Massachusetts Division of Marine Fisheries
Right Whale Conservation Program
2006 Projects and Accomplishments

Submitted to:

National Marine Fisheries Service
National Fish and Wildlife Foundation

PCCS image taken under NOAA Fisheries research permit #633-1763.

May 31, 2007

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EXECUTIVE SUMMARY

The Massachusetts Division of Marine Fisheries (*MarineFisheries*) has conducted the Right Whale Conservation Program for the ninth consecutive year. The purpose of the program is to protect right whales in Massachusetts state waters through research, management, and outreach efforts. In 2006, the program received funding from the National Fish and Wildlife Foundation grant and a contract from the National Marine Fisheries Service. We carried out a range of cooperative projects related to right whale conservation including aerial surveillance, habitat monitoring, acoustic monitoring, fixed fishing gear research, ghost gear removal, gear compliance, and outreach.

During winter and early spring, *MarineFisheries* and the Provincetown Center for Coastal Studies completed the ninth season of the Right Whale Surveillance and Habitat Monitoring Program in Cape Cod Bay. Information collected throughout this program reveals seasonal trends in population demographics, habitat use, and distribution and abundance patterns. *MarineFisheries* also continued to collaborate with Cornell University and Woods Hole Oceanographic Institution to establish an acoustic monitoring system for right whales in Cape Cod Bay. These listening stations will allow managers to more efficiently monitor right whales and address potential threats by following their movement patterns in real-time and over a broader time scale.

Another important project, conducted jointly with the Atlantic Offshore Lobstermen's Association (AOLA), focuses on the development of durable non-buoyant groundline (lines connecting traps). The field-testing portion of the project got underway in 2006, after initial laboratory testing was completed in 2005. Offshore lobstermen are currently fishing with various brands of non-buoyant groundline to test the *in situ* durability of those ropes. *MarineFisheries* and AOLA also expanded their collaboration with Tension Technology International, a rope engineering and testing firm, to evaluate the specific causes of groundline degradation and failure.

In addition, the Commonwealth continued to establish regulations for fixed-gear fisheries in state waters to reduce the risk of entanglement of large whales. Effective January 1, 2007, it became unlawful for any person to fish, store, or abandon any fixed gear in Massachusetts state waters with positively buoyant groundlines connect traps. *MarineFisheries* and the Massachusetts Environmental Police have initiated a compliance project in response to this broad-scale gear restriction.

Research, management, and outreach efforts accomplished by the Commonwealth of Massachusetts are aimed at reducing human-induced mortality and injury of right whales. The ultimate goal is the co-existence between endangered marine mammals and maritime industries. In 2007, *MarineFisheries* will continue to conserve and protect right whales in state waters, through further progress on the acoustic monitoring system and the development of a durable non-buoyant groundline for the lobster fishery. We are grateful to our funding sources, our cooperative partners, and the maritime industry members for their support.

INTRODUCTION

This report summarizes the 2006 activities of the Massachusetts Division of Marine Fisheries' (*MarineFisheries*) Right Whale Conservation Program. The Right Whale Conservation Program (RWCP) has broadened its efforts since 1996, when the Commonwealth of Massachusetts developed a plan to address threats to North Atlantic right whales in state waters. The Commonwealth now has a comprehensive and cooperative program, supported by several funding sources, that is integrated with other programs with similar goals of protecting right whales, including the federal Large Whale Take Reduction Plan. Rather than providing separate reports to each funding agency on the various efforts that they supported, a comprehensive report is provided to encompass all program efforts and accomplishments.

FUNDING SOURCES

Funding for the 2006 calendar year was obtained from two sources -- the National Fish and Wildlife Foundation and the National Marine Fisheries Service.

National Fish and Wildlife Foundation (NFWF)
The NFWF provided $187,590 to support the Commonwealth's Right Whale Conservation Program (# 2005-0326-004). This included support for a collaborative effort with Cornell University to provide near real-time acoustic monitoring of right whales in Cape Cod Bay; support for groundline durability research; funding for a Protected Species Specialist to oversee all program activities; and outreach.

National Marine Fisheries Service (NMFS)
NMFS supported three separate projects in 2006.

1) $421,854 to fund the Right Whale Surveillance and Monitoring Program in Cape Cod Bay (CCB). Funds were also included for off-season acoustic surveillance, acoustic focal follows of right whales, and repair of an Optical Plankton Counter used in right whale habitat studies.

2) $24,975 to respond to off-season aggregations of right whales in Massachusetts and Cape Cod Bays.

3) $24,950 to study of the sources of wear underlying the degradation of sinking groundline.

PROJECTS AND ACCOMPLISHMENTS

During the period January 1 though December 31, 2006 *MarineFisheries* completed the following activities in implementation of the Massachusetts Right Whale Conservation Program:

1) RIGHT WHALE SURVEILLANCE AND HABITAT MONITORING

For the ninth consecutive year, *MarineFisheries* conducted a surveillance and habitat monitoring program for right whales in Cape Cod Bay and adjacent waters from January 1 - May 15. This program is accomplished through a contract with the Provincetown Center for Coastal Studies (PCCS) and involves aerial surveillance of right whales, vessel-based habitat monitoring of right whale food resources, and investigations of whale behavior associated with vocalizations. All right whale sightings were communicated to the NMFS Sightings Advisory System and the University of Rhode Island, home of the right whale distribution database. Photo documentation of right whales was sent to the New England Aquarium (NEAq), curators of the right whale photo-identification catalog. See Jaquet *et al* 2006 for a full report on the surveillance program (http://www.mass.gov/dfwele/dmf/programsandprojects/ritwhale.htm#right).

Aerial Surveillance

The program monitored the presence of right whales in Cape Cod Bay (CCB) and adjacent state waters during winter and spring. Right whale photo-documentation collected during aerial surveys was used to monitor seasonal trends in population demographics, habitat usage, and distribution and abundance patterns.

Figure 1. Aerial photo of right whale feeding, April 2006.
PCCS image taken under NOAA Fisheries research permit #633-1763.

During the 2006 season, PCCS observers completed 36 aerial surveys, totaling 170 hours of flight time over Cape Cod Bay and adjacent waters. Right whales were observed in Cape Cod Bay for 91 days, between January 29 and May 8. This period of occupation was slightly longer than in 2005 (n=86 days) and 2004 (n=90 days). A total of 99 individual right whales visited CCB in 2006, including 6 mother and calf pairs. Three of the females were first-time mothers.

This is the highest proportion of the annual mother/calf population (31%) observed in all previous years (1998-2005). The last four years have shown an increasing trend in the proportion of mother/calf pairs visiting CCB. Overall, the residency time of mother and calf pairs was substantially longer than that of single females and the residency time of single females was substantially longer than that of single males. These results are consistent with all previous years and continue to suggest that CCB is an important nursery area and that the habitat is more intensively used by females than males (Jaquet *et al.* 2006). The figure below shows the inter-annual variability of the total number of right whales that visit Cape Cod Bay each year.

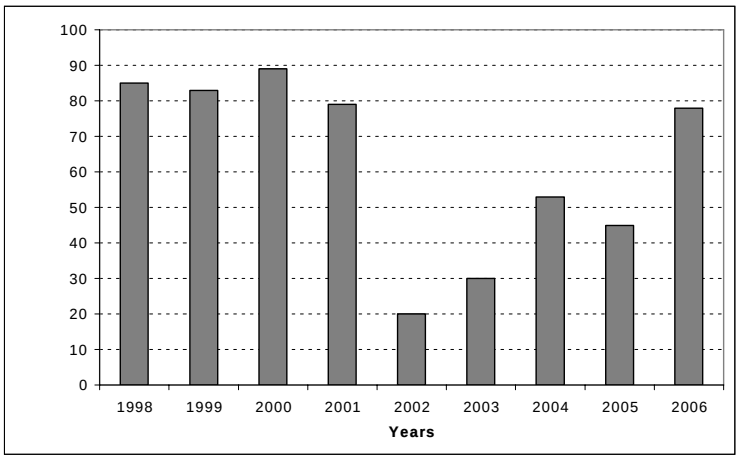


Figure 2. Total number of individual right whales identified within CCB (1998-2006) (PCCS data).

Results of the study also suggest that the right whales that visit CCB in winter/spring are not a random subset of the population. But rather these individuals have a statistically higher probability of being observed in CCB than in all other areas. This means that some individual right whales show strong preference for CCB, while others tend to avoid the area. Thus it is possible that there is a "Cape Cod Bay segment" of the right whale population (Jaquet *et al*. 2006).

The spatial habitat utilization by right whales in Cape Cod Bay has high inter-annual variability. In 2006, a large proportion of right whales were observed around Race Point off Provincetown and in the south-west corner of Cape Cod Bay. This is in contrast to 2004 and 2005 when most sightings were to the east. The western portion of the Bay is in close proximity to Cape Cod Canal, a major shipping route, making the whales more susceptible to ship strike. Similarly, the area off Race Point is close to the Boston shipping lanes. *MarineFisheries* issued advisories to mariners about the presence of right whales in both habitats, requesting the reduce vessel speeds and post look-outs. These advisories are discussed further in the Habitat Monitoring section of this report and copies of the advisories an be found in Appendix B.

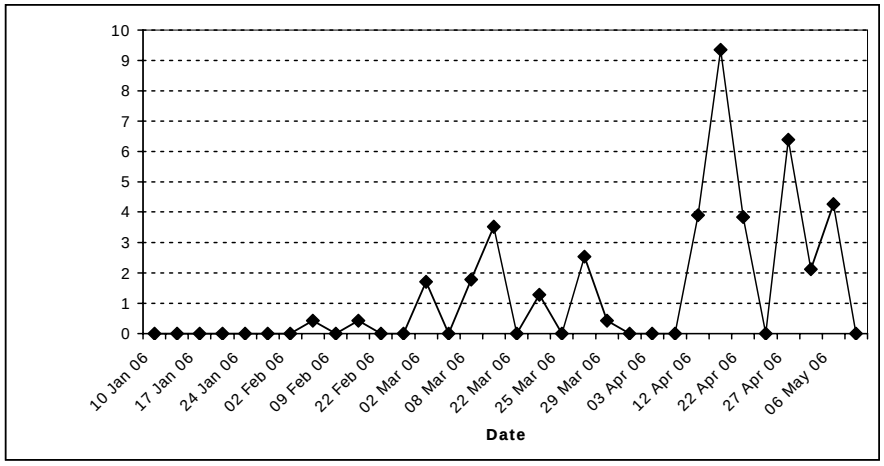


Figure 3. 2006 seasonal trend in right whale sightings per unit effort in Cape Cod Bay (PCCS data).

Three right whales, previously documented with entanglements, were seen in CCB during the 2006 season. These sightings allowed researchers to evaluate the condition of these animals and the state of the entanglement. Right whale #2320, an adult female entangled since 2002, was confirmed as gear-free using photographs taken on April 14, 2006 near Race Point. Right whale #1167 was also sighted gear-free, but the nature of the entanglement makes it impossible to conclusively declare the whale free of gear from the images taken to date. Finally, images taken of right whale #3346 "Kingfisher" showed that his entanglement is still involved with the right flipper (Jaquet *et al.* 2006).

