Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: American Lobster Management Board

FROM: American Lobster Plan Development Team

DATE: January 24, 2017

SUBJECT: Trap Reductions in Draft Addendum XXV

Draft Addendum XXV includes trap reductions as a means of achieving the Lobster Board's 20% to 60% egg production target. Much discussion has been had among the Plan Development Team (PDT) regarding the ability of trap reductions to achieve measurable increases in egg production. The PDT is not unanimous in their thoughts on this issue; some PDT members have expressed concerns about the ability of trap reductions to benefit the stock while others are more confident that trap reductions result in measurable impacts to the fishery. As a result, there is no recommendation from the PDT regarding trap reductions. Instead, this memo provides the various view points of the PDT members in an attempt to provide further context for the Board's discussion.

This memo is split into two sections. The first section looks at some reasons why trap reductions may benefit the stock and why it may be a valuable tool to achieve the goals outlined in Addendum XXV. The second part lists some of the concerns regarding trap reductions and why it may not be a tool which meets the goals of draft Addendum XXV. Again, these represent the various views of PDT members and there is no unanimous recommendation from the PDT.

<u>Potential Benefits of Trap Reductions</u>

The SNE trap reduction program as implemented by Addendum XVIII has the potential to remove a significant portion of allowable traps employed in the lobster and Jonah crab fisheries. This Addendum reduces trap allocations, and potentially removes participants entirely from the industry, depending on a fisherman's participation level and interest pending additional management action.

In the most general sense, there must be some relationship between the amount of gear deployed in the lobster fishery and the exploitation of the lobster stock. Analysis of information from the last stock assessment indicates that this relationship exists, and a logical argument can be made that, at some point, there will be few enough traps deployed in the water that population and egg production benefits will be achieved (i.e. if there are zero traps in the water, there can be zero harvest, bycatch in other fisheries notwithstanding). While human behavior and the rate of decreased exploitation with trap reductions are difficult to define or predict, theoretically there are financial and logistical difficulties to maintain catch rates with decreases in trap allocations.

The goal of Addendum XVIII is to match the number of traps in the SNE fishery to the size of the resource in that region, with the intended benefit of reducing both active and latent traps. The remaining scheduled reductions will pursue this goal and reduce allocations beyond current trap levels. Since these reductions have only been in place for two years, it is important to note that benefits from these existing programs will likely increase in the coming years, and analyses to date have not accounted for these newly implemented measures. Based on comments from the industry and given the current nature of the fishery in SNE (more of the fishery taking place offshore and trap densities dropping to low levels), it is believed that the arguments about changing effort with existing trap levels through shortened soak times and more frequent trips are not economically feasible for the SNE fishery. Simply put, the labor and cost will outweigh the return and are not likely to allow fishermen to realistically increase catch rates or effort levels. Thus, while there is uncertainty as to the number of total traps and how that corresponds with a specific level of decreased exploitation of lobsters, some PDT members believe the current lobster trap reduction program will likely have a measureable impact on regional fisheries.

Potential Concerns Regarding Trap Reductions

Some members of the PDT have expressed concerns regarding trap reductions. Analysis by the TC suggests management measures taken since the last stock assessment, such as a 25% trap reduction, could potentially yield a 13.1% increase in egg production. However, the TC made clear that such analysis provides an upper boundary for the purpose of discussion. Their analysis estimated increases in egg production based on a model that relates the decline in fishery exploitation to the decrease in active traps over the past twenty years. Thus, it makes the following assumptions:

- That the entire 13.1% increase in egg production is attributable only to the trap reductions and not the other management measures that were also implemented;
- That a 25% trap reduction would result in a 25% decrease in traps that were actively fished;
- That effort from the reduced active traps was not compensated by fishing the remaining traps harder;
- That the active traps removed under Addendum XVIII were not replaced by latent traps under the Commission's Trap Transfer Program; and
- That natural mortality would stay constant.

Some of these assumptions are likely false. For example, the TC lumped all of the egg production benefits under prior trap reductions, but they said that clearly an unquantifiable portion of the decrease in exploitation was attributable to other fishery management measures, such as gauge size changes, seasonal closures, and attrition in the fishery. This would reduce the expected egg production benefits from trap reductions to some number below 13.1%. The TC also made clear that while they could not precisely predict future environmental conditions in the SNE stock area, they did not expect those conditions to stay constant.

Another concern is that trap reductions will not remove active effort on a 1:1 basis, and perhaps will not reduce active effort at all. Addendum XVIII's trap cuts impact total allocations, which include active and latent effort. Given the tremendous attrition in the SNE fishery, there is a documented surplus of latent SNE traps. As a result, it is possible that a significant portion of the Addendum XVIII trap cuts applied to latent effort. Further, even if fishermen did not compensate for cut allocation by fishing their remaining allocation harder - arguments based upon anecdotal evidence can be made in either direction – fishermen could replace cut active traps with latent ones. Replacing cut traps was, after all, one of the principle reasons for the Commission's Trap Transfer Program and over the past two years, there have been 129 trap transfers which have transferred in excess of 33,000 traps. The TC has stated that trap reductions poorly equate to egg production and, as a result, some PDT members question what level of egg production, if any, will result from these on-going trap reductions.

All of this is not to deny that trap reductions have conservation benefit. Certainly retiring trap allocation is beneficial to the resource; however, at the present time with the present understanding of SNE conditions, some PDT members feel there is negligible information to support trap reductions achieving a measurable increase in egg production.

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MEMORANDUM

TO: American Lobster Management Board

FROM: American Lobster Technical Committee

DATE: January 25, 2017

SUBJECT: Analysis on Potential Fishery Impacts as a Result of the NEFMC Coral Amendment

The New England Fishermen Management Council is currently working on an Omnibus Deep Sea Coral Amendment which looks to protect deep sea coral habitat in the northwest Atlantic Ocean. This Amendment may impact the lobster and Jonah crab fisheries as currently, there are proposed closures in the Gulf of Maine and Georges Bank. In an effort to estimate potential impacts to the lobster and Jonah crab fisheries, the Technical Committee (TC) conducted two analyses, one which estimates impacts to the offshore fleet which fishes in and around the canyons, and another which estimates impacts to the Maine lobster fleet which fishes around Mount Desert Rock and Outer Schoodic Ridge. The intent of these analyses is twofold. The first objective is to provide an estimate of the potential impacts to the lobster and Jonah crab fisheries which does not rely on data solely from Vessel Trip Reports. The second objective is to provide another method of analysis which can be compared to the impact analysis currently being conducted by the New England Fishery Science Center.

This report is comprised of two parts. The first part estimates impacts to the offshore lobster and Jonah crab fleet by using data from ASMFC's recent mail-in survey as well as bathymetry data from NOAA. It looks at the impact of various scenarios, including discrete canyon zones, broad depth zones, and the national monument. The second part estimates impacts to the Maine lobster fleet which fishes around Mount Desert Rock and Outer Schoodic Ridge. This analysis uses three different methods to estimate impacts to landings and revenue, and considers potential implications of deep-sea coral closures on whales.

1. Alternative Analysis of Lobster Fishing Activity in Deep-Sea Coral Zones Off Georges Bank.

The New England Fisheries Management Council is considering different scenarios for protecting potentially sensitive benthic habitats along the shelf edge of Southern New England and the south side of Georges Bank. Specifically, the Council is interested in understanding how different closure scenarios would impact fisheries in this region. One analysis has been conducted by NEFSC staff, based primarily on revenue and coordinates from vessel trip reports (VTRs). This first approach recognizes and attempts to model the uncertainty of the reported VTR coordinates by distributing the reported landings to a neighborhood around the reported coordinates, then estimating impacts of different spatial closures. The TC's analysis examines an alternate method for assigning value to different habitats and exploring the impacts of different scenarios. The method is applied specifically to the offshore American lobster and Jonah crab

industry, one of the fleets expected to be most affected by such closures, and is largely independent of the VTR data. The primary purpose for this alternate analysis is to validate the estimates from NEFSC based on VTR coordinates. However, comparisons to this analysis are not included in this document because the NEFSC report is not yet finalized.

Methods

The region of interest was defined, based on provided shapefiles for different scenarios, to include NMFS statistical areas *525, 526, 541, 542, 543, 562, and areas 534 and 537 east of -70.55 longitude.*

A value for each portion of habitat in the proposed closure region was estimated by combining results from a recent mail-in survey of LMA3 Fishermen (Whitmore et al. 2016) with a regional bathymetry map. In the survey, fishermen provided the estimated proportion of their effort and revenue across depth intervals of <100m, 100-200m, 200-300m, 300-400m, and >400m. Fishermen also provided their gross lobster and Jonah crab revenue for 2014 and 2015 from the region of interest. Though all fishermen with Area 3 lobster licenses were contacted for the survey, less than half responded and not all responses included all relevant information for this analysis. Thus, it was necessary to assume that the responses that included the necessary information are representative of the fishing fleet in this region (35% of Area 3 fishermen responded to the survey). Percent effort and revenue were averaged across applicable fishermen to get mean unweighted estimates of effort and revenue for each depth interval. To account for differences in catch and revenue among reporting vessels, the vessel reported depth distributions of effort and revenue were weighted by the mean reported revenue for lobsters and Jonah crabs across 2014-2015 to get a weighted distribution of effort and revenue across depth.

To attribute this effort and revenue to bottom habitat, bathymetry data from the NOAA NCEI U.S. Coastal Relief Model was used (*Retrieved 9/10/2013, http://www.ngdc.noaa.gov/mgg/coastal/crm.html),* which has a resolution of 3 arc minutes. The spatial extent of the raster was trimmed to the area of interest with depths of less than 500m as fishermen's responses indicate that there is minimal fishing occurring below 500m. Potential caveats of this assumption are addressed in the discussion. Each pixel was then assigned to a depth category consistent with the depth intervals that were used in the fishermen survey and distributed the reported mean effort for each depth interval evenly across all pixels in the respective depth interval. This is a critical oversimplification and potential source of bias in this analysis as it assumes that all pixels within a depth interval are equally productive for lobster and Jonah crab fishing (i.e. habitat along submarine canyons have the same productivity as habitat at a similar depth along the shelf edge between canyons).

Impacts of a closure scenario on effort or revenue were calculated by overlaying the closed areas on the bathymetry map and summing the effort or revenue value (unweighted or weighted) of all pixels falling inside the closure scenario. Of the proposed scenarios, evaluated closures included depths greater than 300m or 400m, (hereafter 300m+ and 400m+ respectively) the closure of Discrete Canyons (hereafter DC), and the combinations of the depth

based and Discrete Canyons scenarios (Figures 1-3). There are also scenarios proposed for depths greater than 500m or 600m but there was not enough effort data for these scenarios in this analysis. Because a national monument has been legislated for habitat within this region, the impacts of the national monument were also evaluated as well as the five above scenarios plus the national monument to get the total impacts of closures, existing and proposed.

Actual loss of revenue for each of the above scenarios was estimated by applying percentage of lost revenue to the total revenue from the region. Though estimated revenue was reported in the survey, the survey responses represent an unknown portion of the total vessels operating in the regions, so it was necessary to use VTRs to estimate total revenue for all vessels in the region. While vessels fishing in federal waters only for lobsters are not required to file VTRs, 95% of responses to the Whitmore et al survey reported filing VTRs, so it may be assumed that the majority of catch from this region is recorded in VTRs and accounted for in our analysis. To examine fishery revenue for this area over the last decade, data was extracted for all VTRs from 2006 – 2015 that reported fishing lobster pots. Precise spatial data was not necessary for most cases as the analysis mostly includes the spatial extent of entire statistical areas. Not all VTRs had assigned statistical areas but examination of the VTR landings by year suggested that >99.9% of VTR landings included a reported statistical areas if the data were constrained to 2011 – 2015. Statistical areas 534 and 537 are only partially included in the proposed closure areas, requiring more precise spatial data for these areas. Thus, these stat areas were split at 70.55^{o}W longitude (western extent of closure scenarios) and, using the VTRs that had reported coordinates, calculated the percentage of landings by year east of this boundary, relative to landings for the entire statistical areas and then applied these percentages to the remaining VTRs that lacked coordinates to calculate the total landings for these statistical areas east of the boundary.

Revenue was then summed across statistical areas within year and examined landings trends for 2011 – 2015. Regional revenue increased across these years but was similar for 2014 and 2015, so the average of the two years were used to project revenue loss.

Results

Of the vessels that replied to the mail-in survey, 15 reported fishing in the region of interest and supplied effort and revenue percentages by depth. 12 of these 15 also reported total revenue for the region so only these 12 were used for calculating weighted depth-distributions of effort and revenue.

Based on the survey results, the 200 – 300m depth zone has the highest fishing effort but the 100 – 200m depth zone has marginally higher revenue value (Table 1). A total of 26.6% and 32.6% of effort (unweighted and weighted) is in 300m depths or greater and 3.7% and 6.1% of effort (unweighted and weighted) is in greater than 400m. Similarly, a total of 20.9% and 27.9% of lobster and Jonah crab revenue (unweighted and weighted) is reported from depths greater than 300m and 2.7% and 4.8% of lobster and Jonah crab revenue (unweighted and weighted) comes from depths greater than 400m. Most (78.8%) of the habitat within the statistical areas that encompass the region of interest is in less than 100m depths with only 3.1% of the habitat

in deeper than 300 meters and 1.4% of the habitat deeper than 400m (recall that habitat deeper than 500m is not included as potential lobster habitat for the purpose of this analysis). It is noteworthy that the 300-400m depth interval represents a moderate amount of effort (22.9% and 26.5%) and revenue (18.1% and 23.1%) but also represents a very small portion of the habitat. This suggests that this depth increment may have the highest density of fishing activity (i.e. highest effort-to-habitat area or revenue-to-habitat area ratios), followed by the 200 – 300m depth increment.

For scenarios where the existing National Monument were not included, the weighted estimates were consistently higher than the unweighted estimates, suggesting that vessels that reported higher revenues were generally fishing deeper than vessels that reported lower revenues (Table 2). In general, the area within the Discrete Canyons scenario accounts for about 10% of the effort and 8% of the revenue, representing $1.4 – 1.8 million in annual lobster and Jonah crab revenue. The 300m+ scenario encompasses 23 – 28% of the effort, and 17 – 23% of the revenue, representing $3.4 – $4.5 million in annual lobster and Jonah crab revenue. The combined 300m+ and DC scenario are only slightly higher than the 300m+ scenario as the DC scenario includes very little habitat that is not already accounted for in the 300m+ scenario. The 400m+ scenario encompasses 5.5-7.5% of the effort and 4.1-6.2% of the revenue, accounting for $0.8 - $1.2 million in annual lobster and Jonah crab revenue. Because adding the DC scenario to the 400m+ scenario adds a significant amount of shallower habitat, the combined scenario has considerably higher impacts, encompassing 11.9-14.6% of the effort and 9-12.3% of the revenue, representing $1.7 – 2.4 million in annual lobster and Jonah crab revenue.
The newly-designated national monument itself is estimated to account for 13-14.3% of the regional effort and 12.2 – 14.3% of the revenue, representing $2.4 – 2.8 million in annual lobster and Jonah crab revenue (Table 3). Because the national monument includes considerable amounts of productive habitat shallower than 300m, combining the national monument with the different scenarios increases the expected impacts for all scenarios, increasing effort and revenue impacts by about an additional 10%. The 300m+ with DC and the monument combined scenario would have the highest impact, encompassing 33-38.4% of regional effort and 27.5 – 33.4% of revenue, accounting for about $5.4 – 6.5 million in annual lobster and Jonah crab revenue.

