New England Fishery Management Council
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John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: June 9, 2010
TO: Habitat Oversight Committee
FROM: Habitat PDT
SUBJECT: PDT recommendations to Committee re: April 2, 2010 motions

The following document summarizes: (1) goals of EFH Omnibus Amendment 2, (2) committee motions from April 2, 2010, and (3) PDT recommendations and responses based on SASI model outputs.

Goals of Omnibus EFH Amendment 2 specified prior to Phase 1 (Phase 2 goals in bold)

1. Update the identification and description all EFH for those species of finfish and mollusks managed by the Council
2. Identify all major threats (**fishing** and non-fishing) to the EFH of those species managed by the Council
3. Review and update prey species information as required
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 the measurable thresholds 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, including consideration of dedicated habitat research areas**

Motions from April 2, 2010 meeting:

1. Evaluate the appropriateness of the current boundaries of the closed areas in obtaining the goals of the amendment using the SASI model simulated runs
2. Provide the committee with any suggested modifications to the boundaries of the existing closed areas that would better meet the goals of the amendment. This includes suggestions of any new closed areas and elimination of any closed areas.
3. Evaluate boundaries of existing or proposed HAPCs in obtaining the goals of the amendment.

4. Provide committee with any suggested modifications of the boundaries of the existing or proposed HAPCs that would better meet the goals of the amendment. This includes suggestions of any new HAPCs and elimination of any HAPCs.
5. In existing or potential closed areas, provide the committee with an analysis of metrics to characterize the tradeoffs between habitat impacts and fisheries benefits.
6. Provide a list of potential appropriate sites to protect deep-sea corals.

PDT Recommendations

Motion 1:
The Habitat PDT used an Equal Area Permutation (EAP) analysis on the uniform simulation outputs of the SASI model for all gear types to evaluate the appropriateness of current management areas. This analysis compares the area-weighted mean Z infinity ($\bar{Z}_w$) of the 100 km^2 cells that fall within each management area to the distribution of Z values obtained by randomly selecting 10,000 areas of the same area from the domain. For each area of interest, the number of random areas that have Z scores greater than or equal to the management area of interest can be calculated. These areas would be expected to be more appropriate in terms of minimizing the adverse effects of fishing on EFH.

The PDT recommends that if the management area falls within the top 1,000 permutations (i.e. the 90th percentile) the current area could be considered appropriate. The table below lists each area, area-weighted mean Z infinity ($\bar{Z}_w$), percentile, the number of areas with greater or equal area-weighted mean Z infinity ($\bar{Z}_w$), and the maximum percent improvement in Z that could be obtained by selecting the 99th percentile area instead of the area of interest. It is important to note that because the areas are different sizes, the percentiles cannot be compared directly across areas.

The PDT is currently updating the EAP analysis for trawls and scallop dredges. Because the underlying matrices for the trawl and scallop dredge SASI uniform simulation outputs are similar, only trawl results are shown below. The PDT did not run the EAP analysis for hydraulic dredges or for fixed gears, because these gears are either currently not restricted from the groundfish EFH closures (fixed gears), or because there is little overlap between fishing with the gear type and the areas of interest (hydraulic dredge gear). However, gear types capable of catching groundfish are restricted from the groundfish mortality closures.

The following table shows the output of the EAP analysis for the groundfish EFH closures and the groundfish mortality closures. These results are based on the trawl gear uniform simulation SASI model outputs.

Table 1 – Equal Area Permutation analysis of uniform simulated Z∞ trawl outputs. An updated copy of this table with the permutation results will be available at the meeting.

Area		Tested Area Results			Permutation Results			
		km^2	Area weighted mean z∞	Sum z∞	%ile	Areas with ≥ Mean z∞	99^{th} %ile	% z∞ Increase
Groundfish EFH Closures	Cashes L. EFH GF	443.34	51.437	588.063				
	Jeffreys B. EFH GF	498.80	57.667	510.131				
	WGOM EFH GF	2272.28	50.114	1777.546				
	CAII EFH GF	641.44	49.425	844.790				
	CAI N. EFH GF	1937.35	45.186	1287.931				
	CAI S. EFH GF	583.68	46.085	609.666				
	NLCA EFH GF	3386.81	46.787	2205.238				
Groundfish mortality closures	Cashes L. Closed Area	1373.07	48.505	1186.067				
	WGoM Closed Area	3029.63	49.874	2362.747				
	Closed Area I	3938.98	45.891	2556.100				
	Nantucket Lightship	6247.79	46.466	4002.387				
	Closed Area II	6862.19	46.338	4354.635				

Motion 2:
The Habitat PDT used a Local Indicators of Spatial Association (LISA) method to analyze the uniform simulation outputs of the SASI model for all gear types. This analysis identifies cells that are significantly higher or lower than average in their adverse effect score, which is expressed as area-weighted mean Z infinity. Another document explains this method in greater detail.

The Habitat PDT recommends that the committee consider implementing measures to minimize adverse effects of fishing on EFH in the locations identified by the Local Indicators of Spatial Association analysis of the SASI model uniform simulation runs for trawl and scallop dredge gear (trawl and scallop gear were selected since they have the highest level of adverse effect and many of the areas identified in the fixed gear analyses overlapped). These include the following locations identified as clusters of high vulnerability cells at the $p<0.01$ significance level (see Map 1 and Map 2, red and dark green cells):

1. South of Mt Desert Island Cluster
2. Jeffrey's Bank Cluster (trawl only)
3. Platts Bank Cluster
4. Cape Neddick Cluster
5. Georges Shoal Cluster
6. Great South Channel Cluster
7. Brown's Ledge Cluster

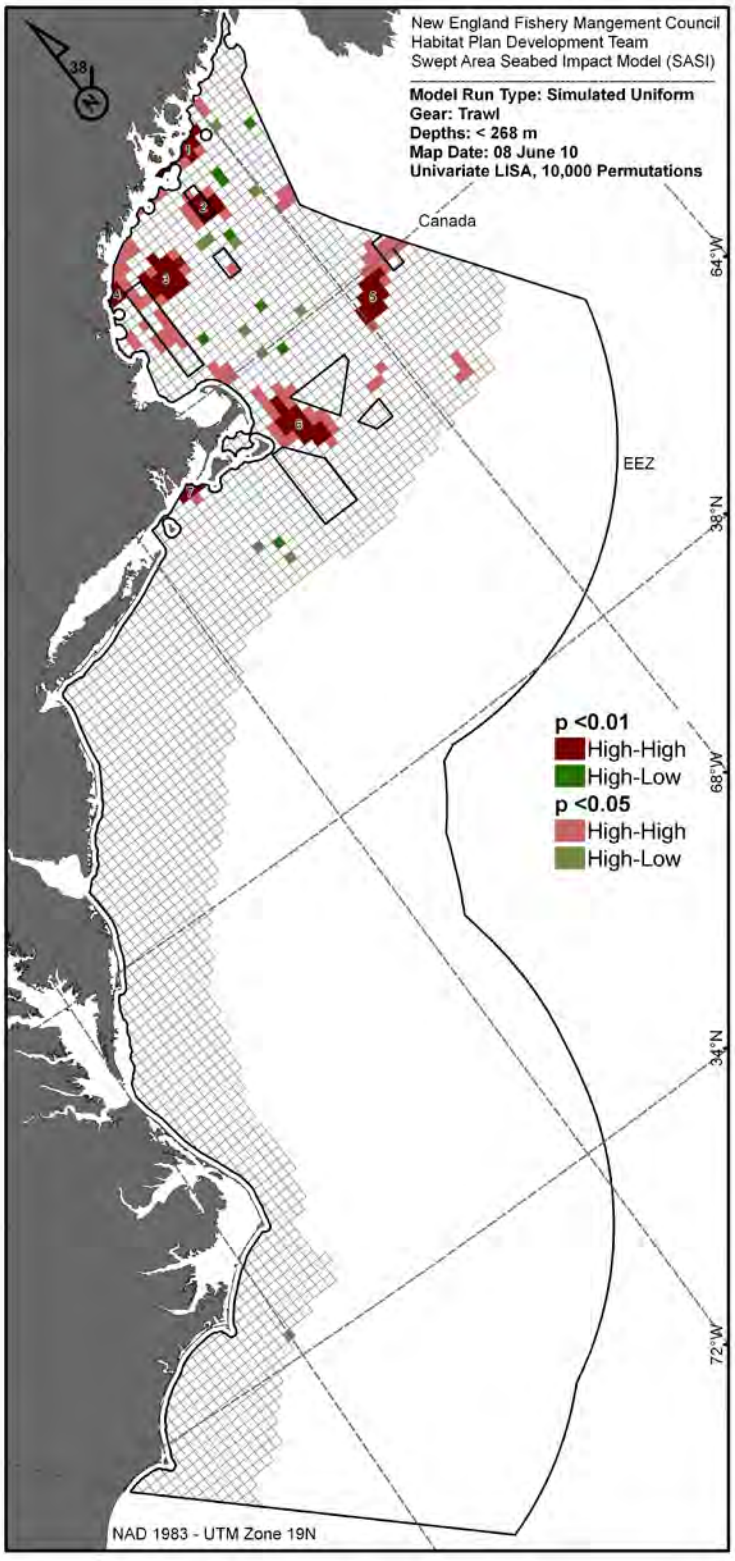
Additional and/or larger areas are highlighted at the $p<0.05$ significance level (pink and lighter green cells in Maps 1 and 2).