The results of the 2006 surveillance continue to reveal that Cape Cod Bay is an important habitat for right whales during winter and early spring, and that this habitat is especially important for single females and cow-calf pairs.

Habitat Monitoring

In addition to aerial surveys, *MarineFisheries* contracts PCCS to conduct habitat monitoring in Cape Cod Bay from January through mid May, during the time right whales occur in the Bay. This monitoring explores the association between the spatial-temporal distribution of right whales and their main prey species, zooplankton. It also examines the biotic and abiotic habitat variables that affect zooplankton density, useful for developing a predictive model of right whale movements based on prey resources. Post-cruise analysis and reporting are completed as rapidly as possible with the goal of delivering to *MarineFisheries* time-critical information that can assist in managing Cape Cod Bay Critical Habitat. Managers are provided with a better understanding of whale location and the potential overlap with human activities such as fishing and shipping. The CCS Habitat Monitoring report, as well as the near real-time cruise reports are published in Jaquet *et al*. 2006.

"Habitat Assessment" reports are circulated within several days of completing a cruise, but near real-time reports are provided to *MarineFisheries* immediately after each cruise. The near real-

time "Preliminary Assessment and Alert of Right Whale Risk" reports relate information about High Risk Areas based on the proximity of aggregations right whales and zooplankton to areas of high ship traffic. *MarineFisheries* uses these near real-time assessments to issue advisories to vessel operators that recommend maintaining slow speeds in these High Risk areas where right whale aggregations will likely remain due to food availability. This real-time reporting strategy has proven very successful, with *MarineFisheries* issuing three advisories in 2006. These advisories can be found in Appendix B of this document.

Figure 4. PCCS researcher emptying plankton net (DMF photo).

In 2006, PCCS conducted physical and biological oceanographic sampling of the Bay during 18 cruises, between Jan 2 and May 18, 2006. The eight sampling stations are located in Cape Cod Bay (Figure 5). Sampling takes place aboard the *R/V Shearwater*. The vessel is equipped with oceanographic and biological sampling equipment including a CTD (conductivity, temperature, and depth) profiler, plankton nets, a vertical plankton pump, and beginning in 2005, an Optical Plankton Counter contributed by *MarineFisheries*. Zooplankton samples were collected at eight fixed stations in Cape Cod Bay, as well as in the vicinity of whales, using both horizontal and oblique tows taken with a standard 333-micrometer mesh conical net, 30 or 60 cm in diameter. Vertical samples were obtained from a pump sampler deployed in the CTD frame. A total of 288 zooplankton samples were collected from surface tows, oblique tows, and vertical pump casts (Jaquet *et al.* 2006).

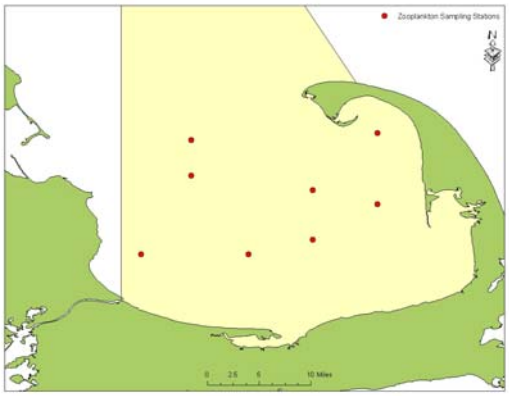


Figure 5. Map of zooplankton sampling stations in Cape Cod Bay (DMF)

In 2006, the zooplankton resource was relatively impoverished in both the surface and mid-water environments throughout most of the late winter and early spring. Right whales seen in the Bay during this period did not remain in the area for any significant period of time. Densities of zooplankton remained well below estimated feeding thresholds until a dramatic, mid-April increase in *Calanus* density (Jaquet *et al*. 2006). This correlated with a high concentration of feeding right whales around the Race Point area, where *Calanus* was especially abundant (Figure 6).

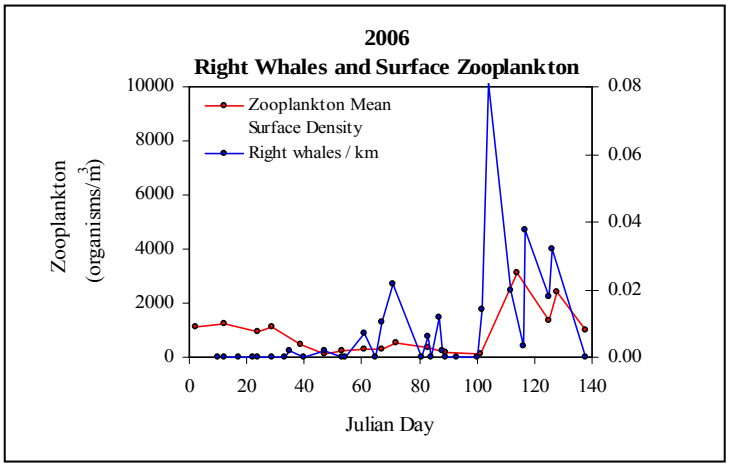


Figure 6. Comparison of 2006 right whale sightings and daily mean surface zooplankton densities

The increased sophistication of habitat assessment techniques has led to improved understanding of the interaction between whale behavior and zooplankton distribution. These concepts have important implications for managing the threats to whales. The vertical distribution of various taxa of copepods in Cape Cod Bay suggest that the greatest risk of mouth entanglement in lobster trap groundlines is likely to occur in mid-winter and early spring when *Pseudocalanus* dominates the resource, while the greatest threat of vessel strike probably occurs from mid to late April through early May when *Calanus*, a taxon that forms mid-water layers, predominates (Jaquet *et al.* 2006).

Right whale focal follows and acoustic behavior

In 2006, the Center for Coastal Studies initiated an acoustic behavior study of the right whales in Cape Cod Bay. Focal follows of individual right whales were conducted to investigate how whale behavior relates to vocalization rates and call types. Individual right whales were recorded between late March and early May, amounting to 40 hours of recordings. In Cape Cod Bay, right whales were mainly quiet while feeding, but did exhibit a range of vocal activities (including contact calls, gunshots, and tonals) during Surface Active Group events. Observations also indicated a strong diel pattern to right whale vocalization, with most calls being heard in the late afternoon and evening. The CCB observations suggest a strong correlation between behavior and vocalization rates. These preliminary findings are similar to those observed in the Bay of Fundy (S. Parks, unpublished data). More focal follow data is needed to better understand the patterns associated with right whale vocal behavior.

Acoustic Monitoring Buoys

Since 2003, *MarineFisheries*, Cornell University, and Woods Hole Oceanographic Institute (WHOI) have worked to build the world's first real-time acoustic monitoring system for right whales in Cape Cod Bay. Right whale protection relies on more than just seeing whales. A great deal can be learned about the movement patterns of right whales by listening for them too. Weather and sea state prevent surveys on many days during the field season.

Armed with a better understanding of the presence and location of whales, we can alert vessel operators about avoiding collisions. Right whale vocalizations are not as complex as humpback whale songs, but they do make sounds to communicate with one another. Dr. Chris Clark of Cornell found that right whales emit routine "contact calls" by putting fixed hydrophones on the bottom of Cape Cod Bay. The seafloor buoys only provide a hindsight view of vocalizations though because they are retrieved only at the end of the season. The challenge has been to get that information in near real-time to make it useful for research and conservation.

Tremendous progress has been made towards this goal. Cornell and WHOI developed a surface buoy system with a hydrophone hanging near the seafloor that transmits right whale detections in near real-time via cell phone. This technology was in its infancy at the start of the project, and a great deal of trouble-shooting has been done along the way. Modifications have been made to the buoy to improve operation and longevity of the acoustic recording systems, and reduce the amount of self-noise generated by the buoy and hydrophone.

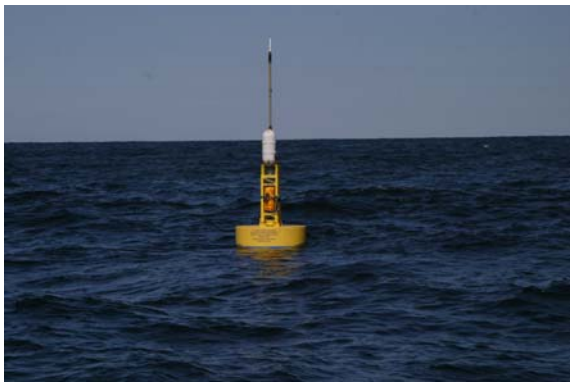


Figure 7. Real-time passive acoustic listening buoy (DMF photo).

In 2006, a major leap forward in perfecting the buoy design was accomplished. The old buoy configuration was too noisy and caused false detections due to the motion of the hydrophone in the water column. The system must be inherently quiet to detect the sound of right whale contact calls. In response to this problem, Woods Hole Oceanographic Institute designed a hydrophone tether that stretches, thus reducing self-noise and false detections. Affectionately known as the "Gumby hose", the new elastic hose compensates for erratic sea surface conditions by stretching up to 3 times its original size. Dr. Chris Clark of Cornell describes the new design as "a rubber band inside a Slinky." The hydrophone will no longer be at the mercy of rough weather, improving our ability to detect right whale calls.

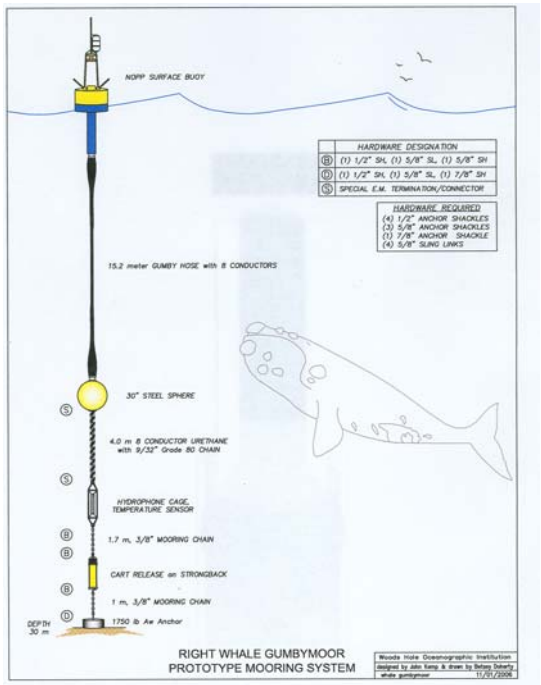


Figure 8. Gumby buoy schematic (WHOI)

The Right Whale Buoy website was also launched in 2006. The website provides daily reports about the detection history of the real-time buoys and audio clips of each confirmed right whale call. The website is currently available only to a small group of members, but the goal is to make this resource available to the public in 2008. The fishing and shipping industry and other maritime users can be alerted to the presence of right whales, based on vocalizations detected by the buoys. Real-time knowledge of right whale locations will aid in the reduction of ship strikes.

