Draft Atlantic Pelagic Longline Take Reduction Plan

Submitted on behalf of the Atlantic Pelagic Longline Take Reduction Team

to the

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Department of Commerce

Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

Deliberations Facilitated

by

Scott McCreary, Ph.D. and Eric Poncelet, Ph.D.
CONCUR, Inc.
1832 Second Street
Berkeley, CA 94710
concur@concurinc.net
www.concurinc.com

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Dedication

The Atlantic Pelagic Longline Take Reduction Team dedicates this Draft Take Reduction Plan to the memory of Nelson Beideman, a.k.a. "Hammer." A former longline fisherman and Executive Director of Blue Water Fishermen's Association, Nelson was relentless in his efforts to represent the views of working commercial fishermen in both national and international arenas. He was a primary force in promoting the use of circle hooks by longline fishermen to reduce injuries to sea turtles and was equally committed to finding solutions for reducing bycatch of marine mammals. Over the course of the Teams' meetings, Nelson ensured that team members had a solid understanding of the gear and operations of the pelagic longline fishery so as to craft management measures that were most likely to be effective in reducing marine mammal bycatch, while not unduly impacting the fishery. He was resolute in his negotiations but always open to other perspectives. His spirited involvement in every aspect of the development of the Plan was instrumental in crafting a consensus document.

Nelson died a week before this Draft Plan was to be submitted to NMFS. His death was a shock to the Team, the fishery, and especially to his family and friends. As noted by his colleagues, the fishery lost their firm hand on the tiller the day Nelson passed away. The Team will remain committed to his ideas and will endeavor to implement the Plan in his absence.

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Executive Summary

The goal of the Atlantic Pelagic Longline Take Reduction Plan (TRP or Plan) is to reduce, within five years of its implementation, serious injuries and mortalities of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), and Risso's dolphins (*Delphinus delphis*) in the Atlantic pelagic longline fishery to insignificant levels approaching a zero mortality and serious injury rate—i.e., where such impacts by all fisheries that interact with each stock totals less than 10% of the "Potential Biological Removal" levels[1] (PBR) established for those stocks.

Impetus and Scope of the Plan

The impetus for this plan is a 2003 settlement agreement between the National Marine Fisheries Service (NMFS) and the Center for Biological Diversity (CBD), that required the convening of a Take Reduction Team (the Pelagic Longline Take Reduction Team, or PLTRT) under the Marine Mammal Protection Act (MMPA) by June 30, 2005, to address bycatch of short-and long-finned pilot whales and common dolphins in the Atlantic pelagic longline fishery[2].

The western North Atlantic stocks of all three species were identified as strategic[3] stocks at the time of the settlement agreement, although only the two pilot whale stocks had recent observed serious injuries and mortalities attributed to the longline fishery. The 2005 U.S. Atlantic and Gulf of Mexico Stock Assessment Report (Waring *et al.* 2006) now lists long- and short-finned pilot whales as non-strategic and indicates that serious injuries and mortalities in the pelagic longline fishery are primarily limited to the Mid-Atlantic Bight. Within the past five years, there have been no observed serious injuries or mortalities of common dolphins in the pelagic longline fishery; this stock was reclassified as non-strategic in the 2005 Stock Assessment Report, based on estimates of serious injuries and mortalities in both the pelagic longline fishery as well as other observed fisheries.

Although not included in the settlement agreement, Risso's dolphins also sustain serious injuries and mortalities incidental to the Atlantic pelagic longline fishery. For both Risso's dolphins and pilot whales, estimated serious injury and mortality levels in the pelagic longline fishery exceed the insignificance threshold but do not exceed the Potential Biological Removal level for the stock. The average combined annual serious injury and mortality incidental to the pelagic longline fishery is 86 pilot whales (CV=0.16, years 2001-2005); the PBR for western North Atlantic pilot whales is 239. The average annual serious injury and mortality incidental to the pelagic longline fishery is 34 Risso's dolphins; the PBR for western North Atlantic Risso's dolphin is 124. Because these species are below PBR and considered non-strategic stocks, NMFS directed the Team to develop and submit a draft Plan to the Secretary within 11 months, in accordance with the mandates of the MMPA.

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[1] The potential biological removal (PBR) is the maximum number of animals, not including natural mortalities, that may be removed annually from a marine mammal stock while still allowing that stock to reach or maintain its optimal population level.

[2] In addition, the 2003 settlement with CBD required convening a Take Reduction Team to address pilot whale and other marine mammal bycatch in certain Atlantic trawl fisheries by September 2006.

[3] A strategic stock is one in which direct human-caused mortality exceeds the potential biological removal level for that stock; which is listed as a threatened or endangered species under the Endangered Species Act of 1973; or, which is declining and likely to be listed as a threatened or endangered species within the foreseeable future.

Context—Marine Mammal Interactions with the Atlantic Pelagic Longline Fishery

A variety of complex factors provide the context for the development of this TRP. These include: (1) evolving knowledge regarding impacts of pelagic longline fishery on short- and long-finned pilot whales; (2) the nature of marine mammal interactions with the fishery; and (3) changes in the dynamics of the pelagic longline fishery over the last several years.

Impacts of the Pelagic Longline Fishery on Pilot Whales

Short- and long-finned pilot whales are difficult to distinguish in the field because of similarities in size, form, and coloration. Therefore, references in NMFS Stock Assessment Reports to date have been made to the combined species, *Globicephala* spp., with respect to both population size and serious injury and mortality due to commercial fishing. The ability to distinguish between the two pilot whale species is particularly relevant for the pelagic longline fishery, as the distributions of the two pilot whales species are thought to overlap along the mid-Atlantic coast of the U.S. between 35° and 39°N., which is the same area where the majority of interactions with the pelagic longline fishery are observed. During the course of the Team's deliberations, NMFS did not have sufficient information to determine the impacts of the pelagic longline fishery on each species separately. However, NMFS expects that this information will be available in time for the next Stock Assessment Report.

The Nature of Interactions with the Fishery

The nature of interactions between the pelagic longline fishery and long- and short-finned pilot whales is not well understood. Pilot whales, like other marine mammals, have been observed to prey on longline bait and/or catch. Pilot whales may perceive catch on longline gear as an easy foraging opportunity, thus increasing the risk of serious injury and mortality to these animals. Depredation may also result in loss of catch and bait, damage or loss of gear, and loss of time fishing, leading to increased vessel costs for the fishermen.

Observed types of injuries on pilot whales and Risso's dolphins include hooks inside or imbedded in the mouth as well as entanglements in gear or trailing gear. These are considered by NMFS to be serious injury because they are likely to lead to mortality. In the pelagic longline fishery, NMFS makes serious injury determinations on a case-by-case basis after reviewing observer data. These determinations are based on guidelines generated from a NMFS workshop in 1997. For small cetaceans, including pilot whales and other delphinids, it was concluded that animals that had ingested hooks, were released with significant amounts of trailing gear, were swimming abnormally, or had suffered some obvious severe external trauma should be considered seriously injured. Conversely, animals hooked externally or released without trailing gear and swam away normally should not be considered seriously injured. The Team stressed the importance to NMFS of reviewing the serious injury guidelines, taking into account incentives for fishermen to disentangle or de-hook animals to reduce serious injury.

Changes in the Dynamics of the Atlantic Pelagic Longline Fishery

The U.S. Atlantic pelagic longline fishery has experienced significant change over the past decade. In 2005, there were approximately 94 active vessels in the U.S. fishery, reflecting a

decrease from a high of 501 active vessels in 1994. Most recently, a suite of measures designed to reduce bycatch or bycatch mortality have been implemented, including time/area closures, gear and safe handling and release requirements for sea turtle interactions, and the switch from traditional "J" hooks to circle hooks, also to reduce interactions with sea turtles. The domestic pelagic longline fleet is also fishing within the context of a broader international pelagic longline fishery. While the U.S. fleet comprises less than 10% of the longline fishing effort in the Atlantic Ocean and adjacent waters, foreign vessels use similar gear and fishing practices and most certainly interact with pilot whales, Risso's dolphins, and potentially other marine mammals. The Team recognizes that, ultimately, the best way to manage trans-boundary stocks is within an international framework and that successful U.S. management measures should be "exported" to foreign fleets.

Convening of the PLTRT

In accordance with the MMPA and the settlement agreement, NMFS convened the PLTRT in June 2005, and held four professionally facilitated meetings and two full-team conference calls between June 2005 and May 2006. During these meetings, the Team heard presentations on abundance and serious injuries/mortalities of pilot whales and Risso's dolphins, descriptions and regulatory structure of the pelagic longline fishery, and analyses of observer data. In addition, the PLTRT was presented with a predictive model that analyzed a number of variables (e.g., environmental factors, gear types, etc.) to determine which variables may be useful in predicting and/or minimizing interactions between marine mammals and longline gear, and possible impacts on target species catch and bycatch of other protected species (i.e., sea turtles).

The predictive model proved to be an invaluable tool for the Team to develop management strategies, since multiple variables could be tested and evaluated. For pilot whales, variables found to have significant correlations included area (81% of interactions occur along the Mid-Atlantic Bight), distance from the 200m isobath (all interactions were observed within 40km of 200m isobath), water temperature (peak interactions occur between 70-80º F), mainline length (interactions were twice as high in sets with mainline lengths > 20nm) and swordfish damage (interaction rates were three times higher in sets with damage to swordfish catch). For Risso's dolphins, similar results were found, although correlations were not as strong. Interactions with Risso's dolphins were also significantly correlated with the Northeast Coastal area and with sets that used squid as bait.

Each meeting also included facilitated discussions to draft and revise various components of the TRP, with emphasis placed on management and research recommendations. On June 8, 2006, the Team reached consensus on the draft TRP including recommendations for management strategies and additional research needs, thus meeting the statutory requirements of the MMPA.

The Team also agreed to include Risso's dolphins in the TRP, with initial focus on those management measures that have the greatest potential for reducing bycatch of pilot whales, and primarily in the Mid-Atlantic Bight area where the greatest level of pilot whale bycatch occurs. The Team anticipates that several of the measures recommended by the Team to reduce serious injury and mortality for pilot whales will also reduce serious injury and mortality for Risso's dolphins. The Team will revisit, as necessary, possible different and/or additional management measures to reduce serious injury and mortality of Risso's dolphins and pilot whales to insignificant levels as new information becomes available about the nature of the fishery's

interactions with these species as well as the stock structure of pilot whales. The Team also recognizes that there is an increasing trend in serious injury and mortality of pilot whales since 2003 and recommends that interactions continue to be tracked closely.

Major Elements of the TRP

The Team recommends a suite of management strategies to reduce mortality and serious injury of pilot whales and Risso's dolphins in the Atlantic pelagic longline fishery. The following four measures are to be implemented via regulation:

(1) Establish a Cape Hatteras Special Research Area, an area defined to capture hot spots of bycatch and a concentration of fishing effort, with the following approximate coordinates: southern boundary = 35 degrees N, northern boundary = 36 degrees 25 minutes N, western boundary = 75 degrees W, and eastern boundary = 74 degrees 35 minutes W. Vessels fishing in this area: must be capable of carrying observers and must carry an observer, if requested by NMFS; must be willing and able to participate in any NMFS-approved research related to the TRP; and must maintain daily communications with other vessel captains fishing in this area;
(2) Set a 20 nautical-mile upper limit on mainline length for all pelagic longline sets within the Mid-Atlantic Bight;
(3) Develop and publish an informational placard that must be displayed in the wheelhouse and the working deck of all active pelagic longline vessels in the Atlantic fishery;
(4) Develop and implement a mandatory certification program to educate owners and operators of pelagic longline vessels about ways to reduce serious injury and mortality of marine mammals;

The Team also recommends implementing the following non-regulatory measures:

(5) Provide for 12-15% observer coverage throughout all Atlantic pelagic longline fisheries that interact with pilot whales or Risso's dolphins;
(6) Encourage vessel operators throughout the fishery to maintain daily communications with other local vessel captains regarding protected species interactions, with the goal of identifying and exchanging information relevant to avoiding protected species bycatch;
(7) Update careful handling/release guidelines, equipment, and methods; and
(8) Distribute quarterly reports of bycatch of marine mammals in the pelagic longline fishery to the Team.

The logistic regression model estimates a reduction in pilot whale interactions of approximately 26% when fishermen in the Mid-Atlantic Bight are limited to longlines <20 nautical miles in length (measure 2 above). This figure assumes 50% compensation in fishing effort for lost hooks by longline fishermen, which PLTRT members considered a reasonable scenario. PLTRT members believe the other recommended management measures, when combined with the mainline length restriction, would result in additional reductions in pilot whale interactions.

The Team also recommended additional short-, medium-, and long-duration research and data collection designed to bolster the success of the Plan. The Team recommends that priority be given to: (1) research on species that are closest to or exceed PBR; (2) research to evaluate the effects of implemented management measures in this Plan, and (3) research on species specific abundance, mortality, and post-hooking survivorship. The Team also recommends that, as funds

become available for pelagic longline take reduction-related research, a subgroup of the Team be convened to advise on selection of research projects.

TRP Implementation and Next Steps: An Adaptive Management Approach

This TRP uses an adaptive management-based, stepwise approach to achieving its goals. The Team recommended reconvening by teleconference approximately six months after submittal of the Plan. In conjunction with the receipt of quarterly bycatch reports, the Team agreed to periodically assess the merits of convening future PLTRT meetings, either in-person or as teleconferences. At each of these meetings, the Team will evaluate the effectiveness of the TRP and make adjustments to it, as appropriate, to ensure that the goal of the plan will be met within 5 years of implementation of the TRP.

Draft Atlantic Pelagic Longline Take Reduction Plan

I. MMPA Statutory Requirements and Establishment of Atlantic Pelagic Longline Take Reduction Team

A. Requirements of the Marine Mammal Protection Act

The 1994 amendments to the Marine Mammal Protection Act (MMPA), section 118, established directives and timelines for the development of Take Reduction Plans to reduce mortality and serious injury (bycatch) of marine mammals incidental to commercial fishing operations. The immediate goal of a Take Reduction Plan for a strategic stock[4] is to reduce, within 6 months of the plan's implementation, the mortality and serious injury of marine mammals incidental to commercial fishing to levels less than the Potential Biological Removal (PBR) level[5] established for that stock. The long-term goal of a Take Reduction Plan is to reduce, within 5 years of the plan's implementation, the mortality and serious injury of marine mammals incidental to commercial fishing to insignificant levels approaching a zero rate (commonly referred to as the Zero Mortality Rate Goal, ZMRG).

Take Reduction Plans must include a review of the information available in marine mammal stock assessment reports (SARs) and any substantial new information that may have become available since the publication of the most recent SAR. Such information should include, but is not limited to, an estimate of the total number and, if possible, age and gender, of animals from the stocks that are being incidentally killed or seriously injured each year during the course of commercial fishing operations. Plans must also include recommended regulatory or voluntary measures for the reduction of incidental mortality and serious injury, and recommended dates for achieving the specific objectives of the plan.

Take Reduction Teams are established by the Secretary[6] to develop draft Take Reduction Plans. Members of Take Reduction Teams must have expertise regarding the conservation or biology of the marine mammal species that the take reduction plan will address, or the fishing practices that result in the incidental mortality and serious injury of such species. Members include representatives of Federal agencies, each coastal state that has fisheries that interact with the species or stock, appropriate Regional Fishery Management Councils, interstate fisheries commissions, academic and scientific organizations, environmental groups, all commercial and recreational fisheries groups and gear types that incidentally take the species or stock, Alaska Native organizations or Indian tribal organizations, and others as the Secretary deems appropriate. In addition, take reduction teams must, to the maximum extent practicable, consist of an equitable balance among representatives of resource user interests and non-user interests.

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[4] A strategic stock is one in which direct human-caused mortality exceeds the potential biological removal level for that stock; which is listed as a threatened or endangered species under the Endangered Species Act of 1973; or, which is declining and likely to be listed as a threatened or endangered species within the foreseeable future.

[5] The potential biological removal (PBR) is the maximum number of animals, not including natural mortalities, that may be removed annually from a marine mammal stock while still allowing that stock to reach or maintain its optimal population level.

[6] Secretary refers to the Secretary of Commerce, whose authority for implementation of the Marine Mammal Protection Act has been delegated to the National Marine Fisheries Service (NMFS).

Take reduction teams are not subject to the Federal Advisory Committee Act, and meetings of the teams are open to the public with prior notice of the meetings made public in a timely fashion.

Draft Take Reduction Plans are developed by consensus. In the event consensus cannot be reached, the take reduction team must advise the Secretary in writing on the range of possibilities considered by the team, and the views of both the majority and minority.

The timelines specified for the development of Take Reduction Plans vary depending on the status of the stocks affected. Strategic stocks are subject to a slightly more accelerated timeline for the development of plans as compared to non-strategic stocks. Take reduction teams that are addressing incidental mortality and serious injury of strategic stocks have 6 months to submit a draft Take Reduction Plan to the Secretary; for non-strategic stocks, the MMPA directs the team to submit a draft plan within 11 months.[7] The Secretary takes the plan into consideration and, within 60 days of receipt of the team's draft plan, the Secretary publishes it in the Federal Register, along with any changes proposed by the Secretary and proposed implementing regulations. Take Reduction Plans are available for public comment for a period not to exceed 90 days. The Secretary issues the final Take Reduction Plan and implementing regulations within 60 days of the close of the public comment period. After the final plan is published, the team will reconvene periodically[8] to monitor the implementation of the final TRP, and can recommend changes to the plan as necessary until the Secretary determines that the objectives of the plan have been met.

B. Scope of the Plan

Species focus

A 2003 settlement agreement between NMFS and the Center for Biological Diversity resulting from a Federal suit filed in California mandated the agency to convene a Take Reduction Team by June 30, 2005, to address bycatch of long-finned pilot whales (*Globicephala melas),* short-finned pilot whales (*Globicephala macrorhynchus*), and common dolphins (*Delphinus delphis*) in the Atlantic pelagic longline fishery. The western North Atlantic stocks of all three species were identified as strategic at the time of the settlement agreement, although only the two pilot whale stocks had recent observed serious injuries and mortalities attributed to the longline fishery[9]. Because the two pilot whale species are difficult to distinguish in the field, population size, serious injury, and mortality are estimated for the two pilot whale stocks together. The 2005 SAR (Waring *et al*. 2006) lists long-finned and short-finned pilot whale stocks as non-strategic,

[7] In the event that a Take Reduction Team does not submit a draft plan to the Secretary within the timeframe required, the Secretary shall publish the proposed plan and implementing regulations within 8 months of the team's establishment for strategic stocks, and within 13 months of the team's establishment for non-strategic stocks.
[8] Every 6 months for strategic stocks, and annually for non-strategic stocks, or at such other times as deemed necessary.
[9] The 2002 SAR identified the annual estimate of serious injury and mortality of pilot whales (combined for long- and short-finned pilot whales) in the longline fishery as 108, total annual fishery-related mortality and serious injury as 199, and PBR as 103. The annual estimate of serious injury and mortality of common dolphins in the longline fishery was identified in the same document as 0, total annual fishery-related mortality and serious injury as 375, and PBR as 227. (Waring *et al*. 2002).

and indicates that serious injuries and mortalities in the pelagic longline fishery are primarily limited to the Mid-Atlantic Bight (defined at 50 CFR 635.2 as an area bounded by straight lines connecting the mid-Atlantic states of New Jersey, Delaware, Maryland, Virginia, and North Carolina's internal waters and extending to 71° W. long. between 35° N. lat. and 43° N. lat). There have been no recent (i.e., within the last 5 years) observed serious injuries or mortalities of common dolphins in the pelagic longline fishery, and the species is not listed as strategic based on estimates of serious injuries and mortalities in other fisheries (Waring *et al*. 2006).

NMFS announced the establishment of the Team on June 22, 2005, in the Federal Register (70 FR 36120). At that time, the Team was directed to address the incidental mortality and serious injury of short and long-finned pilot whales in the mid-Atlantic region of the Atlantic pelagic longline fishery, and to prepare a draft Take Reduction Plan for these non-strategic stocks within 11 months of the Team's establishment. Common dolphins were removed from the discussion due to the lack of recently observed serious injuries or mortalities in the pelagic longline fishery.

During the Team's discussions, NMFS noted that there are serious injuries and mortalities of Risso's dolphins (*Grampus griseus*) incidental to the Atlantic pelagic longline fishery (NMFS 2004, Waring *et al*. 2006). Estimated serious injury and mortality levels exceed the insignificance threshold[10] for Risso's dolphins as well as for long- and short-finned pilot whales. Therefore, NMFS requested that the Team include recommendations to reduce serious injuries and mortalities of Risso's dolphins, as well as long and short-finned pilot whales, in their draft Take Reduction Plan. The Team agreed to include Risso's dolphins in the plan, but to initially focus on management measures that would have the greatest potential for reducing bycatch of long- and short-finned pilot whales, and primarily in the area where the greatest level of pilot whale bycatch occurs (i.e., the Mid-Atlantic), keeping in mind that the range and bycatch of all three species extends beyond the Mid-Atlantic. The Team chose this approach because the estimate of serious injury and mortality for pilot whales is closer to PBR than is the estimate for Risso's dolphins. The Team anticipates that several of the measures recommended by the Team to reduce serious injury and mortality for pilot whales will also reduce serious injury and mortality for Risso's dolphins. The Team will revisit, as necessary, possible different and/or additional management measures to reduce serious injury and mortality of Risso's dolphins and pilot whales to insignificant levels as new information becomes available about the nature of the fishery's interactions with these species as well as the stock structure of pilot whales.

The 2006 proposed MMPA List of Fisheries (71 FR 247, January 4, 2006) identifies several other species of marine mammals that have been observed as seriously injured or killed incidental to the pelagic longline fishery, including Atlantic spotted dolphin (*Stenella frontalis*), bottlenose dolphin (*Tursiops truncatus*), Cuvier's beaked whale (*Ziphius cavirostris*), Mesoplodon beaked whale (*Mesoplodon* spp.), pantropical spotted dolphin (*Stenella attenuata*), and pygmy sperm whale (*Kogia breviceps*) (see also Garrison 2005, Garrison and Richards 2004, Garrison 2003, Yeung 2001, Yeung 1999, and Johnson et al. 1999). With the exception of pygmy sperm whales, all of these species are incidentally seriously injured or killed at a level that is below the insignificance thresholds for these stocks. Although the estimated annual serious injury and mortality of 6 pygmy sperm whales in the longline fishery is greater than the

[10] The insignificance threshold is defined as 10% of a stock's Potential Biological Removal level [69 FR 43338, July 20, 2004].

PBR calculated for pygmy and dwarf sperm whales (*Kogia sima*) together[11] (PBR = 4.7 for *Kogia* spp.), that estimate is based on only one observed serious injury in the past five years (in 2000). The Team noted that pygmy sperm whales are not listed as threatened or endangered under the ESA, or depleted under the MMPA, and frequently strand along the southeastern U.S. (Waring *et al*. 2006). The Team agreed that reducing serious injuries and mortalities of pygmy sperm whales incidental to the longline fishery would not be a mandatory objective of the take reduction plan. However, the Team anticipates that the management measures created under this Take Reduction Plan will contribute to a reduction in pygmy sperm whale bycatch.

Fisheries focus

The focus of the Take Reduction Plan is the U.S. Atlantic pelagic longline commercial fishery, targeting swordfish, tuna, and shark (see description in Section V.A.). Although the Team briefly discussed other U.S. fisheries that may have serious injuries and mortalities of pilot whales and Risso's dolphins, such as trawl, gillnet, and recreational fisheries, as well other non-HMS pelagic longline fisheries, such as the Atlantic dolphin/wahoo fishery and the directed large coastal shark fishery, the Plan does not include recommendations for reducing bycatch in these other fisheries (see Appendix D for a description of other domestic fisheries that may interact with pilot whales and Risso's dolphins). However, some of the management and research recommendations contained in this Plan could help to reduce serious injuries and mortalities of marine mammals if also implemented in other fisheries.

C. Goal of the Plan

The overall goal of the Atlantic Pelagic Longline Take Reduction Plan (TRP or Plan) is to reduce, within five years of its implementation, serious injuries and mortalities of pilot whales (*Globicephala* spp.) and Risso's dolphins in the Atlantic pelagic longline fishery to insignificant levels approaching a zero mortality and serious injury rate (i.e., <10% of PBR). In developing the TRP, the MMPA directs the Team to take into account the economics of the fishery, available technology, and existing state or regional fishery management plans.[12]

NMFS shall consider the goal of the Plan to have been achieved if either:

- **Across fisheries:** The serious injuries and mortalities of pilot whales and Risso's dolphins are reduced to below the insignificance threshold for these stocks, recognizing that other fisheries also have takes of these species and the insignificance threshold needs to be met for the species as a whole; or,

- **Within this fishery:** Further reductions in serious injuries and mortalities of pilot whales and Risso's dolphins in the pelagic longline fishery is determined by NMFS to be infeasible, after considering the economics of the fishery, the availability of existing technology, and existing fishery management plans. If this is the case, NMFS, in

[11] As is the case for pilot whales, pygmy and dwarf sperm whales are difficult to distinguish in the field, so population size, serious injury, and mortality is estimated for the two stocks together.
[12] In the case of the Atlantic pelagic longline fishery, the management authority for highly migratory species in the Atlantic (tunas, swordfish, and sharks) was transferred to the Secretary of Commerce. Therefore, fishery management plans for highly migratory species are Secretarial plans, rather than Council, state or regional plans. The Secretary has delegated authority for management of highly migratory species to NMFS.

consultation with the Team, will monitor technological advances and the economics of the fishery and will reconvene the Team to recommend additional measures to reduce bycatch, if it is deemed that there is new technology available and/or additional reductions could be made in an economically feasible manner.

The Team agreed to take an adaptive management-based, stepwise approach to achieving the goal of the TRP. This TRP lays out a series of management measures designed to make an initial significant contribution to reducing serious injury and mortality. The TRP also includes a research program for assessing current and potential new management measures. The Team agreed to evaluate the success of the TRP at periodic intervals over the next five years and retained the option of revising the Plan based on the results of ongoing monitoring, research, and evaluation. See section IX of the TRP for a more detailed description of this adaptive management approach.

D. The Role of the Facilitator in the Take Reduction Plan Process

NMFS contracted with CONCUR, Inc. (Berkeley, CA) to facilitate team meetings and to assist in logistical arrangements of team meetings. In its role as facilitator, CONCUR was responsible for: contacting potential team members, conducting confidential stakeholder interviews, maintaining a list of all members and their contact information, preparing meeting agendas, planning and facilitating team meetings, working with the team to establish ground rules, guiding and summarizing the deliberations, and synthesizing key results at periodic junctures in meetings. In addition, CONCUR prepared Key Outcomes Memoranda as a concise record of each meeting, posted team work products on a secure website, identified and arranged for appropriate meeting venues and lodging for team members, reimbursed team members for travel expenses, maintained open communications with team members, and ensured timely submission of a draft Take Reduction Plan to NMFS.

