FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

REDUCTION OF SEA TURTLE BYCATCH AND
BYCATCH MORTALITY IN THE
ATLANTIC PELAGIC LONGLINE FISHERY

(Includes Final Supplemental Environmental Impact Statement, Final Regulatory Impact Review, and Final Regulatory Flexibility Analysis)

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Final Rule To Reduce Sea Turtle Bycatch and Bycatch Mortality in the Atlantic Pelagic Longline Fishery

Actions: Limit vessels in the Atlantic pelagic longline fishery for highly migratory species, at all times, to possessing and/or using only certain hooks and baits; re-open the Northeast Distant (NED) Statistical Reporting Area to pelagic longline fishing under specific hook and bait limitations; require possession and use of specific sea turtle handling and release equipment and sea turtle handling and release protocols to reduce the bycatch and bycatch mortality of incidentally captured Atlantic sea turtles in the pelagic longline fishery.

Type of Statement: Final Supplemental Environmental Impact Statement (FSEIS); Final Regulatory Impact Review; Final Regulatory Flexibility Analysis; and Final Social Impact Assessment

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Abstract: On June 14, 2001, The National Marine Fisheries Service (NOAA Fisheries) published a Biological Opinion (BiOp) regarding Atlantic sea turtles which concluded that the continued operation of the Atlantic pelagic longline (PLL) fishery is likely to jeopardize the continued existence of Atlantic leatherback and loggerhead sea turtles. To avoid jeopardy, the Reasonable and Prudent Alternative (RPA) in the BiOp included a closure of the NED, a research program to develop or modify fishing gear, and techniques to reduce sea turtle interactions and the mortality associated with such interactions. The BiOp also included an incidental take statement (ITS) for the Atlantic PLL fishery that established incidental take levels of 438 leatherback and 402 loggerhead sea turtles, respectively, on an annual basis. The BiOp further contemplated modification or reopening of the NED, if sea turtle takes attributable to fishing effort in that area could be reduced sufficiently through gear and fishing technique modifications. The NED research experiment (permitted under section 10 of the ESA) demonstrated that significant reductions in sea turtle interactions could be achieved through application of large size circle style hooks and certain bait combinations.

In December 2003, NOAA Fisheries data indicated that the ITS had been exceeded for Atlantic leatherback sea turtles in 2001 - 2002 and for Atlantic loggerhead sea turtles in 2002. The 2001 and 2002 estimated turtle interaction levels for the Atlantic PLL fishery (2001: 1208

leatherbacks, 312 loggerheads; 2002: 962 leatherbacks, 575 loggerheads) do not include takes associated with the NED research experiment.

To implement measures effective at reducing sea turtle interactions and mortalities, to comply with the ESA and other applicable law, and to minimize the social and economic impacts of bycatch reduction measures to the extent practicable, this action proposes to: 1) limit the possession and use, at all times, of hooks and baits by Atlantic pelagic longline vessels fishing for HMS; 2) allow pelagic longline fishing for highly migratory species in the NED with hook and bait limitations in place; 3) mandate possession and use of certain equipment to safely remove fishing hooks and line from incidentally captured sea turtles; and, 4) require possession of new sea turtle handling and release guidelines.

To more rapidly reduce sea turtle interactions and mortality and to mitigate the economic impacts of sea turtle bycatch mitigation measures, NOAA Fisheries requested and was authorized to execute alternative procedures for the preparation and completion of an SEIS. The Council on Environmental Quality authorized a waiver of 14 of the standard 45 days for the DSEIS comment period. Comments on the draft SEIS and associated proposed rule were accepted from February 11, 2004 through March 15, 2004.

In November 2003, NOAA Fisheries completed a three-year sea turtle bycatch reduction experiment. The Agency also received preliminary data indicating that the Atlantic pelagic longline fishery may have exceeded the ITS in the June 14, 2001, Biological Opinion for Atlantic leatherback sea turtles in 2001 - 2002, and for Atlantic loggerhead sea turtles in 2002. As a result of the conclusion of the experiment and the potential ITS exceedance, the Agency published a Notice of Intent of Proposed Rulemaking (NOI) in the Federal Register (68 FR 66783) identifying significant issues and management measures being considered, and requesting public comment. Based in part on comments received on the NOI, the Draft Supplemental Environmental Impact Statement (DSEIS) examined 16 alternatives to reduce the bycatch and bycatch mortality of sea turtles in the Atlantic HMS pelagic longline fishery, consistent with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Coastal Zone Management Act (CZMA), the Regulatory Flexibility Act (Reg Flex Act), and other domestic laws.

As discussed in detail in Sections 1.2 and 1.3 of this document, the objectives of this rulemaking are multifaceted and include, *inter alia,*: 1) addressing sea turtle interactions and mortalities to avoid jeopardy for Atlantic leatherback and loggerhead sea turtles; 2) reconsidering the NED and other time and area closures in light of possible gear modifications ; and, 3) minimizing, to the extent practicable, the economic impacts of sea turtle bycatch mitigation measures. This document analyzes the ecological, economic, and social impacts of 16 alternatives (and two sub-alternatives) to reduce the bycatch and bycatch mortality of loggerhead and leatherback sea turtles in the Atlantic HMS pelagic longline fishery. A proposed rule was published in the Federal Register on February 11, 2004 (69 FR 6621), which announced public hearings in North Dartmouth, MA (March 2, 2004), New Orleans, LA (March 4, 2004), and Manteo, NC (March 9, 2004). A Notice of Availability (NOA) of the DSEIS was published by the Environmental Protection Agency in the Federal Register on February 13, 2004 (69 FR 7215). The public comment period on both the proposed rule and the DSEIS closed on March 15, 2004. Over 100 people attended the public hearings, and the Agency received approximately 175 written and electronic comment letters.

Preferred alternatives A5 (b), A10 (b), and A16 strike an appropriate balance between protecting and conserving living marine resources and maintaining a viable domestic pelagic longline fleet, in compliance with legal mandates. To achieve this balance, NOAA Fisheries examined and re-examined the best available scientific and soci-economic data and public comment on the DSEIS and proposed rule. Where appropriate, the Agency incorporated refinements to data and modified the preferred measures in the FSEIS based on these examinations and comments.

Changes to the SEIS are summarized below.

PREFERRED ALTERNATIVES IN THE DSEIS	SELECTED ALTERNATIVES IN THE FSEIS
Alternative A3 - Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait	**Alternative A5(b)** - Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks.
Alternative A10(a) - Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook with squid bait.	**Alternative A10(b)** - Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks.
Alternative A16 - Require vessels with pelagic longline gear onboard to possess and use dipnets and line clippers that meet newly revised design and performance standards, plus require these vessels to possess, maintain, and utilize additional sea turtle handling and release gear and comply with handling and release guidelines, as specified by NOAA Fisheries.	Same.

The suite of preferred alternatives best meets the purpose and scope of this rulemaking by providing comprehensive and meaningful protection to Atlantic sea turtles, maintaining the viability of the domestic pelagic longline fishery, and achieving legal and policy obligations. Importantly, by providing a successful roadmap for sea turtle bycatch and bycatch mortality reduction, NOAA Fisheries may provide the impetus for other nations to adopt similar sea turtle conservation measures, thereby bringing truly meaningful protection to sea turtles throughout their entire range.

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1.1 MANAGEMENT HISTORY RELEVANT TO THE PROPOSED ACTION

The Endangered Species Act (ESA) is the primary Federal legislation governing interactions between fisheries and species whose continued existence is threatened or endangered. Through a consultative process, this law allows Federal agencies to evaluate actions in light of the impacts they could have on these ESA-listed species. In the case of marine fisheries, the NOAA Fisheries Office of Sustainable Fisheries consults with the NOAA Fisheries Office of Protected Resources to determine what impacts fishery management actions will have on endangered populations of marine species and what actions can be taken to reduce or eliminate negative impacts. Under the consultative process, the Office of Protected Resources issues a Biological Opinion (BiOp) which outlines expected impacts of the final action and specifies terms and conditions which must be met to mitigate impacts on ESA-listed species.

Several circumstances can create the need to reinitiate consultation: the regulated action exceeds the level of take previously authorized in an existing incidental take statement, the action changes in a way that was not previously considered, or the population status of a listed species changes.

Atlantic highly migratory species (HMS) are managed under a 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (HMS FMP) and Amendment 1 to the Billfish Fishery Management Plan (Billfish FMP). On November 19, 1999, the Office of Sustainable Fisheries requested reinitiation of consultation on Highly Migratory Species (HMS) fisheries based on preliminary information that the number of sea turtles incidentally taken in the pelagic longline fishery had exceeded levels anticipated in the April 23, 1999, BiOp. A bycatch reduction rule (proposed December 15, 1999, 64 FR 69982; final August 1, 2000, 65 FR 47214) also triggered the need to reinitiate consultation.

On June 30, 2000, a BiOp was issued that evaluated the current status of the loggerhead and leatherback sea turtles and concluded that the actions of the pelagic longline fishery jeopardized the continued existence of these species. This conclusion was based on the status of the loggerhead and leatherback sea turtle populations in the Atlantic Ocean, Caribbean, and Gulf of Mexico, the status of the northern subpopulation of loggerhead sea turtle, and the anticipated continuation of current levels of injury and mortality of both species described in the environmental baseline and cumulative effects section of the BiOp at that time. NOAA Fisheries conducted a series of scoping hearings in July and August 2000 to present the findings of the June 30, 2000, BiOp and to gather information and insights from affected constituents. During this process, NOAA Fisheries concluded that further analyses of observer data and additional population modeling of loggerhead sea turtles were needed to determine more precisely the impact of the pelagic longline fishery on sea turtles. Because of this, NOAA Fisheries reinitiated consultation on the HMS fisheries on September 7, 2000.

To comply with National Standard (NS) 9 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and comply with ESA Section 7(a)(2) as provided in the June 30, 2000, BiOp, NOAA Fisheries issued emergency regulations on October 13, 2000, that closed a 55,970 square nautical mile L-shape portion of the NED area from October 10, 2000, through April 9, 2001 (65 FR 60889). This closure was expected to reduce the incidental capture of loggerhead and leatherback sea turtles. The emergency regulations also required the use of dipnets and line clippers meeting NOAA Fisheries design and specification criteria to remove entangling fishing gear and reduce post-release mortality of captured sea turtles in the pelagic longline fishery.

To prevent a lapse in sea turtle bycatch reduction measures, NOAA Fisheries published an interim final rule on March 30, 2001 (66 FR 17370), which continued the requirement to possess and use dipnets and line clippers on all vessels in the pelagic longline fishery. The interim final rule also modified the definition of pelagic longline gear so it would not include high-flyers and reduced the amount of observer coverage required in the shark gillnet fishery outside of right whale calving season.

In January 2001, NOAA Fisheries held a technical gear workshop in Silver Spring, Maryland that was attended by scientists, fishermen, environmentalists, and other interested parties. Additionally, the NOAA Fisheries Southeast Fisheries Science Center (SEFSC) published the Stock Assessments of Loggerhead and Leatherback Sea Turtles and an Assessment of the Impact of the Pelagic Longline Fishery on the Loggerhead and Leatherback Sea Turtles of the Western North Atlantic in February 2001 (NOAA Fisheries, 2001b) .

The June 14, 2001, BiOp incorporated the new information from the assessment report and the gear workshop in its examination of the effect of the pelagic longline fishery on sea turtles in the western Atlantic Ocean. The BiOp specified a Reasonable and Prudent Alternative (RPA) that would avoid the likelihood of jeopardizing the continued existence of these turtles. The RPA included the following elements: closing the NED area effective July 15, 2001; requiring gangions to be placed no closer than twice the average gangion length from the suspending floatlines effective August 1, 2001; requiring gangion lengths to be 110 percent of the length of the floatline in sets of 100 meters or less in depth effective August 1, 2001; and, requiring the use of corrodible hooks effective August 1, 2001. Also, the BiOp included a Term and Condition (TC) for the incidental take statement that required NOAA Fisheries to issue a regulation requiring that all vessels permitted for HMS fisheries, commercial and recreational, post sea turtle guidelines for safe handling and release following longline interactions inside the wheelhouse by September 15, 2001. The requirement that all vessels permitted for HMS fisheries post sea turtle handling and release guidelines was subsequently modified to specify only bottom and pelagic longline vessels by an August 31, 2001, memorandum from the Office of Protected Resources.

On July 13, 2001, NOAA Fisheries published an emergency rule (66 FR 36711) to implement several of the BiOp requirements. NOAA Fisheries published an amendment to the emergency rule to incorporate the change in requirement for the handling and release guidelines which was published in the Federal Register on September 24, 2001 (66 FR 48812). These requirements were effective for 180 days, through January 9, 2002. On December 13, 2001 (66 FR 64378), NOAA Fisheries published a Federal Register notice extending this emergency rule for another 180 days, to July 8, 2002. On January 14, 2002 (67 FR 1688), NOAA Fisheries published an amendment to the emergency rule extension clarifying the effective dates.

On April 10, 2002, NOAA Fisheries published a proposed rule in the Federal Register (67 FR 17349) that would implement the RPA and several other measures required by the BiOp. An accompanying DSEIS finalized on March 29, 2002, analyzed the biological, economic, and social impacts of the preferred and not selected alternatives, including no action, for the proposed rule. A Federal Register notice published on April 29, 2002 (67 FR 20944), announced four public hearings in Panama City, FL; Barnegat Light, NJ; Riverhead, NY; and Silver Spring, MD. NOAA Fisheries presented information concerning this proposed rule and solicited comments on the proposed measures. The comment period on the proposed rule and DSEIS ended on May 20, 2002.

On June 7, 2002, The Environmental Protection Agency published a notice of availability of an abbreviated Final Supplemental Environmental Impact Statement (FSEIS). On July 2, 2002, NOAA Fisheries made available to the public the FSEIS on measures required under the June 14, 2001 BiOp.

On July 9, 2002, NOAA Fisheries published the final rule (67 FR 45393) implementing measures required under the June 14, 2001 BiOp on Atlantic HMS to reduce the incidental catch and post-release mortality of sea turtles and other protected species in HMS Fisheries, with the exception of the gangion placement measure. The July 2, 2002 FSEIS analyzed the biological, economic, and social impacts of the preferred and not selected alternatives, including no action, for the final rule. The rule implemented a closure of the northeast distant (NED) statistical reporting area, required the length of any gangion to be 10 percent longer than the length of any floatline if the total length of any gangion plus the total length of any floatline is less than 100 meters, and prohibiting vessels from having hooks on board other than corrodible, non-stainless steel hooks. In the HMS shark gillnet fishery, both the observer and vessel operator must look for whales, the vessel operator must contact NOAA Fisheries if a listed whale is taken and shark gillnet fishermen must conduct net checks every 0.5 to 2 hours to look for and remove any sea turtles or marine mammals from their gear. The final rule also required all HMS bottom and pelagic longline vessels to post sea turtle handling and release guidelines in the wheelhouse. NOAA Fisheries did not implement the gangion placement requirement because it appeared to result in an unchanged number of interactions with loggerhead sea turtles and an apparent increase in interactions with leatherback sea turtles.

On November 28, 2003, based on the conclusion of a three-year experiment in the NED, discussed in Section 1.2, and based on preliminary data that indicated that the Atlantic pelagic longline fishery may have exceeded the ITS in the June 14, 2001 BiOp, NOAA Fisheries published a Notice of Intent (NOI) to prepare a SEIS to assess the potential effects on the human environment of proposed alternatives and actions under a proposed rule to reduce sea turtle bycatch (68 FR 66783). Among the public comments received during the comment period were suggestions that NOAA Fisheries hold workshops and certify participants in Atlantic HMS fisheries in the application of safe handling and release techniques for sea turtles. NOAA Fisheries addressed other substantive issues raised in response to the NOI in the analyses contained in this document; however, this specific issue was not addressed. The Agency intends to consider this issue in Amendment 2. Additionally, the RPA in the new June 1, 2004, BiOp for the fishery includes additional outreach and educational efforts.

In January 2004, the Office of Sustainable Fisheries formally requested reinitiation of consultation with the Office of Protected Resources after receiving data, based on observer and logbook data, which indicate that the Atlantic pelagic longline fishery exceeded the incidental take statement for leatherback sea turtles in 2001 - 2002 and for loggerhead sea turtles in 2002. As noted above, the Office of Protected Resources completed a new BiOp for the fishery on June 1, 2004. See Section 4.3 for a summary of the 2004 BiOp.

1.2 NEED FOR ACTION

A major concern in the management of the Atlantic HMS fisheries is the incidental take and mortality of threatened and endangered species, specifically loggerhead and leatherback sea turtles. These animals are migratory and exist in many of the oceanic locales targeted by U.S. vessels permitted to catch HMS. Sea turtles are accidentally hooked or entangled in pelagic longline, drift gillnet, and other gear that is meant to target primarily tunas, swordfish, and sharks.

NOAA Fisheries is charged with national and international requirements to avoid and reduce bycatch and bycatch mortality under the MSA, the Marine Mammal Protection Act (MMPA), and the ESA, and through recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT), which are implemented under the authority of the Atlantic Tunas Convention Act (ATCA). Through a number of rulemakings, NOAA Fisheries has taken action to avoid jeopardy of Atlantic sea turtles in the pelagic longline and other HMS fisheries by minimizing bycatch and implementing measures to lower mortality rates associated with unavoidable bycatch. The MSA further requires NOAA Fisheries to minimize the adverse economic impacts on fishing communities to the extent practicable. The 2001 BiOp instructed NOAA Fisheries to conduct research into turtle bycatch and avoidance techniques and to execute rulemaking requiring adoption of bycatch reduction measures before pelagic longline vessels are allowed to fish within the NED. In conjunction with the U.S. Atlantic pelagic longline fleet, NOAA Fisheries completed a three year research program in the NED with the express purpose of developing and testing methods to reduce sea turtle bycatch in the pelagic longline fishery. An additional key objective of the program was to develop and verify techniques to reduce sea turtle interaction and mortality rates that could be exported and applied throughout the range of the domestic and international Atlantic pelagic longline fisheries in the Atlantic basin. The results of that program have been impressive. The research identified various sea turtle bycatch mitigation techniques, primarily involving hook and bait combinations, that reduced turtle interactions by a range of 50 to 90 percent, depending upon hook treatment and species. Much of the analysis contained in this document is based on the results of this experiment, which are considered the best scientific information available.

The NED research program also provided significant economic benefits for that portion of the U.S. pelagic longline fleet that had traditionally fished in the NED before the closure. Anecdotal evidence suggests that without revenues associated with the NED research experiment, many of those vessels would have either ceased operations, or more likely, reflagged their vessel to fish under the jurisdiction of other nations. Losses in this segment of the U.S. longline fleet would translate to a loss of approximately 21 percent of total U.S. Atlantic swordfish landings. Beyond the economic impacts of such losses, should the vessels that participated in the NED be forced to cease operations, reflag, or otherwise exit the U.S. Atlantic pelagic longline fishery, there would possibly be unquantifiable negative environmental consequences. These negative environmental consequences would be expected to stem from increased fishing activities by vessels of other flag-states, which may employ less conservation-oriented practices in areas traditionally fished by the U.S. vessels and throughout the Atlantic, should U.S. swordfish underharvest be redistributed. For these reasons, both socio-economic and environmental, the United States is concerned about the levels of underharvest that exist in the U.S. swordfish fishery today.

In addition to the aforementioned discussion, this rulemaking is necessary to reduce bycatch and bycatch mortality of sea turtles caught incidentally in the Atlantic pelagic longline fisheries, consistent with the requirements of the ESA. As mentioned in Section 1.1, recent information indicates that the level of incidental takes of sea turtles established for the pelagic longline fishery has been exceeded for leatherback sea turtles in 2001 (1208 interactions) and 2002 (962 interactions) and for loggerhead sea turtles in 2002 (575 interactions).

1.3 OBJECTIVES

The objectives and purpose of this rulemaking are multifaceted, and are: 1) to be consistent with the objectives of the HMS FMP and all applicable laws; 2) to implement measures proven during the NED research experiment to reduce sea turtle interactions and mortalities; 3) to avoid jeopardy for leatherback and loggerhead sea turtles by implementing new management measures within the U.S. Atlantic pelagic longline fishery intended to reduce or, at a minimum, prevent increases in incidental takes of sea turtles in this fishery and reduce the mortality associated with such interactions; 4) to reconsider, in light of possible gear modifications, the NED closure and other time/area closures; and, 5) to minimize, to the extent practicable, the economic impact of sea turtle bycatch mitigation measures. The scope of this action is to address impacts on protected species, specifically sea turtles, in the Atlantic pelagic longline fishery and social and economic impacts of management measures on the aforementioned segment of the U.S. fishing fleet.

References Cited in Chapter 1

NOAA Fisheries. 2001b. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, FL, SEFSC Contribution PRD-00/01-08.

2.0 SUMMARY OF THE ALTERNATIVES

NOAA Fisheries considered the following alternatives, ranging from no action to a total prohibition of the gear type, to reduce the incidental catch and bycatch mortality of sea turtles in the pelagic longline fishery for Atlantic HMS. In response to public comment, NOAA Fisheries modified alternatives A5 and A10. Alternatives A5 (a) and A10 (a) are the alternatives as described in the DSEIS; alternatives A5 (b) and A10 (b) reflect the modifications. Alternatives A5 (b), A10 (b), and A16 are currently preferred. Alternatives A6, A11, and A12 were considered but not further analyzed. The ecological, economic, and social impacts of the other alternatives are discussed in later chapters.

2.1 BYCATCH AND BYCATCH MORTALITY MITIGATION MEASURES

Alternative A1 Maintain existing hook and bait restrictions in the Atlantic pelagic longline fishery; maintain existing time/area closures in the Atlantic pelagic longline fishery; maintain existing possession and use requirements for bycatch mitigation gear (dipnets and line clippers), as well as sea turtle handling and release guidelines, as currently specified by NOAA Fisheries. (No Action)

This alternative would maintain existing regulations regarding Atlantic pelagic longline gear and sea turtle interactions, including the closure of the Northeast Distant Statistical Reporting Area (NED) (20˚ to 60˚ West longitude, 35˚ to 55˚ North latitude) to all federally permitted vessels, or vessels required to be permitted, for Atlantic HMS with pelagic longline gear on board.

Alternative A2 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

This alternative would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Vessel operators aboard such vessels would be allowed to possess and/or use only whole mackerel bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks, and the live-bait restriction in the western Gulf of Mexico for vessels participating in this fishery.

Alternative A3 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait.

This alternative would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks, and the live-bait restriction in the western Gulf of Mexico for vessels participating in this fishery.

Alternative A4 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i)18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset circle hooks and squid bait; **OR** iii) 9/0 "J"-hooks with an offset not to exceed 25 degrees and whole mackerel bait.

This alternative would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i)18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset circle hooks and squid bait; **OR** iii) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks, and the live-bait restriction in the western Gulf of Mexico for vessels participating in this fishery.

Alternative A5 (a) Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees.

This alternative would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks, and the live-bait restriction in the western Gulf of Mexico for vessels participating in this fishery.

Alternative A5 (b) *Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks.* (*Preferred Alternative)*

This alternative would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks, and the live-bait restriction in the western Gulf of Mexico for vessels participating in this fishery.

Alternative A6 Allow pelagic longline fishing for Atlantic HMS in the NED, maintaining existing hook restrictions.

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and maintain existing hook restrictions. The NED area was closed to pelagic longline fishing to reduce sea turtle interactions, and was the subject of a three-year research experiment investigating sea turtle mitigation measures. Re-opening this area without implementation of additional bycatch measures would result in an unacceptable increase in sea turtle interactions, inconsistent with NS 9 of the MSA, which requires minimization of bycatch and bycatch mortality to the extent practicable. Therefore, this alternative is not further analyzed in this rulemaking but may be considered, if appropriate and necessary, in a future rulemaking.

Alternative A7 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery.

Alternative A8 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery.

Alternative A9 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following combinations: i) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait; **OR** ii) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait.

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait; **OR** ii) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery.

Alternative A10 (a) Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook with squid bait.

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook and squid bait. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery.

Alternative A10 (b) *Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. (Preferred Alternative)*

This alternative would re-open the NED to pelagic longline fishing for Atlantic HMS and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. This alternative would maintain the current requirement for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery.

Alternative A11 Prohibit the use of pelagic longline gear in Atlantic HMS fisheries.

This alternative would prohibit the use of pelagic longline gear by all U.S.-flagged vessels targeting HMS in the Atlantic Ocean. At this time, appropriate reductions in sea turtle interactions and mortalities may be achieved through other measures examined in this document, with less significant adverse social and economic impacts, consistent with NS 8 under the MSA, which requires minimization of adverse economic impacts to the extent practicable. Therefore, this alternative is not further analyzed in this rulemaking but may be considered, if necessary and appropriate, in a future rulemaking.

Alternative A12 Prohibit the use of pelagic longline gear in HMS fisheries in the western Gulf of Mexico year-round (12 months).

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels targeting HMS in the U.S. Exclusive Economic Zone (EEZ) of the western Gulf of Mexico (GOM), west of 88 degrees West longitude, where large numbers of sea turtles have been observed and reported caught, year-round. At this time, appropriate reductions in sea turtle interactions and mortalities may be achieved through other measures examined in this document, with less significant adverse social and economic impacts, consistent with NS 8 under the MSA, which requires minimization of adverse economic impacts to the extent practicable. Therefore, this alternative is not further analyzed in this rule making but may be considered, if necessary and appropriate, in a future rulemaking.

Alternative A13 Prohibit the use of pelagic longline gear in HMS fisheries in an area of the central Gulf of Mexico year-round (12 months).

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels targeting HMS in a portion of the central GOM, where large numbers of sea turtles have been observed and reported caught, year round. This closure would encompass approximately 25,489 nm^2 and would be defined as the area within the following coordinates, beginning with the northeastern corner and proceeding clockwise: 28°09' N. latitude (Lat.), 88°12' W. longitude (Long.); 27°06' N. Lat., 88°12' W. Long.; 25°46' N. Lat.,90°24' W. Long.; 26°17' N. Lat., 93°03' W. Long.; 26°51' N. Lat., 93°03' W. Long.; 28°09' N. Lat., 90°10' W. Long..

Alternative A14 Prohibit the use of pelagic longline gear in HMS fisheries in portions of the central Gulf of Mexico and the Northeast Coastal Statistical Reporting Area year-round (12 months).

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels targeting HMS in portions of the central GOM and the Northeast Coastal Statistical Reporting Area (NEC), where large numbers of sea turtles have been observed and reported caught, year-round. These closures encompass approximately 56,471 nm^2 in aggregate. The GOM portion of the closure is identical to the GOM closure area in alternative A13, thus the boundary coordinates are not repeated here. The NEC portion of the closure would encompass approximately 30,982 nm^2 and would be defined as the area within the following coordinates beginning with the northeastern corner and proceeding clockwise: 41°08' N. Lat., 66°06' W. Long.; 38°37' N. Lat., 65°16' W. Long.; 37°25' N. Lat., 69°18' W. Long.; 39°55' N. Lat., 70°05' W. Long.

Alternative A15 Prohibit the use of pelagic longline gear in HMS fisheries in portions of the Central Gulf of Mexico and the Northeast Coastal Statistical Reporting Area from May through October (6 months).

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels targeting HMS in portions of the central GOM and the Northeast Coastal Statistical Reporting Area (NEC), where large numbers of sea turtles have been observed and reported caught, from May through October (6 months). The GOM and NEC closure is identical to the area described in alternative A14, thus the boundary coordinates are not repeated here.

Alternative A16 *Require vessels with pelagic longline gear onboard to possess and use dipnets and line clippers that meet newly revised design and performance standards, plus require these vessels to possess, maintain, and utilize additional sea turtle handling and release gear and comply with handling and release guidelines, as specified by NOAA Fisheries. (Preferred Alternative)*

This alternative would require vessel operators aboard all federally permitted vessels, or those required to be permitted, for Atlantic HMS with pelagic longline gear onboard to possess, maintain, and utilize line cutters and dipnets meeting revised design and performance standards as well as require vessel operators to possess, maintain, and utilize additional equipment to facilitate the removal of fishing gear from incidentally captured sea turtles. As described in Appendix B1, this additional equipment would include: A- (1) long-handled line cutter; B- (1) long-handled dehooker for ingested hooks; C- (1) long-handled dehooker for external hooks (the long-handled dehooker for ingested hooks used for item B will also satisfy this requirement); D- (1) long-handled device to pull an “Inverted V” (if 6’ J-style dehooker is used for item C, it will also satisfy this requirement); E- (1) dipnet; F- (1) standard automobile tire; G- (1) short-handled dehooker for ingested hooks; H- (1) short-handled dehooker for removing external hooks (the short- handled dehooker for ingested hooks used for item G will also satisfy this requirement); I- (1) long-nose or needle-nose pliers; J- (1) monofilament line cutter; K- (1) bolt cutter; and, L- (2) types of mouth openers/mouth gags.

Items A - D would be required for sea turtles not boated. Items E - L would be required for sea turtles boated. This equipment must be used in accordance with the handling and release guidelines specified by NOAA Fisheries.

References Cited in Chapter 2

No references cited

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

United States HMS fishermen encounter many species of fish; some of those are marketable, others are discarded for economic or regulatory reasons. Species frequently encountered are swordfish, tunas, and sharks, as well as billfish, dolphin, wahoo, king mackerel, and other finfish species. On occasion, HMS fishermen also interact with sea turtles, marine mammals, and seabirds, known collectively as “protected” species. All of these species are federally managed, and NOAA Fisheries seeks to control anthropogenic sources of mortality. Detailed descriptions of those species are given in the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (NMFS, 1999), the 2003 and 2004 SAFE Reports (NOAA Fisheries, 2003a; NOAA Fisheries, 2004a) and are summarized and updated here. Management of declining fish populations requires decreasing fishing mortality from both directed and incidental fishing. The status of the stocks of concern is summarized below.

3.1 STATUS OF THE STOCKS

With the exception of Atlantic sharks, stock assessments for Atlantic HMS are conducted by ICCAT and its Standing Committee on Research and Statistics (SCRS). In 2002, the SCRS conducted stock assessments for Atlantic white marlin, North and South Atlantic swordfish, bigeye tuna, and bluefin tuna. Also in 2002, the United States conducted stock assessments for the Atlantic large and small coastal shark complexes. A stock assessment summary table is presented below (Table 3.1). As established in the HMS FMP, a stock is considered overfished when the biomass level (B) falls below the minimum stock size threshold (MSST), and overfishing occurs when the fishing mortality rate (F) exceeds the maximum fishing mortality threshold (MFMT).

Table 3.1 Stock Assessment Summary Table. Source: NOAA Fisheries, 2004b

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
North Atlantic Swordfish	B_{02}/B_{MSY} = 0.94 (0.75-1.24)	$0.8B_{MSY}$	F_{01}/F_{MSY} = 0.75 (0.54-1.06)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is not occurring, stock is in recovery
South Atlantic Swordfish	*Not estimated*	$0.8B_{MSY}$	*Not estimated*	F_{year}/F_{MSY} = 1.00	Fully fished; Overfishing may be occurring.*

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
West Atlantic Bluefin Tuna	SSB_{01}/SSB_{MSY}= 0.31 (low recruitment); 0.06 (high recruitment) SSB_{01}/SSB_{75} = 0.13 (low recruitment); 0.13 (high recruitment)	*$0.86SSB_{MSY}$*	F_{01}/F_{MSY} = 2.35 (low recruitment scenario) F_{01}/F_{MSY} = 4.64 (high recruitment scenario)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
East Atlantic Bluefin Tuna	SSB_{00}/SSB_{70} = 0.80	*Not estimated*	F_{00}/F_{max} = 2.4	*Not estimated*	Overfished; overfishing is occurring.*
Atlantic Bigeye Tuna	B_{02}/B_{MSY} = 0.81-0.91	*$0.6B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = 1.15	$_{Fyear}/F_{MSY}$ = 1.00	May be overfished; overfishing is occurring.
Atlantic Yellowfin Tuna	B_{01}/B_{MSY} = 0.73 - 1.10	*$0.5B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = .87-1.46	$_{Fyear}/F_{MSY}$ = 1.00	Not overfished; overfishing may be occurring.
North Atlantic Albacore Tuna	B_{92}/B_{MSY} = 0.68 (0.52-0.86)	*$0.7B_{MSY}$*	F_{02}/F_{MSY} = 1.10 (0.99 - 1.30)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
South Atlantic Albacore Tuna	B_{02}/B_{MSY} = 1.66 (0.74-1.81)	*Not estimated*	F_{02}/F_{MSY} = 0.62 (0.46-1.48)	*Not estimated*	Not overfished; overfishing not occurring.*
West Atlantic Skipjack Tuna	*Unknown*	*Unknown*	*Unknown*	$_{Fyear}/F_{MSY}$ = 1.00	Unknown
Atlantic Blue Marlin	B_{00}/B_{MSY} = 0.4 (0.25 - 0.6)	*$0.9B_{MSY}$*	F_{99}/F_{MSY} = 4.0 (2.5 - 6.0)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
Atlantic White Marlin	B_{01}/B_{MSY} = 0.12 (0.06-0.25)	*$0.85B_{MSY}$*	F_{00}/F_{MSY} =8.28 (4.5-15.8)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
West Atlantic Sailfish	*Not estimated*	$0.75B_{MSY}$	*Not estimated*	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
Large Coastal Sharks (SPM)	N_{01}/N_{MSY} = 0.46-1.18	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = .89-4.48	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring
Sandbar Sharks (SPM)	N_{01}/N_{MSY} = 0.77 - 2.22	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = 1.08-1.68	$_{Fyear}/F_{MSY}$ = 1.00	Not overfished - still rebuilding; overfishing is occurring
Blacktip Sharks (SPM)	N_{01}/N_{MSY} = 1.20 - 1.45	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = 0.42 - 0.82	$_{Fyear}/F_{MSY}$ = 1.00	Not overfished; overfishing is not occurring
Pelagic Sharks	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*

* South Atlantic swordfish, South Atlantic albacore and East Atlantic bluefin tuna are not found in the U.S. EEZ and, therefore, are not managed under the Magnuson-Stevens Act.

3.1.1 Swordfish

Atlantic swordfish (*Xiphias gladius*) are large migratory predators that range from Canada to Argentina in the West Atlantic Ocean. The management units for assessment purposes are a separate Mediterranean group, and North and South Atlantic groups separated at 5°N (NOAA Fisheries, 2003a). Swordfish live to be more than 25 years old, and reach a maximum size of about 902 lb dressed weight (dw). Swordfish are characterized by having dimorphic growth, where females show faster growth rates and attain larger sizes than males. Young swordfish grow very rapidly, reaching about 130 cm lower jaw-fork length (LJFL) by age two. Females mature between ages two and eight, with 50 percent mature at age five at a weight of about 113 lb dw. Males mature between ages two and six, with 50 percent mature at age three at a weight of about 53 lb dw (Arocha, 1997). Large swordfish are all females; males seldom exceed 150 lb dw. These large pelagic fishes feed throughout the water column on a wide variety of prey including groundfish, pelagics, deep-water fish, and invertebrate. Swordfish show extensive diel migrations and are typically caught on pelagic longlines at night when they feed in surface waters. Swordfish are distributed globally in tropical and subtropical marine waters. Their broad distribution, large spawning area, and prolific nature have contributed to the resilience of the species in spite of the heavy fishing pressure being exerted on it by many nations. During their annual migration, north Atlantic swordfish follow the major currents which circle the north Atlantic Ocean (including the Gulf Stream, Canary and North Equatorial Currents) and the currents of the Caribbean Sea and Gulf of Mexico. The primary habitat in the western north

Atlantic is the Gulf Stream, which flows northeasterly along the U.S. coast, then turns eastward across the Grand Banks. North-south movement along the eastern seaboard of the United States and Canada is significant (SAFMC, 1990).

In 2002, total estimated swordfish catch of U.S. vessels, including U.S. vessel landings and dead discards was 2,708.7 metric tons (MT) (NOAA Fisheries, 2003b). This underharvest represents a modest increase of 55.4 MT from 2001, but a 22.5 percent decrease from 2000. U.S. swordfish landings are monitored in-season from reports submitted by dealers, vessel owners and vessel operators, NOAA Fisheries port agents, and mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish. Starting in 1992, the fishery has been monitored using a scientific observer sampling program that strives to observe approximately five percent of the longline fleet-wide fishing effort. This serves as a mechanism to observe amounts of bycatch and to verify logbook data.

According to the latest stock assessment from the International Commission for the Conservation of Atlantic Tunas, North Atlantic swordfish is considered overfished, while overfishing is not considered to be occurring. The stock is in recovery, with the biomass at the beginning of 2002 estimated to be at 94% (range: 75 to 124%) of the biomass needed to produce MSY. This estimate is up from an estimate of 65 percent of MSY in the 1998 assessment. The 2001 fishing mortality rate was estimated to be 0.75 times the fishing mortality rate at MSY (range: 0.54 to 1.06) (SCRS, 2002).

3.1.2 Atlantic Billfish

Blue marlin (*Makaira nigricans*) and white marlin (*Tetrapturus albidus*) are found throughout tropical and temperate waters of the Atlantic ocean and adjacent seas. They range from Canada to Argentina in the western Atlantic, and from the Azores to South Africa in the eastern Atlantic. Blue marlin are large apex predators with an average weight of 100 - 175 kg. The average size of white marlin is 20 - 30 kg. Blue marlin have an extensive geographical range, migratory patterns that include trans-Atlantic as well as trans-equatorial movements, and are generally considered to be a rare and solitary species relative to the schooling scombrids. Although white marlin are generally considered to be a rare and solitary species, they are known to occur in small groups consisting of several individuals. Blue marlin are considered sexually mature by ages two to four, spawn in tropical and subtropical waters in the summer and fall, and are found in the colder temperate waters during the summer. Young blue marlin are one of the fastest, if not the fastest growing of all teleosts, reaching from 30 - 45 kg by age one. Female white and blue marlin grow faster and reach a much larger maximum size than males. Very little is known about the age and growth of white marlin, although they are considered to be very fast growing, as are all the Istiophoridae (NOAA Fisheries, 2003a).

