Maine Fishing Gear Exchange and Research Program
Final Report

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Recipient Organization:

Maine Department of Marine Resources
Erin Summers
P.O. Box 8
West Boothbay Harbor, ME 04575
(207) 633-9556 phone
(207) 633-9579 fax
erin.l.summers@maine.gov
www.maine.gov/dmr

Co-investigators:

Gulf of Maine Lobster Foundation
Erin Pelletier
P.O. Box 523
Kennebunk, ME 04043
(207) 985-8088 phone
(207) 985-8099 fax
erin@gomlf.org
www.gomlf.org

Additional Sub-recipients:

University of Maine
College of the Atlantic/Allied Whale
New England Aquarium

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Project Description and Summary

Floating Groundline Buyback

Elements of the Final Rule amending the Atlantic Large Whale Take Reduction Plan (ALWTRP) began to go into effect on April 5, 2008 and concluded on April 5, 2009. These regulations rely primarily on gear modifications to reduce the likelihood that whales could be entangled by fishing gear. The most significant of these modifications is the mandate to use sinking groundlines, a departure from the historically used floating groundlines in Maine's fixed-gear fisheries. Sink rope is expected to reduce the entanglement risk to large whales by dropping groundlines out of the water column to rest on the bottom between traps. The switch from floating groundlines to sinking groundlines required many Maine fishermen to buy all new rope at their own expense. This resulted in efforts to offer at least partial financial assistance to fishermen affected by the new regulations.

The Gulf of Maine Lobster Foundation (GOMLF), co-investigators on this grant, conducted the Maine Groundline Exchange Program, better known as the Bottom Line Project, since it was first funded through a Congressional earmark in June 2006 through its completion in this award in December of 2011. This program provided economic assistance to eligible Maine lobstermen to comply with the Final Rule amending the ALWTRP, specifically the groundline component of the regulation. Over 2,000 lobstermen participated and over 2million pounds of floating groundline were collected in 15 organized buyback events and a series of small individual transactions that lasted through the duration of the grant.

Gear Research

DMR completed three gear surveys (2005, 2006, and 2008) prior to this award to establish and track the baseline gear configurations (amount of gear on a string, etc.) and density in different areas seasonally. Past surveys concentrated on federal license holders (2006) and were conducted prior to the ALWTRP regulations in 2008. These surveys proved useful in models aimed at determining areas of importance with regards to entanglement risk and were used to draft alternative proposals to the Final Rule. Under this award, DMR undertook additional survey initiatives to update the baseline characterizations of the fisheries and perform further analyses of the information received to update models and assist in efforts to quantify entanglement risk and target regulations aimed at reducing the risk of entanglement in vertical lines. This included two types of fishery characterization methods: fishery dependent and fishery independent.

The fishery dependent methods included sending Annual Logs out to all license holders with their license renewal materials for the 2009 fishing year. These logs had over a 35% return rate (conservative estimate because it does not remove latent licenses from the pool of respondents) and asked respondents to document the maximum number of traps and vertical lines fished per month, fishing zone and distance from shore. Additionally, a more in-depth gear survey was also mailed to all license holders for the 2009 fishing season. These surveys had a 10% return rate and documented the configurations of gear fished in different areas and months, as well as types of ropes used and typical fishing practices. Both of these surveys are being used in models that identify co-occurrence of whales and gear or entanglement risk by area and season and aid in

identifying areas and seasons for the Draft Environmental Impact Statement for vertical line regulations due out in 2013.

It was determined that a method to assess the density of vertical lines in regulated state waters independent of voluntary industry surveys was needed. To this end, two projects were undertaken to determine the density of vertical lines using transect lines: aerial and boat-based surveys. Aerial surveys were flown with near 100% coverage of the non-exempt state waters in either November of 2010 or June of 2011. Each transect line was only covered once due to cost concerns. In an effort to get better temporal resolution, boat-based surveys were conducted year round along similar transect lines and the density and locations of buoys were documented by hand throughout the non-exempt state waters. Both datasets were interpolated using kriging spatial analysis techniques to determine seasonal densities of vertical lines and compared to numbers extrapolated from the fishery dependent surveys.

Two additional gear research projects were completed under this award to document the operational feasibility of potential gear modifications. First, six fishermen were contracted to convert 50 of their traps from singles and pairs to a series of longer trawls, fish those trawls from August through November and keep a log of their experiences. The end goal of that project was to determine how many traps on a trawl a boat could handle that historically fishes singles and pairs. Our participants were comfortable with five trap trawls and while they had positive experiences fishing longer trawls, gear loss rates did increase when compared to the control traps. With the second research project, various configurations of knotted and spliced vertical lines simulating “weak top rope” were tested for breaking strength and all determined to be above the 1,100-pound threshold that was sought for a vertical line that would prevent most entanglements.

Large Whale Habitat Research

Right whale distribution and behavior in the coastal waters of Maine can be hard to study. There are not predictable aggregations of whales in this part of their range as they use the region to transit between larger feeding grounds in southern New England in the spring and the Bay of Fundy in the late summer and fall. Instead, DMR decided to partner with collaborators at the University of Maine to study some of the habitat characteristics that might make Maine waters more attractive to right whales, specifically the presence and abundance of copepods and the processes that drive this. *Calanus finmarchicus*, typically dominates the zooplankton biomass in deep waters of the Gulf of Maine and is also documented to be the primary and preferred prey of right whales in other habitats. The sources and processes controlling the population dynamics of *C. finmarchicus* in the Gulf of Maine, particularly on the coastal shelves and ledges along the Maine coast are not well understood. Knowledge of coastal *Calanus* abundance and distribution patterns is particularly important for evaluation of risks associated with right whale foraging because of the vicinity of high densities of fixed fishing gear in this area. The resulting study served to document the seasonal patterns and summer distribution of *C. finmarchicus* copepodid stage abundance in Maine coastal waters of the Gulf of Maine, based on three plankton surveys conducted in July or August in three successive years and a time series of plankton collections at two Midcoast stations. *Calanus* copepodid stages CIV and CV-CVI, the most energy-rich prey for planktivores, were most abundant in spring, with considerable variability in timing of peak spring abundance, and fall at the coastal time series station. Abundances of these stages in mid-

summer (Jul-Aug) were significantly higher, by a factor of 5-45 for stage CV-CVI at offshore coastal stations > 100 m depth than shallower nearshore coastal stages. Our observations are most consistent with the hypothesis that local coastal production originating upstream from Jordan Basin or the Eastern Maine Coastal Current is the first-order source of *Calanus* in the coastal ocean. Estimated concentrations of late, lipid-rich copepodid stages based on profiles with a Laser Optical Plankton Counter were not sufficiently high to attract right whale foraging behavior inshore of the 100 m isobath, with the possible exceptions of two stations located at depths of 85 m.