E. Establishment of the Take Reduction Team

The selection of team members followed guidance provided by section 118 of the MMPA. NMFS strove to select an experienced and committed team with a balanced representation of stakeholders. Members of the Take Reduction Team include fishermen and representatives of the Atlantic pelagic longline fishing industry, environmental groups, marine mammal biologists, fisheries biologists, and representatives of the Mid-Atlantic Regional Fishery Management Council, the Marine Mammal Commission, and NMFS.

Team members participated in a stakeholder assessment conducted by CONCUR prior to the first meeting of the team. Based on these interviews, CONCUR concluded that TRT members were willing to work together and shared the goal of reducing the bycatch of marine mammals. TRT members recognized that there would be some challenges in producing a consensus-based Take Reduction Plan, given their diverging interest on some issues. However, they also shared many common interests. Most importantly, they all agreed that incidental take of marine mammals is not in the interest of any of their organizations. This realization gave impetus to the ambitious work plan, which called for TRT members to work together in pursuit of mutual gains to devise common ground solutions within the given timeframe.

Members of the Atlantic Pelagic Longline Take Reduction Team (PLTRT) are listed below in alphabetical order. Complete contact information for team members is provided in Appendix A.

Atlantic Pelagic Longline Take Reduction Team Members:

Nelson Beideman, Blue Water Fishermen's Association
Jim Budi, former longline fisherman
Victoria Cornish, NMFS, Southeast Region
Jean Cramer, Thunder Mountain Consulting
Brendan Cummings, Center for Biological Diversity
Glenn Delaney, Blue Water Fishermen's Association
Damon Gannon, Mote Marine Laboratory
Beth Lowell (who replaced Charlotte Gray Hudson), Oceana
Gail Johnson, Fishing Vessel Seneca
David Kerstetter, University of Miami
Jessica Koelsch, The Ocean Conservancy
Kristy Long, NMFS, Office of Protected Resources
Bill McLellan, University of North Carolina Wilmington
Dan Mears, Fishing Vessel Monica
Vince Pyle, Fishing Vessel Carol Ann
Scott Rucky, Fishing Vessel Dakota
Rich Seagraves, Mid-Atlantic Regional Fishery Management Council
Mike Simpkins, Marine Mammal Commission
Nina Young, ORCAS Consulting
Sharon Young, Humane Society of the United States

NMFS Advisors:

Lance Garrison, Southeast Fisheries Science Center
Laura Engleby, Southeast Regional Office
Kate Wells, Southeast Regional Office
Charlie Bergmann, Southeast Fisheries Science Center
Karyl Brewster-Geisz, Office of Sustainable Fisheries, Highly Migratory Species
Dennis Lee, Southeast Fisheries Science Center
Mark Minton, Northeast Regional Office
Karen Raine, NOAA General Counsel for Enforcement and Litigation, Southeast Region
Patricia Rosel, Southeast Fisheries Science Center
Cheryl Scannell, NOAA General Counsel's Office, Protected Resources Law
John Watson, Southeast Fisheries Science Center
John Barylsky, Office of Law Enforcement
David Bernhart, Southeast Regional Office
Diane Borggaard, Northeast Regional Office
Alexa Cole, NOAA General Counsel for Enforcement and Litigation
Guillermo Diaz, Southeast Fisheries Science Center
Tanya Dobrzynski, Office of Protected Resources
Tom Eagle, Office of Protected Resources
Karl Gleaves, NOAA General Counsel
David Gouveia, Northeast Regional Office
Brian Hopper, Northeast Regional Office
Dave Johnston, Pacific Islands Fisheries Science Center

Juan Levesque, Southeast Regional Office
Richard Merrick, Northeast Fisheries Science Center
Deb Palka, Northeast Fisheries Science Center
Michael Payne, Office of Protected Resources
Alicia Van Atta, Pacific Islands Regional Office
Chris Yates, Pacific Island Regional Office

United States Coast Guard Advisor:
Katie Moore

Facilitators:
Scott McCreary, CONCUR, Inc.
Eric Poncelet, CONCUR, Inc.

II. Distribution, Stock Structure, and Abundance of Pilot Whales and Risso's Dolphins

A. Data Sources

The primary source of data used in determining the abundance, distribution, and stock structure of long and short-finned pilot whales and Risso's dolphins are aerial and ship surveys. The Southeast Fisheries Science Center (SEFSC) and the Northeast Fisheries Science Center (NEFSC) both conducted abundance surveys in the summer of 2004 (which also satisfied the California court order). The SEFSC conducted a vessel survey from June 22 to August 19, 2004, covering waters from 50 m deep seaward to the U.S. EEZ, from the Maryland/Delaware border into southern Florida. The NEFSC conducted a vessel survey from June 23 to July 12, 2004, covering waters from 100 m deep to the Gulf Stream, from Virginia to Cape Cod. The NEFSC also conducted an aerial survey from June 12 to July 12, 2004, which extended from the state border between Virginia and North Carolina to the Bay of Fundy, and from the U.S. Atlantic shoreline to the entrance of the Gulf of St. Lawrence. The aerial survey covered continental shelf waters to the 100m isobath in the mid-Atlantic, Georges Bank, and the Gulf of Maine (Palka 2006).

Biopsy samples were collected on vessel surveys conducted in 2004 and 2005 for genetic analyses to identify species and investigate stock structure. Additional biopsy samples were also available from previous NMFS surveys, as well as from stranded animals and animals incidentally taken by commercial fisheries in the Northwest Atlantic U.S. EEZ; no samples were available from animals taken incidental to the pelagic longline fishery.

B. Survey Methodology

The aerial and ship surveys employ distance sampling to estimate the abundance of cetaceans in the survey area (Buckland *et al*. 2001). Distance sampling is a widely used methodology for estimating the density and/or abundance of biological populations. Garrison provided a description of how the distance sampling methodology is used to estimate abundance of marine mammals, as well as survey results, to the PLTRT at the June 2005 meeting. In brief, an observer or a team of observers stationed on a vessel or aircraft survey randomly placed tracklines, searching for animals or clusters of animals. For each animal (or cluster of animals) detected, the observers record the bearing and distance to the sighting, and these measures are used to calculate the perpendicular distance to the trackline. The principal assumption of distance sampling is that the ability of observers to detect animals decreases with distance from the trackline in a predictable manner. Based on the number of observations recorded at each distance, one can model the decline in detection probability with distance and adjust the overall count of observed animals (or clusters) to correct for those missed within the surveyed strip. Several other critical assumptions of this approach include that distances are measured accurately or are at least not biased, animals are randomly distributed with respect to the trackline, and group sizes of animals are estimated accurately. In standard distance analysis, it is assumed that all animals on the trackline are observed. For marine mammal surveys, however, this assumption results in a known negative bias in abundance estimates. This results both from animals that are available to the observers but are missed and because some unknown proportion of marine mammals are submerged and not available to be seen by observers. To correct for this known bias, a direct

estimate is made of the probability of detecting animals on the track line (g(0)) using two independent observer teams (Buckland *et al*. 2001).

Both the NEFSC and SEFSC surveys employed methods during shipboard and aerial surveys to estimate g(0). For shipboard surveys, two visual observer teams simultaneously collected sighting data and operated independently of each other (Palka 2006, SEFSC unpublished data). This dual team approach, in which the proportion of sightings seen by one team was compared to that seen by the other, provides data to directly estimate g(0).

For aerial surveys, *g(0)* was estimated using the Hiby circle-back data collection method (Hiby 1999). The circle-back method modifies standard single-plane line-transect methods by circling back and re-surveying a portion of the track line. The "leading" legs are the legs that initiated the circle-back, and the "trailing" legs are the portions of track line that are re-surveyed. Again, the proportion of sightings for which an animal or group of animals were seen on the track line during the leading legs but not the trailing legs provides an estimate of g(0).

C. Methodology for Genetic Analysis

DNA was extracted from pilot whale samples collected from strandings, bycatch, and remote skin biopsy effort using a standard protocol (Rosel and Block 1996). The mitochondrial DNA control region was targeted during extractions because preliminary data determined that it could reliably distinguish between the two pilot whale species. To identify each sample to species, a phylogenetic tree was constructed. In this tree, the two species form separate, well supported groupings. To identify which group corresponds to which species, sequences from known long- and short-finned pilot whales(collected from stranded animals identified to species by experts) were included in the analysis. This allowed the identification of all the collected samples to species. One sample collected from a dead, stranded neonate, identified in the field as a pilot whale, turned out to be a Risso's dolphin calf. All other samples were pilot whales.

D. Distribution and Stock Structure

Pilot Whales

Long-finned pilot whales are distributed world wide in cold temperate waters in both the Northern (North Atlantic) and Southern Hemispheres. In the North Atlantic, the species is broadly distributed and thought to occur from 40° to 75°N in the eastern North Atlantic and from 35° to 65°N in the western North Atlantic (Abend and Smith 1999). Short-finned pilot whales are also distributed world wide in warm temperate and tropical waters. In U.S. waters of the Atlantic, this species is found in the Gulf of Mexico (GOM) and in the western North Atlantic as far north as the central Mid-Atlantic Bight. Both species tend to favor the continental shelf break and slope, as well as other areas of high relief, but are also present offshore in pelagic environments. In the western North Atlantic, they may be associated with the Gulf Stream north wall and with thermal fronts (Waring *et al*. 1992).

The two species are difficult to tell apart during visual abundance surveys and therefore, in many cases, reference is made to the combined species, *Globicephala* spp. Due to this difficulty, the exact species' boundaries for short-finned and long-finned pilot whales in the western North

Atlantic have not been clearly defined. However, their distributions are thought to overlap along the mid-Atlantic coast of the U.S. between 35° and 39°N (Payne and Heinemann 1993, Bernard and Reilly 1999).

To more clearly define the degree of overlap of the two species in the mid-Atlantic, NMFS conducted a genetic analysis on biopsy samples and samples collected from animals incidentally taken by commercial fisheries in the mid-Atlantic region. Samples analyzed included 194 samples from long-finned pilot whales and 167 samples from short-finned pilot whales (Northwest Atlantic only with an additional 47 analyzed from the Gulf of Mexico). DNA sequence data was collected to identify each sample to species and then ArcGIS was used to plot sample locations and examine areas of overlap. Long- and short-finned pilot whales show a distinct difference in preference for deep water, which may reflect differences in water temperature preferences. Long-finned pilot whales were found on the continental shelf and especially along the shelf break, but did not show evidence of going deeper than the shelf break. Short-finned pilot whales were present on the shelf, especially south of Cape Hatteras, along the shelf edge and in deeper water east of the shelf break (Rosel, unpublished data). No long-finned pilot whale samples were found south of 38°N except for three strandings in North Carolina. These strandings may represent aberrant animals or animals that floated farther south after dying. However, biopsy samples from the winter are needed to determine the southern limit of long-finned pilot whale's winter distribution in the mid-Atlantic region. No short-finned pilot whales were identified north of 40°N; nor east of 71.5°W in the Mid-Atlantic Bight. Because of fairly complete sampling north of 40°N in winter and summer, this may be a fairly good indication that this species is not regularly found north of this latitude. The greatest area of overlap in distribution of the two species seems to be confined to an area along the shelf edge between 38°N and 40°N in the Mid-Atlantic Bight, where long-finned pilot whales are present in winter and summer and short-finned pilot whales are present at least in summer. Further sampling will help determine 1) whether short-finned pilot whales are present in this area during winter, and 2) whether long-finned pilot whales are present farther south, and during what periods.

In addition, the genetic analyses revealed that long-finned pilot whales have extraordinarily low genetic variability in the mitochondrial control region, but that short-finned pilot whales have a slightly higher level of variability at that gene region. These low levels of genetic variability are consistent with what has been seen in other cetaceans with matriarchal social structures such as killer whales and sperm whales.

Population structure for neither long-finned nor short-finned pilot whales in the North Atlantic is well known. For short-finned pilot whales, there is no available information on whether the North Atlantic stock is subdivided into smaller populations. Several indirect and directed studies on long-finned pilot whales indicate that there is some degree of population differentiation within the North Atlantic. Mercer (1975) examined population dynamics of long-finned pilot whales in Newfoundland waters and noted that depletion of pilot whales due to the Newfoundland drive fishery in the 1950s did not coincide with any reduction of long-finned pilot whale landings in the drive fishery of the Faroe Islands, suggesting the existence of two or more demographically independent populations in the North Atlantic.

Similarly, Bloch and Lastein (1993) performed a discriminant analysis on morphometric characters measured from long-finned pilot whales collected in Newfoundland and Faroe Islands drive fisheries. Significant differences were found between pilot whales in these two areas, with

pilot whales in Newfoundland having significantly longer skulls and shorter bodies. In addition, Newfoundland male pilot whales had significantly longer flippers. The authors suggested that the thermal front between the North Atlantic-Irminger current and the East Greenland-Labrador current may provide a physical barrier to dispersal, thereby isolating pilot whales in these two areas and allowing differentiation to arise. They further suggested that, since this front reaches and follows the mid-Atlantic ridge southwards, it may segregate long-finned pilot whales on either side of the Atlantic basin.

Abend and Smith (1995) examined stable isotope ratio differences between long-finned pilot whales sampled in Cape Cod, MA, the mid-Atlantic Bight and the Faroe Islands. Significant differences in nitrogen stable isotope values in different tissue types suggested that the pilot whales in the western and eastern North Atlantic are feeding at different trophic levels, at least in the short and medium term. Using teeth as a proxy for longer-term inferences, significant differences were found between the mid-Atlantic and Faroe samples, but not between Cape Cod and Faroe samples. In addition, differences in isotope ratios in blubber between the mid-Atlantic Bight and Cape Cod suggested these animals were feeding in different areas as well. However, caution should be exercised when interpreting these data because of extremely small sample sizes (three female whales from a single mass stranding event on Cape Cod, three female whales taken in the same haul of a mackerel trawl in the Mid-Atlantic Bight, and three female whales from different pods taken in the pilot whale drive fishery of the Faroe Islands).

Abend and Smith (1999) also thoroughly reviewed all available location information (sightings, strandings, bycatch and harvest reports) and inferential data (prey preferences and distributions, oceanographic processes) for long-finned pilot whales in the North Atlantic. Their conclusions regarding the geographic distribution of the species in the North Atlantic support previously published distributions. However, they concluded the distributional data provide evidence neither for nor against a single population in the Atlantic.

Most recently, Fullard *et al.* (2000) examined eight nuclear microsatellite markers in long-finned pilot whales from Cape Cod, MA, West Greenland, the Faroe Islands and the United Kingdom. Using standard estimates of population subdivision (F_{ST}), pairwise comparisons of the Faroe Islands to Cape Cod, the Faroe Islands to West Greenland, and the West Greenland to Cape Cod were all significantly different from each other, revealing significant genetic heterogeneity and some degree of population subdivision within the North Atlantic. Differentiation was highest between West Greenland and the other three sites suggesting that this population may be isolated from the others in the North Atlantic, perhaps due to an ecological difference between cold West Greenland waters and warmer Gulf Stream waters stretching across the Atlantic. It should be noted however, that pairwise comparisons of Cape Cod to locations in the eastern Atlantic showed significant differentiation, suggesting that there may be population differentiation across the Atlantic as well.

Although genetic and morphometric data, which are perhaps the best indicators of population identity, show population heterogeneity among long-finned pilot whales in the North Atlantic, neither the number of nor the geographic ranges of these smaller populations are known.

Risso's Dolphin

Risso's dolphins occur world wide in warm temperate and tropical waters roughly between 60°N

and 60°S, and records of the species in the western North Atlantic range from Greenland south, including the Gulf of Mexico (Kruse *et al.* 1999). In the U.S. Atlantic EEZ, the species is most commonly seen in the mid-Atlantic Bight shelf edge year round and is rarely seen in the Gulf of Maine (Waring *et al.* 2004). Risso's dolphins are pelagic, preferring waters along the continental shelf edge and deeper, as well as areas of submerged relief such as seamounts and canyons (Kruse *et al.* 1999). There is no information available on population structure for this species.

E. MMPA Stock Definitions

Under the MMPA, NMFS is required to define stocks of marine mammals in U.S. waters using the best available data. For both pilot whale species and Risso's dolphins, NMFS defined a western North Atlantic and a Gulf of Mexico stock, primarily due to the ecological differences between the two regions. Biological data to definitively define stocks within U.S. waters for these species is lacking. While pilot whales from the western and eastern North Atlantic may constitute a single population, most studies to date find some degree of differentiation across the Atlantic (Bloch and Lastein 1993, Mercer 1975, Abend and Smith 1995, Fullard *et al*. 2000). Information on movements and interbreeding for these species also is lacking, as are up-to-date abundance and fishery-mortality estimates outside the U.S. EEZ. As a result of this lack of information, NMFS estimates PBR, abundance, and mortality only for the populations of these species that occur within the U.S. EEZ, consistent with the Guidelines for Assessing Marine Mammal Stocks (GAMMS; Wade and Angliss 1997) and the MMPA. NMFS nevertheless recognizes that these limited range population and PBR estimates are minimum estimates, and that the best approach is to manage trans-boundary stocks within an international framework.

F. Abundance Estimates

At the first meeting of the PLTRT, NMFS presented information from the draft 2005 SAR for both pilot whales and Risso's dolphins. This information was revised and finalized before the Team submitted its plan to NMFS. Therefore, the information included in this section and the next reflect the abundance estimates and PBR levels from the final 2005 SAR (Waring *et al.* 2006).

Pilot Whales

The total number of pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although estimates from selected regions of the habitat do exist for select time periods (see Waring *et al*. 2006 for a complete summary). Observers at sea cannot reliably distinguish long- and short-finned pilot whales visually. As a result, sightings of pilot whales are not identified to species and resulting survey estimates are considered joint estimates for both species. The best available estimate for *Globicephala* spp. in the U.S. EEZ is the sum of the estimates from the summer 2004 U.S. Atlantic surveys, 31,139 (Coefficient of Variation, or CV=0.27), where the estimate from the northern U.S. Atlantic is 15,728 (CV=0.34), and from the southern U.S. Atlantic is 15,411 (CV=0.43) (Waring *et al*. 2006). This joint estimate is the most recent available, and the surveys have the most complete coverage of the species' habitat (although the PLTRT recognized that this estimate was limited to the U.S. EEZ). For *Globicephala* spp., the minimum population estimate, which accounts for uncertainty in the best estimate (Wade and Angliss 1997), is 24,866.

A previous survey of pilot whales in the western Atlantic Ocean was conducted during the summer of 1998. The best estimate for pilot whales that came out of the 1998 survey was 14,524 (CV = 0.30, Waring *et al.* 2004). The estimate for the northern U.S. Atlantic was 9,800 (CV = 0.34), while the estimate from the southern U.S. Atlantic was 4,724 (CV = 0.30). There were important differences in the methods between the 2004 and 1998 surveys. First, the 2004 survey in the southern Atlantic included a significant amount of effort along the shelf break in the mid-Atlantic. This area was poorly covered during the 1998 survey due to both a uniform survey design and poor weather conditions. The majority of pilot whale sightings in 2004 were observed in this area, and it is therefore likely that the 1998 estimates were negatively biased. Second, the 2004 survey in the southern Atlantic and the 2004 aerial survey in the northern Atlantic were corrected for g(0), whereas these 1998 surveys were not corrected for this known negative bias. It is possible that there was an actual increase in the abundance of the species in the surveyed areas between 1998 and 2004. However, the majority of the apparent increase is likely the result of these methodological differences.

Risso's Dolphin

Total numbers of Risso's dolphins off the U.S. or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods (Waring *et al.* 2006). Sightings of Risso's dolphins are almost exclusively in the continental shelf edge and continental slope areas. The best available estimate for Risso's dolphins in the U.S. EEZ is the sum of the estimates from the summer 2004 U.S. Atlantic surveys, 20,479 (CV =0.59), where the estimate from the northern U.S. Atlantic is 15,053 (CV =0.78), and from the southern U.S. Atlantic is 5,426 (CV =0.540) (Waring *et al.* 2006). This joint estimate is the most recent available, and the surveys have the most complete coverage of the species' habitat (although the PLTRT recognized that this estimate was limited to the U.S. EEZ). The minimum population estimate for the western North Atlantic Risso's dolphin is 12,920.

A previous survey of Risso's dolphins in the western Atlantic Ocean was conducted during the summer of 1998. The best estimate for Risso's dolphins that came out of the 1998 survey was 29,110 (CV = 0.29, Waring *et al.* 2004). The estimate for the northern U.S. Atlantic was 18,631 (CV = 0.35), while the estimate from the southern U.S. Atlantic was 10,479 (CV = 0.51). The abundance estimate from the 1998 surveys for Risso's dolphins was higher than that for the 2004 surveys, in particular for the southern U.S. component of those surveys. There were fewer Risso's dolphin sightings, particularly off the coast of Georgia and northern Florida, in the 2004 surveys despite a similar amount of survey effort in this region. It is possible that environmental variability or other factors are responsible for the apparent differences in the spatial distribution and abundance of Risso's dolphins.

G. Potential Biological Removal Level

Potential Biological Removal (PBR) is the product of minimum population size (in this case, of the portion of the stock surveyed within the U.S. EEZ), one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3., 16 U.S.C. 1362). The maximum productivity rate for both pilot whales and Risso's dolphin is 0.04, the default value for cetaceans (Barlow *et al.*

1995). The "recovery" factor, which provides greater protection for endangered, depleted, or threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is 0.48 for both species because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997), and because both stocks are of unknown status. The PBR for the western North Atlantic *Globicephala* spp. is 239, and the PBR for the western North Atlantic Risso's dolphin is 124.

III. Serious Injuries and Mortalities Incidental to the Pelagic Longline Fishery

A. Data Sources and Methodology

The main sources of data estimating mortalities and serious injuries (bycatch) of marine mammals incidental to the pelagic longline fishery are the Pelagic Observer Program (POP) and fishery logbooks. Observer data have been collected since 1992, and logbook data have been reported since the mid-1980s.

Observers are responsible for recording information such as: set locations and times, gear types, target species catch, protected species bycatch, and detail on interactions with fishing gear. Observer effort is allocated randomly among eleven geographic areas (Figure 1) and quarter-years based upon reported fishing effort (Garrison, 2005). Vessels selected for coverage are required to notify NMFS prior to each fishing trip to determine whether they need to carry an observer for that trip (50 CFR 635.7). The POP then either assigns an observer to the vessel or provides a waiver for that trip. This fishery has been monitored on a mandatory basis with 3-6% observer coverage, in terms of sets observed, since 1992. The target annual coverage since 2002 has been 8% of the total reported sets. Between 2001 and 2005, the average percent observer coverage in the Mid-Atlantic Bight, where most marine mammal interactions were observed, was 6.5% of reported hooks. The average percent observer coverage for the Northeast Coastal area was 3.2% for this same period.

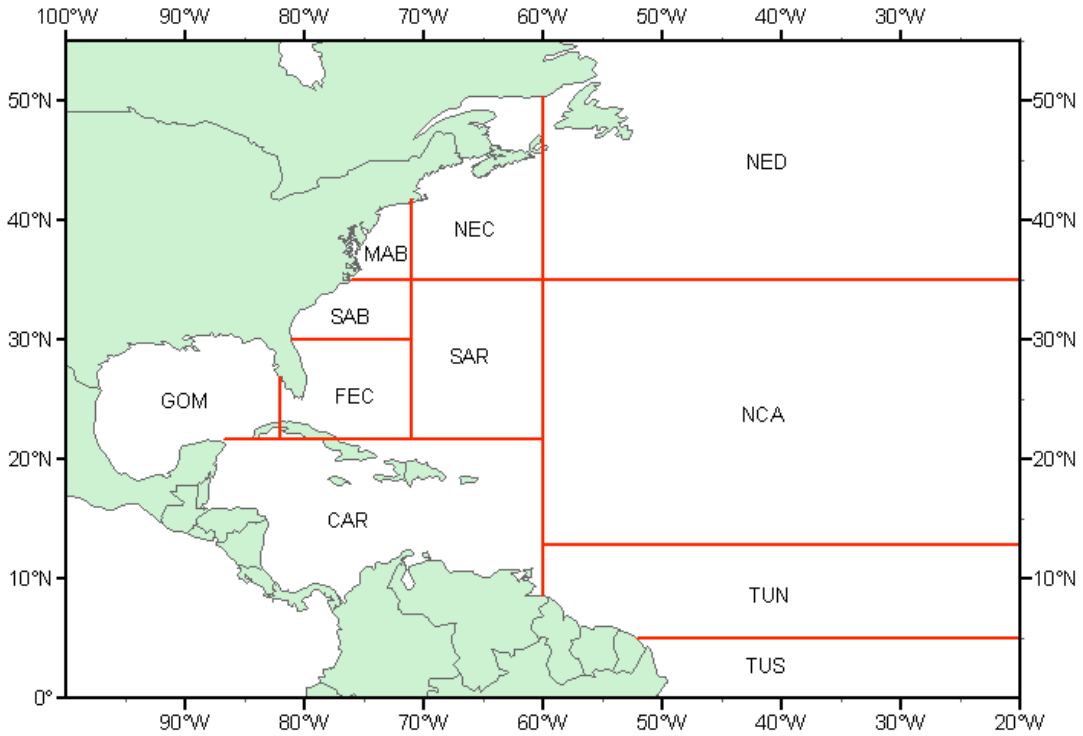

Figure 1. Map designating the eleven areas used in analysis of the swordfish logbook data. Locations of areas are as follows: 1 - Caribbean (CAR), 2 - Gulf of Mexico (GOM), 3 - Florida East Coast (FEC), 4 - South Atlantic Bight (SAB), 5 - Mid Atlantic Bight (MAB), 6 - Northeast Coastal (NEC), 7 - Northeast Distant (NED), 8 - Sargasso (SAR), 9 - North Central Atlantic (NCA), 10 - Tuna North - (TUN), and 11 - Tuna South (TUS). Source: Southeast Fisheries Science Center Sustainable Fisheries Division.

The mandatory fishery logbook system requires vessel operators to report fishing effort, gear characteristics, and target species catch.

Combined data from these two sources have been used to generate annual estimates of marine mammal bycatch (see Garrison 2005, Garrison and Richards 2004, Garrison 2003, Yeung 2001, Yeung 1999, and Johnson et al. 1999 for a detailed accounting of bycatch estimates by year). Serious injury and mortality rates (per 1000 hooks) are quantified based on observer data by year, fishing area, and quarter. The estimated serious injury and mortality rate is then multiplied by the total fishing effort (number of hooks) reported by fishermen in logbooks to obtain estimates of total serious injuries and mortalities for each marine mammal species (Garrison 2005).