Blue and white marlin feed on a wide variety of fish and squid. They are found predominately in the open ocean near the upper reaches of the water column and are caught most frequently as a bycatch in the offshore longline fisheries, which target tropical or temperate tunas using gear intended to fish near-surface waters. However, significant bycatch landings are also made by offshore longline fisheries that target swordfish and bigeye tuna using gear intended to fish deeper in the water column. White and blue marlin are both managed using the single Atlantic stock hypothesis. As discussed infra, marlins, in addition to sailfish and longbill spearfish, are caught as bycatch in the Atlantic pelagic longline and shark gillnet fisheries and they cannot be taken commercially.

Sailfish and spearfish have a pan-tropical distribution. Although sailfish have highest concentrations in coastal waters (more than any other Istiophorid), they are still found in oceanic waters. Spearfish are most abundant in offshore temperate waters. No trans-Atlantic movements have been recorded, suggesting a lack of mixing between east and west. Although sailfish and spearfish are generally considered to be rare and solitary species relative to the schooling Scombrids, sailfish are known to occur along tropical coastal waters in small groups consisting of at least a dozen individuals. Sailfish are the most common, and spearfish are generally the rarest, Atlantic Istiophorid (NOAA Fisheries, 2003a).

Sailfish and spearfish are generally considered piscivorous, but have also been known to consume squid. They are found predominantly in the upper reaches of the water column and are caught as bycatch in the offshore longline fisheries and as a directed catch in coastal fisheries. In coastal waters, artisanal fisheries use many types of shallow water gear to target sailfish (NOAA Fisheries, 2003a).

Sailfish spawn in tropical and subtropical waters in the spring and throughout the summer. Little is known about spearfish life history due to their relatively low abundance in offshore waters. Both sailfish and spearfish are considered to be fast growing species compared to other teleosts. Female sailfish grow faster and reach a larger maximum size than males (NOAA Fisheries, 2003a). The Billfish FMP Amendment provides more detailed background information regarding the life history strategies of Atlantic billfish, including age and growth, reproduction, movement pattern, influence of physical oceanographic features, essential fish habitat, and other information.

The preliminary estimates of 2002 U.S. recreational catches for these billfish species, combining the geographical areas of the Gulf of Mexico (Area 91), the northwestern Atlantic Ocean west of the 60^{o} W longitude (Area 92), and the Caribbean Sea (Area 93) are: 17.1 MT for blue marlin; 5.6 MT for white marlin; and 103 MT for sailfish. The estimates for 2001 were 16.4 MT, 3.1 MT, and 61.7 MT, respectively, for the three species. Estimates of the U.S. recreational catch (landings) do not include any estimates of mortality of released (or tagged and released) fish (NOAA Fisheries, 2003b).

According to the latest ICCAT stock assessment, Atlantic blue and white marlin and West Atlantic sailfish are all considered overfished, with overfishing believed to be occurring for all three species. The latest assessment for blue marlin is slightly more optimistic than the 1998 assessment, however productivity is lower than previously estimated. The total Atlantic stock is approximately 40% of B_{msy}, the current fishing mortality rate is approximately four times higher than F_{msy}, and overfishing has taken place in the last 10-15 years. Blue marlin landings declined in 1999 by 14% from the 1996 level. The 2000 assessment estimated that overfishing was still occurring and that productivity (MSY and stock's capacity to replenish) was lower than previously estimated (NOAA Fisheries, 2003a).

The previous two white marlin assessments, made in 1996 and 2000, indicated that the biomass of white marlin has been below B_{msy} for more than two decades. Thus, white marlin has been overfished for many years. The 2002 assessment results suggest that the total Atlantic stock in 2000 remains overfished, and overfishing is continuing to occur. Given that the stock is severely depressed, the SCRS concluded that ICCAT should take steps to reduce the catch of white marlin as much as possible. Results from the 2002 assessment indicate a MSY of 964 mt (849-1070 mt), a relative biomass (B_{2001}/B_{msy}) of 0.12 (0.06 - 0.25), and a relative fishing mortality rate (F_{2000}/F_{msy}) of 8.28 (4.5 - 15.8) (NOAA Fisheries, 2003a) .

Longbill spearfish and sailfish landings have historically been reported together in annual ICCAT landings statistics. An assessment was conducted in 2001 for the western Atlantic sailfish stock based on sailfish/spearfish composite catches and sailfish "only" catches. The assessment tried to address shortcomings of previous assessments by improving the list of abundance indices and by separating the catch of sailfish from that of spearfish in the offshore longline fleets.

Considerable progress was made on obtaining new, more reliable abundance indices. The new separation of sailfish/spearfish allowed assessments to be attempted on sailfish "only" data. Results from the 2001 sailfish "only" assessment indicate a recent yield (2000) of 506 mt and a 2000 replacement yield of ~ 600 mt. However, considerable uncertainties remain relating to both catches and catch rates that can only be addressed by a substantial research investment in historical data validation and in investigations of the habitat requirements of sailfish (NOAA Fisheries, 2003a).

For the western Atlantic stock, recent catch levels for sailfish/spearfish, combined, seem sustainable, as both CPUE and catch have remained relatively constant over the last two decades. For the combined sailfish/spearfish western Atlantic stock, it is not known whether the current catch level is below or at maximum sustainable yield. For this same stock, tentative catches of sailfish "only" have averaged about 700 MT over the past two decades, and the abundance indices have remained relatively stable for the same period. New analyses do not provide any information on the MSY or other stock benchmarks for the western Atlantic composite or sailfish "only" stock (NOAA Fisheries, 2003a).

3.1.3 Atlantic Tunas

Tunas are members of the family Scombridae in the suborder Scombroidei, which they share with swordfish (family Xiphiidae) and billfishes (family Istiophoridae). Atlantic tunas are wide-ranging in size; skipjack tuna is less than one meter (18 kg) as an adult, and the giant bluefin tuna can grow to more than three meters in length (675 kg or 1485 lbs). The Atlantic tunas include some of the largest and fastest predators in the oceans, and their physiological adaptations reflect that role in the ocean's ecosystems. Tuna have among the highest metabolic rates, fastest digestion rates, and the most extreme specializations for sustained levels of rapid locomotion of any fish (Helfman *et al*,1997).

Many of these characteristics are common among HMS. The tunas' body shape, round or slightly compressed in cross section, minimizes drag as they move through the water. Their lunate tails are deeply forked. These adaptations for speed are further enhanced by depressions on the body surface which are shaped to hold the fins in a streamlined position. Small dorsal and ventral finlets minimize turbulence and allow the tail to propel the fish forward more efficiently. Tunas utilize a respiratory mode known as ram gill ventilation, which differs from the more common mechanism whereby water is actively pumped across the gills. Ram gill ventilation requires that the fish swim continuously with its mouth open to maintain water flow across the gill surfaces. It is believed that this system helps conserve energy for voracious fishes like the tunas (Helfman *et al*., 1997).

Tunas are endothermic, with a physiological mechanism to control their body temperature. These fishes maintain an elevated body temperature by conserving the heat generated by active swimming muscles. This enables tunas to dive into colder and deeper water, giving them an edge in overtaking their prey. Heat conservation is accomplished through an adaptation of the circulatory system. The internal temperatures of these fishes remains fairly stable even as they move from surface waters to colder deep water. Bluefin tuna keep muscle temperatures between 28˚ and 33˚C while swimming through waters ranging from 7˚ to 30˚C, while yellowfin and skipjack tunas maintain muscle temperatures at about 3˚C or 4˚ to 7˚C above ambient water temperatures, respectively.

Tunas move thousands of kilometers annually throughout the world's tropical, subtropical, and temperate oceans and adjacent seas, primarily in the upper 100 to 200 meters of open ocean. As adults and juveniles, they feed on a variety of fishes, cephalopods, and crustaceans, depending on seasonal prey availability. The foraging and movement patterns of tunas reflect the distribution and scarcity of appropriate prey in the open seas; these fishes must cover vast expanses of the ocean in search of sufficient food resources. Consequently, aggregations of tunas are often correlated with areas where higher densities of prey are found, such as current boundaries, convergence zones, and upwelling areas (Helfman *et al*., 1997).

3.1.3.1 Atlantic Bluefin Tuna

In west Atlantic waters, bluefin tuna (*Thunnus thynnus*) reach maturity at about 196 cm (77 inches) straight fork length, and 145 kg (320 lbs). Bluefin tuna of this size are believed to be about eight years old. Stock assessments assume that the spawning population consists of all bluefin tuna eight years and older. Although each spawning Atlantic bluefin tuna produces approximately 30 million eggs, natural mortality on juvenile bluefin tuna is high (National Research Council, 1994). Bluefin tuna have a relatively long life span (20 years or more), which means that the stock consists of several age classes, a condition that serves as a buffer against adverse environmental conditions and that confers some degree of stability on the stock. As opportunistic feeders that can migrate long distances in search of prey, bluefin tuna may also be quite resilient to fluctuations in prey concentrations, although changes in prey availability may greatly influence fishing patterns.

Bluefin tuna are distributed from the Gulf of Mexico to Newfoundland in the west Atlantic, from roughly the Canary Islands to south of Iceland in the east Atlantic, and throughout the Mediterranean Sea. Bluefin tuna spend a large part of the year feeding in temperate waters, returning to the warm waters of the Gulf of Mexico to spawn (Helfman *et al*., 1997). Trans-Atlantic migrations are well-documented, although migration patterns and their significance to species life history are not well known.

The two management units for Atlantic bluefin tuna are separated at 45˚ W above 10˚ N and at 25˚ W below the equator, with an eastward shift in the boundary between those parallels. A new stock assessment was conducted for both Atlantic bluefin tuna management units (East and West) in 2002. The West Atlantic stock assessment included projections for two scenarios about future recruitment. One scenario assumed that future recruitment will approximate the average estimated recruitment since 1976, unless spawning stock size declines to low levels. The second scenario anticipated an increase in recruitment corresponding to an increase in spawning stock size up to a maximum level no greater than the average recruitment for 1970 - 1974. These scenarios were referred to as the low recruitment and high recruitment scenarios, respectively.

The results of projections based on the low recruitment scenario for the Atlantic stock indicated that a constant catch of 2,500 mt per year has a 97 percent probability of allowing rebuilding to the associated B_{MSY} level by 2018. A constant catch of 2,500 mt per year has about a 35 percent probability of allowing rebuilding to the 1975 stock size (SSB75) by 2018. The SCRS notes that, arguably SSB75 is appropriate as a target level for interpreting the implications of projections based on the high recruitment scenario. Under the high recruitment scenario, a constant catch of about 2,500 mt has about a 60 percent probability of allowing rebuilding to the 1975 stock size; a catch of 2,700 has about a 52 percent chance of reaching this stock size. The SCRS cautioned that these conclusions do not capture the full degree of uncertainty in the assessments and projections. The immediate rapid projected increases in stock size are strongly dependent on estimates of high levels of recent recruitment, which are the most uncertain part of the assessment. The implications of stock mixing between the east and West Atlantic add to the uncertainty. For more information see Section 2.2.2 of the 2003 SAFE Report (NOAA Fisheries 2003a).

3.1.3.2 Atlantic Bigeye Tuna

Atlantic bigeye tuna (*Thunnus obesus*) are widely distributed in tropical and temperate waters between 45 degrees N and 45 degrees S latitudes. Young bigeye tuna form schools near the sea surface, mixing with other tuna such as yellowfin and skipjack tunas. Bigeye tuna reach sexual maturity at about four years of age, at which point they are approximately 100 cm long (40 inches). They spawn throughout the year in tropical waters from 15 degrees N to 15 degrees S. Catch information from the surface fisheries indicates that the Gulf of Guinea is a major nursery ground for the species. ICCAT recognizes a single Atlantic stock for management purposes, although the possibility of other scenarios, such as north and south Atlantic stocks, should not be disregarded (SCRS, 1997).

Catch of undersized fish remains a major problem in the Atlantic bigeye tuna fishery. The share of bigeye tuna less than the ICCAT minimum size (3.2 kg) is estimated at up to 59 percent by number of all bigeye tuna harvested. At its 2000 meeting, ICCAT adopted a recommendation that established the first-ever catch limits for bigeye tuna, which went into effect in 2001. These measures were continued for 2002 and 2003. While these measures will not be sufficient to rebuild the stock, bigeye tuna catches in 2000 (100,413 mt) and 2001 (96,482 mt) were down significantly from the 1999 level of 120,883 mt - first steps toward rebuilding (NOAA Fisheries 2003a).

ICCAT currently manages Atlantic bigeye tuna based on an Atlantic-wide single stock hypothesis. However, the possibility of other scenarios, including north and south stocks, does exist, and should not be disregarded (SCRS 2002). The latest stock assessment of Atlantic bigeye tuna was conducted in October 2002. The assessment was hampered by a paucity of information about illegal, unregulated, or unreported (IUU) catches, limited Ghanian fishery statistics, and the lack of a reliable index of abundance for small bigeye tuna. An estimate of natural mortality for juvenile fish was computed, which will help reduce uncertainty in future assessments.

Various production models were used which estimated that the total catch was larger than the upper limit of MSY estimates for the years between 1993 and 1999, causing the stock to decline considerably (SCRS 2002). This period was followed by a leveling off of biomass in recent years as total catches decreased. These results indicate that the current biomass is about 10-20% below the biomass corresponding to MSY and that current fishing mortality is about 15% higher than the rate that would achieve MSY. In addition to the estimates from production models, yield-per-recruit (YPR) analyses and other models support the production model results indicating that the stock is being over-fished. Further YPR analysis indicates that YPR can be increased with a reduction of fishing effort in small-fish fisheries. Increases in biomass are expected with catches below 95,000 mt, and further biomass declines are expected with catches of 105,000 mt or greater.

3.1.3.3 Atlantic Yellowfin Tuna

Yellowfin tuna (*Thunnus albacores*) are fast-growing, reaching sexual maturity at a size of about 25 kg (55 lbs) and 110 cm (44 inches), corresponding to an age of about three years (SCRS, 1997). The maximum size of yellowfin tuna is over 200 cm fork length. In the Atlantic, the greatest concentrations are found within 15 degrees north or south of the equator. Yellowfin tuna may be found seasonally as far north and south as the northeastern United States and Uruguay, with substantial concentrations occurring in the Gulf of Mexico during spring and summer months. Their distribution is determined by water temperature and the availability of prey species such as pelagic fishes and squids. Yellowfin tuna is a schooling species, with juveniles found in schools at the surface mixing with skipjack and bigeye tuna. Larger fish are found in deeper water and also extend their ranges into higher latitudes than smaller individuals. The main spawning ground in the Atlantic Ocean is the Gulf of Guinea near the equator, with spawning occurring from January to April (SCRS, 1998). Individual fish may spawn repeatedly during a single spawning season. All individuals in the Atlantic probably comprise a single population, but movement patterns are not well known (SCRS, 1997).

Based on movement patterns, as well as other information (e.g., time-area size frequency distributions and locations of fishing grounds), ICCAT manages Atlantic yellowfin tuna based on an Atlantic-wide single stock hypothesis. A full assessment was conducted for yellowfin tuna in 2003 (SCRS 2003) applying various age-structured and production models to the available catch data through 2001. At the time of the assessment meeting, only 19 percent of the 2002 catch had been reported (calculated relative to the catch reports available at the time of the SCRS Plenary). The results from all models were considered in the formulation of the Committee's advice. Both equilibrium and non-equilibrium production models were examined in 2003. The effective effort used for the production models was calculated by first creating a combined index from the available abundance indices by fleet and gear, and weighting each index by the catch of that fishery. One of the non-equilibrium models applied estimated the annual effective fishing effort internally, allowing the fishing power trends by fleet to vary.

The estimate of maximum sustainable yield (MSY) based upon the equilibrium models ranged from 151,300 to 161,300 metric ton (mt); the estimates of F_{2001}/F_{MSY} ranged from 0.87 to 1.29. The point estimate of MSY based upon the non-equilibrium models ranged from 147,200-148,300 mt. The point estimates for F_{2001}/F_{MSY} ranged from 1.02 to 1.46; the main differences in the results were related to the assumptions of each model. The Committee was unable to estimate the level of uncertainty associated with these point estimates (NOAA Fisheries 2004a).

3.1.3.3 Atlantic Albacore Tuna

Albacore tuna (*Thunnus alalunga*) are widely distributed throughout temperate waters of the Atlantic Ocean and the Mediterranean Sea, ranging from 50 degrees N to 40 degrees S latitudes. Aggregations are composed of similarly sized individuals, with those groups made up of the largest individuals making the longest journeys. Groups may include other tuna species, such as skipjack, yellowfin, and bluefin. They reach maximum sizes of about 125 cm (50 inches) and maximum weights of about 40 kg (88 lbs). Atlantic albacore tuna are considered mature at the age of five years, corresponding to approximately 90 cm (35 inches) (SCRS, 1998). Albacore tuna spawn in the spring and summer in tropical waters of the Atlantic (ICCAT, 1997).

On the basis of the available biological information, the existence of three stocks of albacore tuna is assumed for assessment and management purposes; northern and southern Atlantic stocks (separated at 5˚ N) and a Mediterranean stock. U.S. fishermen caught relatively small amounts of albacore from the North Atlantic stock/management unit (322 mt in 2001), and had minor catches of South Atlantic albacore (2 mt in 2001).

In 2003, an age-structured production model (ASPM), using the same specifications as in 2000, was used to provide a Base Case assessment for South Atlantic albacore. Results were similar to those obtained in 2000, but the confidence intervals were substantially narrower. In part, this may be a consequence of additional data now available, but the underlying causes need to be investigated further. The estimated MSY and replacement yield from the 2003 Base Case (30,915 mt and 29,256 mt, respectively) were similar to those estimated in 2000 (30,274 mt and 29,165 mt). In both 2003 and 2000, the fishing mortality rate was estimated to be about 60 percent of F_{MSY}. Spawning stock biomass has declined substantially relative to the late 1980s, but the decline appears to have leveled off in recent years and the estimate for 2002 remains well above the spawning stock biomass corresponding to MSY. A statistical (Bayesian) age structured production model was used for the first time in 2003. The results from this model were qualitatively similar to those from the ASPM. Projections were carried out using this alternate model (NOAA Fisheries 2003a).

3.1.3.4 Atlantic Skipjack Tuna

Skipjack tuna (*Katsuwonus pelamis*) are found throughout tropical and warm-temperate seas. The skipjack tuna is a schooling species, forming aggregations associated with hydrographic fronts. These tuna spawn opportunistically throughout the year in vast areas of the Atlantic Ocean. The size at first maturity is about 45 cm (18 inches), slightly smaller for females, which corresponds to about one to one and a half years of age (SCRS, 1997).

The stock structure of Atlantic skipjack tuna is not well known, and two management units (east and west) have been established due to the development of fisheries on both sides of the Atlantic and the lack of transatlantic recoveries of tagged skipjack tuna. U.S. vessels fish on the West Atlantic stock/management unit.

The characteristics of Atlantic skipjack tuna stocks and fisheries make it extremely difficult to conduct stock assessments using current models. Continuous recruitment occurring throughout the year, but heterogeneous in time and area, makes it impossible to identify and monitor individual cohorts. Apparent variable growth between areas makes it difficult to interpret size distributions and their conversion to ages. For these reasons, the SCRS has not conducted a stock assessment for Atlantic (West or East) skipjack tuna since 1999, and few definitive conclusions on the status of the stocks can be made. Standardized abundance indices from the Brazilian baitboat fishery and Venezuelan purse seine fishery both indicated a stable status for the western stock. The SCRS did not propose any management recommendations (NOAA Fisheries 2003a).

The estimated U.S. vessel landings and dead discards of tuna species in commercial and recreational HMS fisheries for 2002 can be seen in Table 3.2.

Table 3.2 **Estimated U.S. Vessel Landings in Metric Tons of Tuna Species in Commercial and Recreational HMS Fisheries in 2002 (MT).** Source: NOAA Fisheries, 2003b.

Gear	Albacore	Bigeye	Bluefin	Skipjack	Yellowfin
Handline	6.1	13.7	4.5	12.4	227
Harpoon	--	--	55.5	--	--
Gillnet	2.5	--	--	~0.6	~5.0
Pelagic Longline	147.1	510.7	49.9	~2.3	2542
Purse Seine	--	--	207.7	--	--
Trawl	0.3	0.3	--	0	0.3
Trap	0.6	--	--	~0.6	0.5
Troll	--	--	--	--	--
Rod and Reel	342	50.9	1557.3	73.5	3067.3
Pound	--	--	--	--	--
Unclassified	*	--	--	--	3.2
Total	**498.6**	**572**	**1,874.9**	**89.6**	**5845**

* < or = 0.5 MT

3.1.4 Atlantic Sharks

Atlantic sharks are managed in several species groups. Many shark species make extensive migrations along the U.S. Atlantic coast. Compared to other fishes, sharks have low reproductive rates which make them particularly vulnerable to overfishing. Because LCS are overfished, SCS are fully fished, and the status of pelagic sharks is unknown at this time, NOAA Fisheries seeks to minimize bycatch in any fishery which encounters them. Additional information on Atlantic sharks can be found in the HMS FMP (NOAA Fisheries, 1999), the 2003 and 2004 Stock Assessment and Fishery Evaluation Reports (NOAA Fisheries, 2003a; NOAA Fisheries, 2004a), and Amendment 1 to the HMS FMP (NOAA Fisheries, 2003c).

Large Coastal Sharks

Species in the large coastal sharks (LCS) group are the main commercial species and are targeted with bottom longline gear. Sandbar and blacktip sharks make up approximately 60 to 75 percent of the bottom longline catch and approximately 75 to 95 percent of the bottom longline landings (GSAFDF, 1996). The remainder of the bottom longline catch is comprised mostly of bull, bignose, tiger, sand tiger, lemon, spinner, scalloped hammerhead and great hammerhead sharks, with catch composition varying by region. These species are less marketable and are often released, so they are reflected in the overall catch but not the landings. Several LCS can also be caught by pelagic longline gear: silky, dusky, sandbar, and hammerhead sharks. The shark gillnet fishery catches several large coastal species including blacktip (targeted and retained), and scalloped hammerhead (discarded). To a lesser extent, sandbar, bull, spinner, tiger, lemon, and silky sharks are caught and retained in the shark gillnet fishery (NOAA Fisheries, 2002).

The latest Shark Evaluation Workshop (SEW) was held in June 2002. Discussions focused on the availability of four additional years worth of catch estimates, biological data, catch rate series, and the types of models that should be used. The modeling itself was performed after the SEW and incorporated new catch and effort estimates for the years 1998-2001 as well as over 20 catch- per-unit-effort (CPUE) series for LCS, sandbar, and blacktip sharks. Considering the outputs of all model analyses combined, the assessment results were considerably more pessimistic for the LCS aggregate as compared to those for individual species within the complex (i.e., sandbar and blacktip sharks). While the results illustrate improvements in the LCS complex since 1998, all of the models and catch scenarios, with the exception of the Bayesian SPM scenario which used only fishery-independent CPUE series, indicate that overfishing may be occurring and that the LCS complex may be overfished. Overall, the stock assessment found that the LCS complex as a whole is overfished and overfishing is occurring (Cortes *et al.*, 2002).

Pelagic Sharks

Pelagic sharks including shortfin mako, porbeagle, common thresher, and blue sharks are commonly taken in the pelagic longline fishery. Pelagic sharks are also sometimes encountered incidentally in the shark gillnet fishery (e.g., thresher sharks, mostly discarded) and bottom longline fishery. Trans-Atlantic migrations of these sharks are common; they are taken in several international fisheries outside the U.S. EEZ (NOAA Fisheries, 2002).

Pelagic sharks are subject to exploitation by many different nations and exhibit trans-oceanic migration patterns. As a result, ICCAT's Standing Committee on Research and Statistics Subcommittee on Bycatch has recommended that ICCAT take the lead in conducting stock assessments for pelagic sharks. Recently, the SCRS decided to conduct an assessment of Atlantic pelagic sharks beginning in 2004. Emphasis will be placed on blue, shortfin mako, and porbeagle sharks.

Prohibited Shark Species

In 1999, NOAA Fisheries prohibited possession of 19 species of sharks. These species were identified as highly susceptible to overexploitation and the prohibition on possession was a precautionary measure to ensure that directed fisheries did not develop. Three species on the prohibited list (i.e., dusky, night, and sand tiger) are also on the Candidate Species List under the ESA (NOAA Fisheries, 2003c).

To date there is little information available regarding the status of individual prohibited species. For the most part, many species that were LCS before 1999 continue to be considered as part of the LCS complex in the latest LCS stock assessment. In 2001, NOAA Fisheries contracted

Virginia Institute of Marine Science (VIMS) to conduct a status review under ESA of the dusky shark (Romine *et al.*, 2002). Additionally, VIMS continues to conduct a fisheries independent longline study off Virginia, which provides valuable information regarding the status of dusky shark. Specifically, relative abundance data (1974-2000) indicates increasing trends in abundance from 1997-2000, despite declines from 1980-1992 (Romine *et al.*, 2002). Catch data, which suggests increasing catch rates from 1994 to 1999, provides evidence that greater numbers of small dusky sharks are being caught. This finding is important considering that hooking mortality increases as shark size decreases. Romine *et al.* (2002) noted that mortality for dusky sharks less than 100 cm fork length was 79 percent, as compared with 37 percent in sexually mature animals (Romine et al., 2002). These data, when combined with other life history information and analyzed by a demographic model, suggest that dusky shark populations will continue to decline so long as fishery-induced mortality is incurred (Romine *et al.*, 2002). NOAA Fisheries will be conducting status reviews for night and sand tiger sharks in the future (NOAA Fisheries, 2003c).

3.1.5 Other Finfish

Dolphin (*Coryphaena hippurus*) are fast-swimming, pelagic, migratory, and predatory fish found in tropical and subtropical waters throughout the world. They are short-lived and fast growing. These traits allow the stock to support high fishing mortality rates. Also referred to as mahi-mahi, these fish are sold by commercial fishermen (driftnet and pelagic longline) and are targeted by recreational fishermen along the Atlantic and Gulf Coasts (NOAA Fisheries, 2002). Wahoo (*Acanthocybium solanderia*) are large pelagic fish found throughout the tropical and subtropical waters of the Atlantic Ocean. The life history of wahoo is largely unknown, although they are a fast-growing species similar to dolphin. These fish are also landed both recreationally and commercially, although encounter rates seem to be lower than those for dolphin (NOAA Fisheries, 2002).

The South Atlantic Fishery Management Council recently received notice that the Fishery Management Plan for Dolphin and Wahoo in the Atlantic Region has been approved by the U.S. Secretary of Commerce. The management plan, developed by the South Atlantic Council in conjunction with the Mid-Atlantic and New England Councils, will set limits on catches of dolphin and wahoo for commercial and recreational fishermen in federal waters along the entire Atlantic coast. The precautionary management plan also establishes a framework for long-term management of both fish species. Management measures included in the plan and approved by the secretary of commerce include requirements for permits, size limits for dolphin, recreational bag limits for both species, commercial trip limits for wahoo and commercial longline closures in conjunction with current closures in the Atlantic for Highly Migratory Species. The plan also will prohibit the sale of recreationally caught dolphin or wahoo, with the exception of for-hire vessels that possess the appropriate state and Federal commercial permits; those vessels will be allowed to sell dolphin harvested under the bag limit. The FMP establishes a non-binding cap of 1.5 million pounds, or 13 percent of the total landings for the commercial dolphin fishery.

3.2 FISHERY PARTICIPANTS AND GEAR TYPES

The HMS FMP provides a thorough description of the U.S. fisheries for Atlantic HMS, including sectors of the pelagic longline fishery. Below is specific information regarding the U.S. pelagic longline fishery for Atlantic HMS. For more detailed information on the fishery, please refer to the HMS FMP (NMFS, 1999), and the 2000 - 2004 HMS SAFE Reports.

3.2.1 Pelagic Longline Gear

The U.S. pelagic longline fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, or bigeye tuna in various areas and seasons. Secondary target species include dolphin, albacore tuna, pelagic sharks (including mako, thresher, and porbeagle sharks), as well as several species of large coastal sharks. Although this gear can be modified (i.e., depth of set, hook type, etc.) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. These vessel operators are opportunistic, switching gear style and making subtle changes to target the best available economic opportunity of each individual trip. Longline gear sometimes attracts and hooks non-target finfish with no commercial value, as well as species that cannot be retained by commercial fishermen due to regulations, such as billfish. Pelagic longlines may also interact with protected species such as marine mammals, sea turtles, and seabirds. Thus, this gear has been classified as a Category I fishery with respect to the Marine Mammal Protection Act. Any species (or undersized catch of permitted species) that cannot be landed due to fishery regulations is required to be released, whether dead or alive. Pelagic longline gear is composed of several parts (see Figure 3.1[1]). The primary fishing line, or mainline of the longline system, can vary

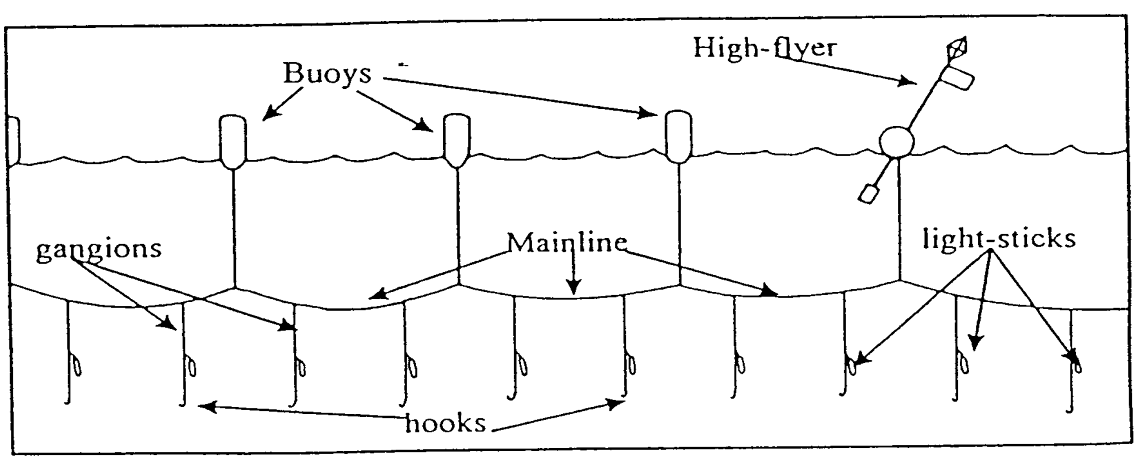

Figure 3.1 **Typical U.S. Pelagic Longline Gear.** Source: Arocha, 1996.

[1] As of April 1, 2001, (66 FR 17370) a vessel is considered to have pelagic longline gear on board when a power-operated longline hauler, a mainline, floats capable of supporting the mainline, and leaders (gangions) with

from five to 40 miles in length, with approximately 20 to 30 hooks per mile. The depth of the mainline is determined by ocean currents and the length of the floatline, which connects the mainline to several buoys and periodic markers which can have radar reflectors or radio beacons attached. Each individual hook is connected by a leader to the mainline. Lightsticks, which contain chemicals that emit a glowing light are often used, particularly when targeting swordfish. When attached to the hook and suspended at a certain depth, lightsticks attract bait fish which may, in turn, attract pelagic predators.

When targeting swordfish, the lines generally are deployed at sunset and hauled at sunrise to take advantage of swordfish nocturnal near-surface feeding habits (Berkeley *et al*., 1981). In general, longlines targeting tunas are set in the morning, deeper in the water column, and hauled in the evening. Except for vessels of the distant water fleet which undertake extended trips, fishing vessels preferentially target swordfish during periods when the moon is full to take advantage of increased densities of pelagic species near the surface. The number of hooks per set varies with line configuration and target catch (Table 3.3).

Table 3.3 **Average Number of Hooks per Pelagic Longline Set, 1995-2002.** Source: Data reported in pelagic longline logbook.

Target Species	1995	1996	1997	1998	1999	2000	2001	2002
Swordfish	539	529	550	563	521	550	625	695
Bigeye Tuna	752	764	729	688	768	454	671	755
Yellowfin Tuna	721	679	647	685	741	772	731	715
Mix of tuna species	NA	NA	NA	NA	NA	638	719	767
Shark	654	531	540	706	613	621	571	640
Dolphin	NA	NA	NA	NA	NA	943	447	542
Other species	231	79	460	492	781	504	318	300
Mix of species	658	695	713	726	738	694	754	756

Figure 3.2 illustrates the difference between swordfish (shallow) sets and tuna (deep) longline sets. Swordfish sets are buoyed to the surface, have few hooks between floats, and are relatively shallow. This same type of gear arrangement is used for mixed target sets. Tuna sets use a different type of float placed much further apart. Compared with swordfish sets, tuna sets have more hooks between the floats and the hooks are set much deeper in the water column. It is

hooks are on board.

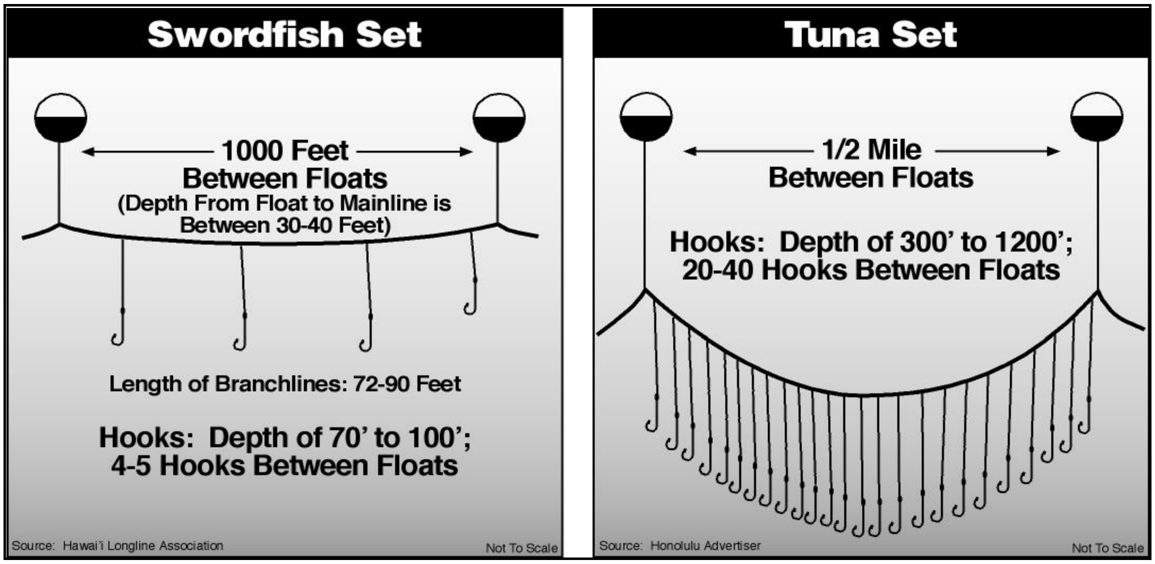

Figure 3.2 **Different Longline Gear Deployment Techniques.** Source: Hawaii Longline Association and Honolulu Advertiser.

believed that because of the difference in fishing depth, tuna sets hook fewer turtles than the swordfish sets. The hook types are also different for each target species. Swordfish sets generally use “J” hooks and tuna sets use “tuna” hooks, which are more curved than “J” hooks. In addition, tuna sets use bait only, while swordfish fishing uses a combination of bait and lightsticks. Compared with vessels targeting swordfish or mixed species, vessels targeting tuna typically are smaller and fish different grounds.

3.2.2 U.S. Pelagic Longline Catch and Discard Patterns

The U.S. pelagic longline fishery sector is comprised of five relatively distinct segments with different fishing practices and strategies, including the Gulf of Mexico yellowfin tuna fishery, the south Atlantic-Florida east coast to Cape Hatteras swordfish fishery, the mid-Atlantic and New England swordfish and bigeye tuna fishery, the U.S. distant water swordfish fishery, and the Caribbean Islands tuna and swordfish fishery. Each vessel type has different range capabilities due to fuel capacity, hold capacity, size, and construction. In addition to geographical area, segments differ by percentage of various target and non-target species, gear characteristics, bait, and deployment techniques. Some vessels fish in more than one fishery segment during the course of the year. Pelagic longline catch (including bycatch, incidental catch, and target catch) is largely related to these vessel and gear characteristics but is summarized for the whole fishery in Table 3.4

Table 3.4 **Reported Catch of Species Caught by U.S. Atlantic Pelagic Longlines, in Number of Fish 1995-2002.** Reported in pelagic longline logbook.

Species	1995	1996	1997	1998	1999	2000	2001	2002
Swordfish Kept	72,788	73,111	68,274	68,345	64,370	60,101	49,220	49,360
Swordfish Discarded	29,789	23,831	20,613	22,579	20,066	16,711	14,448	13,039
Blue Marlin Discarded	3,091	3,310	2,614	1,291	1,248	338	164	401
White Marlin Discarded	3,432	2,924	2,812	1,490	1,971	504	295	709
Sailfish Discarded	1,195	1,443	1,766	827	1,404	517	61	158
Spearfish Discarded	445	553	390	105	156	79	29	51
Bluefin Tuna Kept	239	209	180	206	239	232	183	178
Bluefin Tuna Discarded	2,852	1,709	688	1,304	601	737	348	593
Bigeye, Albacore, Yellowfin, Skipjack Tunas Kept	120,548	85,964	102,798	75,268	99,957	94,677	82,973	80,104
Pelagic Sharks Kept	5,885	5,270	5,134	3,624	2,705	2,932	3,511	2,997
Pelagic Sharks Discarded	90,173	84,330	82,220	44,000	28,910	26,281	23,953	22,844
Large Coastal Sharks Kept	57,676	36,022	21,382	8,742	1,025	7,752	6,510	4,077
Large Coastal Sharks Discarded	11,013	10,403	8,243	5,908	5,774	6,800	4,891	3,815
Dolphin Kept	72,463	35,888	62,811	21,864	29,902	28,095	27,913	30,452
Wahoo Kept	4,976	3,635	4,570	4,303	4,112	3,887	3,084	4,212
Turtles Discarded	1,142	498	267	885	627	270	421	465
Number of Hooks (X 1,000)	*11,064*	*10,657*	*9,861*	*7,676*	*7,488*	*7,570*	*7,740*	*7,151*

3.2.2.1 Regional U.S. Pelagic Longline Fisheries Description

The Gulf of Mexico Yellowfin Tuna Fishery

Gulf of Mexico vessels primarily target yellowfin tuna year-round; however, each port has one to three vessels that directly target swordfish, either seasonally or year-round. Longline fishing vessels that target yellowfin tuna in the Gulf of Mexico also catch and sell dolphin, swordfish, other tunas, and sharks. During yellowfin tuna fishing, few swordfish are captured incidentally. Many of these vessels participate in other Gulf of Mexico fisheries (targeting shrimp, shark, and snapper/grouper) during allowed seasons. Home ports for this fishery include Madiera Beach, FL; Panama City, FL; Dulac, LA; and Venice, LA.