Discussion

The range in values presented for each scenario above represents the difference between unweighted and weighted estimates and do not represent the uncertainty in the estimates. The depth distributions of effort and revenue data come from self-reported mail-in surveys from a limited number of fishermen that may not accurately represent all the vessels in the survey area. Thus, given the small sample size, it is difficult to know how accurate the assumed depth distributions of effort and revenue are. The analysis is also based on data from the recent years and not necessarily predictive of the future. From conversations with industry, many of the vessels working this region have been fishing the same general area for many years. However, given large-scale shifts in lobster distributions to the south and west and the increasing pressure on Johan crabs, this region may become more important to the offshore fishery.

Closures will also impact vessels unequally. As mentioned in the results, the weighted estimates of effort and revenue impacts are consistently higher than unweighted estimates across the scenarios. This suggests that vessels reporting higher landings in this region tend to fish deeper and would be more impacted by closures. Of the 14 survey respondents that provided a depth distribution of their fishing effort, three reported no effort below 300m and five reported 50% or more of their effort below 300m.

It is similarly difficult to predict the directionality of bias in this analysis. The total revenue impacts are partially derived from Vessel Trip Reports and assume that 100% of vessels fishing this area are submitting VTR's. Thus, any level of reporting below 100% would necessarily bias the total revenue estimates lower than actual.

The necessary assumption that all habitat is equally productive is almost certainly incorrect, as deep habitat along canyons is probably more structurally complex and productive than such habitat along the shelf edge, which would also bias the Discrete Canyons, as well as the 400m+ and DC, scenarios low. Lobster vessels have to distribute their fishing gear across a fair amount of space to fish effectively. Thus, it is also possible that, with the closure of deeper habitats, there may be insufficient habitat along the closure boundary to fish efficiently and impacts may be greater than estimated.

Conversely, some lobsters in this region seasonally migrate into shallower water where they would become available to the fishery, though the portion of the population that undergoes this migration is poorly understood. In this case, the analysis would overestimate the impacts on revenue as the results assume that lobsters protected in one area do not become available in other areas. It should also be noted that fishermen commonly follow this annual migration to a degree, fishing in shallower water in the warmer seasons and deeper water in the colder seasons. Thus, closing deeper portions of the lobster fishing habitat in this region would have seasonal impacts on the displacement of fishing effort that are not assessed in this analysis. Finally, the analysis does not explore the impacts of closing habitat deeper than 500m as quantitative data on lobster fishing effort below this depth are not available. While results of the survey indicate that a smaller amount of effort and revenue is allocated to waters deeper than 400m (on average 4% of traps and 3% of revenue from waters deeper than 400m), this does not mean that fishing does not take place in those areas. Of the 19 respondents who did fish in the area of interest, 42% reported setting their deepest traps in water greater than 400m.

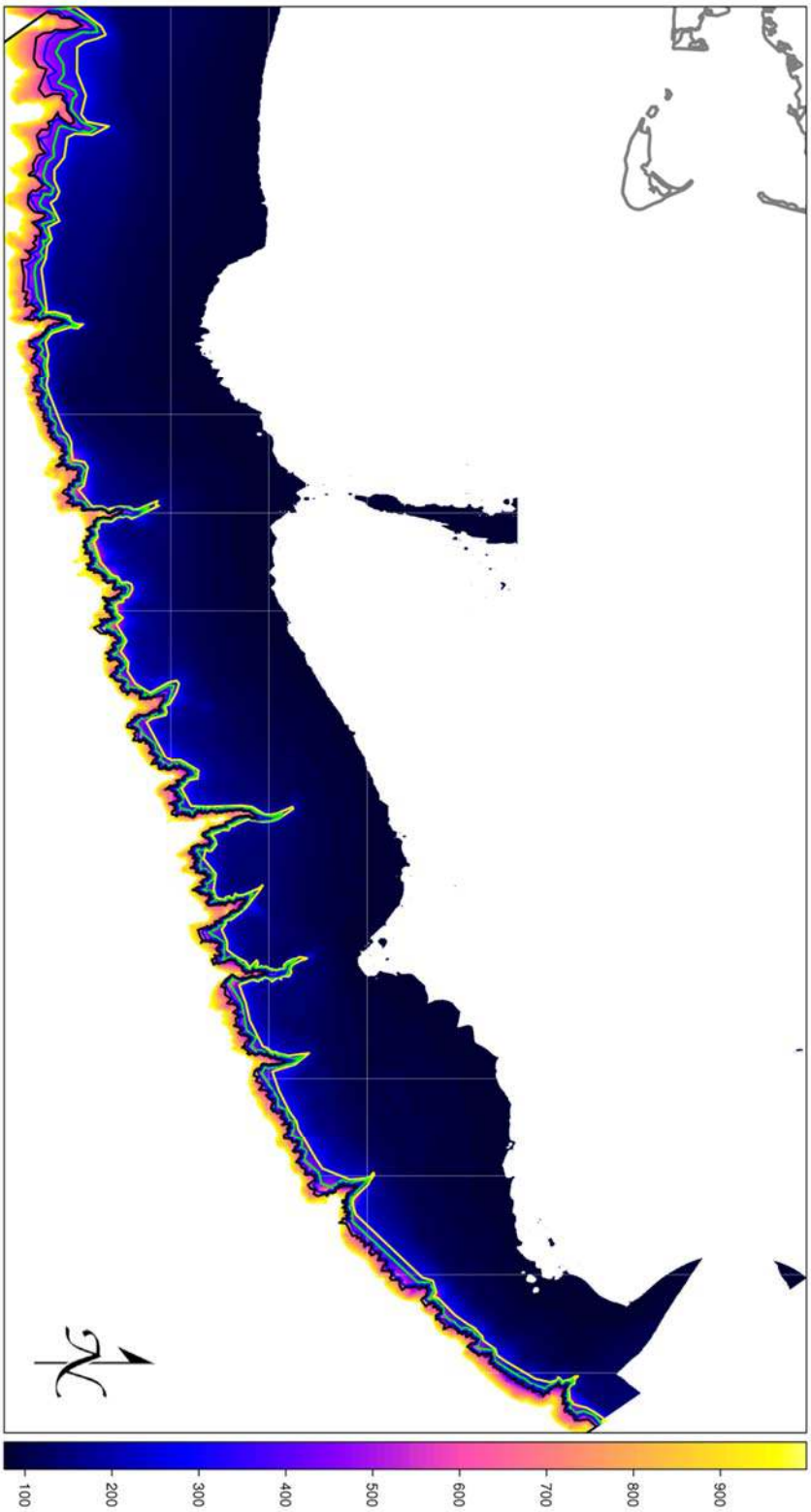

Figure 1. Bathymetry map (rotated) of southern Georges Bank with boundaries for broad-zone designations marked in yellow (300m), green (400m), blue (500m) and black (600m). Depths <75m and >1,000m not shown.

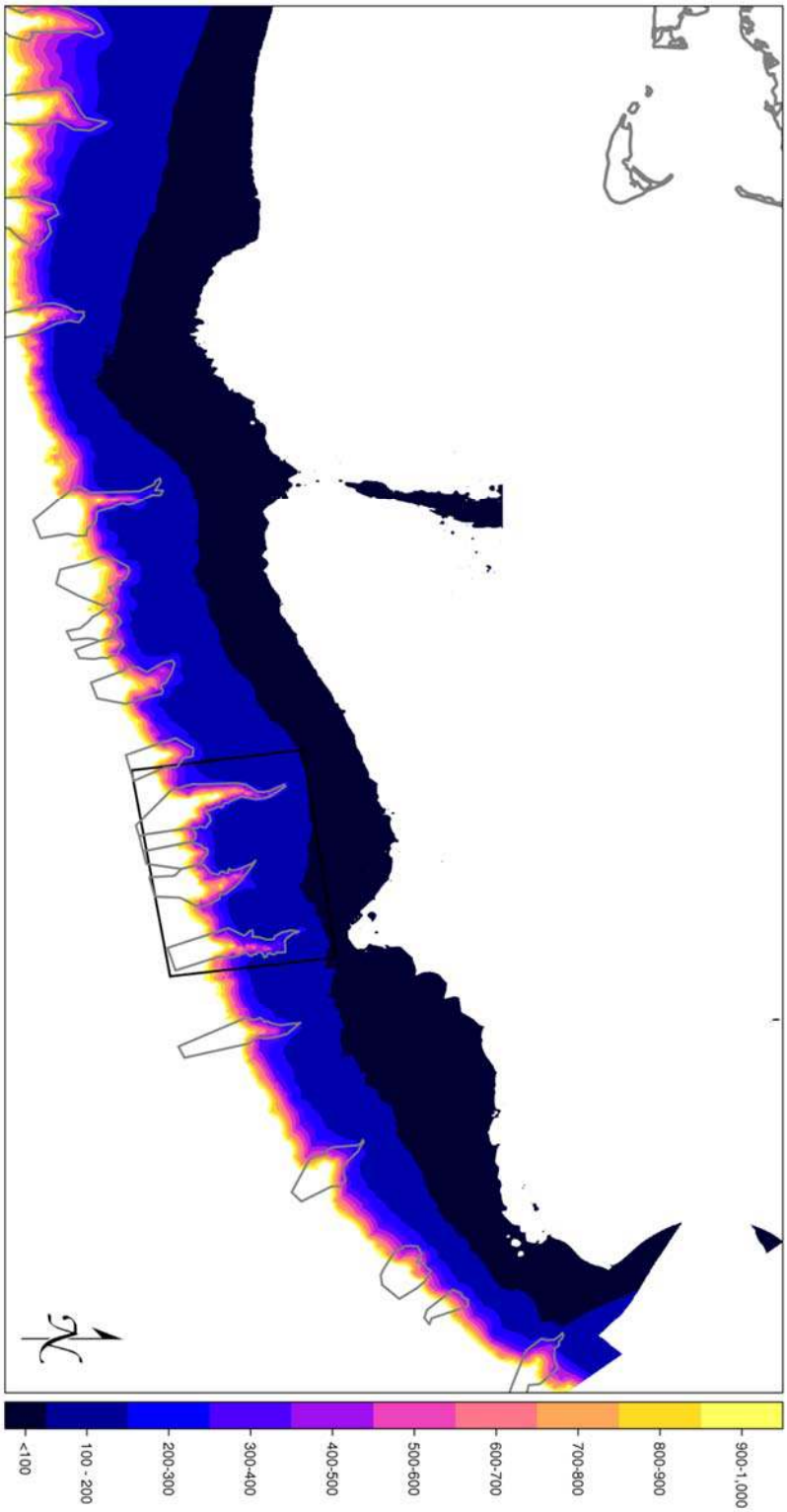

Figure 2. Bathymetry in 100m depth bins with the Discrete Canyons scenario and boundaries of the National Monument. Depths <75m and >1,000m not shown.

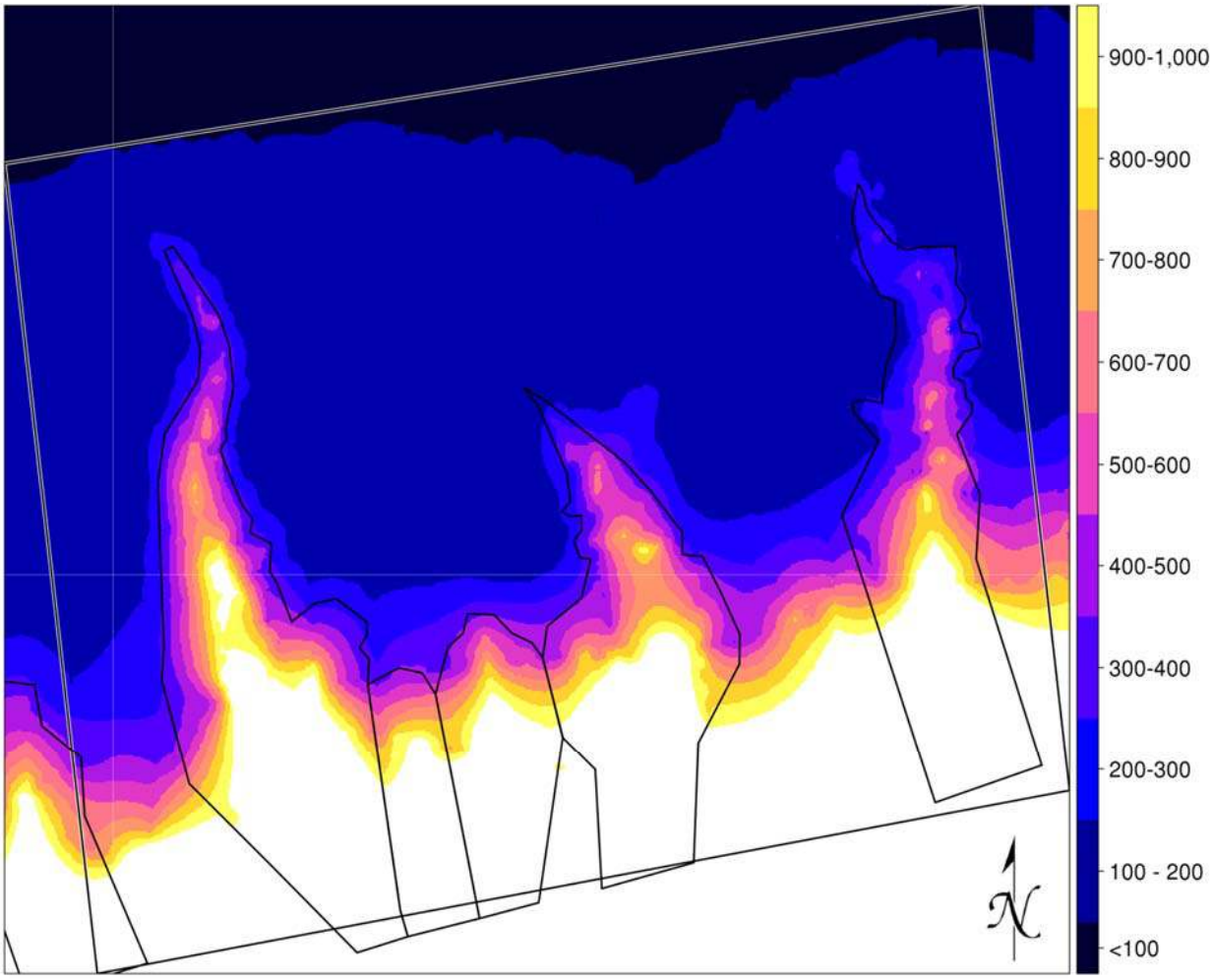

Figure 3. Higher resolution map (example for bathymetry detail) of the National Monument area with included Discrete Canyons. Depths <75m and >1,000m not shown.