Serious Injury Determinations

Serious injury determinations are made based on observer comments and descriptions of mammal interactions with the gear. Serious injury is defined as an injury that is likely to lead to mortality (50 CFR part 229.2). A workshop of NMFS scientists and managers and external experts was convened in 1997 to evaluate the types of injuries occurring in commercial fisheries and develop guidelines for determining when a marine mammal observed interacting with commercial fishing gear was seriously injured (Angliss and DeMaster 1998). For small cetaceans, including pilot whales and other delphinids, it was concluded that animals that had ingested hooks, were released with significant amounts of trailing gear, were swimming abnormally, or had suffered some obvious severe external trauma should be considered seriously injured (Angliss and DeMaster 1998). Conversely, animals that were hooked externally or were released without trailing gear and swam away normally should not be considered seriously injured. In many cases, the exact location of a hook that is inside or near the mouth cannot be determined because the animal is released or breaks free (usually with trailing line) before it is brought close enough to the boat for clear observation. For the pelagic longline fishery, NMFS makes serious injury determinations on a case-by-case basis after reviewing the observations and comments of fishery observers (Garrison 2005). In particular, any animal that appears to have a hook somewhere inside its mouth, which could include hooks imbedded in the mouth or swallowed, is considered to be seriously injured. In addition, animals released with greater than 4 ft. of trailing gear or with entangling gear still on the body are considered seriously injured.

During the PLTRT meetings, NMFS staff reported the agency's aspiration to convene a workshop in the late fall 2006 timeframe to re-examine the serious injury guidelines for marine mammals. Team members expressed their support for this workshop, noting that any change in the serious injury guidelines may have an impact on future estimates of serious injuries of pilot whales and Risso's dolphins.

Representativeness of Observer Coverage

The estimation of serious injury and mortality levels from observer data assumes that observer data are representative of actual fishery bycatch rates, and logbook data represents actual fishing effort. However, each quarter, some percentage of vessels selected by NMFS does not carry observers. Concerns regarding safety or accommodations have limited the pool of sampled vessels,

possibly affecting the program's ability to achieve a random sample. In order for NMFS to accurately monitor levels of serious injury and mortality of marine mammals in the pelagic longline fishery, and hence, monitor the effectiveness of the final pelagic longline TRP, data collected by observers must be representative of both fishing effort and catches. Representativeness of the sample is critical not only for obtaining accurate (i.e., unbiased) estimates of bycatch, but also for collecting information about factors that may be important for mitigating bycatch (NMFS 2004d).

If certain vessels are routinely exempted from observer coverage because they do not meet the safety or accommodations requirements, the observer data may be biased (i.e., not representative of actual fishing effort). Analyses presented by Garrison at the June 2005 PLTRT meeting indicate that observer data are representative of data submitted by fishermen in logbooks, with respect to area fished, hooks per set, and mainline length (Garrison, pers. comm.). However, he also reported that approximately 20% of vessels in the longline fishery reporting effort have never been observed, and these vessels report in their logbooks a lower average number of sets per trip than observed vessels.[13] These unobserved vessels are primarily small vessels (<45 feet) and may be either fishing less sets per trips, or under-reporting actual effort.

B. Serious Injury and Mortality Estimates

All Marine Mammals

A summary of all observed marine mammal interactions in the pelagic longline fishery from 1992-2005 is provided in Table 1. These data have not been extrapolated out to total estimates of serious injury and mortality, and are based upon a total of approximately 4.9 million hooks observed throughout the Atlantic Ocean (including the Gulf of Mexico) between 1992 and 2005.

Table 1. Observed marine mammal interactions in the Atlantic pelagic longline fishery, 1992-2005.

Species	Total Observed Interactions	Total Observed Seriously Injured	Total Observed Dead
Pilot whale	118	61	4
Risso's dolphin	65	30	6
Common dolphin	6	0	0
Bottlenose dolphin	6	2	0
Unid. dolphin	5	2	0
Unid. marine mammal	5	3	0
Unid. beaked whale	3	1	0
Pantropical spotted dolphin	3	0	0
Atlantic spotted dolphin	3	2	0
Striped dolphin	1	0	0
Unid. whale	1	1	0
Northern bottlenose whale	1	1	0
Unid. baleen whale	1	0	0
Killer whale	1	0	0

[13] Lance Garrison (NMFS) also reported that 58% of pelagic longline vessels that reported effort in the Mid-Atlantic Bight between 2001-2005 (47 of 80) have not been observed in the Mid-Atlantic Bight. This represents approximately 25% of all hooks and >25% of all sets.

Species	Total Observed Interactions	Total Observed Seriously Injured	Total Observed Dead
Minke whale	1	0	0
Pygmy sperm whale	1	1	0
Total	**221**	**104**	**10**

The vast majority of marine mammals that interact with the longline fishery are pilot whales and Risso's dolphins. The nature of these interactions also varies by species. Of the 61 pilot whales determined to be seriously injured, 5 were mouth hooked, 20 were released with entangling gear, and 36 were mouth hooked and released with entangling gear. Of the 30 Risso's dolphins determined to be seriously injured, 7 were mouth hooked, 12 were released with entangling gear, and 11 were mouth hooked and released with entangling gear. Of the 13 animals from other species determined to be seriously injured, 2 were mouth hooked, 3 were released with entangling gear, and 8 were mouth hooked and released with entangling gear. Garrison reported to the PLTRT that animals were generally entangled in gangion or leader lines, and occasionally in mainlines.

Figure 2 shows the distribution of marine mammal interactions across the fishery for 1992-2005. It illustrates that pilot whales are primarily observed to interact with the longline fishery in the Mid-Atlantic Bight and Northeast Coastal areas, while Risso's dolphins interact with the fishery in these areas as well as the Northeast Distant area and the Gulf of Mexico. Other species interact with the fishery throughout its range.

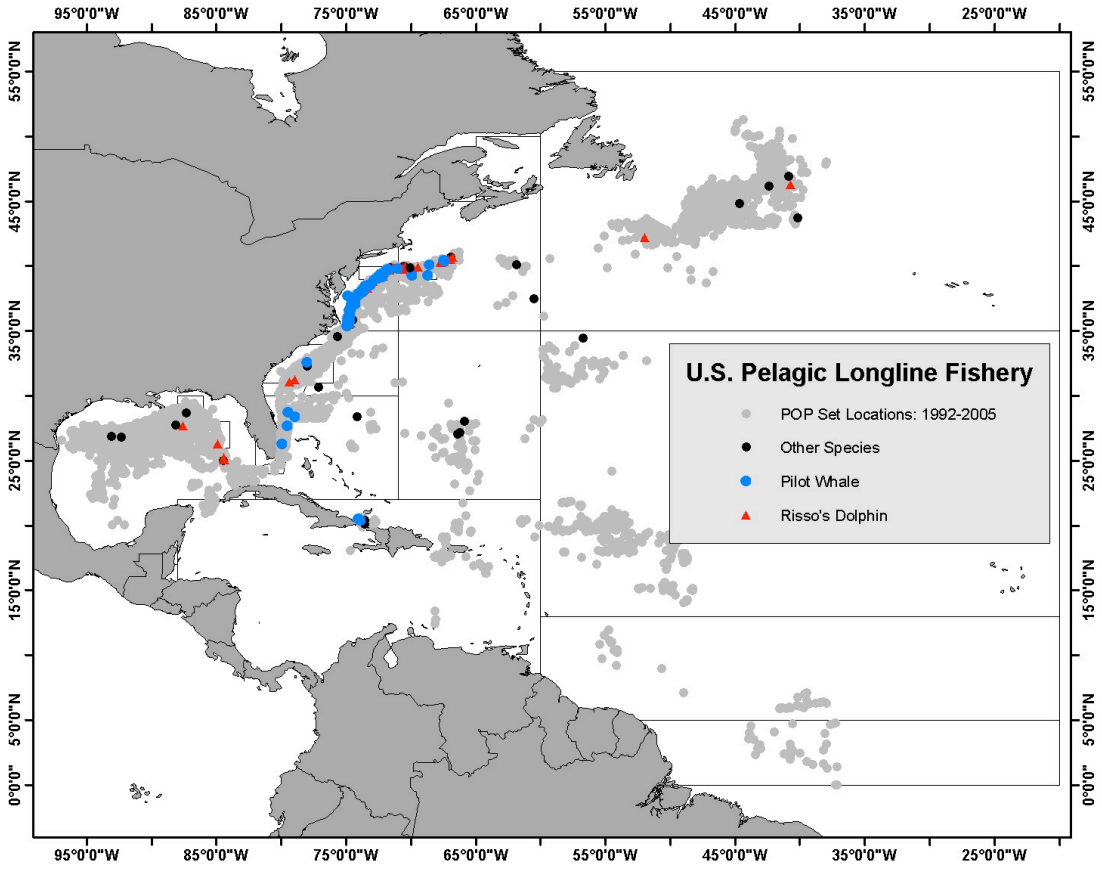

Figure 2. Observed sets and interactions with marine mammals in the pelagic longline fishery, 1992-2005.

Garrison also presented observer data indicating that the majority of pilot whale interactions occur in the Mid-Atlantic Bight region, during the 3rd and 4th quarters of the year (with highest interaction rates in September and October).

In the guidelines for preparing marine mammal Stock Assessment Reports, Barlow et al. (1995) stipulate that a multi-year average of abundance and mortality estimates are to be used, as this will improve the precision of the estimates, reduce the impact of a single "bad" year, and create a more stable behavior for the management system. Typically, a 5-year average is used for mortality and serious injury estimates. Table 2 shows observed interactions with marine mammals by region in the pelagic longline fishery from 2001-2005.

Table 2. Total observed interactions with marine mammals by region in the pelagic longline fishery from 2001-2005.

Fishing Area	**Pilot Whales**	**Risso's Dolphin**	**Other Marine Mammals**
MAB	43	12	3
NEC	0	10	1
NED	1	13	9
SAB	0	1	1
Other Areas	2	1	7

Pilot Whales

The most recent estimate reported in stock assessment reports for the average combined annual serious injury and mortality incidental to pelagic longline fishing is 132 pilot whales (CV=0.49), based on the years 1999-2003 (Waring *et al*. 2006). The numbers of observed serious injuries and mortalities that were used to determine this estimate are shown in Table 3. It also includes more recent information presented by Garrison during the course of the meeting (Garrison 2005, Fairfield-Walsh and Garrison 2006). Including these more recent estimates, the 5-year average combined serious injury and mortality for pilot whales is currently 86 animals (CV=0.16, years 2001-2005).

Table 3. Pilot whale observed and total estimated serious injuries and mortalities, by year, for 1999-2005. The number of hooks observed in each year reflects coverage of the entire fishery and includes areas such as the Gulf of Mexico and offshore waters where marine mammal interactions are rarely observed.

Year	Observed Serious Injury	Observed Mortality	Estimated Annual Serious Injury	Estimated Annual Mortality	Total Estimated Annual Serious Injury and Mortality	Total Hooks Observed (x1000)
1999	4	1	288	93	381	291.6
2000	4	1	109	24	133	322.3
2001	4	1	50	20	70	290.3
2002	4	0	52	2	54	264.9
2003	2	0	21	0	21	436.5
2004	6	0	74.1	0	74.1	505.9
2005	9	0	211.5	0	211.5	431.9

Risso's Dolphin

The most recent estimate reported in stock assessment reports for the average combined annual serious injury and mortality incidental to pelagic longline fishing is 45 Risso's dolphins (CV=0.38), based on the years 1999-2003 (Waring *et al*. 2006). The numbers of observed serious injuries and mortalities that were used to determine this estimate are shown in Table 4. It also includes more recent information presented by Garrison during the course of the meeting

(Garrison 2005, Fairfield-Walsh and Garrison, 2006). Including these more recent estimates, the 5-year average combined serious injury and mortality for Risso's dolphins is currently 34 animals (CV = 0.32, years 2001-2005).

Table 4. Risso's dolphin observed and total estimated serious injuries and mortalities, by year, for 1999-2005. The number of hooks observed in each year reflects coverage of the entire fishery and includes areas such as the Gulf of Mexico and offshore waters where marine mammal interactions are rarely observed.

Year	Observed Serious Injury	Observed Mortality	Estimated Annual Serious Injury	Estimated Annual Mortality	Total Estimated Annual Serious Injury and Mortality	Total Hooks Observed (x1000)
1999	1	0	22	0	22	291.6
2000	1	0	23	41	64	322.3
2001	2	1	45	24	69	290.3
2002	1	0	8	20	28	264.9
2003	3	0	40	0	40	436.5
2004	2	0	27.5	0	27.5	505.9
2005	0	0	2.9	0	2.9	431.9

C. Nature of Interactions

Marine mammals have been observed by longline fishermen to prey on the bait and/or catch (i.e., depredation) and in the process either become fouled or entangled in the line or ingest the hook. These types of interactions result in serious injuries or even mortalities to the marine mammal species involved. They also result in fish or gear loss to fishermen (Beideman, pers. comm.).

Marine mammal interactions with both pelagic and bottom longline gear in other fisheries were the focus of a Workshop on Interactions Between Cetaceans and Longline Fisheries held in Apia, Samoa, in November 2002 (Donoghue *et al*. 2004). At the workshop, researchers noted that depredation on longline gear by marine mammals is an increasing problem. Marine mammals seem interested in what is caught on the gear, as fish caught on longline gear may represent a foraging opportunity for certain marine mammal species. Workshop participants noted that depredation may result in loss of catch, loss of bait, damage to or loss of gear, and loss of time spent fishing. All of this results in increased vessel costs, so fishermen are highly motivated to find a solution to this problem.

Several of the Samoa workshop participants made statements pertaining to their observations regarding depredation. They noted that fish damage due to cetacean depredation is significantly different than damage attributed to sharks. Evidence of this can be seen by examining damaged bait left on the hooks after haul back. They also note that sharks leave small, circular bites, while cetaceans tear flesh away or take the entire fish, leaving only heads or fish "lips," or in some cases nothing, which makes it difficult to quantify the level of depredation occurring. Workshop participants felt that such interactions primarily occur during the hauling of the gear, while several other participants suspected that the vessels themselves were acting as an attractant to whales in the area. It was also noted that depredation was not always correlated with sightings or activities of whales around the gear. Additionally, workshop participants also expressed concerns about the difficulties of identifying the exact species of animal engaging in this behavior at the time of depredation.

Similar observations have been made by the U.S. Atlantic pelagic longline fleet. PLTRT fishing industry representatives noted that while depredation on the whole is a relatively rare event, when it does occur, it usually is observed during the haul back of the gear. They state that the damage that occurs to swordfish and tuna catch from pilot whale depredation is distinguishable from that done by other animals, and is characterized by the removal of the fish from the hook, leaving only the "lips" of the fish behind. They suggested that pilot whales are more likely to depredate on the bait and/or catch and get hooked as a result, whereas there has not been any indication of depredation by Risso's dolphins, and interactions with Risso's dolphins tend to involve entanglement. They further suggest that entanglements in the gear (as opposed to hookings) appear to happen when gear is slack.

An analysis of information recorded on the observer program's incidental take log form is largely consistent with these observations. Garrison noted that the target species primarily associated with pilot whale and Risso's dolphin interactions were tuna and swordfish. Gear interactions are most often in the mouth, although wrapping of line around the tail is also common for Risso's dolphins. He noted that most of the marine mammals observed interacting with the longline fishery were smaller- sized pilot whales (5 to 11 feet in length; not fully grown) and middle-sized Risso's dolphins. It is not known whether this size class are more likely to interact with gear than are those of other size classes, or whether animals of this size class are more likely to be retained by the gear once hooked and/or entangled. Garrison noted that most observer reports do not provide enough information to discern whether pilot whales were taken as a result of depredation on the catch or the bait, nor were there any other obvious trends regarding marine mammal interactions.

IV. Sensory Abilities and Foraging Ecology of Pilot Whales and Risso's Dolphins

A. Sensory Abilities

Odontocete cetaceans rely heavily on acoustics to sense their environment. They use both passive listening and active sonar (i.e., echolocation). Odontocetes possess excellent hearing. Risso's dolphins have a square-shaped audiogram and hear well over a broad range of frequencies (4 to 95 kHz; Nachtigall *et al.* 1995). The frequency sensitivity of the auditory system for either pilot whale species is not well known. However, the most sensitive range of hearing for an animal is often similar to the frequency range of the sounds they produce. Based on the sounds produced by pilot whales, they are likely to be most sensitive to sounds between 2 and 60 kHz. The temporal resolution of odontocete hearing is very high (e.g., Mooney *et al.* 2006), which is likely an adaptation to the higher speed at which sound travels in the ocean (the speed of sound is approximately five times faster in the sea than in air) and the need to follow prey via echolocation from very close ranges during pursuit and capture phases of foraging.

Bottlenose dolphins (*Tursiops truncatus*) have been shown to use passive listening for prey detection (Gannon *et al*. 2005). Mammal-eating or 'transient' killer whales (*Orcinus orca*) have also been shown to incur ecological costs from echolocating (i.e., from prey being alerted by echolocation). Barrett-Lennard *et al*. (1996, Deecke *et al*. (2002), and Guinet (1992) hypothesized that mammal-eating killer whales detect prey via passive listening. It is, therefore, not unreasonable to assume that pilot whales and Risso's dolphins can use passive acoustic cues—such as the sounds made by fishing vessels, fishing gear, or hooked fish—to locate food sources. The open ocean is a good environment for sound transmission. Under favorable conditions, sounds produced by longline vessels should transmit over distances of several kilometers.

Echolocation consists of three distinct processes: sound production, sound reception, and signal processing. For most echolocating odontocetes, as they approach a target on which they are echolocating (e.g., a prey item), the time interval between successive clicks decreases. This results from the decreasing two-way travel time of the click and its associated echo as the whale gets closer to the target. As an echolocating odontocete gets very close to a target the click repetition rate becomes very high, resulting in what is commonly referred to as the "terminal buzz." Risso's dolphins and short-finned pilot whales have been shown definitively to use echolocation. Short-finned pilot whales emit clicks with peak energy between 30 and 60 kHz and source levels of approximately 180 dB re 1 μPa at 1 m (Evans 1973). Risso's dolphins produce broadband echolocation clicks that are 40-70 μs in duration with dominant frequencies around 50 kHz and source levels between 202 and 222 dB re 1 μPa at 1 m, (Philips *et al.* 2003, Madsen *et al.* 2004). Echolocation has not been shown conclusively in long-finned pilot whales, but this is most likely due to a lack of research effort as this species produces broadband clicks that are similar to the echolocation sounds of well-studied species. Risso's dolphins are thought to be able to detect small squid (20-cm mantle length) from a distance of 85 m (Madsen *et al.* 2004). False killer whales, *Pseudorca crassidens*, which produce echolocation sounds that are almost identical to Risso's dolphins, are estimated to be capable of detecting 1 meter-long yellowfin tuna from distances of approximately 210 m (Madsen *et al.* 2004)

In addition to echolocation sounds, pilot whales and Risso's dolphins produce whistles and pulse bursts that are thought to be used for communication. Risso's dolphins produce whistles with

dominant frequencies from 3.5 to 4.5 kHz (Caldwell *et al.* 1969) and pulse bursts with dominant frequencies between 2 and 5 kHz (Watkins 1967). Long-finned pilot whales emit whistles with dominant frequencies from 1.6 to 6.7 kHz and short-finned pilot whales produce whistles having dominant frequencies between 2 and 14 kHz with source levels of approximately 180 dB re 1 μPa at 1 m (Caldwell and Caldwell 1969, Fish and Turl 1976).

B. Foraging Ecology

Risso's dolphins and both species of pilot whale primarily eat medium-sized squids (mantle lengths of 5 to 40 cm) that inhabit neritic, oceanic, and benthic habitats (Gannon *et al.* 1997a, 1997b; Kruse *et al.* 1999; Jordan-Sardi *et al.* 2005). Up to 77% of the long-finned pilot whales' diet in the mid-Atlantic Bight and southern Georges Bank is long-finned squid, *Loligo pealei* (Gannon *et al.* 1997a, 1997b). They also eat a variety of other squids including short-finned squid (*Illex illecebrosus*) and Histioteuthid squid, and small schooling fishes such as Atlantic mackerel (*Scomber scombrus*) and Atlantic herring (*Clupea harengus*). The stomach contents of short-finned pilot whales that stranded on the Outer Banks of North Carolina in February of 2005 included a variety of squids, including *Loligo* sp., *Brachioteuthis riisei*, *Histioteuthis reversa*, and *Taonius pavo*, and fishes such as big scale (*Scopelogadus mizolepis*) and offshore or silver hake (*Merluccius* sp.) (Jordan-Sardi *et al.* 2005).

All three cetacean species typically swallow their prey whole and all appear to forage mostly at night (Gannon 1995; Shane 1995; Gannon *et al.* 1997a, 1997b; Kruse *et al.* 1999; Baird *et al.* 2002). Long-finned pilot whales dive to depths of at least 650 m (Baird *et al.* 2002, Nawojchik *et al.* 2003) and capture their prey by suction (Werth 2000).

Atlantic pelagic longline fishermen have indicated that pilot whales depredate on tuna and swordfish catches (AOCTRP 1996). However, neither tuna nor swordfish is a normal part of the pilot whale diet. Therefore, depredating on longline catches appears to be a learned behavior. It is not known whether one or both species of pilot whales depredate longline catches, and it is not known whether this behavior is confined to a small number of individuals or widespread throughout the population.

V. Description of the Atlantic, Caribbean, and Gulf of Mexico Pelagic Longline Fishery

A. History and Overview

For centuries in Europe, fishermen used baited hooks attached to mainline coiled in wooden tubs as hand-gear to harvest such bottom species as Atlantic cod. The Europeans brought this method of harvest to the western North Atlantic cod fishery, where it was eventually adopted in the New England fisheries for both cod and halibut.

The Japanese developed a similar fishing gear by using hollow glass balls to float the gear in order to target pelagic species, primarily North Pacific bluefin tuna *Thunnus thynnus orientalis*. Originally, the mainline consisted of separate sections that were tied together during gear deployment and detached at haulback. Since the development of monofilament and the combination of baited hooks and various types of floats attached to a single-strand, longline has evolved into the primary worldwide method to commercially harvest large pelagic fishes, such as swordfish *Xiphias gladius*, tunas *Thunnus* sp., istiophorid billfishes, and carcharhinid and lamnid sharks.

B. Domestic Pelagic Longline Fishery

In the U.S. fishery, the pelagic longline gear type currently consists of a continuous monofilament mainline, suspended below the water's surface by a series of foam or plastic floats, with regularly spaced leaders attached that end with baited hooks (see Figure 3 below). Vessels use radar-reflecting floats (high flyers) and radio beacon buoys to monitor the position of the gear while it is fishing. Each deployment of the longline gear is known as a "set." The techniques used for deploying the gear can be modified to target particular species. For example, swordfish-directed sets often also include chemical or electronic light emitters on the leaders. Monofilament line diameters range from 3.0 to 4.5 mm (700 to 1600 pound test strength) for the mainline, and 1.28 to 2.5 mm (150 to 500 pound test strength) for the float lines and hook leaders. This "Florida" style of gear developed over time in part to reduce drag and visibility, because the keener the gear, the more target catch hook-ups, especially tunas and swordfish.

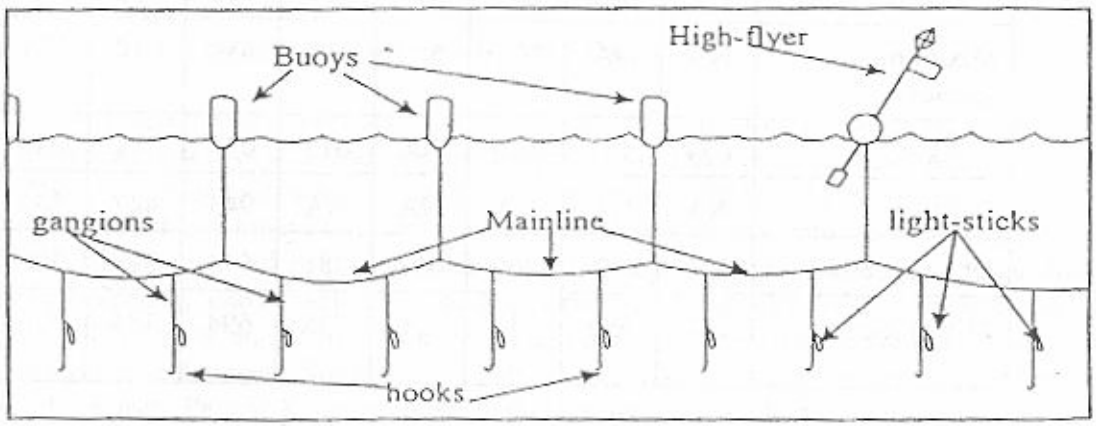

Fig. 3. Typical U.S. pelagic longline gear (Arocha 1996).

The average longline set is approximately 28 miles in length (SEFSC 2006), but the mainline storage capacity can exceed 130 miles depending on the capabilities of the individual vessel. Various lengths of float lines and individual leaders have been used historically in the U.S. pelagic longline fishery to maximize the effective fishing depths. For example, the U.S. Atlantic swordfish fishery used to regularly employ leaders over 40 fathoms in length, but generally has since switched to shorter leaders. For the domestic pelagic longline fleet, the average length of the float line and the leader was 28.8 fathoms in 2004, but with a broad range from 1 to 240 fathoms (SEFSC 2004).

Hook depth can range from just below the surface to over 150 fathoms, although most U.S. longline vessels do not fish this deeper gear configuration. The depth of the hooks depends partly upon the concave curve in the mainline created by the distance between floats, allowing the hooks to effectively fish at varying depths within the same set. This curve can also be created by deploying the mainline faster than the vessel is moving forward or by using a "line thrower." Recent studies (e.g., Bigelow et al. 2006) have suggested that traditional equations used to calculate the predicted depth of the hooks may overestimate the actual depths. The average reported distance between hooks was approximately 230 feet in 2004 (SEFSC 2006).

Opportunistic pelagic longlining by converted groundfish vessels started in the late 1950s in New England for Atlantic bluefin tuna *T. thynnus thynnus* (Wilson 1960). The dedicated longline fishery developed in earnest during the mid-1960s and continuously expanded into the late 1980s (Gibson 1988). Since 1994, the number of vessels has generally declined, although the number of deployed hooks (effort) has fluctuated by year and by NMFS statistical area. The success of this fishery, and all others targeting highly migratory species, is affected by the status of the target species stocks. Both domestic and international conservation measures are necessary to maintain or rebuild the fish populations and the fisheries that depend on them.