In terms of recommending areas for elimination or modification, the PDT recommends that the committee consider eliminating areas that do not overlap with the LISA clusters listed above or on the maps at the $p<0.05$ significance level, and also that they consider modifying the boundaries of existing areas to better match the LISA clusters.

Given data limitations (e.g. SBNMS, Platts Bank, GOM), there may be additional areas not identified in the LISA analysis where management action might be implemented to reduce the adverse effects of fishing on EFH. Also, the LISA analysis may be over-representing cluster size in some areas (e.g. Platts Bank).

Because of the limitations stated above regarding the GOM, the committee may wish to consider gear modifications in addition to wholesale gear restrictions. Gear modifications that would be consistent with minimizing adverse effects of fishing on EFH would prevent gear from being able to operate on large grain size substrate types. For example, a maximum roller gear diameter would be considered a gear modification consistent with minimizing adverse effects of fishing on EFH.

Map 1 - High-High and High-Low LISA clusters for trawl gear



Map 2 - High-High and High-Low LISA clusters for scallop dredge gear

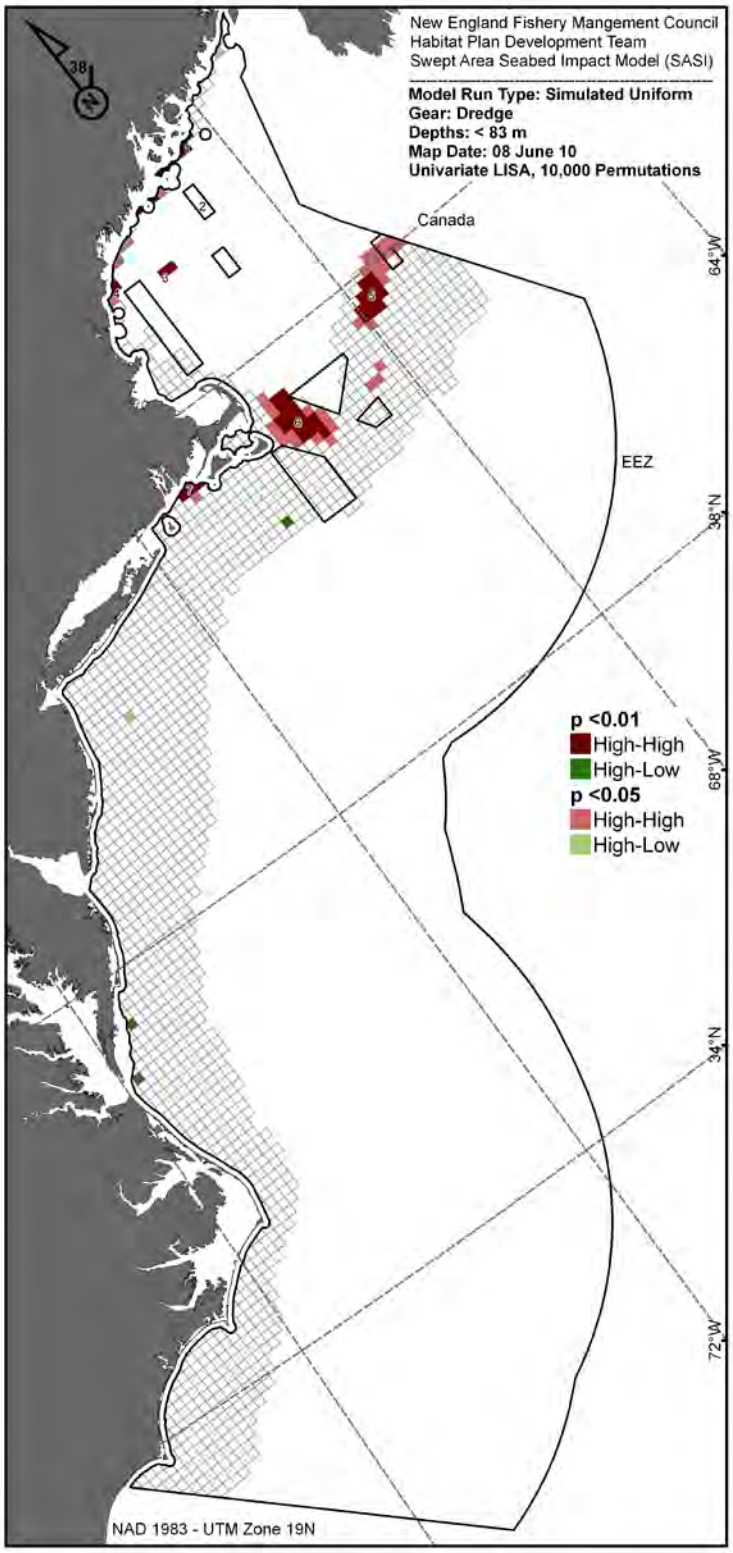


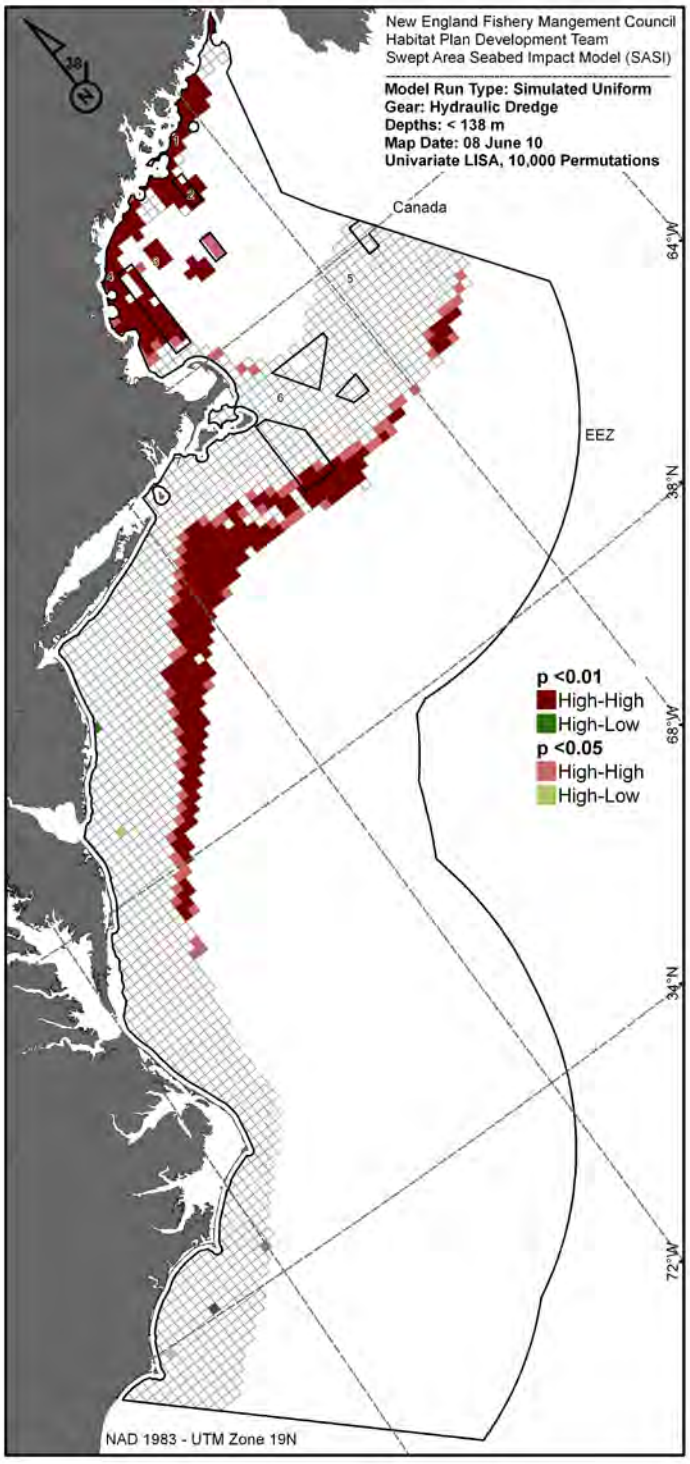
Table 2 shows the mean z_∞ value for the cells in each cluster, the total z_∞ in the cluster, and the size of the cluster. Because of differences in the underlying vulnerability assessment parameters (susceptibility and recovery scores), and differences in the depth threshold for each gear type, the various gears have slightly different sets of clusters and/or similar set of clusters with different sizes and z_∞ values. In particular, the trawl, dredge, gillnet, and longline cluster locations are very similar. The