Table 1. Depth distributions of effort and revenue, unweighted and weighted, and proportion of habitat by depth available in the region or interest.

DepthBin	Effort		Revenue		Proportion
	Unweighted	Weighted	Unweighted	Weighted	of habitat
<100m	17.3%	9.1%	23.0%	17.1%	78.8%
100-200m	20.5%	22.2%	32.7%	28.7%	15.5%
200-300m	35.5%	36.1%	23.4%	26.3%	2.7%
300-400m	22.9%	26.5%	18.1%	23.1%	1.7%
>400m	3.7%	6.1%	2.7%	4.8%	1.4%

Table 2. Proportion of effort and revenue impacted by different scenarios, not accounting for the National Monument. Revenue value is in millions annually.

Metric	Weighting	Discrete Canyons	300m	300m plus Discrete Canyons	400m	400m plus Discrete Canyons
Effort	Unweighted	9.3%	22.9%	24.3%	5.5%	11.9%
	Weighted	11.1%	27.8%	29.3%	7.5%	14.9%
Revenue	Unweighted	7.0%	17.5%	18.6%	4.1%	9.0%
	Weighted	9.2%	23.4%	24.6%	6.2%	12.3%
Revenue Value	Unweighted	$1.4	$3.4	$3.6	$0.8	$1.7
	Weighted	$1.8	$4.5	$4.8	$1.2	$2.4

Table 3. Proportion of effort and revenue impacted by different scenarios, including the National Monument. Revenue value is in millions annually.

Metric	Weighting	Monument	Discrete Canyons	300m	300m plus Discrete Canyons	400m	400m plus Discrete Canyons
Effort	Unweighted	13.0%	19.1%	32.1%	33.0%	17.3%	21.6%
	Weighted	14.3%	21.7%	37.4%	38.4%	20.3%	25.2%
Revenue	Unweighted	12.2%	16.8%	26.8%	27.5%	15.5%	18.7%
	Weighted	14.3%	19.3%	32.6%	33.4%	18.1%	22.1%
Revenue Value	Unweighted	$2.4	$3.3	$5.2	$5.4	$3.0	$3.6
	Weighted	$2.8	$3.7	$6.3	$6.5	$3.5	$4.3

2. Potential Impacts to the Gulf of Maine Lobster Fleet from Proposed Coral Closures

The New England Fisheries Management Council (NEFMC) Omnibus Deep Sea Coral Amendment is considering two potential closures to protect deep sea corals in Lobster Management Area 1[1]. These two areas of sensitive benthic habitat are the Outer Schoodic Ridge and Mount Desert Rock in eastern Maine (Figure 4). An important component of evaluating these areas for habitat protection is understanding the potential economic impact to coinciding fisheries. These two discrete areas under consideration are recognized as productive fishing grounds particularly for the Maine lobster fleet. NEFMC staff has looked at vessel trip report (VTR) data to try and characterize the lobster fishing effort and revenue in these areas; however, this approach likely does not accurately characterize the Maine lobster fishery. Federal permit holders that designate lobster-only are not required to report through VTRs in Maine. Because of this exemption, only 10% of all Maine federal permit holders and 3% of the total Maine lobster fleet report through VTRs. The permits are not uniformly distributed as there is a spatial difference between eastern and western zones. The federal permits requiring VTRs landed 8% of the 2015 federal permit lobster landings in the eastern zones (A, B, and C) while 13% of the 2015 federal landings were by VTR permits in the western zones (D, E, F, and G) (Figure 4). This lack of representative coverage renders the VTR lobster dataset inadequate to assess the economic impact of the potential coral closures on the Maine lobster fleet. The analysis presented here uses Maine landings data to try to characterize the potential range of economic impacts should the two proposed areas be closed. The following figures were provided to the NEFMC Habitat Committee with notes by the Maine Department of Marine Resources, but not as a fully developed report.

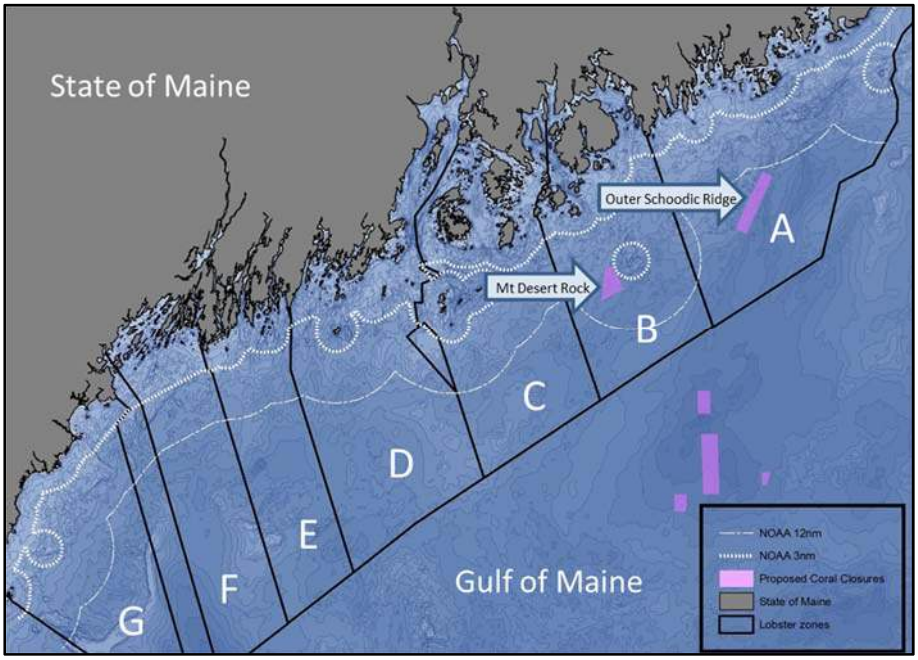

Figure 4. Maine Fishing Zones A through G, east to west with proposed coral closures. License holders declare a zone and must fish 51% of their gear in their declared zone.

[1] http://www.nefmc.org/library/omnibus-deep-sea-coral-amendment

Available Data and Methods

The two areas under consideration are in the eastern part of the Gulf of Maine within federal waters of Lobster Conservation Management Area 1. The Mount Desert area is within the 3-12nm distance from shore in Maine Fishing Zone B while the Outer Schoodic Ridge area is more than 12nm offshore in Zone A (Figure 4). The GIS shapefiles in the maps and area calculations for potential closures were provided by the NEFMC. Due to knowledge of the areas and evidence from Maine at-sea sampling data, it is known that these areas were historically, and are currently, fished by lobster fishermen from adjacent zones. As a result, this analysis considers fishery data from Zones A, B, and C. All federal permit holders must also hold a Maine state license and can fish in either state or federal waters but are required to fish, at a minimum, 51% of their gear in their declared zone. Very few Maine vessels (<3) fish in Area 3 because of the conflicting management rules between LCMA 1 and 3 that prevents boats from fishing both areas.

The Maine lobster industry currently has no fleet-wide reporting requirements that provide spatial resolution finer than the zone level. The State of Maine collects 100% trip-level data through lobster dealers. In this analysis, dealer data were summarized by fishing zone and provided information such as: pounds landed, value, total number of trips, and total number of permits fished annually. Dealer data were categorized by zone according to port landed, so catch could originate from an adjacent zone. Because of this adjacency issue, all analyses using the dealer data included Zones A, B, and C. These data were available for fishing years 2008-2015. We chose to use data from the most recent year of dealer reports, 2015, which consisted of 269,939 transactions.

Maine harvester logbooks are required on an annual basis from a randomly selected 10% of fishermen, stratified by fishing zone and Maine license class. The license classes are based on age (<18 years old, 18-70 yo, and > 70 yo) and number of unlicensed crew allowed to work on the boat in addition to the captain (none, 1, or 2). There is no stratification for federal versus state-only permits in the harvester report selection process. All Maine lobster license holders, except those chosen the previous year, are included in the annual random draw, including licenses that had no landings the previous year and permits that are required to submit VTRs. Those permit holders that are required to submit VTRs do not submit duplicate reports to the Maine harvester logbook, but continue to report only through the VTR process. To complete the representative 10% in this analysis, the VTR permits that were part of the selected 10% were added to the Maine harvester logbook dataset. VTRs collect similar information, except the spatial data comes as a single coordinate of latitude and longitude. To complete the dataset with comparable data, the single point for each trip was plotted in GIS and assigned a zone and distance from shore. The combined VTR and harvester data were summarized into numbers of pounds landed, value, number of permits, by month, zone fished, average depth, and distance from shore (0-3nm, 3-12nm, and >12nm). The zone fished was reported by the fishermen and was assumed to be where the gear was set, not necessarily the license's declared zone. These data were available for fishing years 2008-2014, but we chose to use the most recent four years. In addition to the expansion estimates described later, monthly average trip value and depth were derived from the 2011-2014 harvester data.

For both dealer and harvester data, the monetary value of the catch was calculated for each trip using an average price per month per zone for each year. All data were categorized by permit type as state-only, federal with VTR, and federal without VTR. Although we considered the total value of the fishery in the three zones including all permit types for the three zones, for further expansion, we only used federal permits (with and without VTR) from both the dealer and harvester datasets because only federal permit holders would be directly impacted by the potential closures (state-only permits do not have access).

Through outreach, the Maine DMR and the Maine Lobstermen's Association (MLA) gathered information about the use of the potential closure areas from industry. This was not a systematic survey, but rather a targeted consultation with representative industry members who fish in these areas to determine how many and which harbors could be impacted, rough estimates of numbers of boats, and at what time of year these areas are fished most heavily. The industry members consulted were fishermen identified by the Maine DMR at-sea sampling program, MLA board members and some industry members recommended by the original DMR and MLA contacts.

Expansions

We used three methods to expand total revenue estimates from the more spatially specific but limited (10%) harvester data into the total impacted population. The first approach (Expansion Method 1) applied the average proportions of federal permit holders determined by the harvester logbook data for 2011-2014 to the dealer data. This expansion, using the proportions from the 10% harvester data, assigned the total reported value, landings, and trips from the dealer database into distance from shore categories for each zone. This expansion shows the spatial distribution of the variables across zones and distance from shore, but not the specific value of the smaller coral closures.

The second method (Expansion Method 2) estimated a range of revenue derived from the catch in specific closure areas. We used a combination of industry information on numbers of boats with combined harvester logbook data on average value per trip and number of trips per license by month and distance from shore. Some boats reported fishing in these areas nearly all year, but we concentrated on the months of highest effort described by the industry interviews, November through April. Recognizing the uncertainty of industry-estimated boat counts and that, while a certain number of boats could be fishing in an area, they likely did not fish all of their gear or earn all of their income in the areas under consideration, we applied a range of percent income and two options for boat counts per area. The combined harvester data were averaged over 2011-2014 for > 12nm in Zone A and 3-12nm in Zone B to determine the average trips per month per license and the average value per trip. The value was tallied for an annual estimate for the two areas for each boat count and income percentage category.

The third method (Expansion Method 3) assigned a revenue value by square area and made the assumption that every square mile is equally productive for fishing. Because of the assumption (likely inaccurate) of equal productivity and the uncertainty related to the ability of vessels to fish adjacent zones, we combined the data for Zones A, B, and C. To attribute the value by area,

we used average proportions by distance from shore derived from combined harvester data (2011-2014). It was necessary to average the proportions over four years because of confidentiality and uncertainty due to the relatively small sample size. These value proportions, categorized by distance from shore, were applied to the total value and number of pounds landed, trips, from the 2015 dealer data in the combined three zones. The total area for each zone and distance from shore were calculated in ArcGIS. The square mileage of the proposed closures was 1.5% of the total area of the three zones combined outside 3nm, so the estimates for the entire area (Zones A-C) were multiplied by 1.5% to estimate the value within the proposed closures.

Characterization of the Maine fishery

In 2015, the Maine lobster fishery was worth more than $500 million in total ex-vessel value for both state-only and federally permitted vessels. The combined total value for the three eastern zones was more than $296 million with state-only licenses making up the largest proportion of permits (Figure 5). Zone C represented the greatest value in landings overall, with the highest proportion from state-only permits of the three zones. Zone A had the second highest overall landings value, and Zone B had the lowest overall value. While almost 75% of permits were state-only (Table 4), the federal permits without VTR requirements produced the highest proportion of value in Zones A and B (Figure 5). In all three zones, the VTR permits represented the smallest proportion of value of the three permit types.

