have been documented in ROV sampling living within kelp habitats on Cashes Ledge.

- Due to their small size, the Platts and Fippennies areas may be too small to enforce properly and may offer less protection than broader areas, specifically the existing Cashes Ledge groundfish closure, due to the mobile nature of these species.

- The existing groundfish closure is more expansive in size and includes a greater range of depths and habitat types. It includes hotspots for additional species (e.g. redfish, witch flounder).

Note – The Cashes Ledge groundfish closure was originally intended to reduce overfishing and minimize bycatch.

Possible alternatives for juvenile groundfish habitat and adverse effects minimization in Eastern/Central Gulf of Maine region:

- **Alternative 1 (No Action):** Cashes Ledge habitat and Cashes Ledge groundfish areas, Jeffreys Bank habitat area

- **Alternative 2:** Machias and Eastern Maine juvenile groundfish habitat areas (either smaller or expanded version of Eastern Maine); Fippennies Ledge, modified Jeffreys Bank, Platts Bank, modified Cashes Ledge, and Ammen Rock adverse effects minimization areas; smaller Eastern Maine area as a DHRA

- **Alternative 3:** Machias and Eastern Maine juvenile groundfish habitat areas (either smaller or expanded version of Eastern Maine); modified Jeffreys Bank, modified Cashes Ledge, and Ammen Rock adverse effects minimization areas; smaller Eastern Maine area as a DHRA

- **Alternative 4:** Machias juvenile groundfish habitat area; existing Jeffreys Bank area combined with the Toothaker Ridge juvenile groundfish area, modified Cashes Ledge, and Ammen Rock adverse effects minimization areas; smaller Eastern Maine area as a DHRA

Georges Bank

In the **Georges Bank region**, the relatively small, deeper-water Northern Edge juvenile groundfish area and the various Georges Shoal habitat areas in combination do not meet the objective of improving protection for juvenile groundfish overall as compared to the No Action Closed Area II groundfish closure and No Action Closed Area II habitat closure (Map 3). This assessment is based on an analysis of the hotspot distribution for juvenile large mesh groundfish and the vulnerability of the underlying substrate. The Northern Edge juvenile groundfish area would offer a similar level of protection for juvenile cod based on their distribution during the last ten years, but older data indicate that a larger proportion of the northern edge was previously occupied by juvenile cod (see **Attachment 3** for additional maps of cod distributions).

Issues discussed:

- There are substantial differences in habitat composition and current fishing effort between the northern edge and the southeast parts and while there are stocks that use both areas (e.g. haddock) and they are linked within a single groundfish closed area (Closed Area II) it is important to consider the individual attributes of the two locations.

- In the southeast parts, No Action includes exemptions from the groundfish closure regulations for seasonal access fisheries (e.g. scallop access for limited access vessels; haddock and yellowtail flounder special access programs for specific trawls). Although the habitat is less vulnerable to fishing and is thought to recover more quickly than pebble/cobble substrate, this seasonal closure may have important conservation benefits for some groundfish species, especially juvenile haddock and yellowtail flounder.

- Georges Bank, perhaps the southern portion especially, are important regions due to the high primary production (which leads to high production of prey species), the shallow waters, and the currents that prevent larval fish and prey species from being advected off the shelf.

- As a year round closure to mobile bottom tending gears, the Southeast Part juvenile groundfish habitat area, if implemented without access programs, would increase protection of juvenile groundfish as compared to No Action (i.e. Closed Area II groundfish closure). This area was considered and rejected previously by the Committees. The habitat type in the southeast parts is a relatively dynamic sand habitat.

- In analyses comparing inside/outside attributes prepared for Framework 48, Closed Area II provided benefits for haddock and winter flounder.

- As discussed for eastern Maine, at the present time, levels of observed cod catch in the survey may not reflect the full distribution of suitable habitats in the region given low stock abundance. Additional areas may be occupied as populations rebuild.

- The core habitat area where the most vulnerable types of seabed should be protected from the impacts of mobile bottom-tending gear is the existing CAII habitat area/Habitat Area of Particular concern. While this habitat type generally extends to the west into the Georges Shoal East area, the most complex boulder areas are within the current habitat closure, and the current area has provided opportunity for recovery of benthic habitat for 18 years, while the Georges Shoal East area has been continually fished.

- Modifications to the boundaries of the existing HAPC that include part or all of Georges Shoal East and the Northern Edge juvenile groundfish area were discussed. Two versions of this area are included within the alternatives described below.

- When comparing the habitats in the western areas (Georges Shoal West, Committee-suggested modification) with the eastern areas (Georges Shoal East, current CAII habitat area), protection of the eastern areas should be prioritized.

Possible alternatives for juvenile groundfish habitat and adverse effects minimization in Georges Bank region:

- **Alternative 1 (No Action):** Closed Area II habitat and groundfish areas, Closed Area I habitat and groundfish areas

- **Alternative 2:** Revised Northern Edge area that combines existing CAII habitat area, Northern Edge juvenile groundfish habitat area, and Georges Shoal East area adverse effects minimization area; Southeast Parts juvenile groundfish habitat area; Georges Bank DHRA.

- **Alternative 3:** Smaller version of revised Northern Edge area that combines existing CAII habitat area, Northern Edge juvenile groundfish habitat area, and Georges Shoal East area adverse effects minimization area; Southeast Parts juvenile groundfish habitat area; Georges Bank DHRA.

- **Alternative 4:** Revised Northern Edge area that combines parts of the existing CAII habitat area with the Northern Edge juvenile groundfish habitat area; Georges Shoal gear modification/ground cable area; Georges Bank DHRA.

- **Alternative 5:** Smaller version of revised Northern Edge area that combines existing CAII habitat area, Northern Edge juvenile groundfish habitat area, Georges Shoal gear modification/ground cable area; Georges Bank DHRA.

Great South Channel/Nantucket Shoals/Southern New England

In the **Great South Channel/Nantucket Shoals/Southern New England** area, it is unclear whether some combination of the three Great South Channel areas, the Nantucket Shoals area, and the Cox Ledge areas meet the objective of increased juvenile groundfish habitat protection relative to No Action if they are implemented as mobile-bottom tending gear closures (Map 4). The alternative areas would optimize adverse effects minimization relative to the No Action areas, if implemented as mobile bottom-tending gear closures. These assessments are based on an analysis of the hotspot distribution for juvenile large mesh groundfish and the vulnerability of the underlying substrate. It is not clear whether the alternative areas would meet adverse effects minimization objectives for the region if they are implemented as gear modification areas.

Issues discussed:

- There were very few juvenile groundfish hotspots in the Great South Channel and Southern New England area.

- There is very limited trawl survey sampling in the Nantucket Shoals area, which makes estimates of juvenile groundfish benefits highly uncertain. Strong ocean currents and varied topography make sampling in this area difficult. The area is also relatively data poor from a habitat/substrate perspective such that the results of the Swept Area Seabed Impact Analysis in this area should be interpreted with caution. Seabed type is very well documented further to the east in Davis Bank and the Great South Channel.

- Even considering sampling density issues outlined above, the eastern parts of the Great South Channel area, as well as additional areas east of that area, have a higher degree of overlap with survey catches of juvenile cod (see **Attachment 3**). Thus, including the more eastern parts of this sub-region in the habitat management alternatives will increase protection of Georges Bank cod.

- For trawl gear modification measures to reduce adverse effects to EFH, the quality of the seabed impact and/or the magnitude of swept area need to be reduced. Because we do not know what the reductions in catch rates would be when fishing with modified or no ground cables, it will be difficult to demonstrate with any degree of certainty whether there are positive or negative impacts to EFH under a constant-catch scenario. Results of ongoing research may help us to make reasonable assumptions about changes in catch rates for modified ground cable gear (i.e. ground cables with elevating disks).

Possible alternatives for juvenile groundfish habitat and adverse effects minimization in Great South Channel/Nantucket Shoals/Southern New England region:

- **Alternative 1 (No Action):** Nantucket Lightship habitat and groundfish areas

- **Alternative 2:** Great South Channel option 1 (core plus all extensions) and Cox Ledge adverse effects minimization areas as MBTG restricted areas

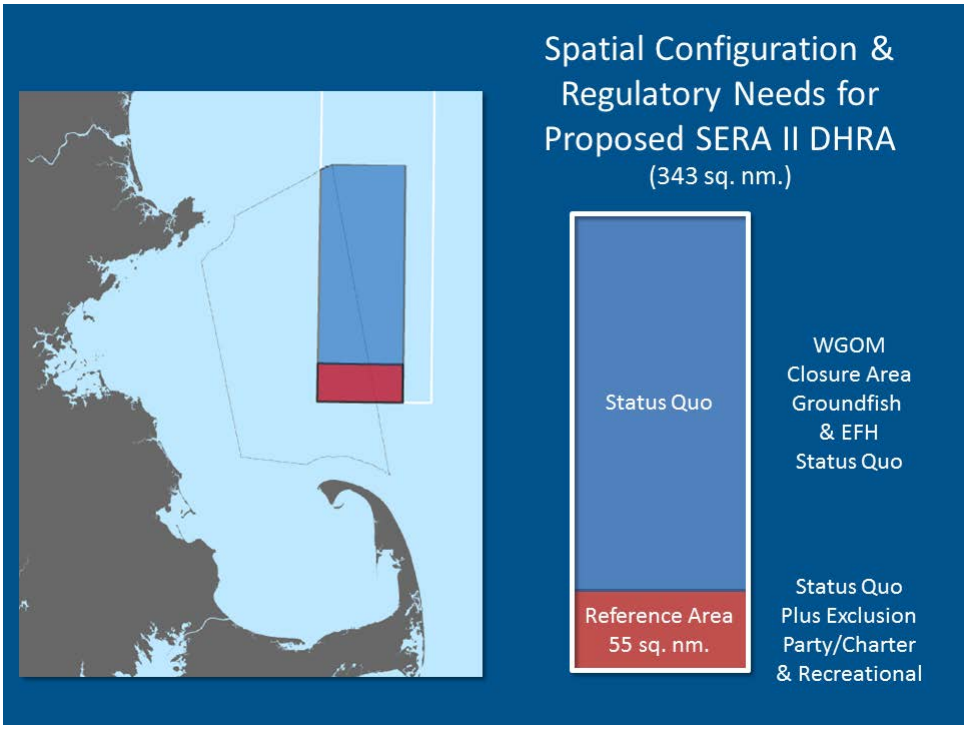
- **Alternative 3:** Great South Channel option 2 (core plus C-F extensions) and Cox Ledge adverse effects minimization areas as MBTG restricted areas

- **Alternative 4:** Great South Channel option 3 (core plus D-F extensions) and Cox Ledge adverse effects minimization areas as MBTG restricted areas

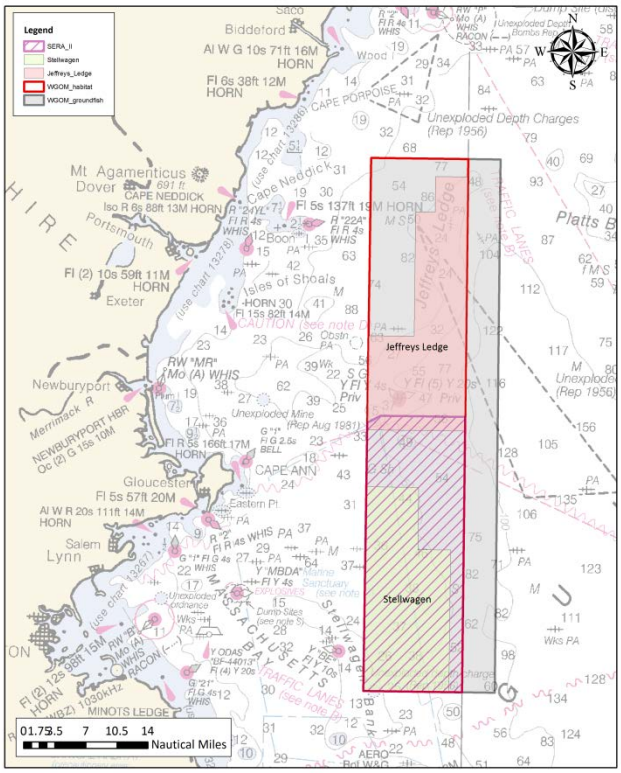
- **Alternative 5:** Nantucket Shoals and Cox Ledge adverse effects minimization areas as MBTG restricted areas

- **Alternative 6:** Great South Channel option 1 (core plus all extensions) as a MBTG restricted area

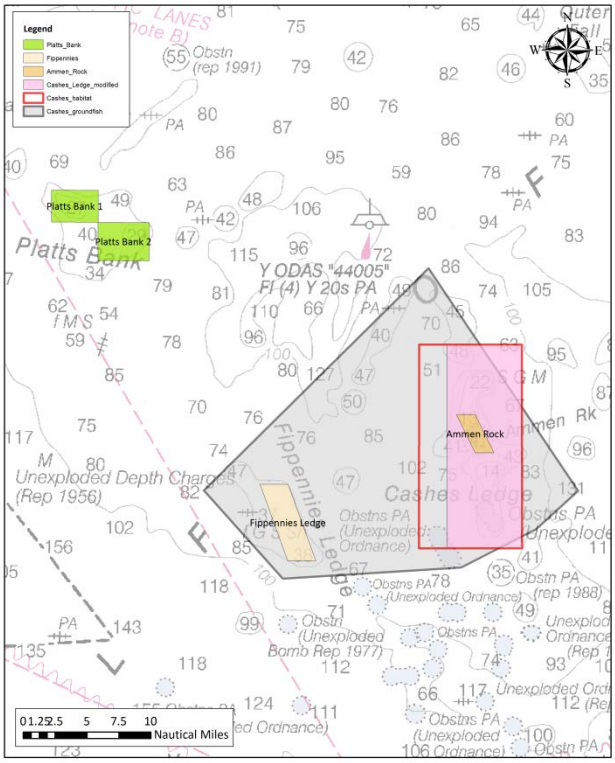
Figure 1 – SERA II configuration



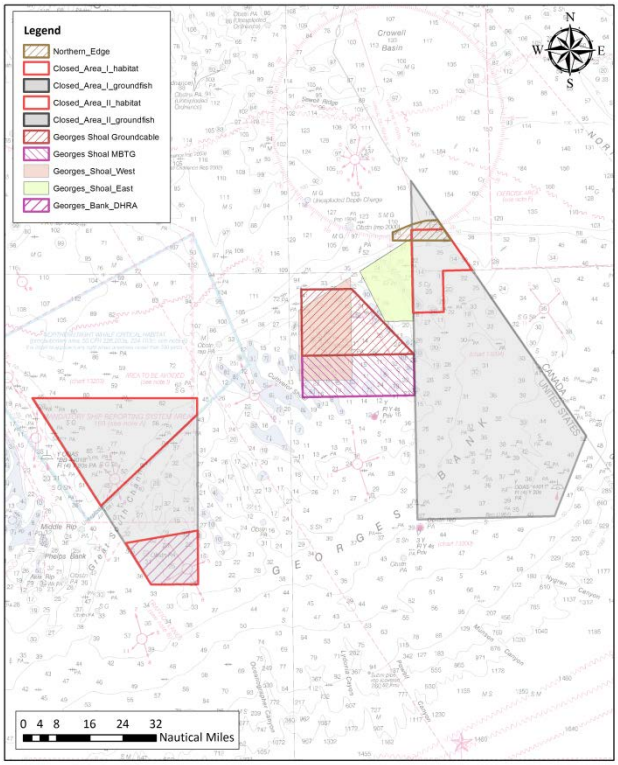
Map 1 - Remaining No Action and alternative habitat/juvenile groundfish management options following the 5/17 joint committee meeting, western Gulf of Maine.



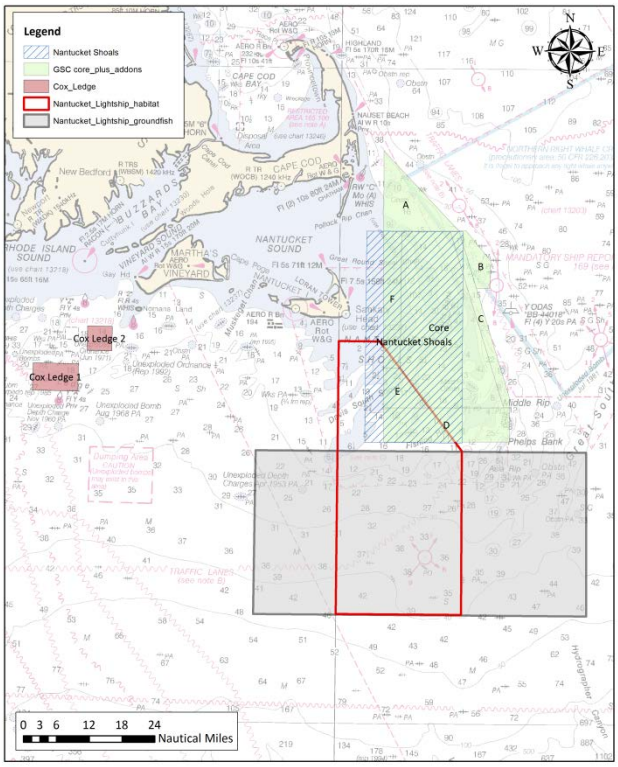
Map 2 – Remaining No Action and alternative habitat/juvenile groundfish management options following the 5/17 joint committee meeting, central/offshore Gulf of Maine.



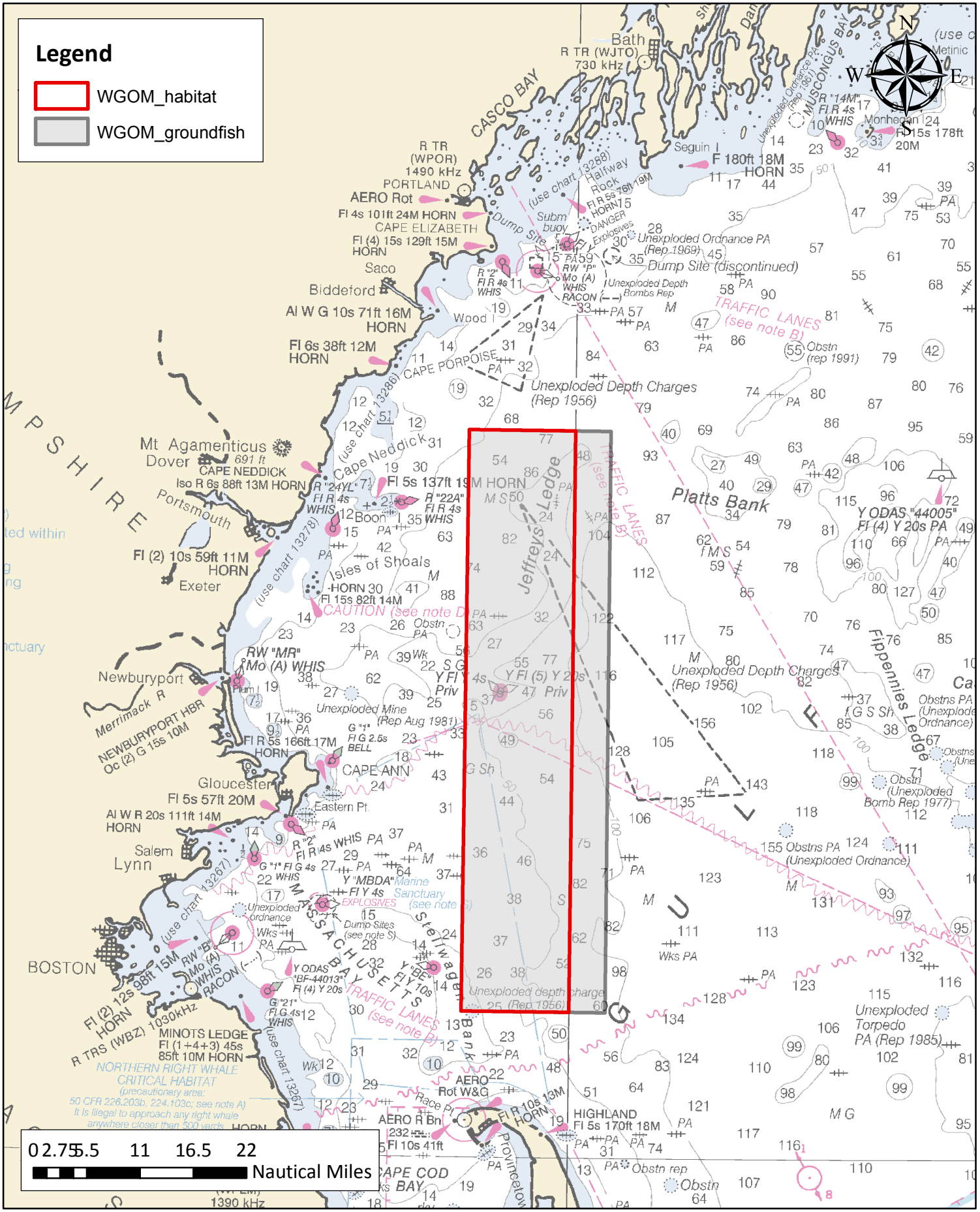
Map 3 – Remaining No Action and alternative habitat/juvenile groundfish management options following the 5/17 joint committee meeting, Georges Bank.



Map 4 – Remaining No Action and alternative habitat/juvenile groundfish management options following the 5/17 joint committee meeting, Great South Channel/Nantucket Shoals/Southern New England.