trap uniform simulation output clustered very differently, such that none of the major trawl clusters could be identified in the LISA outputs. Although the distribution of z_∞ values for traps varied, the magnitude of the values was very similar to the other fixed gears. Because the fixed gear z_∞ values were on average much lower than the mobile gear z_∞ values, the PDT recommends that the committee focus on the clusters identified in the trawl and dredge LISA maps. Additional LISA maps for hydraulic dredges and fixed gears are shown below the table in Map 3, Map 4, Map 5, and Map 6.

Table 2 – LISA cluster summary table, by gear type.

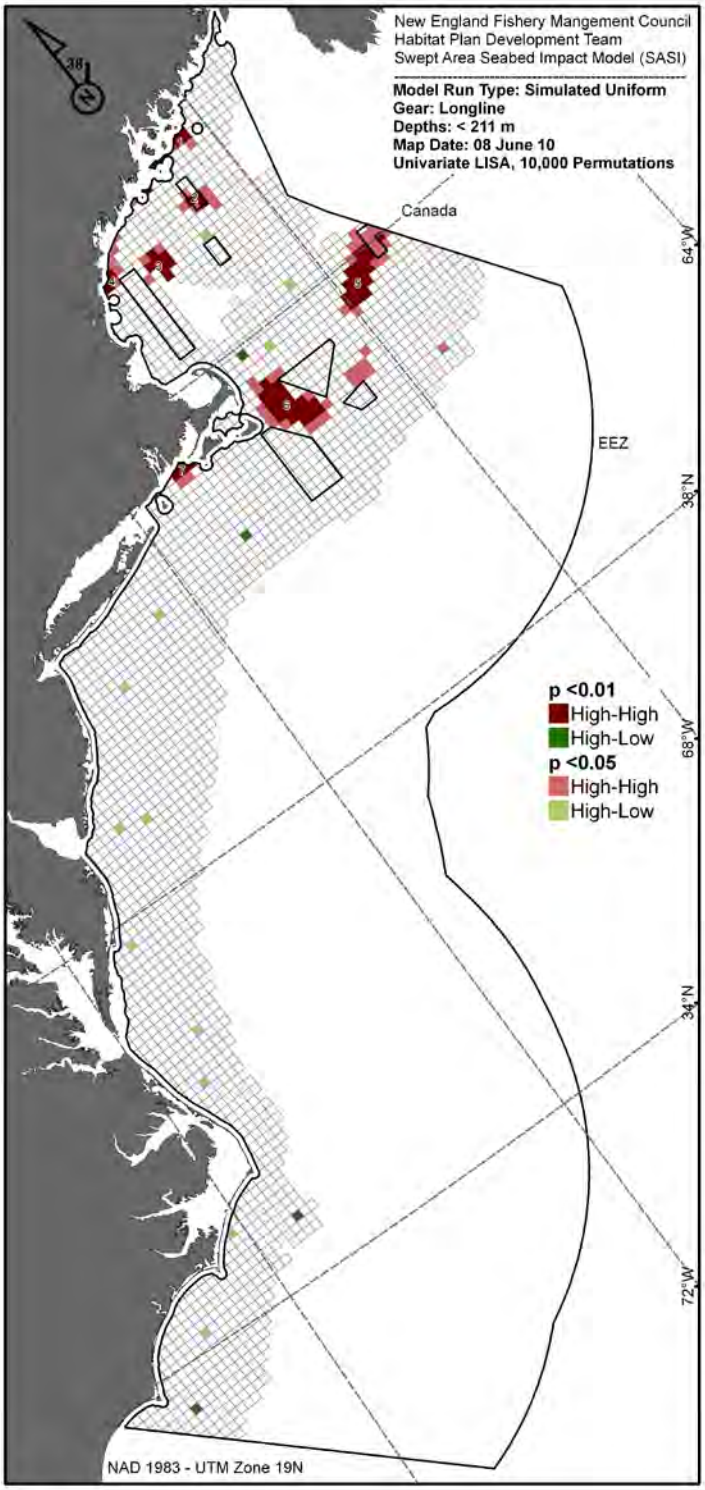
Trawl clusters				
Number	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**Size km^2**
1	South of Mt Desert Island Cluster	67.828	474.797	470
2	Jeffrey's Bank Cluster	60.898	487.185	800
3	Platts Bank Cluster	57.369	917.911	1600
4	Cape Neddick Cluster	51.416	154.247	283
5	Georges Shoal Cluster	57.404	746.251	1300
6	Great South Channel Cluster	55.580	833.696	1500
7	Brown's Ledge Cluster	55.785	223.138	273
Dredge clusters				
Cluster	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**km^2**
1	South of Mt Desert Island Cluster	77.805	311.222	182
2	Jeffrey's Bank Cluster	-	-	-
3	Platts Bank Cluster	68.593	137.186	200
4	Cape Neddick Cluster	58.058	58.058	87
5	Georges Shoal Cluster	59.805	717.656	1200
6	Great South Channel Cluster	58.432	934.908	1600
7	Brown's Ledge Cluster	58.155	232.621	273
Hydraulic Dredge clusters				
Cluster	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**km^2**
1/2	South of Mt Desert Island Cluster	-	-	-
	Jeffrey's Bank Cluster	146.285	6143.961	3756
3	Platts Bank Cluster	142.696	856.173	600
4	Cape Neddick Cluster	138.800	8466.771	5462
5	Georges Shoal Cluster	-	-	-
6	Great South Channel Cluster	-	-	-
7	Brown's Ledge Cluster	-	-	-