As described in the Draft Consolidated Highly Migratory Species (HMS) Fishery Management Plan (FMP) (NMFS 2005c), the U.S. pelagic longline fishery has been historically comprised of five distinct fishery segments. Each segment of the fishery is characterized by differences in target catch, gear characteristics, bait choices, deployment techniques, and general area of operation (for regulatory definitions of management areas, see 50 CFR 635.2). Each component of the fishery is comprised of small, medium and large vessels. Each vessel also has different range capabilities due to fuel capacity, hold capacity due to vessel size and layout, and seasonal versus year-round operations. The fishery segments are described below:

Gulf of Mexico Yellowfin Tuna: These vessels primarily target yellowfin tuna year-round; however, some vessels direct effort to swordfish on a seasonal basis. Many of these vessels also participate in other Gulf of Mexico fisheries. The Gulf of Mexico tuna fishery is currently recovering from extensive vessel and fisheries infrastructure damage resulting from the 2005 hurricane season.

South Atlantic Florida East Coast to Cape Hatteras Swordfish: These pelagic longline vessels primarily target swordfish year-round. Smaller vessels fish in the Straits of Florida up to the bend in the Gulf Stream off Charleston, South Carolina. Mid-sized and larger vessels historically migrated seasonally from the Yucatan to the West Indies and Caribbean Sea and sometimes as far north along the U.S. east coast as southern New England to target bigeye tuna and swordfish during the late summer and autumn. Current international boundary issues now

prevent U.S. vessels from fishing such straits as the Windward Passage between Haiti and Cuba and the Yucatan Channel between Mexico and Cuba, both traditional winter fishing grounds. With the depletion of viable fishing grounds in this segment, this fleet is severely diminished.

Mid-Atlantic and New England Swordfish and Bigeye Tuna: This fishery has evolved during recent years to almost exclusively directed tuna trips. However, swordfish also comprise an important secondary target catch in this multi-species fishery. Some vessels participate in this directed mixed tuna/swordfish fishery during the summer and fall months, then switch to other fisheries, including scallops, monkfish, and tilefish during the winter season.

Additionally, the use of "greenstick" gear to target bigeye and yellowfin tuna in the Mid-Atlantic Bight is a relatively new component of this fishery segment that was only brought to the attention of the Team at its final (April 2006) meeting. Greensticking is a method of trolling pelagic baits behind a moving vessel. The "greenstick" is a fiberglass or wooden pole that stretches 35-45 feet high and holds a long, high test line (Westcott 1996). It is mounted upright near the center-line of the vessel and used to attach multiple trolling lines that stretch several hundred feet behind the boat, and which are held taut by dragging a wooden structure known as a "bird." These lines may be fixed to the mainline and hauled back with the mainline by a single reel or winch, or the lines may be clipped to the mainline and hauled back individually by separate reels. The height of the greenstick allows several lines, often with multiple hooks, to skip across the surface up to approximately 100 yards off the stern of the vessel to attract yellowfin and bigeye tuna. Because it technically falls under the current NMFS definition of pelagic longline gear (because it has a mainline with 3 or more hooks attached, see definitions at 50 CFR 635.2), when fished commercially (i.e., with gear set to be pulled all at once), it is considered to be part of the U.S. Atlantic pelagic longline fishery.

U.S. Atlantic Distant Water Swordfish: The fishing grounds of this fleet range virtually the entire span of the western North Atlantic to as far east as the Azores and the Mid-Atlantic Ridge. Vessels operate out of Mid-Atlantic and New England ports during the summer and fall months, with some vessels moving to Caribbean ports during the winter and spring months. Historically, many of the current distant water operators were among the early participants who began the U.S. directed Atlantic swordfish industry and later entered into chartering arrangements with such countries as Brazil. These are generally larger vessels with greater ranges and capacities than the coastal fishery participants.

Caribbean Island Tuna and Swordfish: Historically, this fleet was similar to the southeast coastal fishery, consisting primarily of smaller vessels making short trips relatively near-shore. Typical of most pelagic fisheries, this fishery had a multi-species catch of swordfish, tunas, and a variety of other pelagic finfish. Due to regulations and increasing expenses, this pelagic longline fishery has vanished. In recent years, a yellowfin tuna directed pelagic longline fishery based in Trinidad and Tobago has developed.

For all segments of the fleet, fishing effort is generally focused on "edges of water" (oceanic fronts, typically identified by differences in currents, water temperature, and color), where targeted pelagic species frequently aggregate. These naturally occurring differences in water masses are generally found between the continental shelf and offshore slope waters, but these "breaks" (fronts) also occur along the Mid-Atlantic and Northeast Coastal areas as "warm-core" rings that spin off from the western edge of the Gulf Stream.

The NMFS Southeast Fisheries Science Center (SEFSC) has the delegated responsibility to collect data from the U.S. fisheries that harvest highly migratory species in the Atlantic Ocean, including the Caribbean Sea and the Gulf of Mexico. The SEFSC cooperates with the NMFS Northeast and Southeast Regional Offices as well as state fisheries agencies to collect these fisheries data. As part of these data collection programs, the commercial pelagic longline fleet is required to carry federal fisheries observers through the NMFS Pelagic Observer Program (POP) when selected and to submit logbooks detailing all of the fishing activities by each vessel for highly migratory species.

The SEFSC publishes annual summaries of pelagic longline activity as reported by both the POP and the mandatory logbook submissions. Longline effort is reported as the number of hooks and the number of sets, as well as the number of active vessels operating in the fishery. The total reported pelagic longline effort included 7.22 million hooks and 9,680 sets during 2004 (Garrison 2005). In 2003, there were only 127 active vessels in the U.S. pelagic longline fishery, reflecting the decrease in the number of active vessels from a high of 501 in 1994 (Abercrombie et al. 2005). This reduction in active vessels continues to date with approximately 94 active in 2005 (Beideman, pers. comm.).

C. International Pelagic Longline Fisheries

Pelagic longline fleets of other nations comprise over 90% of the longline fishing effort in the Atlantic Ocean and adjacent waters (Witzell et al, 2001). These fishing vessels use similar gear and fishing practices as the U.S. fishery and most certainly interact with pilot whales and other marine mammals (no data is available on bycatch of Risso's dolphins in international fisheries). Countries with large registered longline fleets in the Atlantic Ocean include Japan, the various countries of the European Community, the Republic of China (i.e., Taiwan or Chinese-Taipei), and South Korea (ICCAT, 2006).

The United States, through such venues as the International Commission for the Conservation of Atlantic Tunas (ICCAT), has long encouraged other nations to evaluate and adopt mitigation measures in their fishing fleets to reduce the mortality of marine mammals incidentally taken on pelagic longline gear. Any U.S. gear development research effort should include an outreach program to encourage the development and use of practical measures to reduce pilot whale mortalities by foreign fleets.

D. Regulatory/Management Structure

Fishery Management Plans

Atlantic highly migratory species (HMS) are managed under the dual authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the Atlantic Tunas Convention Act (ATCA). The Magnuson-Stevens Act, at 16 U.S.C. 1802(14), defines the term "highly migratory species" as tuna species, marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.), and swordfish (*Xiphias gladius*). Further, the Magnuson-Stevens Act, at 16 U.S.C. 1802(27), defines the term "tuna species" as albacore tuna (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*), and yellowfin tuna (*Thunnus albacares*). Under the Magnuson-

Stevens Act, NMFS must, consistent with the National Standards, manage fisheries to maintain optimum yield (OY) by rebuilding overfished stocks and preventing overfishing. Under ATCA, NMFS is authorized to promulgate regulations, as may be necessary and appropriate to implement the recommendations from the International Commission for the Conservation of Atlantic Tunas (ICCAT). ICCAT consists of 38 contracting parties as well as other cooperating parties - including Canada, the European Union, Japan, and the People's Republic of China - that fish for tunas and tuna-like species throughout the Atlantic. Since 1966, ICCAT's stated objective has been to "cooperate in maintaining the populations of these fishes at levels which will permit the maximum sustainable catch for food and other purposes."

Currently, tunas, swordfish, and sharks are managed under the FMP for Atlantic Tunas, Swordfish, and Sharks (implemented in 1999 and amended in 2003) and billfish under the 1988 Atlantic Billfish FMP (amended in 1999). The implementing regulations for both FMPs are found at 50 CFR Part 635.

Fishery Specific Requirements

Atlantic HMS fishermen who use pelagic longline gear generally target swordfish and tunas, but also catch other species such as sharks, billfish, and dolphin fish (*Coryphaena hippurus*). Longline fishermen also incidentally catch protected species (e.g., sea turtles and marine mammals). Thus, the regulations in place for the pelagic longline fishery are implemented for a variety of reasons at both the domestic and international level in order to ensure sustainability of target and incidental species. Some of the regulations that apply to HMS pelagic longline fishermen include:

- Permit requirements: Fishermen that are targeting swordfish or tunas and who are using pelagic longline gear are required to hold an Atlantic tunas pelagic longline category permit, a directed or incidental Atlantic swordfish permit, and a directed or incidental shark permit. These permits are required to allow fishermen to land at least some of each HMS (not including billfish) that they may catch. Directed permits (those that allow the fishermen to target a specific species) have upgrading requirements that limit the size (i.e., horsepower, length overall, and tonnage) of any future modifications to the existing vessel or the transfer of the permit to a different vessel. Fishermen can only sell their catch to permitted dealers.
- Reporting requirements: Commercial HMS fishermen are required to submit logbooks and cost-earning reports within seven days after every trip, or to submit "no fishing" reports each month, as appropriate. Dealers are also required to submit landings and economic reports to NMFS.
- Gear and vessel marking requirements: Fishermen are required to paint their U.S. Coast Guard identification number on their vessel and their vessel name (initials) on each float and high-flyer.
- Monitoring requirements: Vessels must carry an observer if selected, and observed vessels must comply with all safety regulations and allow the observer access to fish, logs, and equipment. The 2004 ESA Biological Opinion for the Atlantic pelagic longline fishery required an increase in observer coverage to a minimum of 8% of total annual reported sets to ensure that incidental takes of endangered leatherback sea turtles are adequately monitored and do not exceed authorized levels. This "reasonable and prudent alternative" was necessary to avoid jeopardy to ESA-listed species, and also required that

by December 31, 2006, "there must be no quarter-area stratum with an assumed sea turtle take of zero because of lack of current or historic observer coverage and current year reported effort over 30 sets" (NMFS 2004c). Vessels are also required to have an operating vessel monitoring system (VMS) onboard. This system must be turned on and be operating 2 hours before leaving port and remain on until the vessel returns to port.

- Bycatch or bycatch mortality reduction measures: There is a suite of measures designed to reduce bycatch or bycatch mortality. These measures are more fully discussed in Section VI of this document, and include time/area closures, gear requirements for sea turtle interactions, a requirement to move 1 nm after an interaction with a marine mammal or sea turtle, and a prohibition on the use of live bait in the Gulf of Mexico.
- Species-specific restrictions: Fishermen are limited in the amount or size of fish, including target species, which can be landed. Pelagic longline fishermen cannot retain billfish and cannot target bluefin tuna. Fishermen are also limited by the available quota, fishing seasons, minimum size, retention limits, landing restrictions (e.g., swordfish cannot be filleted), and prohibited species.

Proposed Rule to Consolidate HMS FMP

On August 19, 2005, NMFS published a proposed rule to consolidate the management of all Atlantic HMS - swordfish, tunas, shark, and billfish - under one FMP (70 FR 48804). While the proposed rule would affect various aspects of how HMS fisheries are managed, aspects of the proposed rule with possible implications for the pelagic longline fishery are as follows:

- Mandatory sea turtle handling and release workshops to educate vessel owners and operators on using required equipment to handle and release sea turtles and other protected species (with re-certification required every 3 years)[14];
- Close Madison-Swanson and Steamboat Lumps, consistent with Gulf of Mexico Fishery Management Council regulations;
- Establish criteria to consider when implementing or modifying closures; and
- Define pelagic longline gear as having $\geq$ 71 floats and having a certain species composition to the catch, so as to distinguish it from bottom longline gear.

As part of the Draft HMS FMP, NMFS also proposed defining greenstick gear as "a line that is elevated, or suspended, above the water's surface from which no more than 10 hooks or gangions may be hung. The gear must be actively trolled and configured so that the baits are fished on or above the surface of the water. The suspended line, attached gangions, and catch may be retrieved collectively by hand or by mechanical means." The purpose of this definition was to differentiate between greenstick gear and pelagic longline gear and to establish specific regulations for greenstick gear. Specifically, NMFS proposed allowing the commercial harvest of bigeye, albacore, and yellowfin tunas using greenstick. Bluefin tuna would not be allowed. Because this gear uses three or more hooks, greenstick gear currently meets the definition of longline gear at 50 CFR 635.2.

The comment period for the proposed rule and Draft HMS FMP closed on March 1, 2006. The FMP and final rule are expected to be published later in 2006.

[14] Instructions on how to handle and release marine mammals can likely be worked into the workshops and other materials required to be carried on vessel.

VI. Summary of Bycatch Reduction Strategies Currently Used in Longline Fisheries

The following is a summary of both regulatory and non-regulatory strategies that are currently used in the Atlantic longline fishery as well as other longline fisheries to reduce bycatch of marine mammals, sea turtles, or other species.

A. U.S. Atlantic, Caribbean, and Gulf of Mexico Pelagic Longline Fishery

The U.S. Atlantic, Caribbean, and Gulf of Mexico pelagic longline fishery is subject to specific regulatory measures to rebuild overfished stocks, maintain sustainable stocks, and reduce bycatch and bycatch mortality, to the extent practicable, of a number of species including, but not limited to, sea turtles and, to a lesser degree, marine mammals. Additional measures to avoid the likelihood of jeopardy to sea turtles, as required by the ESA, have also been incorporated as necessary for the continued operation of the Atlantic pelagic longline fishery. Regulatory measures include time/area closures, safe handling and release gear and protocols for sea turtles, mandatory use of circle hooks, and use of mackerel bait. Preliminary information provided to the Team indicate that this suite of mitigation measures has reduced bycatch of sea turtles and billfish, but the extent of the reduction, as well as the impact of the mitigation measures on marine mammal bycatch, is not yet known.

Several of the regulatory measures described below were included in the Atlantic Offshore Cetacean Take Reduction Plan (AOCTRP), dated November 22, 1996. AOCTRP recommendations to reduce serious injuries and mortalities of marine mammals in the longline fishery included: increase education and outreach to enhance avoidance techniques (through workshops for fishermen, development and use of guidelines for interactions and disentanglement, and enhanced communication among vessel operators at sea); implement limited entry of new vessels into the fishery; research gear modifications and/or operating procedures, as well as cetacean behavior and acoustical systems; limit the length of longline gear in the Mid-Atlantic Bight; reduce soak time by hauling gear in the order it was set; and move vessels after one entanglement. The AOCTRP also had several research and data recommendations including: more comprehensive surveys of affected marine mammal stocks to improve the precision of abundance estimates; optimal allocation of observer coverage and increased funding for observer coverage; and the development of criteria for assessing marine mammal injuries. Some of these measures were implemented via Magnuson-Stevens Act regulations in 1999, such as limited entry, moving after one entanglement, and a temporary requirement to limit mainline length in the Mid-Atlantic Bight. Guidelines for handling hooked or entangled were developed and distributed to the fishery, and criteria for determining serious injuries were developed at a NMFS workshop held in 1997 (Angliss and DeMaster 1998). Additional funding for observer coverage of the longline fishery was appropriated by Congress beginning in 2001, and additional cetacean surveys were conducted in 2004. Other AOCTRP recommendations were proposed but not finalized, such as the measure to reduce soak time by hauling gear in the order it was set. During the public comment period on the proposed rule, concerns were raised regarding safety and fuel costs associated with this measure. Research recommendations were also not fully implemented. The pelagic longline Take Reduction Team members reviewed these recommendations in their own analysis of potential management measures, and noted that the effectiveness of the pelagic longline TRP will be contingent on implementing all of the final consensus recommendations.

1. Regulatory Measures

Time/Area Closures

A closed area is an area of the ocean closed to either a certain fishing gear, vessel size, or for a certain target species. Closures affecting the Atlantic pelagic longline fishery were implemented at various times since 1999 to reduce bycatch of a number of species or life-stages including, but not limited to, juvenile swordfish, large coastal sharks, prohibited sharks, bluefin tuna, billfish, and sea turtles. It is important to note that while closures may reduce bycatch of certain species, they may also increase bycatch of other species if fishing effort shifts to open areas.

The following time/area closures are currently in effect for the pelagic longline fishery (see also Fig. 4):

- DeSoto Canyon (Gulf of Mexico) – closed all year;
- East Florida Coast – closed all year;
- Charleston Bump – closed February 1 – April 30 of each year;
- Northeastern U.S. – closed in June of each year; and
- Northeast Distant – restricted fishing area.

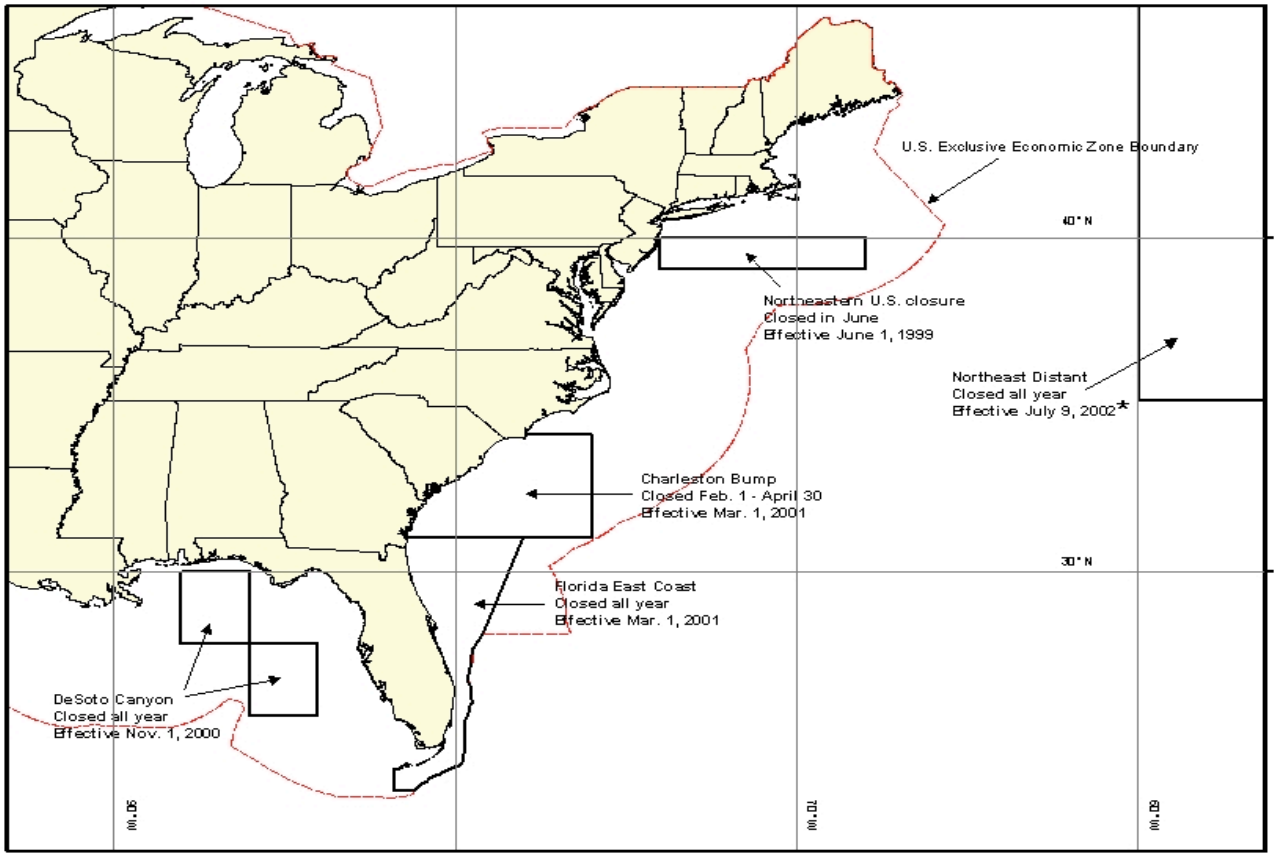

Fig. 4. Map of areas closed to fishing under the HMS FMP for all or part of the year (from the 2005 Guide for complying with the regulations for Atlantic tunas, swordfish, sharks and billfish, (NMFS 2005b)).
*The Northeast Distant Closed area is open to vessels that are using specific gear and bait combinations.

Vessel monitoring systems (VMS) are required on all longline vessels. VMS provides enforcement personnel with periodic reports of the location of fishing vessels, which aids in enforcing closed areas.

Sea Turtle Handling and Release Requirements

Sea turtle handling and release requirements have been established in recent years in the Atlantic pelagic longline fishery to maximize the survival of bycaught sea turtles. The 2004 Biological Opinion on the Atlantic pelagic longline fishery for Highly Migratory Species (NMFS 2004c) required maximum removal of hooks and entangling gear to achieve specific post-hooking mortality reduction targets and ensure against jeopardy[15] to leatherback (*Dermochelys coriacea*) sea turtles, with required adaptive management time/area closures if such targets were not met. These requirements include:

- Posting the sea turtle handling/release guidelines placard (NMFS 2004b) in the vessel's wheelhouse;
- Possessing inside the vessel's wheelhouse the document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury" (Epperly *et al.* 2004);
- Having the necessary mitigation gear onboard (e.g., line clippers, dehooker for internal and external hooks, dipnets, a tire, long-nose pliers, bolt cutters, mouth openers, and gags) as specified at 50 CFR 635.21; and
- Following the procedures for safe handling and release of incidentally taken sea turtles identified on the NMFS (2004d) placard and in Epperly *et al.* (2004), and codified at 50 CFR 223.206(d)(1) and 50 CFR 635.21.

Gear and Bait Requirements

Since 2002, fishermen have been required to ensure that the length of each gangion is 10% longer than the length of any floatline, if the sum of the gangion and the floatline is under 100m. This is to enable turtles caught on deep sets to return to the surface to breathe. Additionally, fishermen are required to use corrodible hooks. As of Summer 2004, NMFS implemented requirements for circle hooks instead of the traditional "J" hook type to reduce sea turtle bycatch and mortality (69 FR 40734, July 6, 2004; see also Watson *et al.* 2004). Gear and bait requirements are as follows:

- Outside the Northeast Distant Area, only circle hooks that are 18/0 or larger with an offset not to exceed 10°, or non-offset circle hooks that are16/0 or larger can be onboard the vessel, and only whole finfish and/or squid bait;
- Inside the Northeast Distant Area, only 18/0 or larger circle hooks with an offset not to exceed 10° can be onboard the vessel and only whole Atlantic mackerel and/or squid bait.

Moving the Vessel

Another method used by fishermen to avoid marine mammal interactions is moving a vessel away from an area where marine mammals have been sighted. This preventative action is based

[15] Reasonable and prudent alternatives in biological opinions such as the gear removal requirements discussed above, must ensure that the continuation of the action at issue do not jeopardize the continued existence in the wild of species protected under the ESA. An action jeopardizes listed species if it would appreciably reduce the likelihood of both the survival and recovery of the species in the wild.

on the observation that both marine mammals and sea turtles (as well as certain target species) tend to congregate along water temperature fronts or near certain bathymetric features. By moving away from these features, fishermen may reduce the potential for further interactions.

Based on observer data indicating that longline fishermen who had one interaction with a marine mammal were more likely to have another interaction if they continued fishing in the same area, the Atlantic Offshore Cetacean Take Reduction Team (AOCTRT 1996) recommended that NMFS implement a regulation requiring a vessel to move after a marine mammal interaction. When the HMS Division implemented the AOCTRT's recommendations, they were expanded to include sea turtles. Current regulations at 50 CFR 635.21(c)(3) require that fishermen move 1 nautical mile after an interaction with either a marine mammal or a sea turtle.

It is difficult to determine just how effective the "move 1 nautical mile" requirement has been. First, fishermen must travel the entire length of the mainline, which is often 20 to 40 nautical miles long, when hauling back a longline set. Thus, depending on where an interaction occurs along a stretch of mainline, the fishing vessel likely will have moved several miles from the interaction while hauling back the rest of the set, making the requirement somewhat irrelevant. Second, the direction of movement is likely to be important; for example, moving into an area with different water conditions may be more effective than moving some predetermined distance (PLTRT discussions, Jan 2006). Third, enforcement of the requirement is difficult. Nevertheless, as a general measure, moving away from areas where protected species interactions have occurred or away from areas where they are observed to be abundant is believed to be an effective bycatch reduction measure.

Limiting the Length of the Mainline

Temporary regulations at 50 CFR 635.21(c)(1) were implemented on August 1, 1999, and expired on November 30, 2000, limiting the length of the mainline of pelagic longline fishing gear in the mid-Atlantic Bight to 24 nautical miles. This measure originated from AOCTRT recommendations to limit mainline length in the Mid-Atlantic Bight to 24 nautical miles from August through November for one year, as an interim strategy. NMFS is currently evaluating the effectiveness of this measure in reducing bycatch of marine mammals during that time frame. A brief examination of the logbook data available for this time period indicated little compliance with the AOCTRT's recommendation, and a significant amount of fishing effort occurred in the Mid-Atlantic Bight with longlines greater than 24 miles. PLTRT members believed that much of this apparent lack of response was related to relatively little outreach and education associated with the implementation of these measures as well as poor enforcement of this requirement.

2. Non-Regulatory Strategies

Atlantic pelagic longline fishermen are motivated to avoid interactions with marine mammals, as these interactions can result in significant economic loss due to both fish and gear loss. They also represent a risk to vessel operators and crew, as pilot whales caught in gear can be very dangerous, due to the size and strength of the whales.

Pelagic longliners use a variety of voluntary methods to both avoid marine mammals and try and release them with minimal harm. They state that releasing pilot whales requires keeping them

calm at all times, and maintaining control of both ends of the main line. De-hookers and line cutters designed for sea turtles may also be useful for releasing marine mammals. Fishermen state that when de-hooking has been attempted, it has been more successful with smaller/juvenile pilot whales (although few details were provided regarding these events).

The following are some additional methods used by the fleet, as indicated by fishermen on the PLTRT. Team members recognized that many of these are difficult to monitor in terms of how often fishermen actually do employ them, and how effective they might be in reducing bycatch of marine mammals if used consistently.

Captain's Communications

Captain's communications involve sharing information among longline vessel operators (i.e., captains). Such information may include reports of recent bycatch, and/or locations of protected species (pods or individual animals). Currently in the Atlantic pelagic longline fishery, these communications consist primarily of conversations between friends or cooperating groups of fishermen. In other instances, these types of communications may be more formal and include gentlemen's agreements, or collection, analysis, and dissemination of communications by a third party (e.g., Seastate, Inc. in the North Pacific groundfish fishery). For this strategy to be effective, the exchange of information must be timely and the entire fleet in an area/region must cooperate. Additionally, it must result in an action being taken to either avoid or reduce bycatch (e.g., captains need to describe the nature of their protected species interactions, discuss the results of any mitigation or safe handling/release measures used, and share best practices). Members of the Team noted that the use of captain's communication to avoid marine mammal interactions in the Hawaii pelagic longline fishery has been limited in its effectiveness because full cooperation by all captains is hard to achieve (Gilman *et al.* (2005).