For catching tuna, the longline gear is configured similar to swordfish longline gear but is deployed differently. The gear is typically set out at dawn (between 2 a.m. and noon) and retrieved at sunset (4 p.m. to midnight). The water temperature varies based on the location of fishing. However, yellowfin tuna are targeted in the western Gulf of Mexico during the summer when water temperatures are high. In the past, fishermen have used live bait, however, NOAA Fisheries recently banned the use of live bait in an effort to decrease bycatch and bycatch mortality of billfish (August 1, 2000, 65 FR 47214). Bait used includes frozen squid, Japanese mackerel, and local finfish. "J" hooks are most commonly used.

Yellowfin tuna inhabit tropical and subtropical waters of the Atlantic, prefer the upper 100 meters of the water column, and eat fishes, cephalopods, and crustaceans, with a preference for squid. This species is extensively fished in the Intertropical Atlantic (45° N - 40° S) by many nations using purse seine, longline, handline, and baitboat.

The South Atlantic ~ Florida East Coast to Cape Hatteras Swordfish Fishery

South Atlantic pelagic longline vessels previously targeted swordfish year-round, although yellowfin tuna and dolphin fish were other important marketable components of the catch. In 2001 (August 1, 2000, 65 FR 47214), the Florida East Coast closed area (year-round closure) and the Charleston Bump closed area (February through April closure) became effective. NOAA Fisheries plans to analyze logbook data to determine the effectiveness of these closed areas and to determine what adjustments have been made by the vessels that used to fish there.

Prior to these closures, smaller vessels used to fish shorter trips from the Florida Straits north to the bend in the Gulf Stream off Charleston, South Carolina (Charleston Bump). Mid-sized and larger vessels migrate seasonally on longer trips from the Yucatan Peninsula throughout the West Indies and Caribbean Sea, and some trips range as far north as the mid-Atlantic coast of the United States to target bigeye tuna and swordfish during the late summer and fall. Fishing trips in this fishery average nine sets over 12 days. Home ports (including seasonal ports) for this fishery include Georgetown, SC; Charleston, SC; Fort Pierce, FL; Pompano Beach, FL; and Key West, FL. This sector of the fishery consists of small to mid-size vessels which typically sell fresh swordfish to local high-quality markets. "J" hooks are most commonly used in this fishery sector.

The Mid-Atlantic and New England Swordfish and Bigeye Tuna Fishery

Fishing in this area has evolved during recent years to focus almost year-round on directed tuna trips, with substantial numbers of swordfish trips as well. Some vessels participate in directed bigeye/yellowfin tuna fishing during the summer and fall months and then switch to bottom longline and/or shark fishing during the winter when the large coastal shark season is open. Fishing trips in this fishery sector average 12 sets over 18 days. During the season, vessels primarily offload in the ports of New Bedford, MA; Barnegat Light, NJ; Ocean City, MD; and Wanchese, NC.

Bigeye tuna inhabit tropical and subtropical waters (50°N lat. and 45°S lat.) and range in surface waters to depths of 250 meters, this species tends to swim the deepest of the tunas. Bigeye tuna feed day and night on a variety of fish species, as well as cephalopods and crustaceans. This species is mostly caught on deep-water longlines for the fresh fish market, but is also caught by baitboat and purse seine as a secondary species by other nations. Bait used is typically frozen squid.

The U.S. Atlantic Distant Water Swordfish Fishery

This fishing ground covers virtually the entire span of the western north Atlantic to as far east as the Azores and the mid-Atlantic Ridge. Approximately 12 large fishing vessels operate out of mid-Atlantic and New England ports during the summer and fall months targeting swordfish and tunas, and then move to Caribbean ports during the winter and spring months. Many of the current distant water operations were among the early participants in the U.S. directed Atlantic commercial swordfish fishery. These larger vessels, with greater ranges and capacities than the coastal fishing vessels, enabled the United States to become a significant player in the north Atlantic fishery. They also fish for swordfish in the south Atlantic. The distant water vessels traditionally have been larger than their southeast counterparts because of the distances required to travel to the fishing grounds. Fishing trips in this fishery tend to be longer than in other fisheries, averaging 30 days and 16 sets. Ports for this fishery range from San Juan, PR through Portland, ME, and include New Bedford, MA, and Barnegat Light, NJ. Bait used includes frozen squid and Boston mackerel. "J" hooks are most commonly used in this fishery sector. This segment of the fleet was directly affected by the L-shaped closure in 2000 and the NED closure in 2001.

The Caribbean Tuna and Swordfish Fishery

This fleet is similar to the southeast coastal fishing fleet in that both are comprised primarily of smaller vessels that make short trips relatively near-shore, producing high quality fresh product. Both fleets also encounter relatively high numbers of undersized swordfish at certain times of the year. Longline vessels targeting HMS in the Caribbean set fewer hooks per set, on average, fishing deeper in the water column than the distant water fleet off New England, the northeast coastal fleet, and the Gulf of Mexico yellowfin tuna fleet. This fishery is typical of most pelagic fisheries, being truly a multi-species fishery, with swordfish as a substantial portion of the total catch. Yellowfin tuna, dolphin and, to a lesser extent, bigeye tuna, are other important components of the landed catch. Ports for this fishery include St. Croix, U.S. Virgin Islands; and San Juan, Puerto Rico. Many of these high quality fresh fish are sold to local markets to support the tourist trade in the Caribbean. Bait used includes frozen squid.

3.2.2.2 Bycatch and Incidental Catch

Marine Mammals

Of the marine mammals that are hooked by pelagic longline fishermen, many are released alive, although some animals suffer serious injuries and may die after being released. Mammals are caught primarily from June through December in the Mid-Atlantic Bight and Northeast Coastal areas (see Figure 3.3). In the past, the incidental catch rate was highest, on average, in the third quarter (July - September) in the Mid-Atlantic Bight. In 2000, there were 14 observed takes of marine mammals by pelagic longlines. This number has been extrapolated based on reported fishing effort to an estimated 403 mammals fleet-wide (32 common dolphin, 93 Risso's dolphin, 231 pilot whale, 19 whale, 29 pygmy sperm whale) (Yeung, 2001). Incidental catch of pilot whales on pelagic longlines is thought to result from pilot whales preying on tuna that have been caught on the gear. In 2001 and 2002, there were 16 and 24 observed takes of marine mammals, respectively. The majority of these interactions were observed in the Mid-Atlantic Bight, followed by the experimental NED fishery. In 2001, a total of 84 Risso's dolphin and 93 pilot

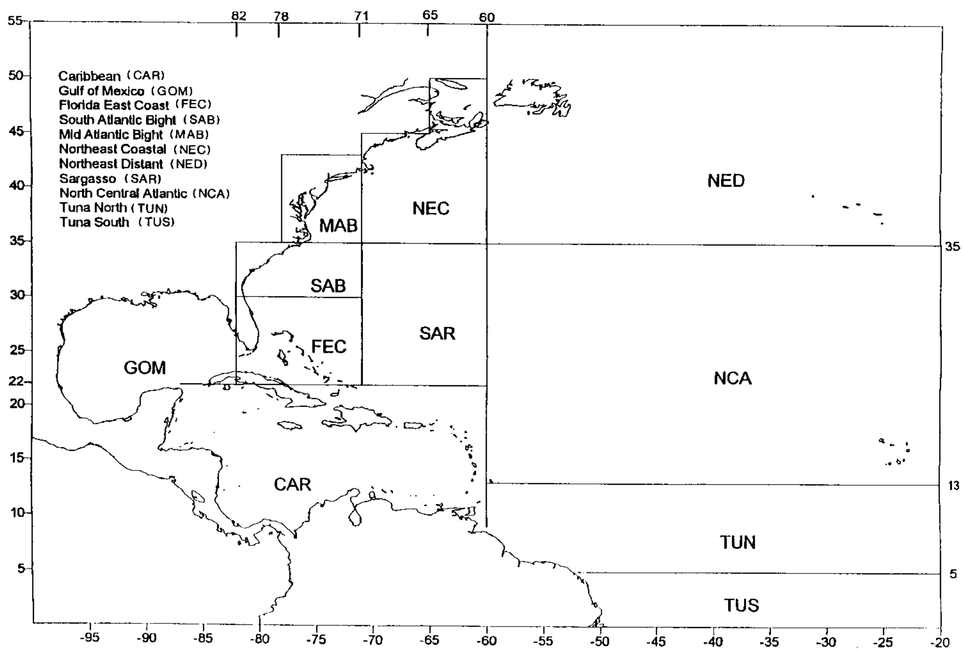

Figure 3.3 Geographic Areas Used in Summaries of Pelagic Logbook Data.
Source: Cramer and Adams, 2000.

whales are estimated to have been interacted with in the pelagic longline fishery. In 2002, the pelagic longline fishery is estimated to have interacted with 87 Risso's dolphin and 114 pilot whales. In the experimental NED fishery, an additional four Risso's dolphin and one northern bottlenose whale were recorded with serious injuries during 2001, as well as three Risso's dolphin, one unidentified dolphin, and one unidentified marine mammal in 2002. One striped dolphin was recorded as released alive during the NED experiment in 2001, as well as one Risso's dolphin, one common dolphin, one pilot whale, and one unidentified dolphin in 2002 (Garrison, 2003).

Sea Turtles

Currently, many sea turtles are taken in the Gulf of Mexico and Northeast Coastal areas (Figure 3.3) and most are released alive. In the past, the bycatch rate was highest in the third and fourth quarters. Loggerhead and leatherback turtles dominate the catch of sea turtles. In general, sea turtle captures are rare, but takes appear to be clustered (Hoey and Moore, 1999). The June 14, 2001, BiOP found that the actions of the pelagic longline fishery jeopardized the continued existence of loggerhead and leatherback sea turtles, based upon projections that the fishery was expected to interact with 991 loggerhead and 1012 leatherback sea turtles per year, for many years into the future. The estimated take levels for 2000 are 1256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). As discussed in Section 1.1 of this document, in 2001 and 2002, NOAA Fisheries closed the NED area and implemented other measures consistent with the BiOp. The estimated take levels outside of the NED closed area are 312 loggerhead and 1208 leatherback sea turtles for 2001 and 575 loggerhead and 962 leatherback sea turtles for 2002 (Garrison, 2003). NOAA Fisheries is currently working to identify the root cause of these increases. As a result of these increased sea turtle interactions, NOAA Fisheries reinitiated consultation for this fishery and completed a new BiOp on June 1, 2004. See Section 4.3 for information on the 2004 BiOp.

Seabirds

Gannets, gulls, greater shearwaters, and storm petrels are occasionally hooked by Atlantic pelagic longlines. These species and all other seabirds are protected under the Migratory Bird Treaty Act. Seabird populations are often slow to recover from excess mortality as a consequence of their low reproductive potential (one egg per year and late sexual maturation). According to NOAA Fisheries observer data from 2002, seven gulls, seven unidentified seabirds, four greater shearwaters, two shearwaters, and one northern gannet were hooked between June and November. The majority of longline interactions with seabirds occur as the gear is being set. The birds eat the bait and become hooked on the line. The line then sinks and the birds are subsequently drowned.

The United States has developed a National Plan of Action in response to the FAO International Plan of Action to reduce the incidental take of seabirds (www.nmfs.gov.gov/NPOA-S.html). Although Atlantic pelagic longline interactions will be considered in the plan, NOAA Fisheries has not identified a need to implement gear modifications to reduce seabird takes by Atlantic pelagic longlines. Takes of seabirds have been minimal in the fishery, most likely due to the setting of longlines at night and/or fishing in areas where birds are largely absent. Observed seabird bycatch in the Atlantic pelagic longline fishery from 1992 - 2002 can be seen in Table 3.11 in Section 3.4.

Finfish

In the U.S. pelagic longline fishery, fish are discarded for a variety reasons. Swordfish, yellowfin tuna, and bigeye tuna may be discarded because they are undersized or unmarketable (e.g., shark bitten). Blue sharks, as well as other species, are discarded because of a limited markets (resulting in low prices) and perishability of the product. Large coastal sharks are discarded during times when the shark season is closed. Bluefin tuna may be discarded because target catch requirements for other species have not been met. Also, all billfish are required to be released. In the past, swordfish have been discarded when the swordfish season was closed. U.S. pelagic longline reported catch for 1995 - 2002 (including reported bycatch, incidental catch, and target catch) is summarized in Table 3.4. The 2002 pelagic longline landings and average weight per fish can be seen in Tables 6.4 and 6.6, respectively. U.S. landings and discard data are also available in the 2003 U.S. National Report to ICCAT (NOAA Fisheries, 2003b)

At this time, direct use of observer data with pooling for estimating dead discards in this fishery represents the best scientific information available for use in stock assessments. Direct use of observer data has been employed for a number of years to estimate dead discards in Atlantic and Pacific longline fisheries, including billfish, sharks, and undersized swordfish. Furthermore, the data have been used for scientific analyses by both ICCAT and the Inter-American Tropical Tuna Commission for a number of years.

Bycatch mortality of marlins, swordfish, and bluefin tuna from all fishing nations may significantly reduce the ability of these populations to rebuild, and it remains an important management issue. In order to minimize bycatch and bycatch mortality in the pelagic longline fishery, NOAA Fisheries implemented regulations to close areas to longline fishing (Figure 3.4) and has banned the use of live bait by longline vessels in the Gulf of Mexico.

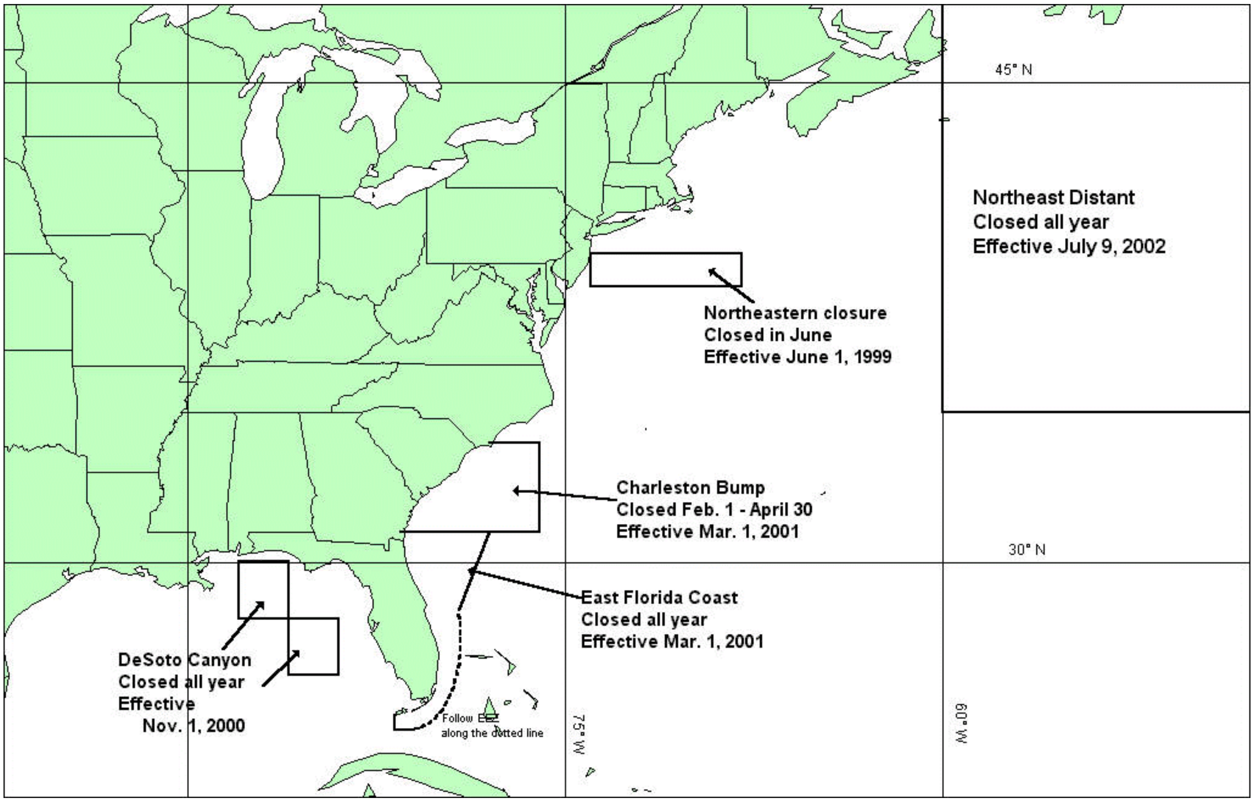

Figure 3.4 Areas Closed to Pelagic Longline Fishing by U.S.- Flagged Vessels.

3.2.3 U.S. Catch in Relation to International Catch of Atlantic Highly Migratory Species

The U.S. fleet is a small part of the international fleet that competes on the high seas for catches of tunas and swordfish (Table 3.5). Although the U.S. fleet landed as much as 35 percent of the swordfish from the north Atlantic, north of 5° N. latitude in 1990, this proportion decreased to 25 percent by 1997. For tunas, the U.S. proportion of landings was 23 percent in 1990, decreasing to 16 percent by 1997. In recent years, the proportion of U.S. pelagic longline landings of HMS has remained relatively stable in proportion to international landings (Table 3.5). The U.S. fleet accounts for none, or virtually none, of the landings of swordfish and tuna from the Atlantic Ocean south of 5° N. latitude, and does not operate at all in the Mediterranean Sea. Tuna and swordfish landings by foreign fleets operating in the tropical Atlantic and Mediterranean are greater than the catches from the north Atlantic area where the U.S. fleet operates. Even within the area where the U.S. fleet operates, the U.S. portion of fishing effort (in numbers of hooks fished) is less than 10 percent of the entire international fleet's effort, and likely less than that due to differences in reporting effort between ICCAT countries (NOAA Fisheries, 2001b).

The U.S. pelagic longline fleet targeting HMS captures sea turtles at a rate estimated to average 912 loggerheads and 846 leatherbacks per year, based on observed takes and total reported effort from 1992 to 2002 (Table 3.10). Estimates for 2000, based on observed take and reported effort, are 1256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). The estimated take levels for 2001 and 2002 are 312 loggerhead and 1208 leatherback sea turtles, and 575 loggerhead and 962 leatherback sea turtles, respectively (Garrison, 2003). Most of these takes occur on the high seas, rather than within the U.S. EEZ. Since other ICCAT nations do not monitor incidental catches of sea turtles, an exact assessment of their impact is not possible. However, high absolute numbers of sea turtle catches in the foreign fleets have been reported from other sources (NOAA Fisheries, 2001b). See Section 3.4.1 for recent catch estimates. If the sea turtle catch rates of foreign fleets, per hook, or even per pound of swordfish landed, are similar to the catch rates of the American fleet, then the American fleet may represent less than one-tenth, and certainly no more than one-third, of the total catch and mortality of sea turtles in north Atlantic pelagic longline fisheries.

Table 3.5 Estimated International Longline Landings of HMS, Other than Sharks, for All Countries in the Atlantic: 1998-2002 (mt ww)*. Source: SCRS, 2003

	1998	1999	2000	2001	2002
Swordfish (N.Atl + S. Atl)	24,432	25,201	24,990	21,773	21,770
Yellowfin Tuna (W. Atl)**	8,795	11,596	11,465	12,535	12,141
Bigeye Tuna	71,825	76,513	70,902	54,842	43,773
Bluefin Tuna (W. Atl.)**	764	914	859	610	727
Albacore Tuna (N. Atl + S. Atl)	23,574	27,209	28,881	28,959	27,491
Skipjack Tuna (N. Atl + S. Atl)	99	51	60	70	88
Blue Marlin (N. Atl. + S. Atl.)***	2,519	2,359	2,187	1,638	1,247
White Marlin (N. Atl. + S. Atl.)***	918	981	893	592	705
Sailfish (W. Atl.)***	1,058	524	811	812	1,050
Total	**133,984**	**145,348**	**141,048**	**121,831**	**108,992**
U.S. Longline Landings (from U.S. Natl. Report, 2003)[#]	**7,139.9**	**8,356.0**	**7,319.7**	**6,012.0**	**5893.2**
U.S. Longline Landings as a Percent of Total Longline Landings	**5.3**	**5.7**	**5.2**	**4.9**	**5.4**

* Landings include those classified by the SCRS as longline landings for all areas
** Note that the United States has not reported participation in the E. Atl yellowfin tuna fishery since 1983 and has not participated in the E. Atl bluefin tuna fishery since 1982.
***Includes U.S. *dead discards.*
Includes swordfish longline discards and bluefin tuna discards.

Mortality in the domestic and foreign pelagic longline fisheries is just one of numerous factors affecting sea turtle populations in the Atlantic (National Research Council, 1990). Many sources of anthropogenic mortality are outside of U.S. jurisdiction and control. If the U.S. swordfish quota was to be relinquished to other fishing nations, the effort now expended by the U.S. fleet would likely be replaced by foreign effort. This could significantly alter the U.S. position at ICCAT and make the implementation of international conservation efforts more difficult. This would also eliminate the option of gear or other experimentation with the U.S. longline fleet, thus making it difficult to find take reduction solutions which could be transferred to other longlining nations to effect a greater global reduction in sea turtle takes in pelagic longline fisheries. The U.S. has, and will continue to make efforts at ICCAT, Inter-American Tropical Tuna Commission (IATTC), and other international forums, to encourage adoption of sea turtle conservation measures by international fishing fleets. However, NOAA Fisheries is not aware of the implementation of sea turtle conservation measures by foreign fleets, and in the absence of a domestic fishing fleet subject to sea turtle conservation measures, foreign vessels would likely increase their fishing effort and sea turtle mortality would likely increase. Further, NOAA Fisheries continues to advance turtle conservation through participation in both domestic and international workshops.

In February 2003, the United States supported a workshop consisting of technical experts on sea turtle biology and longline fishery operations from interested nations in order to share information and discuss possible solutions to reduce incidental capture of marine turtles in these fisheries. The U.S. introduced the NED sea turtle bycatch mitigation research at the November 2003, ICCAT meeting in Dublin, Ireland, and co-sponsored ICCAT Resolution 03-11 which encouraged other nations to improve data collection and reporting on sea turtle bycatch and promote the safe handling and release of incidentally captured sea turtles. A poster and video describing the NED research experiment and preliminary results were displayed, as well as many of the experimentally tested release gears. In January 2004, the Northeast Distant Waters Longline Research ad hoc advisory group met in Miami, Florida. The purpose of this meeting was to present a summary of the 2001 and 2002 NED pelagic longline sea turtle bycatch mitigation research and the preliminary results for the 2003 research, and to discuss future research needs. Also in January 2004, the IATTC-CIAT Bycatch Working Group met in Kobe, Japan. The purpose of U.S. attendance at this meeting was to present results of sea turtle mitigation research by the U.S, to hear research results on bycatch mitigation from other countries, to encourage IATTC countries to evaluate or adopt sea turtle mitigation technology in their fisheries, and to address other bycatch issues in longline fisheries.

Additionally, the Inter-American Convention for the Protection and Conservation of Sea Turtles ("Inter-American Convention") was concluded on September 5, 1996, in Salvador, Brazil, and entered into force in May 2001. This is the first international agreement devoted solely to the protection of sea turtles. The Inter-American Convention calls for the Parties to establish national sea turtle conservation programs. Each party will agree to implement broad measures for the conservation of sea turtles, including the use of turtle excluder devices in commercial shrimp trawl vessels and the mitigation of impacts on sea turtles from other fisheries.

3.2.4 Research Experiment

Consistent with the conservation recommendation of the June 14, 2001, BiOp, NOAA Fisheries initiated a research experiment in the NED area in consultation and cooperation with the domestic pelagic longline fleet. The goal was to develop and evaluate the efficacy of new technologies and changes in fishing practices to reduce sea turtle interactions. In 2001, the experiment attempted to evaluate the effect of gangions placed two gangion lengths from floatlines, the effect of blue-dyed bait on target catch and sea turtle interactions, and the effectiveness of dipnets, line clippers, and dehooking devices. Eight vessels participated, making 186 sets, between August and November. During the course of the research experiment, 142 loggerhead and 77 leatherback sea turtles were incidentally captured and no turtles were released dead.

The data gathered during the 2001 experiment were analyzed to determine if the tested measures reduced the incidental capture of sea turtles by a statistically significant amount. The blue-dyed bait parameter decreased the catch of loggerheads by 9.5 percent and increased the catch of leatherbacks by 45 percent. Neither value is statistically significant. In examining the gangion placement provision, the treatment sections of the gear (with gangions placed 20 fathoms from floatlines) did not display a statistically significant reduction in the number of loggerhead and leatherback sea turtle interactions than the control sections of the gear (with a gangion located under a floatline). The treatment section of the gear recorded an insignificant increase in the number of leatherback interactions. Following an examination of the data, NOAA Fisheries discovered that the measures had no significant effect upon the catch of sea turtles (Watson *et al.*, 2003).

Dipnets and line clippers were examined for general effectiveness. The dipnets were found to be adequate in boating loggerhead sea turtles. Several line clippers were tested, with the La Force line clipper having the best performance. Several types of dehooking devices were tested, with the work on these devices continuing in the 2002 and 2003 NED research experiment.

In the summer and fall of 2002, NOAA Fisheries conducted the second year of the research experiment. The use of circle and “J”-hooks, whole mackerel bait, squid bait, and shortened daylight soak time were tested to examine their effectiveness in reducing the capture of sea turtles. The data indicate there were 501 sets made by 13 vessels with 100 percent observer coverage. During the course of the experiment, 100 loggerhead and 158 leatherback sea turtles were captured and 11 were tagged with satellite tags. In addition to the sea turtles, the vessels interacted with one unidentified marine mammal, one unidentified dolphin, one common dolphin, one longfin pilot whale, and four Risso's dolphins; all were released alive (Watson *et al.*, 2003).

In 2003, the research experiment tested a number of treatments to verify the results of the 2002 experiment in addition to testing additional treatments. Preliminary data indicate that there were 539 sets made by 11 vessels with 100 percent observer coverage. During the course of the experiment, one olive ridley, 92 loggerhead, and 79 leatherback sea turtles were captured; all were released alive (Foster *et al.*, 2004; Watson *et al.*, 2004). In addition to the sea turtles, the vessels interacted with one striped dolphin, one unidentified dolphin, and five Risso's dolphin resulting in one mortality (S. Epperly, pers. comm., 2003).

Since publication of the DSEIS, the reduction rates calculated for various experimental treatments (hook and bait combinations) have been standardized to control for several variables including sea surface temperature, daylight soak time, total soak time, vessel effect, and pairing effect in case of matched paired hook types per set. This FSEIS incorporates the NED research experiment data standardized for these variables.

3.2.5 Management of the Fishery

The U.S. Atlantic pelagic longline fishery is restricted by a limited swordfish quota, divided between the north and south Atlantic (separated at 5° N. lat.). Other regulations include minimum sizes for swordfish, yellowfin, bigeye, and bluefin tuna, limited access permitting, bluefin tuna catch requirements, shark quotas, protected species incidental take limits, reporting requirements (including logbooks), and gear requirements. Current billfish regulations prohibit the retention of billfish by commercial vessels, or the sale of billfish from the Atlantic Ocean. As a result, all billfish hooked on longlines must be discarded, and are considered bycatch. This is a heavily managed gear type and, as such, is strictly monitored to avoid over harvest of the swordfish quota. Because it is difficult for pelagic longline fishermen to avoid undersized fish in some areas, NOAA Fisheries has closed areas in the Gulf of Mexico and along the east coast. The intent of these closures is to relocate some of the fishing effort into areas where bycatch is expected to be lower. There are also time/area closures for pelagic longline fishermen designed to reduce the incidental catch of bluefin tuna and sea turtles. In order to enforce time/area closures and to monitor the fishery, NOAA Fisheries requires all pelagic longline vessels to report positions on an approved vessel monitoring system (VMS).

Pelagic longline fishermen and the dealers who purchase HMS from them are also subject to reporting requirements. NOAA Fisheries has extended dealer permitting and reporting requirements to all swordfish importers as well as dealers who buy domestic swordfish from the Atlantic. These data are used to evaluate the impacts of harvesting on the stock and the impacts of regulations on affected entities.

As of November 2003, approximately 235 tuna longline limited access permits had been issued. In addition, approximately 203 directed swordfish limited access permits, 100 incidental swordfish limited access permits, 249 directed shark limited access permits, and 357 incidental shark limited access permits had been issued.

Dealer permits are required for commercial receipt of Atlantic tunas, swordfish, and sharks, and are detailed in the HMS FMP. As of October 2002, approximately 479 Atlantic tunas, 321 Atlantic swordfish, and 267 Atlantic shark dealer permits had been issued. Dealer and limited access permits are discussed further in Chapter 6.

3.2.6 Observer Program

Eight hundred fifty-six pelagic longline sets were observed and recorded by NOAA Fisheries observers in 2002 (8.9% overall coverage - 100% coverage in the northeast distant statistical sampling area (NED); and 3.7% coverage in remaining areas). Table 3.6 compares the amount of observer coverage in past years for this fleet. The June 14, 2001, BiOp requires that five percent of the pelagic longline trips be selected for observer coverage. In addition, ICCAT requires five percent observer coverage for vessels targeting yellowfin tuna and/or bigeye tuna. Unfortunately, due to logistical problems, it has not been possible to place observers on all selected trips. NOAA Fisheries is working towards improving compliance with observer requirements and facilitating communication between vessel operators and observer program coordinators. In addition, fishermen are reminded of the safety requirements for the placement of observers specified at 50 CFR 600.746, and the need to have all safety equipment on board required by the U.S. Coast Guard.

Table 3.6 Observer Coverage of the Pelagic Longline Fishery. Source: Yeung, 2001 & Garrison, 2003

Year	Number of Sets Observed			Percentage of Total Number of Sets		
1995	696			5.2		
1996	361			2.5		
1997	448			3.1		
1998	287			2.9		
1999	420			3.8		
2000	464			4.2		
2001*	Total	Non-NED	NED	Total	Non-NED	NED
	403	217	186	3.7	2.0	100.0
2002*	856	353	503	8.9	3.7	100.0

*In 2001 and 2002, 100 percent observer coverage was required in the NED research experiment.

3.2.7 Safety Issues Associated with the Fishery

Like all offshore fisheries, pelagic longlining can be dangerous. Trips are often long, the work is arduous, and the nature of setting and hauling the longline may cause injuries due to hooking. Like all other HMS fisheries, longline fishermen are exposed to unpredictable weather. NOAA Fisheries does not wish to exacerbate unsafe conditions through the implementation of regulations. Therefore, NOAA Fisheries considers safety factors when implementing management measures on pelagic longline fishermen. For example, all time/area closures are expected to be closed to fishing, not transiting, in order to allow fishermen to make a direct route to and from fishing grounds. NOAA Fisheries seeks comments from fishermen on any safety concerns they have. Fishermen have pointed out that, due to decreasing profit margins, they may fish with less crew or less experienced crew or may not have the time or money to complete necessary maintenance tasks. NOAA Fisheries encourages fishermen to be responsible in fishing and maintenance activities.

3.2.8 Economic Aspects of the U.S. Pelagic Longline Fishery

3.2.8.1 Costs and Revenues

The amount of economic data available for this gear type is increasing, although additional up to date information is needed. Since 1996, NOAA Fisheries has been collecting economic information on a per trip basis through submission of voluntary forms in the pelagic logbook maintained in the Southeast Fisheries Science Center. Compared to the number of logbook reports, few economic data have been collected, because submission was voluntary. In 2003, NOAA Fisheries initiated mandatory cost earnings reporting for selected vessels in order to improve the economic data available for all HMS fisheries. Mandatory submission of this economic data is needed for NOAA Fisheries to accurately assess the economic impacts of proposed fishery management regulations on fishermen and their communities as required by Federal laws, such as the National Environmental Policy Act (NEPA), Executive Order 12866, the Regulatory Flexibility Act (RFA), and National Standards 7 and 8 of the Magnuson-Stevens Act. Specifically, this information will be used to conduct cost-benefit analyses and develop regulatory impact analyses of proposed regulations in an effort to help NOAA Fisheries develop and improve fishery management strategies.

Larkin *et al.* (2000) examined 1996 logbooks and the 1996 voluntary forms and found that net returns to a vessel owner varied substantially depending on the vessel size and the fishing behavior (i.e. sets per trip, fishing location, season, target species). This study noted that of 3,255 pelagic longline trips which reported, 642 provided the voluntary economic information. From all trips, four species (swordfish, yellowfin tuna, dolphin fish, and sandbar sharks) comprised 77 percent of all species landed and accounted for 84 percent of the total gross revenues for the fleet. Generally, vessels that were between 46 and 64 feet in length, had between 10 and 21 sets per trip, fished in the second quarter, fished in the Caribbean, or had more than 75 percent of their gross revenues from swordfish had the highest net return to the owner (ranging from $3,187 to $13,097 per trip). Vessels that were less than 45 feet in length, had between one and three sets per trip, fished in the first quarter, fished between North Carolina and Miami, FL, or had between 25 and 50 percent of their gross revenues from swordfish had the lowest net return to the owner (ranging from $642 to $1,885 per trip).

Larkin *et al*. (in press) used the above data in a cost function model to determine if and how captains decide on levels of effort in order to minimize variable costs per trip. They found that, on average, increasing the price of bait increased the demand for light sticks (i.e. these inputs are complements); changing the price of fuel did not affect any purchase decisions; and for every additional 10 feet in vessel length, operators demanded an additional 149 light sticks, 319 pounds of bait, and 540 gallons of fuel per trip. They also found that on average increasing swordfish landings required additional light sticks, bait and fuel. Increasing tuna landings reduced the demand for light sticks while increasing the demand for bait and fuel. Additionally, some inputs (i.e. light sticks, bait demand, and fuel demand) varied significantly with region, quarter, number of sets, and target species. They also found that if the price of light sticks or bait increases, the quantity demanded falls, particularly for light sticks (i.e. own-price elasticities are negative). However, elasticities could also change depending on region, target species, or number of trips but did not change between seasons.

Porter *et al*. (2001) conducted a survey of 147 vessels along the Atlantic and Gulf of Mexico (110 surveys were completed) in 1998 regarding 1997 operations. The survey consisted of 55 questions divided into five categories (vessel characteristics, fishing and targeting strategies, demographics, comments about regulations, and economic information of variable and fixed costs). The vessels interviewed were diverse in vessel size and target species (swordfish, tuna, mixed). Information was also used from trip tickets and logbooks. They found that on average, the average vessel received approximately $250,000 annual gross revenues, annual variable costs were approximately $190,000, and annual fixed costs were approximately $50,000. Thus, vessels were left with approximately $8,000 to cover depreciation on the vessel and the vessel owner lost approximately $3,500 per year. On a per trip level, gross revenues averaged $22,000 and trip expenses, including labor, were $16,000. Labor cost the owner the most (43 percent) followed by gear. Generally trip returns were divided so the vessel owner received 43 percent and the captain and crew 57 percent. Based on 2002 data, NOAA Fisheries estimates annual gross revenues of approximately $187,074.00 in 2002. Along with other studies, Porter *et al*. (2001) noted differences between region, vessel size, and target species. Porter *et al*. (2001) also noted that 1997 was probably a financially poor year due to a reduction in swordfish quota and a subsequent closure of the fishery. In all, these studies are consistent with Larkin *et al*. (1998) and Ward and Hanson (1999) in that characteristics of fishing trips can influence the success of the trip and that pelagic longline fishermen do not have large profits. Gross revenues, net revenues, and variable costs are discussed further in Chapter 6.

Many consumers consider swordfish to be a premier seafood product. Swordfish that bring $3.00 per pound to the vessel may sell in some restaurants at prices of over $20.00 for a six-ounce steak. Swordfish prices are affected by a number of demand and supply factors, including the method of harvest, either by distant-water or inshore vessels, and by gear type (harpoon vs. pelagic longline). Generally, prices for fresh swordfish can be expected to vary during the month due to the heavier fishing effort around the full moon. Swordfish prices also vary by size and quality, with prices first increasing with size, up to about 250 pounds dressed weight (lbs dw), then decreasing due to higher handling costs for larger fish. “Marker” swordfish weighing 100 to 275 lbs dw are preferred by restaurants because uniform-sized dinner portions can be cut with a minimum of waste. “Pups” weighing 50 to 99 lbs dw are less expensive than markers but the yield of uniformly sized portions is smaller. “Rats” (33 to 49 lbs dw) are the least expensive but are generally not used by food service or retail buyers who require large portions of uniform size. Larger tunas are also more desirable than smaller ones with prices for tunas ranging from $1.00 - 1.50 for 0 - 29 pound yellowfin tuna to $1.50 - 3.00 for 50+ pound yellowfin tuna (Strand and Mistiean, 1999). Size of fish harvested can be a substantial factor in management because regulations might have the effect of reducing catch but might raise the average size per fish caught and therefore, raise the price. Current ex-vessel and wholesale prices for Atlantic HMS are summarized in the 2004 HMS SAFE Report.

3.2.8.2 Imports

The United States monitors the trade of swordfish, but only as it relates to the sale of Atlantic swordfish in U.S. markets. Monitoring U.S. imports of swordfish is facilitated by the use of U.S. Customs data, the Certificate of Eligibility (COE), and importer activity reports. The U.S. COE program was established to implement an ICCAT recommendation that allows countries to ban the sale of swordfish less than the minimize size. The United States is successfully monitoring swordfish imports through this program and is providing useful information on Atlantic swordfishing activities to ICCAT. If swordfish shipments enter the United States under the swordfish tariff codes required by U.S Customs and Border Protection (formerly U.S. Customs Service) regulations, the shipments can be cross-checked with a COE that indicates the flag of the harvesting vessel and the ocean of origin. Furthermore, the COE validates that the imported swordfish is not less than the U.S. minimum size of 33 lb dressed weight. Japan implemented a swordfish monitoring program in 2000 that is similar to the U.S. COE program in order to implement a 1999 ICCAT recommendation to prohibit the import of swordfish harvested by Belize and Honduras. At its 2001 meeting, ICCAT adopted recommendations for the establishment of swordfish and bigeye tuna statistical documentation programs. NOAA Fisheries is currently developing a proposed rule to implement these recommendations.