Longline clusters				
Cluster	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**km^2**
1	South of Mt Desert Island Cluster	22.788	91.152	251
2	Jeffrey's Bank Cluster	18.732	56.195	300
3	Platts Bank Cluster	19.431	136.017	700
4	Cape Neddick Cluster	16.730	33.460	183
5	Georges Shoal Cluster	17.570	298.682	1700
6	Great South Channel Cluster	17.501	367.531	2100
7	Brown's Ledge Cluster	18.955	94.777	275
Gillnet clusters				
Cluster	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**km^2**
1	South of Mt Desert Island Cluster	22.824	91.294	251
2	Jeffrey's Bank Cluster	17.925	53.775	300
3	Platts Bank Cluster	18.864	150.908	800
4	Cape Neddick Cluster	16.651	33.302	183
5	Georges Shoal Cluster	17.459	331.720	1900
6	Great South Channel Cluster	17.507	350.139	2000
7	Brown's Ledge Cluster	19.093	95.465	275
Trap clusters				
Cluster	**Name**	**Mean z_{inf}**	**Sum z_{inf}**	**km^2**
1	South of Mt Desert Island Cluster	-	-	-
2	Jeffrey's Bank Cluster	-	-	-
3	Platts Bank Cluster	-	-	-
4	Cape Neddick Cluster	-	-	-
5	Georges Shoal Cluster	-	-	-
6	Great South Channel Cluster	-	-	-
7	Brown's Ledge Cluster	-	-	-

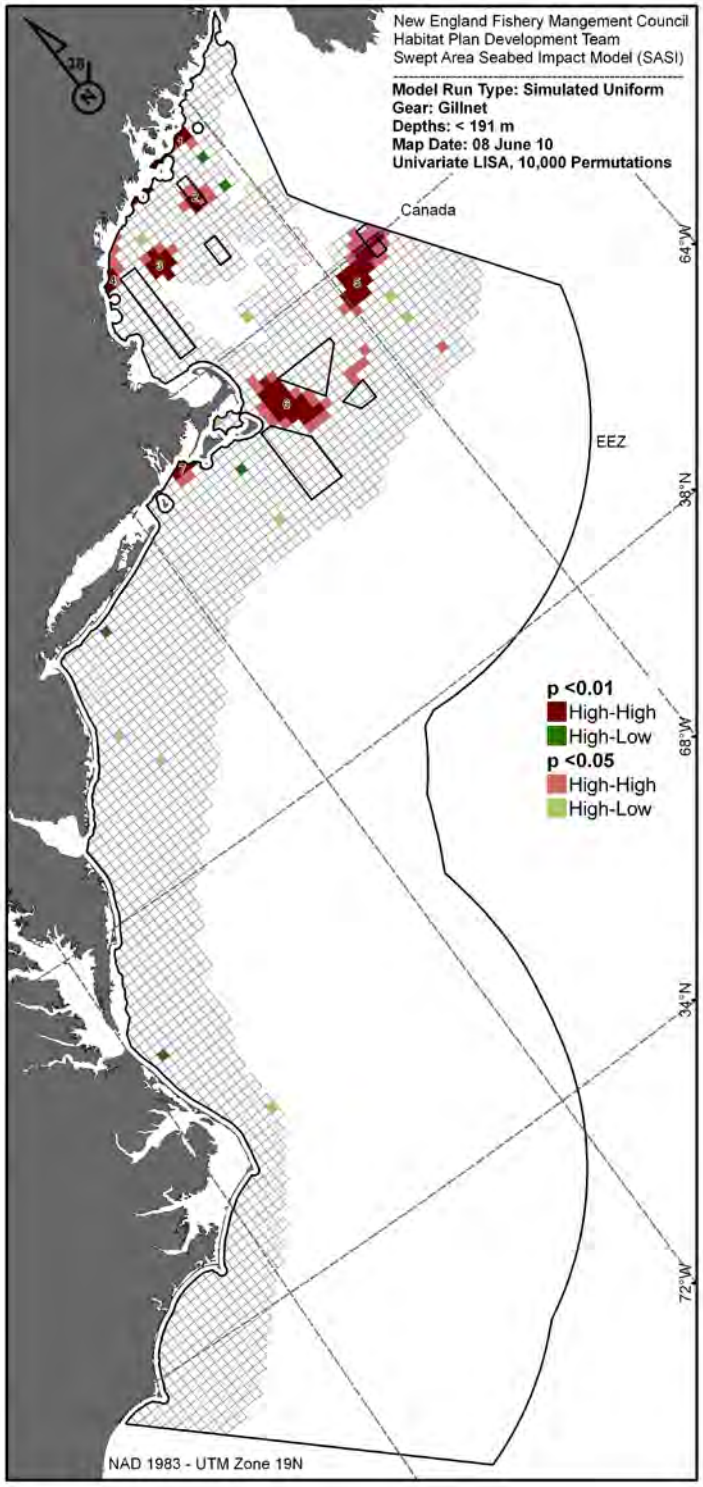
Map 3 - High-High and High-Low LISA clusters for hydraulic dredge gear



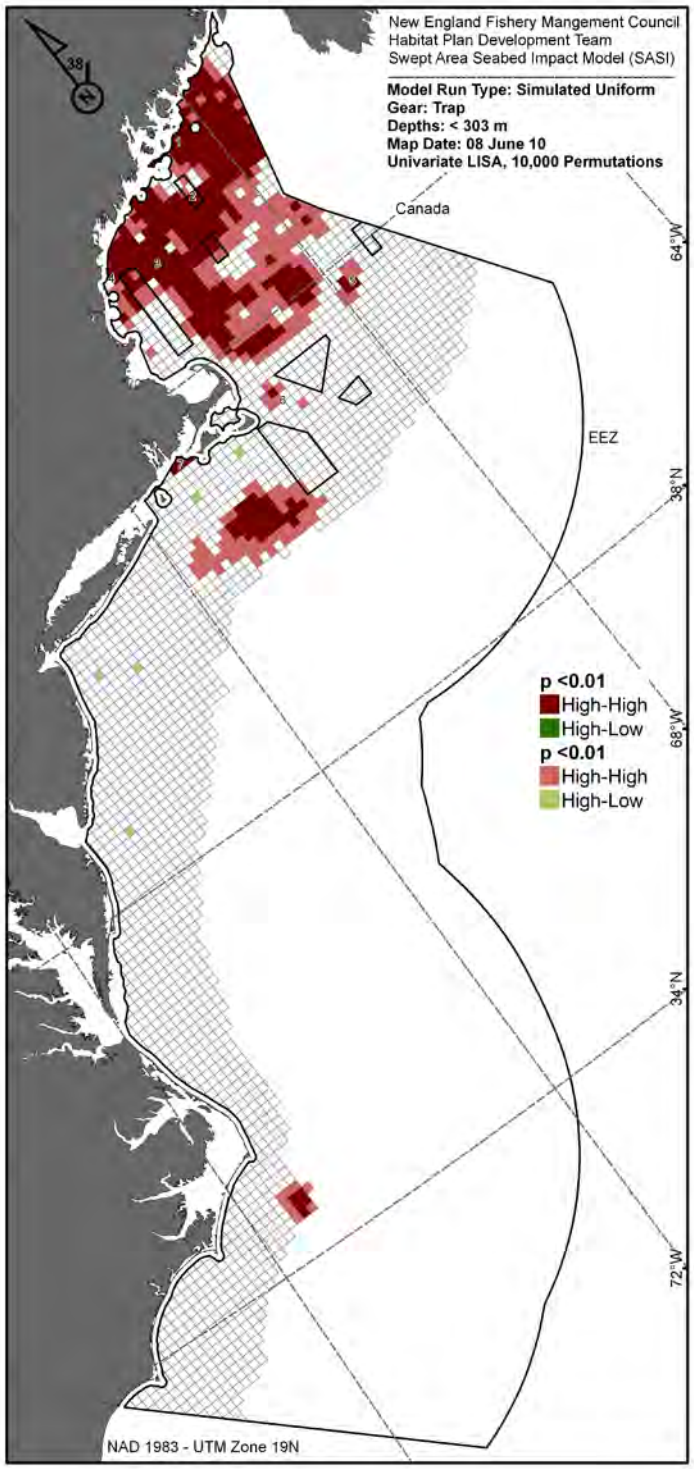
Map 4 - High-High and High-Low LISA clusters for longline gear