In addition to habitat work, DMR wanted to support on-going right, humpback and fin whale research happening at Allied Whale through the College of the Atlantic. This group houses both regional catalogues for humpback and fin whales and represents the only long-term data source for large whale habitat use in Maine. DMR partnered with collaborators at Allied Whale to continue research activities that would bolster current research programs and inform proposed management strategies at the state and federal level designed to minimize the risk of entanglement for large whales in Maine-governed waters. Supported activities included: directed sighting transects throughout the summer and acoustic census at two high use habitats, Mount Desert Rock and the Outer Fall region. Sighting transects occurred June–September, inclusive and used randomized transects that ranged between the GoMOOS "I" buoy to a region known as the "Right Whale Hole", 5 miles southeast of Mount Desert Rock, around Mount Desert Rock and the Inner Schoodic Ridges. Transects were of two types, including census and more detailed focal group work. During census transects, counts of all marine mammals, large fish species (tuna, basking shark, others), and where possible, birds were noted. Focal group transects searched for clusters of animals previously unsurveyed; once found, teams performed full photo-identification and biopsy protocols on those animals under the Whale Center for New England's research permit **NMFS 605-1904**, under which Allied Whale's Principal Investigator (Todd) is a listed collaborator. Note that photo-identification protocols were modified to include capture of images usable for scarification analysis.

The analysis work on the acoustic projects funded through this grant is on-going and will be reported on through the final report of another NMFS grant, NA10NMF4520291, which partially funded this work. Work with collaborators at Allied Whale included the deployment and analysis of passive acoustic buoys deployed around Mount Desert Rock and the Schoodic Ridges, as well as in the offshore region of Outer Fall and Jordan Basin. The results of the Outer Fall study were largely contained within the master's thesis work of Jacqueline Bort at the College of the Atlantic and shows potential evidence for this area to be an important breeding habitat for right whales in the winter months. Additional buoys were deployed throughout regulated state waters in the fall months, during the peak of the fishery in this region. The analysis of the presence and distribution of large whales on this network of passive acoustic buoys is on-going.

Lastly, DMR offered support to the New England Aquarium's right whale research team to accomplish a winter survey effort into the Outer Fall region. This survey aimed to document the individual right whales utilizing this area in an effort to determine the importance of this winter habitat to the breeding population of right whales. This project is in direct support of the acoustic analysis that DMR has been engaged in with collaborators at Allied Whale. Surveys in both 2010 and 2011 were accomplished and researchers have identified 33 individuals to date. This story will continue to unfold as researchers at the Aquarium monitor the calving patterns

and correlate that back to what has been seen in the Outer Fall region the winter prior to calving. This is an important piece to understanding how right whales are utilizing this winter habitat and how important it is to the population.

Gear Exchange and Research

Floating Groundline Buyback Program

The Maine Groundline Exchange Program, or the Bottom Line Project, was conducted in full by Co-investigators at the GOMLF. The program, beginning in June of 2006 through a series of Congressional appropriations, was created by the GOMLF and therefore, the Foundation continued to implement this work for the duration of this funding source: October, 2009 through December, 2011. Over the course of the entire project, 15 groundline exchanges were held (6 during this funding source) in addition to 24 individual exchanges (all through this award). This amounted to a total of over 2 million pounds of floating groundline being removed from Maine fishing waters and nearly 3 million dollars worth of vouchers being handed out for the replacement of that line with sink rope. Over 2,000 Maine lobstermen participated in this program and all of the rope that was collected was either recycled or re-used through local vendors. For a full description of the program and the accomplishments received, please see the attached Appendix I.

Fishery Dependent Gear Surveys

Two methods were employed to collect two types of data. First, annual logs (provided in Appendix II) were mailed to all commercial lobster license holders with their license renewal materials in October of 2009 (roughly 6,100 individuals). DMR received over 2,100 responses from active fishermen, which were successfully recorded into a database. The raw data from these surveys were made available to the NMFS sub-contractor, Industrial Economics (IEC) to replace the gear surveys as the primary dataset used to inform the risk co-occurrence model created for the Atlantic Large Whale Take Reduction Team.

The second initiative was the comprehensive gear survey (provided in Appendix II). Surveys were mailed to the entire lobster (roughly 6,100) and gillnet (roughly 300) industries. DMR received just over 700 surveys from the lobster industry and 50 from the gillnet industry. The databases used to record this information have been provided to IEC, for use in the co-occurrence model.

Additional information was collected through collaboration with other DMR programs, including licenses and trap tags sold through the Licensing program and individual landings by month from 100% dealer reporting to the Landings program. Variations of this information was provided to IEC, as well as being used in DMR's own baseline calculations for the number of vertical lines by month in different areas of the coast. Calculations included corrections to track the active participants in the fishery by month and accounted for latency when the data was scaled up to estimate the baseline amount of gear for the whole population of lobstermen (Appendix II). Also available in Appendix II are the summaries for each survey, calculated densities of vertical lines, gear configurations fished and other information about gear use that was compiled throughout the duration of this award.

Fishery Independent Buoy Density Surveys

Aerial Gear Density Surveys

DMR partnered with Kappa Mapping in Bangor, Maine to develop a flight and analysis plan for mapping all non-exempt state waters for the density of buoys and therefore vertical lines (Figure 1). This area was chosen because state waters represent the majority of the lobster fishery in Maine and additional regulations imposed in this area will have the biggest impact on the fishery. High resolution aerial photography was taken in stereo from a height of 3,960 feet above the water, using strict weather and sea surface guidelines, such as low sunlight and therefore glare, calm winds and therefore minimal surface water chop, and at low or slack tides so buoys that were not pulled underwater and missed. Images were matched up on a computer screen and viewed using three dimensional glasses to classify buoys in each image as "certain", "probable" or "possible". The buoy locations and determinations were then digitized into ArcGIS format for delivery to DMR (Figure 2). The original project was set up to take place during the peak fishery in this area, September through November, since it was too expensive to sample the entire area using this method more than once. All analysis work done by DMR used only buoys that were characterized by Kappa Mapping as "certain" or "probable".

Several changes were made to this project as it progressed. The aerial survey team had a hard time during the original study period finding days that met the strict conditions outlined above. The flight height was set so that 100% of the area would be covered by digital images in stereo. However, the flight team could not obtain a work day in which the cloud ceiling was above the height set for the flight and therefore no digital images could be taken. DMR worked with Kappa to re-evaluate these criteria and decided to change the flight height so that some flights could take place. This resulted in gaps of coverage for small areas between every transect line flown. It was determined that interpolation techniques could be used during data analysis to account for gear that occurred in these holes. Due to these delays, only Lobster Management Zones E, F, G, and parts of C and D were completed before gear started moving out of the area. The remaining zones were put off until the spring fishery began, which in most cases, is not very different from the fall densities in those particular months. The remaining flight lines in A, B, C and parts of D were flown in June of 2011.

Figure 1. Aerial survey flight lines used to sample the non-exempt portion of state waters in November 2010 and June 2011.