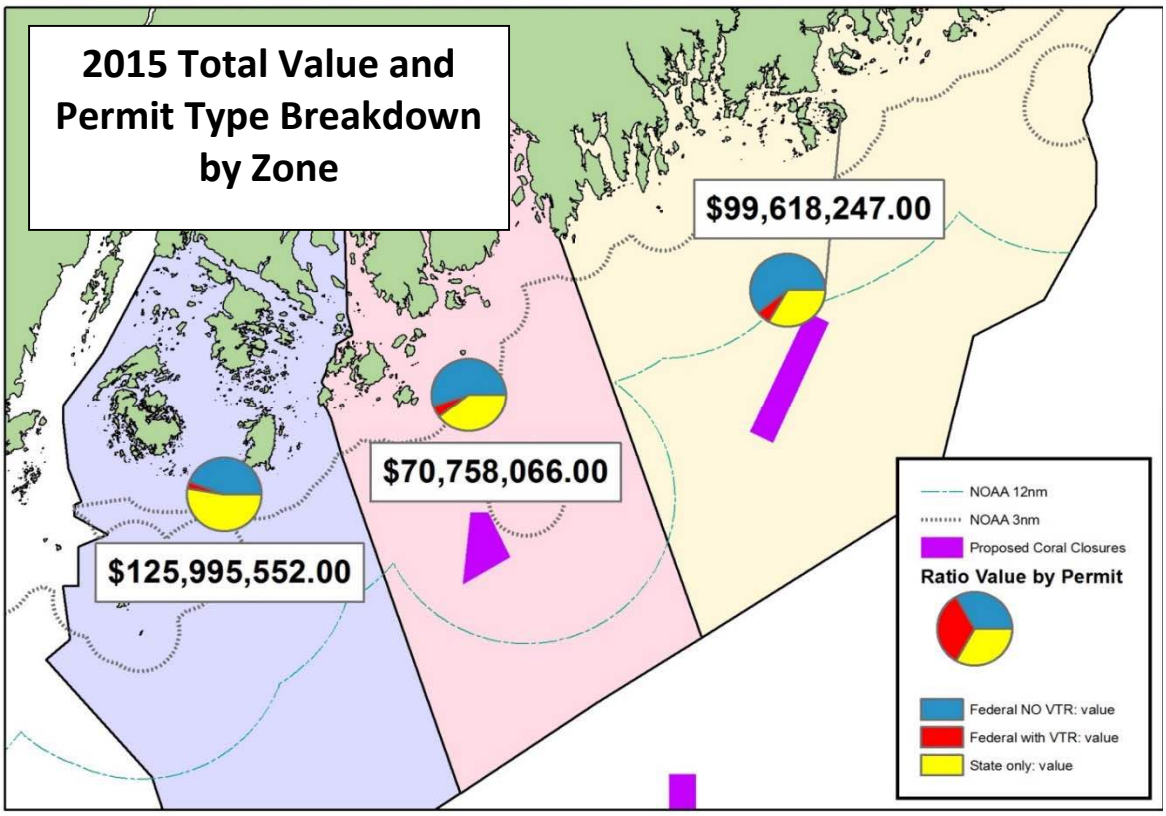

Figure 5. Total value from Maine dealer data for Zones A, B, and C with the ratio of value by permit type for federal with and without VTR requirements and state-only permits.

The total number of permits for Zones A, B and C in 2015 was 2,316 with 640 of those permits being federal permits, with or without VTRs (Table 4). In 2015, federal permits required to submit VTRs harvested 8% of the landings for Zones A, B, and C while all federal permits landed 57% of the total landings in the same area. Within the three eastern zones, 139,780 trips were completed by the lobster fleet with 56,381 trips from the federally permitted vessels (Table 4).

Table 4. Maine 100% trip-level dealer data for 2015 by permit type. Federal includes both VTR and no VTR permits.

Permit numbers

Zone	Federal No VTR	Federal w VTR	State Only	Total	Federal	% federal
A	271	28	664	963	299	31%
B	161	10	408	579	171	30%
C	160	10	604	774	170	22%

Trips

Zone	Federal No VTR	Federal w VTR	State Only	Total	Federal	% federal
A	21,702	2,357	29,539	53,598	24,059	45%
B	13,098	991	17,933	32,022	14,089	44%
C	17,283	950	35,927	54,160	18,233	34%

Value

Zone	Federal No VTR	Federal w VTR	State Only	Total	Federal	% federal
A	60,261,907	6,039,883	33,316,457	99,618,247	66,301,790	67%
B	39,009,830	3,671,325	28,076,911	70,758,066	42,681,155	60%
C	55,979,051	3,791,784	66,224,717	125,995,552	59,770,835	47%

Landings

Zone	Federal No VTR	Federal w VTR	State Only	Total	Federal	% federal
A	15,054,051	1,543,886	9,056,975	25,654,912	16,597,937	65%
B	9,327,846	874,674	6,740,661	16,943,181	10,202,520	60%
C	13,631,809	910,528	17,079,316	31,621,653	14,542,337	46%

The combination of harvester and VTR data determined the proportions of value, number of trips, and landings by zone and distance from shore. Within a given zone, the proportion of effort (trips) that took place in each distance category was not necessarily representative of the resulting landings or value (Table 5). Although there were fewer trips in the > 12nm region, the relative proportion of value was higher (than the trip proportion) in all zones, especially in Zone A (Table 5). For permits and trips, all zones had the highest proportion in state waters, less in 3-12nm, and the smallest distribution in >12nm. For value and landings, Zone A was different from the other two zones where the region between 3-12nm had the highest proportion for value and landings while Zones C and B had the highest in state waters.

Table 5. Proportion of trips, value, and landings by distance from shore (nautical miles) of federal permits averaged over 2011-2014 from the combined harvester and VTR data by zone.

TRIPS			
	0-3	3-12	>12
Zone A	53%	39%	8%
Zone B	59%	31%	10%
Zone C	66%	25%	9%
VALUE			
	0-3	3-12	>12
Zone A	38%	47%	15%
Zone B	49%	36%	14%
Zone C	60%	30%	10%
LANDINGS			
	0-3	3-12	>12
Zone A	40%	48%	13%
Zone B	52%	36%	13%
Zone C	63%	28%	9%

Monthly characteristics of depth and value

The reported value and depth from the harvester logbook dataset indicated trends depending on zone, month, and distance from shore. The highest mean value was found in late fall (October through December) in Zone A outside of 12nm (Figure 6). There was higher variability of value in the late fall, winter and spring months indicated by the length of the violin wands. Generally all areas had a greater value per trip in the fall months when the catch was higher. Prices are typically higher in the winter and spring but the catch volume is lower. Because there are fewer federally permitted vessels and the state-only boats do not have access to offshore fishing grounds, there is opportunity to catch more volume and value per trip offshore in the fall months.

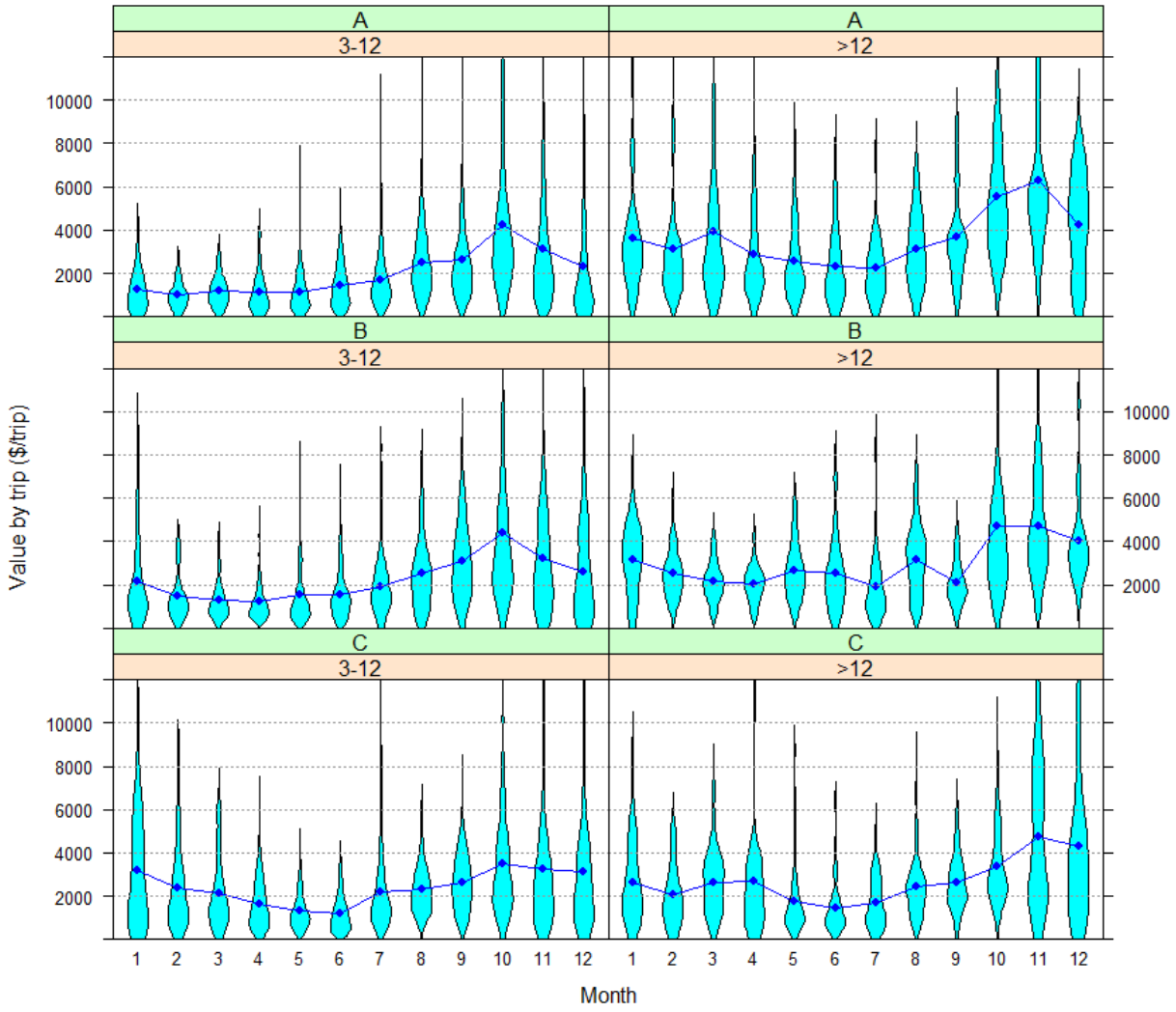

Figure 6. Violin plots of monthly value per trip by zone and distance from shore for federal permits reported by the combined VTR and harvester data over years 2011-2014. The blue dots represent the mean while the width and length of the shape represents the distribution of the data.

Generally the lobster fleet fishes in shallow water during the summer following the lobster movement (molting) and into deep waters for the winter. In the 3-12nm distance from shore,

the average depth fished was less than 100m in all three zones. The greatest average depths fished were outside of 12nm in Zones A. Overall, greater depths were reported in winter and spring but there was high variability year-round (Figure 7). Depths reported in harvester logbooks and VTRs are difficult to verify without more detailed spatial data, but the average trends follow understood patterns of the fleet behavior. The range of depth in the proposed closures is between 100-250m. Using the bathymetry map data from the NOAA NCEI U.S. Coastal Relief Model[2] we characterized the depths of the potential closures (Figure 8). While the fleet fishes shallower depths on average, the distributions of depth within the closures and the reported depths by the Maine lobster fleet overlap, especially in the winter and spring months (Figures 7 and 8).

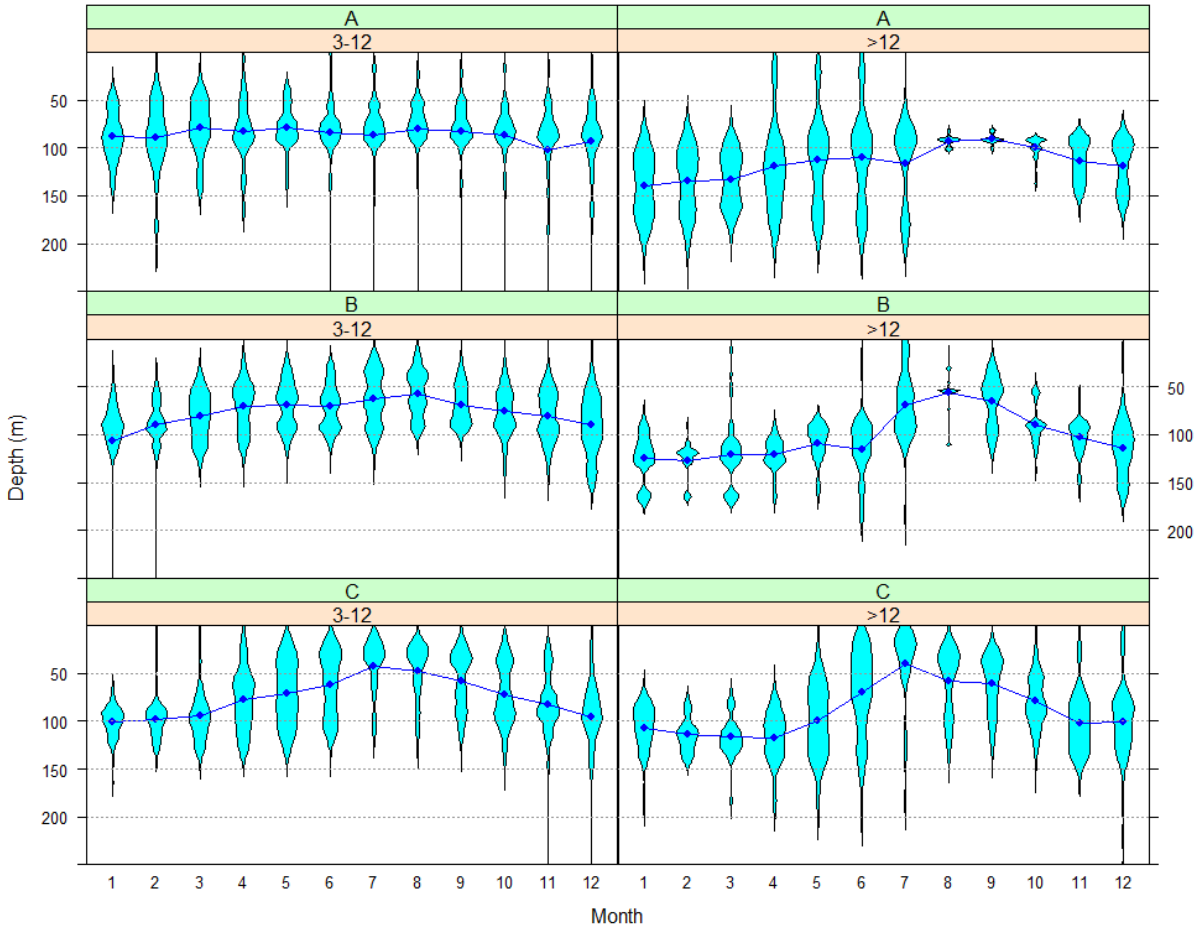

Figure 7. Violin plots of monthly depths per trip by zone and distance from shore for federal permits reported by the combined VTR and harvester data over years 2011-2014. The blue dots represent the mean while the width and length of the shape represents the distribution.

[2] data from the NOAA NCEI U.S. Coastal Relief Model (Retrieved 9/10/2013, http://www.ngdc.noaa.gov/mgg/coastal/crm.html), which has a resolution of 3 arc minutes.