Map 5 - High-High and High-Low LISA clusters for gillnet gear



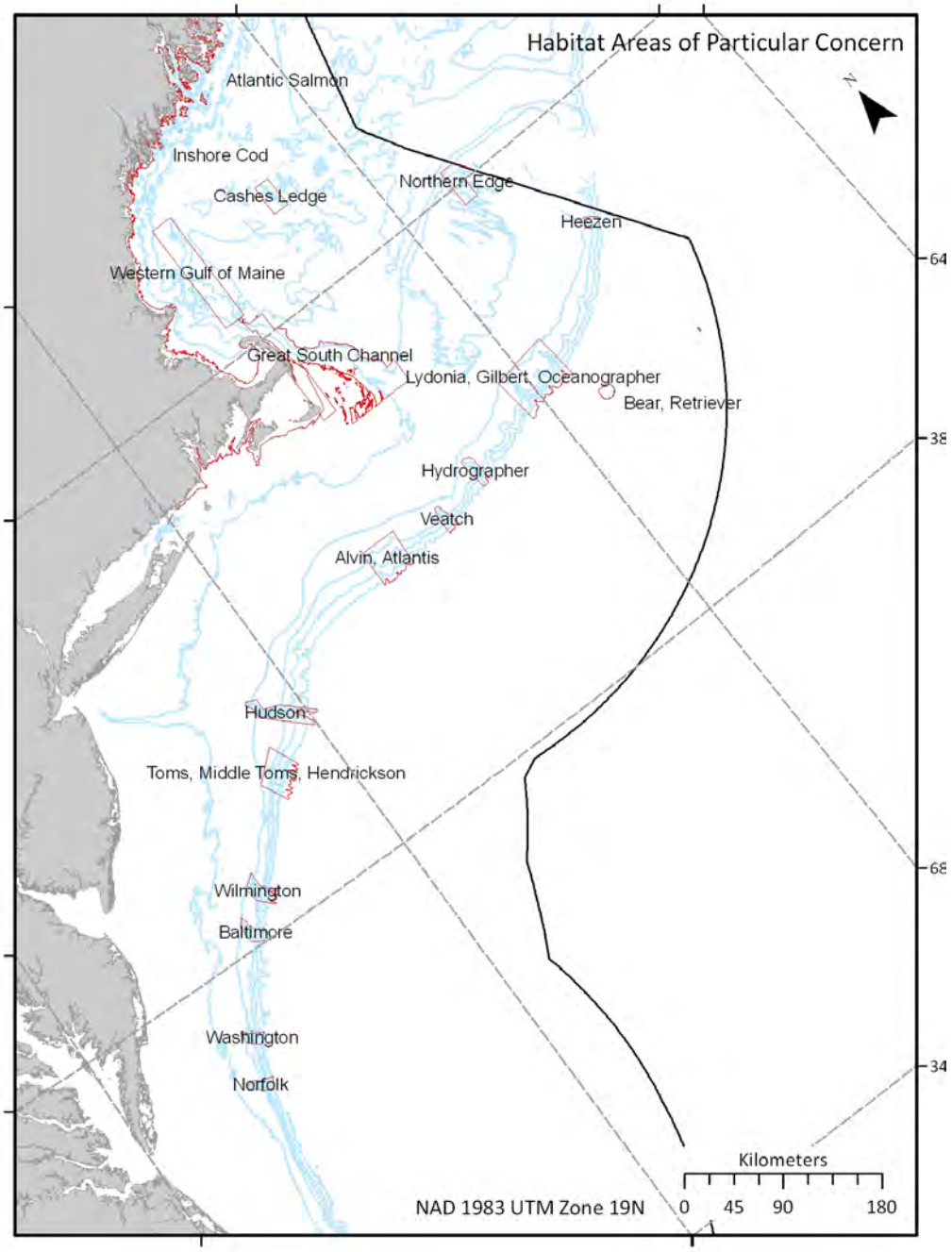
Map 6 - High-High and High-Low LISA clusters for trap gear



Motions 3 and 4:

The Council approved a series of Habitat Areas of Particular Concern (HAPC) during Phase 1. These are shown in Map 7. The Committee asked the PDT to comment on whether these proposed HAPCs should be reconsidered or modified, and also to provide suggestions as to any new HAPCs.

Map 7 – Habitat Areas of Particular Concern approved in Phase 1.



HAPCs are a subset of designated EFH that must meet at least one of the criteria specified in EFH Final Rule:

1. The importance of the ecological function provided by the habitat.
2. The extent to which the habitat is sensitive to human-induced environmental degradation.
3. Whether, and to what extent, development activities are, or will be, stressing the habitat type.
4. The rarity of the habitat type.