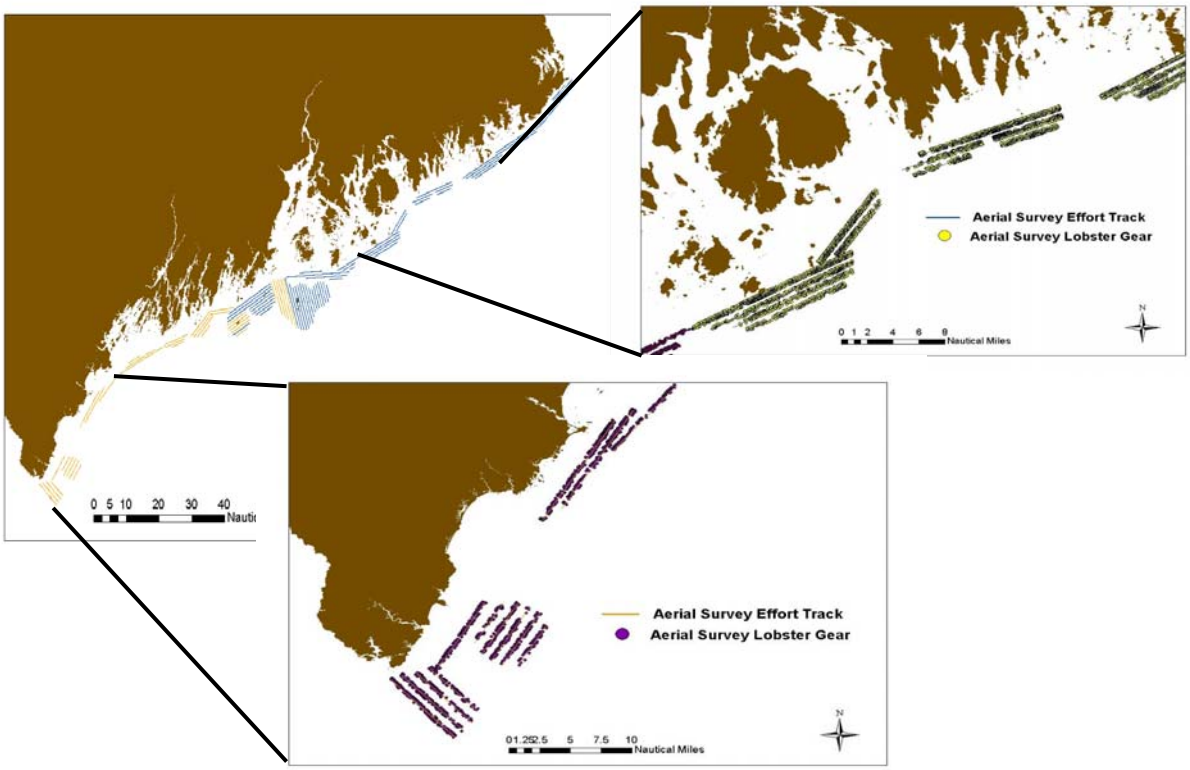

Figure 2. Sample buoy locations digitized from images taken during aerial survey flights.

Boat-based Gear Density Surveys

Due to the cost of the aerial surveys above, they were only performed enough to provide coverage for each transect line once during high use fishing seasons in the study area. Boat-based surveys were created to count vertical lines year-round as a way to increase temporal coverage and document how density changes throughout the season. A pilot project in 2010 performed through the collaboration with Allied Whale/College of the Atlantic served as the basis on which the methods utilized in the boat-based portion of the study were developed. Lobster vessels were contracted through the GOMLF and used to conduct the surveys along the same sampling lines used for the aerial surveys (lines used were randomly selected with no line being able to be sampled twice in a row). Vessels ranged in size from 25-42 feet in length and ran at speeds of 10-15 knots. Observers, placed on the port side of each boat, entered the location of all buoys sighted within 100 meters of the boat using Logger software, a laptop and a handheld GPS unit. Surveys were conducted for a year (Sept. 2010 through Sept. 2011) twice per month in each of three areas (Downeast, Midcoast, and Southern), except January through March, which decreased to one sampling trip in each area per month. After each trip, the locations of all of the recorded buoys were mapped in ArcGIS, in addition to transect survey effort completed (Figures 3-5).

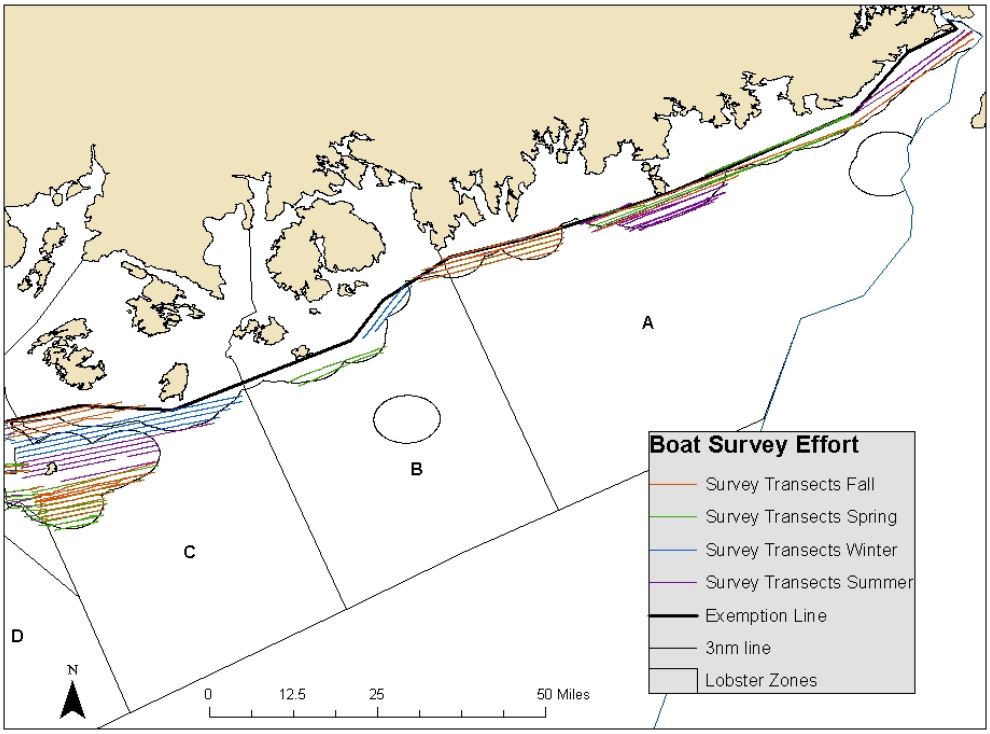

Figure 3. Boat-based survey transects completed by season in Lobster Management Zones A-C.