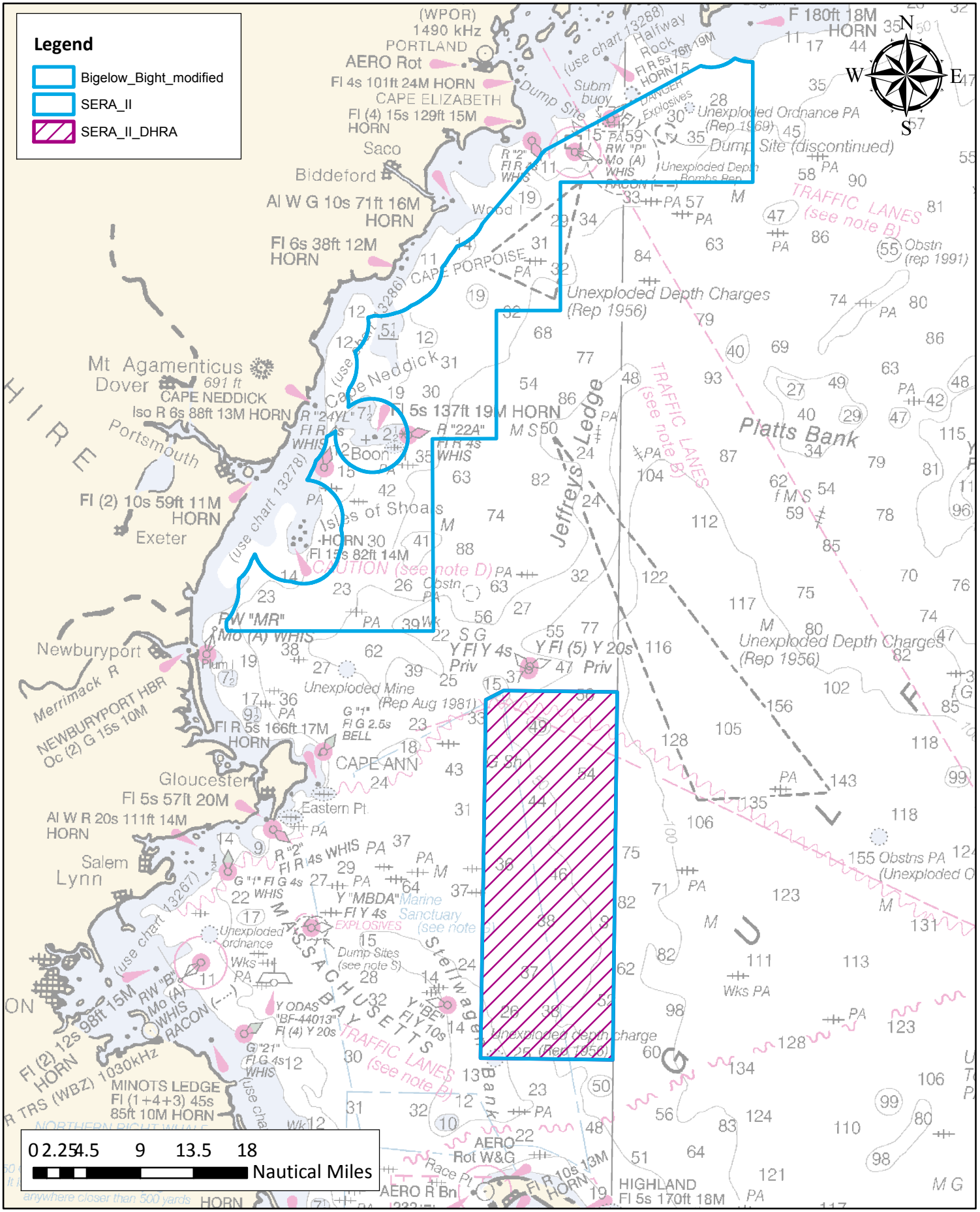


Western Gulf of Maine
Alternative 1 (No Action)



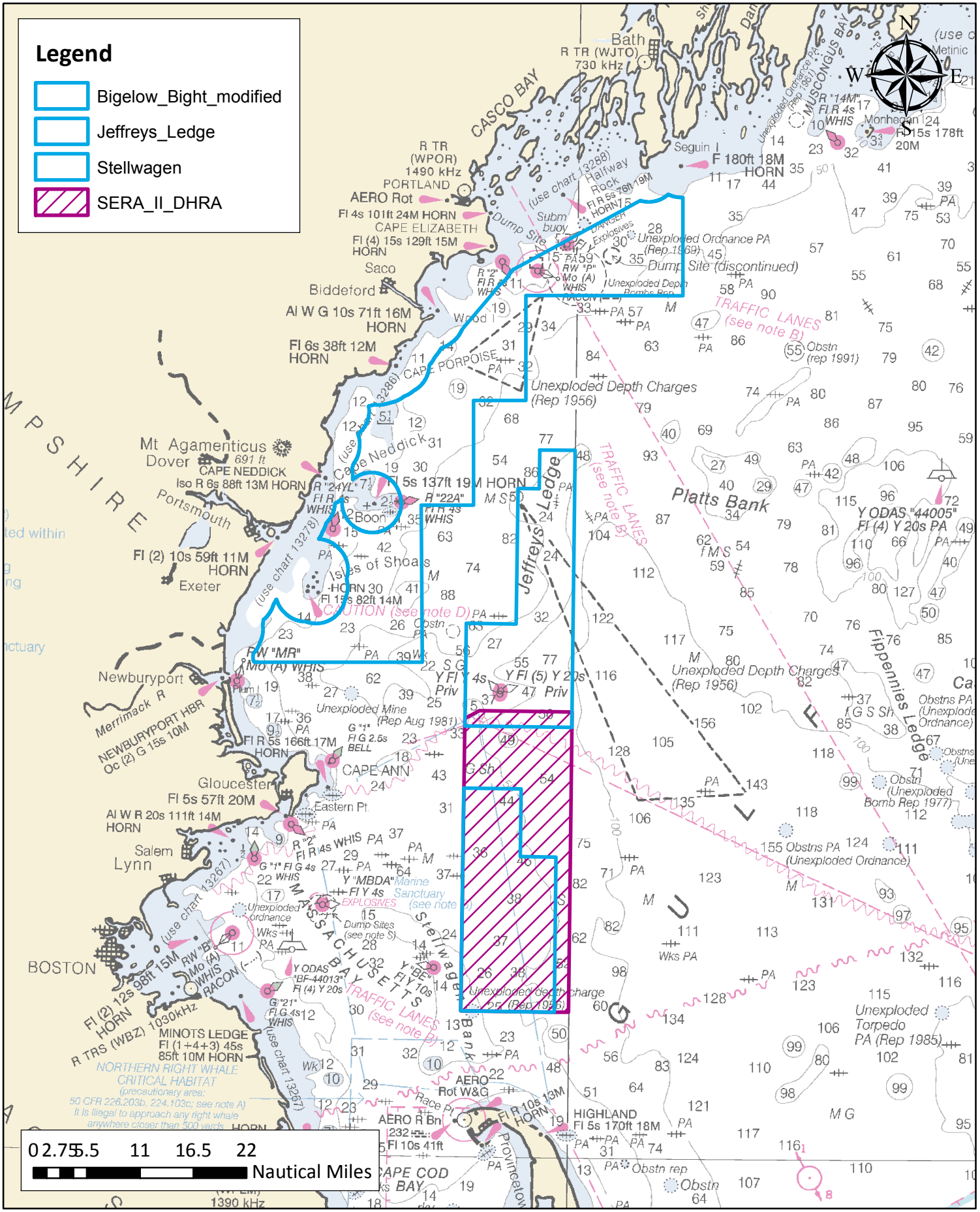
Western Gulf of Maine

Alternative 2



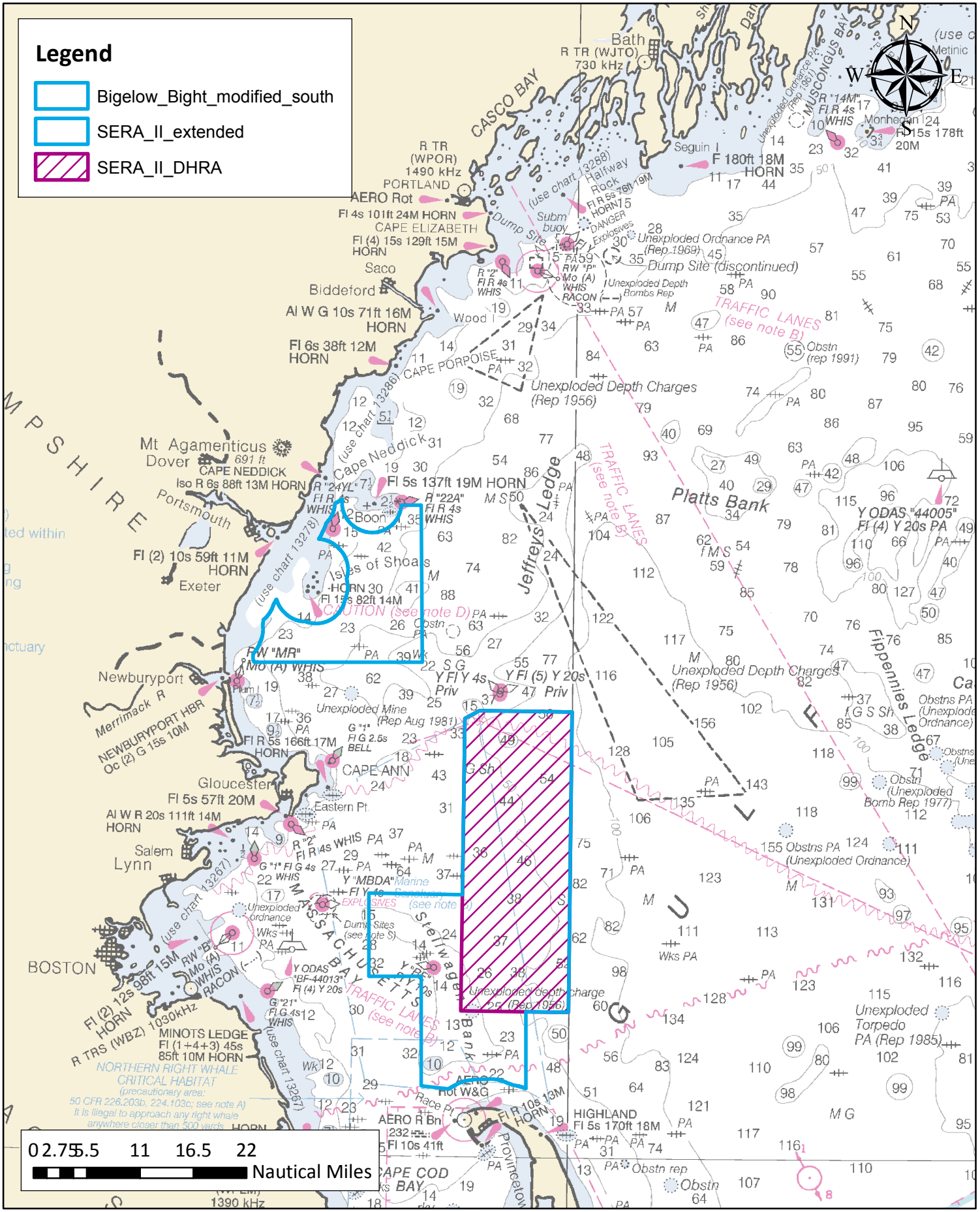
Western Gulf of Maine

Alternative 3



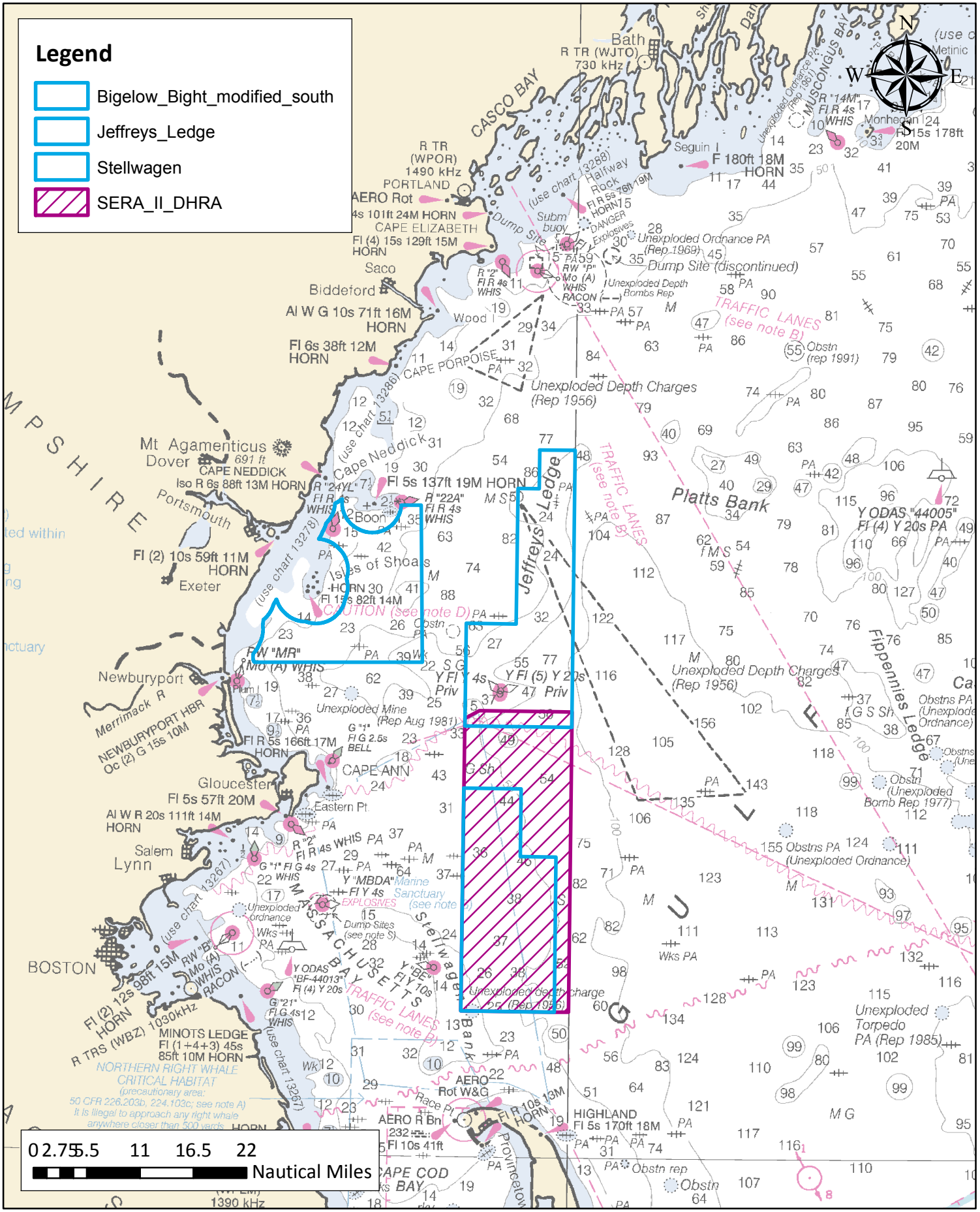
Western Gulf of Maine

Alternative 4



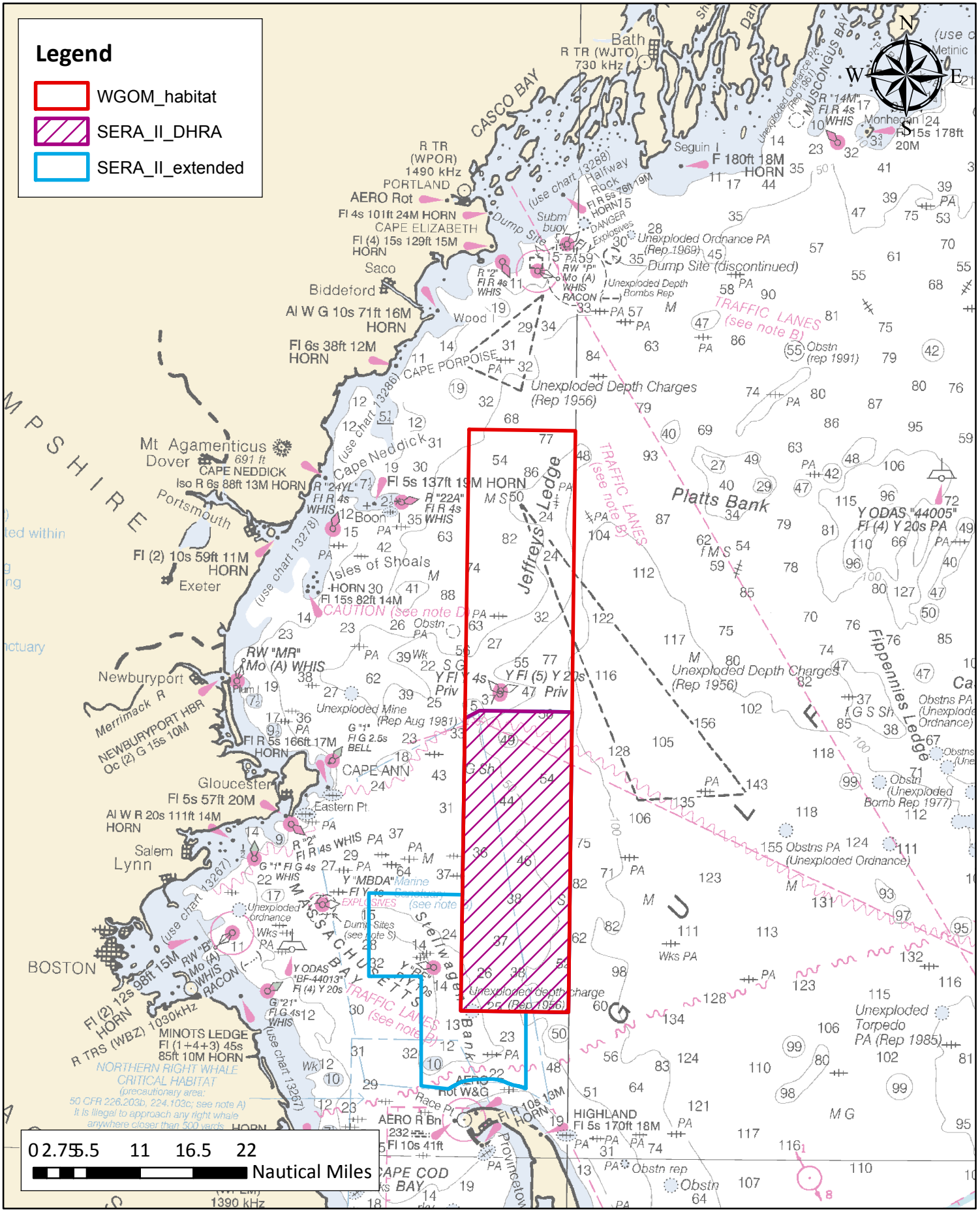
Western Gulf of Maine

Alternative 5



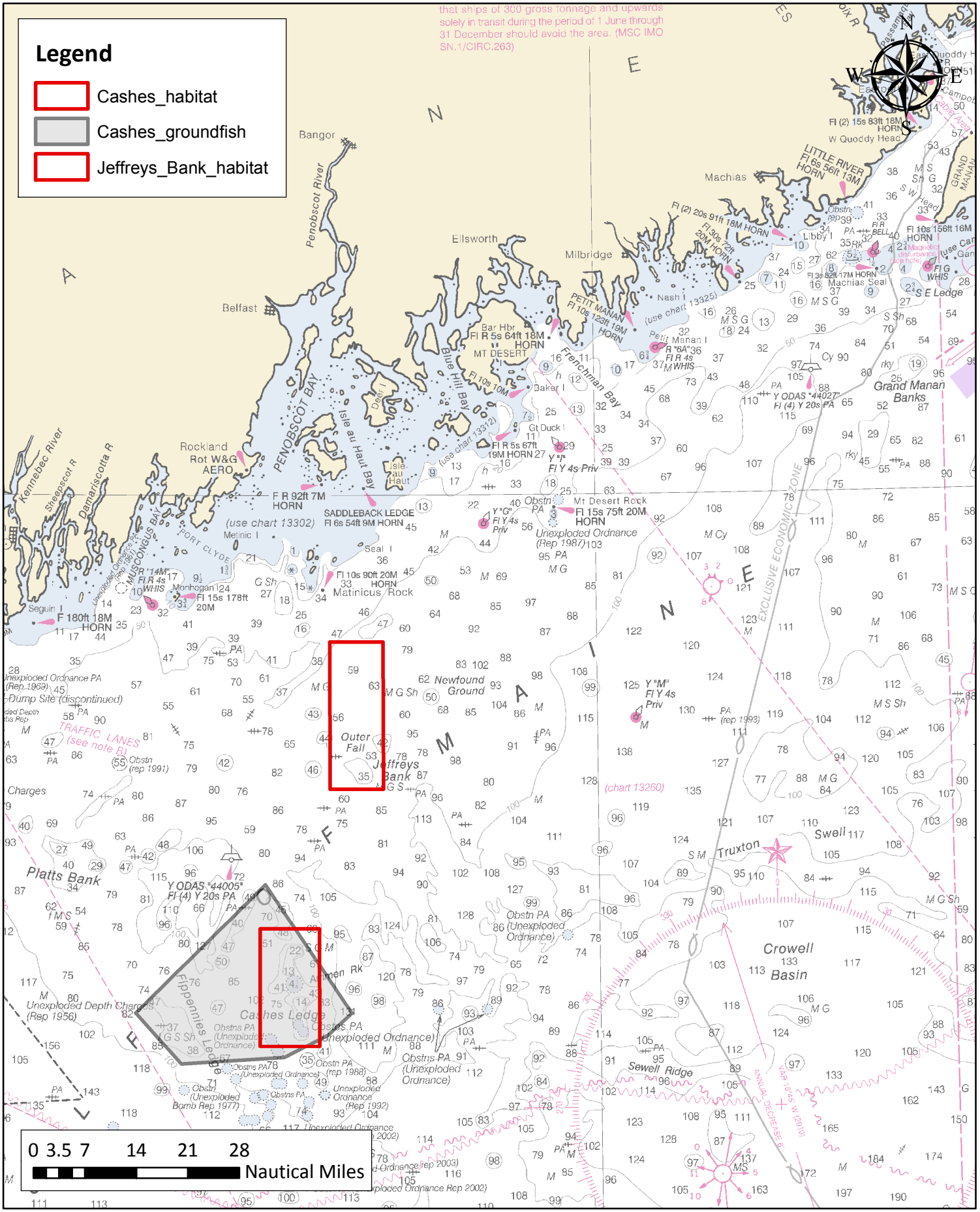
Western Gulf of Maine

Alternative 6



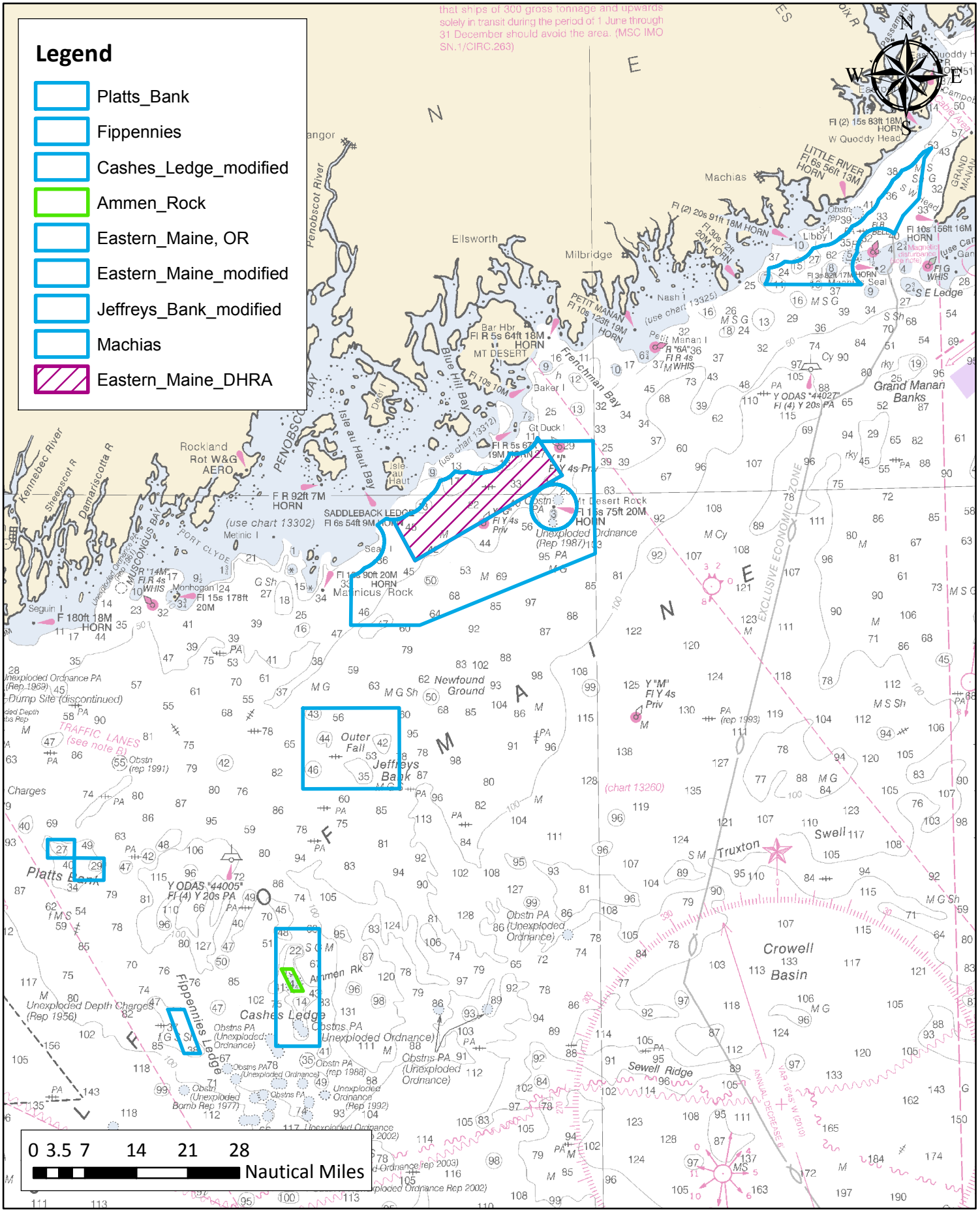
Eastern and Central Gulf of Maine

Alternative 1 (No Action)