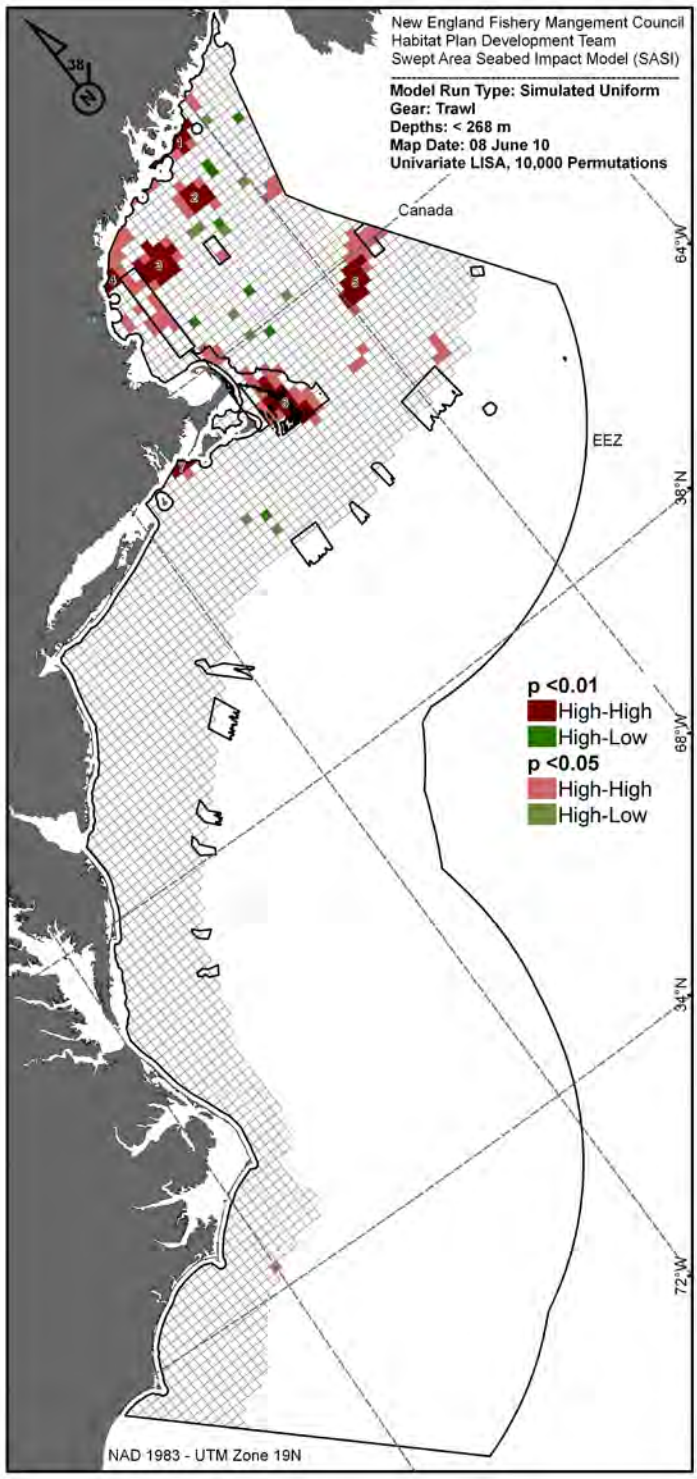
Between December 2004 and March 2005, the Council solicited HAPC proposals from the public for HAPCs that (in no particular order): (1) will improve the fisheries management in the EEZ, (2) include EFH designations for more than one Council-managed species in order to maximize the benefit of the designations, (3) include juvenile cod EFH, (4) meet more than one of the EFH Final Rule HAPC criteria.

Designation of an area as an HAPC is intended to indicate that the area should receive more of the Council's and NMFS' attention when providing comments on federal and state actions (including fishery management actions), and in establishing higher standards to protect and/or restore such habitat. It is important to note that while an area's status as a HAPC should lead to more careful evaluations of the impacts of fishing in that area, no management measures, such as gear restrictions, are associated with individual HAPCs.

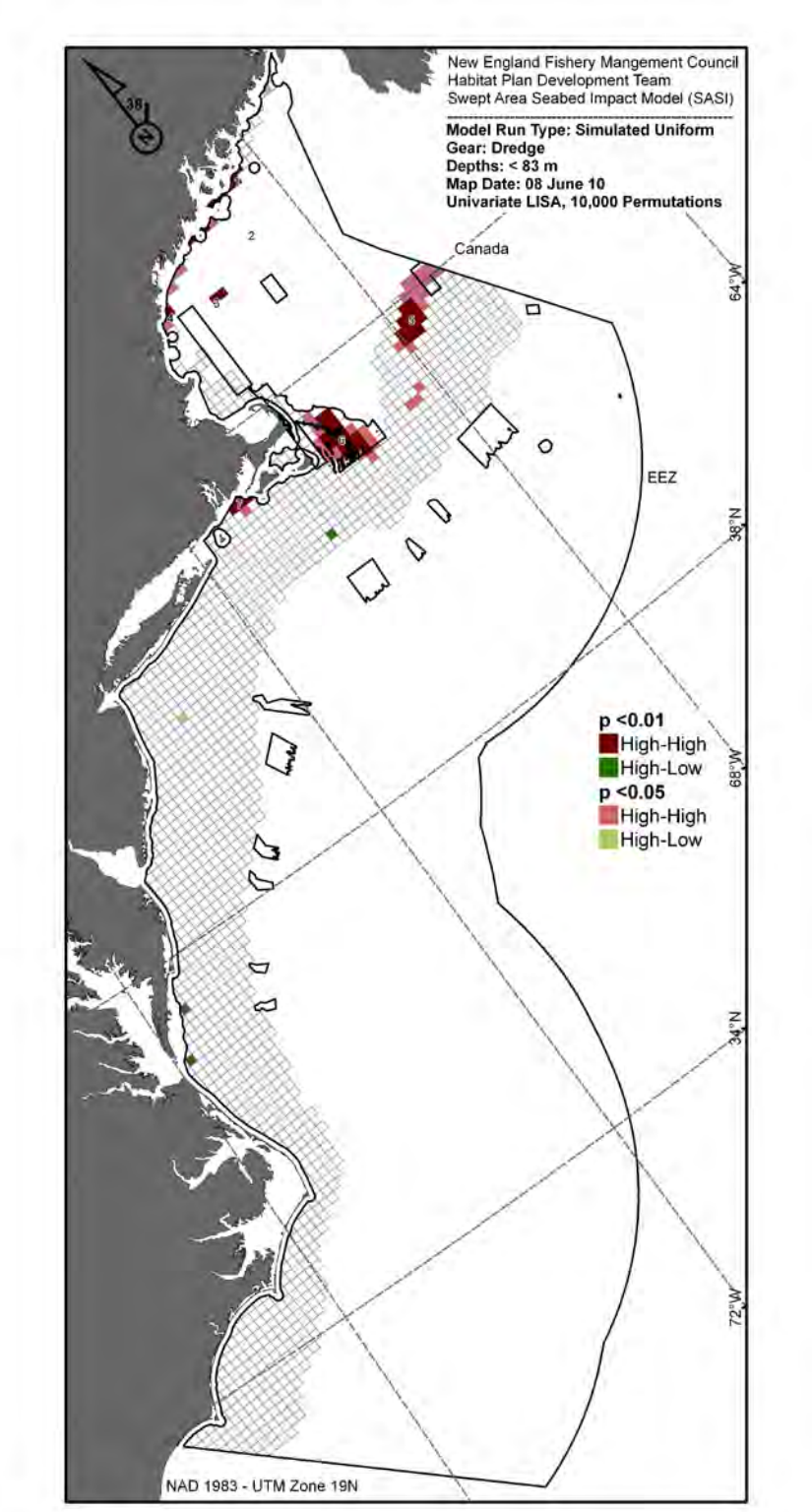
The following maps show the overlay between proposed HAPCs and the SASI LISA outputs for each of the six basic gear types. Some of the HAPCs fall outside of the SASI domain or are located in and around canyons and seamounts. It has been acknowledged previously that the SASI model is not appropriate for evaluating fishing effects on canyon and seamount areas and the underlying substrate data area poorly specified in those locations. Additional PDT work on deep-sea coral alternatives will address the vulnerability of corals in these and potentially other deep-water areas. The PDT notes that fishing gear effects on structural habitat features are only one component of criteria 2, and that criteria 2 is the only HAPC criteria suitable for evaluation using the SASI model. Also, there may be HAPCs for which non-fishing impacts are the primary concern, such that management measures intended to reduce fishing impacts would be neither appropriate nor useful.

The PDT does not recommend eliminating the currently proposed HAPCs, and has no additional HAPC recommendations at this time. Because the HAPC criteria are fairly broad, the PDT would require more specific guidance from the committee in order to make recommendations about new HAPCs.