Since the United States represents a significant market for swordfish and demand for swordfish may provide incentive for nations to export Atlantic swordfish to the United States, NOAA Fisheries reports imports of swordfish to ICCAT every year in November as part of the U.S. National Report. Data are collected from Customs entry forms, certificates of eligibility, and U.S. importer activity reports. This program has been in place since June 1999. Table 3.7 summarizes the bi-weekly dealer report and the COE data for the 2002 calendar year. Table 3.8 indicates the magnitude of swordfish product imports by the United States from 1997 - 2002.

Table 3.7 Swordfish Import Data Collected Under the Swordfish Import Monitoring Program (mt dw) for the 2002 Calendar Year. Source: NOAA Fisheries, 2004a

	Ocean of Origin				
Flag of Harvesting Vessel	**Atlantic**	**Pacific**	**Indian**	**Not Provided**	**Total***
Not Provided	2.7	0.0	0.0	2.8	5.5
Australia	0.0	217.4	41.1	7.2	265.7
Barbados	0.5	0.0	0.0	0.0	0.5
Brazil	1,075.2	0.0	0.0	0.0	1,075.2
Canada	324.9	0.0	0.0	0.0	324.9
Chile	0.0	963.3	0.0	0.0	963.3
Columbia	0.0	0.0	0.0	0.0	0.0
Costa Rica	0.3	406.6	0.0	0.0	406.9
Ecuador	0.5	458.7	0.0	0.0	459.2
El Salvador	0.0	30.3	0.0	0.0	30.3

	Ocean of Origin				
Flag of Harvesting Vessel	Atlantic	Pacific	Indian	Not Provided	Total*
Fiji Islands	0.0	36.0	0.0	0.0	36.0
Grenada	19.8	0.0	0.0	0.0	19.8
Indonesia	0.0	0.0	17.2	0.0	17.2
Japan	0.0	16.6	0.0	0.0	16.6
Malaysia	0.5	29.8	0.0	0.0	30.2
Mexico	0.0	78.1	0.0	2.8	80.8
Namibia	87.0	0.0	0.0	1.4	88.4
New Zealand	0.0	257.9	0.0	0.0	257.9
Panama	0.0	755.5	0.0	0.0	755.5
Philippines	0.0	34.0	0.0	1.0	35.0
R.S.A	0.0	0.0	86.9	0.0	86.9
Samoa	0.0	14.3	0.0	0.0	14.3
Seychelles	0.0	0.0	0.1	0.0	0.1
Singapore	0.0	139.7	3,062.1	0.0	3,201.8
South Africa	146.0	0.7	309.2	0.0	455.9
Taiwan	37.3	0.0	99.8	0.0	137.2
Tonga	0.0	3.8	0.0	0.7	4.5
Trinidad & Tobago	15.4	0.0	0.0	0.2	15.6
Uruguay	245.2	2.3	0.0	0.0	247.5
Venezuela	50.9	4.7	0.0	1.3	56.9
Vietnam	0.0	14.7	0.0	0.0	14.7
TOTAL	2,006.1	3,464.2	3,616.5	17.4	9,104.2
% of total swordfish imports	22.0	38.0	39.7	0.2	100.0

* COE Data as of 2/23/03

Table 3.8 Swordfish Products Imported: 1997-2002. Bureau of the Census data.

Year	Frozen (kg)			Fresh (kg)		Total for all products (kg)	
	Fillets	Steaks	Other	Steaks	Other	kg	$
1997	6,872,850	129,935	117,983	282,106	8,195,182	15,598,056	95,423,460
1998	7,224,329	207,816	259,675	92,560	8,497,451	16,281,831	82,577,668
1999	4,377,159	401,870	386,865	81,233	8,595,843	13,842,970	71,700,000
2000	4,833,867	524,148	167,441	161,763	8,626,856	14,314,075	85,579,449
2001	3,814,454	710,003	119,211	71,323	8,982,601	13,697,592	81,899,112
2002	4,156,755	956,459	677,351	195,211	9,726,199	15,711,975	88,266,887

note: Prior to 1997, Customs codes specific to products beyond the frozen and fresh designations, did not exist.

3.3 HABITAT

This section and Chapter 10 address essential fish habitat (EFH) for Atlantic HMS, in accordance with the MSA.

3.3.1 Regulatory Requirements

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq*., as amended by the Sustainable Fisheries Act in 1996, requires that FMPs describe and identify EFH, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. § 1802 (10)). The EFH regulations (at 50 CFR 600 Subpart J) provide additional interpretation of the definition of essential fish habitat: "'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species "full life cycle."

3.3.2 Description and Identification of EFH

The EFH regulations require that EFH be described and identified within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit. FMPs must describe EFH in text and tables that provide information on the biological requirements for each life history stage of the species. According to the EFH regulations, an initial inventory of available environmental and fisheries data sources should be undertaken to compile information necessary to describe and identify EFH and to identify major species-specific habitat data gaps. Available information should be evaluated through a hierarchical analysis based on: distribution data for some or all portions of the geographic range of a species (Level 1); habitat-related densities or relative abundances (Level 2); growth, reproduction, or survival rate comparisons between habitats (Level 3); and habitat-dependent production rates (Level 4). This information should be interpreted with a risk-averse approach to ensure that adequate areas are protected as EFH for the managed species. Habitats that satisfy the criteria in the Magnuson-Stevens Act and HMS EFH regulations have been identified and described as EFH. Required identifications and descriptions of EFH were included in the 1999 HMS FMP, and are incorporated in this Supplemental Environmental Impact Statement by reference.

3.3.3 Fishing Activities That May Adversely Affect EFH

The EFH regulations and the Magnuson-Stevens Act require the fishery management councils (Councils) and NOAA Fisheries, on behalf of the Secretary of Commerce, to minimize adverse effects on EFH from fishing activities to the extent practicable. Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. Based on an assessment of the potential adverse effects of all fishing equipment types used within an area identified as EFH, the Council should act if there is evidence that a fishing practice is having an identifiable adverse effect on the EFH.

An assessment was made of the gears and practices in order to determine whether HMS fishing activities cause adverse impacts on EFH in the 1999 HMS FMP. Impacts of HMS and non-HMS fishing gears and practices were analyzed by examining published literature and anecdotal evidence of potential impacts or comparable impacts from other fisheries. Based on this assessment, NOAA Fisheries considers that the fishing gears and methods of the HMS fisheries do not appear to have adverse impacts on EFH. Even if there were any adverse impacts, such impacts are not expected to be "more than minimal and not temporary in nature" (50 CFR 600.815(a)(2)(ii)). There is the possibility that other (non-HMS) fisheries may adversely impact HMS EFH, and some HMS gear may impact other EFH; however, the degree of that impact is difficult to ascertain from the data currently available. NOAA Fisheries is aware that other actions may be required in the future as a greater understanding of the impacts of fishing gear on fish habitat is gained. Future management measures could include fishing gear or practice restrictions, additional time/area closures, or harvest limits on the take of species that provide structural habitat or of prey species. Any areas that may be closed to fishing should be used as experimental control areas to research the effects of fishing gears on habitat.

3.3.4 Non-Fishing Activities That May Adversely Affect EFH and Respective Fishing Measures

Section 600.815 (a)(4) of the EFH regulations requires that FMPs identify non-fishing related activities that may adversely affect EFH of managed species, either quantitatively or qualitatively, or both. In addition, Section 600.815 (a)(6) requires that FMPs recommend conservation measures describing options to avoid, minimize, or compensate for the adverse effects identified.

Broad categories of activities that may adversely affect HMS EFH include, but are not limited to: (1) actions that physically alter structural components or substrate, e.g., dredging, filling, excavations, water diversions, impoundments and other hydrologic modifications; and (2) actions that result in changes in habitat quality, e.g., point source discharges, activities that contribute to non-point-source pollution and increased sedimentation, introduction of potentially hazardous materials, or activities that diminish or disrupt the functions of EFH. If these actions are persistent or intense enough they can result in major changes in habitat quantity as well as quality, conversion of habitats, or in complete abandonment of habitats by some species.

3.4 PROTECTED SPECIES

The unintended capture of species listed under the ESA, MMPA, and the Migratory Bird Treaty Act (collectively known as "protected" species) is known to occur as a result of HMS longline fishery activities**.** A description of the impacted species as well as known data accounting for the frequency of such bycatch interactions is outlined below and updates the 1999 HMS FMP.

3.4.1 Sea Turtles

The following summary of the information available regarding sea turtle populations and interactions with HMS longline fisheries represents an update to the HMS FMP. Other NOAA Fisheries documents containing detailed information on sea turtle population trends and/or longline interactions include the June 1, 2004, BiOp for the fishery, the September 15, 2003, the December 2002, BiOp for the S.E. shrimp trawl fishery, and the June 14, 2001, HMS BiOp. The June 1, 2004, BiOp is discussed further in Section 4.3.

The HMS longline fisheries have the potential to interact with any of the five species of sea turtles in the Atlantic (including the Gulf of Mexico), but the vast majority of the interactions occur with loggerhead and leatherback sea turtles. The status of the five sea turtles can be found in Table 3.9.

Table 3.9 Status of Atlantic Sea Turtle Populations. Source: NOAA Fisheries, 2001b.

Species/Stock	**Status: trend in U.S. nesting population**
Loggerhead	Threatened: overall the species is thought to be stable or slightly increasing. The northern nesting assemblage is thought to be stable or slightly declining
Leatherback	Endangered: loss of some nesting populations; possible increases in some nesting populations; overall thought to be stable at best
Green	Endangered: increasing
Kemp's Ridley	Endangered: thought to be increasing
Hawksbill	Endangered: unknown if there is a recent trend

Loggerhead sea turtles

The loggerhead sea turtle was listed as a threatened species in 1978. This species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Within the continental U.S. loggerheads nest from Louisiana to Virginia. The major nesting areas include coastal islands of Georgia, South Carolina, and North Carolina, and the Atlantic and Gulf coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida. Developmental habitat for small juveniles includes the pelagic waters of the North Atlantic and the Mediterranean Sea.

The loggerhead sea turtles in the action area (west Atlantic Ocean, Caribbean Sea, and Gulf of Mexico) represent differing proportions of five western north Atlantic subpopulations, as well as unidentified subpopulations from the eastern Atlantic. The five nesting assemblages are the Northern subpopulation, occurring from North Carolina to northeast Florida; the South Florida subpopulation, occurring from 29˚ N. latitude on the east coast to Sarasota on the west coast; the Florida Panhandle subpopulation; the Yucatán subpopulation from the eastern Yucatán Peninsula, Mexico; and the Dry Tortugas subpopulation from the Dry Tortugas (located west of the Florida Keys), Florida. The June 14, 2001, BiOp considered these subpopulations for the analysis, with particular emphasis on the northern subpopulation of loggerhead sea turtles because unlike the population as a whole, this nesting subpopulation is thought to be declining, or at best, stable. Loggerheads reported captured in the pelagic longline fishery in the open ocean are mostly pelagic juveniles. It is assumed that overall interaction of loggerhead sea turtles with the pelagic longline fishery is in proportion with the overall stock sizes of each nesting aggregation (NOAA Fisheries, 2004c).

In examining the nesting trend for the northern subpopulation, the turtle expert working group (TEWG) concluded that it is stable or declining (1998, 2000). The analysis described in the NOAA Fisheries 2001 stock assessment report summarized the trend analyses for the number of nests sampled from beaches for the northern subpopulation and the south Florida subpopulation and concluded that from 1978-1990, the northern subpopulation has been stable at best and possibly declining (less than 5 percent per year). From 1990 to the present, the number of nests in the northern subpopulation has been increasing at 2.8 - 2.9 percent annually; however, there are confidence intervals about these estimates that include no growth (0 percent). Over the same time frame, the south Florida population has been increasing at 5.3 - 5.4 percent per year from 1978-1990, and increasing at 3.9 - 4.2 percent since 1990. This figure was derived from the most optimistic, and perhaps the least reliable, analysis. NOAA Fisheries (2001) cautioned that "it is an unweighted analysis and does not consider the beaches' relative contribution to the total nesting activity of the subpopulation and must be interpreted with some caution." In fact, more recent analysis, including nesting data through 2003, indicate that there is no discernable trend over the past 15 years in the south Florida subpopulation (NOAA Fisheries, 2004c). All other data and analysis indicated that the number of loggerhead sea turtle nests in the northern subpopulation were remaining the same or declining.

Loggerhead sea turtles are primarily exposed to pelagic longline gear in the pelagic juvenile stage. According to observer records, an estimated 10,034 loggerhead sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 - 2002, of which 81 were estimated to be brought to the vessel already dead (Table 3.10). This figure does not account for post-release mortalities. However, the U.S. fleet accounts for a small proportion (5 - 8 percent) of the total hooks fished in the Atlantic Ocean compared to other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland (Carocci and Majkowski, 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NOAA Fisheries, 2001b for a description of take records). An analysis of the international pelagic longline fisheries' impacts on loggerhead sea turtles throughout the Atlantic and Mediterranean estimated that the annual take ranged from 210,000 - 280,000 incidences (Lewison *et al.,* 2004).

Leatherback sea turtles

The leatherback sea turtle was listed as endangered on June 2, 1970. Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans; the Caribbean Sea; and the Gulf of Mexico (Ernst and Barbour, 1972). Adult leatherbacks forage in temperate and subpolar regions from 71˚N to 47˚S latitude in all oceans and undergo extensive migrations between 90˚N and 20˚S, to and from the tropical nesting beaches. In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NOAA Fisheries, 2001b). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (NOAA Fisheries, 2001b).

The conflicting information regarding the status of Atlantic leatherback sea turtles makes it difficult to conclude whether or not the population is currently in decline. Numbers at some nesting sites are up, while numbers at others are down. Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1 - 11.5 percent increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NOAA Fisheries, 2001b). The largest leatherback rookery in the western north Atlantic remains along the northern coast of South America in French Guiana and Suriname. While Spotila *et al.* (1996) indicated that turtles may have been shifting their nesting from French Guiana to Suriname due to beach erosion, analyses show that the overall area trend in number of nests has been negative since 1987, declining at a rate of 15.0 - 17.3 percent per year (NOAA Fisheries, 2001b). If turtles are not nesting elsewhere, it appears that the Western Atlantic portion of the population is being subjected to high anthropogenic mortality rates, resulting in a continued decline in numbers of nesting females.

Leatherback sea turtles are exposed to pelagic fisheries throughout their life cycle. According to observer records, an estimated 9,302 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 - 2002, of which 121 were brought to the vessel already dead (Table 3.10). This figure does not account for post-release mortalities. Leatherback sea turtles make up a significant portion of takes in the Gulf of Mexico and south Atlantic areas, but are more often released alive. The U.S. fleet accounts for five to eight percent of the hooks fished in the Atlantic Ocean. Other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland also fish in these waters (Carocci and Majkowski, 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NOAA Fisheries, 2001b, for a description of take records). Throughout the Atlantic basin, including the Mediterranean Sea, a total of 30,250 - 70,000 leatherback sea turtles are estimated to be captured by pelagic longline fisheries each year (Lewison *et al.*, 2004).

Table 3.10 Annual Estimates of Total Marine Turtle Bycatch and the Subset that Were Dead When Released in the U.S. Pelagic Longline Fishery. Source: NOAA Fisheries, 2001b (1992-1999 data); Yeung. 2001 (2000 data); Garrison, 2003 (2001-2002 data).

Species	Loggerhead		Leatherback		Green		Hawksbill		Kemp's Ridley		Unidentified		Sum Total
Year	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	
1992	293	0	914	88	87	30	20	0	1	0	26	0	1,341
1993	417	9	1,054	0	31	0					31	0	1,533
1994	1,344	31	837	0	33	0			26	0	34	0	2,274
1995	2,439	0	934	0	40	0					171	0	3,584
1996	917	2	904	0	16	2					2	0	1,839
1997	384	0	308	0			16	0	22	0	47	0	777
1998	1,106	1	400	0	14	1	17	0			1	0	1,538
1999	991	23	1,012	0							66	0	2,069
2000	1,256	0	769	0							128	0	2,153
2001	312	13	1,208	0							0	0	1,520
2002	575	2	962	33							50	0	1,587
Total	10,034	81	9,302	121	221	33	53	0	49	0	556	0	20,215

* Does not account for fishing related mortality that may occur after release.

3.4.2 Marine Mammals

NOAA Fisheries published the final 2003 Marine Mammal Protection Act (MMPA) List of Fisheries on July 15, 2003 (68 FR 41725). The Atlantic Ocean, Caribbean, and Gulf of Mexico pelagic longline fishery is classified as Category I (frequent serious injuries and mortalities incidental to commercial fishing) and the southeastern Atlantic shark gillnet fishery is classified as Category II (occasional serious injuries and mortalities). The following fisheries are classified as Category III (remote likelihood or no known serious injuries or mortalities): Atlantic tuna purse seine; Gulf of Maine and mid Atlantic tuna, swordfish, and shark hook-and-line/harpoon; southeastern mid Atlantic and Gulf of Mexico shark bottom longline; and mid Atlantic, southeastern Atlantic, and Gulf of Mexico pelagic hook-and-line/harpoon fisheries. Data are collected for the fisheries indicating whether the animal was removed dead or alive. In addition to mammals released dead from fishing gear, which is uncommon in the pelagic longline fishery, NOAA Fisheries must consider post-release mortality of mammals released alive when determining fishery impacts. Further details on the number of takes in the pelagic longline fisheries in the Atlantic were presented previously in Section 3.2.

3.4.3 Seabirds

Seabirds are protected under the Migratory Bird Treaty Act; endangered seabirds are further protected under the Endangered Species Act; and all migratory birds are protected under E.O. 13186. The United States has developed a National Plan of Action in response to the Food and Agriculture Organization International Plan of Action to Reduce Incidental Seabird Takes in Longline Fisheries. Many seabird populations are especially slow to recover from mortality because their reproductive potential is low (one egg per year and late sexual maturation). They forage on the surface, but some can also pursue prey fish swimming at shallow depths which makes seabirds somewhat susceptible to driftnets, shallow set longlines, and longline gear being deployed. They are possibly at the highest risk during the process of setting and hauling the gear. Observer data for the Atlantic pelagic longline fishery from 1992 through 2002 indicate that bycatch is relatively low (Table 3.11). Since 1992, a total of 113 seabird interactions have been observed, with 78 seabirds observed killed in the Atlantic pelagic longline fishery. No expanded estimates of seabird bycatch or catch rates are available for the pelagic longline fishery. Observed bycatch has ranged from one to 18 seabirds observed dead per year and zero to 15 seabirds observed released alive per year from 1992 through 2002.

Table 3.11 Seabird Bycatch in the Atlantic Pelagic Longline Fishery from 1992 to 2002. MAB - Mid Atlantic Bight, SAB - South Atlantic Bight, NEC - Northeast Coastal, GOM - Gulf of Mexico. Source: NOAA Fisheries Observer Program. (NOAA Fisheries, U.S. National Report 2003)

Year	Month	Area	Type of Bird	Number observed	Status
1992	October	MAB	Gull	4	Dead
	October	MAB	Shearwater, Greater	2	Dead
1993	February	SAB	Gannet, Northern	2	Alive
	February	MAB	Gannet, Northern	2	Alive
	February	MAB	Gull, Black Backed	1	Alive
	February	MAB	Gull, Black Backed	3	Dead
	November	MAB	Gull	1	Alive
1994	June	MAB	Shearwater, Greater	3	Dead
	August	MAB	Shearwater, Greater	1	Dead
	November	MAB	Gull	4	Dead
	December	MAB	Gull, Herring	7	Dead
1995	July	MAB	Seabird	5	Dead
	August	GOM	Seabird	1	Dead
	October	MAB	Storm Petrel	1	Dead
	November	NEC	Gannet, Northern	2	Alive
	November	NEC	Gull	1	Alive
1997	June	SAB	Seabird	11	Dead
	July	MAB	Seabird	1	Dead

Year	Month	Area	Type of Bird	Number observed	Status
	July	NEC	Seabird	15	Alive
	July	NEC	Seabird	6	Dead
1998	February	MAB	Seabird	7	Dead
	July	NEC	Seabird	1	Dead
1999	June	SAB	Seabird	1	Dead
2000	June	SAB	Gull, Laughing	1	Alive
	November	NEC	Gannet, Northern	1	Dead
2001	June	NEC	Shearwater, Greater	7	Dead
	July	NEC	Shearwater, Greater	1	Dead
2002	July	NEC	Seabird	1	Dead
	August	NED	Shearwater, Greater	1	Dead
	August	NED	Seabird	1	Dead
	September	NED	Shearwater, Greater	3	Dead
	September	NED	Seabird	3	Alive
	September	NED	Shearwater SPP	1	Dead
	October	NED	Gannet, Northern	1	Alive
	October	NED	Shearwater SPP	1	Dead
	October	NED	Seabird	2	Dead
	October	MAB	Gull	3	Alive
	October	MAB	Gull	1	Dead
	November	MAB	Gull	3	Alive

At this time, NOAA Fisheries has not identified a need to implement gear modifications to reduce takes of seabirds in Atlantic HMS longline fisheries. Takes of seabirds are minimal in these fisheries in the Atlantic, probably due to night setting of the longlines or fishing in areas where there are not significant numbers of birds. Interested readers can refer to Alexander et al., 1997, for additional possibilities of mitigating measures for seabird mortality in longline fisheries.

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4. 0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES CONSIDERED

Reducing bycatch, bycatch mortality, and incidental catch in HMS fisheries, particularly the Atlantic pelagic longline fishery, was identified in the HMS FMP as a critical management goal that needed to be addressed pursuant to National Standard 9 of the MSA. The NS 9 guidelines set forth factors to consider to minimize bycatch and bycatch mortality to the extent practicable:

(A) Population effects for the bycatch species;
(B) Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
C) Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
(D) Effects on marine mammals and birds;
(E) Changes in fishing, processing, disposal, and marketing costs;
(F) Changes in fishing practices and behavior of fishermen;
(G) Changes in research, administration, and enforcement costs and management effectiveness;
(H) Changes in the economic, social, or cultural value of fishing activities and nonconsumptive uses of fishery resources;
(I) Changes in the distribution of benefits and costs; and,
(J) Social effects.

The HMS FMP and a final rule published on August 1, 2000 (65 FR 47214), provide detailed discussions of bycatch and incidental catch issues associated with the various HMS commercial and recreational fisheries. Further, these documents also note that additional actions beyond those included in the HMS FMP or final rule would be necessary to address these concerns. The recently completed 2004 BiOp, prepared in accordance with the ESA, advises further actions to reduce bycatch and bycatch mortality of sea turtles. The following sections evaluate a number of alternatives to meet these goals. All of the alternatives described in this document apply only to vessels and vessel operators participating in the Atlantic pelagic longline fishery.

4.1 BYCATCH AND BYCATCH MORTALITY MITIGATION MEASURES

As described in Chapter 2, the following are the alternatives considered for bycatch and bycatch mortality mitigation measures. Alternatives A6, A11, and A12 were considered but not further analyzed.

Alternative A1	Maintain existing hook and bait restrictions in the Atlantic pelagic longline fishery; maintain existing time/area closures in the Atlantic pelagic longline fishery; maintain existing possession and use requirements for bycatch mitigation gear (dipnets and line clippers), as well as sea turtle handling and release guidelines as currently specified by NOAA Fisheries. (No Action)

Alternative A2 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

Alternative A3 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait.

Alternative A4 Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i)18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset circle hooks and squid bait; **OR** iii) 9/0 "J"-hooks with an offset not to exceed 25 degrees and whole mackerel bait.

Alternative A5 (a) Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees.

Alternative A5 (b) *Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. (Preferred Alternative)*

Alternative A7 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

Alternative A8 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.

Alternative A9 Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following combinations: i) 9/0 “J”-hook with an offset not to exceed 25 degrees and whole mackerel bait; **OR** ii) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait

Alternative A10 (a) Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook with squid bait.

Alternative A10 (b) *Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. (Preferred Alternative)*

Alternative A13 Close an area of the central Gulf of Mexico to pelagic longline fishing year-round (12 months).

Alternative A14 Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Central Gulf of Mexico and the Northeast Coastal statistical reporting area year-round (12 months).

Alternative A15 Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Central Gulf of Mexico and the Northeast Coastal statistical reporting area from May through October (6 months).

Alternative A16 *Require vessels with pelagic longline gear onboard to possess or use dipnets and line clippers that meet newly revised design and performance standards, plus require these vessels to possess, maintain, and utilize additional sea turtle handling and release gear and comply with handling and release guidelines as specified by NOAA Fisheries. (Preferred Alternative)*

Analyses in this chapter draw heavily upon the results of the 2001 - 2003 NED experiment to evaluate impacts on interactions with sea turtles and changes in the weight of target species catches. Except where indicated otherwise, the basis for the analyses contained in this chapter was derived directly from the results of the NED experiment (Watson *et al.*, 2003; Watson *et al.*, 2004a; Shah *et al.*, 2004).

Since publication of the DSEIS, the reduction rates calculated for various experimental treatments (hook and bait combinations) have been standardized to control for several variables including sea surface temperature, daylight soak time, total soak time, vessel effect, and pairing effect in case of matched paired hook types per set. Individual year data were used for the sea turtle analyses because year was found to be a significant factor in the NED experiment. In calculating potential sea turtle interaction reductions, NOAA Fisheries has chosen to apply the least effective interaction reduction rate for each treatment from any year of the experiment. As a result, projected turtle interaction estimates may be higher than what might actually occur while employing any particular hook and bait combination. NOAA Fisheries is applying these precautionary reduction rates, as opposed to more optimistic rates that would provide lower projected interaction estimates, given the threatened and endangered status of loggerhead and leatherback sea turtles. In estimating reduction rates for target species, NOAA Fisheries provides ranges that incorporate catch rates from 2002 and 2003 derived from the experiment.

Ecological Impacts

The no action alternative, A1, would maintain current bycatch reduction and minimization measures and continue to provide some positive ecological impacts by helping to avoid and mitigate bycatch and bycatch mortality of species known to interact with pelagic longline gear. Existing hook and bait restrictions, which mandate use of non-stainless steel corrodible hooks throughout the fishery and a prohibition on the use of live bait in the western Gulf of Mexico help reduce bycatch and bycatch mortality of finfish and protected resources. In addition, since 1999, several area closures have been implemented including part or all of the Mid-Atlantic Bight, DeSoto Canyon, Charleston Bump, Florida East Coast, Northeastern, and NED. Federally permitted vessels, or vessels required to be permitted, for Atlantic HMS with pelagic longline gear onboard must also possess and use dipnets and line clippers that meet the current NOAA Fisheries design and performance standards, as well as maintain the requirement to comply with current handling and release guidelines. These measures were implemented to reduce bycatch mortality of incidentally captured sea turtles, marine mammals, and other incidentally captured species. Thus, alternative A1 would continue to provide some positive ecological impacts by facilitating the removal of fishing gear which is expected to increase post-hooking survival of many bycaught species. For sea turtles, fishing gear left in place may cause tissue damage, infection, and digestive tract blockage. Hooks may perforate internal organs or vessels and trailing line may encircle limbs, restrict circulation, cut deeply onto tissue, and can eventually cause loss of function. Ingested line may irritate the lining of the gastrointestinal tract and can cause death by intussusception (telescoping of the gut tube, cutting off its circulation) or torsion (involution) (Watson *et al.,* 2003).

Overall, however, the no action alternative could have substantial negative ecological impacts on sea turtles by allowing the bycatch and bycatch mortality of these protected species to continue at current rates. In addition, should the NED remain closed to U.S. flag longline vessels, there could be an increase in effort in this area by foreign-flag vessels operating under less restrictive measures. Furthermore, an unquantifiable number of U.S.-flag vessels that have traditionally fished in the NED would likely re-flag to other nations. This shift could result in these vessels operating under less stringent regulation, which may result in some additional bycatch of target and non-target species, including protected species.

The two sea turtle species most commonly caught in the pelagic longline fishery are the leatherback and loggerhead sea turtles, both of which are protected under the Endangered Species Act. Leatherback sea turtles are listed as endangered, and loggerhead sea turtles are listed as threatened. Although taken in much lower numbers, green, hawksbill, and Kemp's ridley sea turtles are also listed as either endangered or threatened. Estimated take data indicate that high numbers of leatherback and loggerhead sea turtles are currently being caught on pelagic longline gear, particularly in the Gulf of Mexico. Further information on sea turtle interactions and the ESA consultation history for this fishery are provided in Chapters 1, 3, and 4.3.

A total of 273 marine turtles (122 leatherback, 151 loggerhead) were observed caught in the Atlantic pelagic longline fishery in 2001, including 77 leatherback and 142 loggerhead sea turtles caught in the NED research experiment. A total of 335 marine turtles were observed caught in the Atlantic pelagic longline fishery in 2002, including 158 leatherback and 100 loggerhead sea turtles caught in the NED research experiment. Based on observer data, the agency estimates that 1208 leatherback and 312 loggerhead sea turtles were taken in this fishery in 2001, with an additional 962 leatherback and 575 loggerhead sea turtles being taken in 2002 (Garrison, 2003a).

A total of 16 marine mammals (8 Risso's dolphin, 6 pilot whales, 1 striped dolphin, and 1 Northern bottlenose whale) were observed caught in the Atlantic pelagic longline fishery in 2001, including six taken in the NED research experiment. A total of 24 marine mammals (10 Risso's dolphin, 10 pilot whales, one common dolphin, two unidentified dolphin, one unidentified mammal) were observed caught in the Atlantic pelagic longline fishery in 2002, including nine taken in the NED experiment fishery. Based on observer data, NOAA Fisheries estimates that 92.9 pilot whales and 83.6 Risso's dolphin were taken in this fishery in 2001, with 113.5 pilot whales and 87.2 Risso's dolphin estimated taken in 2002 (Garrison, 2003a).

Observer data for the Atlantic pelagic longline fishery from 1992 through 2002 indicate that bycatch of seabirds is relatively low. Since 1992, a total of 113 seabird interactions have been observed, with 78 seabirds observed killed in the Atlantic pelagic longline fishery. Eight greater shearwaters were observed taken in this fishery in 2001. Twenty-one seabirds of various species were observed taken in this fishery in 2002. No expanded estimates of seabird bycatch or catch rates are available for the pelagic longline fishery. Seabird interactions with the pelagic longline fishery are discussed in greater detail in Section 3.4.

Catches, landings, discards, and bycatch of both target and non-target species are discussed in Section 3.2 and Chapter 6.

Alternative A2 would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait. A photograph containing examples of 18/0 circle hooks can be seen in Figure 4.1, and a diagram showing a hook with a 10 degree offset can be seen in Figure 4.2. The offset measurement is made at the barbed end of the hook and is relative to the shank of the hook..

Figure 4.1 **Examples of 18/0 Circle Hooks.**
Source: Watson et al., 2003

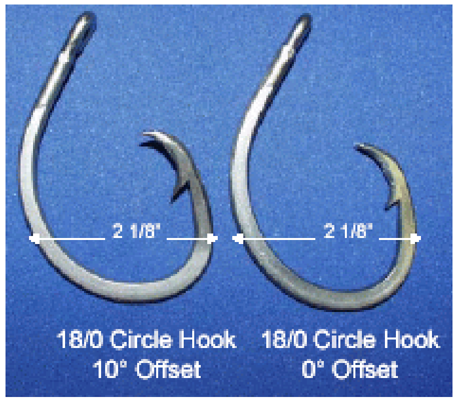
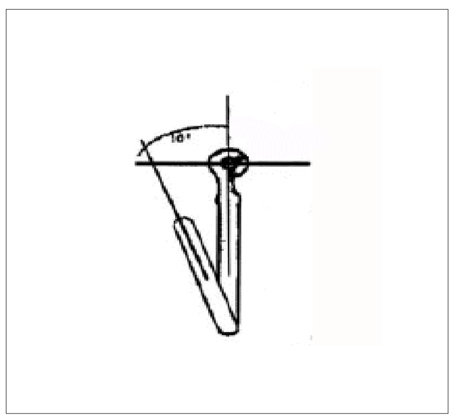


Figure 4.2 **Example of a Hook with a 10 Degree Offset.**
Source: Watson et al., 2003



Assuming similar reductions from gear modifications as reflected in the NED research experiment, alternative A2 could reduce the take of leatherback and loggerhead sea turtles in the Atlantic pelagic longline fishery in areas outside the NED by at least 64.8 percent and 85.8 percent respectively. This would likely result in a reduction in the number of leatherback interactions from approximately 962 to 339 (962.3 * .352 = 338.7) and the number of loggerhead interactions from approximately 575 to 82 (574.6 * .142 = 81.6) annually. Reductions in interactions of this magnitude would have significant positive impacts on these sea turtle populations. Further, this alternative would likely reduce the mortality associated with the interactions by resulting in less injurious hooking locations and facilitating hook removal, therefore having a positive impact on the affected populations. A study conducted in the Azores and a separate Canadian study both found a significant difference in the hooking location between the "J"-hooks and circle hooks in sea turtles with the majority of circle hooks being lodged in the mouth versus being ingested or lodging in the throat (Watson *et al.*, 2004b; Javitech Ltd., 2002). In addition, because the hook point turns in toward the shank, the design of the circle hook reduces foul hooking, the primary type of interaction with leatherback sea turtles (Watson *et al.*, 2004b).

With regard to target species, data from the NED experiment generally indicate that hook and bait treatments that increase swordfish catch by weight tend to decrease tuna catch by weight, and visa-versa. The data indicate that under alternative A2, swordfish catch may increase by a range of 9.22 to 30.24 percent (by weight), while tuna catches may decrease by a range of 81.18 to 87.64 percent (by weight). While data indicate that there may be a connection between cooler water temperatures and catches of larger swordfish, it is not entirely clear whether this effect is derived solely from water temperatures or from a combination of factors including the availability of larger fish capable of taking large hooks/baits and an apparent preference of large fish for colder water. As the N. Atlantic swordfish stock rebuilds, the availability of larger swordfish should increase. Nevertheless, for pelagic longline fishing in warmer waters, these potential increases in swordfish catches and their attendant social and economic benefits are less certain and may decline to zero or even result in declining catches.

Under alternative A2, anticipated increases in swordfish catches may have positive ecological benefits by potentially decreasing the number of sets fishermen must make on a trip given improved hooking efficiency. Consequently, this potential decrease in the number hooks fished could result in a reduction of bycatch and bycatch mortality of species known to interact with pelagic longline gear, including protected species. Increased swordfish catches are not expected to result in adverse ecological impacts given that North Atlantic swordfish are managed under an international rebuilding plan with country specific quotas and the stocks are rebuilding. U.S. landings have been below ICCAT established quotas for the past few years, and increased landings that may result from this alternative would not be expected to cause the U.S. to exceed its ICCAT quota. Further, increased catches should better position the United States to retain its portion of the North Atlantic swordfish quota at ICCAT. Should recent U.S. North Atlantic swordfish quota underages or future quota be redistributed to other ICCAT nations that fish in less conservation oriented ways, there would likely be negative ecological impacts for many bycaught species. Decreased tuna catches by weight may have positive ecological benefits for tunas by leaving more sexually mature tunas in the ecosystem. Decreased tuna catches may have negative ecological impacts for species known to interact with pelagic longline gear if this results in increased fishing effort to offset reduced catches. Increased effort would likely result in increased bycatch and bycatch mortality of both target and non-target species, including protected resources.

Preliminary data analysis for 2002 and 2003 indicates a reduction in blue shark bycatch with 18/0 circle hooks with whole mackerel bait. The reduction rates were 40% for 2002 and 28% for 2003. Reductions in blue shark catch would likely provide an ecological benefit to this species. In addition, circle hooks would likely reduce the mortality associated with the incidental capture of the sharks by resulting in less injurious hooking locations and facilitating gear removal.

Alternative A2 would also likely increase survival of many other bycatch species because circle hooks are less likely to be ingested than "J"-hooks (Falterman and Graves, 1999; Falterman and Graves, 2002), therefore serious ingestion injuries are likely to occur less frequently. This appears to be true for many marine species and circle hook sizes (Lucy and Studholme, 2002). As such, this alternative has the potential to increase survival of a significant portion of the pelagic longline bycatch and have a positive impact on the populations of bycatch species. While the Agency does not have definitive data on the impact of circle hooks on marine mammals and seabirds, it is reasonable to assume that circle hooks would likely reduce the number of such interactions and their associated mortality (K. Wang, pers. comm., 2003) for reasons discussed above.

Alternative A3, would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait. This alternative would likely have significant positive ecological impacts by reducing the take of leatherback and loggerhead sea turtles in the Atlantic longline fishery in areas outside the NED by a range of 64.8 to 63.9 percent and 85.8 to 64.6 percent, respectively. Assuming similar reductions from gear modifications as reflected in the NED research experiment, this alternative would likely reduce the number of leatherback sea turtle interactions in the Atlantic pelagic longline fishery from approximately 962 to between 315 (see calculations in A2) and 347 (962.3 * 0.361) = 347.4) annually, respectively. Thus, this alternative would likely reduce the number of loggerhead sea turtle interactions in this fishery from approximately 575 to between 82 (see calculations in A2) and 203 (574.6 * 0.354 = 203.41) annually, respectively.

Depending on the hook and bait combination chosen and the target species of a given trip, this alternative may have positive, negative, or a mix of impacts on target species. In general, data from the NED research experiment indicate that hook and bait treatments which increase swordfish catch by weight tend to decrease tuna catch by weight, and visa-versa. Alternative A3 provides the flexibility to select between two hook and bait combinations, prior to departing on a trip, that are effective at catching either swordfish or tunas, with either choice being effective at reducing interactions with endangered and threatened sea turtles. However, it would not allow fishermen, while at sea, to switch to the other hook and bait combination to fish opportunistically or to adjust to market conditions. The data indicate that alternative A3, option i, may increase swordfish catch by a range of 9.22 to 30.24 percent (by weight), but may decrease tuna catches by a range of 81.18 to 87.64 percent (by weight). Data further show that alternative A3, option ii, may potentially increase tuna catches by a range of 20.24 to 29.22 percent (by weight), while swordfish catches are anticipated to decrease by a range of 28.54 to 32.58 percent (by weight). See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters. Potential tuna increases are less certain based on the limited tuna catch data obtained during the NED research experiment.