On March 22nd, 2007, the first real-time buoy using the Gumby hose was deployed off Sandwich, Massachusetts. The new system has shown remarkable progress in reducing false detections and improving data quality when compared to the previous design. The Gumby buoy performed exceptionally well in recent high seas and strong winds. During the Noreaster on April 16, 2007, the buoy continued to pick up right whale calls, revealing the fact that the whales rode out the storm in the bay.

Given the early success of the new buoy design, we are excited about surveillance potential for the 2007-2008 right whale season in Cape Cod Bay. We plan to have up to three strategically-placed buoys in Cape Cod Bay to transmit information about right whale presence in to improve protection measures. Our success will pave the way for similar programs in other right whale habitats. The Gumby hose also has applications for WHOI's involvement with other acoustic monitoring programs, including the proposed Liquid Natural Gas terminals in Massachusetts Bay.

Monitoring off-season aggregations of right whales in Massachusetts state waters

In the summer of 2005, *MarineFisheries* received a contract from NMFS to monitor off-season aggregations of right whales in Massachusetts state and adjacent waters. Right whales typically inhabit state waters during late winter and early spring. However, it is not uncommon for right

whales to occasionally reside in the Stellwagen Bank area, as well as Massachusetts Bay and upper Cape Cod Bay in the summer months, particularly June and July. This usually coincides with the active boating and fishing season, thus elevating the risk to right whales from vessel strike and entanglement in fishing gear. Managing around right whales requires knowledge of their distribution and forecast of their likely residency. Federal and state managers need to improve their real-time knowledge of right whale aggregations and the local risks associated with their discrete locations.

However, no reliable reports of off-season aggregations of right whales were documented in 2006. Funding from the off-season grant was allotted to support the development of the real-time Gumby buoy system.

2) IMPROVING THE DURABILITY OF SINKING GROUNDLINE

Scientists and managers advocate the use of non-buoyant (sinking) groundline to reduce the profile of line in the water column and thus reduce the risk of entanglement for large whales. Groundlines connect lobster traps together on the seafloor. Groundline that floats off the bottom creates arcs in the water column that are an entanglement risk for large whales. Entanglement in fixed gear is a major cause of human-induced injury and mortality for endangered whales. In the western North Atlantic, 75% of right whales and 61% of humpback whales bear scars from previous entanglements (Knowlton *et al*. 2005; Robbins *et al*. 2004). Sinking groundline had been a year-round requirement in Cape Cod Bay Critical Habitat since 2004 and has been a year-round requirement in all Massachusetts state waters since January 1, 2007.

While sinking groundline provides conservation benefits to whales, it has drawbacks for fishermen, who report that it causes more hang-downs, chafes on the bottom, and tends to wear out faster than floating line. *MarineFisheries* and the Atlantic Offshore Lobstermen's Association seek to increase the lifespan of sinking groundline and reduce the potential for lost gear by improving durability. The breadth and scope of our groundline investigations have grown considerably since the start of the project.

Use of a Gear Hauling Simulator to Test the Durability of Sinking Groundline

Since 2003, *MarineFisheries* and the Atlantic Offshore Fishing Association (AOLA) have worked to identify an optimal non-buoyant groundline for use in the offshore lobster fishery. Optimal groundlines are those that do not degrade due to substrate abrasion, are strong enough to withstand hauling loads, and are not substantially more expensive than currently used rope. It would take years to field test the various brands of non-buoyant groundline on the market to find the brands that function best in the offshore lobster fishery. Given this time-constraint, *MarineFisheries* and AOLA built a line-testing machine to simulate the wear that groundlines experience in the field in a shorter period of time.

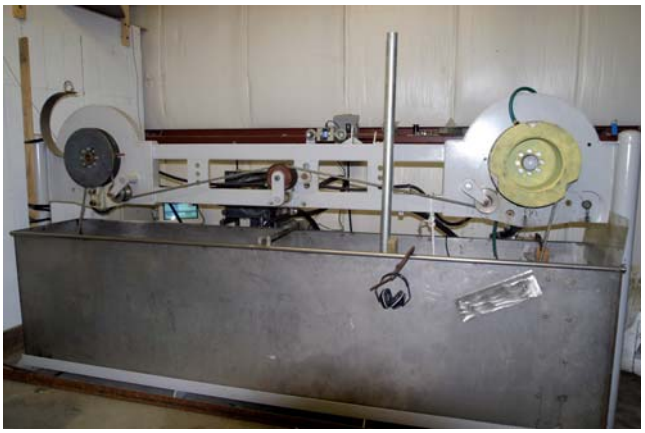


Figure 8. Line testing machine

Initial testing of groundlines in 2004 and 2005 yielded useful results about which brands performed better than others. Lines that performed best were those that exhibited the least wear and loss in breaking strength. The final report on this phase of the project is available on-line at: http://www.mass.gov/dfwele/dmf/programsandprojects/nfwf_report_on_aola_study.pdf.

In 2006, we continued to test more sinking groundline on the machine. These efforts will be discussed further in the following sections. *MarineFisheries* has also received numerous requests from other researchers and organizations to use the machine to assist in their own groundline investigations.

Offshore Field-testing of Sinking Groundlines

In late 2005 and early 2006, we initiated offshore field-testing of the sinking groundlines that performed well on the machine. Five offshore lobster boats are participating in the field component of the study, which will continue through 2006 and 2007. Each fisherman is testing five different brands of 5/8-inch sinking groundline. Lobster trap trawls in the offshore fishery are generally 40 traps in length. Some of the trawls will be rigged with only one brand, while others will be multi-brand trawls. Samples of line from the test trawls will periodically be brought in to evaluate the change in breaking strength and the patterns of wear. The participating fishermen will also complete a qualitative performance evaluation of each line.

Visual and Microscopic Analysis of Rope Damage

MarineFisheries and AOLA have partnered with Tension Technology International (TTI), a rope engineering and testing firm, since 2005 to identify the causes of rope degradation and failure. Analysts as Tension Technology's Scotland laboratory use microscopic and visual techniques to examine ropes and identify the causes of wear. In early 2006, samples of field-used, machine-tested, and unused groundlines were sent to the TTI laboratory. Analysts conducted breaking strength tests, analyzed rope construction, evaluated the type of wear seen, and quantified the presence of sediment.

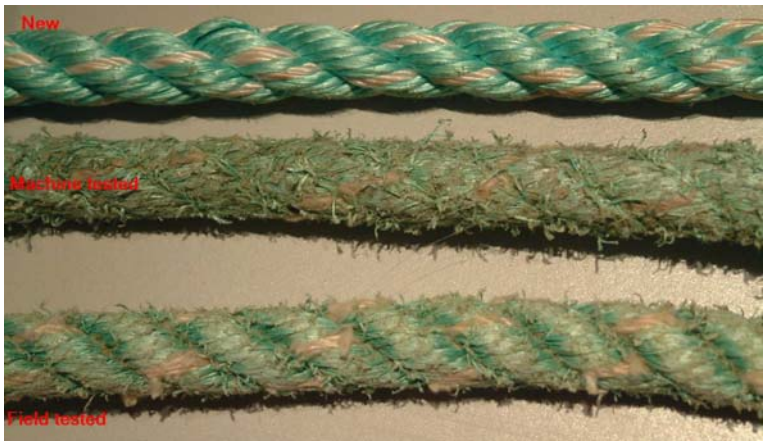


Figure 9. Samples of one rope brand analyzed by TTI

The results of the analysis showed that the machine was successful in simulating the conditions experienced by ropes in the field. While more sediment was found in the field ropes and more mechanical damage was seen in the machine ropes, the analysts concluded that this was consistent with the type of accelerated test we performed. Surprisingly, the analysis showed that the majority of wear seen in both the field-used and machine-tested lines was caused by mechanical damage from the lobster trap hauling system, rather than sediment abrasion. Both internal and external damage was found. Internal damage was caused by strand-on-strand abrasion from the rope bending over the pulleys, and external damage was caused by the steel components of the hauling system (Tension Technology 2006).

Figure 10. View of outer rope yarns from machine tested rope, showing external damage (TTI image).

Fishermen have claimed that sediment abrasion is the primary cause of premature rope degradation. But the results of the sediment analysis are inconclusive at this time. While we cannot say that sediment plays no role in damaging ropes, the finding about mechanical damage demonstrate the potential for improving rope performance by making adjustments to the lobster trap hauling system. The reports from Tension Technology on this analysis can be found at the *MarineFisheries* website, titled "Analysis of Non-Buoyant Lobster Lines: New, Used, and Machine Tested." http://www.mass.gov/dfwele/dmf/programsandprojects/ritwhale.htm#right

Tension Technology also provided guidance on how rope construction and materials affect the durability of a line. We will continue to send samples of rope to TTI for analysis as the field-

testing and machine-testing components of our project progress. The partnership with Tension Technology has provided invaluable insights into the effects of rope construction and the hauling system design on rope performance. By blending our knowledge of fishing gear with TTI's understanding of rope engineering, we have already made great progress toward improving the durability of sinking groundline.

How Rope Construction Affects Durability

Our collaborations with Tension Technology have taught us much about rope. Rope materials and construction play an important role in determining rope durability and sediment-resistance. Important design factors include: the quality of materials used, the way these materials are combined, the tightness of the rope twist, and any coatings or finishes used on the fibers (Tension Technology, 2006). Sinking groundline is typically made of a mixture of polyester and polypropylene fibers. Polyester fibers are heavier than seawater and make the rope sink; while polypropylene is lighter than seawater and floats. The overall weight of the rope is controlled by the ratio mixture of these two materials. The purpose of using both sinking and floating fibers in a sinking groundline is to make the rope just heavy enough to sink. Rope is bought by the pound, so fishermen want sinking groundline to be heavy enough to sink, but not overly so due to the higher price.

Polyester and polypropylene fibers also have very different physical characteristics. Polyester is thinner, round, multi-filament strands, while polypropylene is thicker, rectangular, mono-filament strands. In the photo below, the polyester fibers are the white and the polypropylene fibers are dark.

Figure 11. Outer face of sinking groundline, seen with Scanning Electron Microscope (TTI image)

Internal strand-on-strand abrasion in sinking groundlines may be worsened by contact between the two contrasting fiber types – polyester and polypropylene. Fishermen typically get 5-10 years worth of service out of floating groundline (polypropylene), despite the rope coming in contact with the hauling system. The reduced service life reported in sinking groundline may be a result of how the polyester is mixed with the polypropylene, and the degree of contact between the fibers. The negative effects of this mixing might be reduced by keeping the fibers as separate as possible within the rope. See examples below.