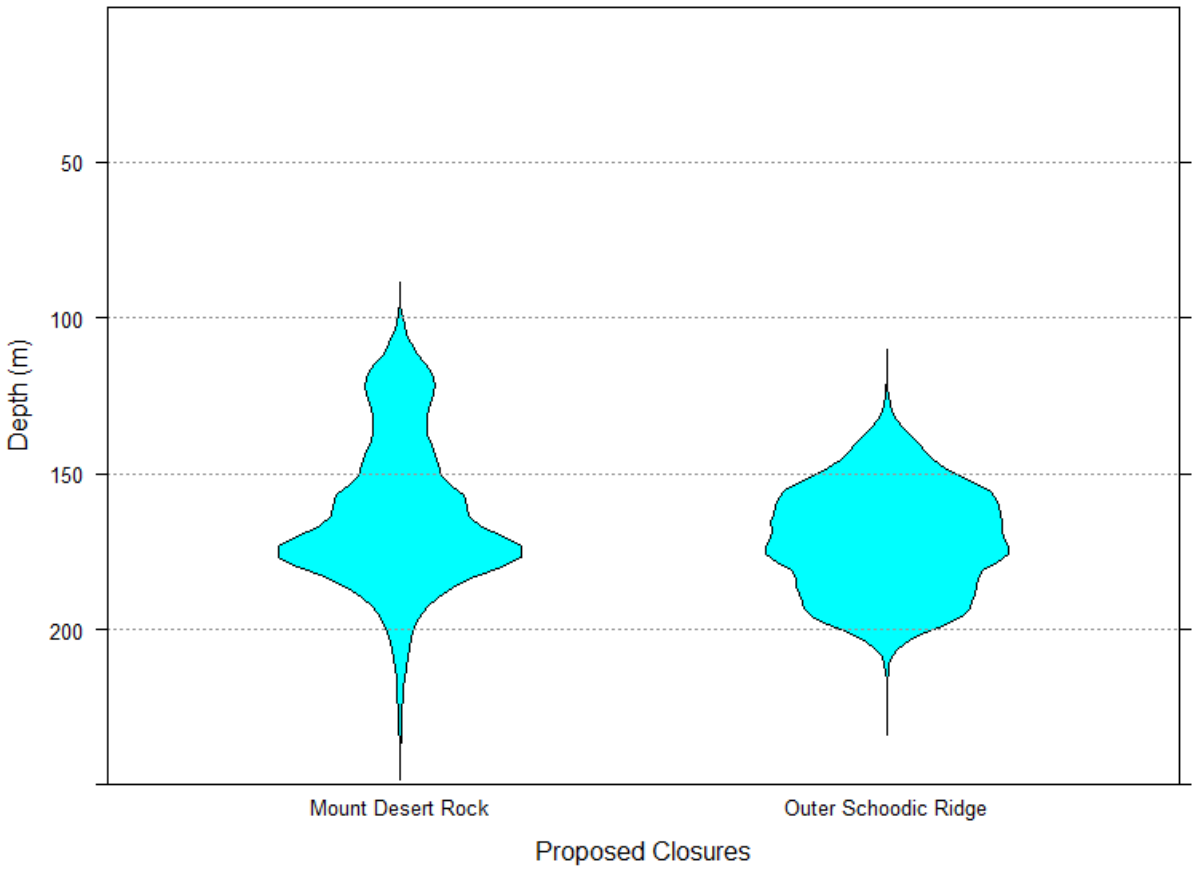

Figure 8. Depth distribution of the proposed closures based on the bathymetry shapefile[2].

Spatially specific industry contributions on potential coral closure

Interviews with lobster industry members indicated that lobster harvesting is the primary economic driver for both Washington and Hancock Counties, the counties adjacent to the closures. The proposed closed areas have recently become particularly important fishing grounds for vessels originating from these counties during the late fall, winter, and spring. Industry members reported that both areas are fished year-round by a smaller number of fishermen. Roughly 35-50 boats from both Zones B and C fish the Mount Desert Rock Area which has become an increasingly valuable fishing ground over the past decade. The Outer Schoodic Ridge Area is fished by at least 50 boats from both Zones B and A and is historically an important fishing area. Combined, the two areas are currently fished by boats from at least 15 different harbors in the two counties across the three zones. Most of these boats employ two crew members in addition to the captain. Areas around the borders of these potential closures are also heavily fished so displacement of effort would likely cause conflict.

Expansion Results

Expansion Method 1: Proportions by distance from shore

Data derived from Tables 4 and 5 were used to apportion trips, value, and landings to distance from shore categories within each zone (Figures 9, 10 & 11). The proportions derived from the 2011-2014 combined harvester and VTR data were used to allocate the totals from the dealer data into different spatial areas. For the Mount Desert Rock area, the value, landings and trips for Zone B between 3 and 12nm was estimated to be $15.3 million and 3.6 million pounds from more than 4,300 trips. The area outside of 12nm in Zone A, surrounding the Outer Schoodic Ridge closure, the numbers were $9.8 million and 2.1 million pounds from about 1,900 trips. Some uncertainty was introduced using this method of combining two data streams because fishermen report the zone fished in the harvester report and VTR, while the total fleet value, pounds, and trips collected by the dealers were attributed to the port and zone where the harvest was sold. With this in mind, some of the 3-12nm region data for Zone C dealer reported value could be attributed to Zone B and some of the greater than 12nm data from Zone B could be attributed to Zone A.

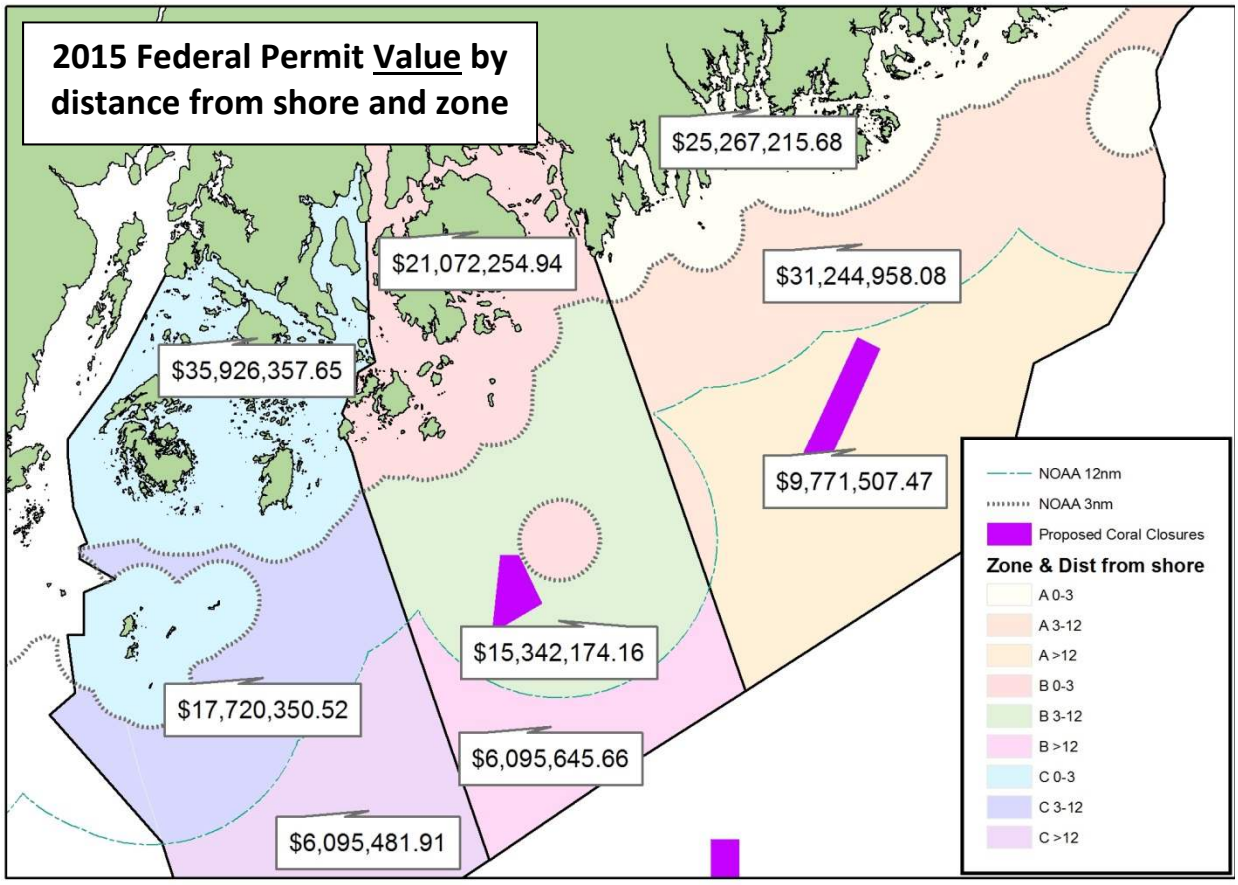

Figure 9. Value from 2015 Maine dealer data by distance from shore (nm) in each zone. Value allocation was based on the average proportions from 2011-2014 from the combination of harvester reports and selected VTRs. Only federal permit data were included.

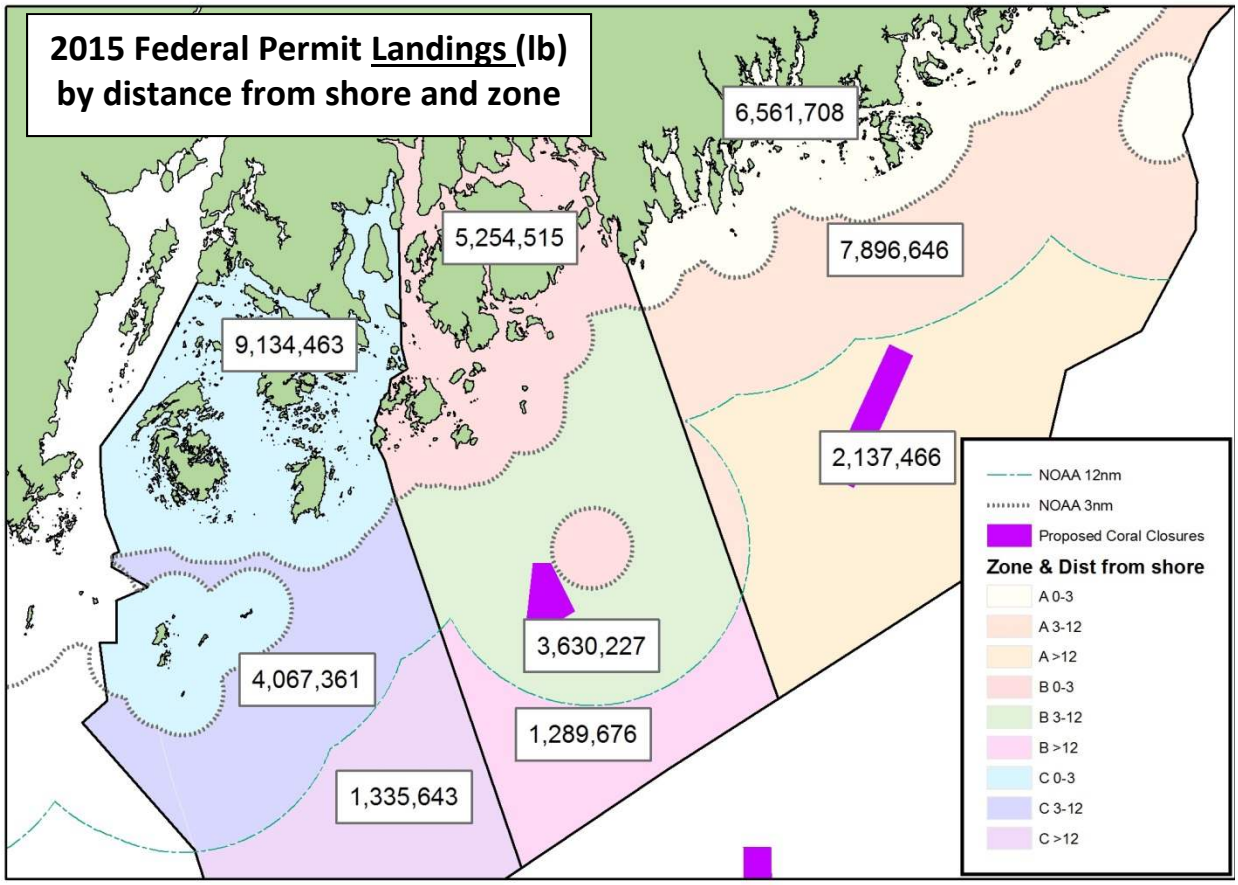

Figure 10. Landings from 2015 Maine dealer data by distance from shore (nm) in each zone. Landings were allocated based on the average proportions from 2011-2014 from the combination of harvester reports and selected VTRs. Only federal permit data were included.

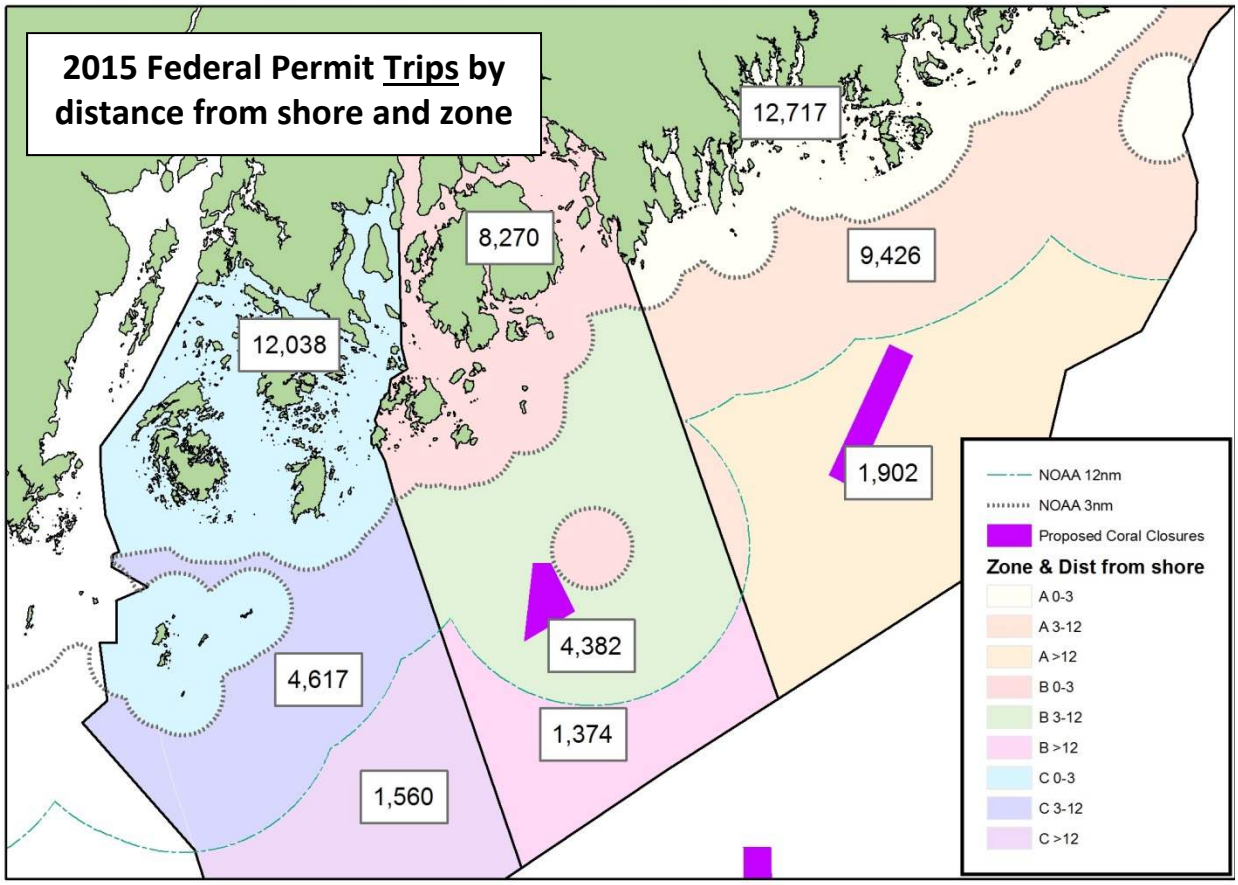

Figure 11. Trip from 2015 Maine dealer data by distance from shore (nm) in each zone. Trip allocation was based on the average proportions from 2011-2014 from the combination of harvester reports and selected VTRs. Only federal permit data were included.