Eastern and Central Gulf of Maine

Alternative 2



Eastern/Central Gulf of Maine

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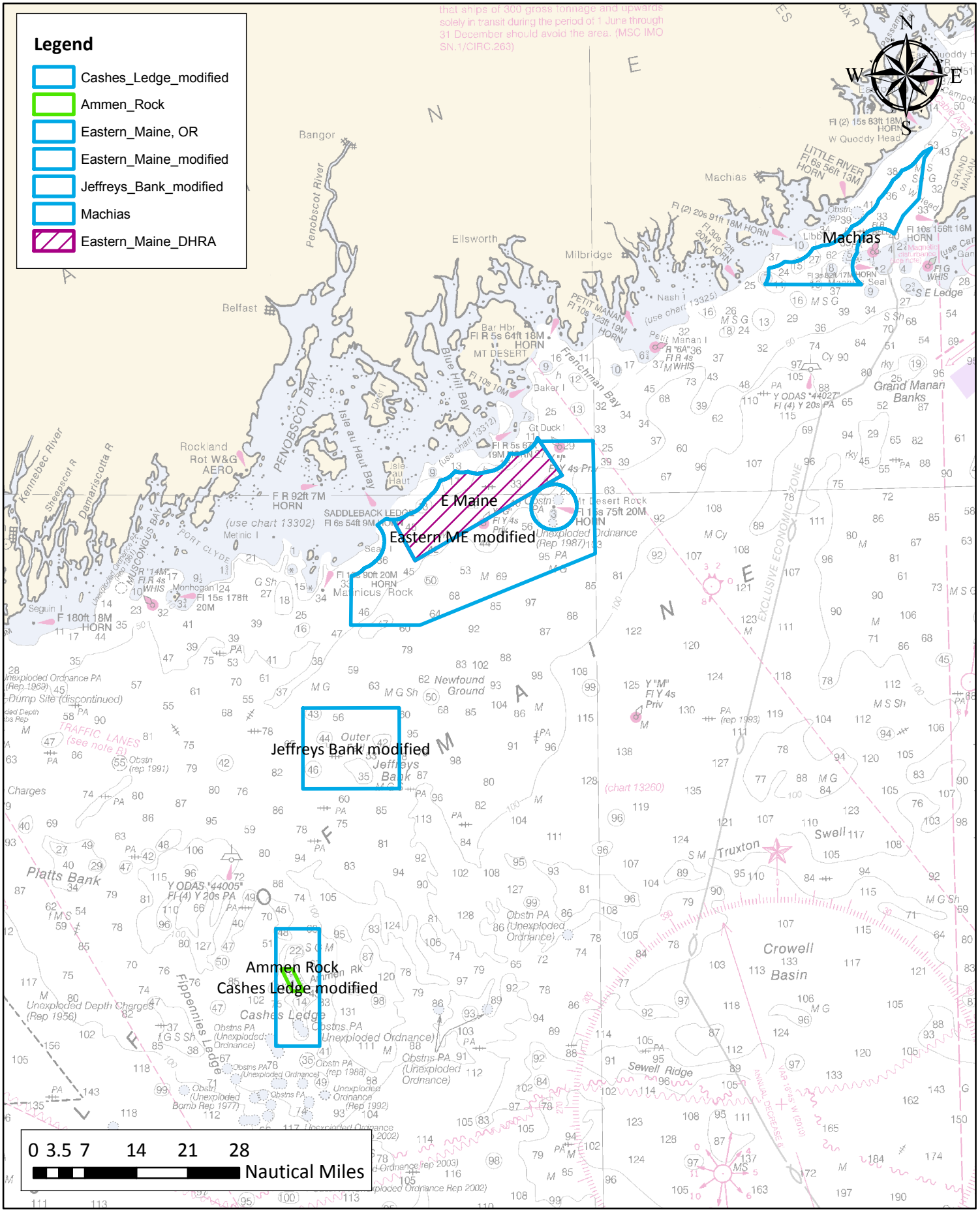
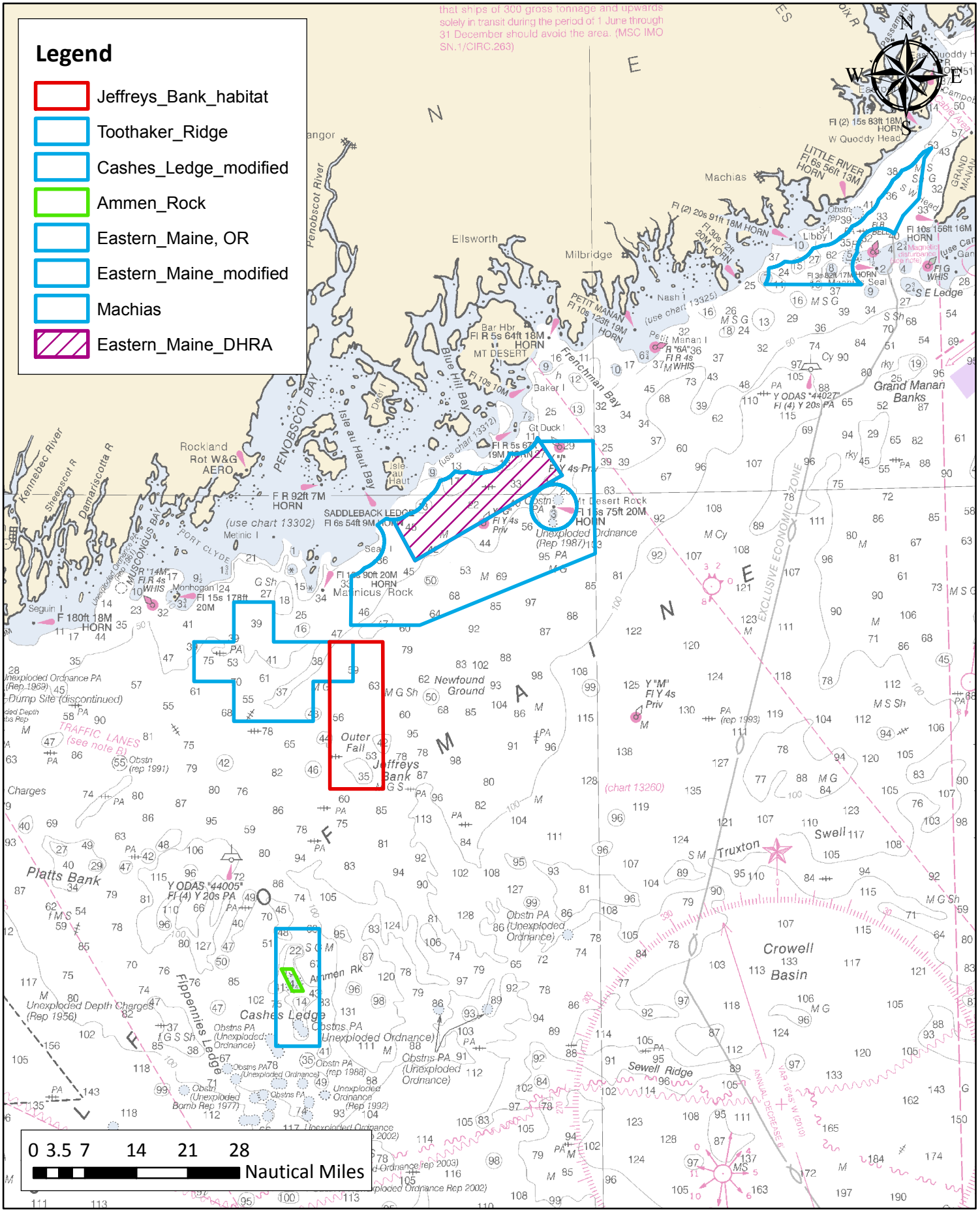


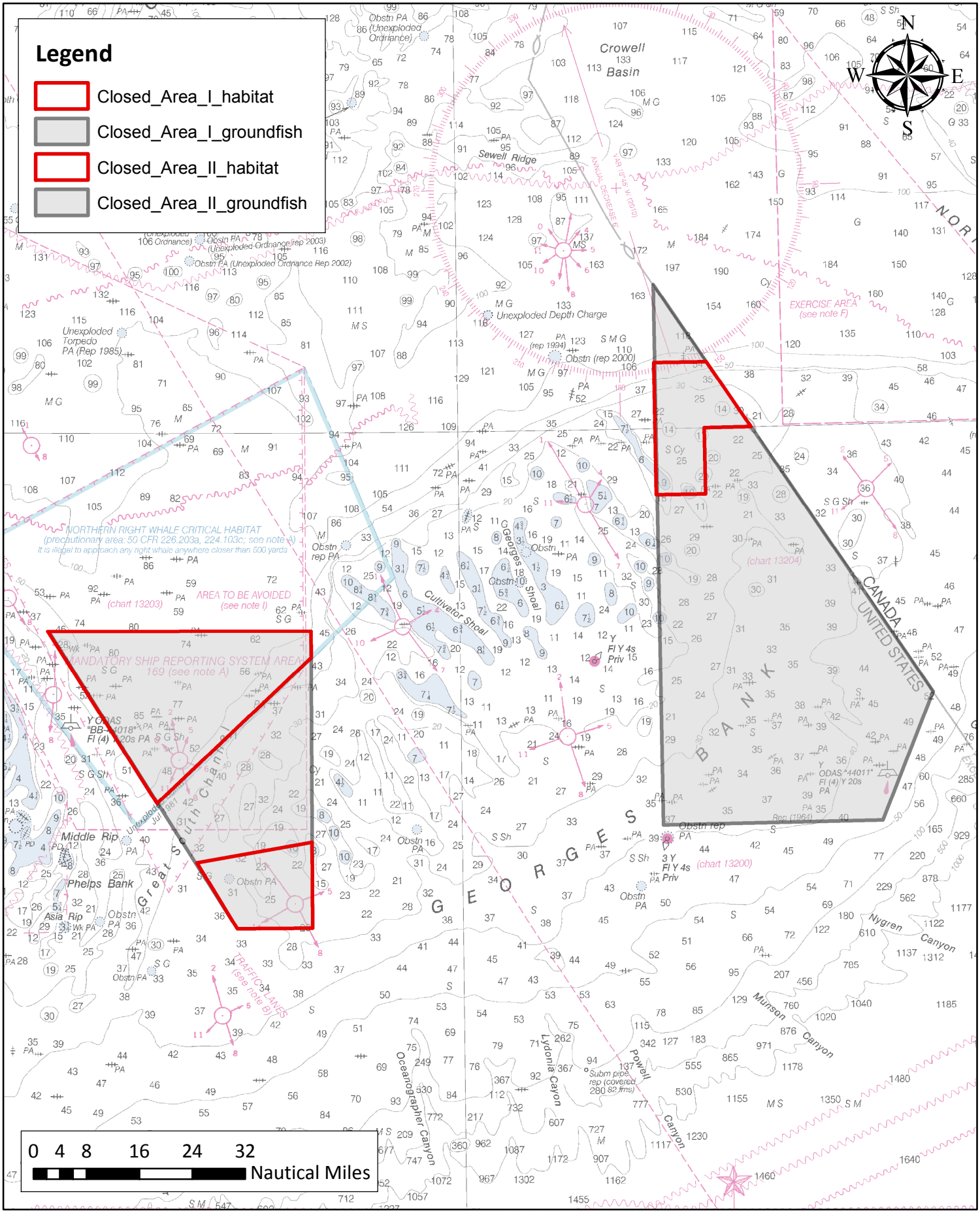
Eastern and Central Gulf of Maine

Alternative 4



Georges Bank

Alternative 1 (No Action)



Georges Bank

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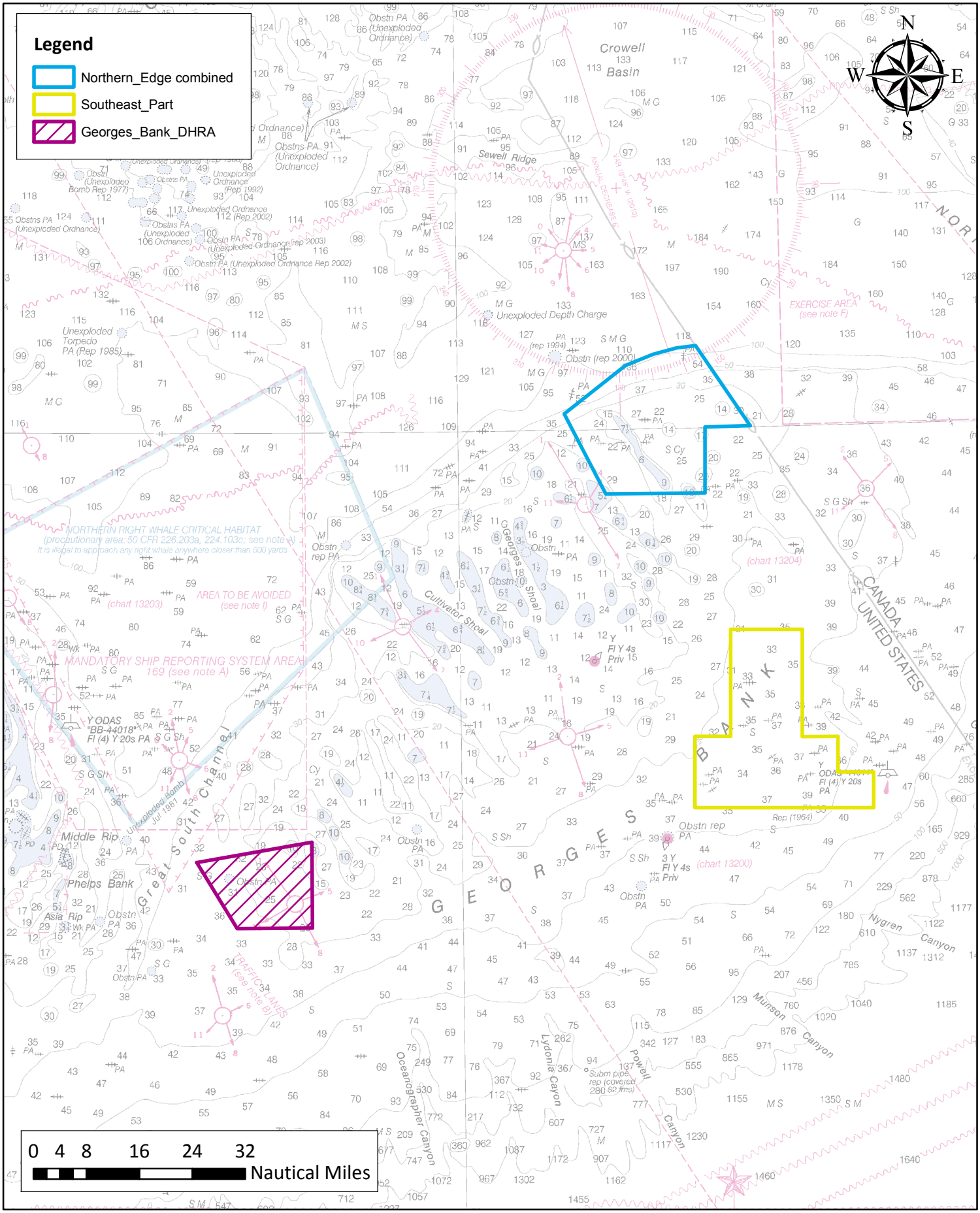
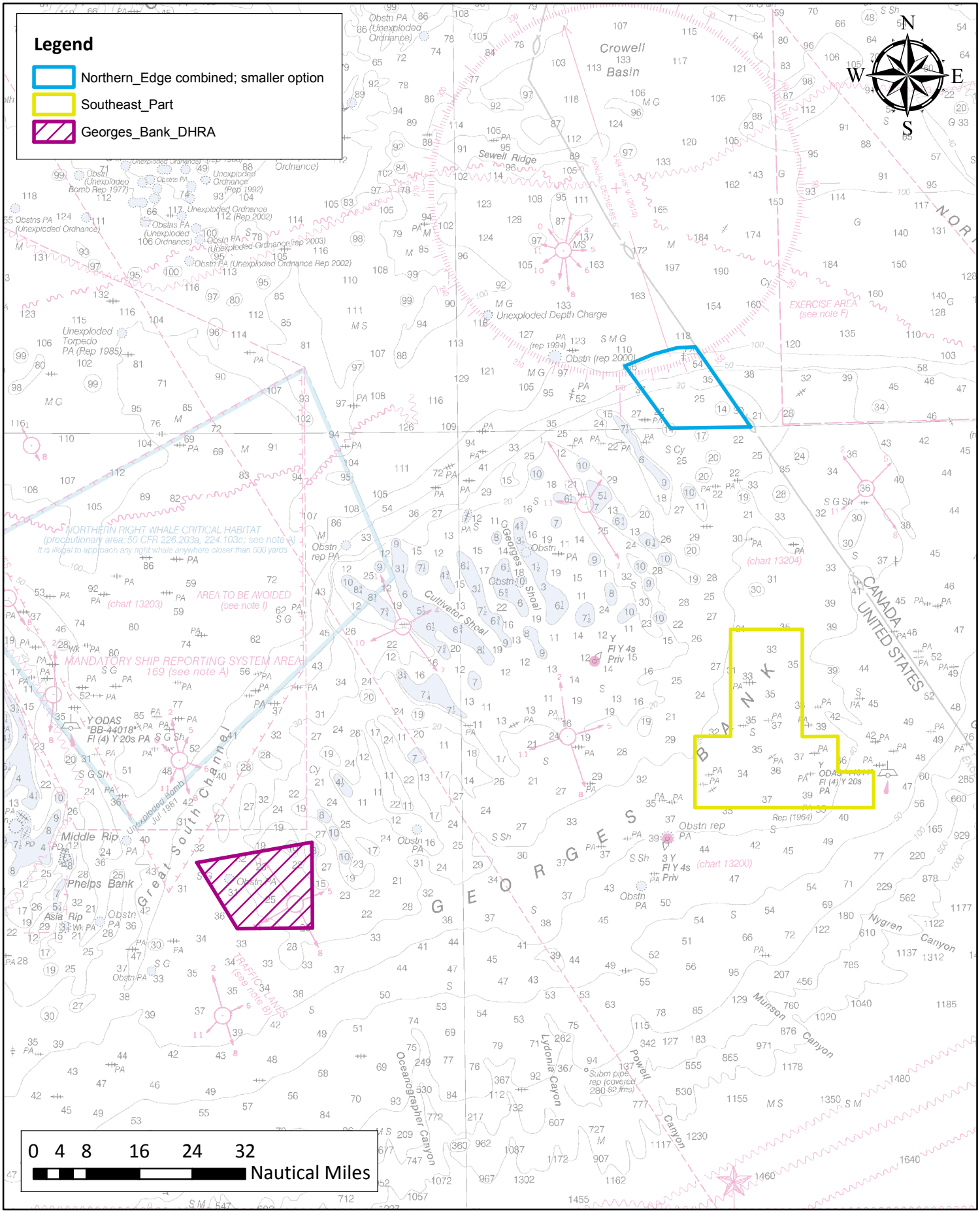