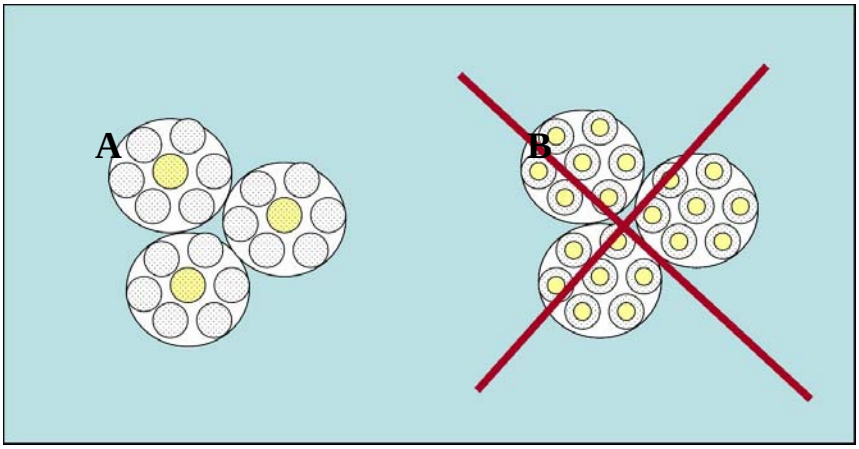


Figure 12. A. Three-strand rope with polypropylene in the center of each strand
B. Three-strand rope with polypropylene in center of smaller strands

The difference in size and shape of polyester and polypropylene may also impact how and where sediment infiltrates the rope body. In the photo below, one can see white sediment particles traveling along the polypropylene fibers. (The thin outer covering seen is tape used to bind the rope during cutting. This is a product of the analysis and is not present in the field). The larger, rectangular polypropylene fibers create gaps around each other. When these fibers are present in the outer surface of the rope, sediment can more easily travel along the path created by the gaps. These sediment paths might be eliminated by placing the finer, stronger polyester fibers on the outer surface of the rope strands, with the polypropylene on the inside of each strand (Figure 12).

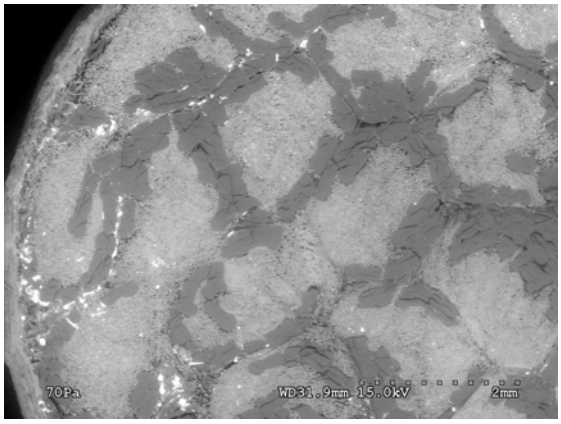


Figure 13. Outer face of sinking groundline, seen with Scanning Electron Microscope (TTI image)

Based on their knowledge of rope properties, Tension Technology provided *MarineFisheries* with design specifications for a durable rope. They recommended a 3-strand, twisted rope with the polypropylene fibers at the center of each of the three strands. Putting the stronger, finer polyester fibers on the outer surface of each strand will reduce sediment intrusion. They also recommended the rope have a hard lay with an angle between 30 and 40 degrees. The harder the rope lay or twist, the more resistant it is to sediment intrusion. In addition, TTI suggested the polyester fibers be coated in a marine finish to reduce strength loss and increase sediment-

resistance. The specification provided by TTI can also be found at the MarineFisheries website: http://www.mass.gov/dfwele/dmf/programsandprojects/ritwhale.htm#right

Constructing a Sinking Groundline Based on Specifications for Durability

MarineFisheries, AOLA, and Tension Technology contracted Anacko Cordage Company of Narragansett, Rhode Island to build a groundline based on TTI's design specifications for a durable rope. Anacko and Tension Technology worked closely to build a rope that meets the specifications recommended as closely as possible. Fabrication of the rope was completed at the end of 2006. The rope will be run on the line-testing machine in 2007 to evaluate the durability of the construction.

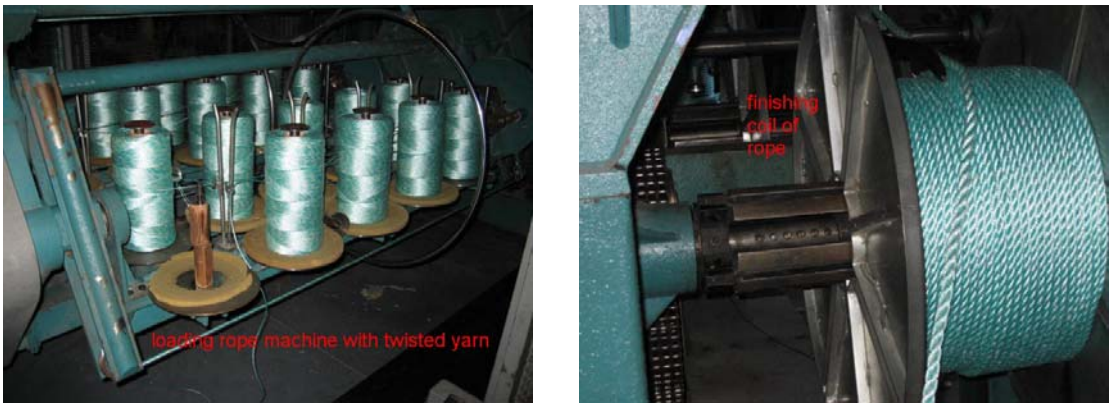


Figure 14. Fabrication process for Anacko sinking groundline made to TTI specifications.

Adjusting the Hauling System to Reduce Groundline Damage

As reported by Tension Technology in their evaluation, a significant portion of the wear seen in groundlines is the result of mechanical damage from the lobster trap hauling system. In order to pull a trawl of lobster traps off the seafloor and onto the boat, the buoylines and groundlines are run through a series of steel components that provide guidance and power. The rope is pulled under tension between two hauling sheaves, which rotate and draw the rope along. A hanging block provides vertical clearance for the trap to be swung on-board, while the fairlead sheave guides the rope into the hauling sheaves. The knife is wedged between the hauling sheaves to eject the rope from the rotating plates. The rope then drops to the deck of the boat. See diagram below for a representation of the hauling system.

These components cause both internal and external damage to ropes. Internal damage is caused by bending around the hauling block and fairlead sheave, and external damage is caused by abrasion over all the components of the hauling system (Tension Technology, 2006). There are several ways of dealing with these sources of wear.

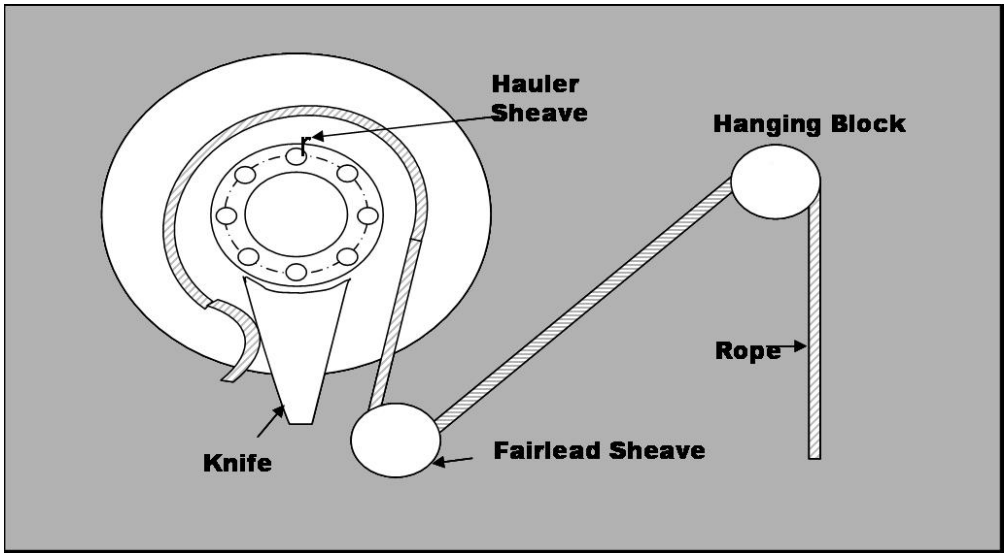


Figure 15. Schematic of lobster trap hauling system

The severity of internal strand-on-strand abrasion is related to the bend radius of the rope over the pulleys. Bending over the hanging block and fairlead sheave creates pressure points inside the line where the strands rub against one another, damaging the rope and reducing its strength. The minimum bend radius depends on the diameter of the line. The pulley diameter should be approximately 5 times the diameter of the rope. The offshore lobster industry uses 5/8-inch rope and often the pulley diameter is less than the minimum bend radius. The service life of groundlines could be improved by increasing the bend radius used in the pulleys. (Personal communication, Hank McKenna, President, Tension Technology).

External damage to ropes from the hauling system is caused by the hauling sheaves, knife, and pulleys. This damage is further worsened as the rope wears grooves into the steel, creating sharp edges that cut the rope fibers. Many industries coat their steel components with plastic polymers, such as polyurethane, to make the steel more durable. In 2006, *MarineFisheries*, AOLA, and Tension Technology worked with Corrosion Control Resources in Texas to make polyurethane treatments for the hauling system. Corrosion Control made polyurethane liners for the hauling sheaves and polyurethane knives. These products were made in different durometers (i.e. the hardness of the material). In 2007 we will test these polyurethane treatments on the simulator to evaluate their impact on rope degradation.

Figure 16. Polyurethane sheave liner and polyurethane knife made by Corrosion Control Resources.

The utility of the simulator extends beyond just testing rope. It can also be used to adjust the components of the hauling system to determine the impact on rope damage and breaking strength. The controlled environment lets us alter certain parts of the hauling system and isolate the impact of these variables. In this laboratory setting under accelerated conditions, we can quickly get answers about how changes to the hauling system might improve rope performance. *MarineFisheries* and the Atlantic Offshore Lobstermen's Association will evaluate the impact of various hauling system components on rope wear during 2007.

Outreach to fishing industry on the results of groundline investigations

Since the start of our groundline investigations in 2003, *MarineFisheries* and AOLA have learned much about the factors affecting the service life of rope. The ultimate goal of our work is to distribute this information to fishermen in order to guide them in purchasing durable and cost-effective whale-friendly rope. We have presented our results to date to the Maine Fishermen's Forum, the Massachusetts Lobstermen's Association, the Large Whale Take Reduction Team, the Right Whale Consortium, and published it in various newsletters. However, as we learn more about the hauling system and continue our investigations, we realize the need for interactive, multi-media links to fishermen. It is our plan to produce pamphlets and videos that demonstrate to fishermen how rope construction, rope materials, and changes to the hauling system can increase the service life of their sinking groundline.

3) REDUCING WHALE ENTANGLEMENT IN FISHING GEAR

Fixed-gear regulations in Massachusetts state waters

The Commonwealth continues to establish pro-active, yet practical, regulations for fixed-gear fisheries in state waters to reduce the risk of entanglement of large whales. More detail on Massachusetts regulations related to protection of North Atlantic right whales can be found within the Code of Massachusetts Regulations (322 CMR 12:00).
http://www.mass.gov/dfwele/dmf/commercialfishing/cmr.htm

In 2006, the Commonwealth continued to pursue ways to broaden the use of non-buoyant groundlines in the fixed gear fishery throughout state waters. In October 2005, a regulatory proposal was put forth to prohibit the use of floating groundline in lobster trawls and gillnets in all Massachusetts state waters year-round. This rule will minimize entanglements of all large whales found in Commonwealth waters. The regulation was approved by the Massachusetts Marine Fisheries Advisory Commission. Effective on January 1, 2007, it became unlawful for any person to fish, store, or abandon any fixed gear in waters under jurisdiction of the Commonwealth with positively buoyant groundline.