Similar to alternative A2, alternative A3, option i, which is anticipated to increase swordfish catches, may have positive ecological benefits by potentially decreasing fishing effort and therefore reducing bycatch and bycatch mortality. As explained under the discussion of ecological impacts for A2, supra, potential increases in catches of swordfish under alternative A3, are not anticipated to result in adverse ecological impacts, and may better position the U.S. to retain its portion of the North Atlantic swordfish quota at ICCAT. Similar to alternative A2, alternative A3, option i may have positive ecological impacts for tunas due to decreased tuna catches (by weight), but could also have negative ecological impacts for species known to interact with pelagic longline gear by potentially resulting in increased fishing effort to offset reduced catches. As discussed in alternative A2, supra, alternative A3 option i may reduce the incidental capture and mortality of blue sharks and have similar ecological impacts.

Under alternative A3, option ii, decreased swordfish catches (by weight) may have positive ecological impacts by potentially leaving more large fecund fish in the ecosystem and speeding achievement of full recovery. Decreased swordfish catches may have negative ecological impacts if it results in increased effort to offset reduced catches, therefore, potentially resulting in increased bycatch and bycatch mortality of both target and non-target species, including protected resources. Decreased swordfish catches may also have negative ecological impacts by decreasing overall U.S. catches and possibly resulting in the transfer of U.S. quota to other ICCAT member nations, whose longline fleets may not fish as ecologically responsibly as U.S. vessels. Minor increased longline tuna catches (by weight) should have minor or no adverse ecological impact, depending on species. Increased tuna catches (by weight) may have positive ecological impacts by potentially decreasing fishing effort and therefore reducing bycatch and bycatch mortality of both target and non-target species, including protected species. Atlantic tunas are managed internationally, with the United States representing only a small fraction of catches for non-bluefin tuna species and adhering to international catch limits. For bluefin tuna, pelagic longlines are not an allowed target gear. For species that are not overfished or experiencing overfishing, increased catches should have no discernible impact. For species that are overfished or experiencing overfishing, minor increases in tuna catches (by weight) may have negligible adverse ecological impacts due to the small numbers of fish harvested by this gear-type relative to the landings of other nations. The actual impacts of alternative A3 would likely fall somewhere in between those described for options i and ii, as not all fishermen would choose the same hook and bait combination for every trip.

Preliminary data analysis for 2002 and 2003 shows no reduction in blue shark catch with 18/0 circle hooks with squid bait. As with alternative A2, alternative A3 would likely increase survival of sea turtle and other bycatch species. See the circle hook discussion for alternative A2, supra, for further explanation. In conjunction with alternative A16, this alternative would likely decrease the bycatch mortality of many incidentally captured species. This alternative, if implemented with other gear requirement or closure alternatives, could significantly reduce the aggregate number of sea turtle interactions in the fishery as a whole.

However, during the public comment period, several commenters expressed concern that this alternative may have the unintended consequence of increasing sea turtle interactions Atlantic-wide. U.S. pelagic longline sea turtle bycatch is relatively small in comparison to Atlantic-wide interactions, thus exporting circle hook technology to foreign nations is critical to sea turtle protection efforts. Commenters stated that this alternative could have substantial economic impacts and that if U.S. vessels suffer major economic losses and go out of business, foreign vessels would likely increase their fishing effort and not use circle hooks. See Appendix C1 for summary of comments and responses.

Alternative A4 would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i)18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset circle hooks and squid bait; **OR** iii) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait. This alternative would likely have significant positive ecological impacts by reducing the number of interactions with leatherback sea turtles in areas outside the NED by a range of 63.9 percent (18/0 non-offset circle hook with squid bait) to 65.6 percent (9/0 "J"-hook with whole mackerel bait). Assuming similar reductions from gear modifications as reflected in the NED research experiment, these reductions equate to leatherback sea turtle interactions declining from approximately 962 to between 347 and 331, on an annual basis, depending on hook treatment applied.

This alternative would likely reduce the take of loggerhead sea turtles in areas outside the NED by a range of 85.8 percent (18/0 offset circle hook with whole mackerel) to 64.6 percent (18/0 non-offset circle hook with squid), with a 70.9 percent benefit anticipated with use of the 9/0 "J"-hook with whole mackerel bait. Based on these estimated reductions, the number of loggerhead sea turtle interactions is expected to decline from approximately 575 to between 82 and 203, with use of the18/0 offset circle hook with whole mackerel or 18/0 non-offset circle hook with squid, respectively, or approximately 167 with use of the 9/0 "J"-hook with whole mackerel.

Depending on the hook and bait combination chosen and the target species of a given trip, this alternative may have positive, negative, or a mix of impacts on target and non-target species. Alternative A4 provides the flexibility to select between three hook and bait combinations (options i, ii, and iii), prior to departing on a trip, that are effective at catching either swordfish or tunas, with all choices being effective at reducing interactions with endangered and threatened sea turtles. However, it would not allow fishermen, while at sea, to switch to other hook and bait combinations to fish opportunistically or to adjust to market conditions. With regard to target species, the ecological impacts of alternative A4, option i, would be similar to those discussed under alternatives A2 and A3, option i, and those of alternative A4, option ii, would be similar to alternative A3, option ii. Alternative A4, option iii, would be expected to have similar impacts as alternative A3, option i, but may be more pronounced as data from the NED research experiment indicate that use of the "J"-hook and whole mackerel bait may increase swordfish catch by 63 percent and decrease tuna by 90 percent.

With regard to bycatch, the use of circle hooks under alternative A4, options i and ii, is expected to have a positive ecological impact by reducing interactions and post-release mortality of sea turtles, mammals, seabirds, and other bycatch species. Alternative A4, option i, may also reduce the incidental capture and mortality of blue sharks. The "J"-hook combination (option iii), if selected, would not be expected to mitigate sea turtle bycatch or bycatch mortality below current levels. See circle hook discussion under alternative A2 for further details.

Alternative A5 (a), which was described as alternative A5 in the DSEIS, would limit vessel operators participating in the pelagic longline fishery for Atlantic HMS operating outside of the NED, at all times, to possessing and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees. This alternative would likely have positive ecological impacts by reducing interactions with leatherback sea turtles. Because the gap between the hook point and shank is smaller on a 16/0 circle hook, the 16/0 circle hook is expected to be at least as efficient, if not more efficient, at reducing foul hooking than 18/0 or larger circle hooks (Watson *et al.*, 2004b). Further, there is no apparent difference in hooking location between 16/0, 18/0, and 20/0 circle hooks (Bolten *et al.*, 2002; Javitech Ltd, 2002). For the 16/0 circle hook, an estimated reduction in leatherback sea turtle interactions of 57 percent or greater is possible (Watson *et al.*, 2004b). NOAA Fisheries is choosing to apply a more biologically conservative reduction rate of 50 percent when estimating future leatherback sea turtle interactions for this alternative, which is derived from the least effective circle hook treatment tested during the NED research experiment. This more precautionary rate is being applied given the threatened and endangered status of loggerhead and leatherback sea turtles

Available data indicate that this alternative would not likely reduce interactions with loggerhead sea turtles (Watson *et al.*, 2004b; Bolten *et al.*, 2002). However, a summary of U.S. pelagic longline observer data from the Gulf of Mexico, 1992 - 2002, indicates that no loggerhead sea turtle has been observed captured on circle hooks (Garrison, 2003b). In addition, as discussed under alternative A2, circle hooks are expected to improve significantly the probability of survival by resulting in less injurious hooking locations, such as the beak or mouth rather than the throat or stomach (Watson *et al.*, 2004b; Bolten *et al.*, 2002; Javitech Ltd., 2002). As there is no apparent difference in hooking location between 16/0, 18/0, and 20/0 circle hooks, the 16/0 hook is expected to reduce substantially loggerhead sea turtle mortalities. In addition, the release gear and safe handing protocols discussed in preferred alternative A16 will likely further reduce mortalities.

Based on the above, alternative A5 (a) is likely to reduce the number of leatherback interactions in areas outside the NED from an estimated 962 to approximately 481. Loggerhead interactions in areas outside the NED are projected to remain at approximately 575 annually, but this alternative is anticipated to decrease post-release mortality of both species.

Available information suggests that little or no impact on tuna catches will occur, although some unquantifiable increase in catches is possible (Watson, *et al.,* 2004b; J. Watson pers. comm., 2003). As such, this alternative would not likely have any ecological impacts, either positive or negative, on tuna populations. Available information also suggests that swordfish catch may decrease by 10 to 20 percent under this alternative (J. Watson pers. comm., 2003). Decreased swordfish catches would be expected to have ecological impacts similar to those discussed under alternative A3, option ii. This measure would likely increase survival of species known to interact incidentally with pelagic longline gear for the reasons discussed under alternative A2.

Alternative A5 (b), a preferred alternative, modifies alternative A5 from the DSEIS in response to public comment. This alternative would limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with these allowable hooks. For the same reasons as alternative A5 (a), this alternative is expected to have positive ecological impacts by resulting in a 50 percent reduction in interactions with leatherback sea turtles, reduced foul hooking, and lower post-release mortality rates. No reduction in loggerhead sea turtle interactions is expected. However, because this alternative would require non-offset 16/0 circle hooks, it would be expected to result in fewer loggerhead sea turtle mortalities than alternative A5 (a), because non-offset 16/0 hooks are less likely to engage in the throat or gut than offset hooks (J. Watson pers. comm., 2004). In addition, the release gear and safe handling protocols discussed in preferred alternative A16 will likely further reduce mortalities.

Based on the above, alternative A5 (b) is likely to reduce the number of leatherback sea turtle interactions in areas outside the NED from an estimated 962 to approximately 481. Loggerhead sea turtle interactions in areas outside the NED are projected to remain at approximately 575 annually, but this alternative is expected to decrease post-release mortality of both species. When alternative A5 (b) is applied in combination with alternatives A10 (b) and A16, these alternatives are expected to decrease interactions and mortalities for leatherback sea turtles and mortalities for loggerhead sea turtles. Additional rulemaking and management measures will be required in this fishery pursuant to the 2004 BiOp. See Section 4.3 for further information on the 2004 BiOp.

As with alternative A5 (a), little to no impact on tuna catches is anticipated, thus no ecological impacts, positive or negative, are expected on tuna populations. Swordfish catch might possibly decrease by 10 to 20 percent, and this would result in ecological impacts on swordfish similar to those discussed under alternative A3, option ii. This alternative would likely increase survival of species known to interact incidentally with pelagic longline gear for the reasons discussed under alternative A2.

During the public comment period, members of the U.S. pelagic longline fishing industry expressed considerable support for alternative A5 (a) (DSEIS alternative A5), because it provides an opportunity to fish for a wider variety of species commonly targeted outside the NED by allowing for some choice in baits and hook sizes. Commenters stated that showing that U.S. vessels can implement bycatch reduction measures and remain financially solvent is critical to ensure that such bycatch technologies can be “exported” to foreign nations. Commenters stated that “exportability” of circle hook and release gear technology is the single most important element of this rule, because U.S. pelagic longline sea turtle bycatch is relatively small compared to Atlantic-wide sea turtle interactions. By successfully demonstrating that U.S. vessels can remain financially solvent while reducing sea turtle interactions and bycatch mortality, other foreign fishing nations are more likely to adopt similar measures, and thereby provide truly meaningful protection to sea turtles throughout their ranges. In response to public comment, the Agency modified DSEIS alternative A5 as alternative A5 (b) to provide for more flexibility in the gear requirements while ensuring sufficient reductions in sea turtle interaction and mortality. See Appendix C1 for summary of comments and responses.

Alternatives A7 - A10 (b) would re-open the NED to pelagic longline fishing for Atlantic HMS subject to certain hook and bait requirements and would maintain the current requirements for possession or use of non-stainless steel corrodible hooks for vessels participating in this fishery. Under these alternatives, approximately 12 vessels would be expected to return to the NED. A December 3, 2003, agreement between Canada and the United States, which allows U.S. fishermen to apply for a license to access Canadian waters and ports, could facilitate additional fishing effort in the NED. However, data over the last six years indicate that less than 12 vessels, on average, fished in the NED. This statement holds true in examining the three years prior to the NED experiment as a unit, the three years of the experiment as a unit, or all six years combined. In addition, an increase in effort is not expected because the NED is a distant water fishery, thus not all pelagic longline vessels (e.g., smaller vessels) could participate in that fishery. As the fishery is under a limited access system, the overall number of permitted vessels would not increase, and there are upgrading restrictions in place. Because vessel monitoring systems (VMS) are required on pelagic longline vessels fishing for HMS, the Agency will have an enhanced ability to monitor changes in the movement of the fleet. If a significant increase in the number of vessels occurs, the Agency will take other action as necessary. Alternatives A7 - A10 (b) would likely have moderate negative ecological impacts as compared to maintaining the existing NED closure (No Action), but significant ecological benefits when viewed against historical fishing activity in the NED.

Alternative A7 would limit vessels with pelagic longline gear onboard in the NED, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait. The expected number of sea turtle interactions in the NED for any particular hook and bait treatment is calculated by multiplying the projected effort (in number of hooks) by the sea turtle CPUEs for specific treatments tested in the NED research experiment. The number of hooks is estimated by multiplying the projected number of vessels returning to the NED by the average number of annual sets per vessel in the NED prior to the experiment and the average number of hooks per set in the NED prior to the experiment (12 vessels * 41.34 sets * 847.24 hooks per set = 420, 298.82 hooks). Using the above approach, alternative A7 would be expected to reduce the number of leatherback sea turtles caught in the NED from a projected 108 - 212 to approximately 47, and the number of loggerhead sea turtles from a projected 168 - 212 to approximately 18. These interactions are in addition to those occurring outside the NED.

Alternative A7 would likely reduce post-release mortality of and facilitate hook removal from sea turtles and other bycatch species, decrease blue shark bycatch, decrease tuna catches (by weight), and increase swordfish catches (by weight), thus having ecological impacts similar to those discussed under alternative A2. See alternative A2 for further details on circle hooks and target and non-target species catches, including potential for decreased swordfish catches in warmer waters.

Alternative A8 would limit vessels with pelagic longline gear onboard in the NED, at all times, to possessing and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait. Using the same estimation process as alternative A7, this alternative would be expected to reduce the number of leatherback sea turtles caught in the NED from a projected 108 - 212 to approximately 30, and the number of loggerhead sea turtles caught from a projected 168 - 212 to approximately 15. These interactions are in addition to those occurring outside the NED. Because of the use of circle hooks, alternative A8 is expected to reduce post-release mortality of and facilitate hook removal from sea turtles and other bycatch species. See circle hook discussion for alternative A2, supra, for further explanation. Preliminary data analysis for 2003 also indicates a reduction in blue shark bycatch of 37 percent with 20/0 circle hooks with whole mackerel bait.

Data from the NED experiment indicate that alternative A8 may increase swordfish catch by approximately 5.8 percent (by weight) and decrease tuna catches by 92.9 percent (by weight), which would result in ecological impacts similar to those discussed under alternative A2. Increased swordfish catches under alternative A8 are less certain, given that these increases were not shown to be statistically significant. See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters.

Alternative A9 would limit vessels with pelagic longline gear onboard in the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait; **OR** ii) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait. Under options i and ii, respectively, the estimated number of leatherback sea turtles caught in the NED would be reduced from a projected 108 - 212 to 71 and 47, and the estimated number of loggerhead sea turtles caught from a projected 168 - 212 to 53 and 18. These interactions would be in addition to those occurring outside the NED. The actual reduction in interactions for both species would likely fall somewhere in between the estimated ranges as not all fishermen would be expected to outfit with the same gear configuration.

If alternative A9, option ii (circle hooks), is utilized, there would likely be a positive impact on sea turtles and other bycatch species from a reduction in post-release mortality and the facilitation of hook removal. There may also be a reduction in the incidental capture and mortality of blue sharks. The "J"-hook and whole mackerel bait (alternative A9, option i) would not be expected to mitigate bycatch or bycatch mortality of other species below current levels. See alternative A2 for further details on circle hooks and bycatch.

Alternative A9 provides the flexibility to select a hook and bait combination, prior to departing on a trip, that is effective at catching either swordfish or tunas, with either choice being effective at reducing interactions with endangered and threatened sea turtles. This alternative may increase swordfish catch by approximately 9 - 63 percent (by weight) and may decrease tuna catches by approximately 81 - 90 percent (by weight), if fishermen deploy the 18/0 circle hook treatment or the 9/0 "J"-hook treatment, respectively. See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters. These increased swordfish catches and decreased tuna catches would be expected to have ecological impacts similar to those discussed under alternative A2.

Alternative A10 (a), which was described as alternative A10 in the DSEIS, would limit vessels with pelagic longline gear onboard in the NED, at all times, to possessing and/or using no more than one of the following hook and bait combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook and squid bait. Under options i and ii, respectively, the estimated number of leatherback sea turtles caught in the NED would be reduced from a projected 108 - 212 to between 47 and 76, and the number of loggerhead sea turtles from a projected 175 - 193 to between 18 to 60. These interactions would be in addition to those occurring outside the NED. The actual reduction in interactions for both species would likely fall somewhere in between the estimated ranges as not all fishermen would be expected to outfit with the same gear configuration. In addition, this alternative would likely have a positive impact on sea turtles and other bycatch species from a reduction in post-release mortality and the facilitation of hook removal, and may reduce the incidental capture and mortality of blue sharks. See circle hook discussion for alternative A2, supra, for further explanation.

Alternative A10 (a) provides the flexibility to select a hook and bait combination, prior to departing on a trip, that is effective at catching either swordfish or tunas, with either choice being effective at reducing interactions with endangered and threatened sea turtles. Swordfish catch may change by a range of approximately +30.24 to -32.58 percent (by weight), depending on whether fishermen equip and deploy option i or option ii, respectively. See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters. Data indicate that tuna catches may change by approximately -87.64 to possibly as much as +29.22 percent (by weight), depending on whether fishermen equip and deploy option i or option ii, respectively. Potential tuna increases are less certain based on the limited tuna catch data obtained during the NED experiment. The actual impacts would likely fall somewhere in between the above ranges as not all fishermen would choose the same hook and bait combination for every trip. Increased or decreased swordfish and tuna catches (by weight) would be expected to have ecological impacts similar to those discussed under alternative A3.

During the public comment period, several commenters stated that limiting vessels to one hook/one bait type per trip would not allow vessels to adapt to changing conditions on longer trips and would result in economic losses. Commenters stated that an unintended environmental consequence of this could be increased overall sea turtle interactions if the circle hook technology is not "exportable" to foreign nations. See Appendix C1 for summary of comments and responses.

Alternative A10 (b), a preferred alternative, modifies alternative A10 from the DSEIS in response to public comment. This alternative would limit vessels with pelagic longline gear onboard in the NED, at all times, to possessing and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits could be possessed and/or utilized with allowable hooks. This alternative would likely reduce the number of leatherback sea turtles caught in the NED from a projected 108 - 212 to 107 and the number of loggerhead sea turtles from 175 - 193 to 60. These interactions would be in addition to those occurring outside the NED. The actual reduction in interactions for both species would likely fall somewhere in between the estimated ranges as not all fishermen would be expected to outfit with the same gear configuration. In addition, this alternative would likely have a positive impact on sea turtles and other bycatch species from a reduction in post-release mortality and the facilitation of hook removal, and also may reduce the incidental capture and mortality of blue sharks. See circle hook discussion for alternative A2, supra, for further explanation. When alternative A10 (b) is applied in combination with alternatives A5 (b) and A16, these alternatives are expected to decrease interactions and mortalities for leatherback sea turtles and mortalities for loggerhead sea turtles. Additional rulemaking and management measures will be required in this fishery pursuant to the 2004 BiOp. See Section 4.3 for further information on the 2004 BiOp.
Alternative A10 (b) provides additional flexibility in possessing onboard and utilizing specific hooks and baits that are effective at catching target species, with each combination being effective at reducing interactions with endangered and threatened sea turtles. Under this alternative, swordfish catch may change by a range of approximately +30.24 to -32.58 percent (by weight), depending on which hook and bait combinations are employed. See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters. Data further indicate that tuna catches may change by approximately -87.64 to possibly as much as +29.22 percent (by weight), depending on which hook and bait combinations are employed. Potential tuna increases are less certain based on the limited tuna catch data obtained during the NED experiment. Ecological impacts of increased or decreased swordfish and tuna catches (by weight) under this alternative would be expected to have ecological impacts similar to those discussed under alternative A3, options i and ii. The actual impacts would likely fall somewhere in between as not all fishermen would choose to employ the same hooks and baits on each trip.

The management measures analyzed in alternative A10 (b) were largely supported by the U.S. pelagic longline fishing industry, because they provide more flexibility regarding allowable baits and hooks than those in alternative A10 (a). Under this alternative, vessels fishing in the NED will be better able to adapt to changing conditions on longer trips to the NED, improve the profitability associated with those trips, and ensure significant reductions in sea turtle interactions. According to many commenters, this is important for sea turtles, because economic losses by U.S. pelagic longline vessels would diminish the "exportability" of circle hook technology to foreign fishing nations. The successful and timely imposition of the management measures in alternative A10 (b) by U.S. vessels may provide the impetus for other foreign fishing nations to adopt similar measures, and thereby provide truly meaningful protection to sea turtles throughout their ranges.

Time and area closures under alternatives A13, A14, and A15 would have varying degrees of ecological impacts. To help identify potential benefits and impacts of the various alternatives, a summary table was created to show the percentage change in sea turtle interactions, targeted species catch, and blue and white marlin discards for each of the three alternatives (Appendix 1, Table 1). The methods and data used to generate the percentages in Table 1 are discussed separately below for each alternative.

The analyses for the time/area closure alternatives use data from the Pelagic Observer Program (POP, 2001 - 2002) and the mandatory fishery logbook system (FLS, 2001 - 2002). Data from the observer program is referred to in the text as “observed”, and data from the logbook system is referred to as “reported” or “logbook” data. A Geographic Information System (GIS) program was used to plot all observed (POP) and reported (FLS) effort and catches of protected species (loggerhead, leatherback, green, hawksbill, and Kemp’s ridley sea turtles) and targeted species (swordfish, yellowfin and bigeye tuna). Blue and white marlin discards were also examined. Data presented for targeted species and for billfish are from the FLS only. Spatial analyses were performed to determine the number of each species observed and reported caught inside each time/area closure in comparison to the rest of the Atlantic and Gulf of Mexico, excluding the NED. The NED data were not included in the analysis because the area has been closed to commercial pelagic longlining since June, 2001, when a research experiment was initiated to study methods of mitigating sea turtle bycatch. Since the data from the NED were part of an experimental design and not part of normal commercial pelagic longlining operations, the data were not considered appropriate for inclusion in the current analysis.

NOAA Fisheries compared observed and reported catch and catch per unit effort (CPUE) in each of the proposed time/area closure alternatives to catch and CPUE fleet-wide, excluding the NED, rather than just to areas adjacent to the time/area closure. This approach was used because an analysis of the mobility of the pelagic longline (PLL) fleet, completed in 2001 for implementation of a Vessel Monitoring System (VMS), indicated that PLL vessels are just as likely to fish in areas away from their homeport as they are to fish in areas immediately adjacent to their homeport (NMFS, 2001). Because vessels do not necessarily fish in or next to their homeport but are mobile and capable of moving considerable distances, this analysis considers catches fleet-wide rather than just from areas adjacent to the closure.

Data were analyzed with and without redistribution of effort. The analysis ‘without redistribution of effort’ assumes that all fishing effort in the time/area closures is removed, and that none of the fishing effort is redistributed to open areas of the Atlantic or Gulf of Mexico. The number and percent reduction in catch of both protected and targeted species in this analysis thus represents the highest expected reduction. The redistribution of effort analysis on the other hand, assumes that all effort currently in the time/area closures will be redistributed to open areas of either the Atlantic, the Gulf of Mexico, or both. In reality, the actual result may lie between these two estimates. While some fishermen will continue fishing in open areas of the Atlantic and Gulf of Mexico, others may choose to leave the fishery entirely as a result of the closure. Thus the actual percentage reduction resulting from the time/area closure will likely fall between the results of the redistribution and no redistribution of effort estimates.

For the redistribution of effort analysis, NOAA Fisheries assumed that if effort is redistributed, it may be distributed to any open area of the Atlantic or the Gulf of Mexico for the same reasons described above. The data from the POP and FLS databases were thus compared to catches in all open areas of the Atlantic, excluding the NED, and all open areas of the Gulf of Mexico.

Alternative A13 would prohibit the use of pelagic longline gear year-round by all U.S. flagged-vessels targeting HMS in a portion of the central Gulf of Mexico where large numbers of sea turtles have been observed and reported caught. This closure would encompass approximately 25,489 nm^2 and would be defined as the area within the following coordinates, beginning with the northeastern corner and proceeding clockwise: 28°09' N. latitude (Lat.), 88°12' W. Long.; 27°06' N. Lat., 88°12' W. Long.; 25°46' N. Lat., 90°24' W. Long.; 26°15' N. Lat., 93°01' W. Long.; 26°51' N. Lat., 93°01' W. Long.; 28°09' N. Lat., 90°10' W. Long. (Appendix 1, Figure 1). Overview maps of all observed and reported sets and sea turtle interactions are provided in Appendix 1, Figures 2 - 3.

Alternative A13 time/area closure without redistribution of effort

The effectiveness of the central Gulf of Mexico time/area closure was evaluated by determining the percent reduction in bycatch of protected species for each month and cumulatively for the year based on both observer and logbook data for the combined years 2001 - 2002. Data were also analyzed to determine the impact on catches of targeted species such as swordfish, yellowfin and bigeye tuna, as well as blue and white marlin discards.

Data from the observer program indicate that 41 percent of leatherback sea turtles (36 of 88) observed caught in the Gulf of Mexico from 2001 - 2002, were caught inside the time/area closure (Appendix 1, Tables 2 - 3, Figure 4). Based on logbook data, 47 percent of leatherback sea turtles (155 of 331) were reported caught inside the time/area closure during the same time period (Appendix 1 Figure 5). Based on both observer and logbook data for 2001 - 2002, and without redistribution of fishing effort, the time/area closure would be expected to reduce the catch of leatherback sea turtles by 41 - 47 percent (Appendix 1, Tables 2 - 3), thus having a positive ecological impact.

Of the observed loggerhead sea turtle interactions, 17 percent (7 of 41) were inside the time/area closure from 2001 - 2002, and 9 percent (9 of 96) of logbook reported catches were inside the time/area closure. Thus, based on both observer and logbook data, the catch of loggerhead sea turtles would potentially be reduced by 9 - 17 percent (Appendix 1, Tables 2 and 4).

The number of other sea turtles (green, hawksbill, and Kemp’s ridley) observed and reported caught between 2001 - 2002 in the Gulf of Mexico was low. All of the observed (2 of 2) and reported (5 of 5) sea turtles were caught inside the time/area closure. The time/area closure would thus be expected to reduce the number of other sea turtle takes by 100 percent (Appendix 1, Tables 2 and 5).

Twenty-one percent of all reported swordfish (17,167 of 82,984), 38 percent of all yellowfin tuna (42,648 of 113,155), and 12 percent of all bigeye tuna (3,613 of 29,885) caught in the Atlantic and Gulf of Mexico were caught in the time/area closure. Therefore, without redistribution of effort, the time/area closure would be expected to reduce the catch of these species by these percentages. Only logbook data were available to evaluate reduction in catch for these species in the time/area closure (Appendix 1, Tables 12-16).

For blue and white marlin, dead discards, live discards, and combined live and dead discards were estimated in the time/area closure in comparison to the rest of the Atlantic and Gulf of Mexico. For blue marlin, 57 percent of all dead discards (296 of 523), 29 percent of live discards (376 of 1,304), and 37 percent of combined live and dead discards (672 of 1832) in the Atlantic and Gulf of Mexico were located in the time/area closure (Appendix 1, Table 18). For white marlin, 39 percent of all dead discards (279 of 433), 26 percent of live discards (410 of 1,183), and 30 percent of combined live and dead discards (689 of 1613) in the Gulf of Mexico were located in the time/area closure (Appendix 1, Table 22).

Alternative A13 time/area closure with redistribution of effort

The ecological effects of redistribution of fishing effort were evaluated for this, and all subsequent alternatives, by determining the percent reduction in total observed and reported bycatch of sea turtles and catch of targeted species inside and outside of the time/area closure in the Atlantic and Gulf of Mexico. The method used to calculate percent changes in catch rates for each species with redistribution of effort is discussed below. Results for the redistribution of effort analyses for the observer and logbook data are presented in separate tables.

NOAA Fisheries examined monthly catches (number of each species) and effort (number of hooks) in each proposed time/area closure in comparison to all remaining areas open to pelagic longlining in the Atlantic and Gulf of Mexico, excluding the NED, based on observer and logbook data for the fishery. The number of each species caught in the open areas outside the proposed time/area closures (column E in all redistribution of effort Tables), was calculated by subtracting the number caught in the closed area from the observed or reported catch in the combined Atlantic and Gulf of Mexico (B-D). The catch-per-unit-effort (CPUE) for the species in the remaining open area was calculated by dividing the number of each species caught in the open area (E) by the number of hooks fished in the open area (calculated by subtracting the number of hooks in the closed area from those in the Atlantic and Gulf of Mexico; A-C). The open-area CPUE was multiplied by the number of hooks that were used in the closed area to determine the number of additional sea turtles or targeted species that would be caught in the open fishing areas by the displaced effort (C*F), which was added to the existing open area catch (E+G) to give a new open area total catch (I). The estimated total catch (I) was subtracted from the original total number caught in the Atlantic and Gulf (B-H) to estimate the change in number of each species that would be caught as a result of the relocated effort. Column J shows the cumulative number of individuals avoided caught by the time/area closure. Columns K and L show the percentage reduction in overall catch by month and cumulatively as a result of the closure, respectively. The total percent reduction in catch was calculated by dividing the sum of column J (cumulative catch avoided by month) by the sum of column B (number of individuals caught in the Atlantic and Gulf of Mexico, excluding the NED).

The redistribution of effort analysis indicates that the overall bycatch of leatherback and other sea turtles would be reduced by the central Gulf of Mexico time/area closure, whereas the catch of loggerhead sea turtles would increase. Based on observer data, 16 percent fewer leatherbacks (14 of 88) would have been caught between 2001 - 2002 with the time/area closure in effect (Appendix 1, Tables 2 and 6), and based on the logbook data, 19 percent fewer leatherbacks (104 of 197) would have been caught during the same time period with the time/area closure in effect (Appendix 1, Tables 2 and 7), thus resulting in a positive ecological impact.

For loggerhead sea turtles, the redistribution of effort analysis indicates that the number of loggerheads caught would have increased 5 percent based on the observer data (2 additional interactions) and 38 percent (36 additional interactions) based on the logbook data. The increase in loggerhead interactions is likely the result of higher catch rates in the Atlantic than in the Gulf of Mexico. The increase in loggerhead interactions stemming from this closure likely would have a negative ecological impact with regard to loggerhead sea turtles.

Data from both the observer program and logbooks indicate that 100 percent of other sea turtles were caught inside the time/area closure (Appendix 1, Tables 2, 10, and 11). Thus, even with redistribution of effort, the time/area closure would have resulted in a 100 percent reduction in bycatch of other sea turtles.

Logbook data indicate that redistribution of effort in the Gulf of Mexico would have resulted in a 17 percent increase in swordfish catch from 2001 - 2002 (Appendix 1, Tables 12 and 14), a 2 percent decrease in yellowfin tuna catch (Appendix 1, Tables 12 and 15), and an increase of 32 percent in bigeye tuna catch (Appendix 1, Tables 12 and 16).

For blue marlin, logbook data indicate that dead discards would have decreased by 30 percent with redistribution of effort, whereas live discards would have increased by 10 percent. Combined live and dead discards would have decreased 1 percent (Appendix 1, Tables 17 and 20 - 22). White marlin dead discards would have decreased by 5 percent, but live and combine live and dead discards would have increased by 17 and 10 percent, respectively (Appendix 1, Tables 17 and 23 - 25).

Alternative A14 would prohibit the use of pelagic longline gear year-round by all U.S. flagged-vessels targeting HMS in an area comprised of both the central Gulf of Mexico closure described in alternative A13, and portions of the Northeast Coastal Statistical reporting area (NEC). These closures encompass approximately 56,471 nm^2 (25,489 nm^2 in the Gulf of Mexico and 30,982 nm^2 in the NEC) in aggregate. The GOM portion of the closure would encompass approximately 25,489 nm^2 and would be defined as the area within the following coordinates, beginning with the northeastern corner and proceeding clockwise: 28°09' N. Lat., 88°12' W. Long.; 27°06' N. Lat., 88°12' W. Long.; 25°46' N. Lat., 90°24' W. Long.; 26°17' N. Lat., 93°03' W. Long.; 26°51' N. Lat., 93°03' W. Long.; 28°09' N. Lat., 90°10' W. Long. The NEC closure would encompass approximately 30,982 nm^2 and would be defined as the area within the following coordinates 41 °08' N. Lat., 66°06' W. Long.; 38°37' N. Lat., 65°16' W. Long.; 37°25' N. Lat., 69°18' W. Long.; 39°55' N. Lat., 70°05' W. Long. (Appendix 2, Figures 1 and 2).

It should be noted that observer coverage in the NEC area was sparse in the two years for which data were available. Only one percent (18 of 1633) of all observed sets were observed in the NEC from 2001 - 2002 with 5 percent (7 of 131) of all observed sea turtle interactions occurring in the NEC. By contrast, 6 percent (1,281 of 20,584) of all logbook reported sets and 19 percent (82 of 1,281) of all reported sea turtle interactions from 2001 - 2002 were in the NEC. Although both observer and logbook data are presented for the following alternatives (A14 and A15), the FLS data is considered to be more representative of the actual effort and rate of sea turtle interaction in the NEC time/area closure.

<u>Alternative A14 time/area closure without redistribution of effort</u>

The effectiveness of the combined central Gulf of Mexico and NEC time/area closure was evaluated by determining the percent reduction in bycatch of protected species for each month and cumulatively for the year based on both observer and logbook data for the combined years 2001 - 2002. Data were also analyzed to determine the impact on catches of targeted species such as swordfish, yellowfin and bigeye tuna, as well as blue and white marlin discards.

Data from the observer program indicate that 43 percent of leatherback sea turtles (38 of 88) observed caught in the Atlantic and Gulf of Mexico from 2001 - 2002, were caught inside the time/area closure (Appendix 2, Tables 1 - 2). Based on logbook data, 58 percent of leatherback sea turtles (192 of 331) were reported caught inside the time/area closure during the same time period. Thus, based on both observer and logbook data for 2001 - 2002, and without redistribution of fishing effort, the time/area closure would be expected to reduce the catch of leatherback sea turtles by 43 - 58 percent.

Of the observed loggerhead sea turtle interactions, 34 percent (14 of 41) were inside the time/area closure from 2001 - 2002, and 56 percent (54 of 96) of logbook reported catches were inside the time/area closure. Thus, based on both observer and logbook data, the catch of loggerhead sea turtles would potentially be reduced by 34 - 56 percent (Appendix 2, Tables 1 and 3).

For other sea turtles (green, hawksbill, and Kemp's ridley), 100 percent of the observed (2 of 2) and 50 percent of the reported (5 of 10) sea turtles were caught inside the time/area closure. The time/area closure would thus be expected to reduce the number of other sea turtle takes between 50 - 100 percent (Appendix 2, Tables 1 and 4).

For targeted species, 21 percent of all reported swordfish (17,185 of 82,984), 38 percent of all yellowfin tuna (42,810 of 113,155), and 12 percent of all bigeye tuna (3,613 of 29,885) caught in the Atlantic and Gulf of Mexico were caught in the time/area closure. Therefore, without redistribution of effort, the time/area closure would be expected to reduce the catch of these species by these percentages. Only logbook data were available to evaluate reduction in catch for these species in the time/area closure (Appendix 2, Tables 11 - 15).

For blue and white marlin, dead discards, live discards, and combined live and dead discards were estimated in the time/area closure in comparison to the rest of the Atlantic and Gulf of Mexico. For blue marlin, 57 percent of all dead discards (300 of 523), 30 percent of live discards (389 of 1,304), and 38 percent of combined live and dead discards (689 of 1832) in the Atlantic and Gulf of Mexico were located in the time/area closure (Appendix 2, Table 17 - 20). For white marlin, 42 percent of all dead discards (301 of 712), 30 percent of live discards (484 of 1,593), and 34 percent of combined live and dead discards (785 of 2,302) in the Gulf of Mexico were located in the time/area closure (Appendix 2, Tables 21 - 24).

Alternative A14 time/area closure with redistribution of effort

The redistribution of effort analysis indicates that the overall bycatch of leatherback, loggerhead and other sea turtles would be reduced by the central Gulf of Mexico and NEC time/area closure. Based on observer data, 10 percent fewer leatherbacks (9 of 88) would have been caught between 2001 - 2002 with the time/area closure in effect (Appendix 2, Tables 1 and 5), and based on the logbook data, 37 percent fewer leatherbacks (123 of 331) would have been caught during the same time period with the time/area closure in effect (Appendix 2, Tables 1 and 6).

Based on observer data, the redistribution of effort analysis indicates that 7 percent fewer loggerheads (3 of 41) would have been caught. Based on logbook data, 35 percent fewer (34 of 96) loggerheads would have been caught.

Data from the observer program indicate that 100 percent (2 of 2) fewer other sea turtles would have been caught, and logbook data indicate that 28 percent (3 of 10) fewer sea turtles would have been caught with the time/area closure in effect (Appendix 2, Tables 1, 9, and 10). Thus, even with redistribution of effort, the time/area closure would have resulted in a 28 - 100 percent reduction in bycatch of other sea turtles.

Logbook data indicate that redistribution of effort in the Atlantic and Gulf of Mexico as a result of the closure would have resulted in an 18 percent increase in swordfish catch from 2001 - 2002 (Appendix 2, Tables 11 and 13), 2 percent decrease in yellowfin tuna catch (Appendix 2, Tables 11 and 14), and 33 percent increase in bigeye tuna catch (Appendix 2, Tables 11 and 15).

For blue marlin, logbook data indicate that dead discards and combined live and dead discards would have increased by 31 percent and 3 percent respectively with redistribution of effort, whereas live discards would have decreased by 8 percent (Appendix 2, Tables 16 and 19 - 21). White marlin dead discards would have increased by 10 percent, but live and combined live and dead discards would have decreased by 9 and 3 percent respectively (Appendix 2, Tables 16 and 22 - 24).