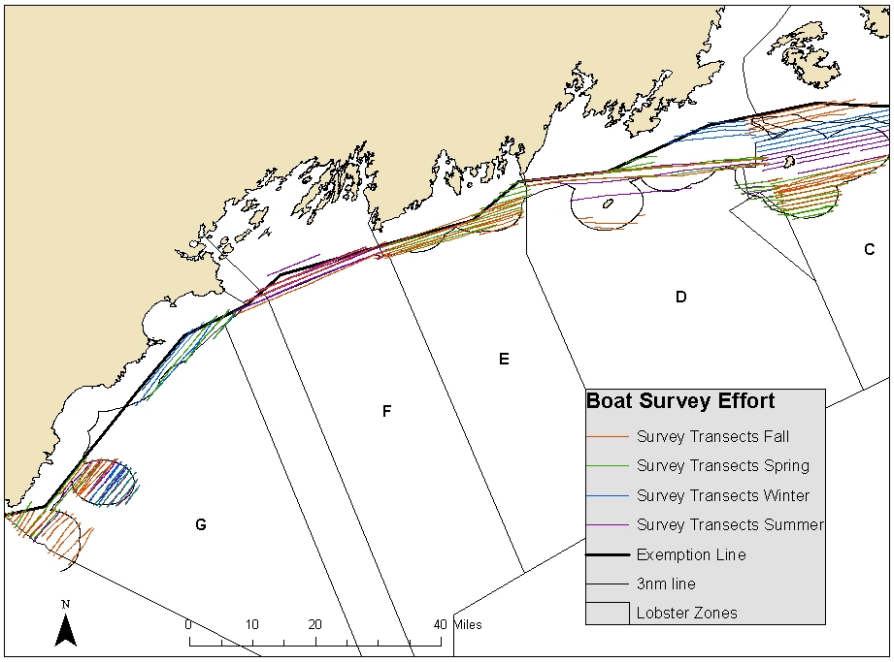

Figure 4. Boat-based survey transects completed by season in Lobster Management Zones D-G.

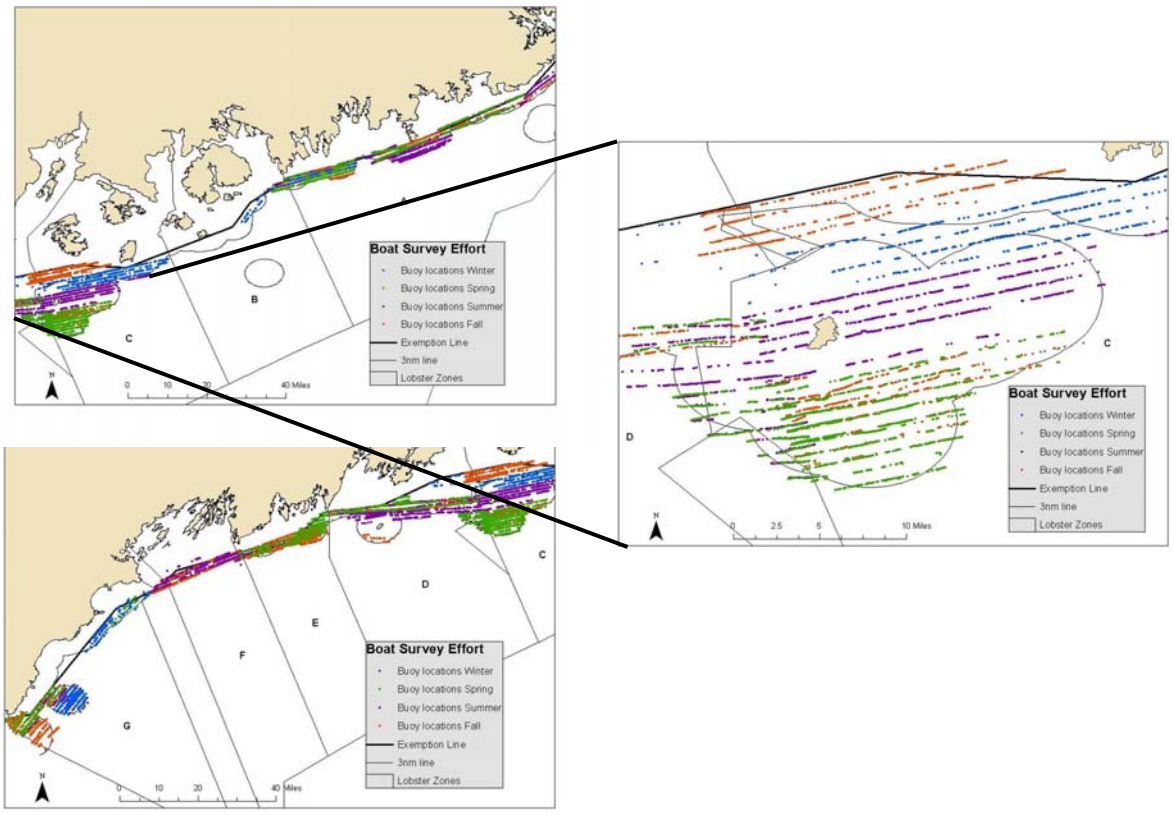

Figure 5. An example of buoy locations recorded on boat-based transects coded by season.

Data Analysis

Both the aerial and boat-based surveys were handled the same for post data collection analysis. Each dataset was mapped in ArcGIS and overlaid with a grid of 1x1 mile squares (Figure 6). For each grid cell in the study area, the sum of the buoys counted in that cell was divided by the amount of effort completed in that cell to create a measure of buoy density. These data were imported into spatial analysis software called "Surfer" and interpolated using kriging methods to get an estimate of the density of buoys in areas not sampled by the surveys. The interpolated surface was exported back into ArcGIS and mapped for display and comparative purposes (Figures 7-12). The data were pooled seasonally to increase coverage and an average density for each Lobster Management Zone was calculated. These data were presented at the ALWTRT meeting in January 2012 and at the Maine Fishermen's Forum in March 2012.