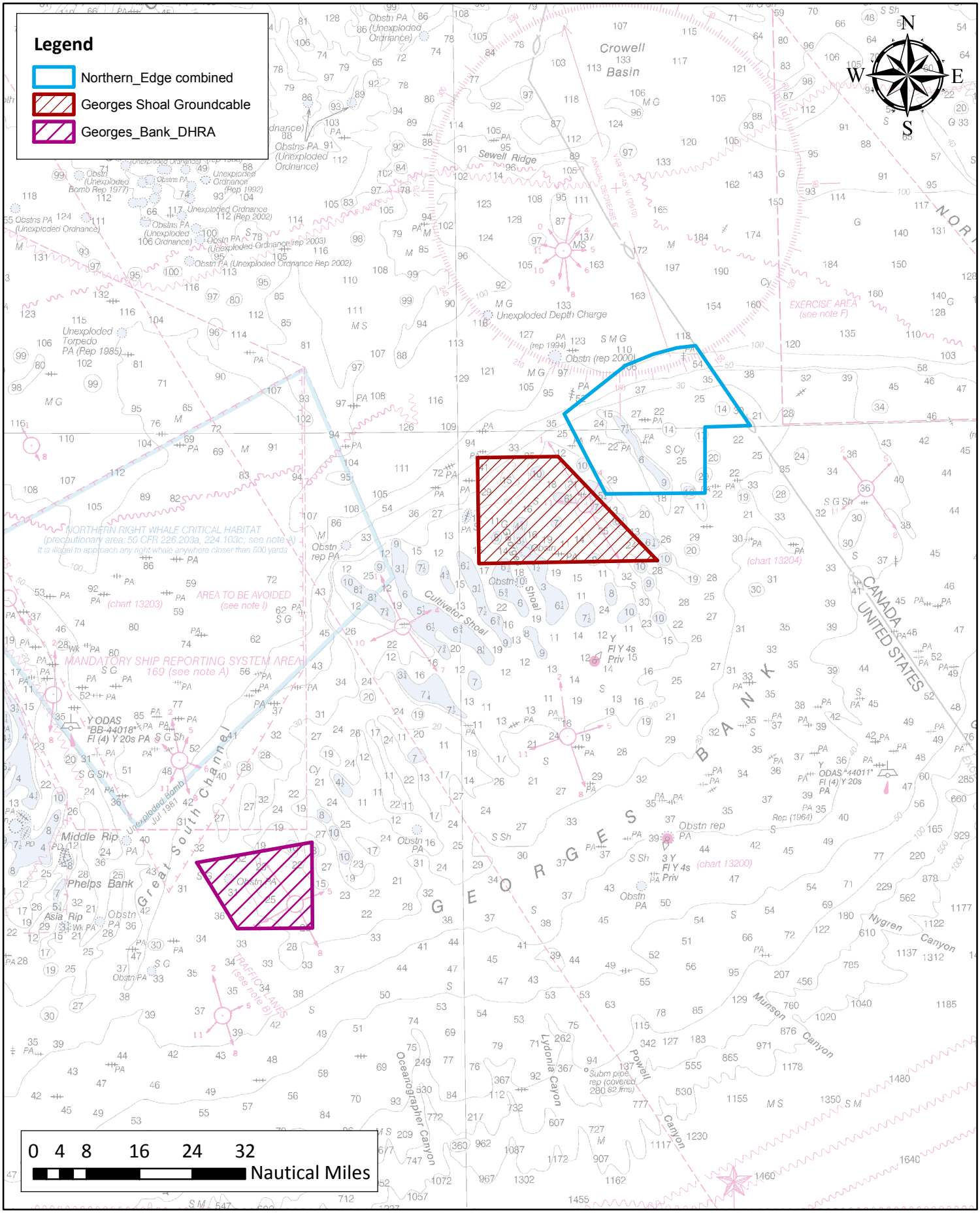
Georges Bank

Alternative 3



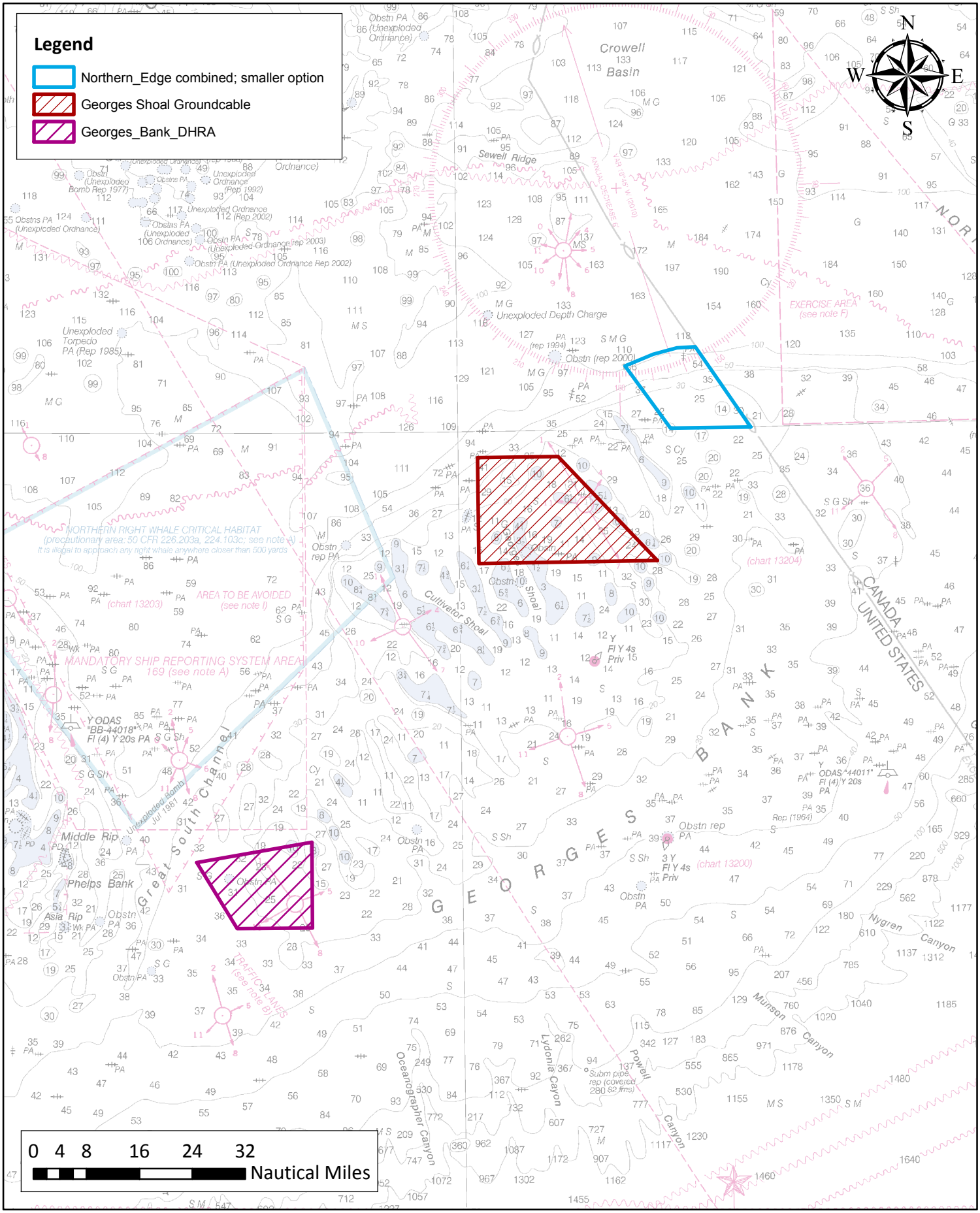
Georges Bank

Alternative 4



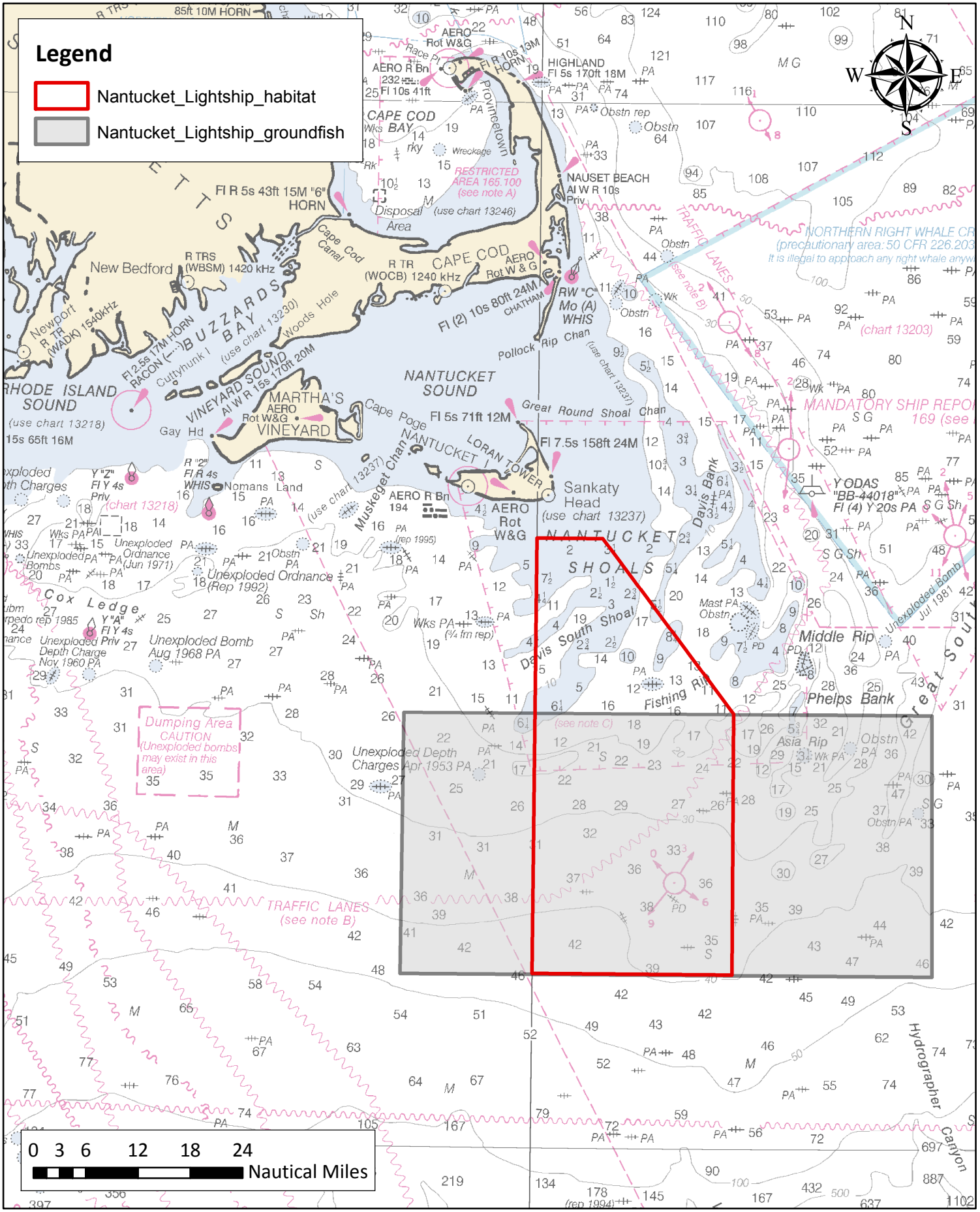
Georges Bank

Alternative 5



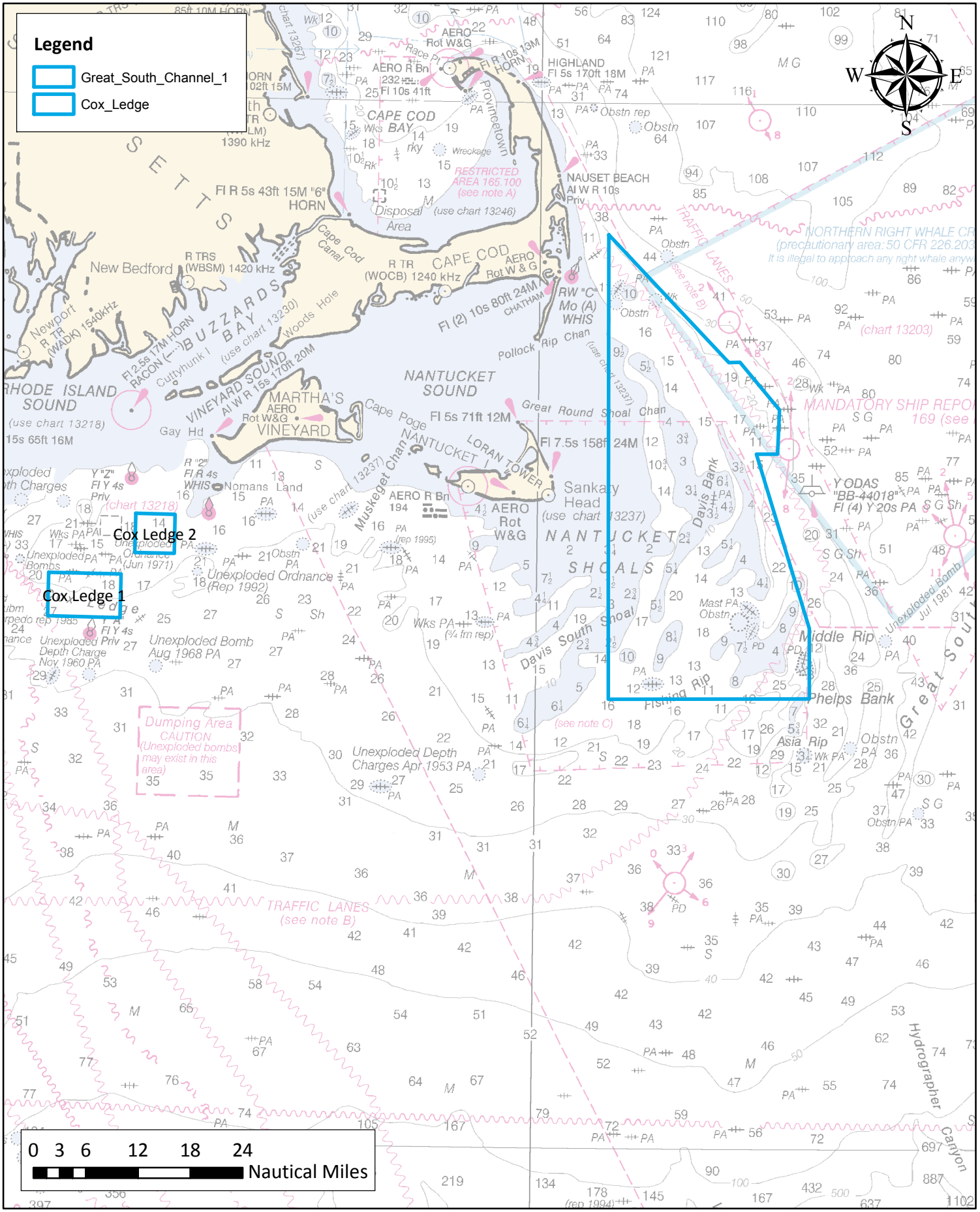
Great South Channel, Nantucket Shoals, and Southern New England

Alternative 1 (No Action)



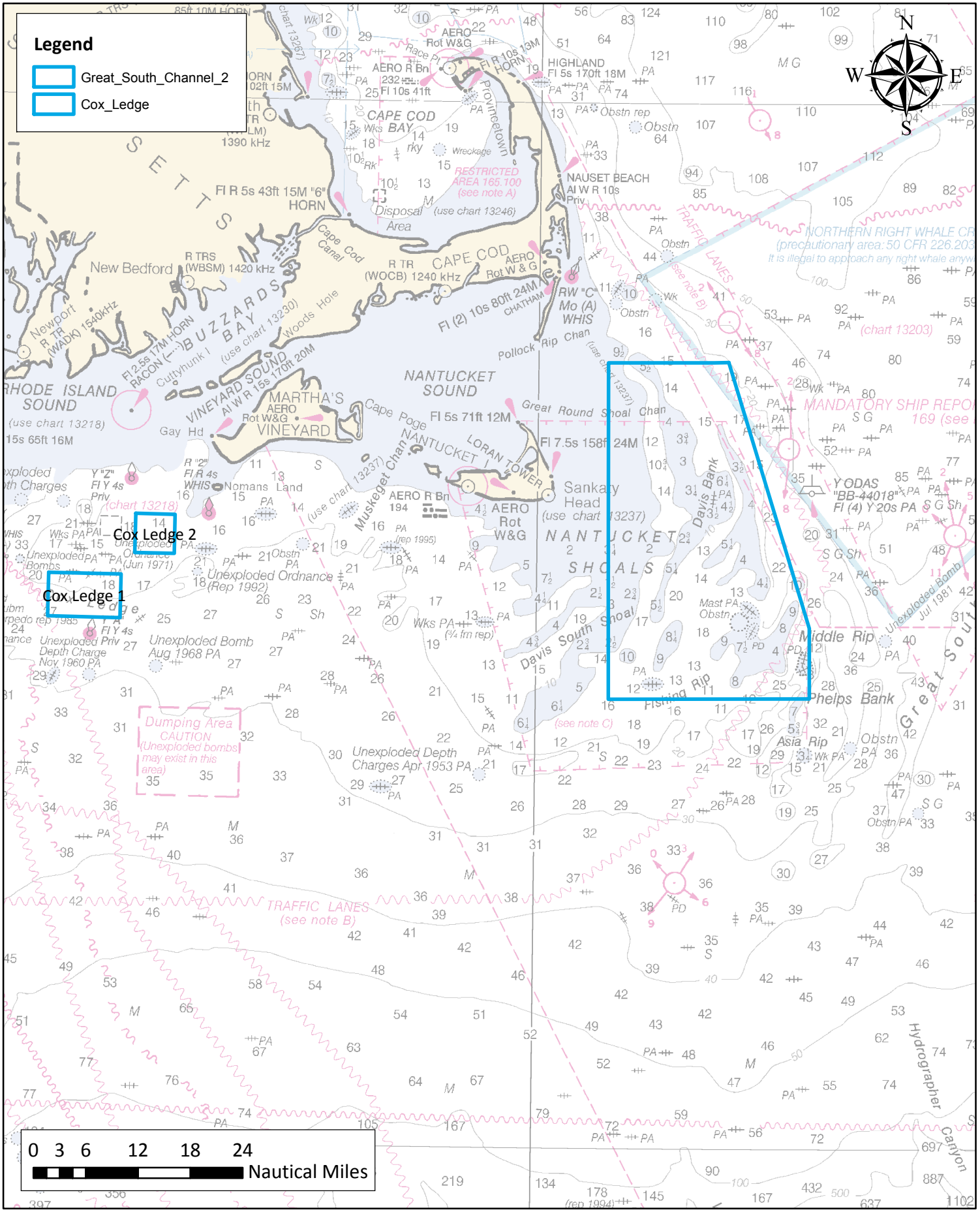
Great South Channel/Nantucket Shoals/Southern New England

Alternative 2



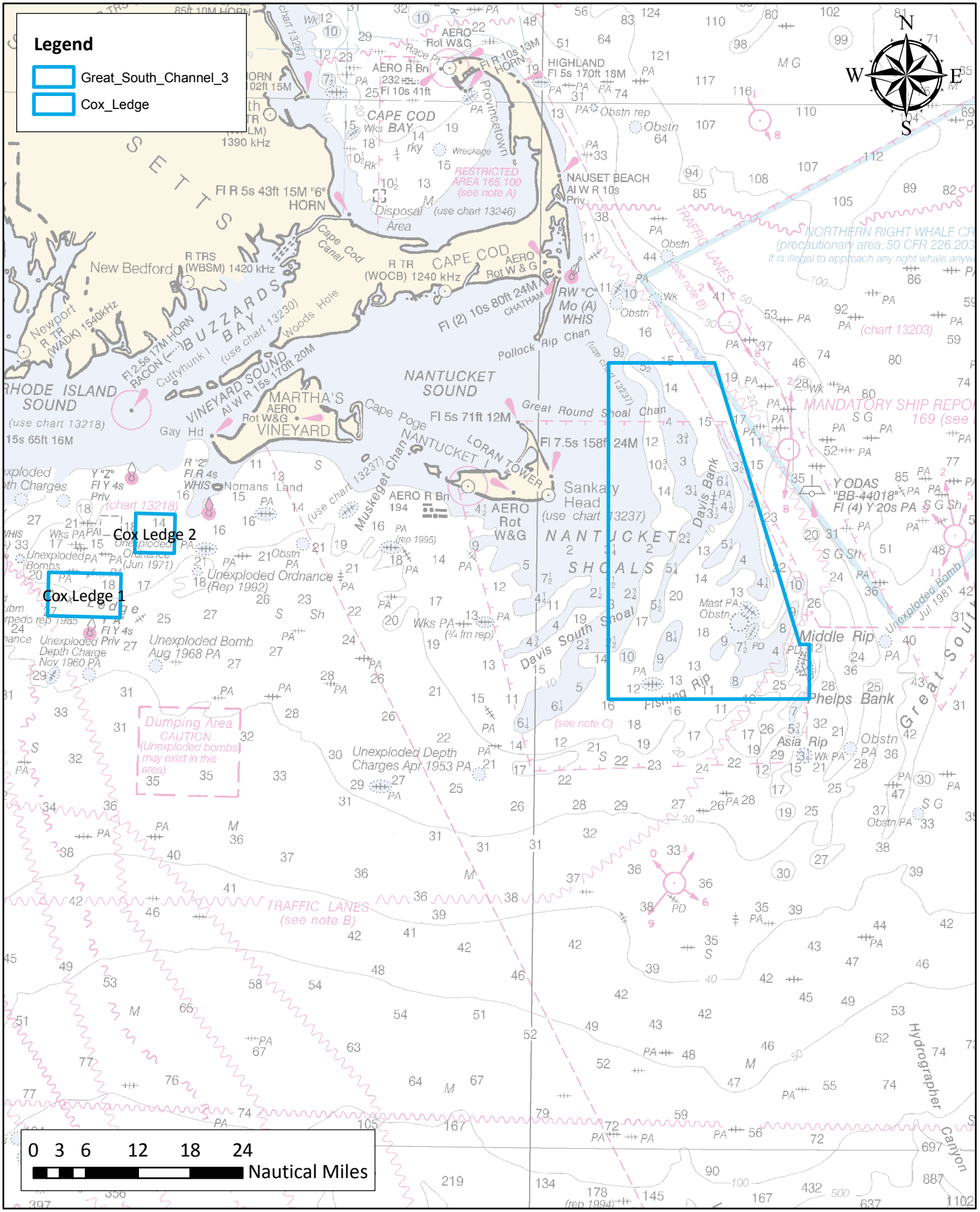
Great South Channel/Nantucket Shoals/Southern New England

Alternative 3



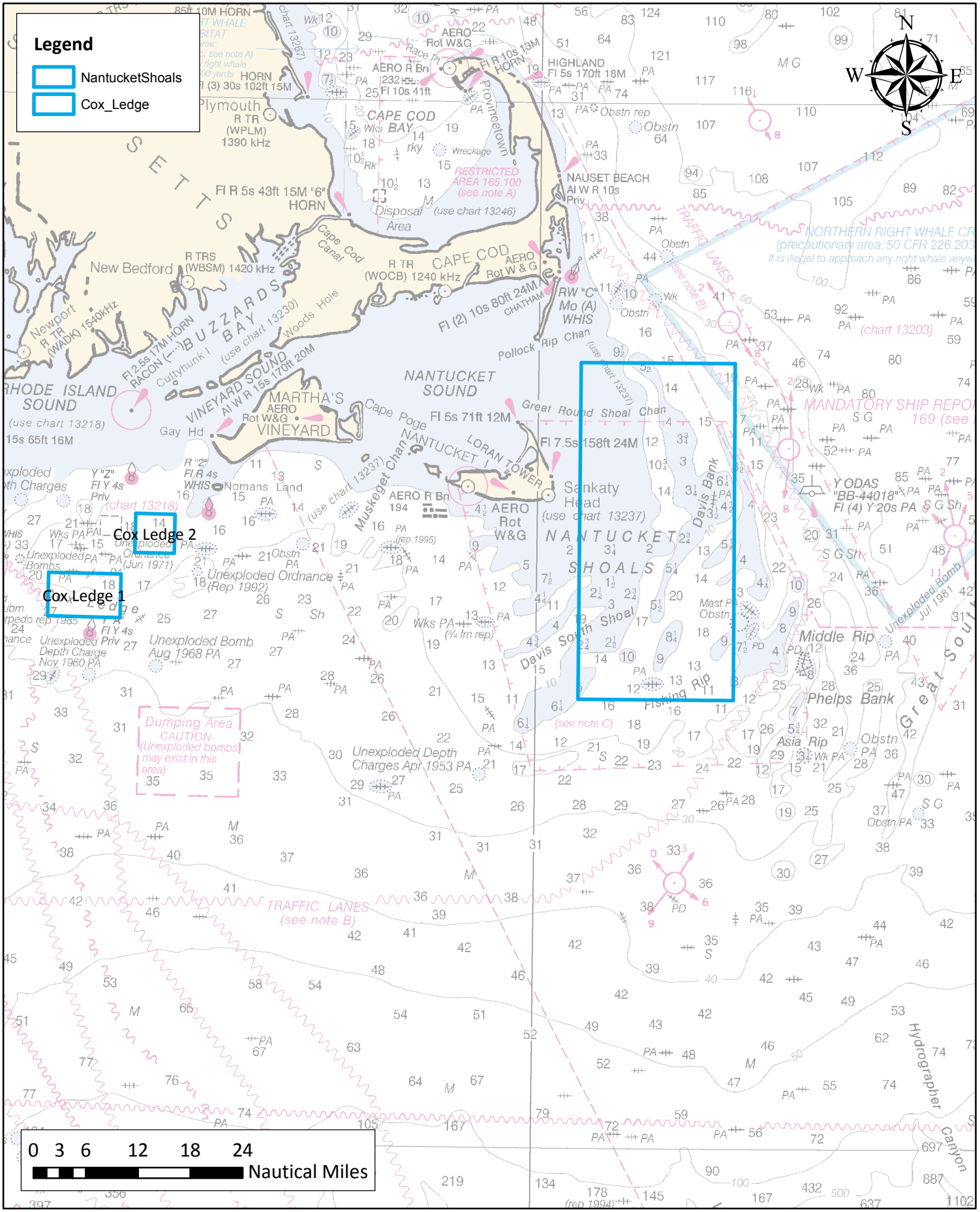
Great South Channel/Nantucket Shoals/Southern New England

Alternative 4



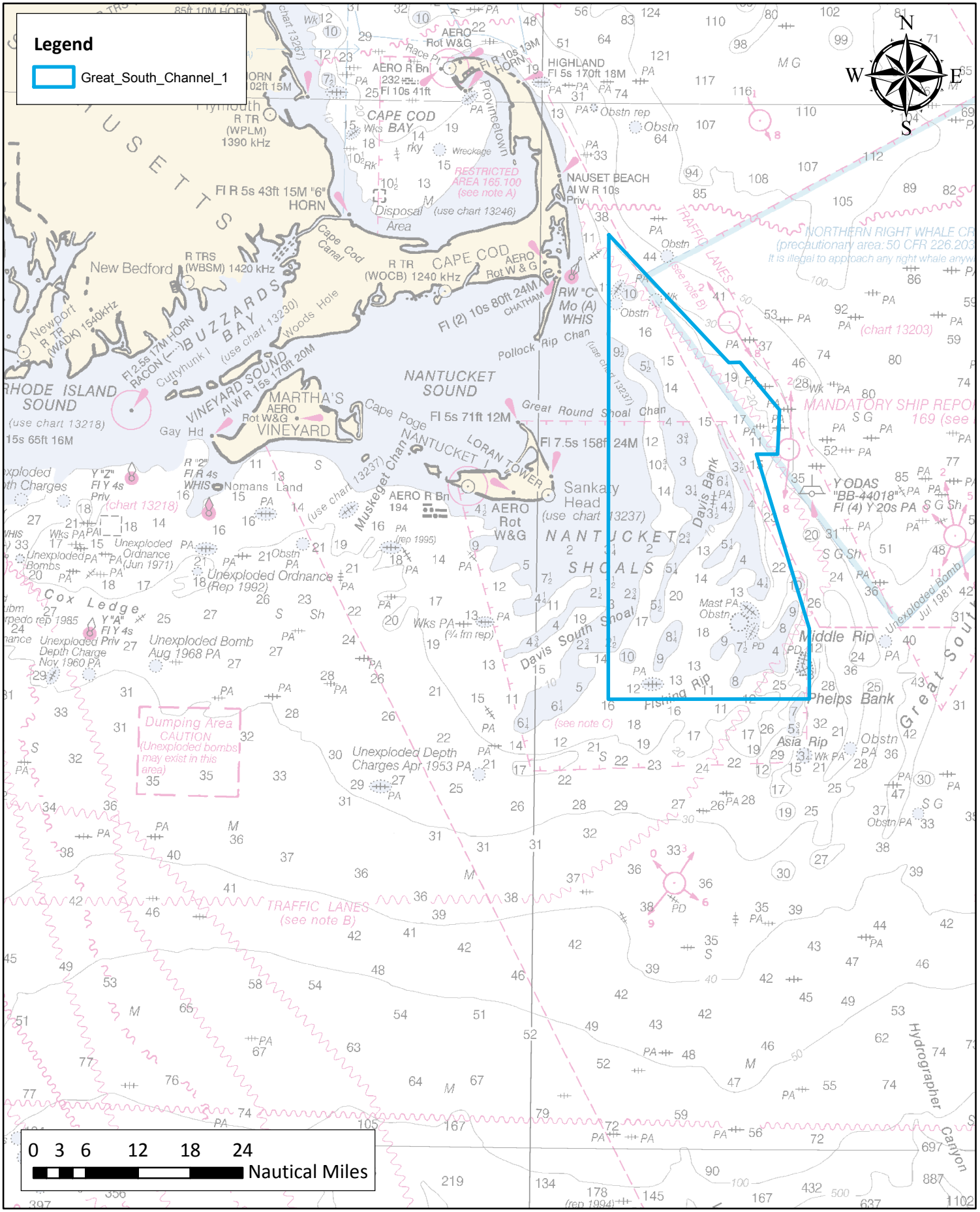
Great South Channel/Nantucket Shoals/Southern New England

Alternative 5



Great South Channel/Nantucket Shoals/Southern New England

Alternative 6



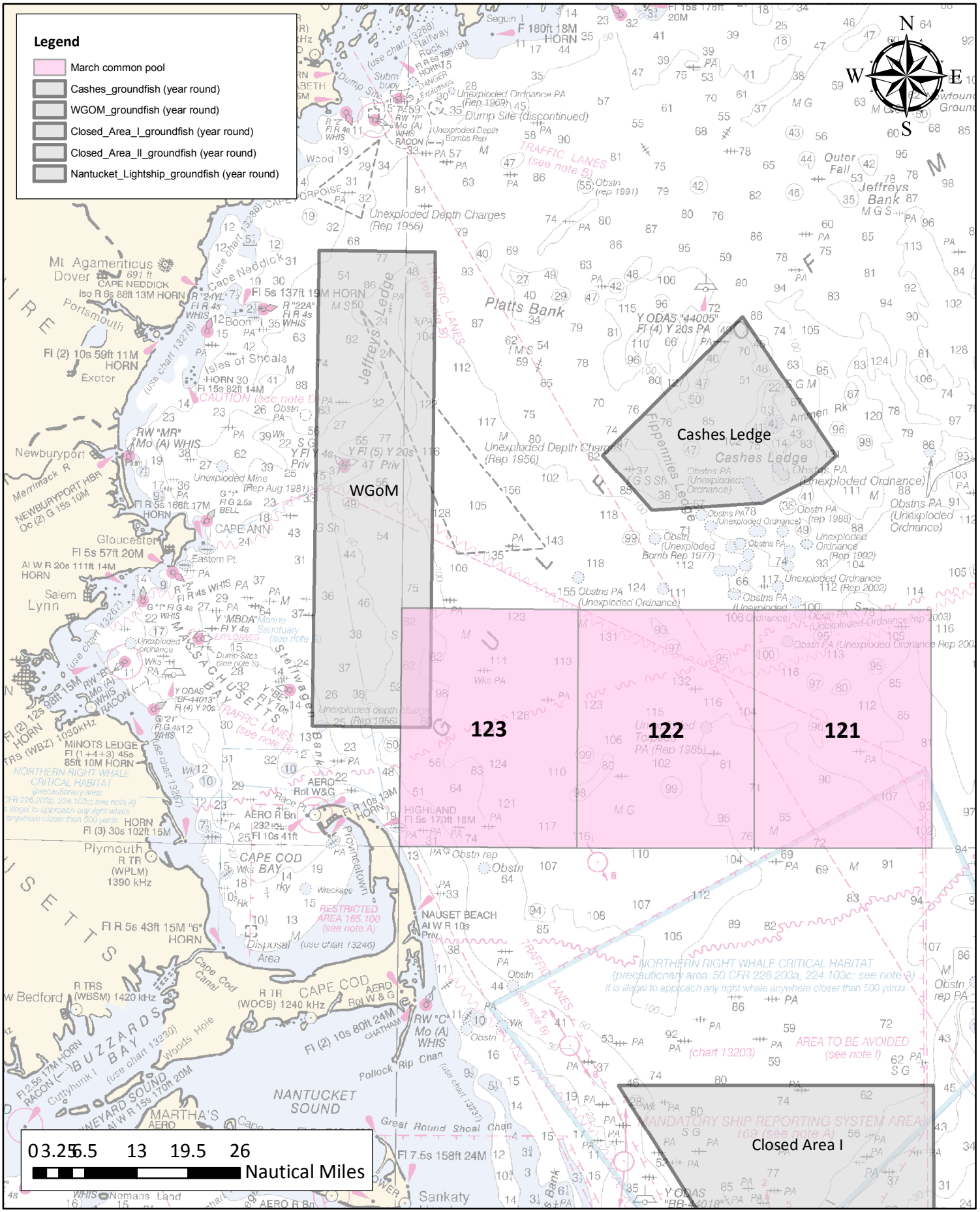
Alternatives for spawning protection

The Committees developed a spawning protection alternative at their recent meeting. The CATT and PDT agreed that the areas described by Alternative 2 below would maintain current protections for spawning fish. One specific point raised by the CATT is that a longer seasonal closure in CAII would more effectively minimize impacts to spawning activities of species including yellowtail flounder and haddock.