Alternative A15 would prohibit the use of pelagic longline gear in the central Gulf of Mexico and the NEC for six months (May through October). The same data used in Alternative A14 (GOM and NEC closure year-round) were used in this alternative, except that the data were analyzed only for the specified months. Separate summary tables of number and percentage reductions in sea turtle interactions and catches of targeted species are presented in Appendix 3.

Alternative A15 time/area closure without redistribution of effort

Based on both observer and logbook data, leatherback sea turtles interactions would be reduced 35 percent (31 of 88 based on observer data, and 115 of 331 based on logbook data), loggerhead sea turtle interactions would be reduced 29 percent (12 of 41) based on observer data and 44 percent (42 of 96) based on logbook data, and other sea turtle interactions would be reduced 0 percent based on both observer and logbook data (Appendix 3, Tables 1 - 4).

Based on logbook data, the catch of swordfish, yellowfin tuna, and bigeye tuna would be reduced by 15 percent, 25 percent, and 8 percent, respectively (Appendix 3 Tables 11 - 12). Blue and white marlin dead and live discards combined would be reduced by 34 percent and 31 percent, respectively (Appendix 3, Tables 16 - 17).

Alternative A15 time/area closure with redistribution of effort

With redistribution of effort, leatherback sea turtle interactions would be reduced by 14 percent (12 of 88) based on observer data, and 24 percent (79 of 331) based on logbook data. Loggerhead sea turtle interactions would be reduced 18 percent (7 of 41) based on observer data, and 34 percent (32 of 96) based on logbook data. For other sea turtles, the number of interactions would be reduced 0 percent based on the observer data, and would have increased 11 percent (1 additional interaction of 10 reported) based on logbook data (Appendix 3, Tables 5 - 10).

Based on analysis of logbook data with redistribution of effort, swordfish catch would have increased 5 percent (additional 4,440 swordfish caught), yellowfin tuna catch would have increased 3 percent (additional 3,022 caught), and bigeye tuna would have increased 17 percent (additional 5,082 caught) (Appendix 3, Tables 13 - 15).

Blue marlin combined live and dead discards would have decreased 8 percent (150 of 1832)(Appendix 3 Tables 18 - 20), and white marlin live and dead discards would have decreased 1 percent (25 of 2,302).

Alternative 16**,** a preferred alternative, would require vessel operators aboard all federally permitted vessels, or those required to be permitted, for Atlantic HMS with pelagic longline gear onboard to possess and use line cutters and dipnets meeting newly revised design and performance standards as well as require these vessels to possess, maintain, and utilize additional equipment to facilitate the removal of fishing gear from incidentally captured sea turtles. This additional equipment would include: A- (1) long-handled line cutter; B- (1) long-handled dehooker for ingested hooks; C- (1) long-handled dehooker for external hooks (the long-handled dehooker for ingested hooks used for item B will also satisfy this requirement); D- (1) long-handled device to pull an “Inverted V” (if 6’ J-style dehooker is used for item C, it will also satisfy this requirement); E- (1) dipnet; F- (1) standard automobile tire; G- (1) short-handled dehooker for ingested hooks; H- (1) short-handled dehooker for removing external hooks (the short- handled dehooker for ingested hooks used for item G will also satisfy this requirement); I- (1) long-nose or needle-nose pliers; J- (1) monofilament line cutter; K- (1) bolt cutter; and, L- (2) types of mouth openers/mouth gags as discussed in Appendix B1.

Items A - D would be required for sea turtles not boated. Items E - L would be required for sea turtles boated. Design standards, example models, example sources, and estimated costs for each piece of equipment can be seen in Appendix B1. This equipment would be required to be used in accordance with the handling and release guidelines specified by NOAA Fisheries (See Appendix B2). Relative to the no action alternative, A1, the use of these additional tools to remove hooks and lines would likely reduce serious injury and post-release mortality of sea turtles, marine mammals, and other incidentally caught species. The proper use of these gears is essential to maximize pelagic longline gear removal from sea turtles thereby maximizing post-hooking survival of these species. Therefore, NOAA Fisheries anticipates making available educational and outreach materials demonstrating the proper use of sea turtle careful release and disentanglement gears. Furthermore, in a future rulemaking, the Agency will likely consider educational workshops or training programs to promote the effective use of these gears.

When alternative A16 is applied in combination with alternatives A5 (b) and A10 (b), these alternatives are expected to decrease interactions and mortalities for leatherback sea turtles and mortalities for loggerhead sea turtles. Additional rulemaking and management measures will be required in this fishery pursuant to the 2004 BiOp. See Section 4.3 for further information on the 2004 BiOp.

During the public comment period, most commenters supported alternative A16, stating that it would better ensure survival of sea turtles incidentally captured in pelagic longline gear. Some commenters indicated that a “turtle teather” should be required, rather than recommended, gear. However, further refinements in the design standards and procedural protocols for use of this gear are still being developed. After further development and testing, NOAA Fisheries will reconsider this as a possible gear requirement.

Under all of the above alternatives, NOAA Fisheries does not expect any adverse impacts to EFH. The HMS FMP and Amendment 1 to the Atlantic Billfish FMP state that Atlantic HMS occupy pelagic oceanic environments. The HMS FMP describes habitat damage by pelagic longlines as negligible to the pelagic environment. The use of specific hooks and baits, area closures, and bycatch mortality mitigation gear will not have an effect on EFH.

Social and Economic Impacts

The social and economic impacts of alternatives discussed below that deal with the NED are analyzed initially from the vantage point that no pelagic longline fishing is allowed in the NED at the time of this rule making. Social and economic impacts of the NED experiment are not factored into this analysis for purposes of comparison, and are discussed only briefly in the analysis of alternative A1. As such, any future social or economic benefit derived from fishing activities in the NED, even if below historic benefits, are considered positive impacts. Where appropriate, comparisons are drawn with pre-NED closure information to provide a relative sense of impacts from traditional practices and levels.

Under alternative A1 (No Action), NOAA Fisheries does not anticipate a significant change in landings, ex-vessel prices, or economic benefits relative to the "status quo" or any significant social impacts, because this alternative does not change current fishing practices. While the NED experiment occurred outside of the fishery itself, it provided positive economic benefits for pelagic longline vessels participating in that program, as well as shore-side businesses dealing with those vessels, which helped mitigate the adverse economic impacts of the NED closure. With termination of the experiment on December 15, 2003, such economic benefits will no longer be available and the full effect of the NED closure will be felt. As such, relative to the status quo, vessels that participated in the NED experiment and associated shore-side businesses could experience moderate adverse social and economic impacts under the no action alternative. Also, significant, unquantifiable adverse economic impacts could result if no action is taken to address sea turtle interactions in the Atlantic pelagic longline fishery consistent with the ESA.

Alternative A2 would be expected to have moderate positive social and economic impacts for those vessels able to successfully target swordfish outside of the NED and substantial negative economic impacts for those vessels targeting tunas or engaged in mixed trips outside the NED. The species composition of landings for pelagic longline trips conducted in all areas**,** except the NED, can be seen in Table 4.1. As previously noted, this alternative may increase swordfish landings by a range of approximately 9.22 to 30.24 percent (by weight) and decrease tuna landings approximately 81.18 to 87.64 percent (by weight). While data indicate that there may be a link between cooler water temperatures and catches of larger swordfish, it is not entirely clear whether this effect is derived solely from water temperatures or from a combination of factors including the availability of larger fish capable of taking large baits. If so, as the N. Atlantic swordfish stock rebuilds, the availability of larger fish should increase. Nevertheless, for pelagic longline fisheries occurring in warmer waters, these potential increases in swordfish catches and their attendant social and economic benefits, should be considered less certain and may decline to zero or even result in declining catches. As discussed in Section 6.2, average gross revenues of Atlantic pelagic longline vessels are estimated at $178,619. Assuming a steady state in all other aspects including catches of other species and prices, the potential increase in swordfish catches could boost the proportion of total landings attributable to swordfish, by weight, from 36.22 percent to between 39.55 and 47.17 percent, as compared with traditional landings. Assuming that the estimated 9.22 to 30.24 percent increase in the weight of swordfish landed will result in a proportional increase in revenues attributable to swordfish, vessel revenues may increase by 3.57 to 11.7 percent ($6,384 to 20,941), resulting in overall gross vessel revenues of between $185,003 and $199,560.

For the purposes of this analysis, hook and bait impacts on bigeye tuna catches, as identified during the NED experiment, are used as a proxy for impacts on all tuna catches. Assuming a steady state in all other aspects including catches of other species and prices, the proportion of total landings attributable to tuna by weight may decline from 58.63 percent to between 7.25 and 11.03 percent. Assuming that the estimated 81.18 to 87.64 percent decrease in the weight of tuna landed will result in a proportional decrease in revenues attributable to tunas, vessel revenues could decrease by between 47.93 and 51.74 percent ($85,610 to $92,422), resulting in overall gross vessel revenues of between $93,009 and $86,197. For fishermen unable to target and catch swordfish in numbers sufficient to offset lost tuna revenues, particularly in the Gulf of Mexico where yellowfin tuna dominates catches, this alternative could have adverse economic and social impacts.

As described in the ecological impacts discussion for alternative A2, this alternative could reduce blue shark bycatch. This likely will have little or no economic impact as blue sharks are generally not retained and marketed, but may increase fishing efficiency and reduce economic losses due to damaged or lost fishing gear. The impact of this hook and bait combination on other sharks, dolphin, and wahoo catches is unknown, and is therefore unquantifiable. While NOAA Fisheries cannot directly quantify the impact of this hook and bait combination on landings or vessel revenues attributable to dolphin, this alternative could result in some unquantifiable decrease. During the comment period, commenters raised this as a concern.

In aggregate, under alternative A2, vessels fishing outside the NED could experience a possible change in total revenues ranging from -$92,422 to +$20,941, depending on the frequency with which particular hook and bait combinations are employed, and target species of trips. For mixed trips, the estimated impacts of this alternative may range from -$64,668 to -$86,037 resulting in a decline of gross vessel revenues from $178,619 to between $113,951 and $92,582.

Table 4.1 **The Species Composition of Landings for Pelagic Longline Trips Conducted in All Areas, *Except the NED*, in 2002.** Source: Pelagic Longline Logbook data maintained by the Southeast Fisheries Science Center.

Species	% by weight	% by gross revenues
Swordfish	36.22 %	38.77 %
Yellowfin Tuna	44.41 %	44.49 %
Bigeye Tuna	10.61 %	11.95 %
Bluefin Tuna	1.08 %	1.96 %
Other Tunas	2.53 %	0.64 %

Pelagic Sharks	3.10 %	1.15 %
Large Coastal Sharks	2.04 %	0.97 %

Alternative A2 may cause a significant portion of fishermen to shift effort to target primarily swordfish. There could be substantial changes in the distribution of fleet with an unquantifiable portion possibly exiting the fishery. Changes in fishing patterns may result in fishermen having to travel greater distances to reach more favorable grounds, which would likely result in increased fuel, bait, ice, and crew costs. While there may be a potential increase in travel, this is unlikely to raise significant safety concerns because the fleet is highly mobile. The potential shift in fishing grounds, should it occur, could result in fishermen selecting new ports for offloading. This would likely have negative social and economic consequences for traditional ports of offloading, including processors, dealers, and supply houses, and positive social and economic consequences for any new selected ports of offloading.

An informal internet and telephone survey of hook suppliers provides a range in price of approximately $0.26 to $0.66 ($0.4176 avg) per hook for large 18/0 commercial grade circle hooks and a range of approximately $0.26 to $1.00 (avg. $0.5733) per hook for large commercial grade "J"-hooks. Assuming that an average of 2,500 hooks per vessel are needed initially to equip vessels with enough required hooks for one trip, the compliance cost, on a per vessel basis, may range from $657.25 to $1,650, with an anticipated average cost of approximately $1,044. This cost is estimated to represent a savings to fishermen of approximately 27 percent versus rigging with the same number of "J"-hooks.

Traditionally, bait accounts for 16 to 26 percent of total costs per trip (Larkin *et al.*, 2000; Porter *et al.*, 2001). Future fluctuations in price and availability of mackerel bait may have substantial impact on profitability, either positive or negative, leading to noticeable social impacts. There would also be unquantifiable lost opportunity costs as fishing crews who have not traditionally fished with this hook and bait familiarize themselves with the most efficient techniques.

Alternative A3 could have widely varying impacts from considerable positive to substantial negative impacts. Depending on whether fishermen select the 18/0 non-offset hook with squid or the 18/0 offset hook with whole mackerel, respectively, swordfish catches could range from -32.58 to +30.24 percent (by weight), and tuna catches from -87.64 to +29.22 percent (by weight). See alternative A2 for further details on swordfish catches and potential for decrease in catch in warmer waters. Increases in tuna landings during the NED experiment were substantial, but given limited data were not considered statistically significant. Therefore, estimated increases in landings of tunas and their attendant socio-economic impacts are less certain than estimated losses of tunas. The experiment indicated that, in general, hook and bait combinations that have a positive impact on swordfish catches tend to have a negative impact on tuna catches, and vice versa. Thus, fishermen would have to decide prior to sailing which species to target.

Alternative A3, option i, would have similar socio-economic impacts as those discussed under alternative A2. Alternative A3, option ii, would likely result in considerable negative economic impacts for fishermen targeting swordfish, minor adverse to positive economic impacts for those undertaking mixed target (tunas and swordfish) trips, and considerable positive economic impacts for those targeting tunas. As discussed in Section 6.2, gross average revenues of Atlantic pelagic longline vessels are estimated at $178,619. Alternative A3, option ii, is expected to reduce that portion of landings historically attributable to swordfish by 28.54 to 32.58 percent from 36.22 percent down to between 24.42 to 25.88 percent, and could result in a decrease in vessel revenues of 11.06 to 12.63 percent ($19,764 to $22,561), resulting in overall gross vessel revenues of between $156,058 and $158,855. With regard to tunas, option ii could potentially increase the portion of landings historically attributable to tunas by a range of 20.24 to 29.22 percent (by weight), from 58.63 percent to between 70.50 and 75.76 percent, and could potentially increase vessel revenues by between 11.95 and 17.25 percent ($21,344 to $30,814), resulting in overall gross vessel revenues of between $199,963 and $209,433. Combining projected changes in swordfish and tuna landings and revenues, the overall impact for vessels fishing outside the NED under option ii could be a change in total revenues ranging between -$22,561 to +$30,814. NOAA Fisheries estimates a change in gross vessel revenues for mixed trips (under alternative A3, option ii) of between -$1,217 to $11,050. This is estimated to result in gross vessels revenues of between $177,402 and $189,669.

Under alternative A3 in aggregate, for vessels able to target swordfish and equip and deploy the most efficient hook and bait combination available, average gross vessel revenues may increase between $6,384 and $20,941. For vessels able to target tunas with the most efficient hook and bait combination available, average gross vessel revenues may increase between $21,344 and $30,814. These potential increases are likely to be over estimates, but provide an estimated range of increased gross vessel revenues of between $185,003 and $209,433. For vessels unable to specifically target swordfish or tunas and which engage in mixed trips, the aggregate impact of alternative A3 may be to change gross vessel revenues by between -$86,037 (18/0 offset circle hook with whole mackerel bait) and +$11,050 (18/0 non-offset circle hook with squid), providing a range of gross vessel revenues of between $92,582 and $189,669. Actual impacts would likely fall between these ranges, depending on the frequency with which particular hook and bait combinations are employed and species targeted. As discussed in alternative A2, results from the NED research experiment indicate a reduction in blue shark catch with 18/0 offset circle hooks and whole mackerel bait. No reduction in blue shark catch is anticipated with the 18/0 non-offset circle hook with squid bait. Potential impacts associated with a reduction in blue shark catch would be similar to those discussed under alternative A2. See alternative A2 for explanation of potential impacts related to catches of other sharks, dolphin, and wahoo. Other potential impacts due to a shift in effort to target certain species, hook and bait costs, and lost opportunity costs would be similar to those discussed under alternative A2.

During the public comment period, numerous commenters expressed concern that this alternative would result in significant economic losses for vessels fishing outside the NED. These vessels frequently engage in mixed target species trips, which were identified in the DSEIS as those most likely to be adversely affected by alternative A3. Other vessel operators and industry representatives stated that the requirement to use 18/0 circle hooks would significantly reduce catches of yellowfin tuna in the GOM and that Atlantic mackerel is either unavailable, expensive, or ineffective in the GOM. Although the DSEIS presented a range of potential positive to negative impacts (depending upon target species and hook and bait choices), commenters indicated that alternative A3 would render many vessels financially insolvent.

Alternative A4 could have widely varying impacts, ranging from moderately positive to substantially negative, depending on the hook and bait combination selected and target species. Fishermen may experience a change in swordfish landings by weight of between -32.58 and +63.4 percent by weight, depending on whether they choose to equip and deploy the 18/0 non-offset circle hook with squid (range: -28.54 to -32.58 percent), the 18/0 offset circle hook with whole mackerel (range: 9.22 to 30.24 percent), or the 9/0 offset "J"-hook with whole mackerel (+63.4 percent). See alternative A2 for information on potential for decreased swordfish catches in warmer waters. Fishermen could experience changes in tuna catches of -90.24 to +29.22 percent by weight depending on whether they choose to equip and deploy the 9/0 offset "J"-hook with whole mackerel (-90.24 percent), the18/0 offset circle hook with whole mackerel (range: 81.18 to 87.64), or the 18/0 non-offset circle hook with squid (range: +20.24 to 29.22 percent). See alternative A3 for information on limited data for increased tuna catch estimates. Because certain hook and bait combinations work better for swordfish and tuna, under this alternative, fishermen would have to decide prior to sailing which species to target.

Alternative A4, option i (18/0 offset circle hook with whole mackerel bait) would have socio-economic impacts similar to those discussed under alternative A2. Option ii (18/0 non-offset circle hook and squid bait) would have impacts similar to this discussed under alternative A3, option ii. Option iii (9/0 offset "J"-hook with whole mackerel bait) could have significant positive social and economic impacts for trips targeting swordfish, but substantial negative economic impacts for mixed trips or those targeting tunas.

As discussed in Section 6.2, gross average revenues of Atlantic pelagic longline vessels are estimated at $178,619. Alternative 4, option iii, may increase that portion of landings historically attributable to swordfish by 63.4 percent (by weight) from 36.22 percent to 59.18 percent, and may increase revenues by 24.58 percent ($43,905), resulting in overall gross vessel revenues of $222,524. With regard to tunas, option iii could reduce that portion of landings historically attributable to tunas by 90.24 percent (by weight), from 58.63 percent to 5.72 percent, and could decrease vessel revenues by 53.28 percent ($95,164), resulting in overall gross vessel revenues of $83,455. The average overall impact on vessel revenues of selecting the 9/0 offset "J"-hook and squid bait combination and engaging in a mixed trip would likely result in a loss of gross revenues of approximately $51,259 reducing gross vessel revenues to $127,360.

Under alternative A4, options i and ii in aggregate, for vessels able to target swordfish and use the most efficient hook and bait combination available, average gross vessel revenues may increase between $6,384 and $43,904. For vessels able to target tunas and use the most efficient hook and bait combination available, average gross vessel revenues may increase by between $21,344 and $30,814. These potential increases are likely to be over estimates, but provide an estimated range of increased gross vessel revenues of between $185,003 and $222,523. For vessels unable to specifically target swordfish or tunas and which engage in mixed trips, gross vessel revenues could change by between -$86,037 (18/0 offset circle hook with whole mackerel bait) and +$11,050 (18/0 non-offset circle hook with squid), providing a range of gross vessel revenues of between $92,582 and $189,669. Actual impacts would likely fall between these ranges, depending on the frequency with which particular hook and bait combinations are employed and species targeted. Alternative A4, options i and ii, would have similar socio-economic impacts on blue sharks, other sharks, dolphin, and wahoo as alternative A2. Other potential impacts due to a shift in effort to target certain species, hook and bait costs, and lost opportunity costs would be similar to those discussed under alternative A2.

Alternative A5 (a) could have minimal to moderate adverse economic impacts depending on the target species. As per the ecological discussion of this alternative, the use of 16/0 circle hooks is expected to result in little or no change in catches of tunas, and a 10 to 20 percent decrease in catches of swordfish. As discussed in Section 6.2 gross revenues of Atlantic pelagic longline vessel are estimated at $178,619. Under this alternative, the proportion of total landings attributable to tuna would likely remain at approximately 58.6 percent by weight, and average vessel revenues attributable to tunas would likely remain at approximately $104,670. With regard to swordfish, the proportion of landings historically attributable to swordfish may decrease from 36.22 percent to between 28.98 and 32.6 percent by weight, and vessel revenues may decrease by 3.88 ($6,925) to 7.75 ($13,850) percent, resulting in overall gross vessel revenues of between $171,694 and $164,769. This reduction in swordfish catch is not anticipated as fishermen would have the flexibility to utilize hook and bait combinations which have been shown to be effective at catching swordfish. Fishermen using 18/0 or larger circle hooks to target large swordfish may experience economic impacts similar to those discussed under alternative A3, *supra*. The impact of the 16/0 hook on catches of shark, dolphin, wahoo, and other marketable species is unknown.

An informal internet and telephone survey of hook suppliers provides a range in price of approximately $0.28 to $0.50 ($0.3539 avg) per hook for large 16/0 commercial grade circle hooks. Assuming that an average of 2500 hooks per vessel are needed to initially comply with proposed hook requirements (equip vessels with enough hooks for one trip), the compliance cost, on a per vessel basis, may range from $697.50 to $1,241.75, with an anticipated average cost of approximately $884.75. The cost of 16/0 circle hooks is estimated to result in a savings of approximately 35 percent versus rigging with the same number of “J”-hooks.

Alternative A5 (a), by itself, would not be expected to cause significant changes in fishing practices or the level of fishing effort, but may result in some limited shift in fishing patterns with fishermen possibly seeking more favorable tuna fishing grounds. Potential impacts due to a shift in effort to target certain species and lost opportunity costs would be similar to those discussed under alternative A2.

Alternative A5 (b), a preferred alternative, may have minimal to moderate adverse economic impacts depending on the target species. This alternative would allow fishermen to target both tunas and swordfish with 16/0 or larger non-offset circle hooks and 18/0 or larger circle hooks with an offset not to exceed 10 degrees, while employing locally available baits traditionally used in different segments of the fishery. This flexibility will allow fishermen to target different species and adjust to changing market conditions while at sea and may help prevent potential bait supply problems and decrease initial compliance costs by allowing the use of hooks that some fishermen may already possess. This alternative addresses concerns raised during public comment that DSEIS preferred alternative A3 provided inadequate flexibility in hook sizes or bait types, while providing reductions in leatherback sea turtle interactions and mortalities and loggerhead sea turtle mortalities. See ecological discussion for alternative A5 for details.

Based on public comment received, NOAA Fisheries expects that the vast majority of fishermen will regularly employ the 16/0 circle hook, which has been employed by vessels in the Gulf of Mexico in the past. As such, the socio-economic impacts of alternative A5 (b) are expected to be similar to those discussed under alternative A5 (a), above.

The measures analyzed in alternative A5 (a) received much support from the U.S. pelagic longline fishing industry, because they provide an opportunity to fish for a wider variety of species, commonly targeted outside the NED, by allowing a choice of baits and a smaller hook size. The measures in alternative A5 (b) also provide flexibility, thus they also are expected to allow vessels outside the NED to fish for a wider variety of species, including yellowfin tuna, and remain financially solvent while doing so.

Alternatives A7 - A10 (b) could have, as described in detail below, varying ranges of economic and social impacts for the estimated 12 vessels that may fish in the NED. Actual impacts for these alternative are expected to fall between the ranges provided. While some of the alternatives may indicate potential decreases in tuna catches, it is important to note that tuna catches in the NED are currently zero given the closure, and as noted in Table 4.2, have traditionally represented only a limited portion of total gross revenues for vessels fishing in the NED. Moreover, given that no pelagic longline vessels can currently fish in the NED, any income derived from future NED trips would result in positive social and economic impacts, regardless of hook and bait restrictions that vessels may have to operate under in this area. For purposes of these analyses, impacts on bigeye tuna catches, as identified during the NED experiment, are used as a proxy for impacts on all tuna catches. Per Section 6.2, average gross revenues of Atlantic pelagic longline vessels are estimated at $178,619.

Alternative A7 may have substantial positive to minor negative impacts for vessels that may fish in the NED. Swordfish catches may increase by approximately 9.22 to 30.24 percent (by weight) over traditional NED catches, while tuna catches may fall by 81.18 to 87.64 percent (by weight). Given that the gross revenues of vessels fishing in the NED have traditionally been primarily derived from swordfish landings (Table 4.2), this alternative would likely have substantial positive economic and social benefits for swordfish vessels over the status quo as well as historically. See alternative A2 for more information on potential decreased swordfish catches in warmer waters.

This alternative could increase the proportion of total landings historically attributable to swordfish from 88.54 percent to the equivalent of between 96.7 to 115.31 percent. Assuming that the projected 9.22 to 30.24 percent increase in the weight of swordfish landed would result in a proportional increase in revenues attributable to swordfish, vessel revenues may increase by between 8.13 percent ($14,515) and 26.65 ($47,608), providing new gross vessel revenues of between $193,134 and $226,227. The portion of total historical landings attributable to tuna may decline from 9.85 percent (by weight) to between 1.22 and 1.85 percent. Assuming that the projected 81.18 to 87.64 percent decrease in the weight of tuna landed would result in a proportional decrease in revenues attributable to tuna, vessel revenues may decrease by between 9.15 ($16,342) and 9.88 percent ($17,642), providing new gross vessel revenues of between $162,277 and $160,977. In aggregate, combining increased swordfish revenues with decreased tuna revenues, vessels fishing in the NED under this hook and bait combination and engaging on a mixed target trip could see changes in vessel revenues ranging from -$3,127 to +$31,266 providing new gross vessel revenue totals ranging from $175,492 to $209,885.

Alternative A7 is not expected to cause noticeable changes on the practices or behavior of fishermen or raise safety at sea concerns. However, there will be a minor unquantifiable lost opportunity, as compared to pre-NED closure trips, as fishing crews who have not traditionally fished with this hook and bait combination familiarize themselves with the most efficient techniques. Changes in hook and bait costs would be expected to be similar to those analyzed under alternative A2. This alternative would be expected to have substantial positive social and economic impacts for fish processors and dealers in the Northeast by providing them additional business. From 1998 to 2000, NED area vessels landed 21 percent of all swordfish landed by the U.S. Atlantic pelagic longline fishery (Cramer, 2001). See alternative A2 for explanation of potential impacts related to catches of blue sharks, other sharks, dolphin, and wahoo.

Table 4.2 **The Species Composition of Landings for Pelagic Longline Trips Conducted in the NED Area in 2000.** Source: Logbook and weigh-out data maintained by the Southeast Fisheries Science Center.

Species	% by number	% by weight	% by gross revenues
Swordfish	87.79	88.54	88.14
Yellowfin tuna	0.39	0.27	0.19
Bigeye tuna	9.57	8.23	8.72
Bluefin tuna	0.12	0.99	2.27
Other tunas	1.00	0.36	0.09
Pelagic sharks	1.14	1.60	0.59

Species	% by number	% by weight	% by gross revenues
Large coastal sharks	0.00	0.00	0.00

* Calculations involving gross revenues of vessels fishing in the NED were executed using weight and revenue values from 2000 to avoid problems with bias stemming from mandated fishing gears and techniques tested in the NED experiment.

Alternative A8 would be expected to have moderate positive social and economic impacts for vessels that may return to the NED to target swordfish, substantial adverse economic impacts for vessels targeting tunas, and moderate adverse economic impacts for vessels embarking on mixed trips. The analysis of this alternative is based on data from year three (2003) of the NED experiment as this hook and bait treatment was only tested during that year. An informal internet and telephone survey of hook suppliers provides a range in price of approximately $0.92 to $1.00 ($0.96 avg) per hook for large 20/0 commercial grade circle hooks. Assuming that an average of 2,500 hooks per vessel are needed to initially comply with proposed hook requirements (equip vessels with enough hooks for one trip), the compliance cost, on a per vessel basis, may range from $2,300 to $2,500, with an anticipated average cost of $2,400.

This alternative may increase swordfish landings by an estimated 5.8 percent (by weight) and decrease in tuna landings 92.9 percent (by weight). However, the increase in swordfish landings for this alternative is less certain, as it was not determined to be statistically significant. See also alternative A2 for discussion of potential decreased swordfish catches in warmer waters. This alternative could increase the proportion of total landings historically attributable to swordfish from 88.54 percent to the equivalent of 93.68 percent (by weight), and increase vessel revenues by 5.11 percent ($9,131), resulting in overall gross vessel revenues of $187,750. The portion of total historical landings attributable to tuna may decline from 9.85 percent (by weight) to less than one percent. Assuming that the projected 92.9 percent decrease in the weight of tuna landed would result in a proportional decrease in revenues attributable to tuna, vessel revenues may decrease by 10.47 percent (-$18,701), resulting in overall gross vessel revenues of $159,918. In aggregate, combining increased swordfish revenues with decreased tuna revenues, vessels fishing in the NED under this hook and bait combination and engaging on a mixed target trip could see a decline in gross vessel revenues of $9,570, providing new estimated gross vessel revenues of $169,049.

Alternative A8 is expected to have similar impacts as alternative A7 on fishing behavior, safety at sea, opportunity costs, other marketable species, and fish processors and dealers in the Northeast. See alternative A2 for explanation of potential impacts related to catches of blue sharks, other sharks, dolphin, and wahoo.

Alternative A9 may have substantial positive to minor negative impacts for vessels that may fish in the NED. Under this alternative, swordfish catches could increase by between 9.22 and 63.4 percent (by weight) over traditional NED landings, depending on whether fishermen chose to equip and deploy the 18/0 offset circle hook with whole mackerel or the 9/0 “J”-hook with whole mackerel, respectively. See alternative A2 for information on potential decreased swordfish catches in warmer waters. This alternative could result in significant decreases in tuna catches of between 81.18 and 90.2 percent by weight (respectively). However, as previously stated, the gross revenues of vessels fishing in the NED have traditionally been derived primarily from swordfish landings. Increased swordfish catches over "traditional" or "pre-NED closure" catches, would likely substantially improve vessel profitability and crew income over the status quo or historical social and economic impacts.

Socio-economic impacts of alternative A9, option ii (18/0 circle hook with whole mackerel bait), would be similar to the impacts discussed under alternative A7. Alternative A9, option i (9/0 "J"-hook with whole mackerel bait), would likely have more positive social and economic impacts. This alternative could increase total landings historically attributable to swordfish from 88.54 percent (by weight) to the equivalent of 144.67 percent. Assuming that the projected 63.4 percent increase in the weight of swordfish landed would result in a proportional increase in revenues attributable to swordfish, vessel revenues may increase by as much as 55.88 percent ($99,814), providing new estimated gross vessel revenues of $278,433. The portion of landings historically attributable to tuna by weight may decline from 9.85 percent of historical landings to less than one percent of historical tuna landings, by weight. Assuming that the projected 90.24 percent decrease in the weight of tuna landed would result in a proportional decrease in revenues attributable to tuna, vessel revenues may decrease by 10.17 percent ($18,166), providing new estimated gross vessel revenues of $160,453.

Combining projected increases in swordfish revenues with projected lost tuna revenues for option i, gross vessel revenues for vessels engaging on a mixed trip may increase by approximately $81,648 providing a new estimated total of $260,267. As such, changes in vessel revenues under alternative A9 (both options i and ii) could range from between -$3,127 and +$81,648, providing for a possible range of total gross vessel revenues of between $175,492 and $260,267. These figures likely represent over estimates in both directions. The actual impact would likely fall between these two, depending on the frequency with which particular hook and bait combinations are employed and species targeted.

Alternative A9 is expected to have similar impacts as alternative A7 on fishing behavior, safety at sea, opportunity costs, other marketable species, and fish processors and dealers in the Northeast. Alternative 9, option ii, would have similar socio-economic impact relating to blue sharks , other sharks, dolphin, and wahoo, as would alternative A2.

Alternative A10 (a) may have substantial positive to substantial negative for vessels that may fish in the NED. Depending on whether fishermen select the 18/0 offset circle hook with whole mackerel or the 18/0 non-offset circle hook with squid, respectively, swordfish catches could change by +30.24 to -32.58 percent (by weight), and tuna catches by -87.64 to possibly as much as +29.22 percent (by weight). See alternative A2 for more information on potential decreased swordfish catches in warmer waters. Increases in tuna landings during the NED research experiment were substantial, but given limited data were determined not to be statistically significant. Because different hook and bait combinations impact swordfish and tuna catches differently, fishermen would have to decide prior to sailing which species to target.

Alternative A10 (a), option i, would have socio-economic impacts similar to those discussed under alternative A7. Alternative A10 (a), option ii, would likely have a small positive impact relative to the status quo, but negative economic impacts from a historical perspective for fishermen targeting swordfish or embarking on a truly mixed target trip in the NED. Further, fishermen would likely experience minor positive increases in revenues associated with tuna catches from a historical perspective; however, these revenues would not likely be able to offset overall historical revenue losses stemming from decreased swordfish catches.

Alternative 10 (a), option ii, would likely reduce the portion of landings historically attributable to swordfish from 88.54 percent (by weight) to between 59.69 and 63.27 percent. Assuming that the projected 28.54 to 32.58 percent decrease in the weight of swordfish landed would result in a proportional decrease in revenues attributable to swordfish, vessel revenues may decrease by between 25.16 percent ($44,932) and 28.72 percent ($51,292), resulting in overall gross vessel revenues of between $127,327 and $133,687. The portion of vessel landings historically attributable to tuna by weight may increase from 9.85 percent to between 11.84 and 12.73 percent. Assuming that the potential 20.24 to 29.22 percent increase the weight of tuna landed would result in a proportional increase in revenues attributable to tuna, vessel revenues may increase by 2.23 percent ($4,074) to 3.29 percent ($5,882), resulting in overall gross vessel revenues of between $182,693 and $184,501. The overall impact on vessel revenues of selecting the 18/0 non-offset circle hook and squid bait combination and engaging in a mixed trip in the NED would likely result in a decline in revenues of between $39,050 and $47,218, providing new estimated gross vessel revenues of between $131,401 and $139,569. As such, for vessels engaging in mixed trips, alternative A10 (a) (both options i and ii) is expected to result in aggregate changes vessel revenues of between -$47,218 and +$31,266, resulting in overall gross vessel revenues of between $131,401 and $209,885. These figures likely represent over estimates. The actual impact would likely fall between these two, depending on the frequency with which particular hook and bait combinations are employed and species targeted. Most fishermen would likely select option i as the preponderance of effort in the NED has historically targeted swordfish, but this alternative also includes a hook and bait type that is effective at catching tunas, should fishermen opt to engage on a tuna directed trip in the NED. While there is a choice between two options, during the comment period, several commenters stated that this alternative would result in significant economic losses to U.S. vessels fishing in the NED. Specifically, commenters stated that requiring the use of only either whole mackerel or squid baits, depending upon whether the hook is offset or not, would not allow vessels to adapt to changing conditions on longer fishing trips. See Appendix C1 for summary of comments and responses.

Alternative A10 (a) is expected to have similar impacts on fishing behavior, safety at sea, opportunity costs, other marketable species, and fish processors and dealers in the Northeast, as alternative A7, discussed above. This alternative would likely have similar socio-economic impacts as alternative A3 with regard to blue shark bycatch. See alternative A2 for an explanation of potential impacts related to catches of other sharks, dolphin, and wahoo.

Alternative A10 (b) may have substantial positive to substantial negative impacts for vessels that may fish in the NED. In response to public comment, noted above, this alternative modifies DSEIS alternative A10 to allow for more efficient opportunistic targeting of swordfish and tunas and the ability to adjust to changing market conditions on longer trips, while ensuring significant reductions in leatherback and loggerhead sea turtle interactions and mortalities.

Given the increased flexibility in terms of the hook and bait combinations that may be selected, the potential range of estimated economic impacts is very broad and, thus, likely exceeds the actual impacts that would result from this alternative. Depending on whether fishermen select the 18/0 offset circle hook with whole mackerel or the 18/0 non-offset circle hook with squid, respectively, when viewed against historical landings, there may be a change in swordfish catches of +30.24 to -32.58 percent (by weight). Results of the experiment also indicate that fishermen could experience changes in tuna catches of -87.64 to possibly as much as +29.22 percent (by weight) depending on whether they choose to equip and deploy the 18/0 offset circle hook with whole mackerel or the 18/0 non-offset hook with squid, respectively, when viewed against historical landings. Increases in tuna landings during the NED research experiment were substantial, but given limited data were determined not to be statistically significant. The experiment results indicate that when the tested hook and bait combinations have a positive impact on swordfish catches they tend to have a negative impact on tuna catches, and visa versa.

The portion of landings historically attributable to swordfish may vary by -32.58 to +30.24 percent, shifting swordfish landings from 88.54 percent (by weight) of landings to between 59.69 and 115 percent. Assuming that the projected changes in the weight of swordfish landed would result in a proportional change in revenues attributable to swordfish, vessel revenues may vary by between -28.72 percent (-$51,292) and +26.65 percent ($47,608), providing new estimated gross vessel revenues of between $127,327 and $226,227. The portion of vessel landings historically attributable to tuna by weight may shift by between -87.64 and +29.22 from 9.85 percent of landings to between 1.22 and 12.73 percent. Assuming that the projected changes in the weight of tuna landed would result in a proportional change in revenues attributable to tuna, vessel revenues may vary by -9.88 percent (-$17,642) to +3.29 percent ($5,882), resulting in a range of overall gross vessel revenues of between $160,977 and $184,501. For vessels engaging on mixed trips, alternative A10 (b) is expected to have an overall impact on vessel revenues of between -$68,934 and +$53,490, resulting in a range of overall gross vessel revenues of between $109,685 and $232,109.

The above estimates represent the outer bounds of the range of impacts. For example, the estimated loss of $68,934 is based upon fishermen choosing to equip and employ the 18/0 non-offset circle hook with squid bait to target swordfish while operating in the NED. This scenario is unlikely to occur as fishermen seek to maximize revenues and this hook and bait combination has been shown to be highly inefficient at catching swordfish. Nevertheless, it represents the maximum potential loss under the available options and, as such, has been included in the range.