Expansion Method 2: Average value of trip and number of boats

The second method for estimating the revenues associated with specific closure areas used a combination of industry input and average trip values from the harvester data. Interviews indicated each area supported a maximum of 50 boats in the late fall, winter, and early spring (MLA/DMR Interviews). We limited the analysis to the months of November through April, understanding that some effort does occur year-round. To account for uncertainty in the numbers of boats over time, we conducted the analysis for two levels of fishing effort: 50 and 25 boats per area. Additional uncertainty was recognized because the proportion of income and gear per license for the specific closure areas was unknown. Assuming that the boats were unlikely to derive 100% of their income from these discrete coral protection areas, we used 100% as a maximum, 50% as the moderate level, and 25% as the minimum.

Expansion of these industry numbers was based on average value per trip and average trips per month per license estimated from the 2011-2014 harvester logbook and selected VTR dataset for the two regions containing the proposed closures (Table 6). The value ranged from a maximum $6,610 per trip in Zone A, >12nm in November to a minimum $1,129 in Zone B, 3-12nm in April. In general, the average number of trips for each permit was highest in the fall

and lowest in January through March. The revenues were summed over both areas and the number of boats was held constant over all included months. The estimated revenues ranged from a maximum of $8.5 million to a minimum of around $1 million from 50 boats, 100% income and 25 boats 25% income, respectively (Table 7).

Table 6. Average value per trip and number of trips per permit per month from the combined harvester report and VTR dataset 2011-2014 for the two specific regions of the potential closures.

Average VALUE per trip (from combined harvester/selected VTR)						
	Jan	Feb	Mar	Apr	Nov	Dec
Zone A >12	$3,260	$3,719	$3,446	$2,632	$6,610	$4,378
Zone B 3-12 mi	$1,822	$1,286	$1,294	$1,129	$3,264	$2,151
Average # of trips per permit (from combined harvester/selected VTR)						
	Jan	Feb	Mar	Apr	Nov	Dec
Zone A >12	3	3	3	4	9	5
Zone B 3-12	3	3	3	5	7	4

Table 7. Expanded revenue estimates using value per trip and number of trips per month with a range of boat numbers and percent income derived from the closure areas.

	100% income	50% income	25% income
25 boats per area	$4,250,650	$2,125,325	$1,062,663
50 boats per area	$8,501,300	$4,250,650	$2,125,325

Expansion Method 3: Percent of Area

High uncertainty was associated with the Expansion Method 3 because of the assumption that every square mile of ocean habitat was equally productive lobster bottom; however, this approach did account for the error associated with boats fishing in adjacent zones and reporting in their home port by combining the three zones. Average proportions of value, trips, and landings by distance from shore derived from the harvester report and VTR dataset were calculated from the combined data for Zones A, B, and C for 2011-2014 (Table 8). The dealer data provided the total value, trips, and landings for the combined three zones (Table 9). The harvester logbook proportions were applied to the dealer data annually from 2011 through 2015 to estimate the trips, landings, and value for each distance from shore category for the whole area. We focused on the total estimates for outside of 3nm (Table 10). Using the 1.5% area calculation of the proposed closures, the estimated revenue was $1.2 million from 349 trips and ~300,000 pounds landed in 2015 (Table 10).

Table 8. Proportion of value, trips, and landings by distance from shore (nm) from the three zones combined based on harvester and VTR data from 2011-2014. Federal permits only.

		Value	Trips	Landings
Zones ABC	0-3	49%	59%	51%
	3-12	38%	33%	37%
	>12	13%	9%	11%

Table 9. Annual total value, trips, and landings from the three zones combined from the dealer data 2011-2015. Federal permits only.

	Value	Trips	Landings
2011	$ 98,088,305	53,384	31,089,672
2012	$ 107,877,076	56,606	40,374,885
2013	$ 127,118,351	58,273	44,492,387
2014	$ 162,049,914	56,483	44,116,485
2015	$ 168,753,780	56,381	41,342,794

Table 10. Expanded estimates for trips, landings and value for all three zones outside of 3nm and for the proposed coral closures (1.5% of the total area outside of 3nm).

Zone	Year	Expanded trips in >3	Est. trips in coral areas	Expanded landings in >3	Est. landings in coral areas	Expanded value in >3	Est. value in coral areas
A, B, & C	2011	22,015	330	15,100,568	226,509	$49,459,548	$741,893
A, B, & C	2012	23,344	350	19,610,490	294,157	$54,395,388	$815,931
A, B, & C	2013	24,031	360	21,610,403	324,156	$64,097,511	$961,463
A, B, & C	2014	23,293	349	21,427,824	321,417	$81,711,225	$1,225,668
A, B, & C	2015	23,251	349	20,080,614	301,209	$85,091,548	$1,276,373

Discussion

The first step in the expansion process that determined the distribution of revenue value, landings, and trips among the three impacted zones by distance from shore illustrates the high value and level of effort in the eastern Maine lobster fishery (Expansion Method 1). Federal permit holders fish in both state and federal waters. The state waters were the most valuable with the highest landings, but the areas outside of 3nm where the proposed closures are located were also important sources of value and significant levels of effort.

The two expansion methods (Expansion Methods 2 and 3) to calculate the fishery revenues and potential direct impact of the proposed coral closure areas likely provide a minimum and maximum range that should encompass the true value. The Technical Committee was wary of trying to determine revenue at a finer spatial scale than the scale at which the data were collected. We considered the best estimate of the revenue value potentially lost from these closures to be the Expansion Method 2 combining industry interviews estimating boats and months fished with the harvester logbooks reporting average number of trips and value by month. Providing the range of estimates based on the maximum and minimum number boats fishing and percent income associated with the closures was intended to account for the uncertainty in those data sources. Taking the full industry estimate of 50 boats in each area for the fall and winter time period and assuming 100% incomes likely produced an overestimate of revenue. Given that the combined area-based estimate (for Zone A >12 and Zone B 3-12) was $25 million (see Figure 8), the $8 million revenue estimate from these two discrete areas was likely too high. Finding middle ground and relying on the input from fishermen, the $4.2 million

revenue estimate for 50 boats in each area and 50% income for the included months seems likely to be the most realistic scenario to estimate the economic impact of these proposed closures (Figure 12). There are unresolved issues concerning uncertainty in the relationship between the amounts of gear fished, value, and months fished. There was substantial variability in the data for value per trip (as reported through logbooks and VTRs), thus estimates of value could be mis-characterized. Additionally, if half the gear for 50 boats was set in these areas at one time, the trap density could be up to 500-1,000 traps per square mile, which seems unrealistically high.

Expansion Method 3, based on calculated area assumed equal productivity of each square mile outside of state waters in the three zones, likely resulted in an underestimate of revenue. It is unlikely that the entire habitat within Zones A, B, and C is equally productive lobster bottom, especially when boats are fishing further from shore. Attempting to estimate the revenue value for a small subset of the total area introduced high uncertainty and error since neither the 10% harvester data nor the 100% dealer data was collected at a finer spatial scale than distance from shore and/ or zone. The scale of the fishery in eastern Maine and the stated importance of these discrete areas at certain times of the year make the annual estimate of less than $1.5 million (Table 10) seem very unlikely. Fishermen interviews indicated that the proposed coral areas could be two to four times as productive as other bottom habitat so the $1.5 million estimate could scale up closer to the $4.2 million estimate.

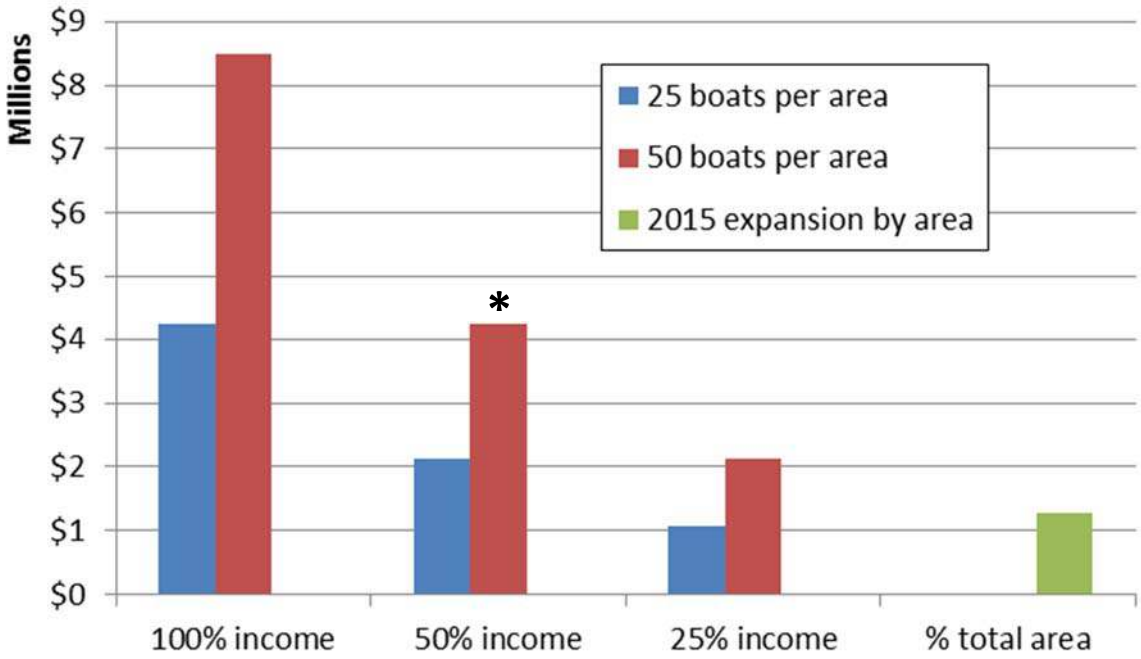

Figure 12. Comparison of revenue estimates based on Expansion Methods 2 and 3. Expansion Method 2 was based on the average value of trip and number of boats with split percent income while Expansion Method 3 calculated the percent value of the total area. The * denotes the scenario determined to best estimate revenues.

Recent observations of corals from ROV surveys were typically found at depths greater than 180m[3]. The Maine logbook data indicates some Maine lobster boats fish at or greater than 180m, but, even during the winter, the fleet does not fish at those depths on average. While the average depth fished by the Maine lobster fleet was less than depths of likely high coral abundance, the depth distribution within the closures does overlap with the fleet's fishing activity as the closures extend to shallower depths (see Figures 7 and 8).

Another source of uncertainty regarding the interaction between the lobster industry and deep sea corals was identified by the industry interviews and could not be quantified. The NEFMC Omnibus Amendment determined that hard corals were most likely to be found in the steepest gradients of depth on hard bottom habitat forming "walls". The lobster fishery is required to use sinking groundlines to prevent large whale entanglements, and this line may chafe when gear is fished near corals or the jagged edges of coral habitat, resulting in loss of gear. Because of this, most fishermen reported trying to avoid corals to prevent the loss of fishing gear.

Whale Co-Occurrence

An additional concern that needs to be addressed relates to the displacement of effort out of closed areas, and the resulting interactions with existing regulations. NOAA Fisheries, in consultation with the Atlantic Large Whale Take Reduction Team, developed a co-occurrence model of endangered right whales and fixed gear fishing effort for the Final Rule of the Atlantic Large Whale Take Reduction Plan in 2014[4]. The lobster industry comprises the majority of fixed gear with vertical lines in this region and is represented in the model using a variety of data sources, including State of Maine dealer and harvester reports, VTR, and fishing practices surveys completed by DMR in 2010. The model explored the overlap of right whales and gear in the form of whale sightings and densities of vertical lines in space and time expressed as a co-occurrence score in ten minute grid cells. The scores have no unit other than the relative amount of overlap between sightings and vertical lines. This can be driven by high numbers of whale sightings, high densities of vertical lines, or the occurrence of both. A plot of co-occurrence scores with the potential coral closure areas was created to show any potential conflicts (Figure 13). The proposed Outer Schoodic Ridge coral closure overlapped with a relatively high co-occurrence score (100-1,000), whereas the other proposed area near Mount Desert Rock did not directly coincide with but is located adjacent to areas of high co-occurrence.

Spatial closures in Maine have been avoided in the Atlantic Large Whale Take Reduction Plan, due in part to concerns about the displacement of effort and the potential to increase the density of vertical lines along the edges of a closure. A similar scenario exists here relative to the proposed coral closures, with displacement of gear creating a higher risk of entanglement in the areas surrounding the closure. For this reason, there is greater concern regarding

[3] Personal communication. M. Bachman, NEFMC 1/24/2017

[4] Final Environmental Impact Statement for Amending the Atlantic Large Whale Take Reduction Plan: Vertical Line Rule. May 2014.

unintended impacts to whales in the Outer Schoodic Ridge area where whales are known to frequent, while the impact near Mount Desert Rock is less certain.