Delaying Fishing Activities

When marine mammals are seen in the fishing area or interact with gear, vessel operators may cease fishing operations until they believe that the animals have left the vicinity. This method is based on the belief that marine mammals are alerted to bait and hooked fish by the sound of the boat or the noise created when gear is being set and/or hauled back. In theory, if fishing activity is halted for an extended period of time (a day or more), the animals will lose interest and eventually leave the area.

Steaming Away From the Gear Prior to Haul Back

This action is based on the theory that marine mammals are cueing into the sound of the boat. Steaming away from the gear prior to haul back is an effort to confuse or lose marine mammals that may be cueing in on the boat. Some longline vessel operators do this in the hopes that "problem" animals will follow the vessel away from the gear and then lose interest and leave the area by the time the boat returns to the gear and actually start haul back.

Bycatch Handling and Release Training Workshops

There have been a number of voluntary, industry-sponsored workshops convened to help vessel operators and crew gain experience and training in the handling and safe release of sea turtles and other bycatch. The requirement for mandatory workshops is a component of the proposed rule to consolidate the HMS FMP.

B. Other Pelagic Longline Fisheries

Pelagic longline fisheries in other areas have also implemented mitigation measures in an effort to decrease marine mammal and sea turtle bycatch.

1. Dolphin and Wahoo Fishery of the Atlantic

On May 27, 2004, the final rule for the dolphin (the fish - *Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*) fishery of the Atlantic was issued (69 FR 30235). The rule is intended to facilitate the management and conservation of dolphin and wahoo stocks off the Atlantic states, and to ensure that no new fisheries develop for these species. The rule requires that the owner or operator of a vessel for which a commercial permit for dolphin and wahoo has been issued, and that has onboard a pelagic longline, must post the sea turtle handling and release guidelines inside the wheelhouse, and comply with some of the same sea turtle bycatch mitigation measures as required for highly migratory species pelagic longline fisheries. These measures include carrying and using equipment such as line clippers and dehookers (50 CFR 622.41(l)(2)). These measures do not include the gear modifications required for HMS pelagic longline fishermen such as gangion length, corrodible hooks, hook size or type, or bait requirements. Longline fishing for dolphin and wahoo is also prohibited in areas closed to the use of such gear for highly migratory pelagic species (50 CFR 622.35(h)). The compliance guide for the final rule summarizes other requirements for the fishery, including permit and reporting requirements, and bag and trip limits (NMFS 2004a). A total of 1680 permits have been issued by the NMFS Southeast Region for dolphin and wahoo; 122 of these permit holders also have swordfish directed and incidental permits (NMFS Southeast Regional Office Permits Office).

2. Hawaii-Based Pelagic Longline Fishery

The Hawaii-based longline fishery has implemented several measures that are targeted at reducing the bycatch of both sea turtles (primarily leatherbacks and loggerheads) and seabirds.

On April 2, 2004 (69 FR 17329), a final rule was published that established several sea turtle conservation and management measures for the Hawaii-based longline fishery (see also 50 CFR 660.33). These included requirements that every longline vessel carry on board NMFS-approved line clippers, dip nets, dehookers, and other devices, and that fishermen follow requirements for safe handling and release of incidentally taken sea turtles. Other sea turtle conservation measures include: 1) an annual limit of 2,120 shallow-set longline sets north of the equator per year (implemented through the issuance of certificates authorizing each set), 2) the use of offset 18/0 or larger circle hooks (10° offset), 3) the use of mackerel-type bait, 4) the mandatory submission of logbooks with shallow-water set certificates attached, and 5) 100% observer coverage of fishing vessels conducting shallow water sets. Mandatory bycatch limits were also set for takes

of leatherback and loggerhead sea turtles, and procedures were established to restrict shallow-water fishing should those limits be reached.

Seabird conservation requirements are directed at longline vessels that fish north of 23° N lat., and include: 1) the use of a line setting machine or line shooter to set the mainline when making deep sets using monofilament line, 2) the attachment of weights, 3) the use of blue-dyed and thawed bait, 4) the discharge of offal or spent bait on the opposite side of the vessel from where the gear is being set or hauled, 5) the removal of hooks from offal or spent bait before discharge, and 6) the setting of gear at night, specifically no earlier than one hour after local sunset and no later than local sunrise. Regulations also specify procedures for handling and release of short-tailed albatrosses (50 CFR 660.35).

In addition, all longline fishermen are required to attend, and earn certification following, completion of a NMFS workshop on mitigation, handling, and release techniques for sea turtles, sea birds, and other protected species (50 CFR 660.34).

On March 24, 2006, NMFS took emergency action and issued a temporary rule to close the Hawaii shallow-set longline fishery because the fishery had exceeded its number of allowed interactions with endangered and threatened sea turtles (71 FR 14824). The fishery will remain closed through December 31, 2006.

C. U.S. Bottom Longline Fisheries

Bottom longline gear is similar to pelagic longline gear in that they both consist of a series of hooks usually numbering in the hundreds to thousands, attached to a mainline that may be up to 40 miles long. The main difference in the two gear configurations is where the hooks are set in the water column. Bottom longline gear is not suspended in the water with floats, as is the case with pelagic longline gear. Instead, bottom longlines employ a series of weights or anchors to ensure that the gear is placed on or close to the ocean bottom.

1. Atlantic and Gulf of Mexico Shark Bottom Longline Fishery

The Atlantic and Gulf of Mexico shark bottom longline fishery has implemented several measures to reduce bycatch of sea turtles, marine mammals, smalltooth sawfish, and prohibited sharks. When a marine mammal, sea turtle, or smalltooth sawfish is hooked or entangled in the gear, fishermen must immediately release the animal, retrieve the gear, and move at least 1 nm (2 km) away from where the interaction occurred before resuming fishing (50 CFR 635.21(d)). Bottom longliners are required to carry and use linecutters and dipnets to release sea turtles, prohibited sharks, and other animals, as appropriate. On March 29, 2006, NMFS published a proposed rule that would require bottom longline fishermen to use the same dehooking equipment that is required in the pelagic longline fishery (71 FR 15680). Fishermen that hook smalltooth sawfish are to keep fish in the water maintaining water flow across the gills, examine the fish for research tags, and cut the line as close to the hook as possible (dehooker devices should not be used on smalltooth sawfish). As of 2005, the Mid-Atlantic Bight is closed to bottom longlines from January 1 to July 31 each year to reduce bycatch mortality of juvenile sandbar and prohibited dusky sharks (NMFS 2005a). Additionally, bottom longliners must use corrodible hooks (50 CFR 635.21(d)).

2. Gulf of Alaska Sablefish Bottom Longline Fishery

Hill *et al.* (1999) conducted a pilot study to observe and document interactions between sperm whales and the Gulf of Alaska bottom longline fishery, following up on anecdotal reports regarding sperm whales stealing sablefish catch off longline gear. The 1998 study placed observers on longline vessels in both the Gulf of Alaska and the Bering Sea. There were no observed interactions in the Bering Sea fishery, but sperm whales were present in 28.5% of the sets in the Gulf of Alaska, with 46.2% of longline sets in which sperm whales were present exhibiting fish damage (Hill *et al.* 1999). Mortality or serious injury to sperm whales was not observed. Interactions were correlated with landings of sablefish and with water depths greater than 200 fathoms (366 meters). Interactions were also more likely to occur in specific locations, namely within North Pacific Fishery Management Council Statistical Reporting Areas 630 through 680. Actual fish loss due to depredation by sperm whales was difficult to estimate due to high variability in fish catch per set and small sample sizes of observed sets with sperm whale depredation.

Jan Straley and Aaron Thode presented information regarding the Southeast Alaska Sperm Whale Avoidance Project (SEASWAP) at the third meeting of the PLTRT. They provided an overview of the gear and fishery, area of research, and vessels involved in the study. They noted that the study is of particular interest to fishermen because of the economic loss due to high depredation rates of bait and target species (sablefish, and to a lesser degree, halibut). The objectives of their research are to:

- Gain a greater understanding of sperm whales in the Gulf of Alaska, using genetic analyses and photo identification
- Determine the spatial and temporal nature of interactions between sperm whales and longline vessels, using a core team of fishermen to collect data on interactions, and
- Study the acoustics of whales and vessels, using passive acoustic recorders.

They noted that before gear modifications could be made or deterrents tested, additional information was needed regarding how whales detect gear, how whales depredate the catch, and whether avoidance is a viable strategy.

Straley reported that the majority of interactions occur in the shelf break area less than 200 fathoms deep, which is 12-20 nm (22-37 km) offshore in Southeast Alaska. Overall, depredation was observed in 22% of observed sets. Roughly a third of all sets had sperm whales present when gear was being hauled, and, of those sets, 71% had occurrences of depredation. When the whales were present during the haul back, a 3% reduction in target catch was recorded, even if there was no evidence of depredation. It was also noted that if whales joined the vessel during the haul, depredation was likely. In addition, they noted that: sperm whales were observed to feed further offshore when vessels were not actively fishing, depredation rates were lowest early in the season, not all whales around vessels appeared to feed off longline gear, and whales involved in depredations are all males.

Thode reported how acoustics were being used in this research. By using simple hydrophone arrays deployed on anchored fishing lines, as well as dummy lines, researchers are able to record whale vocalizations to determine both the whale's depth and distance from the array. They are also able to detect other sounds made in the vicinity of gear. One interesting observation is that vessels make a distinctive cavitation sound when engines are engaged/disengaged during haul back, which whales may be keying in on. One whale was "observed" to cruise at approximately

250 m of depth, and then ascend to 50 m as the gear was being hauled back. During this instance, the whale removed fish from hooks as haul back was occurring. Neither the gear itself, nor the hydraulics, makes these distinctive sounds. In addition, whales are acoustically active when they are in the vicinity of fishing vessels, using sounds thought to be indicative of feeding behavior (i.e., "creeks"). Sperm whales can be detected acoustically via hydrophones from a distance of approximately 4 nautical miles. The acoustic research suggests that sperm whales may use passive acoustics to find longline vessels during haul back. The distances from which whales can detect longline vessels or longline gear is not known. However, whales did not react to vessels retrieving gear at a distance ≥10 nautical miles away.

The SEASWAP team will continue to work collaboratively to identify measures that may be helpful to reduce depredation. Plans are to focus on the following areas of research:

- Distance at which whales can detect gear,
- Frequency of fish that are normally released alive, and whether vocalizations indicate feeding on these drop-offs (which will help refine estimates of depredation rates, as it is not clear how feeding on drop-offs affects depredation rates),
- Testing of various gear modifications and changes in fishing patterns, such as gangion lengths, acoustic reflectors along groundline, hauling in a circle so as to avoid engaging/disengaging the engine, fishing earlier in the season, and listening for whales prior to setting gear, and
- Possible testing of acoustic deterrents.

It is uncertain whether any of this work will result in regulatory measures for the Gulf of Alaska longline fishery, but it will continue to be helpful to direct research in other fisheries where depredatory behavior is resulting in serious injuries and mortalities of marine mammals (such as in the Atlantic pelagic longline fishery).

D. Longline Fisheries Worldwide

As noted in Section III, marine mammal interactions with both pelagic and demersal longline gear were the focus of a Workshop on Interactions Between Cetaceans and Longline Fisheries held in Apia, Samoa, in November 2002 (Donoghue et al. 2004). Various mitigation measures to reduce depredation by marine mammals were explored during the workshop. Such mitigation measures included the use of acoustic deterrents, such as seal scarers or tuna bombs, which participants noted as not being particularly effective; shooting at animals, also not particularly effective and which could actually cause injury to marine mammals; and moving to a new fishing area. The retention of bait and offal instead of dumping it overboard was also mentioned as a plausible mitigation measure, along with masking vessel noises so that marine mammals do not know when a haul is occurring, and avoiding hot spots where depredation by marine mammals is known to be actively occurring. Additional measures included delaying the setting or hauling of gear until animals have left the area, or luring marine mammals away from the area.

VII. Expected Effects of Various Bycatch Reduction Strategies: Analysis of Pelagic Longline Observer Data and Results of Predictive Modeling

A. Goals of the Predictive Model and Explanatory Variables Explored

The Pelagic Observer Program (POP) provides the most comprehensive data available on the characteristics of the pelagic longline fishery and the rate of interactions with marine mammals and other protected species. POP observers record extensive information about the location of fishing effort, environmental characteristics, configuration of the fishing gear, and the composition of the target species catch. The broad base of knowledge available from the POP program was used to evaluate correlations between fishery behavior and the rate of interactions with marine mammals. The goals of this analysis were to: 1) identify fishery and environmental characteristics correlated with marine mammal interactions, 2) develop a quantitative framework with which to evaluate the effectiveness of potential mitigation approaches in reducing bycatch rates, [16] and 3) to predict the impacts of various proposed or potential measures on the annual expected number of interactions with pilot whales and Risso's dolphins in the longline fishery.

These analyses are *correlative* in nature. While the approach may identify statistically significant relationships between explanatory factors and the rate of interactions, this does not provide information on causal relationships or underlying mechanisms. In addition, there are often many confounding factors associated with any given set. Thus, while correlations may appear to be important with a particular gear characteristic, these effects may be masking the effects of other correlated variables. Therefore, the analytical approaches applied here were used primarily as a tool to assess alternative mitigation measures in an objective, quantitative framework. The actual impacts of implementing the proposed measures will be evaluated through ongoing monitoring of the fishery and experimental programs that can directly test the causal relationships underlying any observed effects.

Logistic Regression Analysis

These analyses employed POP data collected between 1992-2004 and modeled the effects of gear and environmental factors on the probability of interacting with pilot whales or Risso's dolphins. Observed marine mammal interactions were converted into a binary response variable where each set was given a "Yes" value if at least one animal was captured, and a "No" value if one was not. This type of data structure is appropriately analyzed using logistic regression, a form of generalized linear model (GLM) used to evaluate the relationship between continuous or categorical explanatory variables and a binary response. Variable selection and model fit are evaluated in a stepwise manner by adding variables (i.e. explanatory factors) and evaluating the change in the explanatory power of the model.

Explanatory Variables Explored

A total of 39 explanatory variables were developed and explored as potential explanatory factors in the logistic regression model. These variables can be classified into five major categories: Environment, Space/Time, Gear Type, Effort, and Catch.

[16] The terms "bycatch rate" and "interaction rate" are used interchangeably in this analysis.

Environmental variables included water depth and average water temperature. Weather conditions (e.g., wind speed, wave height) were also included in the analysis.

Variables describing the spatial location of the set are recorded by the observer on board. Based upon these data and using a GIS system, the distance in kilometers from the 200m isobath was calculated. This spatial distance reflects the distance from the continental shelf break, which is an area of high intensity fishing, high catches of target species, and high observed incidence of interactions with pilot whales and other marine mammals. The analysis was restricted to the Atlantic coastal fishing areas where pilot whales, Risso's dolphins, and other mammals have been most frequently observed interacting with the fishery. The timing of the sets relative to the lunar cycle was included as a variable since fishermen typically time their fishing effort relative to lunar phase associated with tidal effects. The time of day of the haulback (dawn, day, dusk, or night) was also explored in the analysis.

Variables describing the characteristics of the fishing gear were also explored in this analysis. The gear characteristics vary due to the target fishery, the size of the vessel, the region fished, local fishing practices, and other factors. Included in these characteristics was information on the timing of the set, soak, and haul relative to daylight hours. The remaining gear variables include mainline length, hook type and size, gangion lengths, and other gear characteristics.
Eight quantitative variables were evaluated to determine the effect of fishing intensity on the probability of interacting with marine mammals. In each case, these variables measure the amount of gear set in the water and/or the amount of time it remained in the water. Observers record these variables during fishing operations.

The observers also record the numbers of each target species that are captured during each set. These may be correlated with the probability of capturing marine mammals for a number of reasons. The catch of individual species and the sum of all tuna species were explored for correlations with marine mammal interactions.

Finally, the rate and proportion of observed damage to tuna and swordfish catch was included as a potential explanatory variable. Observers record only whether or not damage to the catch was observed, regardless of the type or source of the damage.

B. Results of the Predictive Model

Logistic Regression Results: Pilot Whales

The significance of each explanatory variable was explored in a stepwise fashion. In an initial analysis, all environment, gear type, space/time, and effort variables were entered into the model as single factor main effects. This analysis indicated that only average water temperature, distance from the 200m isobath, fishing area, and mainline length were significantly correlated with pilot whales interactions. These results also indicated that only fishing in the Mid-Atlantic Bight area had a significant effect on the likelihood of interactions. Catch variables and damage to the catch were also explored as potential additional explanatory factors, and the occurrence of damage to swordfish catch on the set was significantly positively correlated with pilot whale interactions. Second order and interaction terms were also evaluated beyond the main effects. The final selected model was highly significant and explained 84% of the variability in the observer data. The model for pilot whales indicated that the probability of interacting with pilot

whales decreased with increasing distance from the 200m isobath, strongly increased in the Mid-Atlantic Bight versus all other Atlantic areas, increased with increasing water temperature with peak rates occurring between 70-80ºF, increased in sets with swordfish catch damage, and increased with increasing mainline lengths. Further analysis of the mainline length effect indicated that fishing with mainlines less than 20 miles in length resulted in an approximately 50% reduction in the probability of interacting with a pilot whale relative to longer mainline lengths.

Logistic Regression Results: Risso's Dolphins

A similar logistic regression analysis was conducted for Risso's dolphins. As with pilot whales, the significant explanatory factors were assessed in a stepwise manner including terms for second-order and interaction effects. The resulting model was highly statistically significant and accounted for 81% of the variation in the data. Variables retained in the model included a strong increase in Risso's dolphin interactions in the Mid-Atlantic Bight and Northeast Coastal areas relative to other areas, a strong decline in interactions with increasing distance from the 200m isobath, and an increase in interactions in the presence of damaged swordfish catch. Mainline length showed a similar but weaker correlation than was the case for pilot whales, with generally lower interaction rates in sets less than 20 miles in length. Interestingly, there was a very significant correlation between bait type and interactions with Risso's dolphins. The probability of an interaction increased significantly with the presence of squid baits on the gear as opposed to fish baits.

Application of Logistic Regression Results

The logistic regression model developed for pilot whales was used to explore the potential effects of a mandated reduction in mainline length to less than or equal to 20 nautical miles. This management measure was chosen for exploration because it was the only potential change in fishing gear expected to have a significant effect upon pilot whale interactions.

The effectiveness of mandating reduced mainline lengths in the longline fishery was assessed using a subset of reported fishing effort during 2004 in the mid-Atlantic and other Atlantic geographic areas as a test case. For each reported set, the predicted probability of interacting with one or more pilot whales was calculated based upon the output of the logistic regression model and the gear and environmental data for that set. The total expected number of pilot whale interactions for this dataset is the sum of these probabilities across all sets.

The mean bycatch rate (CPUE, expressed as Catch per 1000 hooks) for leatherback turtles, loggerhead turtles, swordfish, and tunas (all species) was calculated for each geographic area, quarter, and mainline length category (less then or greater than 20 miles) averaged across all reported effort from 2002-2004. The estimated catch (numbers of animals) for the set is then the product of the number of hooks and the CPUE. The sum of these expected catches across strata gives the expected total catch of each species.

The status quo 2004 data set, and the associated total catch estimates, was used as a reference point to evaluate the effectiveness of reducing mainline lengths under several scenarios. The goal of this exploratory analysis was to assess the potential response of fishermen to this management measure and bracket the extreme range of possibilities. The actual reaction to any measure is

unpredictable, as are other unforeseen factors (e.g., environmental variability) that may impact bycatch rates and total interactions. A series of possible scenarios for this management measure were developed to account for varying degrees of possible "compensation" by fishermen for the reduction in effort associated with a mandated reduction in mainline length (see Table 5). This included cases where some fishermen might choose to set multiple longlines in the same general location to compensate for the reduced length of those lines, as well as more extreme cases where the number of hooks (total effort) in the water column remained the same as or even increased over status quo conditions. For each scenario, the expected catch of pilot whales, swordfish, tunas, leatherback turtles, and loggerhead turtles was modeled.

Table 5. Scenarios explored to account for possible "compensation" by fishermen for the reduction in effort associated with mandated reduction in mainline length (excerpt from April 24, 2006 memorandum from Lance Garrison (NMFS) to the PLTRT.

Scenario #	Scenario Name	Description and Assumptions
0	Status Quo	Reported fishing activity during 2004. Logistic regression model used to predict the probability of a pilot whale interaction for each reported set. The total estimated take is then the sum of these probabilities across all sets. Some sets were removed from the actual reported effort due to errors in spatial location or missing environmental data. Each set reporting swordfish catch was assigned a value for swordfish damage (0 or 1) as a random deviate from a binomial distribution at a rate equal to the observed rate for each month and geographic area. A total of 3,661 sets were used in this "status quo" data set.
1	Reduce Mainline Lengths - No Compensation	Any mainline length greater than 20 nautical miles is reduced to 20 nautical miles. There is no compensation by fishermen by increasing the number of sets. The total number of hooks is calculated based upon hook spacing used on the gear (#hooks/mainline length). Thus, a gear reduced in length by 50% would fish 50% fewer hooks under this scenario.
2	Reduce Mainline Lengths - Full Compensation	Any mainline length greater than 20 nautical miles is reduced to 20 nautical miles. Affected fishermen compensate by increasing the number of sets proportional to the reduction in the number of hooks. So, a fisherman with a 30-mile original mainline length with 600 hooks will compensate by fishing one 20-mile line (400 hooks) and one 10-mile line (200 hooks). This is accomplished based on hook spacing by calculating the length of line needed to compensate for the loss of hooks. If this length exceeds 20 miles, then the set is reduced to 20 miles with an appropriate reduction in the number of hooks. The additional sets have the same environmental and location values as the initial set.
3	Reduce Mainline Lengths - Almost Full Compensation	Same general pattern as scenario #2. However, fishermen do not fish less than 5 miles of mainline to compensate for the lost hooks. This assumes that most fishermen fishing just over 20 miles of line will not compensate by setting pieces of smaller gear in the same place.
4	Reduce Mainline Lengths - 50% compensation	Same pattern as scenario #3. However, only 50% of the effort is compensated for on average. This is accomplished by generating a random 0 or 1 to each set with a uniform distribution, essentially a coin flip. If the random value is zero, then the compensation set is not included in the effort.
5	Reduce Mainline Lengths - Over compensation	In this case, any set with an original mainline length greater than or equal to 30 miles is replaced by two, 20 mile sets with the same hook spacing as the original long set. This is assumes that large boats capable of deploying long gear would choose to maximize effort above their current capacity. Vessels fishing between 20-30 miles of line are treated as in scenario #4. This scenario demonstrates that the number of hooks is irrelevant to catches of pilot whales, and even under the scenario of larger boats actually increasing their effort there would still be a reduction in pilot whale interactions.
6	Scenario #4 applied ONLY to sets in the MAB and NEC	Same as Scenario #4 - but only for the MAB and NEC
7	Scenario #4 applied ONLY to sets in the MAB	Same as Scenario #4 - but only for the MAB

If all fishermen using mainlines greater than 20 nautical miles reduced the lines to 20 nautical miles or less, then the logistic regression model predicted a 43% reduction in interactions with pilot whales in the 2004 test data, assuming no compensation by the fishermen. The reduction in mainline length would result in an estimated 21% reduction in effort relative to the status quo as measured by the number of hooks.

Various scenarios of fishery behavior resulted in a reduction of this benefit to pilot whales and maintained both fishing effort levels and target species catches (see Table 6).

Table 6. Predicted bycatch reduction and catch, as determined by the logistic reduction model (excerpt from April 24, 2006 memorandum from Lance Garrison (NMFS) to the PLTRT).

Scen-ario [17]	Total Sets	Total Hooks	Estim-ated Take - MAB	Estim-ated Take - Other Areas	Total Take	Take Reduc-tion vs. Status Quo	Reduc-tion vs. Status Quo Effort (Hooks)	Sword-fish Catch	Tuna Catch	Leather-back Catch	Logger-head Catch
0	3,661	2,525,864	62.9	17.9	80.8	-	-	49,390	36,127	291	458
1	3,661	2,000,598	38.0	7.9	45.9	0.432	0.208	40,685	31,585	194	443
2	5,812	2,517,642	53.8	13.6	67.4	0.166	0.003	51,656	39,365	246	575
3	4,979	2,409,496	46.0	11.3	57.3	0.291	0.046	49,335	37,740	236	552
4	4,355	2,211,687	42.0	9.8	51.8	0.359	0.124	45,195	34,715	216	500
5	4,979	2,540,976	46.0	11.3	57.3	0.291	0.006 increase	52,089	39,805	250	586
6	3,981	2,375,592	42.0	14.7	56.7	0.298	0.059	48,551	34,695	225	460
7	3,816	2,438,356	42.0	17.9	59.9	0.259	0.035	46,180	36,495	228	470

If all fishermen compensate perfectly, and fish the same number of hooks, then the reduction in pilot whale interactions falls to 17%. It is likely however, that at least some fishermen, particularly those fishing longlines just slightly over 20 miles long, will choose not to compensate. Depending on how these responses are modeled, the resulting predicted reduction in pilot whale interactions is 29% to 36%. Finally, if fishermen overcompensate by fishing two sets of gear 20 miles in length, then there is no change in the predicted pilot whale interaction rates relative to a similar scenario. This is because the actual number of hooks in the water column appears to be irrelevant to the probability of catching a pilot whale; rather, the number of sets is the important covariate for this process.

The logistic regression model examined two scenarios focused on bycatch reduction in sub-regions of U.S. Atlantic waters. When mainline lengths were limited to <20 nautical miles in the Mid-Atlantic Bight and Northeast Coastal areas only (scenario 6), the model predicted a

[17] See Table 5 for scenario descriptions.

reduction in pilot whale interactions of approximately 30%, assuming 50% compensation in fishing effort for lost hooks by longline fishermen. When mainline lengths were limited to <20 nautical miles in just the Mid-Atlantic Bight area (scenario 7), the model predicted a reduction in pilot whale interactions of approximately 26%, again assuming 50% compensation in fishing effort.

Predicted target species catches generally follow expected trends relative to changes in the number of hooks in the water column. It should be noted that some scenarios showed an expected reduction in pilot whale takes with relatively little change in expected target species catch. For all scenarios, the leatherback bycatch was predicted to decline. However, loggerhead turtle bycatch rates were predicted to increase due to the compensation of increasing the number of sets in the water. It should be noted that these data do not include "circle hook" effort except for the later half of 2004, and incorporating that factor may impact expected bycatch of turtles.

The results of these analyses suggest that reducing mainline lengths is likely an effective mitigation strategy to reduce the likelihood of interactions with pilot whales. The Team took these quantitative predictions into account as they developed potential management measures and research goals in the development of the TRP.