Based on public comment, hook and bait efficiencies, and traditional target species, the majority of fishermen are expected to employ the 18/0 offset circle hook with whole mackerel while pursuing swordfish in the NED, and opportunistically switch to the 18/0 non-offset circle hook with squid while at sea for sets targeting bigeye tunas. As such, landings of target species are expected to increase over historical levels.

Alternative A10 (b) is expected to have similar impacts on fishing behavior, safety at sea, opportunity costs, other marketable species, and fish processors and dealers in the Northeast, as alternative A7, discussed above. This alternative would likely have similar socio-economic impacts as alternative A3 with regard to blue shark bycatch. See alternative A2 for an explanation of potential impacts related to catches of other sharks, dolphin, and wahoo.

Alternatives A13, A14, and A15 will all likely have some substantial negative social and economic impacts on commercial fishermen, their communities, buyers, and dealers. Alternative A13, the closure in the central portion of the Gulf of Mexico year-round, is the smallest area geographically of the three alternatives and would likely have the least social and economic impact, whereas alternative A14, the time/area closure of the central Gulf of Mexico and the NEC area year-round would likely result in the greatest social and economic impact. Alternative A15 encompasses the same geographic area as alternative A14, but is targeted at specific months (May through October) with the highest sea turtle interactions.

The year-round closure in the central Gulf of Mexico encompasses 25,489 nm^2 and the combined GOM and NEC closure encompasses over twice the area at approximately 56,471 nm^2. Since both of these areas (central GOM and NEC) have experienced high levels of fishing effort in the past, a substantial number of fishing vessels would have to adjust their fishing practices accordingly. For all fishing areas, this could mean that fishermen may travel greater distances to reach favorable fishing grounds, and spend longer periods at sea which could result in increased fuel, bait, ice, crew costs, and may also raise some safety concerns. The greater distances traveled might also cause a shift in ports selected for offloading. Fishermen may choose to offload in ports closer to their new fishing grounds and not at their homeports or traditional offloading ports. This could have a negative economic impact on buyers and dealers in traditional offloading ports, and potentially adverse social impacts on families and communities. However, a shift in offloading ports could create positive economic impacts in newly utilized offloading ports, and potential positive social and economic impacts for these communities.

In addition to the aforementioned potential impacts, analyses pertaining to alternative A13 indicate that with redistribution of effort, swordfish and bigeye tuna catches may increase by as much as 17 and 32 percent, respectively, in terms of numbers of fish. Analyses for alternative A14, indicate that with redistribution of effort, swordfish catches may increase by as much as 18 and 33 percent, respectively, in terms of numbers of fish. Analyses for alternative A15 indicate that with redistribution of effort swordfish, yellowfin tuna, and bigeye tuna catches would likely increase by 5, 3, and 17 percent, respectively, in terms of numbers of fish. As the size of fish caught within and outside these closures were not known at the time of this rule making, it is unclear if the changes in swordfish and tuna catches would result in positive or negative economic impacts. As such, while the impacts are not quantifiable at this time, NOAA Fisheries anticipates that the overall impacts of closures of these sizes would likely be adverse in nature.

The redistribution of effort analysis indicates that the catch of targeted species such as swordfish and yellowfin tuna could potentially increase as a result of the time/area closures. This may be the result of catch per unit effort (CPUE) which is as high or higher outside the time/area closure as it is inside the time/area closure. This is not the case for bigeye tuna, however, for which the catch decreases in alternative A13 and A14 with redistribution of effort. Only alternative A15 showed an increase in the catch of all three targeted species with redistribution of effort (Appendix 1, Table 1). The economic impact of increased or decreased catches by number is not quantifiable at this time as potential change in the overall weight of landings remains unknown. A shift in fishing effort could result in greater conflicts between fishermen if the space for setting gear becomes constricted.

Alternative A16, a preferred alternative, would likely have only minor initial adverse social and economic impacts, as there are currently similar requirements in the pelagic longline fishery, with minor positive long-term impacts resulting from reduced hook replacement costs. The purchase of the release and disentanglement gear would likely be a relatively minor expense to most fishermen. A full suite of release gear is estimated to cost between $485.00 and $1056.50. Some of this cost could be reduced if fishermen were able to construct some pieces themselves, subject to NOAA Fisheries approval, instead of purchasing pre-assemble gear from commercial suppliers. NOAA Fisheries has received comment in the past that the use of dehooking devices and other disentanglement gear may not only reduce costs for fishermen by retrieving hooks, but may also increase the efficiency of fishing operations by reducing the time and effort spent re-rigging gear and removing hooks and line from target and non-target species. However, if the use of these additional gears requires more time during haulback, corresponding increases in fishing costs could be expected.

With regard to administrative and enforcement impacts, the no action alternative (A1) is not expected to have any impacts, as it does not change current fishing practices. The gear modification alternatives (A2 - A5 (b), A7 - A10 (b)) and release gear/handling alternative (A16) raise administrative and enforcement considerations, because they would establish new limitations, throughout the fishery, on the type of hooks and baits that vessels could use, thus changing current fishing practices. Additional costs could include outreach, development of brochures or other materials, and/or training or workshops to educate fishermen and enforcement personnel on the new requirements. In the gear alternatives, NOAA Fisheries has tried to mitigate such impacts to the extent practicable by providing that vessels, at all times, are limited to having only specific hooks and baits on board and/or in use. In addition, as discussed in Section 1.1, NOAA Fisheries is exploring operational and implementation considerations of educational workshops and a certification process. Alternatives A13 - A15 would require enforcement to monitor new time and area closures. However, the existing requirement for all pelagic longline vessels to have and use vessel monitoring systems on board would help to facilitate monitoring of the closures.

Conclusion

As discussed in greater detail in Sections 1.2 and 1.3, the objectives of this rule making are multifaceted and include, *inter alia,*: 1) addressing sea turtle interactions and mortalities to avoid jeopardy for Atlantic leatherback and loggerhead sea turtles; 2) reconsidering the NED and other time and area closures in light of possible gear modifications; and 3) minimizing, to the extent practicable, the economic impacts of sea turtle bycatch mitigation measures. Preferred alternatives A5(b), A10(b), and A16 strike an appropriate balance between protecting and conserving living marine resources and maintaining a viable domestic pelagic longline fleet, in compliance with legal mandates. To achieve this balance, NOAA Fisheries examined and re-examined the best available scientific and socio-economic data and public comment on the DSEIS and proposed rule. Where appropriate, the Agency incorporated refinements to data and modified the preferred measures in the FSEIS based on these examinations and comments.

Alternatives A5 (b), A10 (b), and A16 are the preferred alternatives because in combination they are expected to provide significant conservation benefits to sea turtles in the Atlantic pelagic longline fishery, while allowing the fishery to continue operating, consistent with the 2004 BiOp, the ESA, the MSA, and other applicable law. The preferred hook and bait alternatives (A5 (b) and A10 (b)) are expected to result in interactions with 588 leatherback sea turtles and 635 loggerhead sea turtles. The numbers of interactions were calculated in a precautionary manner by applying the lowest estimated sea turtle interaction reduction rates for the allowable hook and bait types. As such, actual sea turtle interaction rates could be lower than the estimates provided above. These alternatives may also have important bycatch mitigation benefits for other species known to interact with pelagic longline gear, such as sea birds, marine mammals, sharks, marlin, and other finfish. In addition, alternatives A5 (b) and A10 (b) mitigate potential adverse economic impacts by providing flexibility in the selection of hooks and baits. Alternative A16 is a preferred alternative because it is expected to further reduce post-hooking mortality of incidentally captured sea turtles and other species.

The suite of preferred alternatives best meets the purpose and scope of this rulemaking by providing comprehensive and meaningful protection to Atlantic sea turtles, maintaining the viability of the domestic pelagic longline fishery, and achieving legal and policy obligations. Importantly, by providing a successful roadmap for sea turtle bycatch and bycatch mortality reduction, NOAA Fisheries may provide the impetus for other nations to adopt similar sea turtle conservation measures, thereby bringing truly meaningful protection to sea turtles throughout their entire range.

4.2 IMPACTS ON ESSENTIAL FISH HABITAT

The Magnuson-Stevens Act requires that NOAA Fisheries evaluate the potential adverse effects of fishing activities on EFH and must include management measures that minimize adverse effects to the extent practicable. At this time, there is no evidence that physical effects caused by pelagic longline fishing under this FMP are adversely affecting EFH to the extent that detrimental effects can be identified on habitat or fisheries. The preferred alternatives will have no direct impact on EFH. Further discussion of EFH is provided in Chapter 10.

4.3 IMPACTS ON PROTECTED SPECIES

The preferred alternatives are expected to reduce sea turtle interaction and mortality levels. Background information on threatened and endangered sea turtles and ESA consultation history for this fishery are provided in Chapters 1 and 3. On June 1, 2004, a new BiOp was completed for the Atlantic PLL fishery. The 2004 BiOp is summarized below. A copy of the BiOp is available on request or on the internet at http://sero.nmfs.noaa.gov/pr/rulings/hmsbo060104.pdf

4.3.1 Findings of the June 1, 2004, Biological Opinion

NOAA Fisheries has analyzed the best available scientific and commercial data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of any sea turtle species. In doing so, the analysis focused on the impacts and population response of sea turtles in the Atlantic Ocean. However, as discussed in the June 1, 2004, BiOp (NOAA Fisheries, 2004), the impact of the effects of the proposed action on the Atlantic populations is directly linked to the global populations of the species, and the final jeopardy analysis is for the global populations as listed in the ESA.

Based upon the analyses described above, the June 2004 BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery, authorized under the Atlantic Highly Migratory Species FMP:

- **is not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley sea turtles**; and

- **is likely to jeopardize the continued existence of leatherback sea turtles**.

Critical habitat has not been designated for these species in the action area; therefore, the destruction or adverse modification of critical habitat will not occur.

4.3.2 Reasonable and Prudent Alternative (RPA) Contained in the June 1, 2004, Biological Opinion

The 2004 BiOp indicates that the continued operation of the Atlantic HMS pelagic longline fishery, as proposed, is likely to jeopardize the continued existence of leatherback sea turtles. The clause "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR §402.02).

Regulations implementing Section 7 of the ESA (50 CFR §402.02) define RPAs as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and, (4) would, NOAA Fisheries believes, avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The BiOp recognized that threatened and endangered sea turtles face a risk of global extinction because of a wide array of human activities and natural phenomena. The BiOp recognized, for example, that the number of turtles killed by foreign longline fleets poses a much larger and more serious threat to the survival and recovery of sea turtles than U.S. HMS fisheries in the Atlantic Ocean. Further, the BiOp recognized that sea turtles will not recover without addressing the full range of human activities and natural phenomena that could cause these animals to become extinct in the foreseeable future. The existence of these other threats, however, does not affect NOAA Fisheries' responsibility to ensure that the action is not likely to jeopardize the continued existence of leatherback turtles. An RPA that ensures that the HMS pelagic longline fishery is not likely to jeopardize the continued existence of listed species may not necessarily ensure that the species will recover in the wild and may not prevent other human activities from causing their ultimate extinction.

4.3.2.1 Specific Elements of the Reasonable and Prudent Alternative

The BiOp stated that NOAA Fisheries must undertake management and conservation measures to address and reduce the adverse effects to leatherback populations expected to result from this action. Specifically, the BiOp requires: (1) reduce post-release mortality of leatherback sea turtles; (2) improve monitoring of the effects of the fishery and take management action to avoid long-term elevations in leatherback takes; (3) confirm the effectiveness of the hook and bait combinations that are required as part of the action; and, (4) take management action to avoid long-term elevations in leatherback takes and mortality. These measures are necessary to avoid the likelihood of jeopardy and to authorize the continued prosecution of the HMS pelagic longline fishery. The RPA is designed to reduce the effects of the HMS pelagic longline fishery to such a degree that the effects are not likely to appreciably reduce these sea turtles' likelihood of surviving and recovering in the wild (NOAA Fisheries, 2004). What follows is a summary of the RPA.

Maximize Gear Removal to Maximize Post-release Survival

Sea turtle post-release survival is not only dependent on the type of interaction (i.e., where hooked, entangled or not), but also on the amount of gear left following the release. Removal of some or all of the gear – except deeply-ingested hooks – is likely to improve the probability of a sea turtle surviving an interaction event. The January 2004 draft post-release mortality criteria account for the probable improvement in survivorship resulting from removal of gear, where appropriate, for each injury. Maximizing gear removal therefore is critical for lowering mortality ratios.

Based on results from the NED research experiment, substantial reductions in mortality can be achieved by maximizing the amount of gear removed from hooked sea turtles. The post-release mortality ratio for leatherback sea turtles using the NED gear removal proportions and circle hook data was only 13.1%. The NED research experiments had 100% observer coverage and captains and crew that were well trained, well equipped, and experienced in gear removal from sea turtles. That post-release mortality ratio, therefore, represents the level of mortality NOAA Fisheries expects if the fishery is required to use circle hooks and to have all required gear-removal equipment on board, and has the training, experience, and willingness to use the equipment.

It is critical that the same level of gear removal achieved in the NED research experiment be attained throughout the fishery. Improving the post-release mortality ratio in the entire HMS pelagic longline fishery to levels associated with circle hook use in the NED research experiment would decrease total leatherback sea turtle mortality caused by the fishery by 58%. The NED experience shows that extensive training, experience, and high motivation is needed to achieve these high rates of success. Therefore, NOAA Fisheries will provide outreach and training to maximize gear removal, and will monitor the effectiveness of these efforts.

As part of the outreach and training strategy discussed in the document, the June 2004 BiOp requires development and distribution of training materials on the safe handling of sea turtles and gear removal techniques to all HMS pelagic longline permitted vessels. In addition, it requires that a fishery outreach point of contact (POC) be established. The POC will have a critical role in ensuring that fishermen learn the requirements, the techniques, and the reasons for maximum gear removal. In addition to simply answering fishermen's questions, the POC will actively reach out to fishermen to learn about their experiences, troubleshoot problems, and share solutions and successful experiences with other fishermen and NOAA Fisheries' scientists and managers. (In response to this requirement, NOAA Fisheries has already designated the following POC,

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The BiOp requires voluntary training workshops to explain the final sea turtle conservation requirements to fishermen. In addition, pelagic longline observers must provide additional outreach and training to captains and crews on sea turtle safe handling and gear removal techniques, as well as provide constructive feedback to captains and crew. Before disembarking, the observers will inspect the onboard sea turtle release and disentanglement gear and determine whether it meets the requirements. This information is to be recorded for management purposes to assess the implementation of this RPA; this information is not intended to be used for enforcement purposes.

The BiOp requires implementation of a training and certification program to ensure that the captain on board each permitted HMS vessel authorized to fish with pelagic longline gear has successfully completed training on sea turtle safe handling and gear removal by December 31, 2005. Training must include demonstrations of sea turtle release equipment and protocols and pelagic longline equipment modifications required under HMS regulations. The training content must be developed in consultation with the SEFSC. The certification process must reasonably ensure that the certified individual has actually completed and understood the training material. The certification process must also include documentation requirements so that law enforcement officers can readily verify a vessel's compliance with the requirement for a certified captain and one crew member. After 2005, training and certification opportunities must be available so new captains can receive training.

The outreach, training, and certification requirements, described above, are expected to bring the whole fleet up to the high level of gear removal performance that was seen in the NED research experiment. The fleet will receive initial outreach in 2004, mandatory training and certification in 2005, and will gain experience after that training throughout 2006. By the beginning of 2007, then, it is anticipated that the fleet will have reached the maximum performance level seen in the NED research experiment.

The BiOp requires monitoring of the overall expected mortality of sea turtles caught in the pelagic longline fishery, based on their release condition and the January 2004 draft post-release mortality criteria. Net mortality ratio targets are intended ensure that the fleet's progress in improved sea turtle handling and gear removal reach the net mortality ratios of 13.1% for leatherback sea turtles and 17.0% for loggerhead sea turtles by the beginning of 2007 (the long-term targets). These long-term mortality targets are based on consistent, annual progress in 2004, 2005, and 2006. The targets are presented in Table 4.3.

Table 4.3 **Net Mortality Rate Performance Standards.** Source: NOAA Fisheries, 2004

	Assumed 3rd & 4th Quarters, 2004	Target for 1st Quarter, 2005	Target for 1st Quarter, 2006	Target for 1st Quarter, 2007 and onward
Leatherbacks	32.8%	26.2%	19.6%	13.1%
Loggerheads	21.8%	20.2%	18.6%	17.0%

Improve the Accuracy and Timeliness of Reporting and Analysis, and Take Corrective Action to Prevent Long-Term Elevated Mortality

The sea turtle take estimates used in the jeopardy analysis are produced from observed bycatch rates and logbook effort data. Bycatch rates (currently catch per hook) are quantified based on observer data by geographic area and quarter. The estimated bycatch rate is then multiplied by the total fishing effort (currently number of hooks) reported in the mandatory logbook to obtain estimates of the total interactions for sea turtles. Both the accuracy of the data and the timeliness of its reporting are critical to monitoring the effects of the fishery and assessing whether the RPA avoids jeopardy for leatherback sea turtles. Observer coverage must be sufficient to produce a statistically reliable sample of the HMS pelagic longline fishery that accurately represents the entire fishery. These data must also be available in a timely fashion to monitor the fishery and take corrective action to avoid long-term elevation of turtle takes beyond those authorized in this opinion. Levels of observer coverage and timeliness of reporting have been insufficient in the past. Improvement in the level of observer coverage and within-year and annual reporting are needed.

The jeopardy analysis concluded that the incidental mortality of 198 leatherback turtles annually, based on the estimated annual capture of 588 animals, was expected to reduce the likelihood of leatherback turtles' survival and recovery in the wild. The first element of the RPA will, over the next two-and-a-half years, reduce the net post-release mortality for leatherback turtles by 60%, and NOAA Fisheries has specified requirements to monitor this reduction. No measures are specified, however, in the RPA that further reduce the estimated annual bycatch levels of leatherbacks beyond the level predicted for the action. Because the basis of the jeopardy determination – total estimated mortality – is the product of the post-release mortality ratio and the estimated take levels, NOAA Fisheries must also ensure that take levels do not become elevated.

The jeopardy analysis stressed that one-time or short-term mortality on leatherback sea turtles, on the scale of the action's annual impacts, is not likely to produce any noticeable effect on the population. Similarly, minor, short-term exceedance of estimated take and mortality levels is not expected to have noticeably worse population effects, as long as take and mortality do not also increase on average over the long term. High degrees of variability in natural and anthropogenic mortality, nesting levels, recruitment success, and the inherent ability of long-lived animals to withstand short-term impacts require focus on long-term, rather than short-term effects, because of both the biological significance of long-term effects the likely inability to detect a population response from short-term impacts.

NOAA Fisheries has issued incidental take statements for the fishery on an annual basis in the past. Annual take estimates have high variability, however, because of natural and anthropogenic variation. For example, leatherback sea turtle takes over the history of the observer program have ranged from as low as 308 in 1997 to the all time high of 1,208 in 2001. This high variability and the absence of within-year take monitoring of estimates have precluded early detection of possible take exceedances.

To ensure that the long-term operation of the fishery does not jeopardize the continued existence of leatherback sea turtles, the BiOp requires improved monitoring of takes in the fishery and the ability to take timely corrective action. However, corrective action within any one single year will likely never be practicable, and minor or short-term exceedance of annual predicted take levels is not believed to be sufficient to jeopardize leatherback sea turtles. Therefore, the RPA and the associated ITS establishes a three-year authorized take level for sea turtles. The BiOp requires the provision of timely take information during the course of each three-year period to allow ample time to detect significant problems in remaining within the authorized take levels and to take corrective action (e.g., closure of sea turtle interaction hot spots, additional gear restrictions). The BiOp states that a three-year period is the shortest practicable time period to detect and avoid potential long-term take exceedance. Three years is expected to be sufficiently protective of leatherback sea turtles: within a reporting period, highly elevated takes could only theoretically continue for two consecutive years before corrective action would be taken in the third year to maintain the total take at the authorized annual average level. Maintaining long-term takes at the average 3-year level considered in the BiOp, even though higher take levels may occur in certain years, will ensure that the effects of elevated takes do not reduce appreciably the likelihood of leatherback sea turtles' survival and recovery in the wild.

Improve Observer Coverage

The BiOp requires at least 8% observer coverage in the HMS pelagic longline fishery, based on total annual reported sets. The BiOp requires adjustment of the observer program's internal target number of observed sets to achieve the 8% minimum coverage level, taking into account the program's average success rate of observing only 81% percent of the planned sets, and improved communication between vessel operators and the observer program in an effort to increase the success rate in placing observers on longline trips. The BiOp further requires increased efforts to achieve observer coverage in areas and quarters where sampling has historically been low. By December 31, 2006, there should 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.

Improve Observer Data Collection

To be able to use observer data to analyze the potential effects of the newly required hooks and baits, the BiOp requires more detailed hook and bait information be collected by the observer program. The BiOp stipulated that the Agency train and require observers to record not only hook size and brand, but also amount of hook offset and whether different sizes, brands, and/or offset hooks are used on a given set. In the case of sets with multiple hook or bait styles, observers must record the proportion of each hook and bait style used, and if any sea turtles are captured, the exact hook and bait involved. It is also recommended that exact hook and bait details be recorded for catches of the primary target species.

Improve Within-Year Monitoring

The BiOp requires improved within-year monitoring to detect high take levels as soon as possible by improving the existing quarterly reports:

a) Sea turtle take estimates must be prepared using observer data and preliminary effort data for that quarter. If preliminary effort data are not available, quarterly take estimates must be prepared based on effort data from previous years.
b) Quarterly reports must be submitted to SERO, HMS Management Division, the Northeast Regional Office Protected Resources Division, and the Office of Protected Resources no later than 45 days into the subsequent quarter. In addition to the information previously provided in the quarterly reports, they must include the quarterly take estimates specified here, the number of unique vessels observed, the cumulative number of unique vessels observed since the effective date of the sea turtle conservation regulations, and the percent of observed vessels that had the required turtle handling and gear removal results.
c) Observed takes by statistical area and quarter over the history of the observer program must be reviewed for any notable trends or patterns that can be used to further interpret the significance of the number of observed takes reported during each quarter. A summary of that review should be completed by March 31, 2005. Any take prediction hypotheses stemming from that review must be tested retrospectively using the 2004 quarterly and annual take estimates. Results should be included in the 2004 annual take report.

Improve Timeliness of Reporting Yearly Take Estimates
The BiOp requires improved timeliness of reporting yearly sea turtle take estimates by:
a) Compiling logbook effort data in computer databases and conducting quality control as logbooks are submitted throughout the year, so that effort data are available for analysis as soon as possible after the end of the year;
b) Completing annual take estimates based on observer and effort data by March 15 of each year;
c) Subsequently revising the annual estimates by May 31, if quality control of the effort data for ICCAT purposes results in changes in the effort data; and
d) Immediately providing these take estimates to SERO, HMS Management Division, the Northeast Regional Office Protected Resources Division, and the Office of Protected Resources.

Confirm Effectiveness of Hook and Bait Combinations

Additional research on the effect of offsetting hooks is needed to determine how significant a factor hook offsets are in turtle catch rates.

The biop requires that the long-term implementation of the action reduce leatherback sea turtle interactions by at least 50% as compared to current U.S. longline industry-standard practices. In addition, while the opinion focuses on the effects of the U.S. Atlantic longline fleet, the sea turtle population impacts from the longline fleets of other nations, both in the Atlantic and globally, are much more severe than the effects of the U.S. fleet. Convincing other nations to adopt comparable gear and/or bait modifications to reduce their impacts is essential for the conservation of leatherback and loggerhead sea turtles globally. As long as uncertainty remains about the economic effects of the use of the 16/0 or the 18/0 circle hook, there is little hope that the international longline fleets will adopt alternate fishing gear and therefore little hope of achieving significant threat reduction for sea turtles from international longline gear. The BiOp requires a research project, with an expected completion date of December 31, 2006, to address the following:

Evaluation of Leatherback Sea Turtle Bycatch
The BiOp requires experiments and/or monitoring of the longline fishery to confirm whether the assumed bycatch reduction rate of leatherback sea turtles with the use of the 16/0 circle hook is equivalent to the 18/0 circle hook by:

a) comparison of the effects of the 16/0 and 18/0 hooks in controlled fishing experiments, or
b) comparison of the effects of the 16/0 hook to the former status quo hooks in controlled fishing experiments, or
c) comparison of fishery dependent data.

Evaluation of Effect of Offset Circle Hooks
The BiOp requires experiments and/or monitoring of the longline fishery to determine more precisely the effect of offsets up to 10˚ on rates of sea turtle bycatch, hooking location, and post-release mortality by:

a) comparison of the effects of the 16/0, non-offset and 16/0, 10˚ offset circle hooks in controlled fishing experiments, or
b) comparison of the effects of the 18/0, non-offset and 18/0, 10˚ offset circle hooks in controlled fishing experiments.

Evaluation of Economic Impacts
The BiOp requires experiments and/or monitoring of the longline fishery to verify the target species catch effects of the 18/0 circle hook in tuna-directed fishing by either:

a) comparison of the effects of the 16/0 and 18/0 hooks in controlled fishing experiments, or
b) comparison of the effects of the 16/0 hook to the former status quo hooks in controlled fishing experiments.

Principles for Conducting Evaluations
The BiOp requires the continuation of the successful practice of working cooperatively with government and academic researchers, the U.S. pelagic longline industry, and foreign partners to accomplish the required research effectively, efficiently, and with broad buy-in. Separate evaluations may be combined in individual projects for efficiency. In particular, sea turtle and target species evaluations may be particularly amenable to combined study.

In selecting among the various alternatives and designing actual experiments, some catch rate effects will be difficult to detect because of the low rates of catch and bycatch in the pelagic longline fishery, and the high variability in those rates. Experiments looking at negative effects (i.e., intended to support a conclusion that two rates are *not* different), in particular, should be statistically designed with an understanding of the power of the test and an understanding that decisions involving conservation of endangered and threatened species are to be risk-averse. That is, statistical analysis of sea turtle catch effects shall err on the side of assuming an adverse effect does exist or a beneficial effect does not exist, rather than the converse.

Research funded or implemented by NOAA Fisheries may be subject to permit requirements under the ESA or the MSA. NOAA Fisheries conducts Section 7 analyses on the issuance of any such permits. Some of the research may not require additional authorizations, however, if it would involve fishing with allowed gear (under the requirements of the action) and interventions with any bycaught sea turtles would be consistent with the action and the currently authorized operation of the pelagic observer program, or any other properly authorized research program.

Application of Evaluation Results
The BiOp requires analysis of the results of the previous years' scientific experiment (or require reporting from government-funded researchers) for the effects of all the tested parameters on sea turtle and target species catch rates, within 3 months of the completion of each fishing season (*i.e.*, before April 2005, April 2006, and April 2007). The BiOp requires that the research results must be communicated and coordinated with research partners and other interested parties in a timely manner, so that continuing research might be adapted or modified appropriately.

The BiOp requires evaluation of the interim and final research results against the requirements of the action. The BiOp further requires consideration of the possible application of the results through rulemaking to modify the action, if necessary to reduce sea turtle interactions or improve fishery economic performance.

Take Corrective Action to Prevent Long-Term Elevated Take and Mortality

Implement Adaptive Management Strategy to Prevent Exceedance of Three-Year ITS
The ITS accompanying the opinion specifies authorized incidental take levels for sea turtles, over three-year periods, beginning with 2004. The final annual reports of take estimates will be the basis for assessing actual vs. authorized takes. During the course of each three-year period, the BiOp requires review of each quarterly and annual report as soon as it becomes available. If these reports indicate that the fishery is not likely to stay within the authorized three-year take levels, the BiOp requires protective/corrective action to be taken to avoid long-term elevations in sea turtle takes and ensure that take levels in the ITS are not exceeded. Such actions may include time-area closures, additional gear modifications or restrictions, or any other action deemed appropriate. In addition to the above possible actions, NOAA Fisheries should consider establishing a rule that would allow implementation of corrective measures through framework action. Such a rule would provide industry with greater certainty on the types of management responses that may occur and would allow for more timely action, reducing the need for later, more drastic action.

Reduce Near-Term (2004-2006) Mortality of Leatherbacks by Reducing Fishery Interactions, If Necessary

The conservation measures in the first and third elements of the RPA will be carried out over the next two-and-a-half years. The post-release mortality reduction is not expected to be fully effective until 2007. Likewise, completion of testing that can confirm the effectiveness of the required hook and bait combinations is not required or likely to be completed before 2007. When those elements are successfully implemented, after 2006, long-term average annual capture and mortality of leatherback sea turtles are expected to be 588 interactions and 84 mortalities, and the three-year authorized incidental take for leatherback turtles would be 1,764 interactions, with a corresponding 252 mortalities. In the meantime, however, mortality will likely be higher as gear removal and post-release survival incrementally improve. Estimated three-year capture and mortality of leatherback sea turtles for 2004 - 2006 would be 1,981 interactions and 548 mortalities. The 548 mortalities in 2004 - 2006 would be more than double the level expected in 2007 - 2009 and beyond, and represent only a 17% reduction in mortalities, compared to the action without the first element of the RPA. Also, the risk to leatherback sea turtles from the action during this initial three-year period will be higher, as the effectiveness of the required hook and bait combinations will not have been confirmed. Therefore, it is particularly important that mortality rates associated with the fishery not be allowed to exceed the targets laid out in the first element of the RPA.

The RPA requirements will ensure that total leatherback sea turtle *takes* do not exceed long-term average take rates, over three year periods. NOAA Fisheries may need to take additional management action to reduce leatherback *mortality* in the near-term (2004 - 2006), while the other elements of this RPA are being implemented and reaching full effectiveness. Because the impacts to leatherback sea turtles during the near-term are already expected to be greater than the future impacts, the BiOp requires careful monitoring of post-hooking survival, particularly during the next two-and-a-half years. If fleet-wide gear removal rates are not sufficient to meet the performance targets, the BiOp requires immediate action to offset the increased mortality rates and bring overall anticipated mortality back down to the level specified in the first element of the RPA.

Closure of the Gulf of Mexico to Pelagic Longline Fishing

The Gulf of Mexico fishing area in the second and third quarters (April-September) accounted for fully half of the estimated leatherback sea turtle bycatch in the longline fishery, based on 2002 observer data. The BiOp states that a large-scale closure of the Gulf of Mexico during that time will significantly reduce fishing effort – and thus sea turtle interactions – and likely not simply result in effort displacement. The effect of such a closure would be a 41% reduction in leatherback sea turtle interactions, annually, if there is no effort redistribution. Some redistribution of longline effort would likely occur, but the BiOp states that redistribution will likely be minimized under the large-area closure scenario. Many Gulf of Mexico-based vessels may convert to other fisheries or stay idle for a six-month closure.

If fleet-wide gear removal rates are not sufficient to meet the performance targets in Table 4.3, the BiOp requires immediate implementation of a closure for the entire Gulf of Mexico. The timing and duration of the closure must be sufficient to offset, through reduced interactions, the effects of the higher post-release mortality associated with the poor gear removal levels, and may be longer or shorter than the six-month closure discussed above.

The BiOp allows substitution of an alternative closure or closures to the required Gulf of Mexico closure, if analyses show that the alternative closure(s) would be equally effective at reducing leatherback sea turtle bycatch, after accounting for redistribution of fishing effort. NOAA Fisheries may consider whether alternative closure formulations would be more desirable because of reduced socioeconomic impacts, increased bycatch reduction of other species (e.g. loggerhead turtles, billfish, bluefin tuna, undersize target species), or other relevant factors.

Removal of Closure Requirement
The time-area closure(s) may be removed when data collected on gear removal and post-release survival show that fleet-wide interaction types and gear removal rates have met the post-release mortality targets. With successful implementation of the other elements of the RPA, those criteria should be met by early 2007. If they are not met, the closure(s) must remain in effect until they are.

Corrective Action to Achieve Post-Release Survival Targets
If the 2005 and 2006 targets (Table 4.3) are not achieved, in addition to the closure discussed above, the BiOp requires NOAA Fisheries to determine whether there are identifiable problems in training, compliance in the fishery, effectiveness of the circle hooks, or effectiveness of the gear removal tools and techniques. NOAA Fisheries must then take corrective action, as appropriate, to ensure that the long-term targets are successfully achieved.

4.3.3 Effect of the Reasonable and Prudent Alternative

As noted earlier, the RPA is designed to reduce the effects of the HMS pelagic longline fishery to a level where they are not likely to appreciably reduce the leatherback sea turtle's likelihood of surviving and recovering in the wild. The measures in the RPA will also necessarily affect the impacts of the action on loggerhead and other hardshell sea turtles, which were not found likely to be jeopardized by the action. This section briefly summarizes the effects of the action, as modified by the RPA, on all affected species of sea turtles.

The first element of the RPA provides measures to minimize post-release mortality over a two-and-a-half year period. The second element of the RPA requires improvements in the monitoring of the fishery's effects. The third element of the RPA requires further research on the required hook and bait types. The fourth element of the RPA requires that the long-term average take rates are not exceeded. The fourth element also requires careful monitoring of the progress the fishery makes towards maximum gear removal and conditionally requires the closure of the Gulf of Mexico area (or an equivalent alternative) for a period necessary to offset the mortality effects if the fishery does not meet the post-release mortality reduction targets. Table 4.4 summarizes the anticipated take levels and associated mortality based on implementation of the RPA and contrasts it with the mortality associated with the action without the RPA (shown in parentheses). Because the Gulf of Mexico closure is conditional, Table 4.4 does not reflect the effect of a closure in the take levels.

Table 4.4 Anticipated Triennial Incidental Takes and Mortality of Listed Species in the Pelagic Longline Fishery with Implementation of the RPA. Note: Total estimated mortality without the RPA is shown in parentheses. Source: NOAA Fisheries, 2004

Species	Time Period	Total Captures	Post-Release Mortality	Total Estimated Mortality
Leatherback	2004-2006	1981	32.8% in 2004, declining to 26.2% in 2005, declining to 19.6% in 2006	548 (662)
	2007-2009, 2010-2012...	1764	13.1%	252 (594)
Loggerhead	2004-2006	1869	40.3% in 1st & 2nd Qtrs 2004, declining to 20.2% in 2005, declining to 18.6% in 2006	438 (468)
	2007-2009, 2010-2012...	1905	17.0%	339 (429)
Other hardshell sea turtles	2004-2006	105	40.3% in 1st & 2nd Qtrs 2004, declining to 20.2% in 2005, declining to 18.6% in 2006	25 (25)
	2007-2009, 2010-2012...	105	17.0%	18 (21)

Leatherback sea turtles receive the greatest benefits from the RPA in reduced total mortality, both over time and compared to the proposed action. Over the long-term, the RPA reduces total estimated mortality by 58% for leatherback sea turtles. Long-term mortality is reduced by 21% for loggerhead sea turtles and by 15% for the other hardshell species. Because NOAA Fisheries determined that the mortality of slightly higher numbers of loggerhead, green, Kemp's ridley, hawksbill, and Olive ridley sea turtles is not likely to jeopardize the continued existence of those species, the same conclusion for the action under the RPA was reached.

The jeopardy analysis for leatherback sea turtles focused on the action's effects on females. The BiOp indicates that the effects on males would be the same as on females, with an assumed 50:50 sex ratio and no reason to believe that there is a sex-selectivity in pelagic longline captures of leatherback sea turtles. Female sea turtles were critical to the analysis, however, as their numbers are most measurable as nesters and their survival more directly affects the species' reproduction. The BiOp highlighted a number of concerns resulting from aspects of the species' biology, the impacted segments of the population, and the scientific uncertainty about the species' status, the species' life history, and the effectiveness of the hook and bait combinations in the proposed action.

With implementation of the first element of the RPA, continued prosecution of the longline fishery is expected to result in mortality of only 21 adult and 21 subadult females annually. This reduced level of mortality represents only 0.5% of the total leatherback sea turtle mortality from pelagic longline fleets in the Atlantic and the Mediterranean and less than 0.1% of the estimated adult female leatherback sea turtle population in the Atlantic. In addition, the second element of the RPA will ensure that the fishery's effects will not exceed the predicted take levels for three-year periods. The third element of the RPA further reduces the risk to leatherback sea turtle populations associated with the action by more definitively confirming the effects of hook and bait combinations and the implications of the sea turtle conservation rulemaking. The third element is also expected to have important conservation implications for sea turtles, beyond just the RPA, by improving the scientific and management arguments available to convince other nations – whose sea turtle impacts are much larger than the U.S. Atlantic HMS pelagic longline fleet's – to adopt hook and bait requirements for sea turtle conservation. The fourth element also provides an important check on the effectiveness of the first element by requiring that closures be implemented if the post-release survival gains are not achieved in a timely manner. The jeopardy analysis stated that one-year or short-term mortality – at the level of the action – would not have a noticeable population effect, but the Agency is aware that it would be part of a continuing action. Therefore, during the near-term period when mortality will be higher than the long-term target for the RPA, but below the level of the action without the RPA, the fourth element assures that mortality will be tightly controlled and not allowed to exceed the near-term targets. With the near-term risks controlled and long-term annual leatherback sea turtle mortality reduced to exceedingly low levels, compared to the overall mortality (half-a-percent of longline mortality in the basin) and the population's size (less than a tenth of a percent), the BiOp indicates that the anticipated effects of these losses will be below the threshold where they would produce a detectable change in Atlantic leatherback sea turtle populations. Taken together, the elements of the RPA are expected to reduce the threat posed by the U.S. Atlantic HMS pelagic longline fishery to leatherback sea turtles to a level where it is unlikely that the action would appreciably reduce the likelihood of the species' survival and recovery. Therefore, the BiOp concludes that – if all of the elements of this RPA are fully implemented – the long-term continued operation of the U.S. Atlantic pelagic longline fishery is not likely to jeopardize the continued existence of leatherback sea turtles.

4.3.4 Incidental Take Statement

Section 9 of the ESA and protective regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of the ITS.

Section 7(b)(4)c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under Section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided and no take is authorized. Nevertheless, the HMS Division must immediately (within 24 hours, if communication is possible) notify the NOAA Fisheries' Office of Protected Resources should a take of an endangered whale occur.