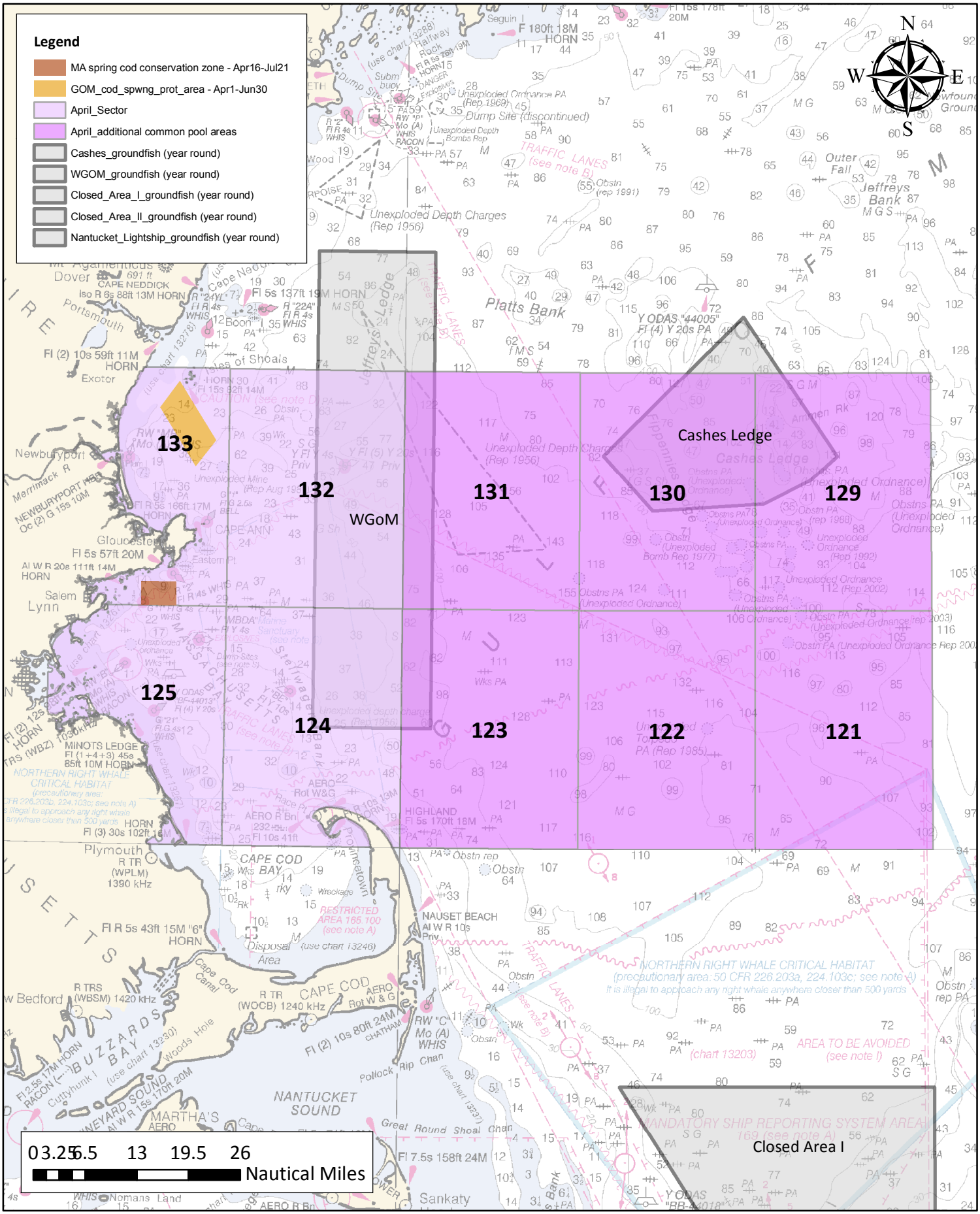
- **Alternative 1 (No Action):** Year round groundfish closures (WGOM, CL, CAI, CAII, NLCA), sector rolling closures, common pool rolling closures, May Georges Bank closure, GOM seasonal cod spawning area (Whaleback). Also note the two Massachusetts cod spawning zones.

- **Alternative 2:** Seasonal implementation of CAI and CAII groundfish closures (Feb, March, April), sector rolling closures (April, May, June), May Georges Bank closure, GOM seasonal cod spawning area (Whaleback). Also note the two Massachusetts cod spawning zones.

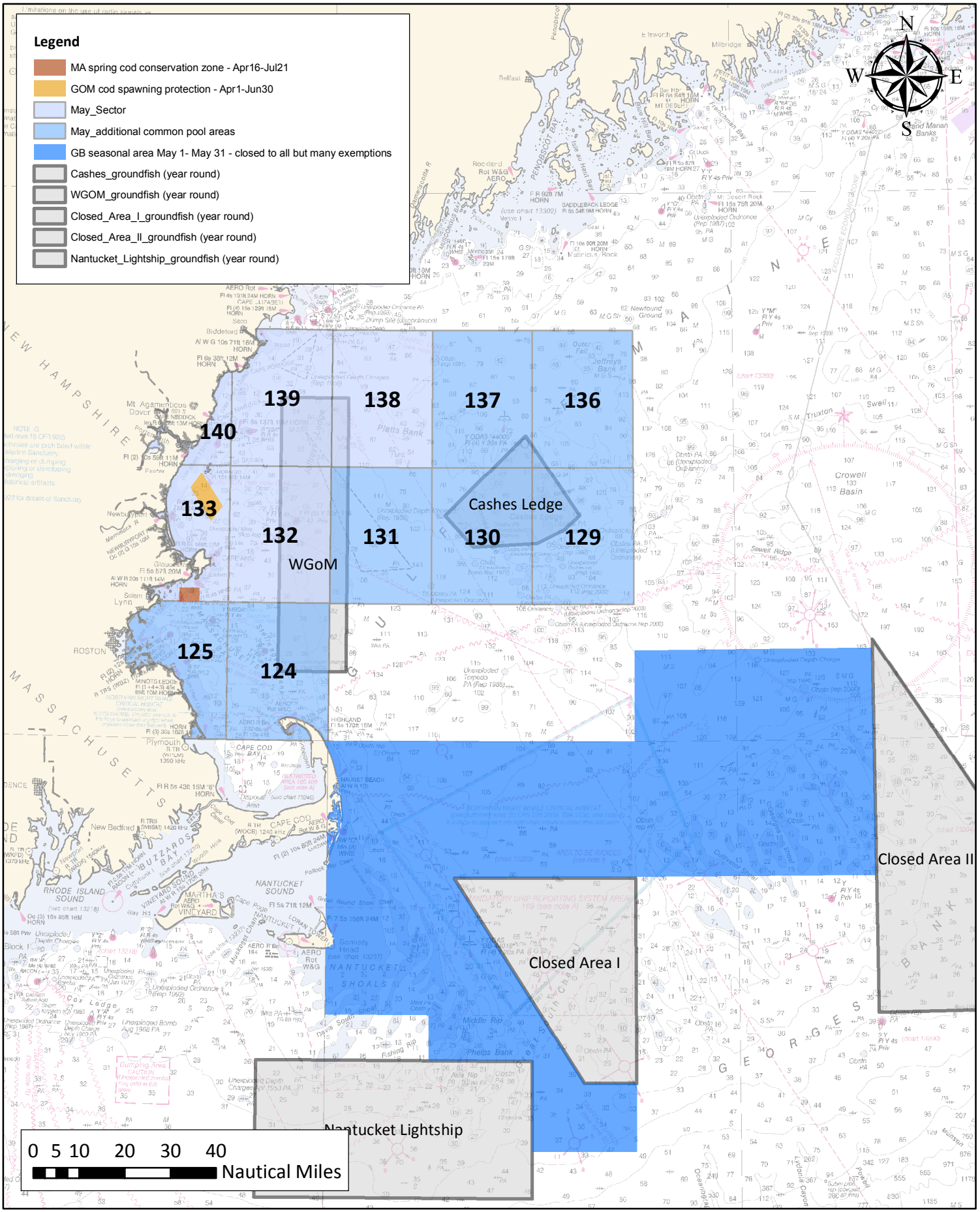
No Action Spawning Closure Areas, March. Generally, gears capable of catching groundfish are restricted.



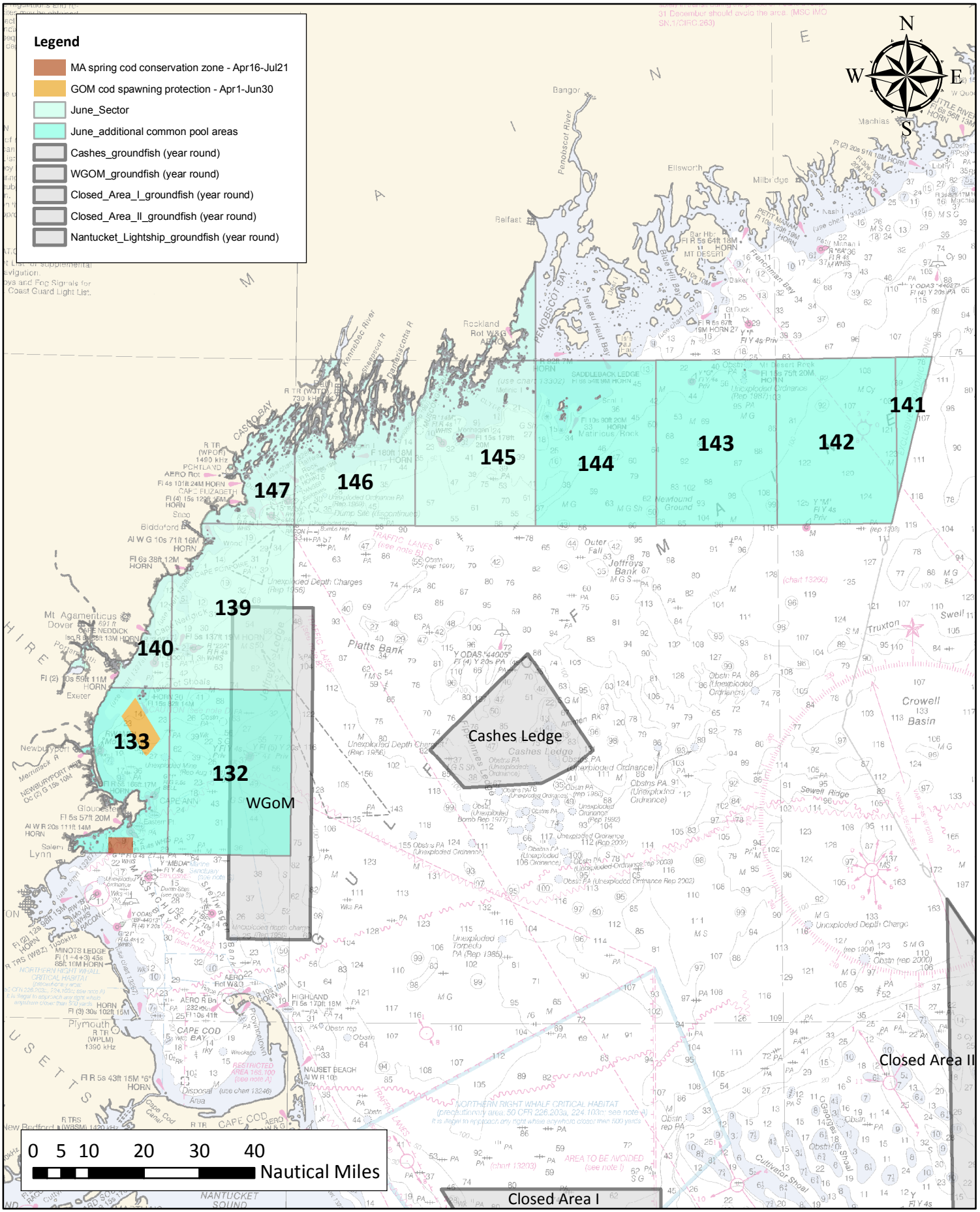
No Action Spawning Closure Areas, April. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, gears capable of catching groundfish are restricted.



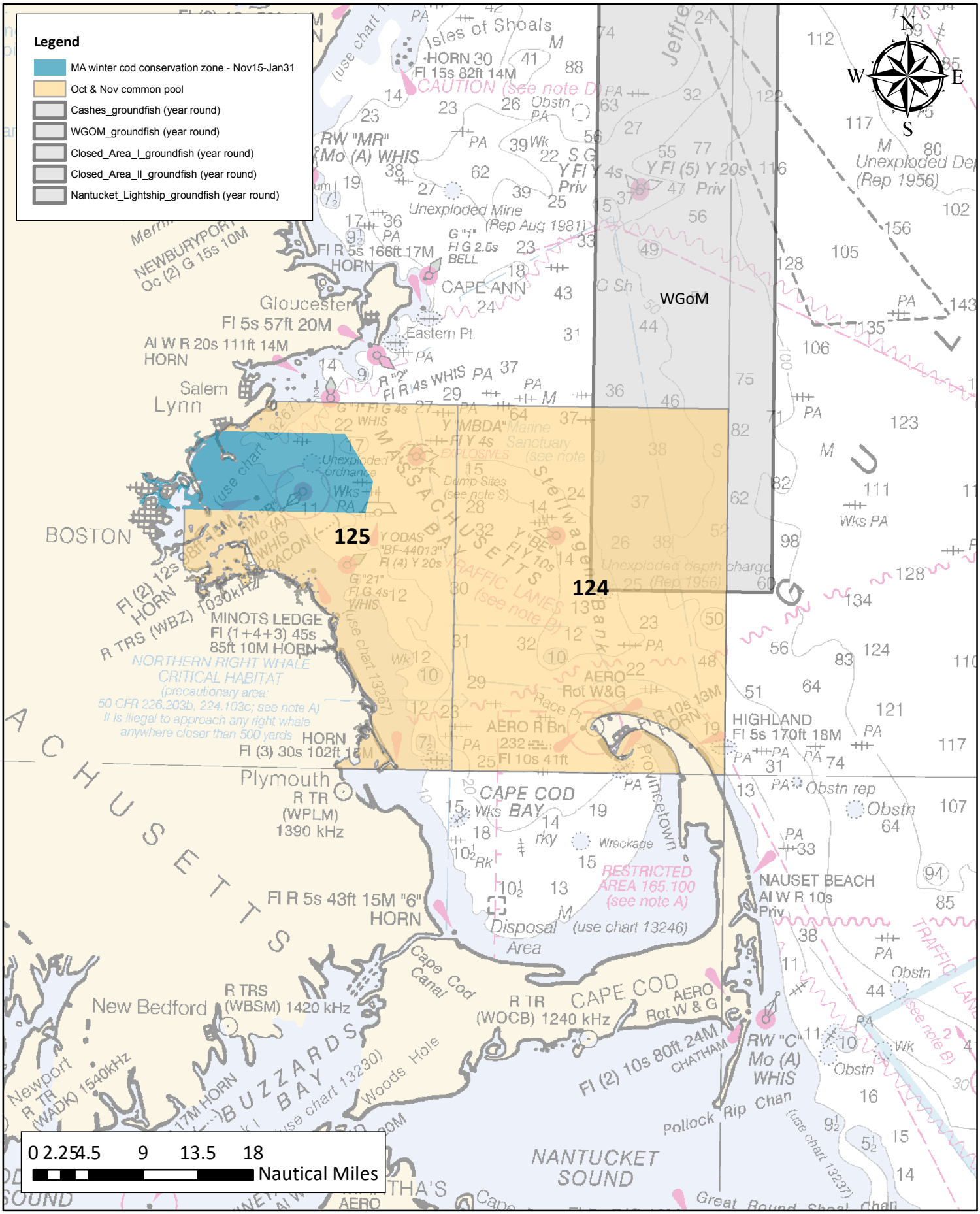
No Action Spawning Closure Areas, May. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, gears capable of catching groundfish are restricted.



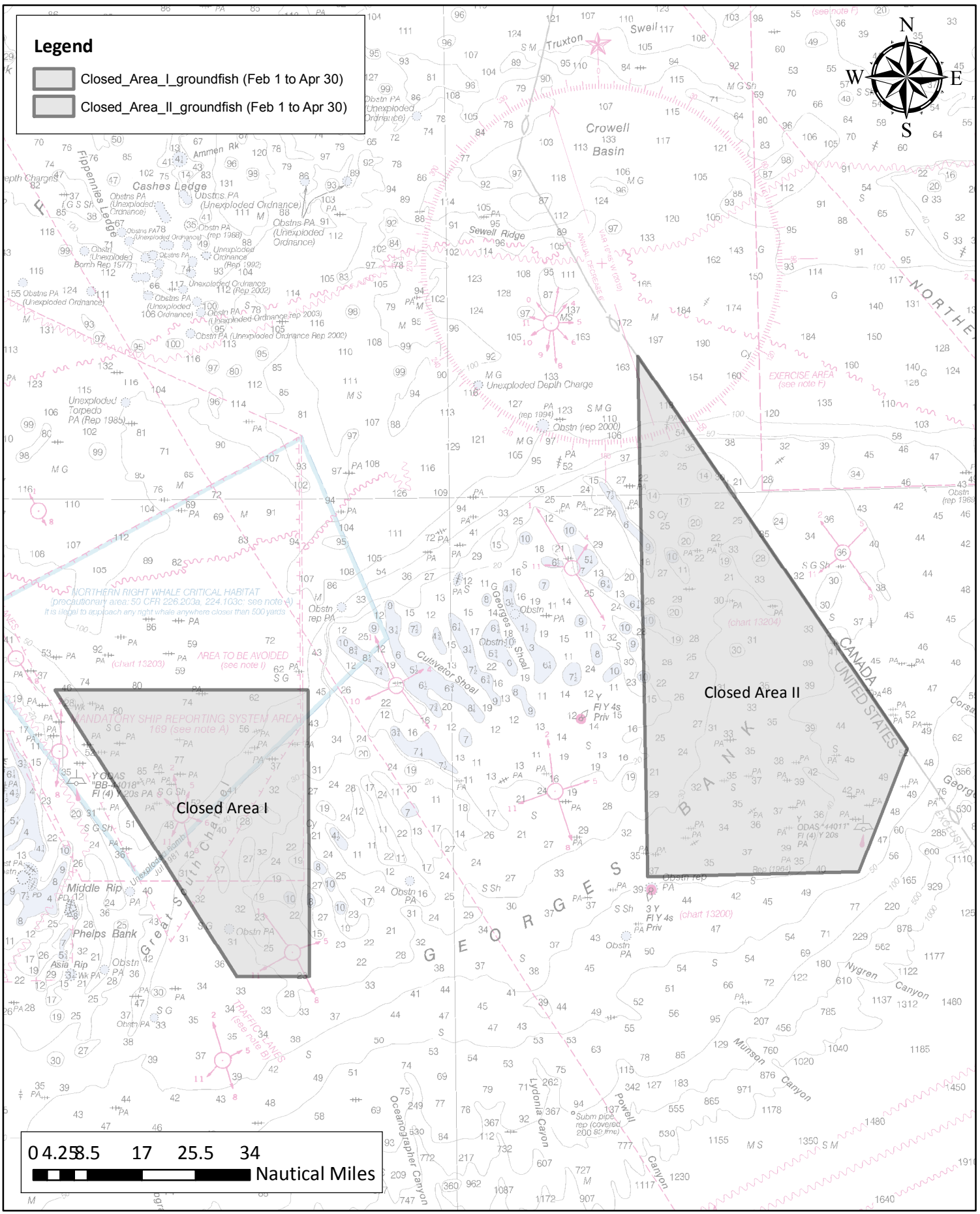
No Action Spawning Closure Areas, June. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, gears capable of catching groundfish are restricted.



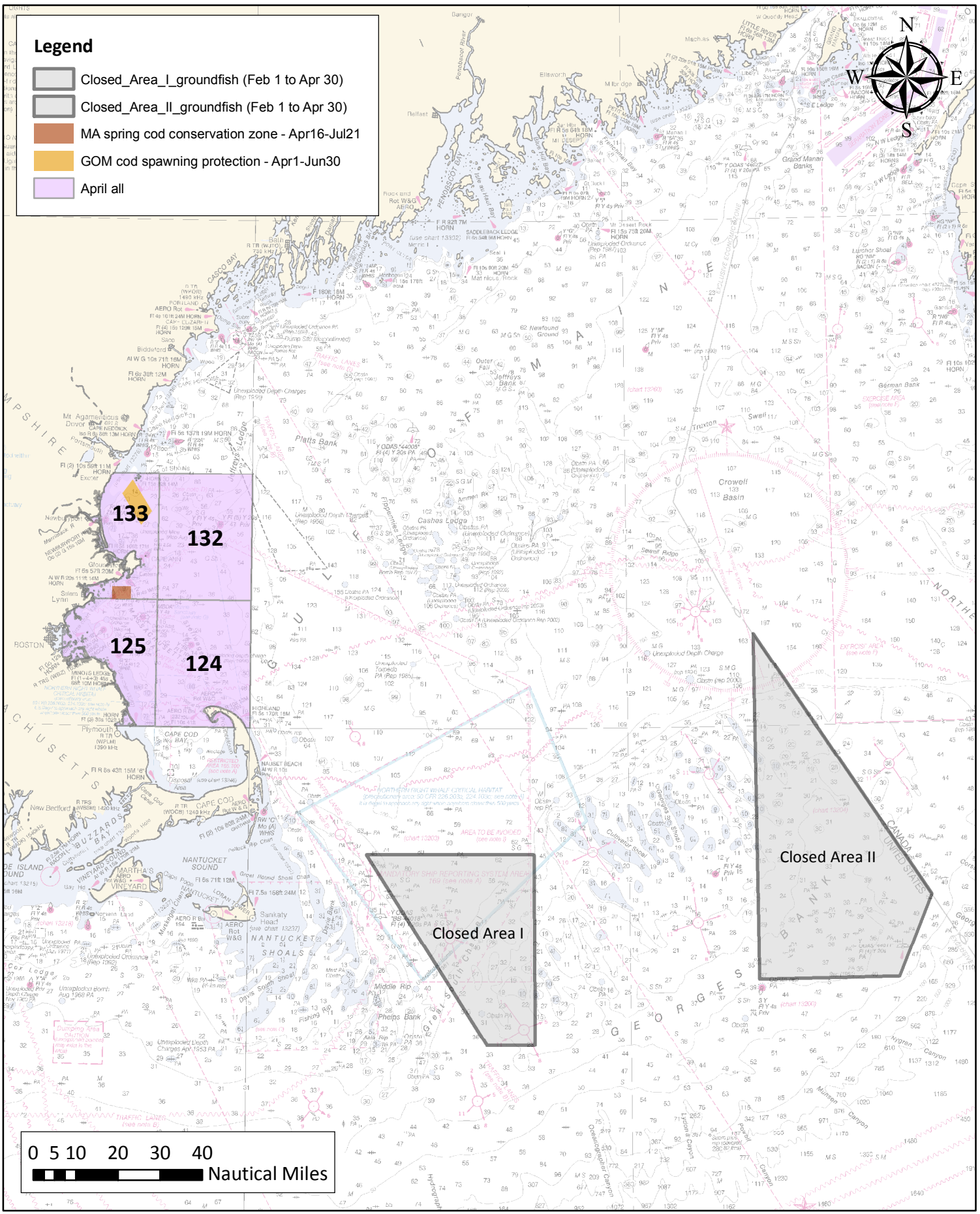
**No Action Spawning Closure Areas, Oct 1 to Nov 30. The Massachusetts spring and winter areas are not Council-mana
are shown for reference. Generally, gears capable of catching groundfish are restricted.**



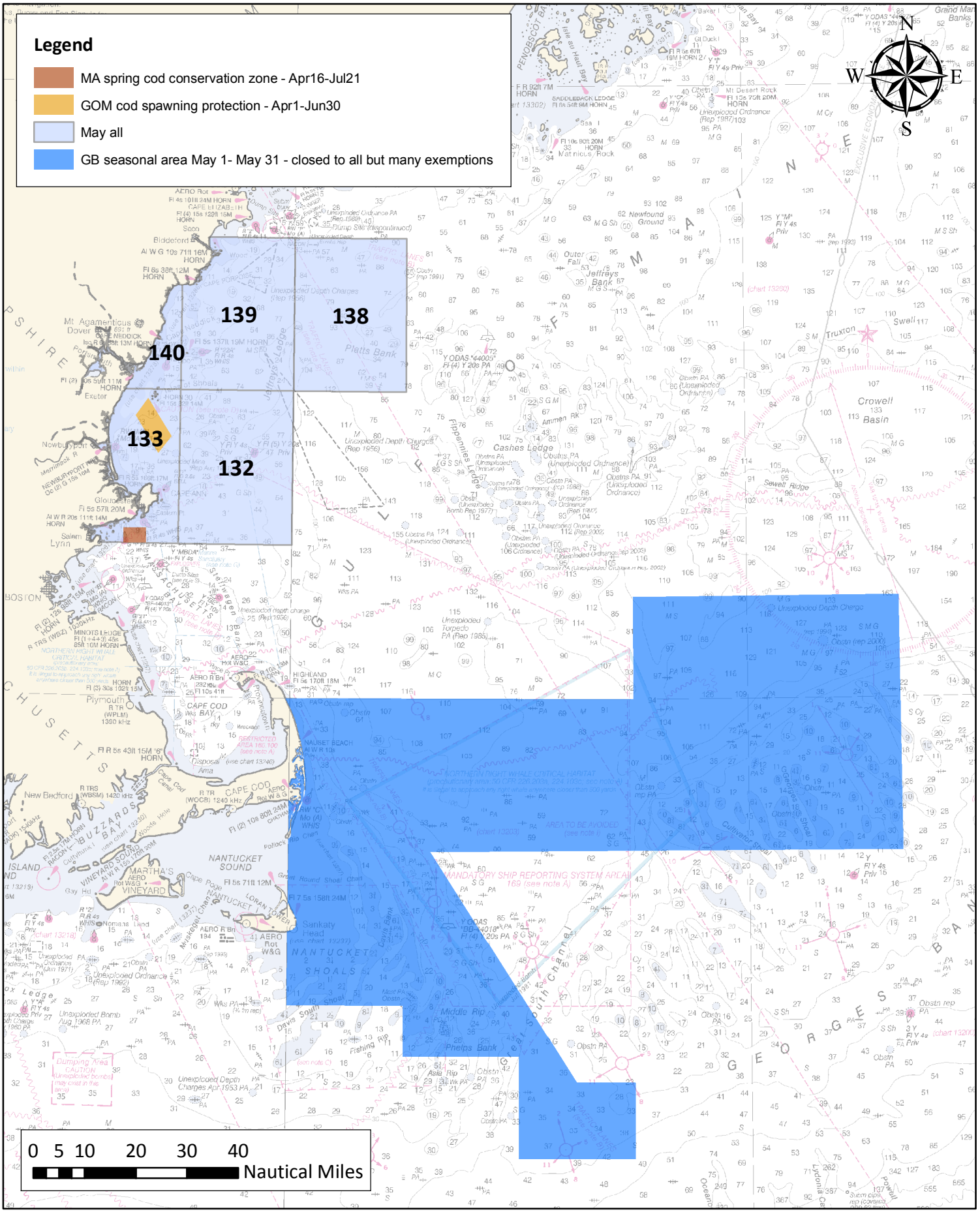
Proposed Spawning Closure Areas, February and March. Generally, commercial and recreational gears capable of catching groundfish would be prohibited.