C. Spatial Analyses and Potential Active Avoidance Measures

During the course of deliberations, the Team noted that the interactions with pilot whales in the longline fishery, particularly in recent years, were highly clustered in space particularly in the region just north of Cape Hatteras, NC. This is also an area with high sighting rates of pilot whales during the 2004 SEFSC survey. The Team chose to further explore this spatial patterning at sub-regional spatial scales to determine if management measures focused on "hot spots" would be effective. In particular, the Team wished to explore the potential effectiveness of temporarily closing small-scale areas to fishing following an observed interaction with a pilot whale (the Team viewed this as a type of "active avoidance measure").

Spatial patterning in the distribution of fishery effort based on logbook reports from 2001-2005 was used to explore the appropriate spatial scales at which the fishery aggregates its effort. These scales reflect the underlying spatial distribution of habitat variables that are likely to impact both the distribution of target species and pilot whales. This analysis indicated that spatial cells oriented along the shelf break in the Mid-Atlantic Bight that were 50km in the north-south direction were appropriate for aggregating and describing fishery activities.

Within each 50 km spatial cell, the observed rate of pilot whale interactions in the POP data from 2001-2005 was summarized by bimonthly periods to account for seasonality. Due to the sparseness of the observer data, these cells were further aggregated into three zones corresponding to the southern, middle, and northern Mid-Atlantic Bight. The observed interaction rates within each of these zones was used to evaluate both the probability of observing an interaction during a given season and the effects of displacing fishing effort spatially due to either dynamic or fixed seasonal closures of part of the Mid-Atlantic Bight fishing area. In addition, the combined effects of reducing mainline lengths and local restrictions of fishing effort were explored.

As with the logistic regression analysis, a suite of scenarios was explored in the spatial analysis accounting for the variable potential behaviors of the fishery and to bracket the extreme range of potential responses. The observed bycatch rates suggested that the probability of observing a pilot whale interaction in any given season in each zone was extremely high. Therefore, the temporary, small-scale closures initially discussed by the Team were very likely to occur in any given period, resulting in effectively a seasonal closure of an area.

The scenarios explored a range of potential seasonal closures (either July-October or July-December) of the region just north of Cape Hatteras. Various assumptions were made about the effects of either redistributing fishery effort to the middle and northern mid-Atlantic bight and/or reducing the total amount of effort in the fishery.

The results of these analyses suggested that short-term, sub-regional area closures would result in relatively small reductions in the overall number of pilot whale interactions. Closures of the region just north of Cape Hatteras for the latter half of the year in combination with reductions in effort would be required to achieve a 33% reduction in pilot whale interactions. In addition, sub-regional applications of the restrictions on mainline length would result in only limited benefit. Only the combination of region-wide restrictions in mainline length, seasonal closures of the southern Mid-Atlantic Bight, and reductions in fishing effort would result in predicted reductions in pilot whale interactions approaching 70%.

The results of these analyses indicated that dynamic management efforts focused on small regions would be unlikely to significantly reduce pilot whale interactions. The required seasonal closures would impart a significant economic impact on the fishery, particularly fishermen local to North Carolina, and closures of this temporal and spatial extent were not considered further by the Team. However, the spatial analyses did demonstrate the aggregation of pilot whale interactions in the area just north of Cape Hatteras, particularly in the last 12-18 months. This apparent “hot-spot” in interactions is therefore a potentially important area on which to focus research on both pilot whale spatial distribution and interactions with the pelagic longline fishery.

VIII. Recommendations for Management Strategies to Reduce Mortalities and Serious Injuries of Pilot Whales and Risso's Dolphins in the Pelagic Longline Fishery

A. Background

Over the course of four in-person meetings and numerous work group teleconferences, PLTRT members discussed options for and eventually developed a package of recommended management measures.

During the first PLTRT meeting, PLTRT members discussed the possible applicability of measures from the Atlantic Offshore Cetacean Take Reduction Plan to the case of incidental take of pilot whales and Risso's dolphins in the pelagic longline fishery. Key management measures and research/data collection topics discussed included:

- Increase education and outreach to enhance avoidance techniques (e.g., through workshops for fishermen, development and use of guidelines for interactions and disentanglement, and enhanced communications among captains at sea)
- Implement limited entry of new vessels into the fishery
- Conduct research on gear modifications and/or operating procedures, as well as cetacean behavior and acoustical systems
- Limit the length of longline gear in the Mid-Atlantic Bight
- Reduce soak time by hauling gear in the order it was set
- Move vessels after one interaction
- Conduct more comprehensive surveys of affected marine mammal stocks to improve the precision of abundance estimates
- Pursue optimal allocation of observer coverage and increased funding for observer coverage
- Develop criteria for assessing marine mammal injuries

During the second PLTRT meeting, PLTRT members participated in a breakout group activity to provide input into management strategies for reducing mortality and serious injury. To facilitate brainstorming, PLTRT members discussed three overarching categories of strategies: (1) strategies for avoiding exposure of pilot whales to vessels/gear (large scale); (2) strategies for reducing probability of interaction once pilot whales were in the vicinity of gear (medium scale); and, (3) strategies for minimizing impacts of interactions once one has occurred. PLTRT members also discussed research, data, or technology needs for the three strategies. Results from the breakout group activity were then synthesized and refined into recommended management measures, as well as research recommendations (these research recommendations are described in Section IX of this Plan).

At the third PLTRT meeting, Garrison presented the results of a predictive model that analyzed a number of variables to determine which variables may be useful in predicting and/or minimizing interactions between marine mammals and longline gear, as well as interactions with sea turtles and catches of target species.

For pilot whales, variables found to have significant correlations included:

- The Mid-Atlantic Bight area: 81% of the interactions occur in this area

- Distance from the 200m isobath: all interactions were observed within 40km of the 200 m isobath
- Water temperature: peak interaction rates occur between 70-80° F)
- Mainline length: interaction rates were twice as high in sets with mainline lengths greater than 20 nautical miles than for sets with mainline lengths less than 20 nautical miles. (Note: There was not sufficient scientific information available to provide guidance to fishermen on minimum distance between sets; therefore, the Team recommended that research be conducted on this topic—see Section IX.)
- Swordfish damage: interaction rates were three times higher in sets with damage to swordfish catch.

For Risso's dolphins, similar results were found, except that correlations were not as strong. Interactions with Risso's dolphins were also significantly correlated with the Northeast Coastal area, and with sets that used squid as bait.

PLTRT members began discussing the synthesized management measures for inclusion in the TRP (see Appendix E). However, based on results from the predictive model presented by Garrison at the third meeting, a multi-interest work group offered a 4-point proposal that included a 20 mile limit to mainline length, active avoidance measures, a mandatory certification program on marine mammal bycatch, and a mandatory information placard to be placed in vessel wheelhouses.

In deliberations prior to and at the fourth PLTRT meeting, Garrison presented the results of several key analyses:

- Predicting the impact of changes in mainline length on pilot whale and target species catch. In this analysis, the model predicted a reduction in pilot whale interactions of 17-43% by limiting mainline length to no greater than 20 nautical miles. This range corresponded to a variety of fishery responses, ranging from full compensation in effort by the fishery (17% reduction in pilot whale interactions) to no compensation in effort by the fishery (44% reduction in pilot whale interactions). Team members agreed that the likely response would fall somewhere within that range.
- Variability in pilot whale interactions among individual vessels. In this analysis, Garrison concluded that there was no strong correlation between vessel characteristics (including hull material, vessel tonnage, and vessel length) and marine mammal bycatch.
- Analysis of "active avoidance" measures for reducing interactions with pilot whales in the Mid-Atlantic Bight. Garrison presented analyses examining the observed bycatch rates and fishing effort in bi-monthly periods in 50 km "zones" within the Mid-Atlantic Bight fishing area. Based upon observed pilot whale interaction rates, he evaluated the potential effects of short-term (1-2 months) and long-term closures within a fishing zone just north of Cape Hatteras where the highest interaction rates have been observed. Scenarios were developed exploring the impacts of redistribution of fishing effort into other zones and outright reductions in the total amount of fishing effort as a result of closures. These analyses indicated that a closure of the area just north of Cape Hatteras for the third quarter would result in a 14% reduction in pilot whale interactions. A 6-month closure of this area and an overall reduction in fishery effort would result in a 50% reduction in interaction rates. These scenarios help define a range of possibilities of attempting to reduce pilot whale interactions by focusing on sub-regional areas with high

interaction rates. The results suggest that large reductions could only be achieved with long-term closures and associated reductions in fishing effort in the Mid Atlantic Bight. While closures were not explicitly considered by the Team, these analyses demonstrate that "active avoidance" approaches at sub regional spatial scales would likely have little quantifiable impact on pilot whale interactions.

- Garrison also presented analyses evaluating the combined effects of reductions in mainline length and sub-regional closures. During 2002-2005, the observed data indicated a 41% reduction in bycatch rate if fishermen in the Mid-Atlantic Bight were limited to longlines <20 miles in length. This result is consistent with that predicted by the logistic regression model based upon data from 1992-2004. Applying this reduction to only fishing effort in the zones near Cape Hatteras for the second half of the year would result in an expected 17% reduction in pilot whale interactions. The combination of restrictions in mainline length and a 6-month closure (July-December) of the area near Cape Hatteras would result in an estimated 70% reduction in interactions. This combination of options was not explicitly considered by the PLTRT. However, this analysis indicates that applying mainline restrictions throughout the Mid-Atlantic Bight is required to produce substantial expected reductions in bycatch rates.

B. Recommended Management Measures

The Atlantic pelagic longline Take Reduction Team developed several consensus recommendations for management strategies to reduce mortalities and serious injuries of short- and long-finned pilot whales and Risso's dolphins in the pelagic longline fishery. These recommendations include:

(1) The designation of a special research area offshore of Cape Hatteras with specific observer and other requirements for fishermen operating in that area;
(2) A limitation on mainline length for all pelagic longline sets in the Mid-Atlantic Bight region;
(3) An increase in observer coverage in all highly migratory species fisheries that interact with pilot whales and Risso's dolphins;
(4) The development and use of equipment and methods for careful handling and release of entangled or hooked marine mammals;
(5) The promotion of voluntary daily communications among captains regarding interactions with protected species and other bycatch throughout the Atlantic pelagic longline fishery;
(6) The distribution of an updated informational placard that must be displayed in the wheel-house and on the working deck of all active pelagic longline vessels;
(7) The development of mandatory certification workshops for owners and operators of pelagic longline vessels on marine mammal bycatch; and
(8) The distribution of quarterly reports of pilot whale and Risso's dolphin bycatch rates to the Take Reduction Team for its review.

Each of these recommendations is described in more detail below. (Note: Although fishing with a "greenstick" technically falls under the current NMFS definition of pelagic longline fishing, the Team recommends that users of greenstick gear be excluded from requirements to comply with the provisions of this TRP. The Team also recommends that NMFS further clarify its definition of longline fishing in the Draft HMS FMP with respect to greenstick gear.)

1. **The Take Reduction Team recommends that the National Marine Fisheries Service designate a special research area offshore of Cape Hatteras.** The proposed research area would include all waters inside and including a rectangular boundary prescribed by the following lines: Southern latitude 35 degrees N, Western longitude 75 degrees W, Northern latitude 36 degrees 25 minutes N, and Eastern longitude 74 degrees 35 minutes W (see figure 5). This research area encompasses an area that, over the past five years, has exhibited high fishing effort and high pilot whale bycatch rates. The establishment of this research area will enable focused research on pilot whale interactions with the pelagic longline fishery. This will contribute to achieving the objectives of the TRP. NMFS will develop the specific research design in consultation with pelagic longline fishermen and other stakeholders. Section IX of this Plan lists priority research topics recommended by the Team.

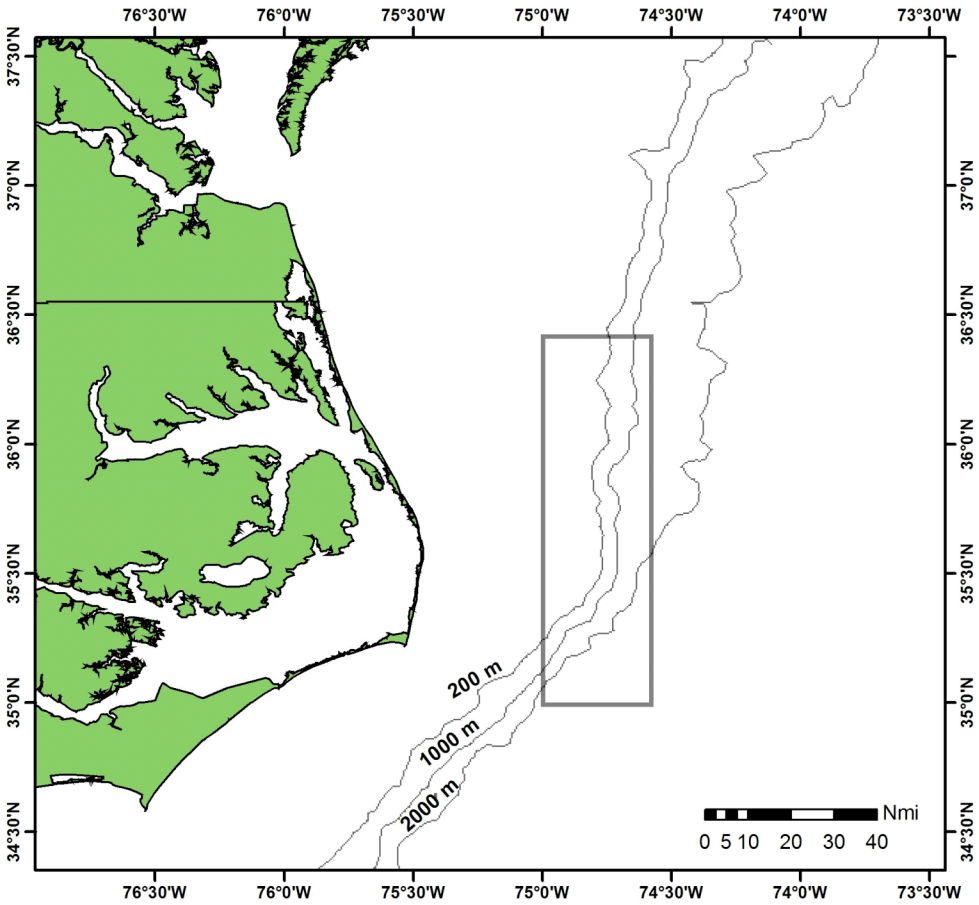

Figure 5. Special research area offshore of Cape Hatteras.

In order to use pelagic longline gear within the research area, the owner and operator of a vessel must meet several requirements:

- First, the owner and operator of the vessel must be both willing and able to participate in government-sponsored research programs targeting marine mammal bycatch reduction; pilot whale behavior, biology, or ecology; or other related topics.
- Second, the owner and operator of the vessel must accept, facilitate, and be capable of taking research or government observers. For a vessel to meet this second requirement, it must comply with the observer requirements found at 50 CFR Part

600.725 and 600.746, and Part 635.7. Vessels that do not comply with all observer requirements will not be granted waivers. If an observer is not placed on a vessel because the vessel is not in compliance with all regulations, the vessel shall not fish for or retain any Atlantic HMS[18] within the special research area.

- Third, the operator of the vessel must maintain daily communication with other local vessel operators regarding marine mammal interactions with the goal of identifying and exchanging information relevant to avoiding bycatch of marine mammals and other protected species. Daily communication must take place among the fleet after the day's haul and before the next set.

Any vessel with pelagic longline gear onboard that is fishing—which includes but is not limited to setting gear, hauling gear, or having gear that has drifted within the research area—must be in compliance with any current Special Research Area requirements.

Additional outreach to the fishery is critical to ensure full compliance with this requirement. PLTRT members are encouraged to work with NMFS to assist in implementation of this recommendation.

2. **The Take Reduction Team recommends that the National Marine Fisheries Service set a 20 nautical-mile upper limit on mainline length for all pelagic longline sets within the Mid-Atlantic Bight region, including in the Special Research Area.** Operators of individual fishing vessels would be allowed to fish multiple sets at one time, if they so desired, but the mainline length for each set must not exceed 20 nautical miles. It may be desirable to extend the limitation on mainline length to sets occurring in the Northeast Coastal region in the future based on additional information on the effectiveness of the limitation in reducing pilot whale bycatch rates in the Mid-Atlantic Bight region, stock structure of pilot whales and Risso's dolphins, and on pilot whale and Risso's dolphin bycatch rates in the Northeast Coastal region. Prior to any such geographic extension of this limitation by the National Marine Fisheries Service, the Take Reduction Team would like to review and consider the additional information and offer its recommendation to the National Marine Fisheries Service.

   The logistic regression model estimates a reduction in pilot whale interactions of approximately 26% when fishermen in the Mid-Atlantic Bight are limited to longlines <20 nautical miles in length. This figure assumes 50% compensation in fishing effort for lost hooks by longline fishermen, which PLTRT members considered a reasonable scenario. Reductions in pilot whale interactions due to the other recommended management measures were not estimated, as there was no quantitative basis for making these estimates. However, the PLTRT believes these other management measures, when combined with the mainline length restriction, would result in additional reductions in pilot whale interactions.

   At its discretion, the National Marine Fisheries Service may waive this restriction in specific cases to support research for reducing bycatch of marine mammals in the pelagic longline

[18] The regulations at 50 CFR 635.7 currently provide sufficient authority to implement these provisions without further rulemaking. However, NMFS may need to seek authorization for additional information collections under the Paperwork Reduction Act before implementing this recommendation, as it requires more frequent notifications to NMFS by vessels selected for observer coverage.

fishery (see Recommended Management Measure #1 above). NMFS will notify the PLTRT in cases where the agency intends to waive this restriction.

The Team recognized that this measure may have implications for other bycatch (e.g., sea turtles, sharks) and emphasized that the measure should avoid increasing the impact on other protected species.

3. **The Take Reduction Team recommends that the National Marine Fisheries Service increase observer coverage to 12-15% throughout all Atlantic pelagic longline fisheries that interact with pilot whales or Risso's dolphins.** This recommendation is to ensure representative sampling of fishing effort. Sampling design should be targeted toward achieving statistical reliability of marine mammal bycatch estimates. It should also take into account the objectives of marine mammal bycatch reduction. If resources are not available to provide such observer coverage for all fisheries, regions, and seasons, the Take Reduction Team recommends that the National Marine Fisheries Service allocate observer coverage to fisheries, regions, and seasons with the highest observed or reported bycatch rates of pilot whales.

   While this measure is geared towards improving the precision of serious injury and mortality estimates, additional coverage would also better characterize fishing operations and marine mammal behavior in this area, facilitate data needed for research, and increase opportunities to collect biopsy samples from hooked or entangled marine mammals. The additional coverage may be by NMFS observers that have been specially trained to collect additional information to support marine mammal research, or by designated and specially-trained "marine mammal observers" (deployed by either NMFS or cooperating researchers) that would supplement the traditional observer coverage. If structured as supplemental observer coverage, any vessels selected for coverage by the Pelagic Observer Program (POP) during the same quarter would be required to fulfill the POP requirement first.

4. **The Take Reduction Team recommends that the National Marine Fisheries Service update guidelines for careful handling and release of entangled or hooked marine mammals.** Those guidelines should include descriptions of appropriate equipment and methods. The Take Reduction Team encourages both the National Marine Fisheries Service and the pelagic longline fishing industry to develop new technologies, equipment, and methods for safer and more effective handling and release of entangled or hooked marine mammals. Such developments should be evaluated carefully and incorporated into revised guidelines for careful handling and release of marine mammals when appropriate.

5. **The Take Reduction Team recommends that the National Marine Fisheries Service and the pelagic longline fishing industry encourage vessel operators (i.e., captains) to maintain daily communication with other local vessel operators regarding protected species interactions with the goal of identifying and exchanging information relevant to avoiding protected species bycatch.** Such communication should be mandatory for vessel operators operating within the Cape Hatteras special research area, as described above, but would be voluntary in all other areas.[19]

[19] The PLTRT discussed and considered implementing a mandatory, region-wide Captain's communication program that would apply to regions (e.g., MAB, NEC) in which pilot whale and/or Risso's dolphin bycatch was elevated.

6. **The Take Reduction Team recommends that the National Marine Fisheries Service, in consultation with the pelagic longline fishing industry, develop and publish an informational placard that must be displayed in the wheelhouse and the working deck of all active pelagic longline vessels in the Atlantic fishery.** The placard would be based on the existing marine mammal Handling/Release Guidelines for pelagic longline gear. It would also draw on information presented in the mandatory certification program. Members also recommended that the placard include reference to the legal requirement of filling out the NMFS "Marine Mammal Injury/Mortality Reporting Form." Team members also provided input to be used in updating the existing "Marine Mammal Handling/Release Guidelines."

7. **The Take Reduction Team recommends that the National Marine Fisheries Service develop and implement a mandatory certification program for owners and operators of pelagic longline vessels on marine mammal bycatch.** Such certification of both owner and operator of a vessel would be required for the vessel to use pelagic longline gear within the Atlantic fishery. The Team recommends that the certification program proposed in the Draft Highly Migratory Species Fishery Management Plan be expanded to incorporate information regarding marine mammal interactions. The certification program should cover such issues as:
    a. Safe handling and release techniques for marine mammals;
    b. Current regulations and guidelines that apply to the fishery, especially those related to marine mammal bycatch, and an explanation of the purpose and justification of those regulations and guidelines;
    c. Information to be recorded in log books and auxiliary forms associated with particular research projects;
    d. Guidelines for captain's communications;
    e. Updates on NMFS' observer program, including relevant recent findings;
    f. Description of research and monitoring projects aimed at reducing marine mammal bycatch, including an explanation of the purpose of this research and a description of key research results to date.
    g. Information on species identification. Team members noted that the existing NMFS "Guide to Marine Mammals and Turtles of the US Atlantic and Gulf of Mexico" could be distributed as part of the certification program.

    Take Reduction Team members recommend that the above marine mammal-focused materials be incorporated into the existing HMS certification program as soon as possible.

8. **Finally, the Take Reduction Team recommends that the National Marine Fisheries Service provide quarterly reports of bycatch of marine mammals in the pelagic longline fishery to the Take Reduction Team for its review.**

The team acknowledged that a region-wide mandatory program would be difficult to enforce and regulate. The team also generally found the concept of bycatch avoidance through a third party real time (daily) Captain's communication process to be a positive and progressive potential measure. However, the team recognized that this may be too cumbersome (regulatory) and expensive for this fishery at this time.

C. Implementation of Recommended Management Measures

PLTRT members recommended that several of these management measures—including measures 1, 2, 6, and 7 above—be implemented via regulation. Team members believed that, without a regulatory basis, implementation of these measures by the pelagic longline fishery would not result in sufficient reduction of marine mammal bycatch. Team members also recommended that the remaining measures be implemented via non-regulatory means.

IX. Recommendations for Additional Research and Data Collection

The research recommendations presented below were derived over the course of several PLTRT deliberations and discussions. These included a facilitated brainstorming session at the second PLTRT meeting, the convening of an ad hoc work team which met several times by teleconference, and full PLTRT deliberations at the third and fourth meetings.

The discussion began at the second PLTRT meeting with a facilitated brainstorming session on the topic of long-term research, data and technology needs. At the meeting, members of the PLTRT identified research strategies that addressed information needs for the following: (1) strategies for avoiding exposure to vessel/gear, (2) reducing the probability of interaction once whales are in the vicinity of longline gear, and (3) strategies for minimizing impacts of an interaction once it has occurred.

A research work team was established at the second PLTRT meeting to identify, sort and begin prioritizing research needs, building on the results of the brainstorming exercise. Over the course of several meetings, the work team developed a list of data mining and research needs. The full Team also identified general enhancements to observer program data collection.

While the predictive model provided tremendous guidance to the PLTRT process, there is a significant lack of information concerning how pilot whales and Risso's dolphins interact with the pelagic longline fishery. Thus, many of the research recommendations are general in scope, and applicable to both pilot whales and Risso's dolphins unless specified otherwise.

The PLTRT recommends that priority should be given to: (1) research on species that are closest to or exceed PBR; (2) research that evaluates the effects of implemented management measures in this plan, and (3) research on species specific abundance, mortality, and post-hooking survivorship. The PLTRT also recommended that, when funds become available for PLTRT-related research, a working subgroup of the PLTRT be convened to provide guidance and expertise on which projects should be funded based on priorities and the amount of funds available.

Data mining and research needs are further sub-divided into three categories based on the estimated time needed to complete the research, once it was initiated: (1) short duration projects that could be completed within one year of initiation; (2) medium duration projects that would require one to three years to complete, and (3) long duration projects that would take five years or longer to complete. The PLTRT emphasizes that these categories reflect the time needed to complete a project relative to initiation of the research effort; they are not intended to reflect the level of priority for implementation.

A. Data mining of existing data and/or information

1. Short duration (up to one year)

a. Using existing data, describe and compare pelagic longline fishing in the GOM with other regions to identify possible fishing practices that could further reduce incidental serious injury and mortality in the Atlantic pelagic longline fishery.

2. Medium duration (one to three years)

a. Investigate the effects of displaced fishing effort that may result after management measures are implemented.

b. Evaluate and compare the rate and impact of pilot whale and Risso's dolphin interactions with pelagic longline gear that uses circle hooks versus J-hooks.

3. Long duration (five or more years)

a. Determine what other organizations or groups are doing with regard to investigating the use of quiet ship technology. For example, consult within NMFS regarding the working group investigating quiet ship technology.

B. Research Needs

1. Short duration (up to one year)

a. Characterize and evaluate the interaction of pilot whales and Risso's dolphins with pelagic longline fishing gear during haul back.

1) Characterize pilot whale/Risso's dolphin interactions with pelagic longline fishing gear during the entire fishing operation, including haul back. Do whales/dolphins interact with gear more during haul back than any other time?

2) Examine pilot whale/Risso's dolphin interactions correlated with haul back order, soak time, and direction. Is the order of haul back correlated with higher bycatch?

3) Examine the relationship between the presence of pilot whales/Risso's dolphins prior to haul back, evidence of depredation and hooking/entanglements.

4) Investigate whether there is a correlation between interactions and when/whether vessels are engaging and disengaging their engines during haul back, as may be occurring in Alaska (see section VI.C.2 above).

5) Conduct studies to determine whether the Alaskan circle haul back technique reduces the frequency of interaction.

6) Investigate fishermen experiences with de-hooking and disentangling pilot whales and Risso's dolphins, including the extent to which such de-hooking and disentangling has occurred in the past and the results of these efforts.