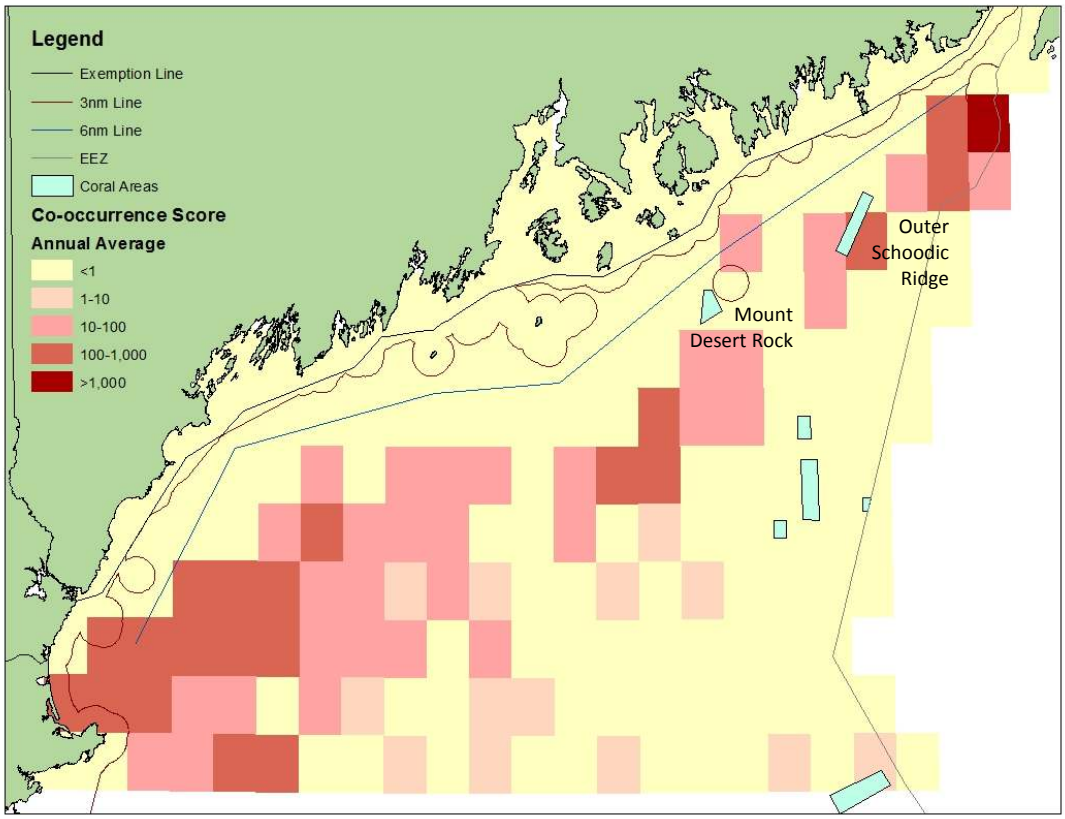

Figure 13. The annual average co-occurrence score in ten minute grid cells shown with proposed coral closure areas. Right whale sightings used to calculate the co-occurrence score include aerial and shipboard standardized surveys from 1978-2011 summarized in the North Atlantic Right Whale Consortium Database and the Navy Marine Resource Assessment Database. Vertical line densities used to calculate the co-occurrence scores include VTR, State of Maine dealer and harvester data, and voluntary gear configuration surveys done by DMR in 2010.

Literature Cited:

Whitmore, K., Morrissey, E., Ware, M., and Glenn, R. 2016. Characterization of the offshore American lobster and Jonah crap trap fishery in Lobster Conservation Management Area 3 in and around the Southern New England and Georges Bank canyons. Prepared for the Atlantic States Marine Fisheries Commission. Updated July 5, 2016; 17pp

January 16, 2017

Robert E. Beal
Executive Director
Atlantic States Marine Fisheries Commission
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201

Dear Bob:

It has come to our attention that some Lobster Board members and TC members have voiced concerns about the inclusion of trap reductions as a management alternative in draft Addendum XXV (note most recent letter from CT). As longstanding members of the lobster industry, and longstanding supporters of traps limits, trap caps, transferability, and trap reductions, we could not disagree more with the logic expressed in the recent correspondences. As those who have participated in the industry for decades, we offer the following general SNE observations and specific comments about the benefits of trap cuts.

General Observations:

To begin, it is important to reflect on the past and the realities of SNE lobster management and stock assessment. The ASMFC has spent over 15 years developing trap reduction, limited entry, and trap transferability programs (Addenda I, III, IV, V, VI, VII, IX, XI, XII, XIII, XIV, XV, XVIII, XIX, XXI, XXII, XXIV). Collectively, these Addenda focus on the needs to lower mortality, increase the number of sexually mature animals, reduce and cap effort, and in the case of SNE specifically, right size the fishery to the reduced productivity of the resource.

Importantly, at the peak of the SNE fishery, 50+% of the lobster landings were generated by just two inshore fisheries, NY and CT, which now contribute less than 9% to landing (Table 2, Oct. 2016 draft Addendum XXV, see Appendix). This was during a time when 87% of the fishery was inshore (Figure 3, draft Addendum XXV, see Appendix). Presently, according to draft Addendum XXV for the October Board Meeting, *"roughly two-thirds of landings in 2012 now come from the LCMA 3"* (page 7), whose inshore boundary is at approximately 300 feet of water. This shift in effort has resulted in a major disconnect between the fishery and many of the assessment's and technical analyses' assumptions, because the majority of sampling programs in SNE are still inshore, the exception being fishery dependent sampling initiatives involving Areas 2 and 3 fishermen.

The Technical Committee (TC) has remarked on these deficiencies in a number of prior memorandum. Chief among their comments is that most fishery independent sampling programs are still based in areas less than 200 feet deep, with paltry sampling taking place offshore. Those of us that participate in the inshore sampling programs, note that most inshore sampling actually takes place less than 130 feet deep.

> "*There are no larval surveys, settlement surveys, or ventless traps surveys occurring offshore or at depths >200'. There is also no existing information on survival or growth rates of EBP lobsters in deep, offshore, low-relief habitats. These factors make the contribution from offshore areas to the total recruitment in SNE highly uncertain."*
>
> *"In general, the catch disposition of the state waters portion of the SNE lobster fishery is fairly well characterized. Fishery-dependent monitoring programs currently in place are sufficient to detect*

and assess the effectiveness of input controls, such as changes in the minimum and maximum legal size and v-notch programs in the state waters portion of SNE."

"In contrast, the catch disposition for a substantial portion of the SNE lobster fishery which occurs in federal waters is poorly characterized. NOAA fisheries does not require vessels which only have a federal lobster permit to submit Vessel Trip Reports (VTR's) or otherwise report their landings."

"The biological data collection programs currently administered in SNE are sufficient to characterize the disposition of the catch in the state waters portion of SNE."

"The resolution of these programs is lacking in federal waters where a substantial portion (> 50%) of the SNE fishery currently occurs" (January 19, 2016 TC memo to the Board).

To be clear, the SNE zones that now contributes 60+% of the landings have the poorest sampling programs. While the 2015 benchmark stock assessment may be the best ever done, it has significant data gaps in offshore waters, where the fishery is now located. Equally problematic, the States that historically generated the most landings have abandoned some of their biological monitoring and sampling efforts and have not addressed what has become latent effort.

With all due respect to the Commission and the Technical Committee, as both groups have done excellent work and made major improvements in the lobster management program, <u>they lack the ability to change the key culprit in SNE, which is the environment</u>. Lobster in SNE are at the fringe of their biological range and worse yet, the scientific consensus predicts a far more hostile environment to Northwest Atlantic species in the future, with lobster distribution changes highly likely (see Hare et. al, 2016 and Saba et. al, 2016). For example, the once predomination Long Island Sound fishery has virtually disappeared, raising serious questions about our collective abilities to rebuild the SNE stock to levels seen in the 1990's, the levels currently reflected in SNE reference targets.

<u>Trap Cuts – History/Rationale:</u>

Although rarely credited to the industry, Area 2 and Area 3 fishermen advocated for very restrictive historical participation requirements. In Area 2, the Commission used a short qualification timeline of 2001-2003, with a maximum limit of 800 traps. In Area 3, based on the recommendations of offshore industry, NOAA required fishermen to prove they landed 25,000 lbs. of lobster and fished 200 plus traps for at least two years during the qualifying period of 1991-1999. NOAA also imposed restrictive trap limits on Area 4 and 5 fishermen, which now have just 23,854 and 13,484 traps respectively (Table 5, draft Addendum XXV, see Appendix).

These stringent trap qualifying standards imposed broad trap cuts, with a subset of the most active in the fishery being quite severely impacted. For example, in Area 2, prior to the adoption of the 800 trap limit it was not uncommon for a typical RI inshore highliner fisherman to fish 2,000 traps. The initial trap limit imposed cuts on these fishermen approaching 60%. Following the adoption of the 800 trap limit, Area 2 underwent additional trap cuts based on historical participation. The Area 2 LCMT then proposed further cuts of allocated traps; a 25% reduction that was taken in FY 2016 and another 25% that is approved for future years.

In Area 3, four vessels from Point Judith each fished in excess of 2,000 traps, with some as high as 6,000 traps prior to NOAA's action to cap effort at 2,000 traps per permit. Area 3 fishermen then insisted on further trap cuts. Table 1 below shows trap reductions in Area 3 from 2003 through fishing year (FY) 2016. This area has removed traps by 41.5%, with an additional 20% cut approved for FY 2017-2020. Often overlooked, conservation tax alone reduced traps by 5% in Area 3 at the start of FY 2016.

Table 1. Area 3 Trap reductions from qualification, trap cuts, and trap transfer tax programs.

Fishing Year	Traps	% Reduction
Historic Participation	211,408	-
2000	211,408	-
2001	211,408	-
2002	211,408	-
2003	187,287	11.4%
2004	180,980	14.4%
2005	175,909	16.8%
2006	172,627	18.3%
2007	169,996	19.6%
2008	155,796	26.3%
2009	151,901	28.1%
2010	148,103	29.9%
2011	145,889	31.0%
2012	146,625	30.6%
2013	145,569	31.1%
2014	145,872	31.0%
2015	144,716	31.5%
As of July 2016	123,613	41.5%

One of the chief complaints of trap limits is that the system needs to make major cuts in traps in order to reduce mortality and remove latency. We submit that this is exactly what has taken place in Areas 2, 3, 4, and 5. The only area that has not addressed latent effort is Area 6, which has 250,294 traps allocated and only fishes 36,230 tap according to Tables 4 and 5 in the draft Addendum (see Appendix). Given this large amount of latency (86%) it is highly uncertain if any of the indirect management measures will achieve their objectives, as most can be circumvented by the reactivation of effort.

We note that trap reductions have been supported by the TC. From Addendum XVIII:

> *"However, it is the TC's belief that the current fishery needs be scaled to the size of the of the SNE stock, and that the total fishing capacity (both active and latent traps) of the SNE fishery severely limits the Boards ability to manage this fishery and to provide adequate conservation to the SNE stock…We recommend proportional decreases in trap numbers throughout all of the LCMA's within SNE stock area. Trap reductions that do not achieve 50% or 75% reductions in landings could still enhance the benefits of other types of regulation changes."* (pg. 32)

Responding to the above Technical Committee recommendations the Board approved Addendum XVIII (2012) for LCMA 2 and 3, to scale the size of the fishery to the reduced capacity of the SNE stock, only Areas 2 and 3 took action, although all areas within SNE were supposed to "right size" their fisheries. No mortality credits were given for these efforts, as none were required, and the analysis of the relationship between traps and mortality was not completed until 2016. Since these trap reductions have only just begun (May 2016) and are not reflected in the 2015 stock assessment, these mortality reductions need to

be credited to Areas 2 and 3 as part of Addendum XXV; otherwise the Board will be penalizing proactive LCMTs.

Relatedly, the Board should consider the industry's recommendation of accelerating the existing trap reduction schedule. In the current document draft, the PDT prematurely writes off this management alternative as placing a disproportional conservation burden on LCMAs 2 and 3 before seeking public comments. It appears many lobstermen in these Areas support this alternative and should be given the opportunity to provide public testimony. Removing this option from the document prior to the hearings would be disrespectful of the LCMT process and past efforts of the industry.

Trap Cuts – TC Opposition:

The benefits of the trap cap/reduction strategy largely get discounted by the Technical Committee because of largely speculative, and we would say, invalid assumptions. It is certainly true that the Technical Committee has consistently advised the Board of the scientific uncertainty regarding the relationship between traps and exploitation. However, what they neglect to note is that much of this uncertainty is based on assumptions and caveats that do not apply to a majority of the remaining SNE fleet, which is now primarily fishing offshore.

The Technical Committee has cited a number of published studies that conclude that trap fishermen have the ability to increase catch rates by hauling substantially less gear more often and more effectively.

> From Draft Addendum XVIII: *"Experimental (Wilson 2010) and theoretical (Fogarty and Addison 1997) results suggest that large trap reductions would be required to reduce fishing mortality in the American lobster fishery. This is due to both the excess of gear currently being fished and the ability of the fishing industry to adjust fishing practices."*
>
> From the Lobster Technical committee memorandum of July 15, 2016: *"In addition to the frequency with which traps are hauled, a lobster trap's efficiency (number of lobsters it retains/number of lobster it encounters) typically reaches its maxima between 1 to 4 days in inshore areas (Thomas 1973, Fogarty & Borden 1980, Auster 1986, Estrella & McKiernan 1989) and 5 to 9 days in offshore areas (Skud 1979)…A trap reduction program in the Florida Keys spiny lobster fishery also had limited success in reducing fishing mortality. Specially, management measures which removed roughly 40% of the traps in the fishery (939,000 traps in 1991 to 568,000 traps in 1995) only reduced fishing mortality by 16% (Mueller et al., 1997)"*

Most of the cited studies were conducted in inshore waters when lobster abundance was extremely high. For example, the Wilson research was conducted in inshore Area 1, in an area with trap densities well in excess of those in SNE. Over 3 million traps are fished in the Gulf of Maine (ASMFC, 2015 American Lobster Stock Assessment), translating to 142 traps per square mile. By contrast, there are approximately 150,000 active traps in Southern New England (Draft Addendum XXV), which translated to 3 traps per square mile. With such widely different trap densities, the TC's assumptions about trap efficiency based on GOM research are not necessarily valid for SNE.

Additionally, the cited trap reduction studies do not all indicate a lack of effectiveness. The spiny lobster example provides evidence of the success of trap reductions to manage mortality, in that they found a 16% reduction in mortality in an overcapitalized fishery the reduced traps by 40%. The Board should reflect on the fact that the trap reductions in SNE, through management and attrition, have been substantially in excess of 40% already, with more scheduled for FY 2017-2020.

From Addendum XXV "*Importantly, the TC heavily caveated this result by highlighting the analysis assumes fishermen maintain a constant soak time when their trap allocation is reduced. Studies show this is not true, as fishermen reduce their soak time to compensate for fewer traps."*

The technical committee, with all due respect, has little understanding of the economics of fishing operations, and thus can only speculate about soak time. They also did not consider the multi-species nature of the SNE fishery. Current data collection programs do not distinguish between crab and lobster trips, therefore a substantial amount of the current "lobster" effort is actual directed Jonah crab trips. Jonah crab effort, trip length, vessel operating costs, crew, fuel, bait costs, and crew morale all make it highly unlikely that directed lobster hauls would increase in SNE in response to trap reductions.