Sinking Groundline Compliance Study

** This work was conducted in early 2007 under a NFWF grant extension.*

MarineFisheries initiated a pilot study in 2006 to evaluate compliance with the floating groundline ban which took effect on January 1, 2007. Floating groundline is an entanglement risk for whales and is illegal to use in Massachusetts state waters. This pilot study was meant to assist the Massachusetts Environmental Police in enforcing whale-safe gear regulations. Single beam sonar, the type used in standard fish-finders and depth-sounders on most small vessel, can be used to visualize floating groundline underwater. Fishermen frequently use it to find lost trawls composed of floating groundline because the sonar can pick up the acoustic signal of the rope in the water column. Enforcement officers also have single beam sonar on their patrol vessels, making it possible for them to use the same tool to enforce the floating groundline ban.

MarineFisheries designed a controlled field experiment to examine the acoustic signal produced by sinking and floating groundline, using both single beam and multi beam sonar. We contracted a local fisherman to set two 10-pot trawls – one rigged with floating groundline and the other with sinking groundline. The fisherman monitored the gear while *MarineFisheries* used sonar to visualize the trawls underwater. Our operations took place aboard the *R/V Mya*, a 31-foot *MarineFisheries* vessel. The vessel was equipped with single beam and multi beam sonar. The sinking and floating line trawls were viewed with both sonar types to compare the effectiveness of each tool.

The multi beam unit we used was a Konsberg EM3002 sonar system that operates at 300 kHz. It displays data in three different forms – water column, backscatter, and depth. The swath of data produced by the multi beam is 3x the depth of water. This equipment is typically used for seafloor mapping, habitat mapping, and inspection of underwater infrastructure. The multi beam unit was mounted on an adjustable arm that could be bent over the side of our research vessel.

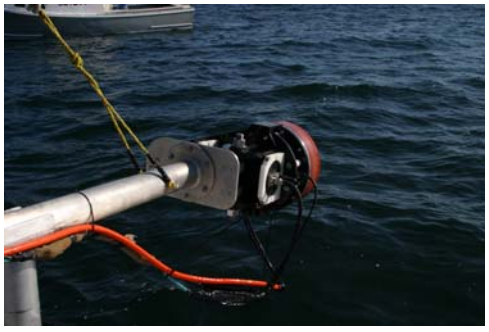


Figure 17. Multi beam transducer on adjustable arm

The single beam sonar transducer is attached to the vessel stern transom. It is typically used to as a depth sounder and fish finder by fishermen and other mariners. The single beam we used operates at 200 kHz. Data is viewed on a screen that scrolls a 30-second history of sonar pings at a time, allowing us to view a continuous string of targets. The single beam does not have recording capabilities, unlike the multi beam unit which archives the data collected. Thus digital photos were taken of the single beam screen images during testing.

We spent approximately 3 hours using both types of sonar to visualize the sinking and floating groundline in the water. While the multi beam depth and backscatter displays clearly showed the lobster pots on the seafloor, the floating groundline was not visible. The water column feature, similar to that used by the single beam, was able to pick up the signal of the floating groundline. Unfortunately, the multi beam viewing software we own does not process the pings in a continuous string in real-time. This analysis must be done in post-processing. On the boat we were only able to see one ping at a time with the floating groundline represented as a single dot. Without the ping history, the signature of the line is indistinguishable from other targets in the water column. The lack of real-time processing of the water column data compromises the use of multi beam as an effective enforcement tool in the field. In addition, we are experiencing difficulties with the multi beam data processing software and are awaiting technical support to conduct post-processing analysis. The multi beam sonar is impractical tool as a real-time enforcement tool due to the complexity of the system, the potential technical difficulties associated with its operation, the high cost of the equipment, and technical expertise required.

In contrast, single beam sonar is found on most vessels, is easy to use, and it did an excellent job of visualizing the groundlines and traps. When the scrolled pings are displayed on the screen, we got a very clear picture of what was underneath us, including the floating groundline arcing up in the water column. We were also able to tell the difference between the height of the floating groundline at slack and running tides.

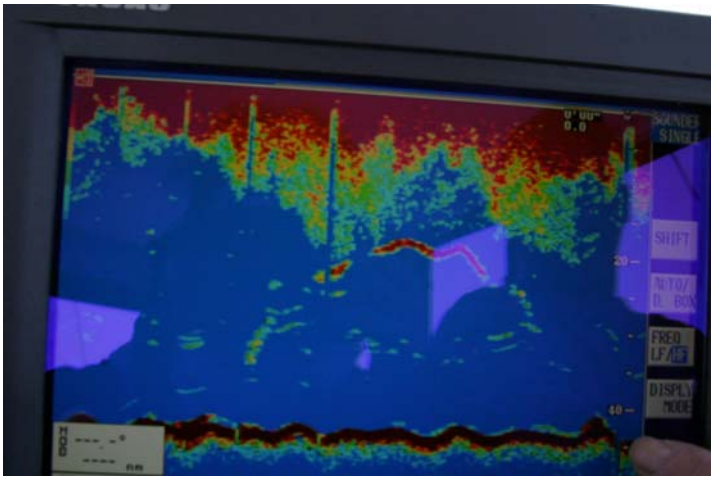


Figure 18. Single sonar image of floating groundline at slack tide, seen as arc in water column.

The use of single beam sonar to visualize floating groundline does require some finesse and patience. There a number of reasons why the gear can be difficult to detect. First, the single beam sonar has only a 10 degree cone, so the swath or footprint is approximately 1/6 the depth of water. For example, in 50 feet of water, your acoustic footprint on the seafloor is an 8.8 foot circle. The sonar cone doesn't provide a wide area of view on any given pass. Second, the transducer location on the vessel's stern transom makes it tough to get right over the top of what you're trying to visualize. Because of this and the narrow sonar swath, it is important to be able to pass the transducer directly over the gear you want to detect. Lastly, because of low visibility in New England waters, the potential location of the groundline must be determined from the orientation of the gear's surface buoys. However, floating groundline is subject to movement by the tides and currents because it is suspended in the water column. The horizontal *and* vertical

location of that groundline, relative to the orientation of the gear, will be affected by the direction of the tide and current. Floating groundlines shifts horizontally in the water column, depending on the direction of the tide. And we also know that the vertical height of floating groundline is lower when the tide or current is running. During scale model studies in the flume tank at Memorial University in Newfoundland, we found that floating groundline height was reduced by half under current conditions of 0.2 knots (Lyman and McKiernan, 2005). We saw this reduced profile on the single beam sonar during these recent investigations.

Despite these constraints and complications, the single beam sonar worked well in identifying floating groundline below the water's surface. It requires practice to use this tool. Vessel operators must understand the gear, the currents, and the swath limits of the transducer. After successfully completing our controlled test trial, *MarineFisheries* has arranged for further field testing on commercial fishing gear while on patrol with the Massachusetts Environmental Police. We will report on the results of these investigations as our work continues.

Sinking Groundline Discussion Forum

In 2006, *MarineFisheries* proposed the creation of a web-based Sinking Groundline Discussion Forum to Commercial Fisheries News, a northeast fisheries newspaper. The forum is meant to give fishermen a venue to exchange information about what sinking groundline brands or configurations are working in their area. Armed with a better understanding of what works and what doesn't work, fishermen can make better rope-buying decisions in order to find a sinking groundline that they can successfully fish in their area.

The seafloor type, tides, and currents vary greatly across New England waters. A groundline type or brand that works well in one habitat might not work as well in another. Many lobstermen in New England have already been fishing sinking groundline, even prior to its use as a whale conservation strategy. Sinking groundline is often necessary in areas where the fishing grounds have space limitations and fishermen's gear is in close proximity to each other. Sinking groundline prevents gear fouling. Cape Cod Bay lobstermen have been required to fish sinking groundline since 2004, due to the resident population of right whales. Other fishermen have switched over because their fishing grounds are frequently subject to federal DAM zones, where floating groundline is prohibited. And, as mentioned earlier, Massachusetts has banned the use of floating groundline in state waters since January 1, 2007. Many of the fishermen mentioned above have had time to determine what sinking groundline types and configurations work for them. They are an invaluable source of information for other fishermen who are now faced with the prospect of switching from floating to sinking groundline.

With this in mind, we envisioned the forum as a "virtual" place where fishermen can discuss sinking groundline success and failure stories in order to make informed rope-buying decisions. On-line discussion forums exist for a variety of consumer products. Due to the new Massachusetts rules and impending federal regulations, many fishermen are in the market for sinking groundline. Fishermen have the ability to share important information with others. MarineFisheries supported the creation of the forum with a $3,000 contract to Commercial Fisheries News. The Sinking Groundline Discussion Forum can be found on the Commercial

Fisheries News website: http://www.fish-news.com/cfn/

Support of the Atlantic Large Whale Disentanglement Network

The Right Whale Conservation Program continues to support the efforts of the Disentanglement Network. Erin Burke, the *MarineFisheries*' Protected Species Specialist, is a Level 2 Network member, trained to actively assist with the location and documentation of entanglements. The Massachusetts Office of Law Enforcement (OLE) has offered to assist disentanglement efforts by providing on-the-water support to respond to reports of entangled whales and transport rescue team members. They have a Joint Enforcement Agreement with the National Marine Fisheries Service.

4) OUTREACH, PUBLIC EDUCATION, AND TRAINING

Throughout 2006 *MarineFisheries'* staff continued public education efforts regarding the Right Whale Conservation Program by meeting with industry groups, fielding calls, and lecturing in public forums. Dan McKiernan (Deputy Director) and Erin Burke (Protected Species Specialist) attended various meetings and trade shows related to large whale conservation and fishing interactions. Formal presentations were given at many of these meeting and shows. In 2006, Erin Burke made public presentations about the RWCP at the Maine Fishermen's Forum, the Right Whale Consortium meeting, and the Large Whale Take Reduction Team meeting. Dan McKiernan serves as a member of the Atlantic Large Whale Take Reduction Team (ALWTRT). In January 2006, an article was written in *Commercial Fisheries News* about the rope durability work conducted by the RWCP. The efforts of the Right Whale Conservation Program were also highlighted in the 2006 Massachusetts State of the Environment. Outreach efforts and articles can be found in Attachment D.

5) ACTION PLAN AND FUNDING SOURCES FOR 2007

MarineFisheries has received $420,000 from the National Marine Fisheries Service to support the Right Whale Surveillance and Habitat Monitoring Program in Cape Cod Bay in 2007. This funding included an allocation to assist in the maintenance of the acoustic surveillance buoys.