NOTE: *The research work team discussed several challenges to this research topic, such as: (1) interactions often don't occur close to the fishing vessel, and (2) collecting data could take a long time and be labor intensive given the low rate of interactions. To address these challenges, the work team suggested: (1) replicating an approach used in Alaska of a "study fleet" where fishermen are trained by scientists in photographic techniques and data collection, (2) creating multi-phased observers so that when a*

marine mammal interacted with gear, the observer would become a marine mammal observer, and prioritize data collection on those interactions, and (3) develop alternative platforms for observer coverage and research. Finally, it was mentioned that the SEFSC will place some marine mammal observers on pelagic longline fishing boats beginning May 2006.

b. Conduct separate population estimates for short-finned and long-finned pilot whales based on existing survey data and biopsy samples.

2. Medium duration (one to three years)

a. Evaluate the effects of implemented PLTRP Management Measures.

1) Conduct research on the effects of reducing mainline length to <20miles and how this affects fishermen behavior, catch, bycatch, etc.
   i. Determine the accuracy of mainline length estimation methods
   ii. Investigate the effects of distance between sets on catch, bycatch, etc.
   iii. Investigate the mechanism that links shorter mainlines to reduced bycatch

2) Evaluate the type, frequency, and success rate of release techniques and tools used to disentangle marine mammals.

3) Other research to be determined based on management measures.

b. Increase knowledge about the stock structure of pilot whale species and Risso's dolphins that are interacting with the pelagic longline fishery.

1) Identify which species are being taken in the fishery (e.g. long-finned or short-finned pilot whales) through biopsy samples collected from bycaught animals and partition mortality information for each species.
2) Conduct winter biopsy surveys to better define the range and potential overlap of short- and long-finned pilot whales in the Mid-Atlantic Region during winter months.
3) Further expand biopsy sampling and analysis in other areas beyond the Mid-Atlantic Bight.

c. Characterize and investigate interactions between pilot whales/Risso's dolphins and the pelagic longline fishery.

1) Further investigate how pilot whales and Risso's dolphins are interacting with longline gear. As part of this investigation, further examine the prevalence of *depredation* in hooking/entanglement of pilot whales and Risso's dolphins. Sub-issues for this examination of depredation include:
   - Determine how much of the observed interaction is due to feeding on the catch vs. feeding on the bait.
   - Determine the frequency of depredation by marine mammals in the pelagic longline fishery and whether or not entanglement is involved.
   - Determine whether or not, and how often, the presence of marine mammals and/or depredation by marine mammals results in hooking/entanglement.

- Describe what is left on the hooks after depredation by marine mammals
- Determine source of depredation (e.g. shark, marine mammal, squid).
- Identify alerting cues used by pilot whales and other marine mammals when in the vicinity of pelagic longline fishing. Investigate how pilot whales and Risso's dolphins detect the gear.
- Determine whether offal discarded by vessels is a cue or attractant to pilot whales and/or Risso's dolphins. Look at other observer program data to determine if pilot whales and/or Risso's dolphins are associated with offal from other fisheries discards.

d. Experiment with gear and bait alterations.

1) Experiment with hook and bait alterations (e.g., bait dyes, or alternate baiting methods), particularly for Risso's dolphins.
2) Consider further modifications to hooks (e.g. weak hooks).
3) Investigate if setting gear with tension reduces the likelihood of entanglement.

e. Disentanglement techniques.

1) Evaluate disentanglement protocols. Have the commercial fishing industry survey their membership about what does and does not work in terms of recommended disentanglement guidelines, including overall feedback about various techniques being used. After the survey, a workshop could be convened to amend the marine mammal handling and release guidelines, if necessary.
2) Develop and test new Careful Handling/Release tools (i.e. in-line hook cutter and throw grapple)

f. Investigate possible environmental and other effects associated with the potential strategy of allowing modifications to pelagic longline vessels to make them more offshore capable. The Team recognizes that some pelagic longline fishermen are impeded from avoiding bycatch "hot spots" because of the size of their vessels.

3. Long duration (five or more years)

a. Determine survivorship of hooked/entangled pilot whales and Risso's dolphins.

1) What is the post-release survival rate of entangled/hooked pilot whales/Risso's (e.g., explore the use of tagging and telemetry)?

2) Examine the mortality risk resulting from actual pilot whale/Risso's dolphin interaction with pelagic longline gear.

3) Investigate how serious injury is related to the size and age class of the animals.

4) Investigate the frequency, occurrence, and location of healed scars on stranded pilot whales and Risso's dolphins. While difficult to interpret, this may provide useful information that could contribute to better understanding serious injury.

b. Investigate the role of acoustics in interactions between pilot whales and Risso's dolphins and the pelagic longline fishery.

   1) Determine if acoustic signal from individual vessels affects the behavior of pilot whales and Risso's dolphins.

   2) Conduct experimental acoustic playbacks that simulate vessel activity.

   3) What are the differences between Mid Atlantic and GOM with respect to the acoustic signature or noise of local vessels?

c. Characterize pilot whale's social structure/behavior in the Mid-Atlantic Bight region and how it may influence interactions with pelagic longline fishing.

   1) Investigate broad scale movements of pilot whales by satellite tagging individuals within a group and from many groups of whales in the Mid-Atlantic Bight region.

   2) Determine whether certain age/sex classes (e.g., females or juveniles) or social groups of pilot whales are more likely to engage in depredation

   3) Use mark-recapture studies to examine the degree to which interactions with longline gear may be a learned behavior.

d. Investigate preferred habitat of pilot whales in the Mid-Atlantic Bight region

   1) Investigate the fine scale spatial distribution of pilot whales in relationship to habitat and determine if there are preferred habitats and/or if certain areas are used by pilot whales for reproduction and feeding.

   2) Evaluate whether bycatch of marine mammals and target species is affected by specific habitat features (similar to NED experiment).

e. Develop and test the effectiveness of potential deterrents.

f. Investigate effects of altering the detectability of pelagic longline gear.

C. Improvements to Observer Data Collection

The Team recommends that NMFS improve observer coverage and data collection to support the reduction of bycatch of pilot whales and Risso's dolphins in the following ways:

1) Improve observer coverage for other commercial (e.g., dolphin-wahoo) and recreational fisheries that also have interactions with pilot whales or Risso's dolphins, and improve data on the nature and extent of marine mammal bycatch in these fisheries.
2) Request sufficient funding to achieve higher levels of observer coverage. The funding requests would support the recommended management measure to increase observer coverage to 12-15% throughout all Atlantic pelagic longline fisheries that interact

with pilot whales or Risso's dolphins (see Section VIII.B), as well as improvements recommended in this section.

3) Reduce the number of vessels that have never carried an observer while fishing with pelagic longline gear. The Team recognizes that 20% of vessels in the pelagic longline fishery reporting effort have never been observed. The Team recommends that the NMFS, consistent with the observer recommendations contained in the June 1, 2004 Endangered Species Act (ESA) Section VII Consultation Biological Opinion (June 2004 BiOp) on the Atlantic Pelagic Longline Fishery for Highly Migratory Species (HMS), must strive to observe at least one trip on each active, permitted pelagic longline vessel fishing the Mid-Atlantic Bight region. It is also the Team's intent that no waivers be granted relative to the lack of a Fishing Vessel Safety Decal required to embark an Observer, consistent with the Terms and Conditions contained in the June 2004 BiOp, under section 9-4 (f).[20]
4) Develop a new marine mammal incidental take form to include additional information regarding marine mammal interactions.[21] This additional information should include: (1) how and where (on what part of the gear) the animal was caught, (2) whether there were signs of depredation on that set, (3) evidence for consumption of bait by other species, and (4) how entangled/hooked animals were handled and released, as appropriate. The PLTRT initiated efforts to revise this form after the Team's second meeting, and a draft of the revised marine mammal incidental take form is included in Appendix G.
5) Improve data collection by providing in-depth, systematic debriefs on marine mammal interactions to observers and vessel operators, and by improving observer training.
6) Establish a standard procedure to collect biopsy samples from marine mammals that interact with longline gear (using a biopsy pole). Fishermen should facilitate the ability of NMFS observers to conduct a full necropsy on any dead marine mammals, or collecting all or part of the animal for further investigation on land.

[20] Section 9-4 (f) of the June 2004 BiOp states: "*Compliance with vessel safety requirements for observer coverage.* NOAA Fisheries must establish procedures to notify OLE of any vessel authorized to fish with pelagic longline gear and selected for observer coverage that is found to be inadequate or unsafe for purposes of carrying an observer and allowing operation of normal observer function. Such vessels are prohibited from fishing without observer coverage. NOAA Fisheries must establish procedures for those vessels issue regulations requiring vessels authorized to fish with HMS pelagic longline gear to notify the OLE and POP when safety problems have been corrected, before the vessel conducts another fishing trip."

[21] Observer information currently used to determine whether a marine mammal is seriously injured upon release is made using information recorded in the "comments" section of the incidental take log. Serious injury coding occurs during data analysis by the SEFSC Protected Resources and Biodiversity Division, and is not performed by the observers.

X. Next Steps

A. Adaptive Management Approach

The Take Reduction Team agreed to take a stepwise adaptive management approach to achieving the goal of the TRP to reduce, within five years of its implementation, serious injuries and mortalities of pilot whales and Risso's dolphins in the Atlantic pelagic longline fishery to insignificant levels approaching a zero mortality and serious injury rate. The Team agreed to build into the five-year implementation phase of the TRP a series of monitoring and evaluation steps. In an adaptive management fashion, the Team will periodically: 1) analyze the status of scientific information on pilot whales and Risso's dolphins, 2) evaluate the effectiveness of the TRP, and 3) adjust the Plan's management measures and research program, as appropriate.

The Team requested that the following types of information be made available by NMFS to inform these periodic assessments:

- Status of TRP implementation
- Updated stock assessment reports
- Updated habitat analyses
- Update on data collection and research findings
- Update on voluntary efforts being carried out by the pelagic longline industry
- Update on status of observer coverage
- Updated results of the predictive model for pilot whales and Risso's dolphins, based on updated data sets (PLTRT members requested that the predictive model be updated, evaluated, and run approximately once a year, or as deemed necessary by the PLTRT)

The Team agreed that the timing of these assessments should be tied to both the availability of data and the time needed to adequately evaluate the effectiveness of management measures or the results of the research program. The Team requested that they be provided with quarterly bycatch reports, which will in turn help inform the decision of when it will be timely and useful to reconvene.

B. Near-Term Next Steps

The Team recommended that immediate steps be taken to reduce the bycatch of pilot whales and Risso's dolphins in the Atlantic. This will help ensure that the bycatch of these stocks remains under PBR. Key near-term steps include:

1. Initiate the Rulemaking Process

PLTRT members recommended that implementation of the package of measures, through rulemaking, begin as soon as the Draft TRP is completed. They also recognized that rulemaking involves several layers of review within NMFS, NOAA, DOC, and OMB. As such, they recognized that rulemaking to implement the TRP may take 12-15 months, or longer from the time of completion of the Plan (May 31, 2006).

2. Pursue near-term bycatch reduction measures

PLTRT members recommended that a suite of actions be implemented by the end of Summer 2006 to help produce an immediate reduction in pilot whale and Risso's dolphin interaction with the pelagic longline fishery. Recommendations regarding key near-term actions include:

a. NMFS should conduct voluntary outreach/education workshops on marine mammal bycatch over the summer of 2006 targeted to pelagic longline fishermen who typically fish in the Mid-Atlantic Bight. The workshops would explain the Plan and the recommended measures and would encourage fishermen to begin adopting these measures as best practices in advance of rulemaking.
b. NMFS should work with stakeholders to revise the informational placard containing marine mammal Handling/Release Guidelines for pelagic longline gear and distribute these to the pelagic longline fleet for display in their wheelhouses and on their working decks. This will be implemented as a voluntary measure until a regulation requiring display of the placard is adopted.
c. NMFS should work with stakeholders to prepare information on marine mammal interactions to be incorporated into ongoing HMS certification workshops.
d. Relevant research projects should be initiated immediately, including cooperative research between NMFS and pelagic longline fishermen. At the time of submittal of the draft plan, NMFS was working with North Carolina Sea Grant to fund two research projects. The first is a study of pilot whale behavior and acoustical research in the Mid-Atlantic Bight, and the second is a pilot study interviewing fishermen regarding the circumstances surrounding marine mammal hooking/entanglement events.
e. Initiate industry initiative to voluntarily convert to the Mustad 2x, 4 mm (200 pound pull strength) weak hook when fishing from 35 to 37 North Latitude along the Hatteras slope.
f. NMFS should begin coordinating with other take reduction teams, including the trawl fishery TRT focused on bycatch of pilot whales and Risso's dolphins and other TRTs involving the longline fishery.

3. Convene an initial PLTRT follow-up teleconference

The Team recommended reconvening by teleconference approximately six months after completion of the Plan (November-December 2006). The primary focus of the call would be to:

- Assess TRP implementation and the status of the rulemaking process
- Assess the status of the stocks based on new bycatch reports
- Review the results of voluntary measures taken over the Summer
- Review the results of near-term research findings
- Discuss the need and timing for future teleconferences or in-person PLTRT meetings
- Update the status of observer coverage
- Incorporate information if and when it becomes available about bycatch and take reduction plan requirements from other fisheries interacting with pilot whales and Risso's dolphins.
- Further discuss the issue of potentially segmenting the Atlantic pelagic longline fishery into components based on level of marine mammal bycatch within each component to inform the List of Fisheries process. This could include further discussion of the "greenstick" sub-segment of the Atlantic pelagic longline fishery.

C. Longer-Term Next Steps

In conjunction with the receipt of quarterly bycatch reports, the Take Reduction Team agreed to periodically assess the merits of convening future PLTRT meetings, either in-person or teleconferences. At each of these meetings, the Team will evaluate the effectiveness of the TRP and make adjustments to it, as appropriate, to ensure that the goal of the plan will be met within 5 years of implementation of the TRP.

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Appendix A

List of Pelagic Longline Take Reduction Team Members (as of April 2006)

Marine Mammal Biologists:

1. Damon Gannon
   Mote Marine Lab
   Marine Mammal Center
   1600 Ken Thompson Pkwy.
   Sarasota, FL 34236
   Ph: (941) 388-4441 ex. 450
   Email: damon@mote.org

2. Bill McLellan
   Biological Sciences
   University of North Carolina Wilmington
   601 South College Rd.
   Wilmington, NC 28403
   Ph: (910) 962-7266
   Email: mclellanw@uncw.edu

Fisheries Biologists:

3. Jean Cramer
   Thunder Mountain Consulting
   68 Thunder Mountain Rd.
   Edgewood, NM 87015-9554
   Ph: (505) 286-7603
   Email: jean.cramer@higherspeed.net

4. David Kerstetter
   Cooperative Institute for Marine and Atmospheric Studies
   University of Miami
   4600 Rickenbacker Causeway
   Miami, FL 33149
   Ph: (305) 361-4242
   Fax: (305) 361-4219
   Email: david.kerstetter@noaa.gov

Regional Fishery Management Council:

5. Rich Seagraves
   Mid-Atlantic Fishery Management Council
   300 S. New Street
   Room 2115 Federal Building
   Dover, DE 19904
   Ph: (302) 674-2331 x14
   Email: rseagraves@mafmc.org

Environmental Organizations:

6. Brendan Cummings
   Center for Biological Diversity
   P.O. Box 549
   Joshua Tree, CA 92252
   Ph: (760) 366-2232 x304
   Fax: (760) 366-2669
   Email: bcummings@biologicaldiversity.org

7. Jessica Koelsch
   The Ocean Conservancy
   449 Central Avenue Suite #200
   St. Petersburg, FL 33701
   Ph: (727) 895-2188 x 14
   Email: jkoelsch@oceanconservancy.org

8. Beth Lowell
   Oceana
   2501 M St. NW Suite 300
   Washington, DC 20037
   Ph: (202) 833-3900
   Email: blowell@oceana.org

9. Nina Young
Ocean Research, Conservation, and Solutions (ORCAS) Consulting
1609 B. Corcoran St. NW
Washington, DC 20009
Ph: (202) 297-4244
Email: orcasconsulting@msn.com

10. Sharon Young
Humane Society of the United States
22 Washburn St.
Sagamore Beach, MA 02562
Ph: (508) 833-0181
Email: syoung@hsus.org

Marine Mammal Commission Representative:

11. Mike Simpkins
Marine Mammal Commission
4340 East-West Hwy.
Bethesda, MD 20814
Ph: (301) 504-0087
Email: msimpkins@mmc.gov

Alternate:
Tim Ragen
Marine Mammal Commission
4340 East-West Hwy.
Bethesda, MD 20814
Ph: (301) 504- 0087
Email: tragen@mmc.gov

***Fishing Industry Representatives*:**

12. Nelson Beideman
Blue Water Fishermen's Association
P.O. Box 398
910 Bayview Ave.
Barnegat Light, NJ 08006
Ph: (609) 361-9229
Fax: (609) 494-7210
Email: nelson@bwfa.org

13. Jim Budi
18 Barnwall Drive
Beaufort, SC 29907-1171
Ph: (843) 522-1595
Email: j.budi@worldnet.att.net

14. Glenn Delaney
Blue Water Consultant
601 Pennsylvania Avenue. NW
Suite 900
Washington, DC 20004
Ph: (202) 434-8220
Email: grdelaney@aol.com

15. Gail Johnson
Fishing Vessel Seneca
34 Edgewater Colony Rd.
Harpswell, ME 04079
Ph: (207) 833-6083
Email: Pocahontas@gwi.net

16. Dan Mears
Fishing Vessel Monica
P.O. Box 324
Barnegat Light, NJ 08006
Ph: (609) 226- 4082
Email: fvmonica@aol.com

Alternate:
Eric Burcaw
Fishing Vessel Lori-Marie
10 Crestview Dr.
Seaville, NJ 08230
Ph: (609) 390-9592
Email: lmtuna@aol.com

17. Vince Pyle
    Fishing Vessel Carol Ann
    629 Northeast 3rd. St.
    Dania, FL 33004
    Ph: (954) 612-8747
    Fax: (954) 925-0622
    Email: afbdania@bellsouth.net

Alternate:
    Greg O'Neill
    P.O. Box 606
    Dania Beach, FL 33004
    Ph: (954) 925-6336
    Fax: (954) 925-0622

18. Scott Rucky
    Fishing Vessel Dakota
    15 Huntting Lane
    East Islip, NY 11730
    Ph: (631) 224 - 4820
    Email: dakfish@aol.com

Alternate:
    Marty Scanlon
    40 Grissom Way
    Hauppauge, NY 11788
    Ph: (631) 234-8090
    Email: proii@fnol.net

***National Marine Fisheries Service Team Members*:**

19. Vicki Cornish
    Southeast Regional Office
    263 13th Avenue South
    St. Petersburg, FL 33701
    Ph: (727) 824-5312
    Fax: (727) 824-5309
    Email: Vicki.Cornish@noaa.gov

20. Kristy Long
    Office of Protected Resources
    1315 East-West Hwy. Room 13738
    Silver Spring, MD 20910
    Ph: (301) 713-1401 ex: 171
    Fax: (301) 427-2522
    Email: Kristy.Long@noaa.gov

Pelagic Longline Take Reduction Team Advisors and Facilitators

U.S. Coast Guard Advisor:

21. Katie Moore
    U.S. Coast Guard Atlantic Area
    Fifth District, Office of Law Enforcement
    431 Crawford St.
    Portsmouth, VA 23704-5004
    Ph: (757) 398-6504
    Fax: (757) 398-6279
    Email: Kmoore@lantd5.uscg.mil

***National Marine Fisheries Service Advisors*:**

22. Laura Engleby
    Southeast Regional Office
    263 13th Avenue South
    St. Petersburg, FL 33701
    Ph: (727) 824-5312
    Fax: (727) 824-5309
    Email: Laura.Engleby@NOAA.gov

23. Kate Wells
    Southeast Regional Office
    263 13th Avenue South
    St. Petersburg, FL 33701
    Ph: (727) 824-5312
    Fax: (727) 824-5309
    Email: Kate.Wells@noaa.gov

24. David Bernhart
    Southeast Regional Office
    263 13th Avenue South
    St. Petersburg, FL 33701
    Ph: (727) 824-5312
    Fax: (727) 824-5309
    Email: David.Bernhart@noaa.gov

25. Cheryl Scannell
NOAA General Counsel, Southeast Region
263 13th Avenue South
St. Petersburg, FL 33701
Ph: (727) 824-5370
Fax: (727) 824-5376
Email: Cheryl.Scannell@noaa.gov

26. Lance Garrison
Southeast Fisheries Science Center
75 Virginia Beach Dr.
Miami, FL 33149-1003
Ph: (305) 361-4488
Fax: (305) 361-4478
Email: Lance.Garrison@noaa.gov

27. John Watson
Southeast Fisheries Science Center
3209 Frederic St.
P.O. Drawer 1207
Pascagoula, MS 39567-4112
Ph: (228) 762-4591 ex: 292
Fax: (228) 762-8699
Email: John.Watson@noaa.gov

28. Charlie Bergmann
Southeast Fisheries Science Center
3209 Frederic St.
Pascagoula, MS 39567-4112
Ph: (228) 762 –4591 x259
Fax: (228) 826-3135
Email: Charles.Bergmann@noaa.gov

29. Karyl Brewster-Geisz
Sustainable Fisheries HMS
1315 East-West Highway
Silver Spring, MD 20910
Ph: (301) 713-2347
Fax: (301) 713-1917
Email: Karyl.Brewster-Geisz@noaa.gov

30. Mark Minton
Northeast Region
One Blackburn Dr.
Gloucester, MA 01930-2298
Ph: (978) 281-9300 x6509
Fax: (978) 281-9394
Email: Mark.Minton@noaa.gov

Alternates:
David Gouveia
Northeast Region
Ph: (978) 281-9280
Email: David.Gouveia@noaa.gov
Diane Borggaard
Northeast Region
Ph: (978) 281-9300 x6503
Email: Diane.Borrggard@noaa.gov

31. David Johnston
Pacific Islands Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822-2396
Ph: (808) 983-5398
Fax: (808) 983-2902
Email: Dave.Johnston@noaa.gov

32. Guillermo Diaz
Southeast Fisheries Science Center
75 Virginia Beach Dr.
Miami, Fl 33149
Ph: (305) 361-4200
Fax: (305) 361-4219
Email: Guillermo.Diaz@noaa.gov

33. Dennis Lee
Southeast Fisheries Science Center
75 Virginia Beach Dr.
Miami, FL 33149
Ph: (305) 361-4247
Fax: (305) 361-4478
Email: Dennis.Lee@noaa.gov

34. Patricia Rosel
Southeast Fisheries Science Center
646 Cajundome Blvd. Suite 234
Lafayette, LA 70506
Ph: (337) 291-2123
Fax: (337) 291-2106
Email: Patricia.Rosel@noaa.gov

35. Chris Yates
Pacific Islands Regional Office
1601 Kapiolani Blvd.
Honolulu, HI 96814-4700
Ph: (808) 973-2935
Fax: (808) 973-2941
Email: Chris.Yates@noaa.gov

36. Richard Merrick
Northeast Fisheries Science Center
166 Water St.
Woods Hole, MA 02543
Ph: (508) 495-2291
Email: Richard.Merrick@noaa.gov

Alternate:
Deb Palka
Northeast Fisheries Science Center
Ph: (508) 495-2291
Email: Debra.Palka@noaa.gov

37. Mike Payne
Office of Protected Resources
1315 East-West Hwy.
Silver Spring, MD 20910
Ph: (301) 713-2322
Fax: (301) 713-2644
Email: Michael.Payne@noaa.gov

38. Tom Eagle
Office of Protected Resources
1315 East-West Hwy
Silver Spring, MD 20910
Ph: (301) 713-2322
Fax: (301) 427-2522
Email: Tom.Eagle@noaa.gov

39. Tanya Dobrzynski
Office of Protected Resources
1315 East-West Hwy.
Silver Spring, MD 20910
Ph: (307) 713-2322 x160
Fax: (301) 427-2522
Email: Tanya.Dobrzynski@noaa.gov

40. John Barylsky
Office of Law Enforcement
P.O. Box 2980
Kitty Hawk, NC 27949
Ph: (252) 449-0456
Fax: (252) 480-6599
Email: John.Barylsky@noaa.gov

41. Alecia M. Van Atta
Pacific Islands Regional Office
1601 Kapiolani Blvd.
Honolulu, HI 96814-4700
Ph: (808) 944-2257
Fax: (808) 973-2941
Email: Alecia.Vanatta@noaa.gov

42. Karen Raine
General Counsel for Enforcement
and Litigation, Southeast Region
263 13th Ave. South
St. Petersburg, FL 33701
Ph: (727) 824-5360
Fax: (727) 824-5376
Email: Karen.Raine@noaa.gov

43. Alexa Cole
General Counsel for Enforcement and Litigation
Ph: (301) 427-2202
Email: Alexa.Cole@noaa.gov

Facilitators:

44. Scott McCreary
CONCUR Inc.
1832 Second St.
Berkeley, CA 94710
Ph: (510) 649-8008
Fax: (510) 649-1980
Email: Scott@concurinc.net

45. Eric Poncelet
CONCUR Inc.
1832 Second St.
Berkeley, CA 94710
Ph: (510) 649-8008
Fax: (510) 649-1980
Email: Eric@concurinc.net

Appendix B

Ground Rules – Atlantic Pelagic Longline Take Reduction Team (Adopted June 30, 2005; revised September 27, 2005)

The following ground rules have been informed by CONCUR's professional experience, discussions with NMFS, directives in the Marine Mammal Protection Act, and confidential interviews conducted with the primary Take Reduction Team (TRT) members. These ground rules are intended to foster and reinforce constructive interaction and deliberation among TRT members. They emphasize clear communication, respect for divergent views, creative thinking, collaborative problem solving, trust building, working towards consensus, and the pursuit of mutual gains. The TRT may decide to reconsider and revise these ground rules if they appear not to be serving the TRT process.

Representation

- **TRT recruitment and selection**. TRT members have been invited to serve by the NOAA Assistant Administrator for Fisheries, Dr. William Hogarth. TRT members were selected based on professional expertise or experience in the areas of conservation or biology of marine mammal species or fishing practices which result in the incidental mortality and serious injuries of such species. TRT members were also selected for their diversity of interests, geographic location, communication network, capability to work with diverse viewpoints, and commitment to developing a consensus-based Take Reduction Plan in the prescribed timeframe.

- **Checking back with constituencies**. TRT members have also been recruited based upon their ability to ably represent the views of an important constituency. TRT members should work to keep their constituencies informed of the TRT's efforts and to reporting relevant feedback to the TRT. In reporting back, TRT members will strive to integrate the views of their constituency rather than resorting to a "lowest common denominator" portrayal.

Participation and Collaboration

- **Primary and alternate TRT members**. Primary TRT members will make every effort to attend all of the TRT meetings. Team members may identify alternates if they will not be able to make all team meetings. Alternates should represent the same organization or constituency as the primary representative, be knowledgeable and able spokespersons, and be committed to work collaboratively towards a consensus agreement. Primary TRT members will work with their alternates to ensure that they are up to speed on TRT deliberations. This will enable alternates to step in effectively as needed and keep the project from "backsliding."