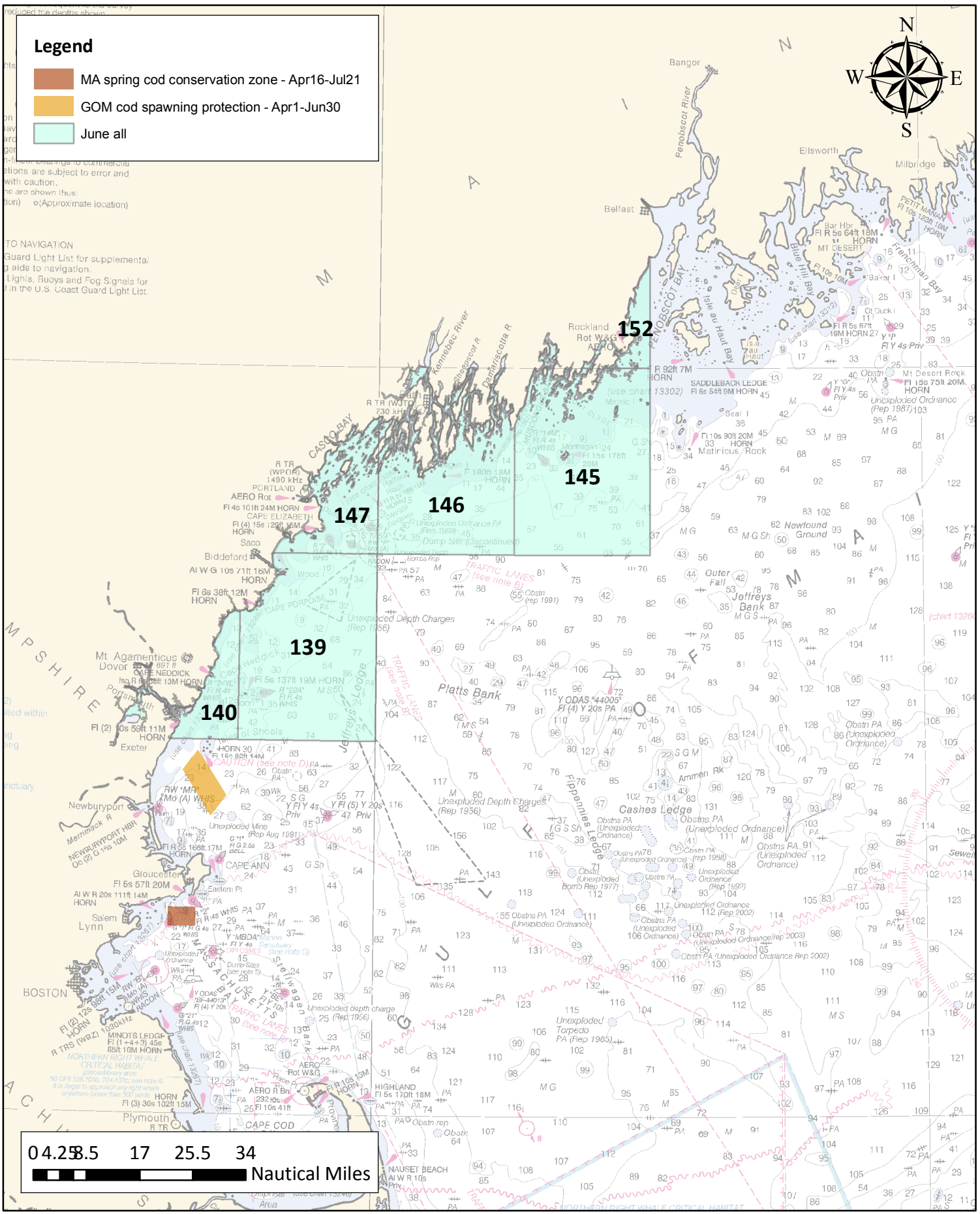
Proposed Spawning Closure Areas, April. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, commercial and recreational gears capable of catching groundfish would be prohibited.



Proposed Spawning Closure Areas, May. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, commercial and recreational gears capable of catching groundfish would be prohibited.



Proposed Spawning Closure Areas, June. The Massachusetts spring and winter areas are not Council-managed but are shown for reference. Generally, commercial and recreational gears capable of catching groundfish would be prohibited.



Attachment 1: Goals and objectives of the Omnibus EFH Amendment

The purpose of Omnibus EFH Amendment 2 is to address measures necessary to meet NMFS' published guidelines for implementation of the Magnuson-Stevens Act's EFH provisions to review and revise EFH components of FMPs at least once every five (5) years; and to develop a comprehensive EFH management plan that will successfully minimize adverse effects from fishing on EFH through actions that will apply to all Council-managed FMPs. In April 2011, the Council voted to expand the scope of Omnibus EFH Amendment 2 to include modification of groundfish closed areas. Specific goals and objectives related to this expansion of scope were approved in November 2012. These include goals 9 and 10 and objectives K-N.

GOALS:

1. Redefine, refine or update the identification and description of all EFH for those species of finfish and mollusks managed by the Council, including the consideration of HAPCs;
2. Identify, review and update the major fishing activities (MSA and non-MSA) that may adversely affect the EFH of those species managed by the Council;
3. Identify, review and update the major non-fishing activities that may adversely affect the EFH of those species managed by the Council;
4. Identify and implement mechanisms to protect, conserve, and enhance the EFH of those species managed by the Council to the extent practicable;
5. Define metrics for achieving the requirements to minimize adverse impacts to the extent practicable;
6. Integrate and optimize measures to minimize the adverse impacts to EFH across all Council managed FMPs;
7. Update research and information needs;
8. Review and update prey species information;
9. Enhance groundfish fishery productivity
10. Maximize societal net benefits from the groundfish stocks while addressing current management needs

OBJECTIVES:

A. Identify new data sources and assimilate into the process to meet goals (state, federal and other data sources);
B. Implement review of existing HAPCs and consider modified or additional HAPCs (Goal 1);
C. Review EFH designations and refine or redefine where appropriate as improved data and analysis become available (Goal l);
D. Develop analytical tools for designation of EFH, minimization of adverse impacts, and monitoring the effectiveness of measures designed to protect habitat (Goal l, Goal 3 and Goal 5);
E. Modify fishing methods and create incentives to reduce the impacts on habitat associated with fishing (Goal 4);

F. Support restoration and rehabilitation of fish habitat which have already been degraded (by fishing and non-fishing activities) (Goal 4);
G. Support creation and development of fish habitat where appropriate and when increased fishery resources would benefit society (Goal 4);
H. Develop a strategy for prioritizing habitat protection (Goal 4);
I. Develop criteria for establishing and implementing dedicated habitat research areas (Goal 7);
J. Design a system for monitoring and evaluating the benefits of EFH management actions including dedicated habitat research areas (Goal 7);
K. Improved groundfish spawning protection; including protection of localized spawning contingents or sub-populations of stocks (Goals 9 and 10);
L. Improved protection of critical groundfish habitats (Goals 9 and 10);
M. Improved refuge for critical life history stages (Goals 9 and 10);
N. Improved access to both the use and non-use benefits arising from closed area management across gear types, fisheries, and groups. These benefits may arise from areas designed to address the other three groundfish closed area objectives. (Goals 9 and 10).

Attachment 2: Memorandum regarding development of additional options

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
C.M. 'Rip' Cunningham, Jr., *Chairman* | Tom A. Nies, *Executive Director*

MEMORANDUM

DATE: **June 3, 2013**

TO: Closed Area Technical Team & Habitat PDT

FROM: Andrew Applegate

SUBJECT: **An alternative hotspot grid weighting using a Z-infinity score threshold**

During our meeting last week, the CATT and PDT considered an alternative strategy to develop conservation areas for juvenile groundfish habitat using the hotspot analysis framework to identify areas that gave a non-zero weight to hotspots for species with substrate affinity scores of 2 and 3 (associated with harder substrates) whose status was below the target (i.e. Bmsy/B > 1) that overlap 100 km^2 grids with a SASI Z-infinity score[1] greater than or equal to 48.5. For comparison, the mean Z-infinity (vulnerability) score for grids with hotspots was 47.6 in spring, 47.8 in summer, 48.3 in fall and 47.6 in winter[2]. Thus, this approach generates candidate areas where juvenile (age 0 & 1) groundfish that have high substrate affinity were detected by the surveys in areas that the Habitat PDT's SASI model identified as being vulnerable to mobile bottom tending fishing gears.

This alternative hotspot weighting gives non-zero weights to both stocks of cod, Gulf of Maine haddock, Atlantic halibut, and ocean pout (see Option 3C in the table below). Unlike the previous analysis (labeled Option 3 in the table below), this analysis removes consideration of Georges Bank haddock, pollock, and redfish because the stocks are at or above the target biomass.

Applying the above Option 3C criteria, the CATT generated a new set of hotspot grid maps and identified areas that encompassed most of the grids with hotspots. Isolated hotspot grids were not included in the candidate areas and some holes between adjacent grids with hotspots were included within the boundaries (think of it as a one-grid closure rule).

[1] The SASI Z-infinity score is an indicator of how vulnerable the substrate is to adverse effects from mobile bottom tending gears, the higher the score the greater the potential impact.
[2] The average SASI score varies because different grids have hotspots in each season.

Table 1. Alternative grid weights applied to the CATT hotspot grid analysis.

Stock (Red cells indicate selected stocks for Option 3C)	Stock (Red cells indicate selected stocks for Option 3)	Juvenile size threshold Age 0 and 1 length (90th percentile, cm)	Length at 20% female maturity (cm) (re-estimated by CATT)	Vulnerability of species (Bmsy/B)[1]	Sub-populations[2]	Residency[3]	Substrate[4]	Final Weighting Sum
GB Cod	GB Cod	24 (Sp), 34 (Fa)	36	14.11	2	1	3	20.11
GOM Cod	GOM Cod	24 (Sp), 34 (Fa)	36	5.53	3	1	3	12.53
GB Yellowtail Flounder	GB Yellowtail Flounder	13 (Sp), 15 (Fa)	25	9.39	1	2	1	13.39
CC/GOM Yellowtail Flounder	CC/GOM Yellowtail Flounder	13 (Sp), 15 (Fa)	25	4.21	1	2	1	8.21
SNE/MA Yellowtail Flounder	SNE/MA Yellowtail Flounder	13 (Sp), 15 (Fa)	25	0.77	1	2	1	4.77
GOM Winter Flounder	GOM Winter Flounder	18 (Sp), 28 (Fa)	27	UNK	UNK	2	1	10.04
GB Winter Flounder	GB Winter Flounder	18 (Sp), 28 (Fa)	27	1.22	3	2	1	7.22
SNE/MA Winter Flounder	SNE/MA Winter Flounder	18 (Sp), 28 (Fa)	27	6.17	3	2	1	12.17
White Hake	White Hake	34 (Sp), 39 (Fa)	25	1.21	UNK	2	1	6.04
GOM Haddock	GOM Haddock	24 (Sp), 34 (Fa)	28	1.71	1	1	3	6.71
GB Haddock	GB Haddock	24 (Sp), 34 (Fa)	28	0.75	1	1	3	5.75
Witch Flounder	Witch Flounder	20 (Sp), 19 (Fa)	28	2.45	3	2	1	8.45
American Plaice	American Plaice	12 (Sp), 18 (Fa)	24	1.70	UNK	1	1	5.54
Pollock	Pollock	23 (Sp), 32 (Fa)	39	0.46	2	2	2	6.46
Acadian Redfish	Acadian Redfish	14 (Sp), 13 (Fa)	19	0.76	1	2	3	6.76
Atlantic Halibut	Atlantic Halibut	see winter flounder	NA	28.82	UNK	2	2	34.66
Ocean Pout	Ocean Pout	29	29[6]	12.05	UNK	1	2	16.88
Northern (GOM-GB) Windowpane Flounder	Northern (GOM-GB) Windowpane Flounder	see yellowtail flounder	18	3.48	UNK	2	1	8.31
Southern (SNE-MA) Windowpane Flounder	Southern (SNE-MA) Windowpane Flounder	see yellowtail flounder	18	0.69	UNK	2	1	5.52
Atlantic Wolffish	Atlantic Wolffish	47	47[7]	3.48	UNK	UNK	2	8.99
	Sum							208.52
	Mean			**5.21**	**1.83**	**1.68**	**1.70**	**10.43**

[1]Either SSBmsy/SSB or Bmsy/B used depending on what is reported in the assessment

[2]Derived from Table 81 in Framework 48 or from NEFSC biological data. 1=no subpopulations, 2=some evidence, 3=known subpopulations

[3]Based on information in literature. 1=less resident, more migratory; 2=more resident, less migratory

[4]Based on information in literature. 1=almost exclusively in mud or sand substrates, 2=occur in a variety of substrates including gravels, 3=strong affinity for coarse or hard substrates

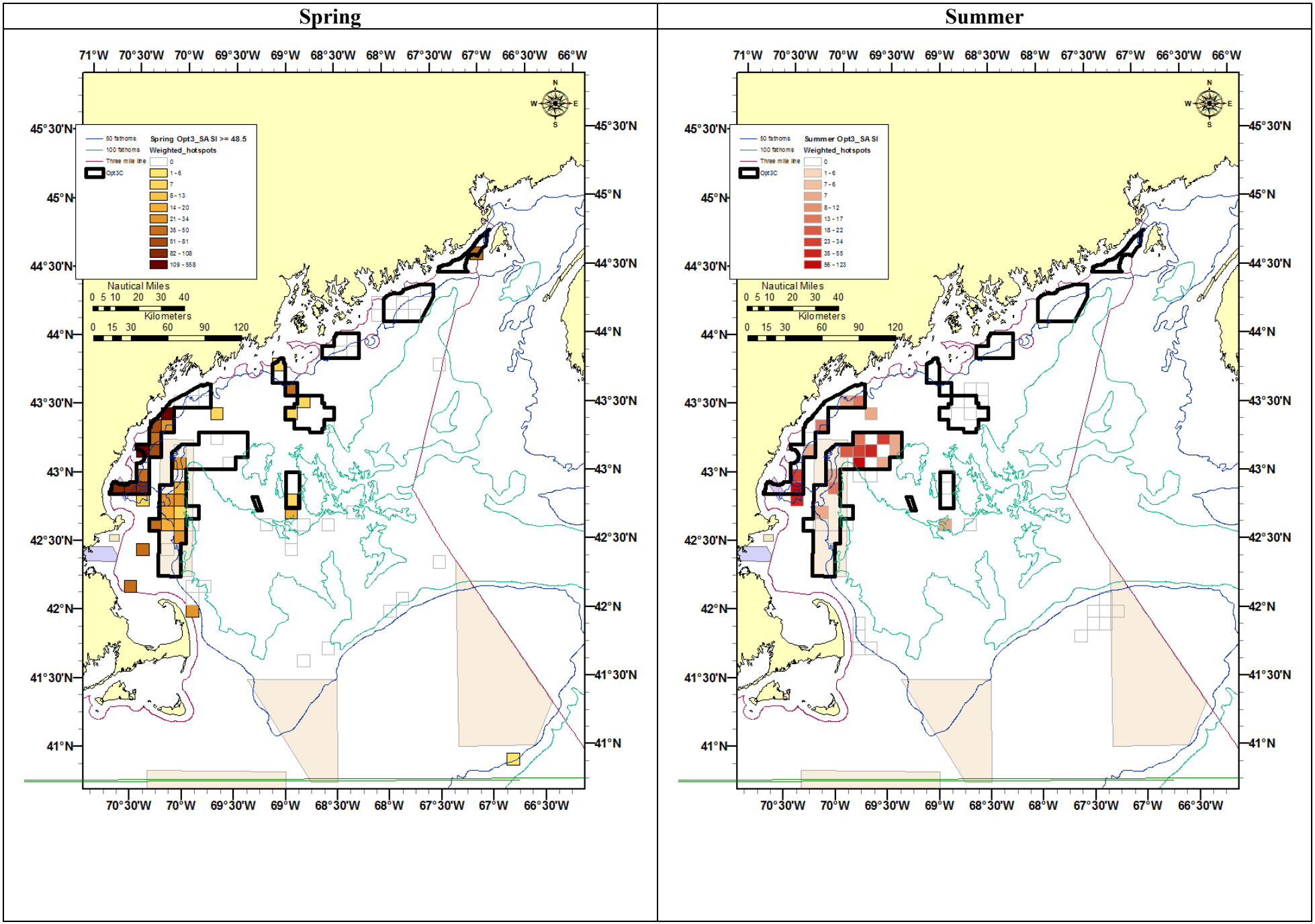
[5]Sums include a mean value for unknowns

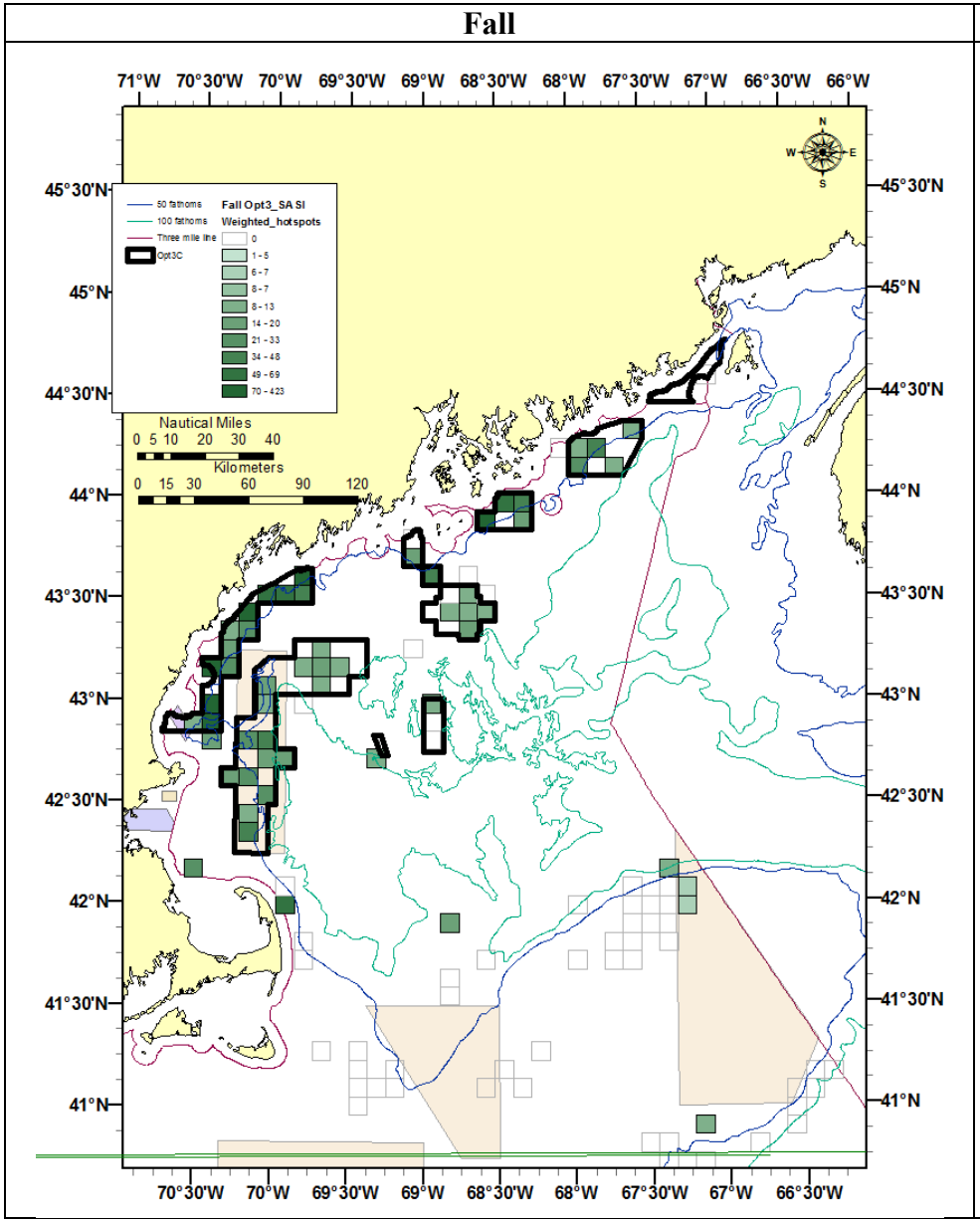
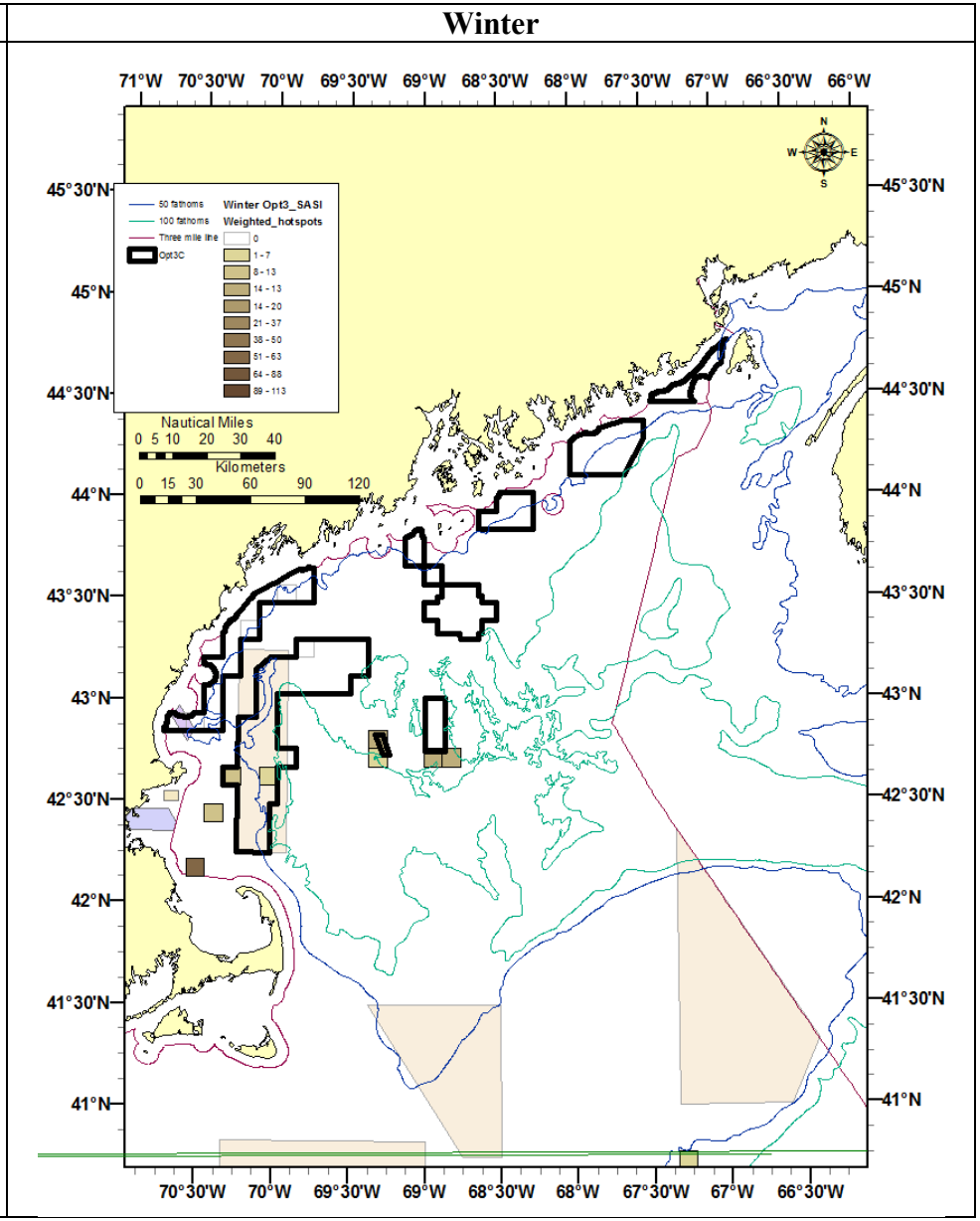
[6] From O'Brien et al. (1993)

[7] From Templeman (1986)

Generally, the hotspots in this analysis were centered around the Stellwagen and Jeffreys Ledge Adverse Effects Habitat Areas (AEMA), the inshore portion of the Bigelow Bight Area, areas surrounding Cashes and Fippennies AEMA, a broad area around Platts Bank, areas surrounding and overlapping the Jeffreys Bank AEMA, an area along the coastline of Eastern ME, and the Machias Area (see maps below). The Machias Area was identified as an important juvenile groundfish area by the CATT's original hotspot analysis, but not in the Habitat PDT's SASI model because the substrate information is lacking there and the model did not include state waters which largely overlap the original hotspots.