Most inshore fishermen haul traps after 4-6 night sets. If they could haul after 2-3 nights and increase their net income they would be doing so currently. Instead, the trend inshore is actually opposite of what the TC suggests~~,~~ because vessel operating costs (e.g. bait) have gone up substantially and the net returns have gone down. Further, because of the operational and economic nature of the Area 2 trap transfer and reduction program, traps and permits are being consolidated; in other words, fewer fishermen are operating, but those remaining are operating at the maximum trap cap. The vessels remaining can't possibly fish all of their traps in one day (one vessel fishing 800 traps takes two days to haul all that gear, versus two vessels each fishing 400 traps daily). Factoring in operating costs and weather, it will be nearly impossible for even the inshore fleet to significantly modify trap haul behavior. The only reasonable outcome from the reduced number of traps and vessels is highly reduced numbers of trap hauls.

The offshore fleet, now the majority in SNE, will find it even more difficult to change soak time behavior, because of the logistics and economics associated with fishing more than 50 miles from shore. Retaining a qualified crew is a challenge and you can only push so much before eroding crew morale. Giving crews sufficient downtime on board and on land, in combination with the weather dependent nature of the job, makes it nearly impossible to fish more than 30-35 trips per year or haul more traps during any given trip. Yet, the TC assumes, under the reduced soak time caveat, that offshore vessels would increase effort far in excess of current levels; this is simply not possible.

The Technical Committee's memorandum dated July 15, 2016 clearly states that trap reductions are a valid method to reduce exploitation under a scenario where soak time is unchanged. *"Although these analyses accurately depict the observed relationship between active traps fished and exploitation in SNE, they are based on the explicit assumption that soak time is constant."* We submit that the Board should discount the conjecture and speculation in some of the Technical Committee memoranda and provide the industry full credit for the trap cuts.

Final Remarks:

Trap reductions in combination with the transferability program have come at great cost to the industry and the states where trap programs are now operating (note the time and cost to develop the transferability database). Some individuals have invested hundreds of thousands of dollars to purchase permits as part of the reduction, transfer, and consolidation effort. This is the best example of an industry funded buyback program on the east coast. It would be grossly unfair to the industry to now abandon traps as a currency of lobster management, as some Board Members seem to be suggesting; particularly when many of the provisions developed in the above listed Addenda have just been, or are soon to be, enacted by federal rulemaking. The Board has spent the last 15 years developing and refining the trap consolidation program, but aspects of the program have only recently gone in to operation, so we are nowhere near being able to assess the impacts. After all of the investment (industry, state, ASMFC), it seems foolish to completely ignore this as a viable and impactful management strategy.

Areas 2 and 3 have chosen to undergo very significant trap cuts, utilizing them as their preferred management measure in responding to a reduced resource size in SNE. Lobstermen who are still fishing and investing in the lobster fishery are beginning to realize and gain the rewards of these trap cuts and are insistent that these trap reductions are having a significant impact on resource recovery. This management strategy has changed the mindset of the industry, and made many Area 2 and 3 fishermen advocates for additional conservation measures. We note that both the Area 2 and 3 LCMT's proactively advocated for additional management restrictions recently for SNE, prior to any request by the Board (see most recent LCMT recommendations). To paraphrase an Area 2 fisherman, if the resource is destined to shrink due to environmental change, then we need the ability to consolidate the industry so that the remaining participants stay economically viable. We want a viable fishery, even if it has to be far smaller than historic standards. Our trap consolidation program provides us with such a mechanism, and will do so even more effectively when NOAA promulgates Area 3 trap cap reductions and both Areas 2 and 3 complete the future slated trap reductions.

The collective impacts of ASFMC's trap consolidation Addenda and past federal actions, have had numerous positive impacts on the SNE lobster population and fishery. The offshore fishery, which contributes 66% of landings, is basically stable. The average size of a lobster landed both inshore and offshore has gone up significantly, and with it, so has the value per individual and egg production per recruit. The prior actions have also dramatically reduced effort in SNE, which is one key to making the indirect management measures work and reducing conflicts with protected species and mobile gear.

We urge the Lobster Board to factor these collective perspectives into their considerations and take a full range of options out to public hearing, including trap reductions as a standalone alternative.

Thank you for the opportunity to comment and please distribute this letter to the Board.

Submitted by:

J. Grant Moore, President
Atlantic Offshore Lobstermen's Association
LCMT Area 3 Chair

Greg Mataronas, President
Rhode Island Lobstermen's Association

Lanny Dellinger, Past President
Rhode Island Lobstermen's Association
LCMT Area 2 Chair

Beth Casoni, Executive Director
Massachusetts Lobstermen's Association

cc: Megan Ware, ASMFC American Lobster Plan Coordinator

Table 2. SNE landings, in pounds, by state from 1981 to 2015.

Year	MA	RI	CT	NY	NJ & South	Total
1981	952,396	749,571	806,891	835,551	714,297	4,058,705
1982	1,161,835	1,737,241	879,643	1,119,947	1,007,511	5,906,177
1983	1,340,409	3,236,382	1,653,465	1,208,132	912,713	8,351,101
1984	1,494,732	3,611,168	1,796,765	1,307,340	1,168,449	9,378,453
1985	1,276,475	3,509,755	1,380,092	1,241,201	1,322,772	8,730,295
1986	1,300,726	4,310,032	1,254,429	1,417,571	1,382,297	9,665,054
1987	1,274,270	4,241,689	1,571,894	1,146,402	1,591,736	9,825,991
1988	1,384,501	3,897,768	1,922,429	1,571,894	1,699,762	10,476,354
1989	1,485,914	4,989,055	2,076,752	2,345,716	2,198,006	13,095,443
1990	2,004,000	6,382,375	2,645,544	3,414,956	2,350,125	16,797,000
1991	2,059,115	5,998,771	2,674,204	3,128,356	1,761,491	15,621,937
1992	1,792,356	5,502,732	2,533,108	2,652,158	1,263,247	13,743,601
1993	1,913,610	5,509,345	2,175,960	2,667,590	981,056	13,247,562
1994	2,158,323	6,078,137	2,147,300	3,955,088	597,452	14,936,301
1995	2,160,528	5,628,395	2,541,927	6,653,543	663,591	17,647,983
1996	2,151,709	5,557,847	2,888,052	9,409,318	690,046	20,696,973
1997	2,574,996	6,086,956	3,467,867	8,878,005	895,076	21,902,900
1998	2,420,673	5,897,359	3,712,580	7,896,949	745,162	20,672,722
1999	2,180,369	7,656,645	2,594,838	6,452,923	985,465	19,870,240
2000	1,629,214	6,483,787	1,386,706	2,883,643	1,005,307	13,388,657
2001	1,649,056	4,179,960	1,322,772	2,052,501	641,544	9,845,833
2002	1,653,465	3,600,144	1,062,627	1,439,617	293,214	8,049,068
2003	1,025,148	2,742,547	668,000	945,782	249,122	5,630,599
2004	989,874	2,250,917	639,340	1,170,653	425,492	5,476,276
2005	1,117,742	3,068,831	712,092	1,225,769	436,515	6,560,949
2006	1,199,313	2,769,003	789,254	1,300,726	529,109	6,587,405
2007	850,983	2,321,465	544,541	888,462	760,594	5,366,045
2008	751,775	2,707,273	416,673	705,478	800,277	5,381,477
2009	888,462	2,334,693	410,059	729,729	855,393	5,218,336
2010	762,799	2,231,075	432,106	811,300	806,891	5,044,171
2011	548,950	1,604,963	196,211	343,921	751,775	3,445,821
2012	637,135	1,845,267	240,304	275,578	992,079	3,990,362
2013	696,660	1,618,191	127,868	246,917	791,459	3,481,095
2014	727,525	1,807,788	141,096	216,053	619,542	3,512,004
2015	771,617	1,966,521	156,528	145,505	505,982	3,546,153

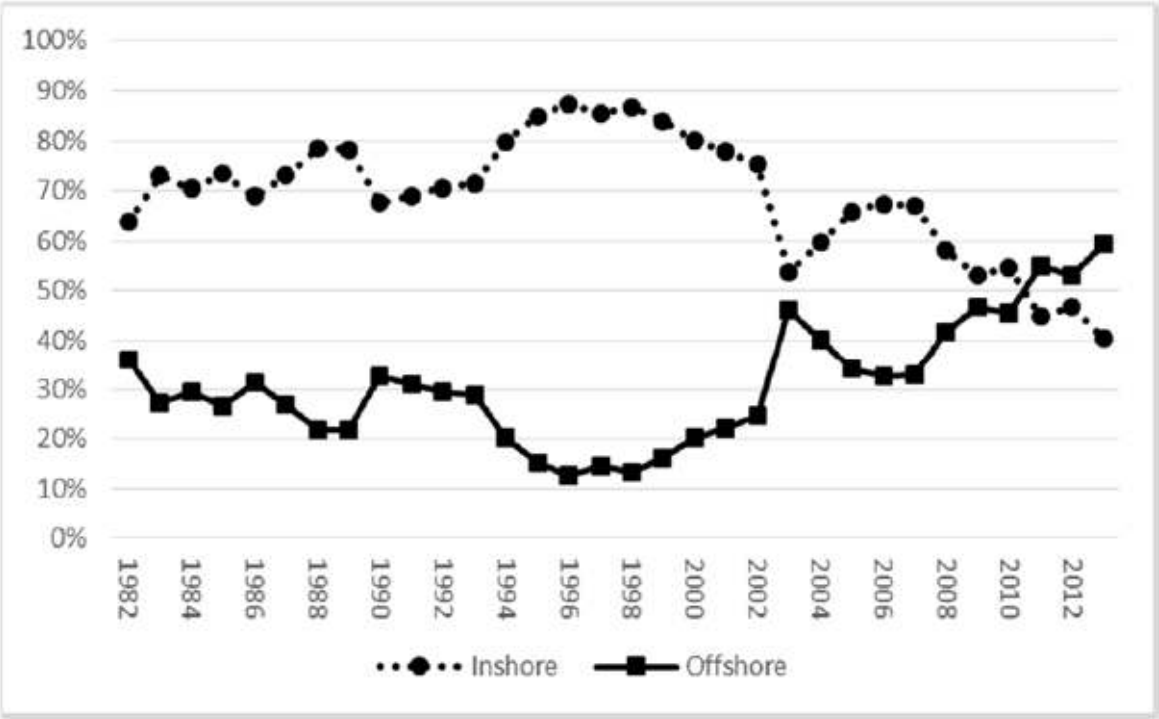

Figure 3: Percentage of landings in SNE occurring in the inshore and offshore fishery. The inshore fishery is defined as landings from statistical areas 538, 539, 611, 612, 613, 614, 621, 625, 631, and 635. The offshore fishery is defined as landings from statistical areas 533, 534, 537, 615, 616, 622, 623, 24, 626, 627, and 632.

Table 5: Current trap allocations by LCMA in the SNE stock. LCMA 3 includes traps fished in both the SNE stock and the Gulf of Maine/Georges Bank stock.

	LCMA 2	LCMA 3	LCMA 4	LCMA 5	LCMA 6
MA	33,377	49,040	1,100		
RI	59,789	41,288	2,424		
CT	4,163	652	2,725		139,186
NY	1,141	2285	11,075	600	111,108
NJ	940	12,155	6,530	3,154	
DE				4,530	
MD				4,000	
VA				1,200	

Table 4. The number of active permits (MA, RI, CT, NJ) or total permits (NY) in the SNE stock.

	MA	RI	CT	NY	NJ	Total
1990	341			994		1335
1991	320			1067		1387
1992	309			1171		1480
1993	350			1211		1561
1994	405			1265		1670
1995	397		365	995		1757
1996	377		322	932	42	1673
1997	392		305	888	42	1627
1998	399		311	761	40	1511
1999	405		299	746	41	1491
2000	365		245	657	53	1320
2001	347		234	600	54	1235
2002	378		210	554	46	1188
2003	324		167	507	34	1032
2004	290		177	477	35	979
2005	264		179	458	27	928
2006	276		220	428	27	951
2007	285	304	195	412	31	1227
2008	238	288	162	384	30	1102
2009	228	267	139	375	33	1042
2010	218	269	129	360	30	1006
2011	219	216	98	344	30	907
2012	209	195	80	334	29	847
2013	198	163	59	326		746
2014	190	156	57	309		712

Good morning David,

Just a few more comments.

Where is the science coming from for the SNE offshore area to have more restrictions placed on it? I know they have
done the vent less trap survey in area 2 but the areas the traps were set in were computer generated and from personal
knowledge most of these set areas have never held lobsters. At least 75% of the traps were set on unproductive bottom
so when there are no lobsters that means the area has collapsed. I'm sure you saw a big uptick in lobster catches in area 2 and also there is probably only 10% of the gear being fished there as previously was. There is no way area 3 lobsters come from
area 2 brood stock. I'm sure some of the bigger lobsters do migrate but not in the amount that is offshore.

With what we are seeing offshore the resource is coming back. The traps are full of shorts, eggers, and big lobsters. I think we need
to be very careful moving forward since most lobstermen feel we have not seen the full evaluation of the previously instituted
gauge increases and trap reductions. What we need to do is curtail the illegally fished traps-that is a real problem and no restrictions
will over come that. Enforcement in a non-adversarial way is a must!

If more restrictions are warranted (which I don't believe they are) gauge increases may have the least impact to lobstermen.
That could be instituted across all of area 3 with the greatest impact on SNE and not so much in GB. We still have three more years of trap reductions and that may be done on an accelerated bases. Closed seasons will not work because most of the SNE boats are crabbing
from December to April with very little lobster by catch so that will do nothing. Bringing the gear home is not an option because there is no where to put all that gear and rope and I'm sure the mobile gear fishermen will move in and decimate the lobster bottom that we all have
worked to protect. If there is a separation line you are going to have to have a CG cutter on sight to enforce it and I don't think anyone really wants to give up their bottom and move to the east. That is why a gauge increase throughout all of area 3 will possibly prohibit that from happening.

Dave, I really don't think any more restrictions are needed, but if they are indeed going forward with restrictions in some form they must be fully vetted so they don't have totally adverse impacts on the industry.

Sincerely,

Gary Mataronas
F/V Edna May
F/V Night Prowler

If there is anyway you could enter this as a public comment I would really appreciate it.

Jonah Crab Draft Addendum II Public Hearing

Newport News, VA

December 8, 2016

VMRC staff: Joe Cimino (Board member); Megan Wood

No public attended the meeting. Joe Kelly (Parksley, VA) a commercial fisherman called the VMRC office prior to the meeting to provide comments.

Issue 1: Claw Harvest

- Mr. Kelly supports option C, a coastwide claw fishery.

Issue 2: Bycatch Definition

- Mr. Kelly supports option B, stating as the fishery grows it is important to prevent new directed fisheries that may occur from a loophole if this is not defined.