- **Active, focused participation**. Every participant is responsible for communicating his/her perspectives and interests on the issues under consideration. Voicing these perspectives is essential to enable meaningful dialogue. Everyone will participate; no one will dominate. Only one person will speak at a time (i.e., no sidebar conversations).

Everyone will help stay on track. Participants will turn off their cell phones during TRT meetings.

- **Respectful interaction.** Participants will respect each other's personal integrity, values and legitimacy of interests. This includes avoiding personal attacks and stereotyping.

- **Integration and creative thinking.** In developing, reviewing and revising work products, participants will strive to be open-minded and to integrate members' ideas, perspectives and interests. Disagreements will be regarded as problems to be solved rather than battles to be won. Participants will attempt to reframe contentious issues and offer creative solutions to enable constructive dialogue.

- **Mutual gains approach**. Participants will work to satisfy not only their own interests but also those of other TRT members. Participants are encouraged to be clear about their own interests and to recognize the important distinction between underlying interests and fixed positions.

Commitment to process

- Participants will make a good faith effort to achieving the goals of the project. This includes working collaboratively with other TRT members to develop a consensus-based product.
- Participants will review meeting materials in advance of the meetings and come prepared to address the meeting objectives.
- Meetings will start on time. Participants who know that they will be absent, late, or have to leave early will inform project staff in advance and coordinate with their alternates as needed.
- As a set of mutual obligations, TRT members will commit to adhere to these ground rules once they are ratified. TRT members are encouraged to help uphold and enforce these ground rules.

TRT Decision Rules

- The TRT will strive to develop and come to agreement on a draft Take Reduction Plan using a consensus decision rule. In particular, TRT members will pursue "conditional unanimity," where all participants are able to support (i.e., "to live with") and agree not to block a package of agreements developed over the course of the group's deliberations.
- TRT members recognize the need to make simple process agreements to move the effort forward. TRT facilitators will use "straw votes" to track progress and help the group arrive at short-term decisions to propel the process forward in an efficient fashion.
- In the event consensus cannot be reached, the TRT will advise the Secretary of Commerce in writing on the range of possibilities considered by the team and the extent of support for respective elements of TRT's proposals, As appropriate, majority and minority views will also be represented.

Multi-interest Work Teams and Interest Group Caucusing

- NMFS staff and CONCUR expect that cross-interest group work teams may be an important way to develop constructive, integrative work products during and between TRT meetings. The aim of such work teams is to encourage multi-interest options and work products rather than work products put forward by a single bloc or interest group. It is anticipated that work teams will meet primarily by teleconference.
- As appropriate, opportunities will be provided during TRT meetings for caucusing within interest groups.

Media Contact and Contact with Political Representatives

- TRT members will refrain from discussing details of the TRT process with the media or political representatives. In particular, TRT members will not represent the views of others, characterize ideas or proposals still under discussion, or prejudge outcomes. TRT members recognize that premature efforts to "negotiate through the press" or through other political avenues can undermine the success of a collaborative effort.
- TRT members contacted by the media are encouraged to direct these inquiries to NMFS staff. As well, NMFS staff will work with the TRT to develop “talking points” for relating to the media.
- TRT members will develop a media strategy as part of its Draft Take Reduction Plan.

Information Sharing and Joint Fact Finding

- TRT members recognize that the Atlantic Pelagic Longline TRT project depends on using the best readily available information.
- TRT members commit to identify information needs in a timely fashion and to contribute in framing needs for additional research and analysis.
- TRT members commit to share, and not withhold, relevant information. Preliminary information will be treated as such.

TRT Communication Protocols

- TRT members wishing to send email correspondences or documents to the full TRT are requested to send these through the facilitation team and the convenor.

Use of Project Website

- CONCUR has prepared a confidential project website. It is intended for use by the TRT and will serve as a repository of meeting agendas, Key Outcomes Memoranda, and meeting presentations.
- Use of the website is intended to be limited to the TRT; the URL should not be shared (except with members of your organizations); it should not be published or broadcast, and organizational members should be reminded of this protocol.
- Internal TRT documents are intended primarily for use by TRT members. They should not be posted on public websites. Nor should the project website URL. TRT members may email TRT documents to their constituents so long as it is understood that these documents are not meant for public consumption.

Role of Facilitation Team

- The TRT facilitation team (CONCUR, Inc.) is non-partisan and will not act as an advocate for particular outcomes. The facilitators will strive to ensure that all TRT members clearly articulate their respective interests and to assist members to complete their work in a well-informed and efficient fashion.
- The TRT facilitation team will prepare Key Outcomes Memoranda (KOMs) to summarize the main results of the TRT meetings. These KOMs will endeavor to summarize key decisions made, issues discussed, and the next steps identified for moving the process forward. They will not serve as a transcript of the meetings. The facilitators will strive to prepare KOMs within two weeks of the meetings. The facilitators will typically not invite comment on the KOMs; nor will formal approval of KOMs be agendized at the TRT meetings.
- In the event that TRT members believe the KOMs significantly misrepresent particular decisions, issues, or next steps discussed in such a way that will impedes the TRT process, they are requested to notify the project facilitators and convenors. The project facilitators and convenors will review the matter and use their professional judgment to determine if a revision to the KOM is in order. If so, they will prepare a revised KOM and distribute it in a timely fashion to all TRT members.
- The TRT facilitation team will serve as the primary secretariat in assisting parties to develop the draft and final Take Reduction Plan. The Take Reduction Plan, unlike the Key Outcomes Memoranda, will be subject to detailed review and approval by all TRT members.

Appendix C

Brief Summary of PLTRT Meetings

Because pilot whales are non-strategic stocks (Waring *et al*. 2006), the PLTRT's charge was to develop a draft plan by May 2006, which was 11 months from the time of the Team's establishment on June 22, 2005 (70 FR 36120). The Team reviewed stock assessment information for each stock, appropriate marine mammal behavioral studies, available mortality and serious injury data from fishery observer reports, target species catch data, take reduction strategies tested in similar fisheries, and other pertinent information. The Team developed management strategies to reduce mortalities and serious injuries of pilot whales and Risso's dolphins in the mid-Atlantic region of the pelagic longline fishery and developed recommendations for additional research and data collection to support these strategies. The Team held 4 meetings in Maryland, Virginia, and Florida over the course of 10 months. Team meetings were open to the public, and notices of meetings were published in the Federal Register or posted on NOAA Fisheries Service (NMFS) FishNews. Team meetings were facilitated by CONCUR, Inc.

Meeting #1 - Bethesda, Maryland, June 29-30, 2005

The primary objectives for the meeting were to:

1) Introduce TRT members and project support staff,
2) Review and adopt ground rules,
3) Review project goals and roles of team members,
4) Present and discuss key background information,
5) Review major findings of stakeholder interviews, and
6) Begin developing PLTRT work plan.

Key outcomes from the meeting were as follows:

- Adopted ground rules for the PLTRT
- Presented briefings on project goals and team roles
- Established two multi-interest Work Teams to produce information to support future PLTRT meetings. The goals of the two Work Teams were as follows:
    1) Prepare a list of candidate mitigation measures; review existing and emerging mitigation measures and technologies.
    2) Prepare a predictive model to provide quantitative assessment of mitigation measures.
- Identified eight additional informational briefings to support future PLTRT meetings. A combination of NMFS staff and other PLTRT members took the lead in producing these.
    1) Marine mammal behavior and sensory abilities
    2) Characteristics of the Atlantic pelagic longline fishery
    3) Nature of interactions between marine mammals and the longline fishery
    4) Communications protocols among captains
    5) Entanglement and hook removal procedures in use for sea turtles
    6) Summary of current regulations in the pelagic longline fishery
    7) 2005 third quarter bycatch estimates
    8) Outline for Take Reduction Plan

Meeting #2 - Falls Church, Virginia, September 27-29, 2005

The primary objectives for the meeting were to:

1) Provide additional guidance on the scope and goal of the Take Reduction Plan,
2) Provide focused briefings on information and data gathering efforts and implications for the TRP,
3) Outline elements of the TRP, and
4) Initiate discussion on potential bycatch reduction strategies.

Key outcomes from the meeting were as follows:

- Adopted new ground rules regarding communication protocols (see Appendix B), use of the project website, and preparation and revision of Key Outcomes Memoranda.
- Discussed the password-protected project website.
- Discussed possibility of expanding the TRP scope to include Risso's dolphins.
- Reviewed and commented on the draft TRP outline.
- Discussed NMFS' plan to revise serious injury guidelines for marine mammals.
- Reviewed recent data on pilot whales and Risso's dolphins, including the results of 1st and 2nd quarter bycatch preliminary estimates and descriptions of stock structure and sensory abilities.
- Reviewed information on the Atlantic pelagic longline fishery, including fishing effort, distribution, seasonality, and the nature of pelagic longline interactions with marine mammals.
- Received an update on proposed changes to the Highly Migratory Species Fishery Management Plan and regulations.
- Brainstormed mitigation strategies and possible data needs with regard to:
    - Avoiding exposure of marine mammals to vessel/gear
    - Reducing the probability of interaction once in the vicinity of the gear
    - Minimizing impacts once interaction has occurred
- Established work teams to assist in preparations for the next PLTRT meeting and in outlining potential elements of the TRP. Work teams will focus on the topics of:
    1) Developing a predictive model,
    2) Revising the observer data form,
    3) Identifying and sorting priority research, and
    4) Developing disentanglement guidance.

Meeting #3 - Miami, Florida, January 25-27, 2006

The primary objectives for the meeting were to:

1) Address the framing of the PLTRT scope,
2) Provide briefings from work teams and other information gathering efforts, and discuss implications for the TRP,
3) Draft, discuss, review, and revise working sections of the Preliminary Draft TRP, and
4) Outline a game plan for completing the TRP.

Key outcomes from the meeting were as follows. The PLTRT:

- Agreed to include Risso's dolphins in the scope of the TRP and to text conveying that decision.

- Reviewed recent data on 3rd and 4th quarter bycatch estimates, genetic analyses of pilot whales in the NW Atlantic, observer data form revisions, sea turtle disentanglement gear, lessons learned from efforts to reduce takes of sea turtles and from the Alaska sablefish bottom longline fishery, and enforcement capabilities.
- Received a report on the most significant variables affecting pilot whale and Risso's dolphin bycatch as determined by a predictive model.
- Developed a preliminary list of primary management strategies for reducing mortalities and serious injuries of pilot whales and Risso's dolphins. Key strategies included:
    - Reduce mainline length to 20 miles or less.
    - Adopt active avoidance measures (including moving vessels after interactions).
    - Institute a mandatory certification program for avoidance and safe handling/release strategies.
    - Place mandatory informational placards in vessel wheelhouses.
- Identified key information needs associated with additional candidate management strategies, and discussed the prioritization of broader research and data collection needs.
- Established work teams to assist in preparations for the next PLTRT meeting, including work teams on:
    1) Developing a TRP section on improved observer data collection,
    2) Determining the uniqueness of vessel interaction,
    3) Revising the TRP section on research and data collection,
    4) Revising informational placards on handling/release guidelines for marine mammals in pelagic longline gear,
    5) Further developing and using the predictive model,
    6) Enhancing collection of marine mammal biopsies, and
    7) Further defining key management strategies.

Meeting #4 - St. Petersburg, Florida, April 25-27, 2006

The primary objectives for the meeting were to:

2) Present briefings from work teams and information-gathering efforts, and discuss the implications for the Take Reduction Plan (TRP)
3) Discuss, review, and revise the Draft TRP (April 18, 2006 version)
4) Outline plan for completing the Draft TRP to present to NMFS by May 31, 2006
5) Outline next steps for achieving the goals of the PLTRP.

Key outcomes from the meeting were as follows:

- PLTRT members deliberated and reached agreement on key elements of a proposed management strategy (for Section VIII of Draft TRP). PLTRT members recommended that the following four measures be implemented via regulation:
    a) Set a 20 nautical-mile upper limit on mainline length for all pelagic longline sets within the Mid-Atlantic Bight (MAB).
    b) Establish a Cape Hatteras Special Research Area, an area defined to capture hot spots of bycatch and a concentration of fishing effort, with the following approximate coordinates: southern boundary = 35 degrees N, northern boundary = 36 degrees 25 minutes N, western boundary = 75 degrees W, and eastern boundary = 74 degrees 35 minutes W. (The southern boundary coincides exactly with the southern boundary of the MAB). Vessels fishing in this area: must be capable of carrying observers and

must carry an observer, if requested by NMFS; must be willing and able to participate in any NMFS-approved research; and must maintain daily communications with other vessel operators fishing in this area.

c) Develop and distribute an informational placard that must be displayed in the wheelhouse and the working deck of all active pelagic longline vessels in the Atlantic Fishery.
d) Develop and implement a mandatory certification program to educate owners and operators of pelagic longline vessels about ways to reduce serious injury and mortality of marine mammals.

PLTRT members recommended that the following additional measures be implemented via non-regulatory means:

e) Provide for 12-15% observer coverage throughout all highly migratory species fisheries that interact with pilot whales or Risso's dolphins.
f) Encourage vessel operators to maintain daily communications with other local vessel operators regarding protected species interactions, with the goal of identifying and exchanging information relevant to avoiding protected species and all other bycatch.
g) Employ careful handling/release equipment and methods, including the development of new technologies.
h) Provide quarterly reports of bycatch of marine mammals in the pelagic longline fishery to the PLTRT.

- PLTRT members identified research and data collection tasks for Section IX of the Draft TRP. PLTRT members organized these tasks into three time frames, keyed to how long the tasks would take to complete once initiated--i.e., near term tasks completed within one year of initiation, short term tasks completed within 1-3 years of initiation, and long term tasks completed within 5 years of initiation. The PLTRT recommended that priority be given to research on species that are closest to PBR, research that evaluates the effects of the TRP's recommended management measures, and research on species-specific abundance, mortality, and post-hooking survivorship. They also stressed that research framed as "longer term" is not intrinsically of lower priority than more near/short term research.
- PLTRT members offered several specific revisions to the other TRP sections. Specific PLTRT members agreed to prepare new or revised text for specific sections of the plan.
- PLTRT members agreed that implementation of the package of measures, through rulemaking, should begin as soon as the Draft TRP is completed. They also recognized that rulemaking involves several layers of review within NMFS, NOAA, DOC, and OMB. As such, they recognized that rulemaking to implement the TRP may take 12-15 months, or longer.
- PLTRT members agreed to an adaptive management-based approach for achieving the goals of the TRP (section IX. of the TRP). Members recommended scheduling future PLTRT meetings to coincide with the availability of new bycatch estimates and other critical data as well as the outcomes of key research. In particular, members recommended that quarterly bycatch estimates be used as the trigger for potential conference calls with the whole Team (to be scheduled as needed), and that the calls be used to take stock of the need to convene in person. Members agreed provisionally to schedule a conference call approximately 6 months after completion of the TRP to discuss the status of the Plan document and implementation of measures. Members discussed the possibility of convening an in-person meeting approximately one year from either the completion or the publishing of the TRP.

- PLTRT members agreed to a series of next steps to support completing the Draft TRP by May 31, 2006.
- NMFS staff concluded the meeting with broad statements of thanks and appreciation.

Appendix D

Other Domestic Fisheries that Interact with Pilot Whales and Risso's Dolphins

Bycatch of long-finned and short-finned pilot whales has been observed and documented by NMFS observers in the Southern New England (SNE) squid trawl (*Ilex* and *Loligo*) and bottom trawl fisheries, the Gulf of Maine (GOM)/Grand Banks (GB) herring mid-water trawl joint venture fishery, and the mid-Atlantic coastal gillnet fishery, in addition to the pelagic longline fishery (Waring *et al.* 2006). Mean annual mortality of pilot whales in each of these fisheries is as follows:

- SNE/Mid-Atlantic *Ilex* squid trawl fishery: 11 (CV=0.65)
- SNE/Mid-Atlantic *Loligo* squid trawl fishery (offshore): 10 (CV=0.97)
- SNE/Mid-Atlantic bottom trawl fishery: 46 (CV=1.03)
- GOM/GB herring mid-water trawl joint venture/foreign fishery: 11 (CV NA).

Mortality of Risso's dolphins has been observed in the Northeast multispecies sink gillnet fishery, in addition to the pelagic longline fishery (Waring *et al.* 2006). Mean annual mortality of Risso's dolphins in the Northeast sink gillnet fishery is 3 animals (CV=1.06).

More detailed information on levels of bycatch of pilot whales, Risso's dolphins, and other marine mammals in U.S. Atlantic, Gulf of Mexico, and Caribbean commercial fisheries can be found in the 2005 SAR (Waring *et al.* 2006).
Observer coverage has steadily increased within the past 10 years, and additional Category I and II fisheries are expected to be observed in the future (although overall observer coverage levels are expected to remain relatively low).

Appendix E

Management Measures Considered and/or Discussed But Not Recommended for Inclusion in the TRP

Over the course of the PLTRT's deliberations, the Team considered and discussed a wide variety of management measures for reducing mortality and serious injury to pilot whales and Risso's dolphins in the pelagic longline fishery.

Some of these management measures have been advanced as recommendations and are incorporated in Section VIII of the TRP. Still others appear to have promise, but were thought by the Team to require additional research. These appear in Section IX of the TRP.

The purpose of this Appendix is to capture the measures that were mentioned or discussed, but were not recommended for inclusion in the TRP.

The brainstorming of management measures began at the second meeting and continued through the third and fourth meeting. This effort began as a breakout group activity during the second PLTRT meeting (September 27-29, 2005). During this meeting, PLTRT members discussed three overarching categories of strategies: (1) Strategies for avoiding exposure of pilot whales to vessel/gear (large scale); (2) strategies for reducing probability of interactions once pilot whales were in the vicinity of gear (medium scale); and (3) once an interaction has occurred, strategies for minimizing impacts of that interaction (fine scale). The Team continued to discuss these and other potential strategies at its third and fourth meetings in January and April 2006. At its fourth meeting, the Team came to agreement on a package of management measures. The Team also identified several promising management measures for additional research.

The management measures below are described in varying levels of detail. This reflects to a large extent the degree to which they were discussed by the PLTRT. Some of these ideas were discussed in considerable detail. Others received relatively little discussion and are expressed in very brief outline form. In some cases, this limited discussion represented the preliminary assessment of Team members that these management measures were likely to be less effective, more difficult to quantify in terms of benefits, and/or more difficult to implement.

I. Strategies for avoiding exposure to vessel gear.

A. Alter fishing effort in the Mid-Atlantic region

Team members brainstormed several strategies aimed at altering *fishing effort*. Key strategies included:

- Reduce effort by paying fishermen to not fish (this is also a kind of economic incentive; see below).
- Implement Closures: Seasonal Area Management or Time-Area Closures. PLTRT members discussed closures in general, noting that they are easier to implement and enforce than many other types of management measures. Team members, acknowledged, however, that closures would have a significant negative economic impact on the fleet. As such, Team members were reluctant to seriously consider

closures before thoroughly exploring all other potential management measures on the table.

- Allow Vessel Modifications. A number of pelagic longline fishing vessels are greater than 75 feet in length and outfitted so that they are able to fish beyond the Exclusive Economic Zone (EEZ) and/or in the Gulfstream, where the likelihood of marine mammal interactions is greatly reduced. Vessels in the 45-foot range are not large enough to fish any great distance from shore, and hence make short trips and stay relatively close to shore (Blue Water Fishermen's Association 2005). Since most of the bycaught species are concentrated along the continental shelf break and associated water fronts, modifying vessels by making them larger would allow fishermen to fish beyond the shelf break and perhaps avoid the most concentrated populations of pilot whales and Risso's dolphins. However, there are currently regulations in place that prevent vessel owners from increasing the size of their vessel more than 10% in length, and 20% in horsepower (CFR 635.4(1)). Outfitting a fishing vessel to allow it to travel further offshore is also not an economically feasible option for most pelagic longline fishermen and may carry with it other resource management or bycatch concerns. Given the current regulations in place, the PLTRT chose not to include this strategy as a recommended management measures. The Team did, however, recommend that NMFS investigate possible environmental and other effects associated with the strategy of allowing modifications to pelagic longline vessels to make them more offshore capable (see Section IX above).
- Spread out fishing effort in time and space.

B. Use other economic or regulatory incentives and/or disincentives to encourage fishermen to reduce bycatch

PLTRT members brainstormed several measures involving *incentives* to encourage fishermen to reduce bycatch. Individual members suggested several possibilities intended to reduce fishing effort. These included providing cash incentives not to fish, further restricting access to fishing permits, or establishing quotas on catch (perhaps associated with monetary penalties if quotas are exceeded). Team members mentioned implementing a per-vessel, by group, or fleet-wide cap on bycatch, to be monitored in real time. They also suggested encouraging more over peer pressure from other fishermen, backed up by definitive information.

C. Implement Other Methods

Another strategy mentioned to help avoid exposure to gear involved taking whales on a "wild goose chase" (i.e., luring them out of the area to reduce interactions).

II. Strategies to reduce the probability of an interaction once in the vicinity of gear.

Team members brainstormed several potential strategies that involved *gear modifications*. Individual Team members suggested shortening the length of the gangion (although it was later noted that this would not be possible due to sea turtle regulations), altering line strength, and using weak links at connections between line and hook.

Appendix F

List of Acronyms

ALWTRP – Atlantic Large Whale Take Reduction Plan
AOCTRP – Atlantic Offshore Cetacean Take Reduction Plan
ATCA – Atlantic Tunas Convention Act
BDTRP – Bottlenose Dolphin Take Reduction Plan
CFR – Code of Federal Regulations
EEZ – Exclusive Economic Zone
FR – Federal Register FMP – Fisheries Management Plan
GAMMS – Guidelines for Assessment of Marine Mammal Stocks
HMS – Highly Migratory Species
ICCAT – International Convention for the Conservation of Atlantic Tunas
KOM – Key Outcomes Memorandum
MAB – Mid-Atlantic Bight
MMC – Marine Mammal Commission
MMPA – Marine Mammal Protection Act
NED – Northeast Distant
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
OY – Optimum Yield
PBR – Potential Biological Removal
PLTRT – Atlantic Pelagic Longline Take Reduction Team
PLTRP – Atlantic Pelagic Longline Take Reduction Team
SAB – South Atlantic Bight
SAR – Stock Assessment Report
SEASWAP – Southeast Alaska Sperm Whale Avoidance Project
SED – Southeast Distant Water
SEFSC – Southeast Fisheries Science Center
SI – Serious Injury
TRP – Take Reduction Plan
TRT – Take Reduction Team
VMS – Vessel Monitoring System
ZMRG – Zero Mortality Rate Goal

Appendix G

DRAFT Revised Marine Mammal Incidental Take Form
for the Pelagic Observer Program

MARINE MAMMAL INCIDENTAL TAKE FORM

Form Version: 6/2006

OBSERVER/TRIP ID _____ HAUL # _____

YEAR (YYYY) _____ MONTH (MM) _____ DAY (DD) _____ TIME (24 hr) _____

LOCATION OF TAKE:

LATITUDE _____ deg _____ min N / S LONGITUDE _____ deg _____ min W

SPECIMEN NUMBER (BY TRIP) _____

SPECIES IDENTIFICATION Species Code_____ (if unable to identify, leave blank)

____ Short-finned pilot whale ____ Long-finned pilot whale ____ Unid. pilot whale

____ Risso's dolphin ____ Atlantic spotted dolphin ____ Pantropical spotted dolphin

____ Bottlenose dolphin ____ Common dolphin ____ Unid. dolphin

____ Cuvier's beaked whale ____ Unid. beaked whale ____ Pygmy sperm whale

____ Unid. marine mammal Other _____

Diagnostic features _____

Confidence Level of Species ID ____ Good ____ Fair ____ Poor

Photos Taken? Y / N Number of photos taken _____

HOOKING OF MARINE MAMMAL

Was animal hooked? Y / N / U (If No, skip to next section)

Location Internal: Hook visible? Y / N ___ Visible to insertion point ____ Partial hook ____ Not visible

Location in Mouth:____ Upper ____ Lower ____ Side ____ Swallowed ___ Unknown

External: ____ Front Flipper ____ Dorsal fin ____ Body ____ Head / Neck ____ Tail

____ Other/Unknown (explain) _____

Was hook removed from animal? Y / N / U / Lost at surface

If No, was line cut? Y / N Amount of line left trailing (in ft) _____

ENTANGLEMENT OF MARINE MAMMAL

Was animal entangled? Y / N / U

Entanglement Location (check all that apply) ____ Front Flipper ____ Head / Neck ____ Tail ____ Body

____ Mouth ____ Other _____

Gear involved ____ Hook ____ Mainline ____ Gangion ____ Dropline/Floatline ____ Float

Was gear removed from animal? Y / N / Partial / Unknown / Lost at surface

If No, amount of line left on animal (in ft)? _____ Were loops cut? Y / N / Unknown

DESCRIPTION OF GEAR REMOVAL PROCEDURE / GEAR REMAINING (Use addtl. sheet as necessary)

_____

_____

_____

_____

_____

SKETCH OF ANIMAL SHOWING WHERE GEAR WAS HOOKED OR ENTANGLED ON BODY
(Include other identifying or unusual marks as appropriate)

CONDITION OF MARINE MAMMAL UPON RELEASE

____ Alive, swam away normally ____ Alive, swam abnormally ____ Dead

Description of animal's behavior/condition upon release (use addtl. sheets as necessary) _____

_____

_____

_____

WAS ANIMAL BOARDED? Y / N If No, approx. length of animal (ft): _____

If yes, complete the following. If full necropsy performed, use separate necropsy data sheet.

Total length (tip of rostrum to fluke notch, in cm): _____ Straight / Curved / Estimated

Sex: M / F / Unknown Disposition of Carcass: _____

Additional comments: _____

_____

BIOPSY SAMPLES TAKEN? Y / N / Attempted (unsuccessful)

If yes, itemize samples: _____

TAGS Tag present on animal upon capture? Y / N

Animal tagged before release? Y / N Tag number _____ Type: metal (1) / plastic (2)

Position of tag: ____ Left flipper ____ Right flipper ____ Dorsal fin ____ Tail

PRESENCE OF OTHER MARINE MAMMALS AT TIME OF CAPTURE

Were other marine mammals present at time of capture? Y / Didn't look / Looked but did not see

Number of other marine mammals present (record all three) _____ MIN _____ MAX _____ BEST GUESS

Same species as animal captured? Y / N / U Species ID if different _____

Approximate distance from vessel (in ft) _____

DETERRENCE/AVOIDANCE

Were actions taken to deter or avoid animals? Y / N / U

Describe (use addtl. sheets as necessary; indicate whether actions taken before, during, or after interaction)

_____

_____

_____

Debriefed: Y / N Debriefed by:_____ Date: _____