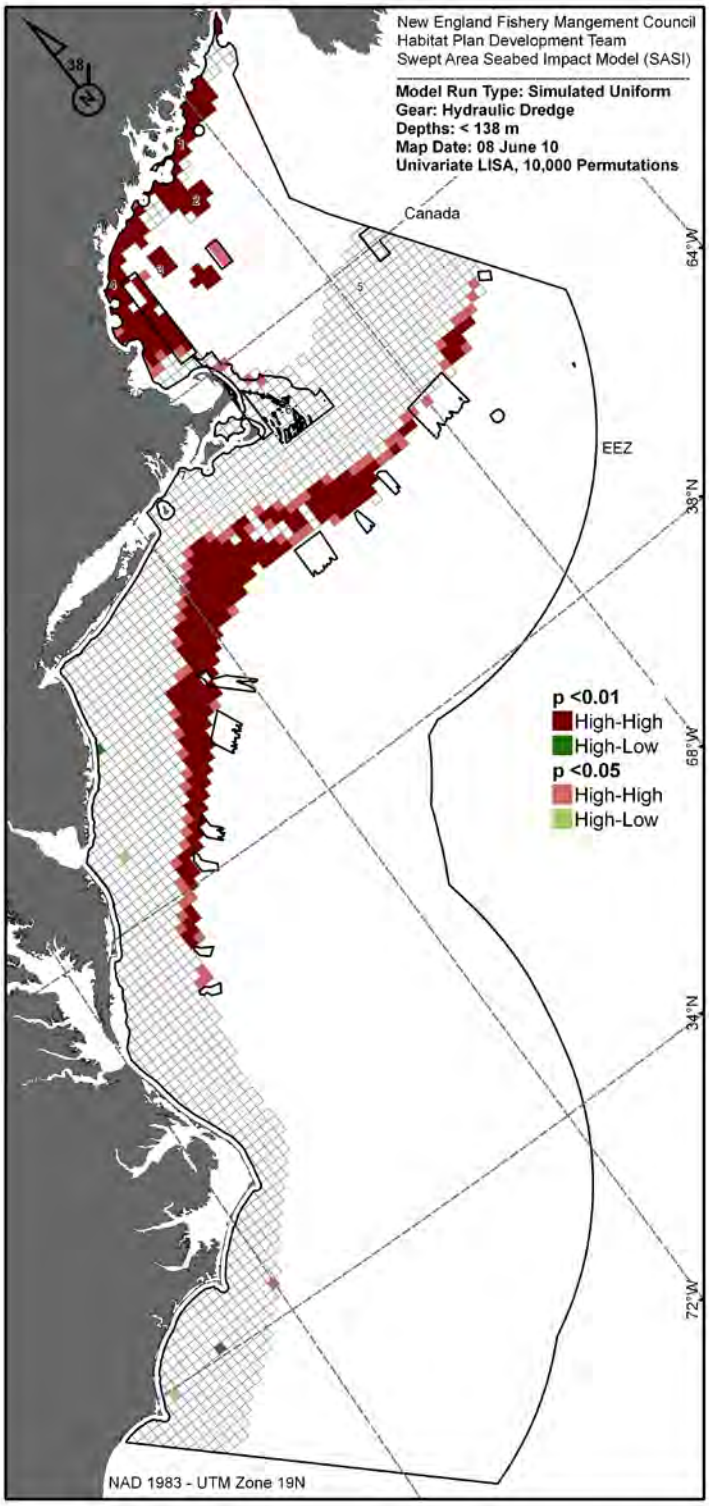
Map 8 – Overlay between trawl LISA outputs and proposed HAPCs.



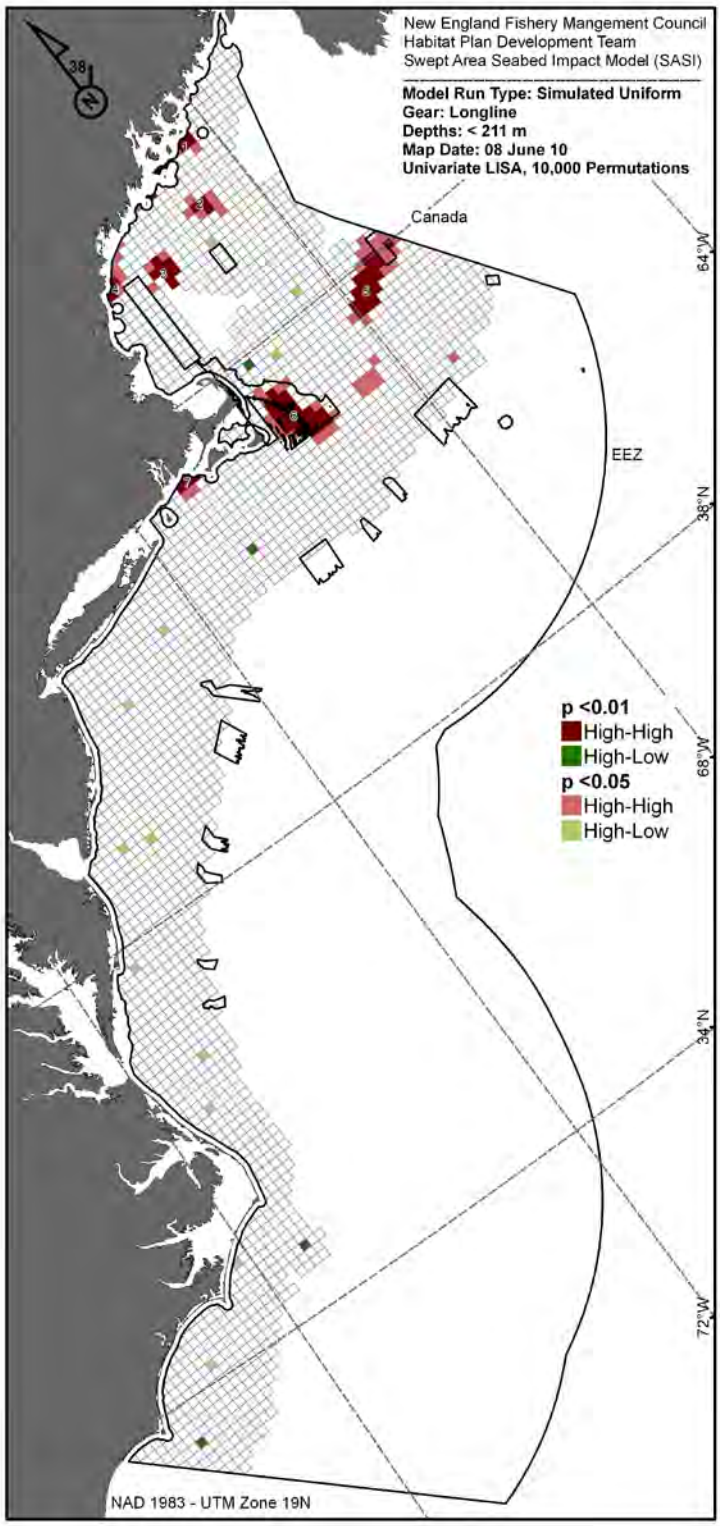
Map 9 - Overlay between scallop dredge LISA outputs and proposed HAPCs.