In addition, *MarineFisheries* was awarded $163,605 from the National Fish and Wildlife Foundation to conduct activities under the Right Whale Conservation Program. Allocations were included for groundline durability investigations, collaborations with Cornell University on acoustic monitoring of right whales in Cape Cod Bay, outreach efforts, and support for the Protected Species Specialist. Some activities will include the fabrication and deployment of two real-time acoustic Gumby buoys in CCB and the web-based dissemination of right whale detections; and collaborating with the Atlantic Offshore Lobstermen's Association to improve the service life of sinking groundline. Training and outreach will also continue to be a priority for the Right Whale Conservation Program.

MarineFisheries was also awarded a grant ($13,500) from the National Marine Fisheries Service's Marine Debris Program. This grant will cover ghost gear removal in Cape Cod Bay Critical Habitat in collaboration with the Massachusetts Environmental Police.

References

Jaquet et al. 2006. Surveillance, Monitoring and Management of North Atlantic Right Whales in Cape Cod Bay and Adjacent Waters in 2006. Final report submitted to the Division of Marine Fisheries, Commonwealth of Massachusetts, Boston, MA. November 2006.

Report on the analysis of non-buoyant lobster lines – new, used, and machine-tested. Tension Technology International, Weston, Massachusetts. May 2006.

List of Attachments

Attachment A	**Code of Massachusetts Regulations (322 CMR 12.00) -- fishing gear regulations related to right whales.**
Attachment B	**Advisories and notices posted by Commonwealth regarding right whales.**
Attachment C	**Articles on Right Whale Conservation Program activities.**
Attachment D	**Outline of outreach efforts.**

ATTACHMENT A

Code of Massachusetts Regulations – fishing gear regulations related to right whales. State-wide prohibition on floating groundline included (section 12.03).

322 CMR 12.00: NORTHERN RIGHT WHALES

Section 12.01:Purpose 12.02:Definitions 12.03:Surface Floating Line Ban 12.04:Critical Habitat and Adjacent Waters Gear Restrictions during January 1 through April 30 12.05:Gillnet Breakaway Requirements 12.06:Buffer Zone 12.07:Harassment and Harm 12.08:Entanglement Reporting 12.09:Exceptions 12.10:Permit for Surface or Drifting Gillnets 12.11:Critical Habitat Map

12.01 Purpose The northern right whale is the rarest of the world's great whales. Despite international protection by the International Whaling Commission established pursuant to the 1946 International Convention for the Regulation of Whaling and national protection afforded by the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973 the northern right whale is listed as endangered and its population remains dangerously low in the Atlantic.

In response to this threat the Massachusetts Legislature passed a Resolve in 1985 requesting the Department of Fisheries, Wildlife and Environmental Law Enforcement to study the right whale in Massachusetts waters and make recommendations for its conservation. That study recommended, among other measures, a 500 yard buffer zone between right whales and vessels within Massachusetts waters.

The purpose of 322 CMR 12.00 is to: (1) implement the 500 yard buffer zone recommendation and, in addition, prohibit activities of vessels that affect large whales, including right whales within waters under the jurisdiction of the Commonwealth. 322 CMR 12.00 exempts vessels with federal or state Right Whale scientific study permits and commercial fishing vessels in the act of hauling back or towing gear. In addition, 322 CMR 12.00 applies to both commercial and recreational fishermen, but only to the territorial and inland waters of the Commonwealth. (2) minimize the risk of large whale entanglements, including right whales, in waters under the jurisdiction of the Commonwealth.

12.00 ▲

12.02 Definitions For the purposes of 322 CMR 12.00: (1) Bottom or Sink Gillnet means a gillnet, anchored or otherwise, that is designed to be, capable of being, or is fished on or near the bottom in the lower third of the water column. (2) Buffer Zone means an area outward from a right whale a distance of 500 yards in all directions. (3) Cape Cod Bay means the area that encompasses the state waters portion of the Cape Cod Bay Critical Habitat plus an additional area to the west of the Critical Habitat south of a line that runs east and west at 42 [degrees] 05' and that terminates at the Brant Rock shoreline in the town of Marshfield. (4) Critical Habitat means those waters in Cape Cod Bay under the jurisdiction of the Commonwealth that fall within the federally designated critical habitat area listed in the federal Right Whale Recovery Plan and found in 322 CMR 12.11. (5) Double means a two pot string with a single line attached. (6) Fixed Fishing Gear means any bottom or sink gillnets or pots that are set on the ocean bottom or in the water column and are usually connected to lines that extend to the water's surface. (7) Gillnet means anchored, or surface or drifting vertical walls of webbing, buoyed on top and weighted at the bottom, designed to capture fish by entanglement, gilling, or wedging. (8) Groundlines means the lines connecting pots on a pot trawl and lines connecting gillnets to anchors. (9) Harass means to approach, pursue, chase, follow, interfere with, observe, threaten, harm in any fashion, turn in any manner to intercept or attempt to engage in any such conduct. (10) Negatively Buoyant Line means line that has a specific gravity equal to or greater than that of seawater, 1.03, and does not float up in the water column. (11) Positively Buoyant Line means line that has a specific gravity less than that of seawater, 1.03, and floats up in the water column. (12) Pot means any lobster or fish trap placed on the ocean bottom. (13) Pot Trawls or Strings means single pots tied together in a series and buoyed at both ends. (14) Right Whale means that species of marine mammal known as *Eubalaena (Balaena) glacialis*. (15) Single Pots means individual pots buoyed at the surface. (16) To Abandon means to knowingly leave fixed gear in the Critical Habitat during January 1 through April 30 that fails to comply with the gear restrictions in 322 CMR 12.04. (17) To Fish means to use, set, maintain, leave in the water or haul gillnets or pots to harvest, catch, or take any species of fish or lobster. (18) To Store means to leave fixed gear in the water and fail to haul it for more than 30 days. (19) Vessel means any waterborn craft. (20) Weak Buoy Link means a breakable

section or device that will part when subjected to 500 lbs. or less of pull pressure and after parting, will result in a knot-less end, no thicker than the diameter of the line, the so-called "bitter end" to prevent lodging in whale baleen.

12.00 ▲

12.03 Prohibition on Certain Lines in Waters Under Jurisdiction of the Commonwealth. It shall be unlawful for any person to fish, stock or abandon fixed fishing gear with: (1) Lines floating at the water's surface; (2) Positively buoyant groundline; and (3) Buoy lines comprised of positively buoyant line except the bottom portion of the line which may be a section of floating line, not to exceed 1/3 of overall length of the buoy line.

12.00 ▲

12.04 Critical Habitat and Adjacent Waters Gear Restrictions (1) Seasonal Gillnet Closure. It is unlawful to fish, store, or abandon gillnets in Critical Habitat and in waters of Cape Cod Bay west of the Critical Habitat south of 42 [degrees] during the period January 1 through May 15. 322 CMR 12.04 may be amended in a future rulemaking, with notice and opportunity for public comment, if gillnet specifications are developed and demonstrated that will minimize risk of entanglement to right whales (2) Single Pots and Pot Trawls in Critical Habitat. To minimize the number of vertical buoy lines during the period January 1 through May 15, in the Critical Habitat, fishermen may fish them in either multiple pot trawls of four pots or more with vertical buoy lines on each end or may set doubles.

It is unlawful to fish, store, or abandon: (a) (a) single pots, or (b) a trawl with less than four pots with vertical lines on the first and last pot of the trawl. (c) a trawl with four or more pots having other than a single vertical line attached to the first and last pot of the trawl. (d) a double with more than one vertical buoy line. (3) Break-away Buoy Lines Fitted with Weak Buoy Links in Critical Habitat. During January 1 through May 15, all buoy lines attached to trawls or doubles shall be equipped with a Weak Buoy Link along the buoy line. A list of DMF approved weak-buoy links is available from DMF and furnished to fishermen upon request. (4) Special Marking Scheme for Fixed Gear in Critical Habitat. During January 1 through May 15 lobster-gear fished in Critical Habitat shall be marked in accordance with 322 CMR 4.13(3)(d). (5) Modifications. The Director may amend by emergency authority the gear time and area restrictions in response to changes in right whale migrations and distributions. The Director may suspend the fixed gear rules if whales depart the Bay early in the season. If at least three full surveys of Cape Cod Bay are successfully completed after April 1 yielding no right whale sightings, and if corroborating evidence supports whales' departure from the Critical Habitat, the Director may suspend the fixed gear restrictions beginning on April 21 or thereafter. (6) Experimental Fishery Permits for Gear Testing. The Director may issue experimental fishery permits to authorize a person to fish fixed gear that does not conform with the specifications set in 322 CMR 12.00 for the purposes of developing and testing new gear designs to minimize risk of right whale entanglement in Critical Habitat.

12.00 ▲

12.05 Gillnet Breakaway Requirements It is unlawful to fish any gillnet in any waters under the jurisdiction of the Commonwealth unless the net is rigged with the following breakaway features: (1) Knot-less weak link at the buoy with a breaking strength of 600 lbs. (2) Weak links with a breaking strength of up to 1,100 lbs. are installed in the float rope between net panels. (3) Anchoring system for the gillnets must be comprised of one of the following on each end: (a) dead weights weighing at least 50 lbs. (b) anchors with the holding power of at least 22 lbs. Danforth anchor. (c) lead-line weighing at least 100 lb. per 300 ft. for each net panel in the string.

12.00 ▲

12.06 Buffer Zone Except as otherwise provided for in 322 CMR 12.09, it is unlawful: (1) for any vessel to enter a right whale buffer zone, (2) for any vessel to approach or intercept a right whale within a buffer zone; (3) for any vessel not to depart immediately from a buffer zone, or; (4) for any commercial fishing vessel which has completed a haul back, a tow of its gear or otherwise completed its fishing operation and is no longer at anchor not to depart immediately from a buffer zone;

12.00 ▲

12.07 Harassment and Harm It is unlawful for any vessel to harass or to harm any right whale at any time or place.

12.00 ▲

12.08 Entanglement Reporting It is unlawful for any commercial or recreational vessel to fail to report the entanglement of a right whale in its gear or lines.

12.00 ▲

12.09 Exceptions (1) Federal Permit. Any person issued a permit from any federal department, agency or instrumentality having authority to issue permits for the scientific research, observation, or management of the right whale, may conduct the activity authorized by such permit. (2) State Permit. Any person issued a permit in accordance with 322 CMR 7.01(4)(d) for the scientific research, observation, or management of the right whale may

conduct the activity authorized by such permit. (3) Commercial Fishing. Commercial fishing vessels in the act of hauling back, towing gear or engaged in fishing operations at anchor within a buffer zone created by the surfacing of a right whale, may complete the haul, tow or fishing operation provided it does so with a minimum of disruption to the right whale, hauls, tows or conducts it fishing operation in a direction away from the right whale, and departs form the buffer zone immediately after the haul, tow or fishing operation. In no event may 322 CMR 12.09(3) be construed to authorize a commercial fishing vessel to begin to haul, tow or conduct its fishing operation in or into a buffer zone. (4) Disentanglement. (a) To assist federally approved disentanglement efforts for northern right whales, any vessel that reports to the National Marine Fisheries Service, the Division of Environmental Law Enforcement, the Coast Guard, or to designees of those agencies, that it has sighted an entagled right whale may operate in the buffer zone to assist those agencies in locating and tracking the whale if requested to do so by those agencies. (b) Any vessel operating in the buffer zone under 322 CMR 12.06(4) shall: 1. operate so as to minimize disruption to the right whale, and 2. immediately depart the buffer zone once the dientanglement effort begins, or when requested to do so by the agencies or their designees. (c) When conducting activities within the scope of 322 CMR 12.06(4), vessels shall make every effort to comply with 322 CMR 12.00.