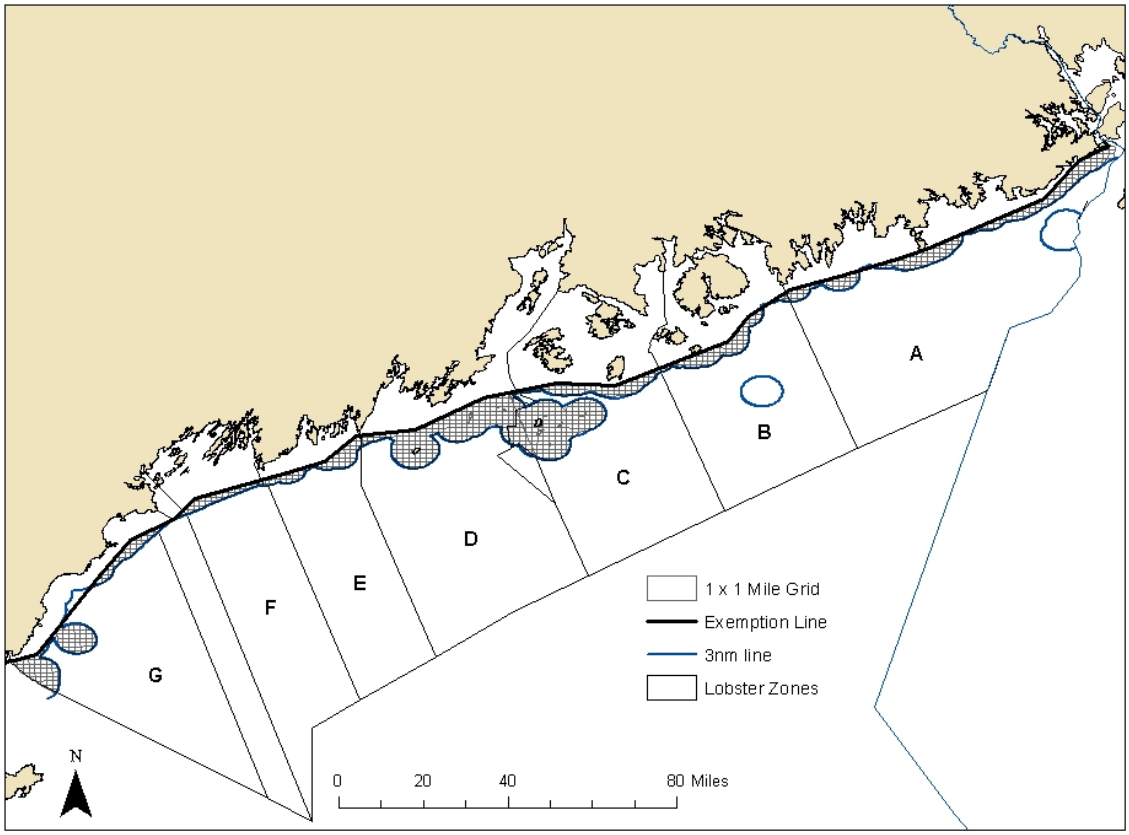

Figure 6. The 1x1 mile grid applied across the study area allowed for a calculation of the corrected density of buoys per unit effort. This was a common calculation that could be used for both methods and make the data collected on the aerial and boat-based surveys comparable.

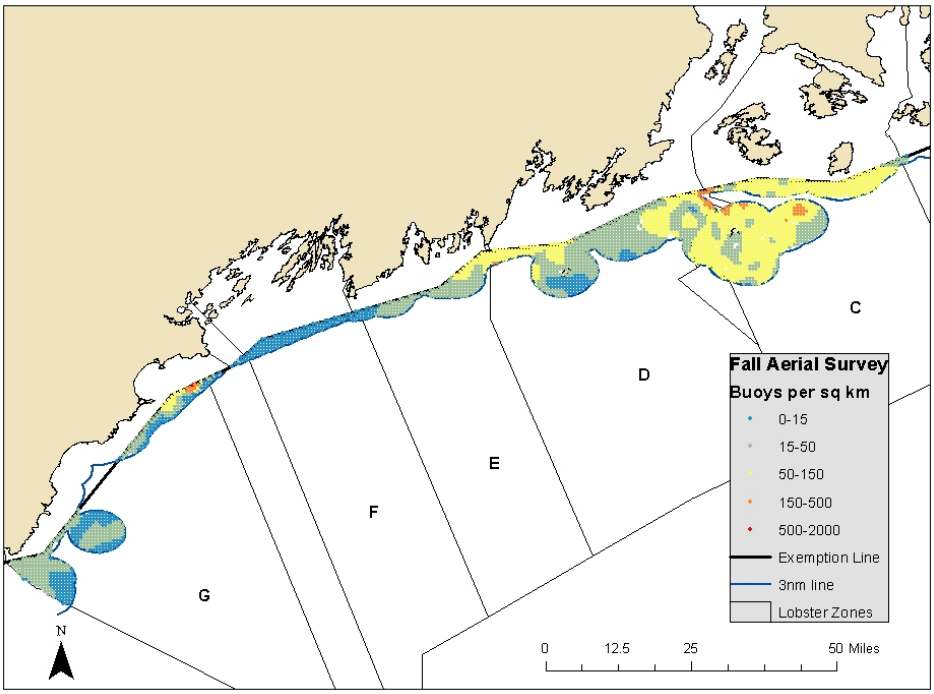

Figure 7. The interpolated density of vertical lines in the fall as recorded by aerial surveys performed in Nov.

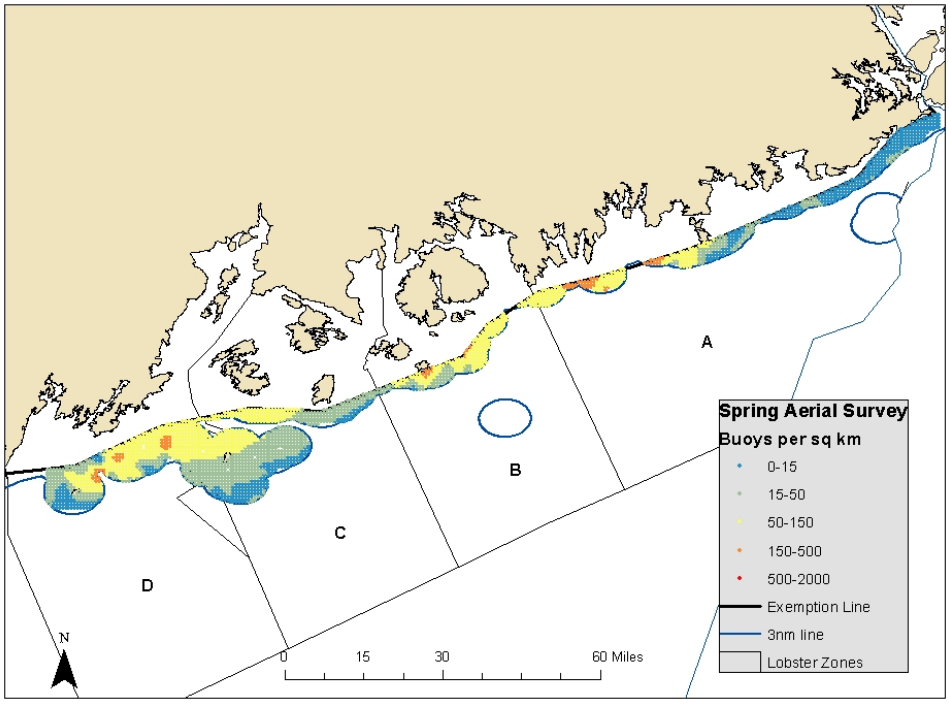

Figure 8. The interpolated density of vertical lines in the spring as recorded by aerial surveys performed in June.

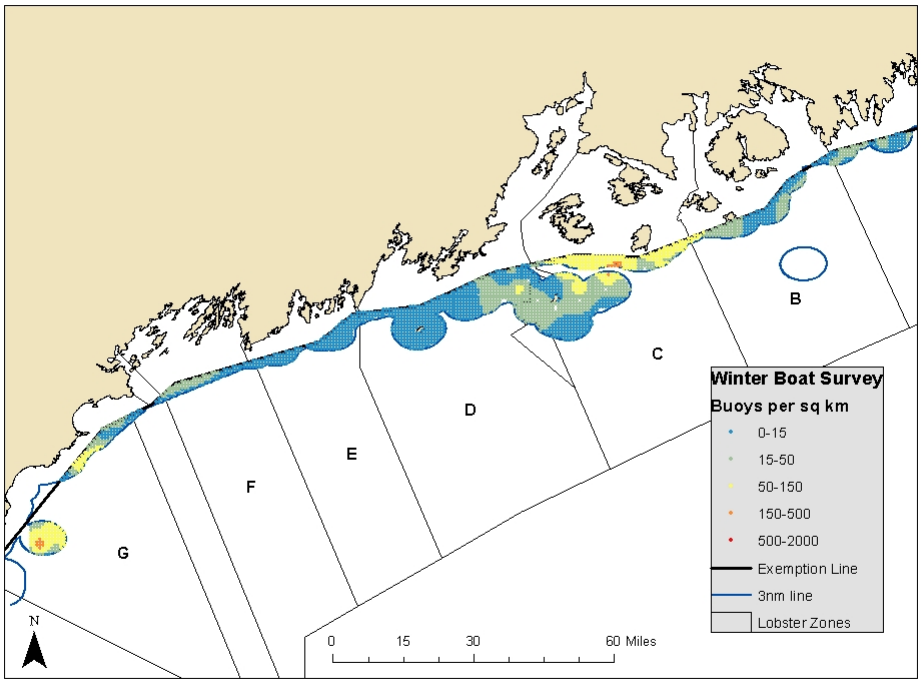

Figure 9. The interpolated density of vertical lines in the winter as recorded by boat surveys Jan-March.