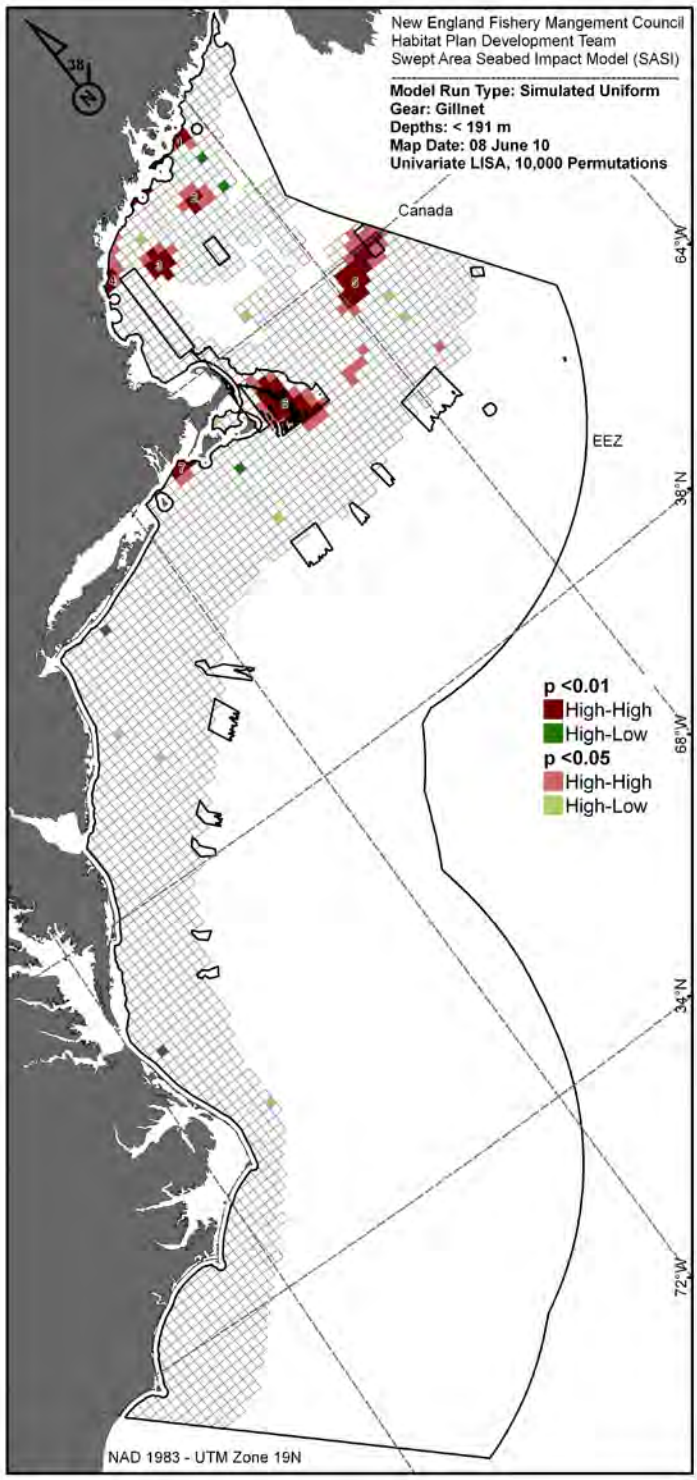
Map 10– Overlay between hydraulic dredge LISA outputs and proposed HAPCs.



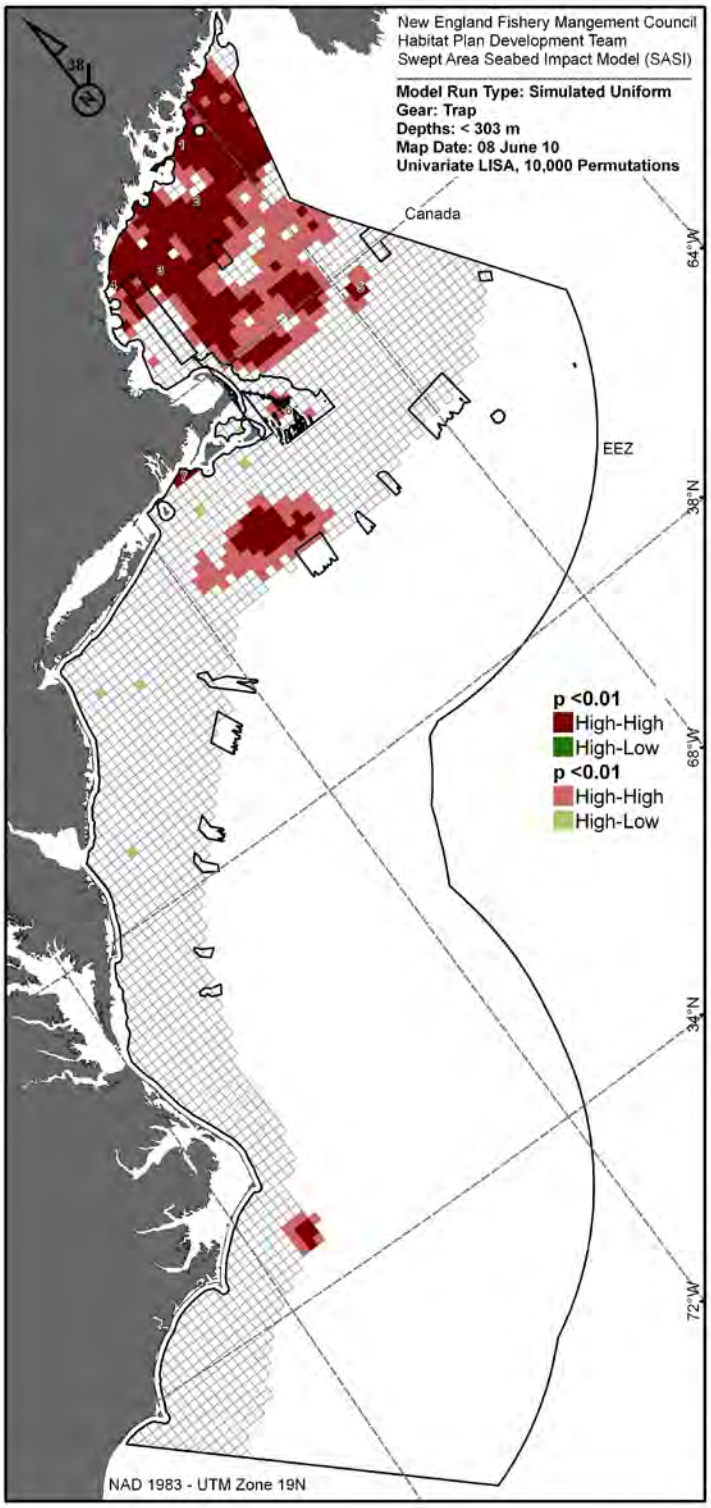
Map 11– Overlay between longline LISA outputs and proposed HAPCs.



Map 12– Overlay between gillnet LISA outputs and proposed HAPCs.



Map 13 – Overlay between trap LISA outputs and proposed HAPCs



Motion 5:
The Committee asked the PDT to provide an analysis of metrics to characterize the tradeoffs between habitat impacts and fisheries benefits. The PDT recommends quantifying habitat impacts using Z (adverse effect) and fisheries benefits using revenue data from vessel trip reports (and the dealer database, as necessary). The PDT has developed a practicability module of the SASI model called the 'Z Net Stock' model, which allows for gear-by-gear comparisons of spatially specific instantaneous adverse effect estimates and spatially specific revenue estimates. Specific practicability analyses can be developed by the PDT depending on the specific alternatives recommended by the committee.

Motion 6:
The Committee asked the PDT to recommend areas for deep-sea coral protection. The PDT has compiled information on deep-sea corals, specifically, (1) their vulnerability to fishing (see summary in SASI Part 1 document), (2) their distribution, and (3) the overlap between their distribution and the distribution of fishing effort (realized area swept data). This information will be used in the coming weeks to generate a list of areas that might be suitable as coral protection zones, which may or may not overlap with proposed canyon and seamount HAPCs. These recommendations will be forwarded to the Committee at their next meeting.