12.00 ▲

12.10 Permit for Surface or Drifting Gillnets It is unlawful for any fisherman to fish, store or abandon, surface or drifting gillnets in waters under the jurisdiction of the Commonwealth without a regulated fishery permit issued in accordance with 322 CMR 7.01(4)(a).

Attachment B

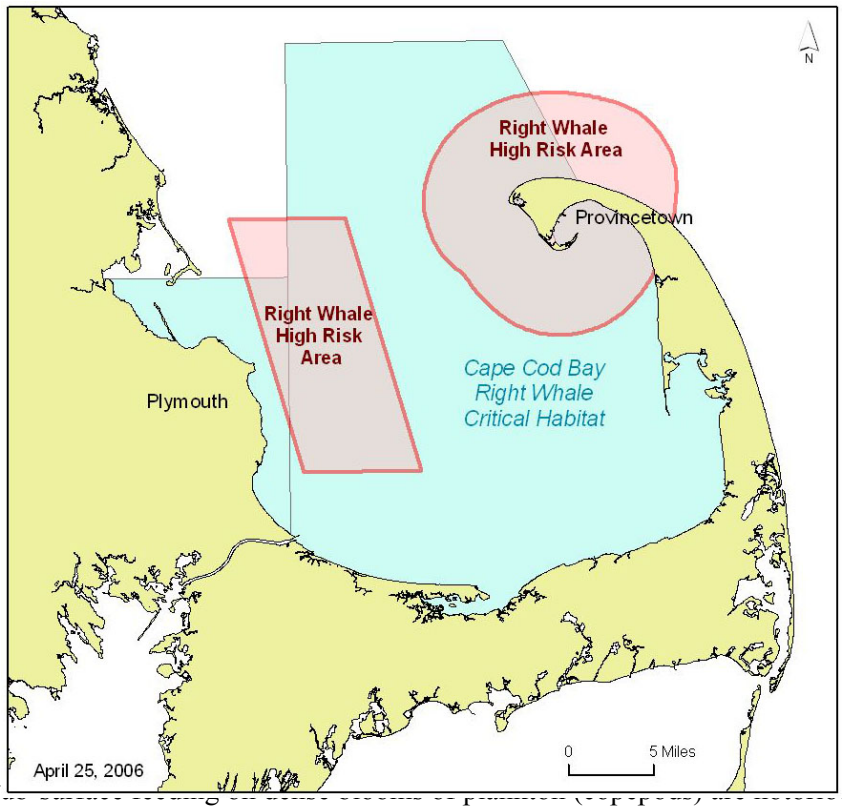
ADVISORIES AND NOTICES POSTED BY THE COMMONWEALTH REGARDING RIGHT WHALES.

April 26, 2006

ADVISORY TO MARINERS

AGGREGATIONS OF RIGHT WHALES IN WESTERN CAPE COD BAY AND RACE POINT AREA

An aggregation of right whales in the western portion of Cape Cod Bay has prompted *MarineFisheries* to issue an advisory to all vessel operators. Operators are advised to reduce speed (as slow as 12 knots), post lookouts, and proceed with caution to avoid colliding with this highly endangered whale. On April 22, the DMF/CCS aerial survey team first reported an aggregation of 10 right whales sub-surface feeding in the western margin of the bay. A bay-wide habitat sampling cruise on April 24 confirmed that plankton patches in this area are stable and extensive. The habitat sampling cruise also confirmed that plankton densities around Race Point are still high enough to support feeding right whales. Last week, an advisory was issued for this area due to an aggregation of 27 feeding right whales. The plankton resources off Race Point and in the western portion of Cape Cod Bay are high enough to support right whale feeding, aggregation, and residency. It is recommended that ships transiting between Cape Cod Canal and Boston use extreme caution. When right whales depart the area, the advisory will be lifted.



Whales that are s[illegible] usly difficult to

detect. Scientists believe feeding right whales may be oblivious to their surroundings, thereby unable to avoid an oncoming vessel. Sub-surface feeding right whales are particularly vulnerable to ship strikes. More vessel traffic is expected in this area over the next few weeks with seasonal increases in recreational and commercial fishing, as well as whale watching, and passenger ship activity. Right whales are the most endangered of the large whales in the western Atlantic Ocean, with a population of only about 350 animals. Ship strikes are believed to be the primary cause of human-induced mortality to the right whale. Vessels are prohibited by state and federal regulations from approaching within 500 yards of a right whale. Massachusetts Environmental Police and U.S. Coast Guard are authorized to enforce the 500-yard rule. The last known ship strike in waters near Massachusetts occurred in April 1999 when a sixty ton, female right whale nick-named "Stacatto" was discovered dead in eastern Cape Cod Bay. Dissection and subsequent necropsy revealed a broken jaw and five broken vertebrae suggesting ship-strike as the cause of death.

Management of maritime activities near right whales is part of the *MarineFisheries* Right Whale Conservation Program. The Right Whale Conservation Program is a cooperative effort between *MarineFisheries* biologists and the Provincetown Center for Coastal Studies (CCS) to study and protect right whales in Cape Cod Bay.
Cape Cod Bay is one of only five known critical habitats for northern right whales, with typically 1/3 of the population utilizing the bay throughout the late winter and early spring. They usually depart the bay by the end of the April for other habitats, notably the Great South Channel Critical Habitat and Bay of Fundy

Real-time monitoring of right whales through vessel and aerial–based surveillance, and forecasting of right whale presence through habitat analysis, makes the Massachusetts Right Whale Conservation Program the most comprehensive of any program throughout the species' range. The presence of whales is also being monitored by Cornell University researchers who use autonomous buoys rigged with hydrophones to listen for the presence of whales around the clock. Right whale "call" counts are communicated back to Cornell and shared with researchers, vessel operators, and fishery managers. Support for the Conservation Program is granted from NOAA Fisheries, the National Fish & Wildlife Foundation., and the Mass. Environmental Trust.

The National Marine Fisheries Service (NOAA Fisheries) has been issuing warnings to mariners and others via the Northern Right Whale Sighting Advisory System (SAS). Participating agencies in the SAS include the Commonwealth's *MarineFisheries* and Environmental Police, the U.S. Coast Guard, the U.S. Army Corps of Engineers (ACOE), CCS, and other research groups. Advisories can be viewed at the NOAA Fisheries Northeast Region web site (www.nero.noaa.gov/ro/doc/whale.htm) and are broadcast over NOAA weather radio (http:// 205.156.54.206/nwr/).

For more information, visit the *MarineFisheries* website at www.mass.gov/marinefisheries or contact Erin Burke (Erin.Burke@state.ma.us, 978 551-0152) or Dan McKiernan (dan.mckiernan@state.ma.us, 617 626-1536). Center for Coastal Studies (www.coastal studies.org) right whale researchers Dr. Charles (Stormy) Mayo and Dr. Nathalie Jaquet can be reached at (508) 487-3623.

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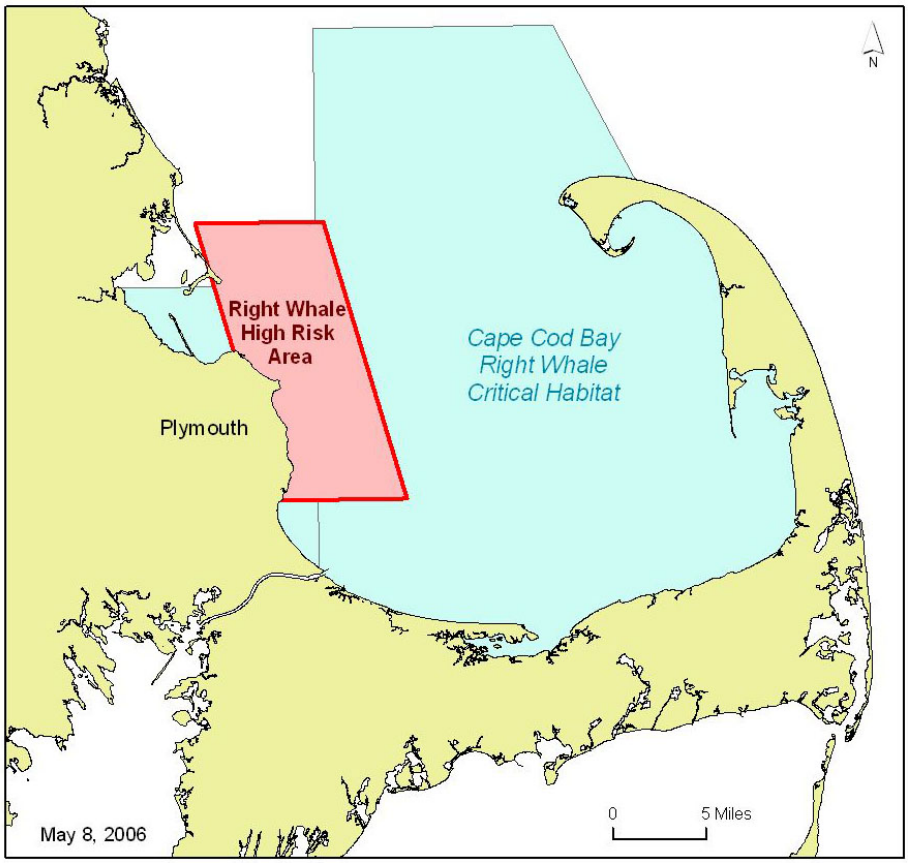
May 9, 2006

ADVISORY TO MARINERS

RIGHT WHALES CONTINUE TO AGGREGATE IN WESTERN CAPE COD BAY

Right whales continue to aggregate and feed in western Cape Cod Bay. The extremely dense zooplankton resource in this area places feeding right whales at an elevated risk of ship strike. *MarineFisheries* issued an initial advisory for this area on April 25, however, the current High Risk Area has been shifted to the west. This corresponds with a change in distribution of the whales and the zooplankton resource, now overlapping with the Cape Cod Canal shipping lanes. Zooplankton surveys indicate that right whales will continue feeding in this area for several days.

MarineFisheries recommends that vessel operators use extreme caution in this area. Reduce speeds (as slow as 12 knots) and post lookouts to avoid colliding with this highly endangered whale. It is recommended that ships transiting between Cape Cod Canal and Boston use extreme caution. The Massachusetts Environmental Police and the Coast Guard have been notified.



OTHER RIGHT WHALE UPDATES

The High Risk Area off Race Point has been suspended. Zooplankton densities are not high enough to support right whale foraging. Thus the risk of ship strike in this area is expected to be low.