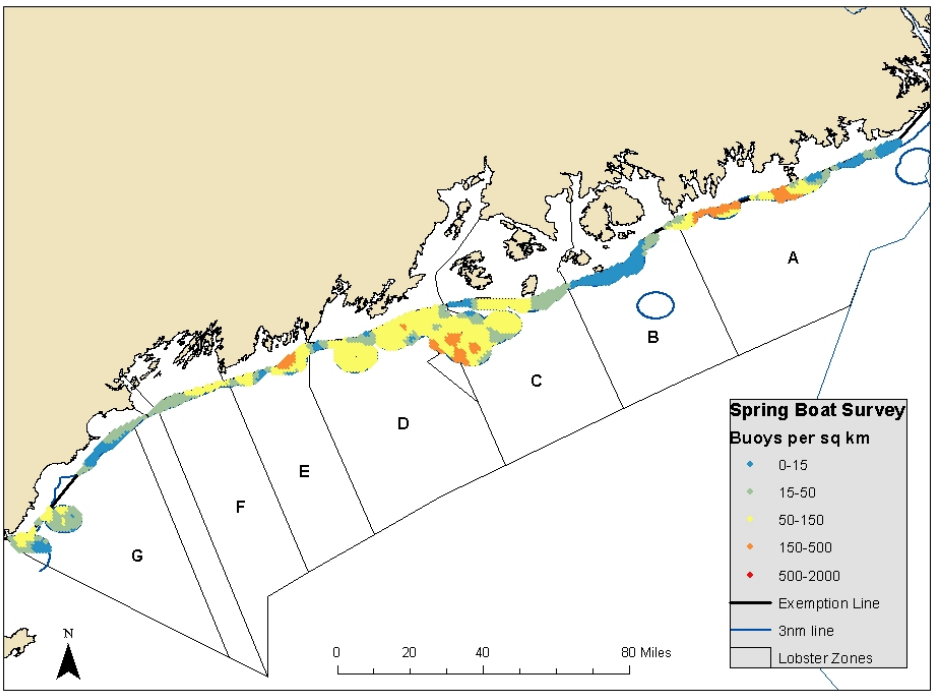

Figure 10. The interpolated density of vertical lines in the spring as recorded by boat surveys April-June.

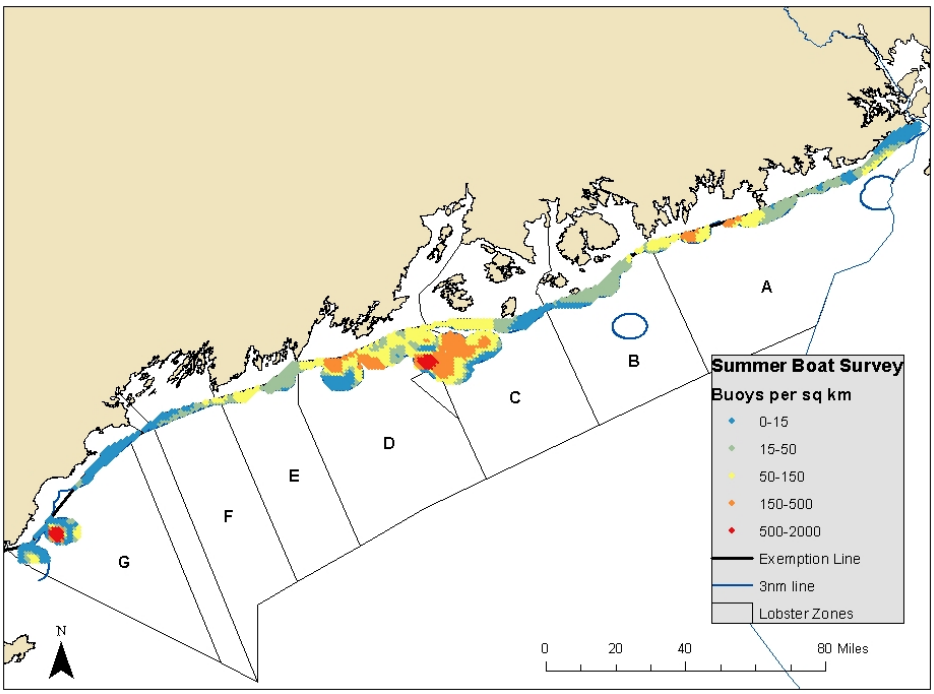

Figure 11. The interpolated density of vertical lines in the summer as recorded by boat surveys July-Sept.

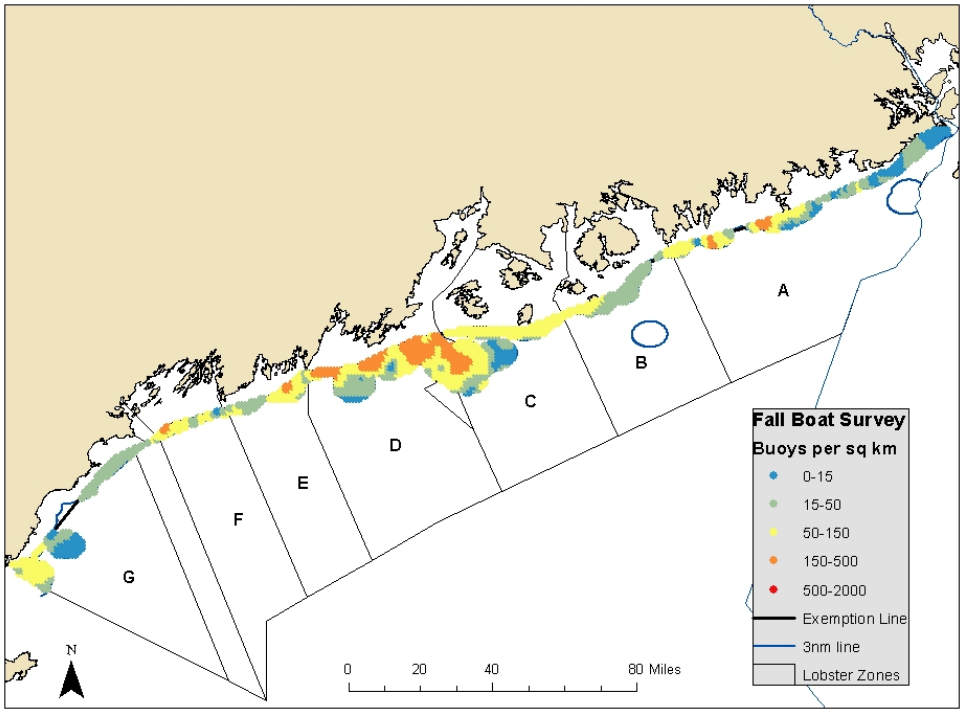

Figure 12. The interpolated density of vertical lines in the fall as recorded by boat surveys Oct-Dec.