Map 1. Distribution of weighted gridded hotspots for cod, Gulf of Maine haddock, Atlantic halibut, ocean pout, and Atlantic wolfish in grids with SASI z-infinity scores >= 48.5.



Fall	Winter
	

71°W 70°30'W 70°W 69°30'W 69°W 68°30'W 68°W 67°30'W 67°W 66°30'W 66°W
45°30'N 45°N 44°30'N 44°N 43°30'N 43°N 42°30'N 42°N 41°30'N 41°N
50 fathoms
100 fathoms
Three mile line
Opt3C
Fall Opt3_SASI
Weighted_hotspots
0
1 - 5
6 - 7
8 - 7
8 - 13
14 - 20
21 - 33
34 - 48
49 - 69
70 - 423
Winter Opt3_SASI
Weighted_hotspots
0
1 - 7
8 - 13
14 - 13
14 - 20
21 - 37
38 - 50
51 - 63
64 - 88
89 - 113
Nautical Miles
0 5 10 20 30 40
Kilometers
0 15 30 60 90 120
N
W
E
S

Few grids in the previously-identified Mass Bay Area met the Z-infinity threshold (>= 48.5), although the CATT and PDT noted that the area south and west of the Stellwagen AEMA was obviously important for juvenile cod in the spring and fall. Likewise, the area previously identified for haddock in the southern part of Closed Area II did not meet the revised criteria. However the CATT and PDT recognized that this area is apparently important for juvenile haddock (and it may also be noted, for spawning yellowtail flounder). It is unclear whether and how fishing with mobile bottom tending fishing gear affects the habitat there.

Based on the above analysis and a more detailed examination of cod hotspots, a revised Bigelow Bight area derived from this analysis was considered as a measure to include in the alternatives to meet the amendment's objectives. The group also included southward and westward extension of the Stellwagen Bank or SERA II area measures where juvenile cod hotspots were identified in Mass Bay. State waters for these area measures were not included because the Oversight Committee decided not to include state waters for potential area closures and furthermore the SASI values used as a filter did not go into state waters. Maps for these areas showing the hotspot weights and cod number/tow distributions are given below.

The alternatives for the Western Gulf of Maine include all of the revised Bigelow Bight area (shaded blue and purple below) where hotspots from this analysis were found to overlap areas with SASI Z-infinity/vulnerability scores >= 48.5. A subset of this area was also identified where the cod hotspots predominate, although the CATT and PDT recognized that juvenile cod catches are frequently observed throughout the Bigelow Bight area. The south and westward extension of the Stellwagen Bank AEMA/SERA II area was identified to conserve the habitat of juvenile cod on the inshore flank of Stellwagen Bank, where juvenile cod are frequently observed in the spring (blue), fall (yellow) and winter (magenta) in the NMFS Trawl and IBS cod surveys.

The Toothaker Ridge (dark blue area in map below) and E. Maine (olive) areas were also identified as areas having juvenile groundfish hotspots, but the CATT/PDT analysis exhibited no cod hotspots in these areas. The CATT and PDT did however note that there was a low amount of juvenile cod catches in these areas and that the NMFS spring, fall, and shrimp surveys may be missing the main component of cod when they occupy these areas. Some configuration of these areas were retained by the Groundfish and Habitat Oversight Committees at their May 17, 2013 meeting.

Likewise the Committees retained the Machias Area as a juvenile groundfish habitat area due to the amount of hotspots for vulnerable species including cod, haddock, and halibut. Like other areas, the CATT and PDT clipped this area by the three-mile limit boundary to exclude state waters from the amendment's alternatives.

On Georges Bank, the revised analysis did not include hotspots in areas with SASI Z-infinity/vulnerability scores >= 48.5. Most of these 100 km^2 SASI grids are in areas with shallower depths than grids where the haddock and cod hotspots occurred. Furthermore, this revised analysis does not include Georges Bank haddock because the stock is over the Bmsy target. Nonetheless, the CATT and PDT agreed with the Oversight Committees that a Northern Edge Area originally identified by the CATT should remain in the alternatives and that the Georges Bank AEMAs should include the deeper waters where these survey hotspots were detected.

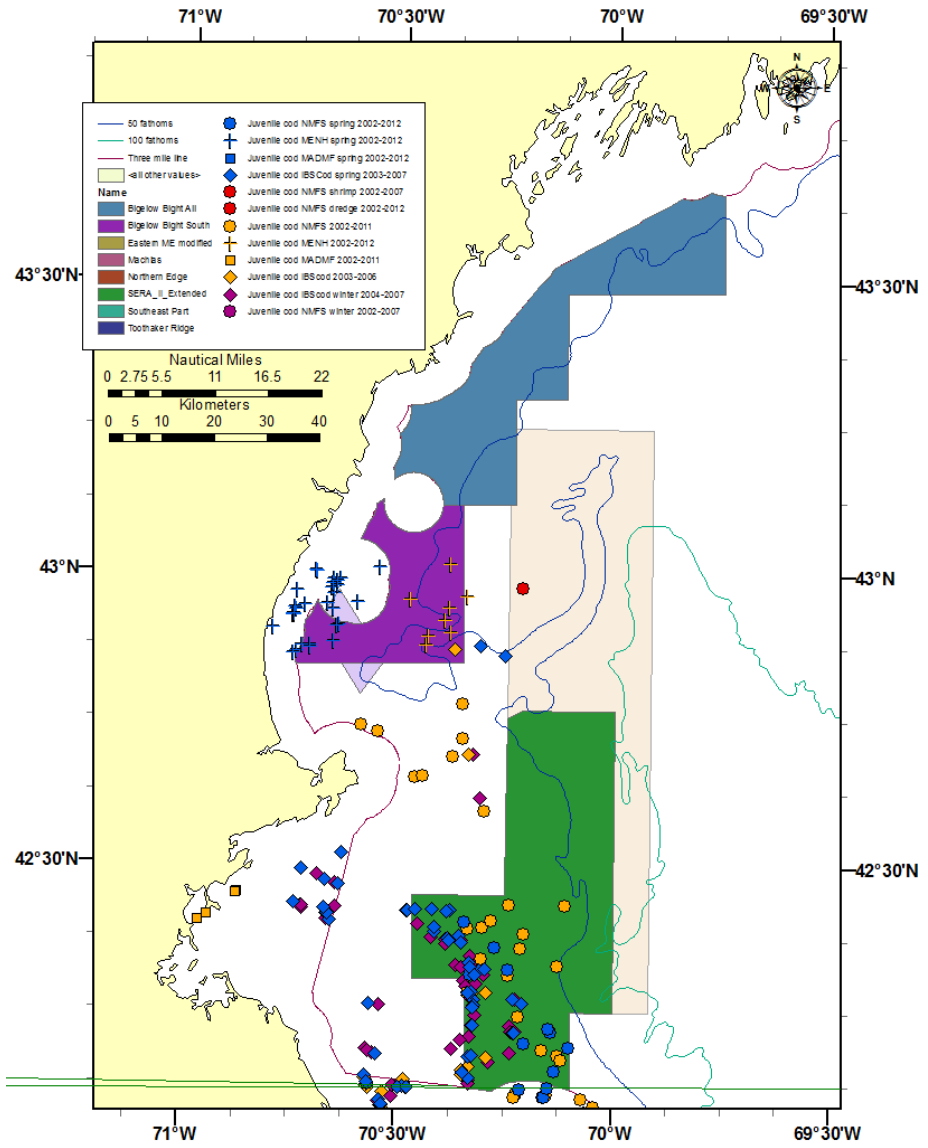
The CATT and PDT also had an extended debate about the utility of the identified area with juvenile haddock hotspots in the southern part of Closed Area II. This area includes hotspots identified in the NMFS spring and NMFS summer dredge surveys. Although the substrate in this area is not considered to be the most vulnerable, many CATT and PDT members thought that conservation in this area is needed to enhance productivity of haddock and possibly cod and yellowtail flounder. Both cod and yellowtail flounder are currently at historically low biomass (NEFSC 2013; TRAC 2012). It has been noted that yellowtail flounder biomass in particular has responded strongly both positively to the closure of Closed Area II and negatively to the Special Access Program in Closed Area II (TRAC 2012).

Earlier research and analysis (Link et al 2005) identified this area as important for juvenile haddock, having much higher polychaete abundance than surrounding areas, possibly serving as a potential food source. Although the substrate in this area may not be as vulnerable to fishing compared to hard substrates, fishing may alter the biological characteristics making it less suitable for juvenile haddock growth and survival. Therefore many (but not all) CATT and PDT members felt that this area should be included in alternatives meant to improve a refuge for a critical life stage, one of the objectives approved by the Council.

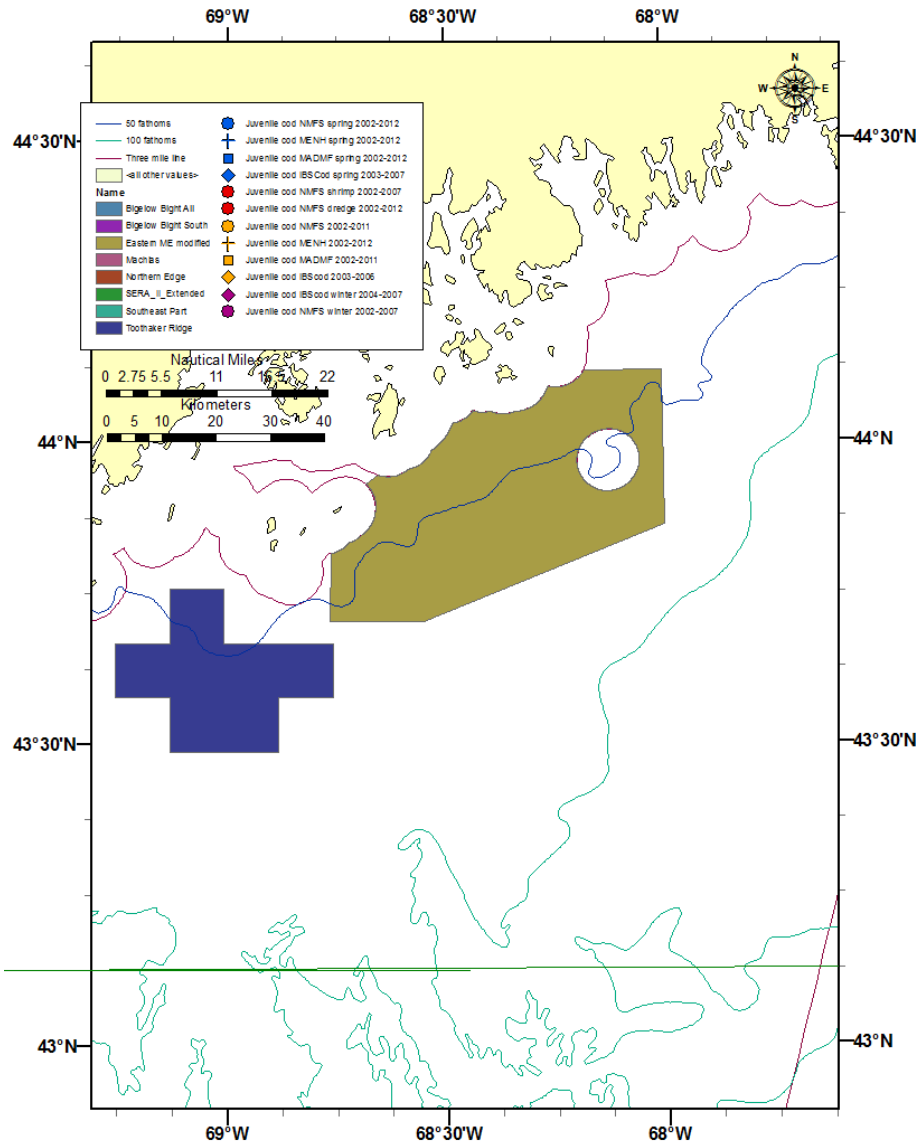
Consistent with the SASI model results, the Link et al 2005 paper describes the area as being composed of “relatively high-energy sand habitat of low to moderate complexity and has a relatively low vulnerability to trawling and dredging”. Some members of the CATT and PDT therefore felt that restrictions on mobile bottom tending gears would not be warranted here.

Map 2. Proposed juvenile groundfish areas and juvenile groundfish hotspots for selected species. Shape of hotspot references the type of survey. Spring surveys are shaded blue, summer surveys are shaded red, fall surveys are shaded yellow, and winter surveys are shaded magenta.

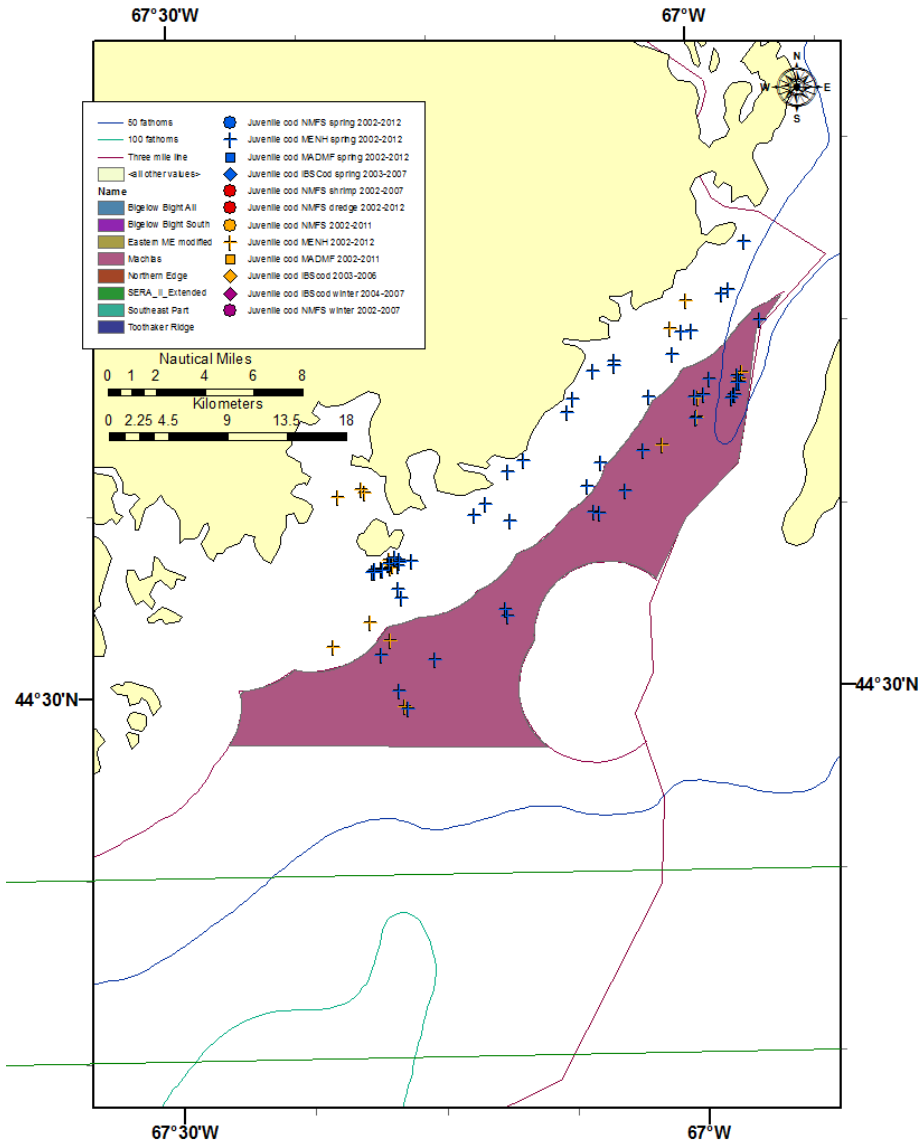
Western Gulf of Maine region juvenile groundfish areas and juvenile cod hotspots

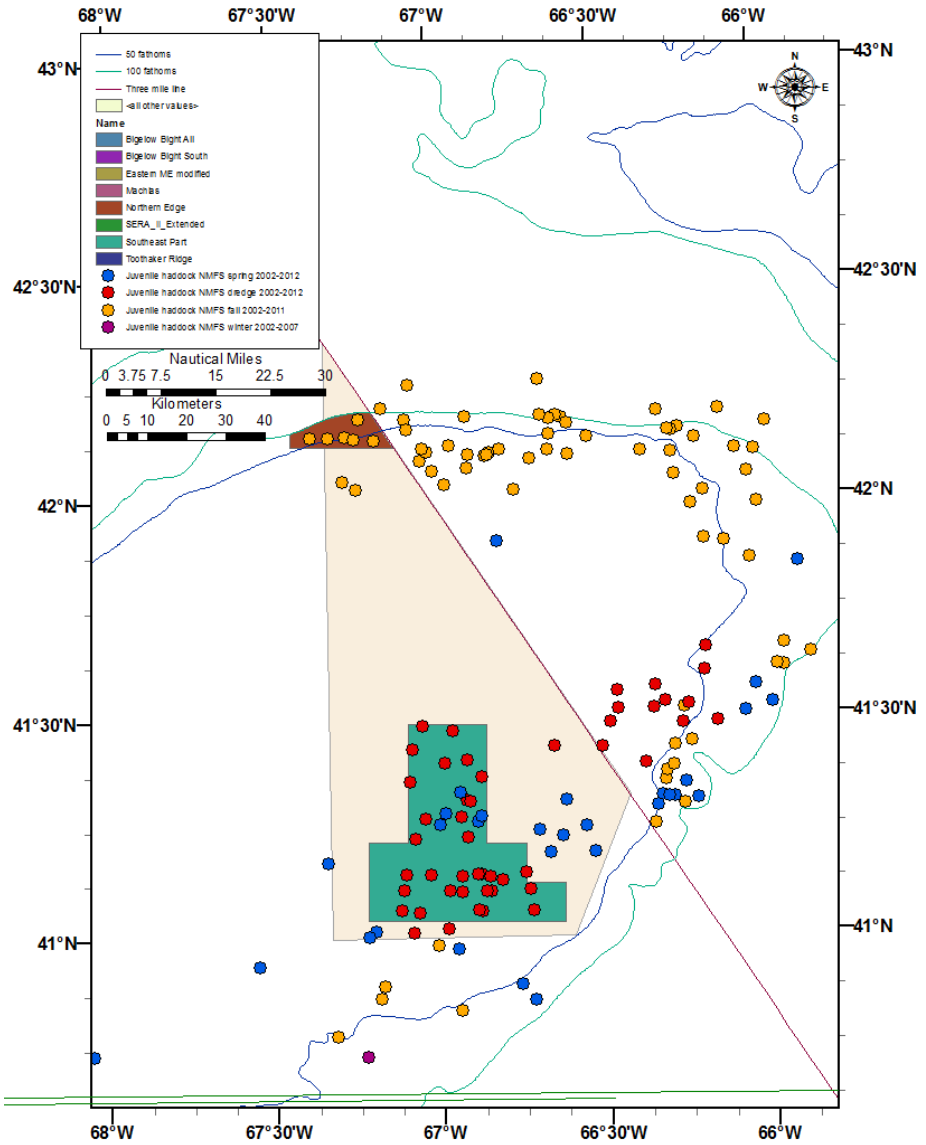


E. Maine juvenile groundfish areas and juvenile cod hotspots



Machias juvenile groundfish area and juvenile cod hotspots	Georges Bank juvenile groundfish areas and haddock hotspots