In another action, the National Marine Fisheries Service has triggered a DAM closure of an area east of Boston from May 10-24. Lobster trap/pot and anchored gillnet fishing gear in this zone must comply with required gear modifications. http://www.nero.noaa.gov/whaletrp/

A portion of the DAM overlaps with Cape Cod Bay Critical Habitat, which has state-mandated gear regulations. The gear requirements inside the Critical Habitat are still in effect until May 15, after which the DAM requirements will continue in that area until May 24. Setting single pots in state waters will be allowed during this DAM, so long as buoylines are composed of non-buoyant line (except the bottom third) and all buoys have a 600-lb weaklink. It should be noted that setting single pots in Cape Cod Bay Critical Habitat is only allowed after May 15.

More information on gear modifications can be found at the following sites:

Commonwealth of Massachusetts Regulations related to right whales
http://www.mass.gov/dfwele/dmf/commercialfishing/322cmr12.htm#12.03

Atlantic Large Whale Take Reduction Plan gear modifications
http://www.nero.noaa.gov/whaletrp/

If you have any questions, please contact Erin Burke (Erin.Burke@state.ma.us, 978 551-0152) or Dan McKiernan (dan.mckiernan@state.ma.us, 617 626-1536). Center for Coastal Studies (www.coastal studies.org) right whale researchers Dr. Charles (Stormy) Mayo and Dr. Nathalie Jaquet can be reached at (508) 487-3623.

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May 19, 2006

RIGHT WHALE AGGREGATION DEPARTS CAPE COD BAY

ADVISORY LIFTED

Recent survey and monitoring efforts by the Center for Coastal Studies and the Division of Marine Fisheries have determined that the large aggregation of right whales observed in western Cape Cod Bay has departed. The recent period of poor weather conditions prohibited observations of right whales in the Bay; however, the aerial and vessel-based surveillance teams were able to complete surveys on May 18. No right whales were sighted from the aircraft or boat, and habitat monitoring revealed a sharp decline in the zooplankton resource, suggesting that right whale aggregations are not likely to return in the near future.

With the departure of these animals the Commonwealth is lifting the May 9th advisory to mariners in Cape Cod Bay. *MarineFisheries* would like to thank fishermen, whale watch companies, and other

mariners for their assistance and compliance with measures designed to protect this highly endangered animal. During the past month, large aggregations of right whales have been seen feeding in high traffic areas such as Race Point and the Cape Cod Canal Shipping Lanes. *MarineFisheries* monitors the presence of right whales in Cape Cod Bay through aerial surveys, habitat sampling, and acoustic monitoring. Sightings observed through these efforts allow *MarineFisheries* to address threats to right whales on a real-time basis. We greatly appreciate the diligence and alertness of mariners and our surveillance team during the 2006 season.

The National Marine Fisheries Service (NOAA Fisheries) issues warnings to mariners and others through the Northern Right Whale Sighting Advisory System (SAS). Advisories regarding Cape Cod Bay and surrounding waters can be viewed at the NOAA Fisheries Northeast Region web site (http://www.nero.noaa.gov/ro/doc/whale.htm) and are broadcast over NOAA weather radio (http:// 205.156.54.206/nwr/).

For more information, visit the *MarineFisheries* website at http://www.mass.gov/marinefisheries or the Center for Coastal Studies at www.coastalstudies.org.

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ATTACHMENT C

NEWS ARTICLES

Oil Spill Act

The Massachusetts Oil Spill Act (Chapter 251 of the Acts of 2004) was implemented two years ago in response to a major oil spill in Buzzards Bay in 2003, and to address gaps in the existing federal regulatory scheme. The Act accords Buzzards Bay, Vineyard Sound, and Mount Hope Bay the status of "areas of special interest," thereby triggering a range of safeguards for their waters and wildlife.

Among its provisions, the Act requires financial assurance in the amount of $1 billion for vessels transporting 6,000 barrels or more of oil, hazardous material, or hazardous waste; the use of a local pilot and a tug escort to assist in the transit of these vessels through areas of special interest; alcohol and drug testing, enhanced watch, and other crew requirements; assessment of per-barrel-of-oil fees to be used for a range of oil spill prevention and response activities; and creation of a vessel traffic service (VTS) system.

In January 2005, the United States brought suit in U.S. District Court in Massachusetts, seeking to nullify certain provisions of the Act based on claims that they are preempted by federal law. In July 2006 the Court ruled in favor of the United States, enjoining the Commonwealth from enforcing the challenged provisions, including the tug escort requirement. Massachusetts, through the Office of the Attorney General, has appealed the ruling.

Despite the ongoing litigation, MassDEP has continued working cooperatively with the Coast Guard and the U.S. Army Corps of Engineers to establish the VTS system. Through its assessment of Oil Spill Response and Prevention Fees, MassDEP has also provided coastal communities with critical tools for responding to marine spills, including fully equipped emergency response trailers.

Conservation Programs Aim to Protect Threatened Right Whale Population

The western North Atlantic is home to more right whales than anywhere else in the Northern Hemisphere, but this population has dwindled to only about 300 individual whales. Recent models predict that under current conditions, these magnificent creatures will be extinct in less than 200 years.

For the last eight years, the Division of Marine Fisheries has conducted a vital program aimed at protecting right whales in Massachusetts waters through research, management, and public education efforts. During spring and winter, DMF and the Provincetown Center for Coastal Studies conduct the Right Whale Surveillance and Habitat Monitoring program in Cape Cod Bay, collecting information on seasonal trends in population demographics, habitat usage, and distribution and abundance patterns.

Another important project, being conducted jointly with the Atlantic Offshore Lobstermen's Association and rope manufacturers, focuses on the development of durable non-buoyant groundline (line that connects lobster traps) to reduce the risk of large whales becoming entangled in it. Starting on January 1, 2007, floating groundline will be prohibited in all Massachusetts state waters.

Photo taken pursuant to NOAA Fisheries Permit 633-1483 under the authority of the U.S. Endangered Species and Marine Mammal Protection Act

Offshore lobster industry tests sinking rope

GLOUCESTER, MA - The ideal sinking groundline for the offshore lobster fishery has yet to be found, but a cooperative research project has produced some preliminary results that could be a step in the right direction.

In preparation for anticipated federal right whale protection regulations banning the use of float rope in groundlines, the Massachusetts Division of Marine Fisheries (DMF) and the Atlantic Offshore Lobstermen's Association (AOLA), in cooperation with the National Marine Fisheries Service (NMFS), fishermen, and a number of cordage companies, have been working since August 2003 to test the durability of different brands of sinking rope.

In July 2005, DMF published a report on the laboratory portion of the project. Among the brands of rope that stood up best to rigorous testing were Everson 5/8", Portuguese 4-strand, and Orion Ropeworks - Orco.

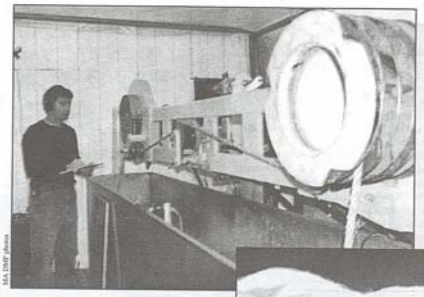
The actual top-ranked line in terms of breaking strength was Orion Ropeworks - Hoverline. However, this brand does not meet NMFS criteria for being a nonbuoyant line.

These results are only the first phase of the project. Lobstermen are now field testing the top-ranked lines to see how they hold up under actual fishing conditions.

Project principals also expect manufacturers will use the durability information to create new, stronger sinking rope, and DMF plans to machine test any new or improved nonbuoyant rope provided by the cordage industry.

And DMF and AOLA have engaged a rope engineer to perfect the line testing system and to look at a whole new trap-trawl hauling system that could substantially lengthen rope life.

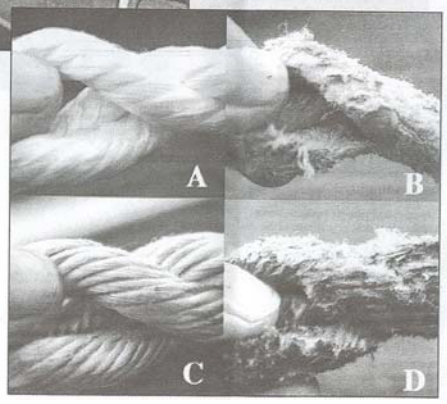
"We're still looking for an optimal product but, from our point of view, we're



MA DMF photos

At left, phase one of the rope project used the line-testing machine to simulate and accelerate some of the long-term wear and tear on trap trawl lines. Here a test loop of line runs on the machine.

Below, two examples of how lines looked before and after line testing on the machine. A) Line 1 before, B) Line 1 after; C) Line 2 before, and D) Line 2 after.



projects has been provided by NMFS and the National Fish and Wildlife Foundation.

Groundline arcs

All of this work has been prompted by the steady advancement of federal regulations to reduce the risk of entanglement to endangered whales.

"DMF's position has been that the most effective strategy to reduce entanglement is to lower the profiles of groundlines by prohibiting the use of floating line in that portion of the gear," the agency said in the report, adding that "the use of nonbuoyant line should be practical and safe for fishermen."

DMF has been studying how lobster gear behaves underwater since 1997 using underwater remote operated vehicles and data mini-loggers placed on the gear. Much of that work was conducted by Ed Lyman, DMF's former protected species specialist who has since left the agency to work in a whale research program based

ATTACHMENT D

2006 OUTREACH EFFORTS OF THE RIGHT WHALE CONSERVATION PROGRAM

Date	Event	Location	Topic
Feb 2-5	Mass. Lobstermen's Assoc. Annual Meeting	Hyannis, MA	Booth and poster on DMF gear work
Feb 14	Meeting with inshore and offshore lobstermen	Gloucester, MA	Non-buoyant groundline durability
Mar 2-4	Maine Fishermen's Forum	Rockland, ME	Presented on rope work
Mar 14-15	Endangered Species Act Section 6 meeting	Washington DC	Presented on conservation efforts
Mar 27	Meeting at Cape Cod Hook Fishermen's Assoc.	Chatham, MA	Inshore groundline issues
May 10	Meeting at New England Aquarium	Boston, MA	Coordinating regional rope work
May 23	Atlantic Offshore Lobstermen's Assoc. meeting	Westport, MA	Update on status of rope project
May 25	Sea turtle disentanglement training session	New Bedford, MA	Train DMF staff
June 7-9	Consortium for Wildlife Bycatch Reduction meeting	Hull, MA	Attended
Aug 5	Salem Maritime Festival	Salem, MA	Operate booth on whale conservation
Aug 12-19	New England Aquarium field station	Lubec, ME	Assist in right whale research
Oct 3	Harbor Porpoise Take Reduction outreach meeting	Gloucester, MA	Attended
Nov 8-9	Right Whale Consortium Meeting	New Bedford, MA	Presented on groundline durability
Dec 6-8	ALWTRT Meeting	Virginia Beach, VA	Presented on whale/gear research