Gear Trawling Project

As DMR was preparing for the ALWTRT meeting in January of 2012, it became apparent that data were needed on the operational realities of requiring boats to fish longer trawls. The question about how many traps on a trawl was too many for an in-shore vessel to handle came up, but there was no data to point to that documented any of the operational challenges that could come from this change. DMR partnered with its collaborators at the GOMLF to set up a project that would document these experiences and track any changes that the fishermen would experience in catch rates and gear loss over the course of a fishing season. The original intent of the project was to get an entire fishing community to participate in the project so that the experience of fishing trawls would occur around other trawls and would therefore reflect the environment that would result if everyone was regulated to make these changes. After extensive outreach on the part of both DMR and the GOMLF, no community of fishermen could all agree to participate. We moved forward with the project utilizing six individual fishermen in a region that historically has relied heavily on singles and pairs. While these fishermen had to overcome the challenge of fishing trawls around fishermen who were using shorter sets of gear, they were overwhelmingly able to make the project work by communicating with other fishermen in their area about where their trawls were set and/or fishing their longer trawls just off to the side of those fishing singles and pairs. This allowed our participants to avoid most gear conflicts and still collect meaningful results for the project. Trawls were set out in August after extensive training in project needs and how to keep their logbooks took place in June and July. Traps were fished through November and resulted in over 3,000 hauls of the experimental trawls and control gear combined. The results were preliminarily presented at the ALWTRT meeting in January. Results of the project were also made available through a printed report and on the display boards of both the GOMLF and DMR at the Maine Fishermen's Forum in March, 2012. Outreach for this project will continue through DMR's involvement with fishing industry meetings and mailings. Details of the methods used and results of the project are available in the report attached in Appendix III.

Weak Top Rope Breaking Strength Tests

DMR partnered with co-investigators at the GOMLF to initiate and complete an experiment on the breaking strengths of different configurations of vertical lines with weak top ropes. DMR heard support for the idea of a weak top rope throughout the state scoping meetings that were held in the summer of 2011, however, there was no data to determine if the ideas being suggested would result in a conservation benefit. Many fishermen said that they were willing to tie or splice 11/32 line into the upper 1/3 of their vertical lines to make the overall vertical line under 1,100 pounds breaking strength, a strength that has been preliminarily shown to result in serious injury or mortality for fewer right whales of all age classes. Thirteen configurations of vertical lines were constructed using the most commonly used diameter lines, 7/16" and 3/8". Ten of each configuration was broken through a contracted company called Southwest Ocean Technologies. No configurations tried by the experiment resulted in a breaking strength of less than 1,100 pounds and therefore could not be pursued (Table 1).

ID #	Rope Config	Rope Type	Diameter	AVG break strength	% strength reduction	% strength retained
1	Solid line	Sink	3/8	4203		
2	Solid line	Float	3/8	3636		
3	Solid line	Sink	7/16	4109		
4	Solid line	Float	7/16	4304		
5	Solid line	Sink	11/32	2592		
6	Spliced*	Float	3/8	2573	29%	71%
7	Spliced*	Sink	3/8	2573	39%	61%
8	Spliced*	Float	7/16	2477	42%	58%
9	Spliced*	Sink	7/16	2622	36%	64%
10	Knotted*	Float	3/8	1582	56%	44%
11	Knotted*	Sink	3/8	1614	62%	38%
12	Knotted*	Float	7/16	1740	60%	40%
13	Knotted*	Sink	7/16	1710	58%	42%

Table 1. Results of the weak top rope experiment. Thirteen different configurations were tested, including solid or straight lines of each diameter, as well as ropes with 11/32" rope knotted or spliced into the top 1/3 of the line. The average breaking strength is lower for lines knotted together than for splices, but this is contrary to the best practice of having knotless lines. The lines with 11/32" lines spliced in did reduce the breaking strength when compared to a straight line of that diameter, but were not significantly lower than the straight breaking strength of 11/32" sink line.

Large Whale Habitat Research

Inshore/Offshore Plankton Surveys

As discussed above in the project summaries, habitat characterization became a focus of DMR's work when it became apparent that studying the direct behavior of right whales over rocky bottom, coastal habitats would prove difficult. DMR attempted to collaborate on suction cup tagging projects in collaboration with the Woods Hole Oceanographic Institute and other partners to determine local diving and feeding behavior, but no taggable right whales could be found over the course of the project's three week cruise window. After this attempt, no other funding sources for this endeavor could be found. DMR reached out to partners at the University of Maine to implement a state-wide study into the distribution, movement, sources and concentrations of zooplankton in the near-shore western Gulf of Maine. This study began with funding set aside for whale research from DMR's revenues from trap tag sales to the lobster fishery. Two years of the planned three-year study were carried out under this funding source until the trap tag funds appropriated for this purpose were no longer available. DMR was able to work with NMFS to re-task some of the funds in this award to pay for large whale habitat use research, after it became apparent that not all of the funds were going to be needed for the Maine Groundline Exchange Program. The final field season (2 surveys and the cost of sampling at two stations in the Midcoast and Downeast) and analysis that continued after its completion were funded out of this award and resulted in the final product that is attached to this report in Appendix IV. This is the final draft of a scientific research paper that is going out for publication in a peer reviewed journal.

Passive Acoustic Monitoring and Inshore Whale Habitat Use

When it became clear that not all of the funds were needed to buy back floating groundline, DMR was able to successfully amend this funding source to begin or extend several research projects, including passive acoustics. This effort aimed at documenting potential habitat use by right, humpback and fin whales in several different habitats across the coastal waters of Maine. First, our partners at Allied Whale/College of the Atlantic deployed four pop-up buoys from July to October 2010, three north of Mount Desert Rock and one along the Inner Schoodic Ridges. These locations support the transect and land-based sightings work done by Allied Whale and should be able to be used in conjunction with visual sightings as data analysis progresses. An initial analysis of the results of these buoys can be found in the report provided by Allied Whale/College of the Atlantic in Appendix V. A more thorough analysis of the data will be provided in the final report for NA10NMF4520291, since this portion of work was split funded by both awards and analysis is continuing under that award through its duration.

Secondly, the potential right whale breeding habitat in the Outer Fall region has been monitored by DMR and Allied Whale near continuously from October of 2009 through May of 2011 (partially funded under this award). The results of the first year of this study were completed as a part of Jacqueline Bort's master's thesis through the College of the Atlantic, the highlights of which are available in the report in Appendix V. The second stage of that project, two additional buoys deployed from October 2010 until May 2011, is still in the analysis phases. Results of these buoys will be available in reports for NA10NMF4520291, since this was partially funded by this award and analysis is on-going under that grant.