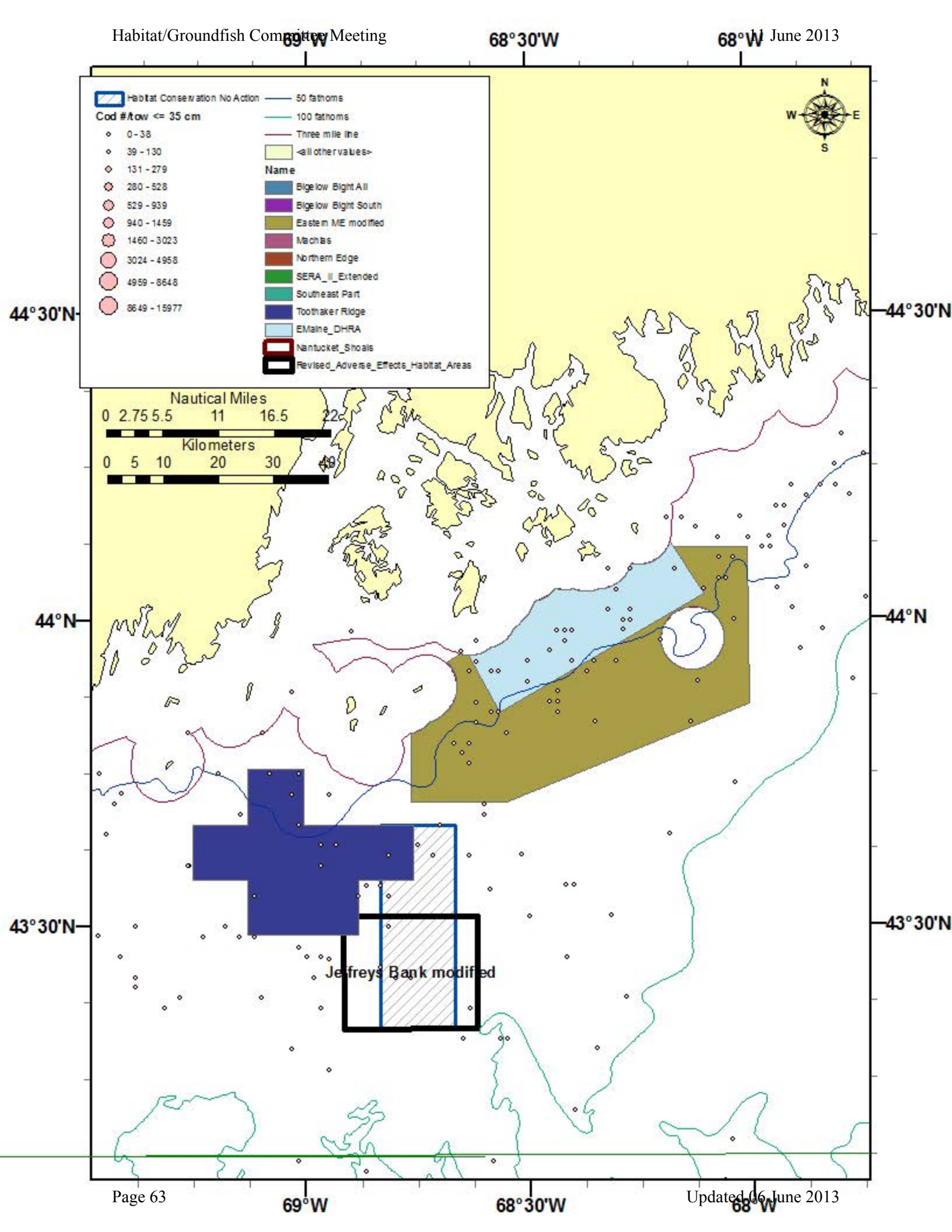
Literature cited

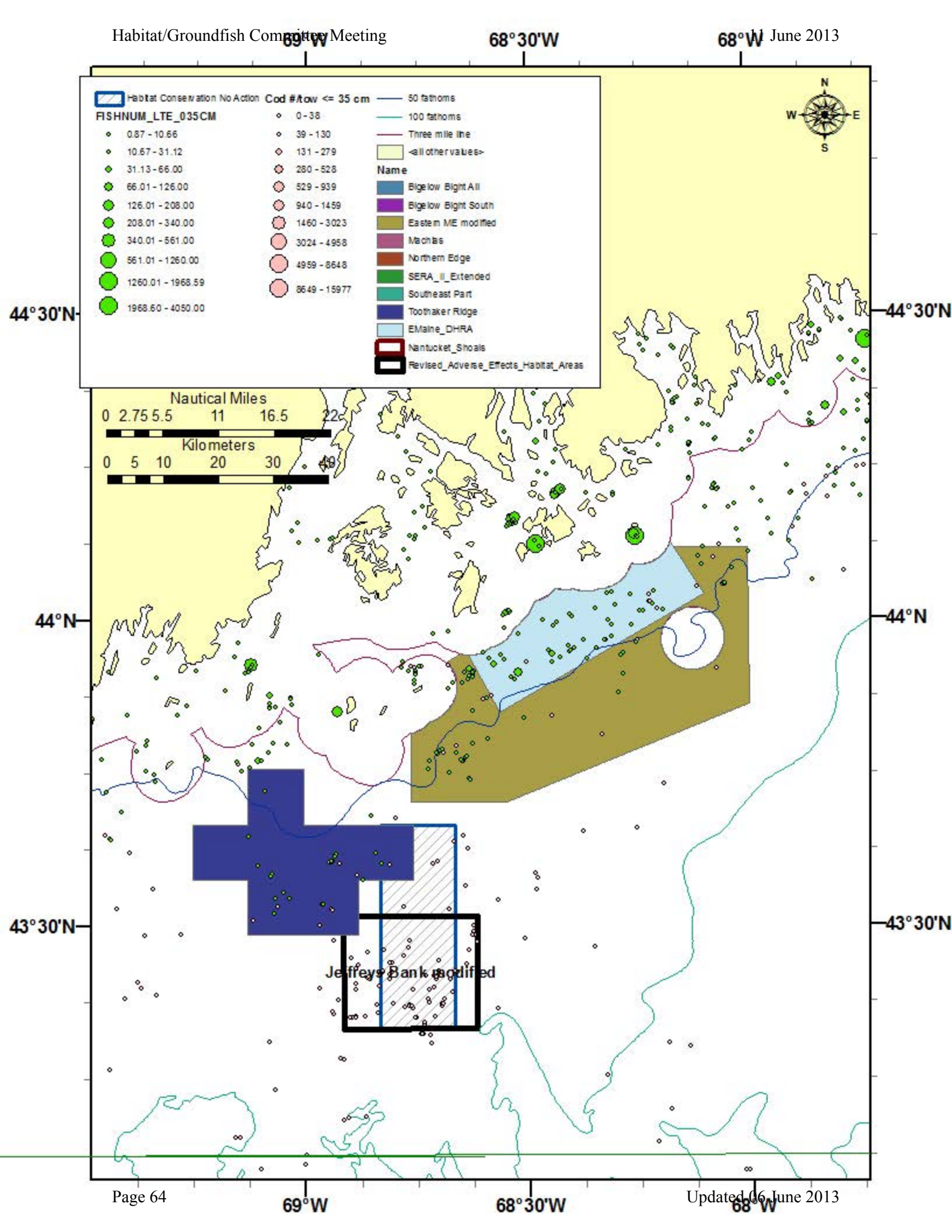
Link, Jason, Frank Almeida, Page Valentine, Peter Auster, Robert Reid, and Joseph Vataliano. 2005. The Effects of Area Closures on Georges Bank. Am. Fish. Soc. Symp. 41:345-368

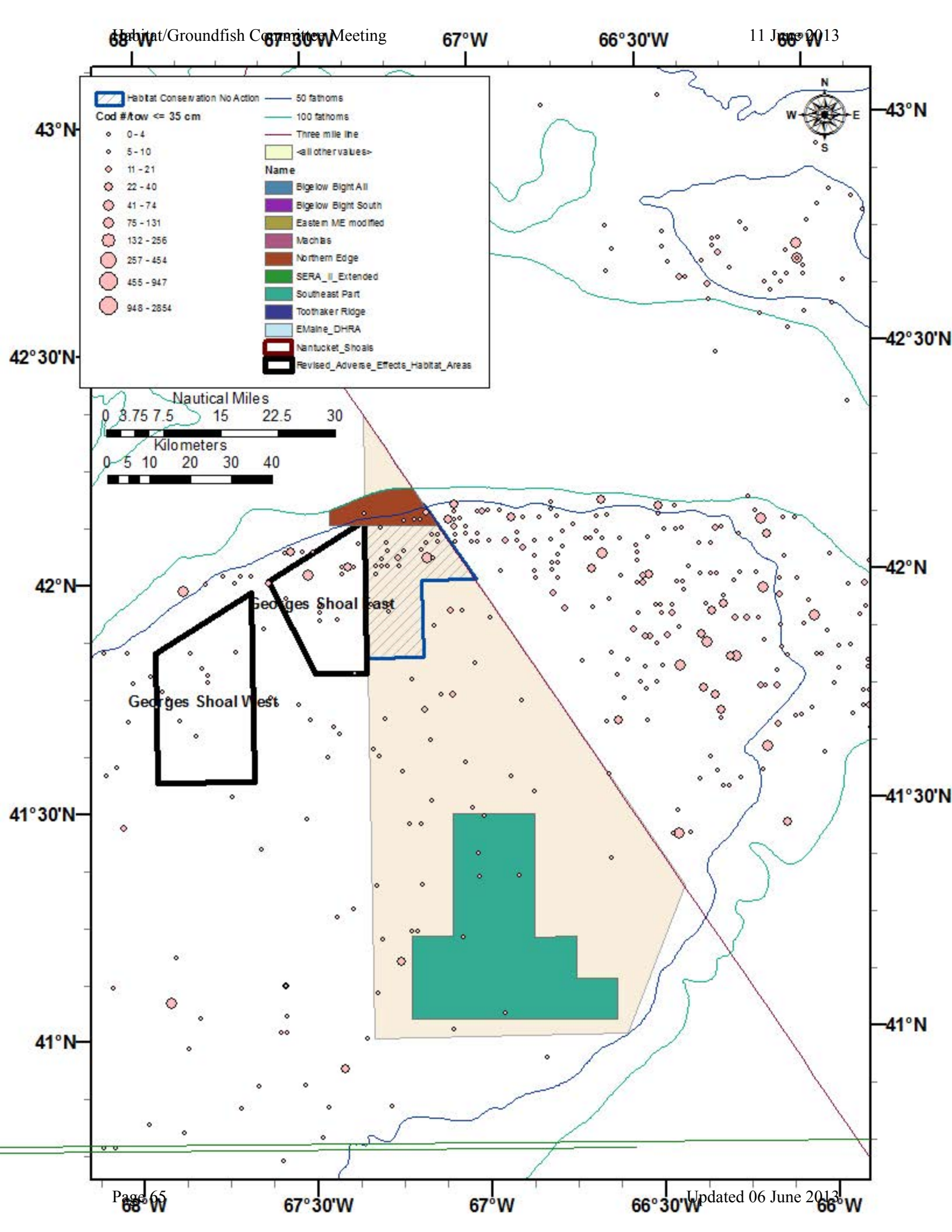
Northeast Fisheries Science Center (NEFSC). 2013. 55th Northeast Regional Stock Assessment Workshop, Assessment Summary Report. NEFSC Ref. Doc. 13-01. 47 pp.

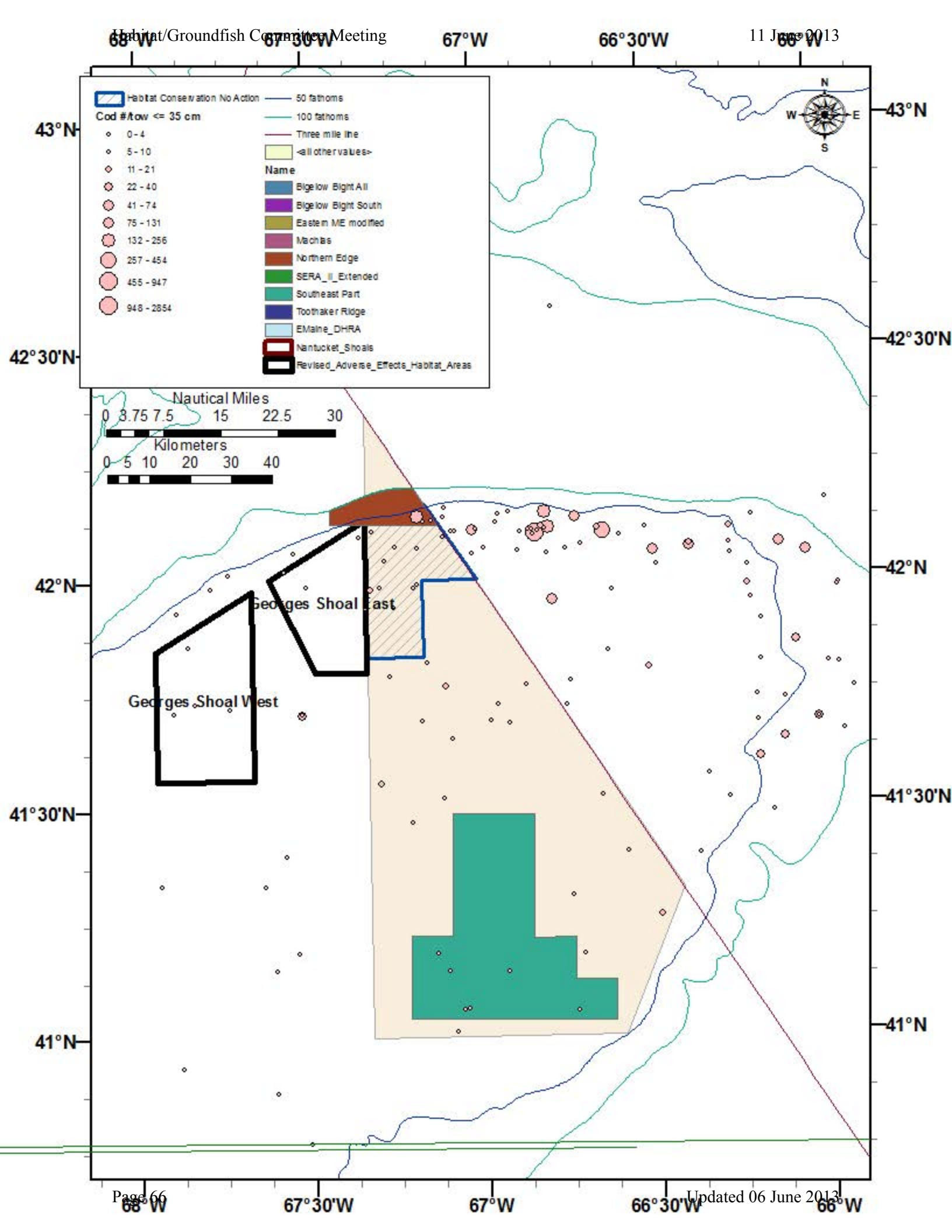
Transboundary Resources Assessment Committee (TRAC). 2012. Georges Bank Yellowtail Flounder Assessment. Status Report 2012/01 (Revised). http:www.mar.dfo-mpo.gc.ca/science/TRAC/trac.html.

Attachment 3: Additional cod distribution maps. The first of the two maps for each area shows juvenile cod catches in the NMFS and MADMF trawl surveys between 1963-1990. The second map shows juvenile cod catches in the NMFS, MADMF, and ME-NH trawl surveysbetween 2002-2012. This later time period is consistent with the timeframe evaluated in the hotspot analysis. Various management areas are shown for reference.


Habitat Conservation No Action
Cod #/tow <= 35 cm
0 - 38
39 - 130
131 - 279
280 - 528
529 - 939
940 - 1459
1460 - 3023
3024 - 4958
4959 - 8648
8649 - 15977
50 fathoms
100 fathoms
Three mile line
<all other values>
Name
Bigelow Bight All
Bigelow Bight South
Eastern ME modified
Machias
Northern Edge
SERA_II_Extended
Southeast Part
Toothaker Ridge
EMaine_DHRA
Nantucket_Shoals
Revised_Adverse_Effects_Habitat_Areas
Nautical Miles
0 2.75 5.5 11 16.5 22
Kilometers
0 5 10 20 30 40
N
W
E
S
69°W
68°30'W
68°W
44°30'N
44°N
43°30'N
Jeffreys Bank modified


Habitat Conservation No Action
FISHNUM_LTE_035CM
0.87 - 10.66
10.67 - 31.12
31.13 - 66.00
66.01 - 126.00
126.01 - 208.00
208.01 - 340.00
340.01 - 561.00
561.01 - 1260.00
1260.01 - 1968.59
1968.60 - 4050.00
Cod #/tow <= 35 cm
0 - 38
39 - 130
131 - 279
280 - 528
529 - 939
940 - 1459
1460 - 3023
3024 - 4958
4959 - 8648
8649 - 15977
50 fathoms
100 fathoms
Three mile line
<all other values>
Name
Bigelow Bight All
Bigelow Bight South
Eastern ME modified
Machias
Northern Edge
SERA_II_Extended
Southeast Part
Toothaker Ridge
EMaine_DHRA
Nantucket_Shoals
Revised_Adverse_Effects_Habitat_Areas
N
W
E
S
Nautical Miles
0 2.75 5.5 11 16.5 22
Kilometers
0 5 10 20 30 40
69°W
68°30'W
68°W
44°30'N
44°N
43°30'N
Jeffreys Bank modified


Habitat Conservation No Action
Cod #/tow <= 35 cm
0 - 4
5 - 10
11 - 21
22 - 40
41 - 74
75 - 131
132 - 256
257 - 454
455 - 947
948 - 2854
50 fathoms
100 fathoms
Three mile line
<all other values>
Name
Bigelow Bight All
Bigelow Bight South
Eastern ME modified
Machias
Northern Edge
SERA_II_Extended
Southeast Part
Toothaker Ridge
EMaine_DHRA
Nantucket_Shoals
Revised_Adverse_Effects_Habitat_Areas
Nautical Miles
0 3.75 7.5 15 22.5 30
Kilometers
0 5 10 20 30 40
N
W
E
S
Georges Shoal East
Georges Shoal West
68°W
67°30'W
67°W
66°30'W
66°W
43°N
42°30'N
42°N
41°30'N
41°N


Habitat Conservation No Action
Cod #/tow <= 35 cm
0 - 4
5 - 10
11 - 21
22 - 40
41 - 74
75 - 131
132 - 256
257 - 454
455 - 947
948 - 2854
50 fathoms
100 fathoms
Three mile line
<all other values>
Name
Bigelow Bight All
Bigelow Bight South
Eastern ME modified
Machias
Northern Edge
SERA_II_Extended
Southeast Part
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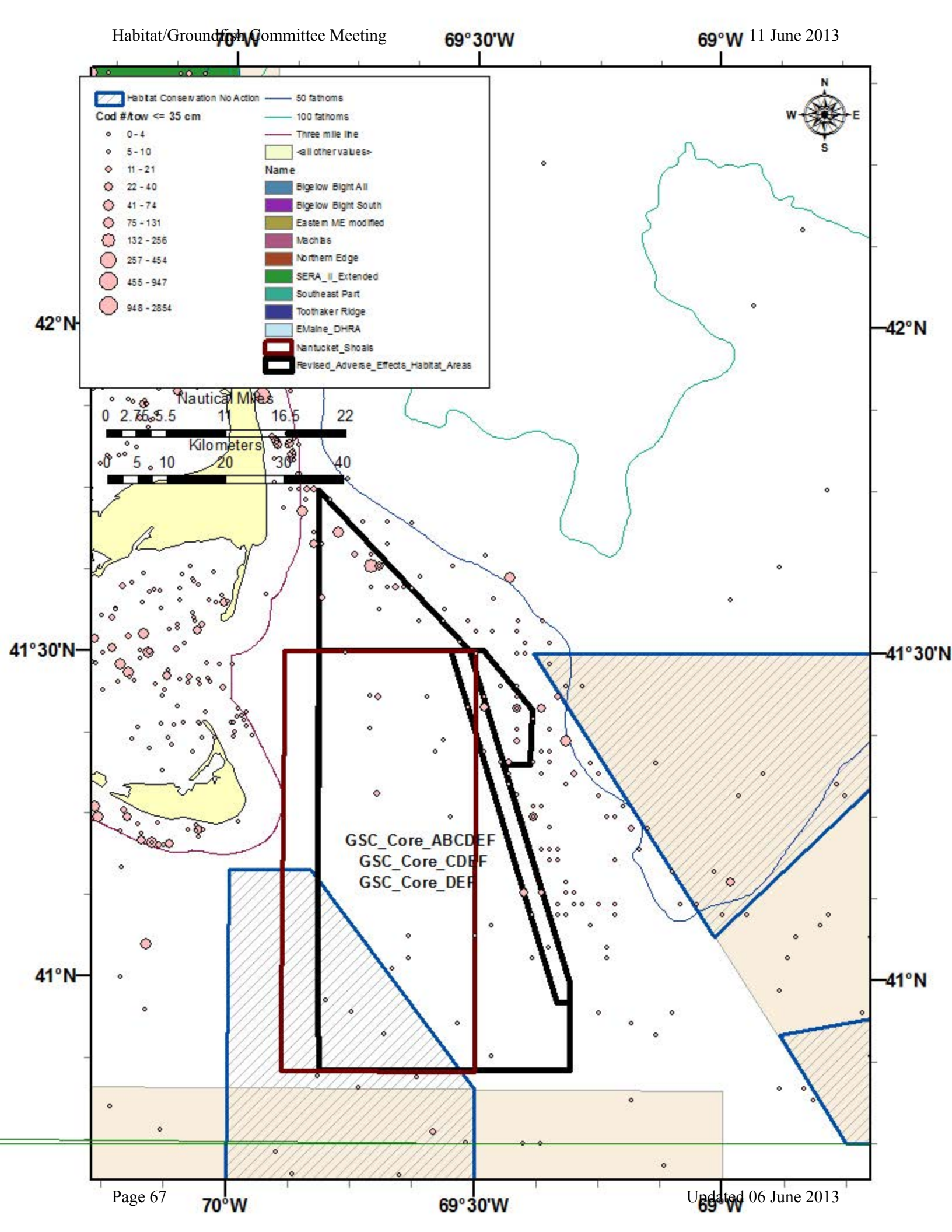
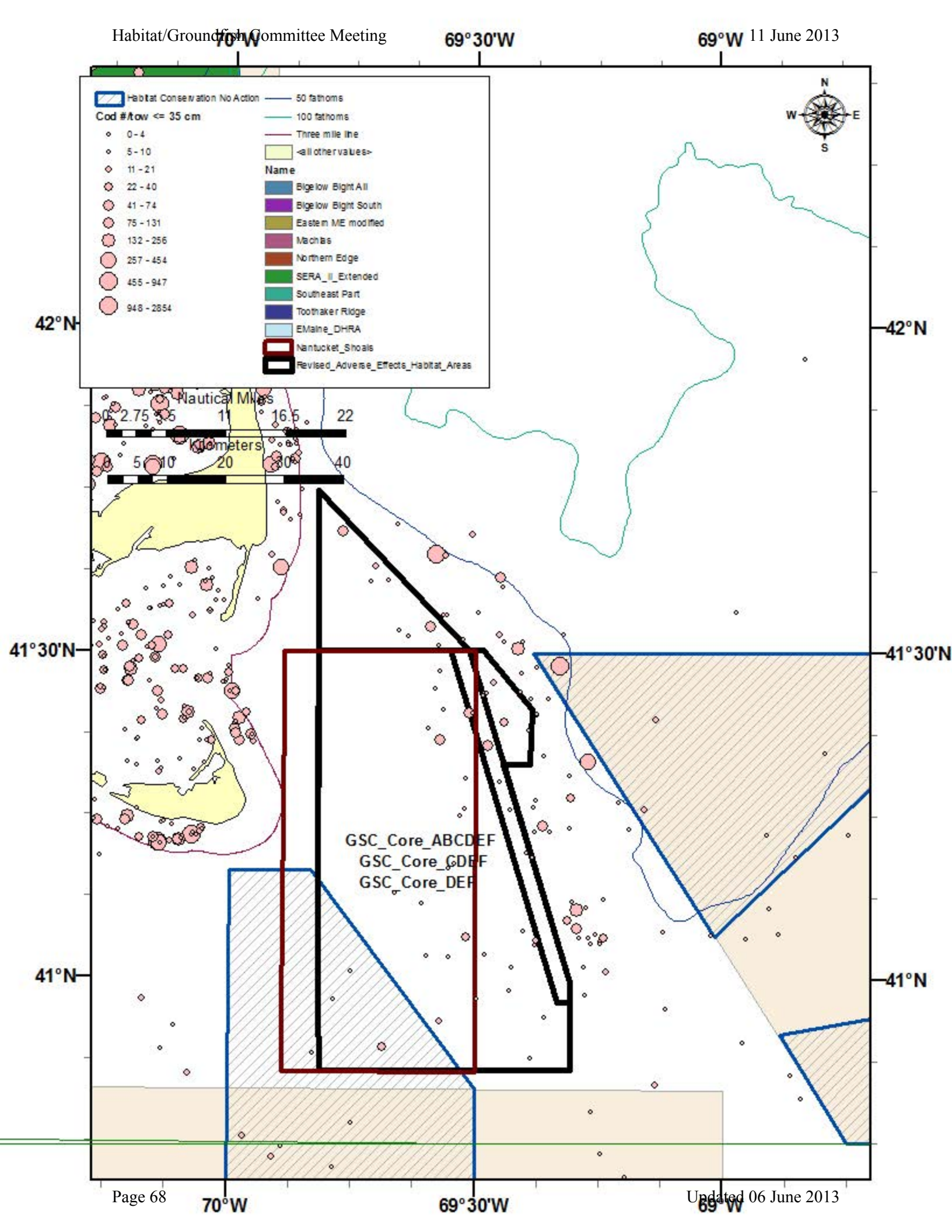
Nautical Miles
0 3.75 7.5 15 22.5 30
Kilometers
0 5 10 20 30 40
N
W
E
S
Georges Shoal East
Georges Shoal West
68°W
67°30'W
67°W
66°30'W
66°W
43°N
42°30'N
42°N
41°30'N
41°N


70°W
69°30'W
69°W
42°N
41°30'N
41°N
Habitat Conservation No Action
Cod #/tow <= 35 cm
0 - 4
5 - 10
11 - 21
22 - 40
41 - 74
75 - 131
132 - 256
257 - 454
455 - 947
948 - 2854
50 fathoms
100 fathoms
Three mile line
<all other values>
Name
Bigelow Bight All
Bigelow Bight South
Eastern ME modified
Machias
Northern Edge
SERA_II_Extended
Southeast Part
Toothaker Ridge
EMaine_DHRA
Nantucket_Shoals
Revised_Adverse_Effects_Habitat_Areas
N
W
E
S
Nautical Miles
0 2.75 5.5 11 16.5 22
Kilometers
0 5 10 20 30 40
GSC_Core_ABCDEF
GSC_Core_CDEF
GSC_Core_DEF


Habitat Conservation No Action
Cod #/tow <= 35 cm
0 - 4
5 - 10
11 - 21
22 - 40
41 - 74
75 - 131
132 - 256
257 - 454
455 - 947
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50 fathoms
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0 5 10 20 30 40
70°W
69°30'W
69°W
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41°30'N
41°N
GSC_Core_ABCDEF
GSC_Core_CDEF
GSC_Core_DEF