Lastly, DMR deployed ten pop-up buoys throughout regulated state waters from September through December of 2010, with the exception of the buoy off the coast of York, which was deployed in July of that year for an additional three months of data in that location (Figure 13). The timing of this deployment was meant to overlap the peak fishing season of the study area. The analysis of the data is on-going through another funding source, but when complete, will be used to determine relative risk of entanglement in the areas with the highest gear densities outside of the regulatory exemption line in Maine.

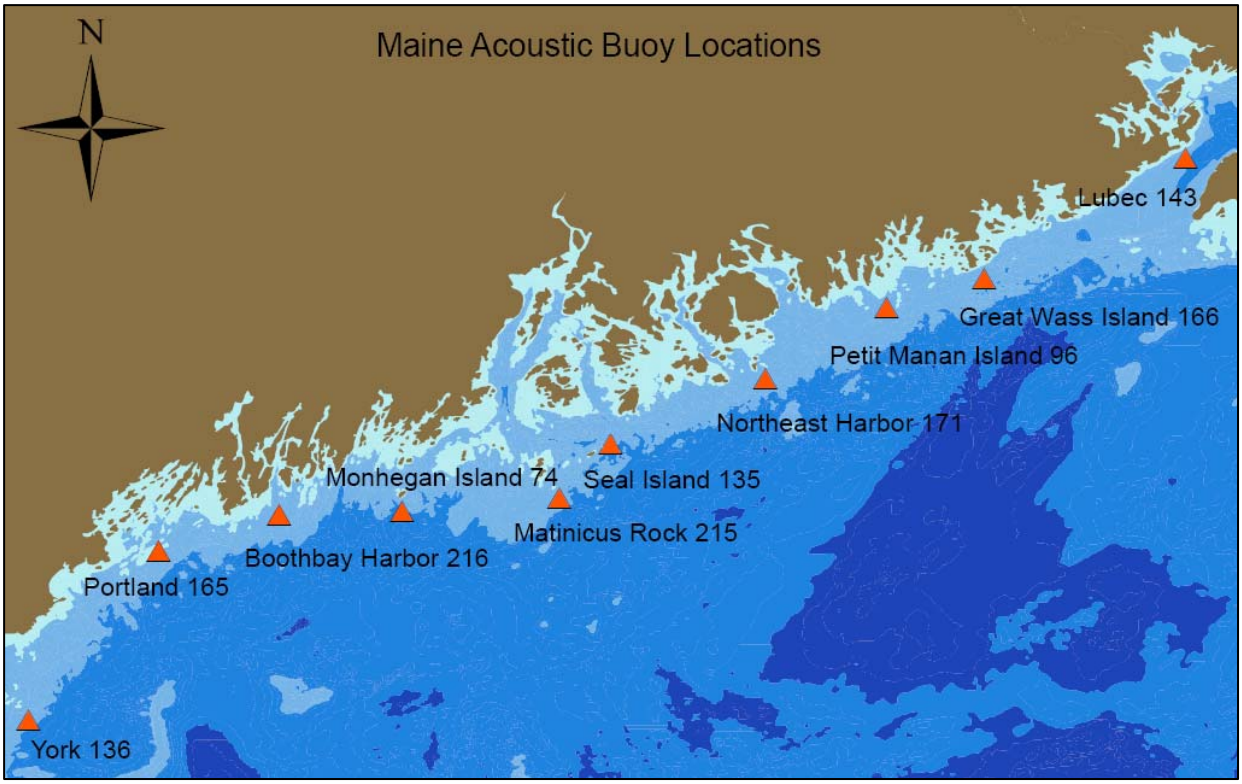

Figure 13. Deployment locations (and buoy number) of the ten pop-up acoustic buoys deployed inside of Maine regulated state waters. All buoys were deployed from Sept. through Dec. of 2010, with the exception of the York buoy (136), which was deployed three months earlier in July.

In addition to passive acoustics, DMR contracted with collaborators at Allied Whale to support on-going large whale habitat use research being conducted by the group as discussed above in the project description. This study began with funding set aside for whale research from DMR's revenues from trap tag sales to the lobster fishery. Two years of the planned three-year study were carried out under this funding source until the trap tag funds appropriated for this purpose were no longer available. DMR was able to work with NMFS to re-task some of the funds in this award to pay for large whale habitat use research, after it became apparent that not all of the funds were going to be needed for the Maine Groundline Exchange Program. The final year of large whale transects, sightings acquisition from the Mount Desert Island team, etc. in the 2010 field season were funded out of this award and resulted in the analysis that is attached to this report in Appendix V.

Winter Survey of Offshore Right Whale Habitat

In November and December 2010 and December 2011, a joint international research effort was initiated in the central Gulf of Maine. DMR contributed funds from this award to the New England Aquarium (NEAq), which was combined with additional support from the U.S. Marine Mammal Commission, the Canadian Whale Institute, and the Canadian Wildlife Federation/TD Financial Group. These funds were used to initiate a new vessel survey program for right whales in November and December in the Outer Fall/Jordan Basin region in the central Gulf of Maine. The goal of the research program was to survey the area to locate and obtain photographs of right whales for individual identification, skin biopsy samples and faecal samples for genetic and hormone studies respectively, and to use these data to test the hypothesis that this area is the

mating ground for the critically endangered North Atlantic right whale. For an area to be considered a potential mating ground, there must be the co-occurrence of adult males, females that give birth twelve to thirteen months later, and the sightings must be in November, December, or January to coincide with the estimated gestation time and peak in calving. Three survey days were accomplished in November and December of 2010 and an additional survey day was completed in December of 2011. In 2010, 32 right whales were photographed with 30 of those being matched to 20 individuals to date. In 2011, 20 right whales were photographed with 15 of those being matched to 13 individuals to date. While the 2010 year didn't elucidate the trends that the research team was hoping for, it was followed by the poorest calving year since 2001. However, preliminary results for this year suggest a correlation between this offshore habitat and breeding success. Of the 13 individuals documented so far, all are adults with 5 of the 6 males being proven fathers and all 7 of the females being reproductively available. Researchers will have to wait until the next calving cycle to determine if the individuals sampled here gained reproductive success this winter. For an entire report on the findings of the NEAq research team, please see attached Appendix VI.

Work to be Completed

Some of the projects discussed in this report were split funded between this award and another, NA10NMF4520291. This includes the fishery independent buoy density surveys (boat and aerial) and the passive acoustics program. Analysis for both projects is still on-going and will be reported on in full in the final report of the other funding award. This will include a full method comparison between the boat surveys, aerial surveys and fishery dependent gear surveys for estimating the density of gear in the water at a given time. Additionally, the presence/absence of right, humpback and fin whales on a biweekly basis will be done for all acoustic buoys, a calculation of ambient noise levels for all locations and an assessment of right whale call types in the Outer Fall habitat. Lastly, the state waters acoustic dataset will be paired with the data obtained through buoy density surveys for an assessment of the areas of inshore Maine that are at the highest risk for large whale entanglements.