4.3.4.1 Amount or Extent of Take

The BiOp indicates that the levels of incidental take shown in Table 4.5 may be expected to occur as a result of the action and the implementation of the RPA. These numbers represent the total takes over three-year periods, beginning with 2004. Total annual takes in the fishery are estimated by the SEFSC based on their pelagic observer program, the NED research experiment results, and reported fishing effort. The reasonable and prudent measures specified in this ITS, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The BiOp requires immediate reinitiation of formal consultation, an explanation of the causes of the take exceedance, and review of the need for possible modification of the reasonable and prudent measures (50 CFR 402.16). The RPA contains specific requirements to prevent the incidental take levels from being exceeded, so take exceedance should only occur under exceptional circumstances.

Table 4.5 Anticipated Incidental Takes of Listed Species in the Pelagic Longline Fishery. Source: NOAA Fisheries, 2004

Species	Number Captured from 2004-2006	Number Captured each Subsequent 3-Year Period
Leatherback turtle	1981	1764
Loggerhead turtle	1869	1905
Green, Hawksbill, Kemp's ridley, and Olive Ridley turtle, in combination	105	105

4.3.4.2 Effect of the Take

The BiOp determined that the level of anticipated take specified in Table 4.5 is not likely to result in jeopardy to the green, hawksbill, Kemp's ridley, olive ridley, or loggerhead sea turtle. This level of take is also not likely to result in jeopardy to leatherback sea turtles when the RPA specified in Section 8 of the BiOp is enacted, and the following reasonable and prudent measures are fully implemented. The RPA reduces the level of mortality affecting captured sea turtles, improves monitoring and reporting, requires management action to avoid long-term elevations in sea turtle takes, and confirms the effectiveness of hook and bait combinations.

4.3.5 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires that, when an agency action is found to comply with Section 7(a)(2) of the ESA and the action may incidentally take individuals of listed species, NOAA Fisheries will issue a statement specifying the impact of any incidental taking. It also states that reasonable and prudent measures necessary to minimize impacts, and terms and conditions to implement those measures be provided and must be followed to minimize those impacts. Only incidental taking by the Federal agency or applicant that complies with the specified terms and conditions is authorized.

The reasonable and prudent measures and terms and conditions are specified as required by 50 CFR § 402.14 (i)(1)(ii) and (iv) to document the incidental take by the HMS pelagic longline fishery and to minimize the impact of that take on sea turtles. These measures and terms and conditions are non-discretionary, and must be implemented in order for the protection of Section 7(o)(2) to apply. There is a continuing duty to regulate the activity covered by this incidental take statement. If there is a failure to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or a failure to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of the incidental take, the BiOp requires reporting on the progress of the action and its impact on the species as specified in the incidental take statement [50 CFR 402.14(i)(3)].

NOAA Fisheries notes that the HMS pelagic longline fishery has been the subject of several previous biological opinions which have specified their own reasonable and prudent measures to monitor and minimize the impacts of incidental take. Most of those reasonable and prudent measures have been permanently implemented through regulations or as standard operating procedures. In addition, the purpose of the HMS Management Division's February 11, 2004, proposed rule is to reduce the bycatch rates and bycatch mortality of sea turtles in the pelagic longline fishery. Thus, the action already includes many measures to monitor and minimize the impact of the longline fishery's incidental take of sea turtles. Further, the RPA in this opinion contains additional sea turtle conservation measures, necessary to remove jeopardy to leatherback sea turtles, that also monitor and minimize the impact of the action's incidental take of sea turtles. The BiOp indicates that the following reasonable and prudent measures are necessary and appropriate to monitor and minimize the effect of take of listed species considered in this opinion:

a) Improve the understanding of leatherback sea turtle life history and population status and provide updated information to be used in management decisions.

b) Continue efforts to better understand sea turtle post-release mortality rates and the factors affecting these rates.

c) Take action to ensure improved compliance with safe handling and release gear required on board.

d) Improve the HMS pelagic longline fishery's compliance with vessel safety requirements to reduce the number of inadequate or unsafe vessels for purposes of carrying an observer and for allowing operation of normal observer function vessels in the fleet.

4.3.6 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the BiOp stipulates the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

a) *Convene an expert working group on leatherback sea turtles.* By December 31, 2004, NOAA Fisheries must select and assemble a group of population biologists, sea turtle scientists, life history specialists, and natural resource managers who are known experts on sea turtle conservation issues, especially for leatherback sea turtles. These experts may come from academic, government, industry, and/or non-profit organization backgrounds. This group will be charged with compiling the best, most up-to-date information on leatherback sea turtle life history, ecology, population status, and threats. The information is then to be synthesized and presented in a NOAA technical memorandum to be used as a reference on the ecology and status of leatherback sea turtles in the Atlantic and to provide information to be used in making sound management and conservation decisions.

b) *Leatherback research plan*. NOAA Fisheries must develop and implement a research plan to obtain the necessary demographic data to conduct stock assessment analysis and determine the status of the Atlantic leatherback sea turtle. These include, but are not limited to survivorship in each life history stage, age and growth, age and size at stage, age and size at maturity, fecundity and the associated variability of each, and recruitment and dispersal.

c) *Finalize post-release mortality criteria.* OPR must issue final post-release mortality criteria by December 31, 2004.

d) *Post-release mortality studies.* NOAA Fisheries must initiate a full study of post-hooking mortality of loggerheads based on the results of the pilot study conducted in the NED and begin a pilot study for leatherbacks. NOAA Fisheries has demonstrated the ability to capture control (fishery independent) and treatment (fishery dependent) loggerheads, and should now implement a full study in order to attain an appropriate sample size to compare survival between the two groups. A similar study should be initiated for leatherbacks as well. Results of these studies would refine post-hooking mortality estimates currently used by the OPR.

e) *Compliance with Safe Handling and Release Equipment On Board.* NOAA Fisheries must ensure NOAA Fisheries' Office of Law Enforcement (OLE), in cooperation with the U.S. Coast Guard and state law enforcement partners, receive training on the new safe handling and release equipment requirements and conduct dock-side and at-sea boardings that ensure that the gear is on board.

f) *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 for allowing operation of normal observer function. Such vessels are prohibited from fishing without observer coverage. NOAA Fisheries must establish procedures for those vessels and 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.

4.4 ENVIRONMENTAL JUSTICE CONCERNS

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on the activities of minority and low-income populations. In particular, the environmental effects of the regulations should not have a disproportionate effect on minority and low-income communities. The communities of Dulac, LA, and Fort Pierce, FL, have significant populations of Native Americans and Black-Americans respectively. These two communities also have significant populations of low-income residents. Additionally, there is a diffuse Vietnamese-American population in LA who actively participate in the pelagic longline fishery, and who commute to fishing ports, but do not live in "fishing communities" as defined by the MSA and identified in Chapter 9 of this document. None of the preferred alternatives are expected to have a disproportionate impact on these minority populations and low-income populations. See Chapter 9, infra, for further description of communities.

4.5 COASTAL ZONE MANAGEMENT CONCERNS

The Coastal Zone Management Act (CZMA, 1972, reauthorized 1996) requires that Federal actions be consistent to the extent practicable, with the enforceable policies of all state coastal zone management programs. NOAA Fisheries has determined that the preferred alternatives which seek to minimize protected species interactions with pelagic longline fishing gear and associated mortality will be implemented in a manner consistent to the maximum extent practicable with the enforceable policies of the coastal states in the Atlantic, Gulf of Mexico, and Caribbean that have federally approved coastal zone management programs. During the proposed rule stage, NOAA Fisheries asked for states' concurrence with this determination. As of June 2004, seven states had replied affirmatively regarding the consistency determination. NOAA Fisheries presumes that the remaining states also concur with the determination. NOAA Fisheries has worked closely with states in the past and will continue to work with the states to ensure consistency between state and Federal regulations.

4.6 CUMULATIVE IMPACTS

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and future activities or actions of Federal, non-Federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity. The goal of this section is to describe the cumulative ecological, economic and social impacts of past, present and reasonably foreseeable future actions with regard to the pelagic longline fishery.

Past, Present, and Reasonably Foreseeable Actions

In addition to this current rulemaking, which is intended to address the bycatch and bycatch mortality of threatened and endangered sea turtles in the Atlantic pelagic longline fishery, NOAA Fisheries has implemented rules in the past and expects to implement more in the future to address the management and conservation of target and non-target species in the HMS fisheries.

One of the primary goals of the 1985 Atlantic Swordfish FMP and the 1999 HMS FMP was to establish management measures intended to reduce overfishing and rebuild north Atlantic swordfish populations. Measures implemented to rebuild and manage the north Atlantic swordfish fisheries included, among other things, quotas, gear restrictions, retention and size limits, overharvest and underharvest adjustment authority, and permitting and reporting requirements, including a limited access system. The limited access system was intended to prevent overcapitalization and reduce latent effort in the fishery.

Since the HMS FMP, NOAA Fisheries has issued two FSEIS for final actions designed to reduce impacts on both target and non-target species. The first one, published in June 2000, analyzed time/area closures and gear restrictions, including live bait prohibitions and corrodible hook requirements, to reduce bycatch, bycatch mortality, and incidental catch in the pelagic longline fishery. The final actions were expected to have negative direct, indirect, and cumulative economic and social impacts for pelagic longline fishermen and were expected to have positive ecological impacts.

The second FSEIS, published in July 2002, implemented measures contained in the June 14, 2001, BiOp that addressed sea turtle bycatch and bycatch mortality in HMS fisheries. The final actions were expected to have positive ecological impacts. Certain measures, such as the NED closure, were expected to have negative direct, indirect, and cumulative economic and social impacts on pelagic longline fishermen. These effects, however, were mitigated in the short-term for vessels that were able participate in in the NED experiment. The rulemaking also implemented measures in the shark gillnet fishery. Although the management measures for the shark gillnet fishery (required net checks for sea turtles and other marine mammals at least every two hours and ceasing of fishing and notification to NOAA Fisheries if a whale is taken) were not anticipated to have any impacts on pelagic longline fishermen, they are expected to have some positive impact in regard to reductions in sea turtle mortality.

Other subsequent actions include the implementation of VMS requirements for pelagic longline vessels and mandatory cost earnings reporting. Reasonably foreseeable future actions include the development of final rules for proposed rules related to: an international trade permit and additional trade tracking requirements for swordfish, bigeye tuna, and bluefin tuna (69 Fed. Reg. 19147 (April 12, 2004)); chartering permits and import prohibitions (69 Fed. Reg. 25357 (May 6, 2004)); and implementation of ICCAT swordfish quotas (68 Fed. Reg. 36967 (June 20, 2003)). In addition, NOAA Fisheries is currently developing Amendment 2 to the HMS FMP and Amendment 2 to the Billfish FMP and may, in these amendments or in future rulemakings, consider additional bycatch reduction measures, quota allocations between directed, incidental, and recreational permit holders, changes to season openings and closings, permit streamlining, and additional species specific quotas.

Cumulative Ecological Impacts

The HMS FMP concluded that the cumulative long-term impacts of management measures implemented in the FMP would be to rebuild overfished fisheries; minimize bycatch and bycatch mortality, to the extent practicable; identify and protect essential fish habitat; and minimize adverse impacts of fisheries regulations on fishing communities, to the extent practicable. Subsequent to the HMS FMP, NOAA Fisheries has taken other actions, including those described above to promote the long-term sustainability of the HMS fisheries, in compliance with the MSA, ESA, ATCA, and other applicable law.

The HMS FMP and subsequent regulatory actions provide for domestic management and conservation measures for Atlantic swordfish, bigeye tuna, yellowfin tuna, albacore, and other HMS species. However, international efforts are necessary in order to rebuild these stocks. The United States has participated and will continue to participate at ICCAT to further international management of these species throughout their range. Currently, North Atlantic swordfish, although still overfished, are recovering, and are estimated to be at 94% of the biomass needed to produce MSY (Table 3.1). Atlantic bigeye tuna is overfished and overfishing is occurring. Recent stock assessment results indicate that the current biomass of Atlantic bigeye tuna is about 10 - 20 percent below the biomass corresponding to MSY and that current fishing mortality is about 15 percent higher than the rate that would achieve MSY. Atlantic yellowfin tuna are not overfished but overfishing may be occurring. The reported yellowfin tuna landings appear to be close to the MSY level and fishing effort and fishing mortality may be in excess of levels associated with MSY. North Atlantic albacore tuna are overfished and overfishing is occurring (Table 3.1). Recent analyses indicate that the current spawning stock biomass is about 30 percent below that associated with MSY. However, the United States is a minor harvesting nation with regard to Atlantic bigeye, yellowfin, and albacore tunas. For example, U.S. fishermen caught relatively small amounts of albacore from the North Atlantic stock/management unit (322 mt in 2001) and minor catches of South Atlantic albacore (2 mt in 2001) (NOAA Fisheries, 2003a).

In 2002, total estimated swordfish catch of U.S. vessels, including U.S. vessel landings and dead discards was 2,708.7 mt (NOAA Fisheries, 2003b). This represents a modest increase of 55.4 mt from 2001, but a 22.5 percent decrease from 2000. U.S. swordfish landings are monitored in-season from reports submitted by dealers, vessel owners and vessel operators, NOAA Fisheries port agents, and mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish. The U.S. pelagic longline fleet has historically accounted for a small percentage of total Atlantic HMS landings. Even when including U.S. discards for bluefin tuna, swordfish, blue marlin, white marlin, and sailfish, the U.S. accounts for approximately five to six percent of all pelagic longline landings reported to ICCAT.

For non-target species, which include a variety of finfish species and protected species such as sea turtles, NOAA Fisheries has undertaken rulemakings to implement bycatch reduction measures and reductions in overall fishing effort, including: a limited access permit regime, closed areas, gear restrictions, minimum size restrictions, and requirements to post handling and release guidelines for incidentally captured sea turtles and marine mammals. In addition, the VMS requirement for pelagic longline vessels will further assist NOAA Fisheries in enforcing time/area closures, and protecting vulnerable HMS life stages. Several time/area closures have been implemented as part of HMS fisheries to reduce discards, protect juvenile HMS, and to reduce bycatch of protected species. Currently, approximately 3 million square miles of ocean are closed to HMS fishing at various times of the year. In addition, NOAA Fisheries has undertaken the NED research experiment and engaged in other domestic and international efforts to address sea turtle bycatch as discussed in Section 11.2.

The suite of preferred alternatives in this action (A5 (b), A10 (b), and A16) are expected to have significant conservation benefits for protected sea turtles and other bycatch species consistent with the ESA, MSA, and other applicable law. Additional positive ecological impacts are anticipated from actions to be taken pursuant to the 2004 BiOp. See Section 4.1 for further information on the impacts of the preferred alternatives, and Section 4.3 for a summary of the 2004 BiOp. In addition, the successful implementation of bycatch and mortality reduction gears and techniques in the U.S. will facilitate the promotion and use of such gears and techniques by foreign vessels. Other alternatives analyzed also could have positive ecological impacts. As described in Section 4.1, implementing different hook and bait treatments could result in varying degrees of reductions in interactions and mortalities of sea turtles and other non-target species as well reductions or increases in target catches. Certain hook and bait requirements outside the NED (alternatives A2 - A5 (a)), when applied with certain NED requirements (alternatives A7 - A10 (a)) and/or time and area closures (alternatives A13 - A15), could result in significant positive ecological impacts for sea turtles, including interaction levels that may be lower than the suite of preferred alternatives.

Reasonably foreseeable future actions, noted above, would implement ICCAT recommendations. The international trade permit and trade tracking requirements, if finalized, would facilitate monitoring of swordfish, bigeye tuna, and bluefin tuna and help combat illegal, unreported, and unregulated fishing (IUU). The chartering permit final rule would allow for monitoring of fishing activities of U.S. vessels engaged in arrangements to fish in foreign waters, and also implement import sanctions for certain countries and species. ICCAT quotas for swordfish and other HMS species are negotiated as part of international rebuilding efforts. None of these actions are expected to have significant ecological impacts.

In summary, all of the above past, present, and reasonably foreseeable future actions are expected to have positive cumulative ecological impacts by allowing stocks to rebuild and reducing bycatch and bycatch mortality of protected and other non-target species.

Cumulative Economic and Social Impacts

The cumulative economic and social impact of actions taken since the 1985 Atlantic Swordfish FMP, and the 1999 HMS FMP has been to reduce the number of participants and overall latent effort in the pelagic longline fishery. By reducing the number of permitted vessels in the fishery, implementing bycatch reduction measures, expanding the list of prohibited shark species, and a variety of other commercial measures, the fishery has had to deal with regulatory impacts and adapt to economic changes.

In June 1984, vessels targeting swordfish by methods other than rod and reel were required to obtain permits from the Southeast Regional Office. In January 1985, 340 permit requests had been received. This number was presumed to be the total number of commercial swordfishing vessels operating in the management area. This number was believed to represent a decline since 1980. Despite the decrease in the number of vessels operating in the management area, it was believed that effort may have increased (SAFMC, 1985). With the implementation of the

HMS FMP in 1999, both the number of vessels and fishing effort were reduced. The limited access permit system reduced the number of swordfish permits to 303 (203 directed and 100 incidental) as of November, 2003. Because pelagic longline vessels must possess a tuna longline permit, a swordfish permit (directed or incidental), and a shark permit (directed or incidental), the maximum number of vessels currently eligible to participate in this fishery is 303. Recent analysis indicates that of these 303 vessels, only 148 reported landings in 2002 (See Chapter 6).

As a result of management actions, vessels that used to participate in the pelagic longline fishery may have moved to other fisheries, gone out of business, or experienced other adverse economic impacts. Average ex-vessel prices for swordfish, tunas, and sharks have remained fairly constant, and have not increased enough to offset potential declines in landings. The reasonably foreseeable future actions, noted above, would not likely have significant social or economic impacts. If finalized, the international trade and chartering permit final rules would impose additional reporting requirements and some potential costs associated with applying for permits. The final rule implementing ICCAT quotas for swordfish could have some positive economic benefit; however, current quotas have not been reached and effort is not expected to increase. None of these actions are expected to have significant adverse socio-economic impacts.

The preferred alternatives in this action (A5 (b), A10 (b), and A16), while they would not directly reduce the number of fishery participants, may have negative socio-economic impacts by altering traditional fishing practices and imposing additional costs associated with new gear requirements. However, this action is expected to have significant positive economic impacts for the portion of the fleet that may fish in the current NED closed area, and may have positive economic impacts elsewhere depending on the hooks and baits utilized and target species. As discussed in Section 4.1, in response to public comment, this action modifies the preferred alternatives from the DSEIS to mitigate for adverse economic impacts. The preferred alternatives, individually, and in aggregate, may reduce gear related costs over the long-term. Other alternatives for hook and bait requirements outside the NED (A2 - A5 (a)) and within the NED (A7 - A10 (a)) and for time/area closure alternatives (A13 - A15) could have significant negative socio-economic impacts if they alter fishing practices to the extent that vessels cannot effectively target species. All of the alternatives analyzed, including the preferred alternatives, would raise some administrative and enforcement costs, as discussed in Section 4.1, but no significant safety at sea concerns.

The overriding goal of HMS management has been to provide sustainable harvests that will provide the greatest economic benefits to the largest number of individuals. Some of the economic impacts experienced by the fishery are not solely the result of Federal actions. The year-round availability of imported HMS (See Section 3.2), fluctuating fuel prices, and consumer boycotts have likely contributed to economic impacts experienced by pelagic longline fishermen. In summary, while certain actions have resulted in negative socio-economic impacts, all of the above past, present, and reasonably foreseeable future actions are expected to ensure the long-term sustainability and continued economic viability of the pelagic longline fishery consistent with applicable law. Management and conservation measures promote the recovery and rebuilding of target species and protected resources, which provide for the continued operation of the fishery. As noted above, for this action, the preferred alternatives mitigate for potential socio-economic impacts to the extent practicable, consistent with the ESA, MSA, and other applicable law.

4.7 COMPARISON OF THE ALTERNATIVES

The ecological, social, and economic impacts compared in Table 4.6 are for the foreseeable short-term future. However, many of the potential short-term, adverse social and economic impacts associated with the alternatives could translate into positive long-term social and economic impacts as operating efficiency increases over time. This table presents a rough summary of impacts associated with each of the alternatives analyzed; however, there are competing impacts associated with many of the alternatives listed. As such, please reference the individual alternatives as analyzed in Chapters 4, 6, 7, and 8.

Table 4.6 **Impacts of Alternatives Considered**. The symbols +, -, and 0 refer to positive, negative, and zero impacts respectively. A combination of symbols (e.g. + +/- -) indicate variable impacts for different segments of the fishery. See preceding sections for details of impacts of each alternative.

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Bycatch and Bycatch Mortality Reduction Measures				
Alternative A1	Maintain existing hook and bait restrictions in the Atlantic pelagic longline fishery; maintain existing time/area closures in the Atlantic pelagic longline fishery; maintain existing possession and use requirements for bycatch mitigation gear (dipnets and line clippers), as well as sea turtle handling and release guidelines as currently specified by NOAA Fisheries. (No Action)	- - -	0	0
Alternative A2	Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.	+ + +	+ +/- - -	+ +/- - -

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Alternative A3	Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following hook and bait combinations: i) 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hooks and squid bait.	+ + +	+ +/- - -	+ +/- - -
Alternative A4	Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following hook and bait combinations: i)18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait; **OR** ii) 18/0 or larger non-offset circle hooks and squid bait; **OR** iii) 9/0 "J"-hooks with an offset not to exceed 25 degrees and whole mackerel bait.	+ +	+ +/- - -	+ +/- - -

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Alternative A5 (a)	Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees.	+ +	- -	- -
Alternative A5 (b)	*Limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks.* (*Preferred Alternative)*	+ +	+ +/- -	+ +/- -
Alternative A7	Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.	- -	+ + +/-	+ + +/-

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Alternative A8	Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait.	- -	+ +/- - -	+ +/- - -
Alternative A9	Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only one of the following hook and bait combinations: i) 9/0 "J"-hook with an offset not to exceed 25 degrees and whole mackerel bait; **OR** ii) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait.	- -	+ + +/-	+ + +/-

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Alternative A10 (a)	Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing and/or using only one of the following hook and bait combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees with whole mackerel bait; **OR** ii) 18/0 or larger non-offset (flat) circle hook with squid bait.	- -	+ + +/- - -	+ + +/- - -
Alternative A10 (b)	*Open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. (Preferred Alternative)*	- -	+ + +/ - - -	+ + +/- - -
Alternative A13	Prohibit the use of pelagic longline gear in HMS Fisheries in an area of the central Gulf of Mexico year-round (12 months).	- -	- -	- -

ALTERNATIVE		ECOLOGICAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
Alternative A14	Prohibit the use of pelagic longline gear in HMS fisheries in portions of the central Gulf of Mexico and the Northeast Coastal Statistical Reporting Area year-round (12 months).	+ + +	- - -	- - -
Alternative A15	Prohibit the use of pelagic longline gear in HMS fisheries in portions of the central Gulf of Mexico and the Northeast Coastal Statistical Reporting Area from May through October (6 months).	+ + +	- - -	- - -
Alternative A16	*Require vessels with pelagic longline gear onboard to possess or use dipnets and line clippers that meet newly revised design and performance standards, plus require these vessels to possess, maintain, and utilize additional sea turtle handling and release gear and comply with handling and release guidelines as specified by NOAA Fisheries. (Preferred Alternative)*	+	-	-

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5.0 MITIGATION AND UNAVOIDABLE IMPACTS

The preferred alternatives, as a suite of management measures, will have significant conservation benefits by reducing leatherback and loggerhead sea turtle mortality and reducing leatherback sea turtle interactions. Overall, NOAA Fisheries anticipates significant positive ecological impacts due to the reductions in mortalities of both species, especially as fishermen become more adept at using the release and disentanglement gears. While opening the NED to pelagic longline fishing (alternative A10 (b)) could increase sea turtle interactions as compared to the no action alternative, the gear restrictions under alternative A10 (b) are expected to reduce the incidental capture and mortality of sea turtles in regard to historical bycatch levels. The preferred alternatives could have adverse social and/or economic impacts. These alternatives would: limit vessels with pelagic longline gear onboard, at all times, to possessing and or using only specific hook and bait types in the NED, and non-NED areas; allow fishing in the NED subject to the hook and bait requirements; and require the possession and use of specific release and disentanglement gears.

5.1 MITIGATION MEASURES

As described in the previous chapters in this document, the expected impacts of the preferred alternatives may range from minor to substantial. Some of the preferred alternatives may help mitigate the impacts of other preferred alternatives while also meeting the objectives of this rulemaking, consistent with the ESA, the Magnuson-Stevens Act, and other applicable law. For example, any adverse ecological impact of allowing fishing in the NED is expected to be mitigated by gear modifications in the NED (alternative A10 (b)) and the other sectors of the fishery (alternative A5 (b)), as well as the required use of additional release and disentanglement gears (A16). Additionally, NOAA Fisheries attempted to mitigate the economic and social impacts as much as possible in designing the alternatives considered. For example, although preferred alternatives A5 (b) and A10 (b) limit pelagic longline fishermen to 16/0 or larger and 18/0 or larger circle hooks, they do allow for some choice in the possession and use of flat and offset hooks (up to 10 degrees) and in the use of baits. Alternatives A5 (b) and A10 (b) increase flexibility and may reduce the social and economic impacts identified for the hook and bait alternatives preferred in the DSEIS (A3 and A10 (a)). In addition, preferred alternative A16 would require the possession and use of release and disentanglement gear meeting specific design standards. The design standards allow for construction of some of the equipment, subject to NOAA Fisheries approval, from material that is readily available and using skills that most fishermen likely possess. Further, the design standards were developed in cooperation with the fishing industry during the NED research experiment. The use of these gears may not only result in positive ecological impacts but may also reduce fishing costs by retrieving hooks. The potential savings from the retrieval of hooks may help to mitigate any negative impacts resulting from the preferred hook and bait alternatives. Additionally, anticipated increases in vessel revenues, from increased swordfish catches (by weight), may potentially mitigate decreased revenues stemming from reduced tuna catches and other costs associated with purchase of gear required to comply with new management measures.

The June 1, 2004, BiOp identified the Reasonable and Prudent Alternative (RPA) necessary to avoid jeopardy for leatherback sea turtles, and listed the Reasonable and Prudent Measures and Terms and Conditions necessary to authorize continued take of Atlantic sea turtles as part of the pelagic longline ITS. The RPA includes: 1) maximization of pelagic longline gear removal to maximize post-release survival of incidentally-captured sea turtles; 2) improve the accuracy and timeliness of sea turtle reporting and analysis, and take corrective action to prevent long-term elevated mortality; and, 3) confirm the effectiveness of hook and bait combinations.

Additionally, each element of the RPA has several sub-components. These sub-components include: distribution of training materials that demonstrate careful release of sea turtles; establishment of a fishery outreach point of contact (POC); implementation of training workshops and a certification process; enhanced observer coverage; quarterly and annual monitoring of estimates; further research and evaluation of circle hooks; and, corrective action, if necessary, to ensure that the ITS is not exceeded and that the net mortality performance standards are achieved.

NOAA Fisheries will undertake additional rulemaking and non-regulatory actions, as required, to implement additional mitigation measures consistent with the 2004 BiOp. The June 1, 2004, BiOp is discussed further in Section 4.3.

5.2 UNAVOIDABLE ADVERSE IMPACTS

As described above, in aggregate, the preferred alternatives are expected to have positive ecological impacts on sea turtles and other incidentally caught species. For species that are overfished (e.g. North Atlantic swordfish, bigeye tuna), there could be potential increases in catches (by weight) resulting from the preferred hook and bait alternatives (A5 (b) and A10 (b)). However, such increases would only have negligible adverse ecological impacts given that the U.S. catches swordfish and non-bluefin tuna constitute a small percentage of international catches. Further, the U.S. has been well below its ICCAT quota for swordfish, so any potential increase in catches of that species are not expected to have a significant impact on rebuilding. Should catches of target species decrease under the preferred alternatives, minor adverse impacts may develop if fishermen increase effort to offset decreased catches; however these potential adverse ecological impacts are uncertain and may not actually be realized. The preferred alternatives may have adverse economic and/or social impacts. The reasons for selecting the preferred alternatives are outlined in the previous chapters of this document. The preferred alternatives, including those with adverse impacts, are necessary to reduce the incidental take and mortality of threatened and endangered Atlantic sea turtles associated with the operation of the Atlantic pelagic longline fishery. The preferred alternatives are consistent with the HMS FMP, the Magnuson-Stevens Act, the ESA, and other applicable law. In considering the alternatives, NOAA Fisheries preferred alternatives that would minimize the adverse impacts while maximizing the positive impacts. Thus, any resulting economic or social impacts are unavoidable.

5.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The preferred alternatives would not result in any irreversible and irretrievable commitment of resources. In aggregate, the preferred alternatives are expected to protect and conserve threatened and endangered Atlantic sea turtles in U.S. Atlantic fisheries consistent with the ESA. These alternatives are also expected to reduce the bycatch mortality of target and other non-target species consistent with the MSA, ATCA, and other applicable law.

<u>References Cited in Chapter 5</u>

No references cited.

6.0 ECONOMIC EVALUATION

This section assesses the economic impacts of the alternatives presented in this document. Additional economic and social considerations and information are discussed in Chapters 4, 7, 8, and 9 of this document and Chapter 5 of the annual SAFE report.

6.1 NUMBER OF FISHING AND DEALER PERMIT HOLDERS

6.1.1 Number of Commercial Permit Holders and Dealers

The HMS FMP established six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. To reduce bycatch concerns in the pelagic longline fishery, these permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a swordfish (directed or incidental, not handgear) and a shark permit. Swordfish handgear and shark permits are valid without another limited access permit.

As of November 2003, approximately 235 tuna longline vessel permits had been issued. In addition, approximately 203 directed swordfish limited access permits, 100 incidental swordfish limited access permits, 249 directed shark limited access permits, and 357 incidental shark limited access permits had been issued. Excluding swordfish handgear limited access permits, the total number of HMS limited access permits, as of November 2003, are provided in Table 6.1.

Table 6.1 HMS Limited Access Permits as of November, 2003. Source: NOAA Fisheries permit database

Permit	Number Issued
Tuna Longline	235
Swordfish (Directed & Incidental)	303
Shark (Directed & Incidental)	606

Because pelagic longline vessels must possess a Tuna Longline permit, a Swordfish permit (directed or incidental), and a Shark permit (directed or incidental) to be considered valid, the maximum number of vessels potentially affected by this action is 303 (*e.g*. the number of limited access swordfish permits issued). Since 1999, the number of valid limited access Swordfish permits has decreased by approximately 33 percent, the number of Tuna longline permits has declined by approximately 48 percent, and the number of Shark limited access permits has declined by approximately 31 percent. The decrease in the number of permit holders may be attributable to a variety of reasons. For a description of possible reasons, please see Chapter 9 of the 2003 SAFE Report (NOAA Fisheries 2003).

The addresses of limited access swordfish permit holders range from Texas through Maine, with Florida (105), New Jersey (49), Louisiana (42), New York (21), North Carolina (19), Massachusetts (14), and Texas (13) representing the states with the most permitted swordfish limited access vessels, as of October 2003.

Not all valid and permitted HMS longline vessels actually report fishing with pelagic longline gear in the logbooks (considered "active"). In 2002, 148 vessels reported pelagic longline activity in the pelagic logbook. Table 6.2 lists the number of active pelagic longline vessels from 1990 to 2002. The number of active vessels has been decreasing since 1994.

Table 6.2 **The Number of Vessels that Reported Fishing with Pelagic Longline Gear in the Pelagic Logbook.** Source: Pelagic Logbook data.

Year	Number of active vessels	Year	Number of active vessels
1990	416	1997	350
1991	333	1998	268
1992	337	1999	224
1993	434	2000	199
1994	501	2001	161
1995	489	2002	148
1996	367	-	-

In general, the number of vessels reporting fishing in each area has also been decreasing. In 2002, most vessels fished, at least part of the year, in the Gulf of Mexico, the mid-Atlantic Bight, and the South Atlantic Bight (Table 6.3). Since 1997, the number of vessels reporting fishing in the NED has ranged from 22 to 9 vessels, with an average of 14 vessels.

Table 6.3 **The Number of Vessels that Reported Fishing with Pelagic Longline Gear by Area.** Source: Pelagic Logbook data. Note: Vessels that fish in more than one area during the year are counted in both areas. CAR: Caribbean, GOM: Gulf of Mexico, FEC: Florida east coast, SAB: South Atlantic Bight, MAB: mid-Atlantic Bight, NEC: Northeast Coastal, NED: Northeast Distant, SAR: Sargasso, NCA: North Central Atlantic, TUN: tuna north, TUS: tuna south

Area	1997	1998	1999	2000	2001	2002	Total
CAR	45	30	18	18	19	12	142
GOM	118	98	89	79	79	68	531
FEC	73	69	53	52	43	28	318
SAB	67	53	45	46	45	39	295

MAB	81	64	68	59	60	58	390
NEC	57	40	39	36	40	34	246
NED	22	15	10	13	9	15	84
SAR	11	9	4	5	4	9	42
NCA	24	12	9	6	8	6	65
TUN	21	12	9	5	8	7	62
TUS	21	11	8	3	3	5	51
Total	540	413	352	322	318	281	2,226

As of October 2002, there were 321 dealers permitted to buy Atlantic swordfish, 479 dealers permitted to buy Atlantic tunas, and 267 dealers permitted to buy Atlantic sharks. Dealer addresses ranged from Texas through Maine, with Florida, Massachusetts, New York, New Jersey, North Carolina, and Louisiana having the most permitted dealers. Because many dealers possess more than one permit, the number of potentially impacted small entities is expected to be approximately 500, but could range from 479 to as many as 1067 dealers. NOAA Fisheries believes that all permit holders and related businesses (e.g. bait shops, gear manufacturers, gear distributors, processors, exporters) could experience a range of ecological, economic, and social impacts because of the alternatives described in this document. These impacts are described in Chapter 4 of this document. Additional economic information is provided in this section.

6.2 GROSS REVENUES OF PELAGIC LONGLINE VESSELS

Gross revenues of pelagic longline vessels vary greatly depending upon fishing location, target species, species availability, and unique characteristics of a vessel's fishing trips. In recent years, several analyses have been conducted to examine average annual gross revenues of pelagic longline vessels targeting HMS (Porter *et al.*, 2001; NOAA Fisheries, 2000; and, NOAA Fisheries, 2002). These studies indicate average annual vessel gross revenues ranging from $113,173.00 (NOAA Fisheries, 2000) to $250,000.00 (Porter *et al.*, 2001). These studies confirm that annual and trip-specific gross revenues are highly variable among vessels, probably due to the diversity of the pelagic longline fleet. Other factors contributing to the wide variability of average annual gross revenue estimates include changes in the number of permitted vessels and changes in ex-vessel prices. In general, swordfish, yellowfin tuna, and bigeye tuna contribute the most revenue, among HMS species, to pelagic longline vessels. One study also found that sandbar sharks are an important source of revenue (Larkin *et al.*, 2000).

Using numbers of fish landed as reported in 2002 pelagic longline logbooks (Table 6.4) and the average weight per fish (Table 6.5), NOAA Fisheries calculated 2002 landings, by weight (Table 6.6). Then, using 2002 ex-vessel prices for Atlantic HMS (Table 6.7), NOAA Fisheries calculated the annual overall gross revenue of the pelagic longline fleet. The annual gross revenue estimate was then divided by the 148 active vessels reporting landings to derive an average annual gross revenue per vessel. These calculations indicate an overall 2002 annual gross revenue estimate for the pelagic longline fleet of approximately 26.4 million dollars (Table 6.8). The average pelagic longline vessel is estimated to produce annual gross revenues of approximately $178,618.58 in 2002. This value is a fleet-wide estimate for all Atlantic HMS vessels reporting landings. Please note that updated 2002 ex-vessel prices were utilized in this FSEIS. Because the updated prices were lower than those previously reported in the DSEIS, the average annual gross vessel revenue is lower.

Most HMS revenues were derived from landings of swordfish (11.4 million dollars), yellowfin tuna (10.6 million dollars), and bigeye tuna (3.1 million dollars). Five statistical regions accounted for over 80 percent of HMS landings revenue: the Gulf of Mexico (41.37%); the Mid-Atlantic Bight (14.25%); the Northeast Distant area (10.07%); the Northeast Coastal area (8.33%); and, the South Atlantic Bight (8.24%).

Table 6.4 **2002 PLL Landings (numbers of fish) by Statistical Region.** Source: Pelagic Longline Logbook data maintained by the Southeast Fisheries Science Center. CAR: Caribbean, GOM: Gulf of Mexico, FEC: Florida east coast, SAB: South Atlantic Bight, MAB: mid-Atlantic Bight, NEC: Northeast Coastal, NED: Northeast Distant, SAR: Sargasso, NCA: North Central Atlantic, TUN: tuna north, TUS: tuna south

	SWO	BFT	Pel	LCS	BET	YFT	ALB	SKJ
CAR	4084	0	24	1	262	154	66	0
FEC	3344	16	73	29	3259	1550	946	0
GOM	8356	101	112	148	715	44207	239	57
MAB	6064	8	1914	2318	3890	7441	3159	13
NCA	2724	1	38	0	822	386	563	0
NEC	4612	10	417	13	1225	3429	1000	0
NED	8649	34	240	0	1173	19	282	0
OTH	47	0	3	0	1	36	0	0
SAB	8488	1	106	1567	40	1599	42	0
SAR	1236	7	18	1	336	81	229	0
TUN	761	0	37	0	1490	277	220	0
TUS	995	0	15	0	618	249	29	0

Table 6.5 **The 1998 Average Ex-vessel Weight (lb dw) Used to Estimate 2002 Landings by Weight.** Data reported to the Southeast Fisheries Science Center

Species	Avg Weight (lb dw)
Swordfish	71.77
Bluefin Tuna	606.69
Yellowfin Tuna	60.29
Bigeye Tuna	67.64
Other Tunas	31.06
Large Coastal Sharks	40.36
Other Sharks	90.82
Other Fish	24.58

Table 6.6 **2002 PLL Landings (lbs dw) by Statistical Region.** Source: Pelagic Longline Logbook data maintained by the Southeast Fisheries Science Center. CAR: Caribbean, GOM: Gulf of Mexico, FEC: Florida east coast, SAB: South Atlantic Bight, MAB: mid-Atlantic Bight, NEC: Northeast Coastal, NED: Northeast Distant, SAR: Sargasso, NCA: North Central Atlantic, TUN: tuna north, TUS: tuna south

	SWO	BFT	Pelagic Sharks	LCS	BET	YFT	ALB	SKJ	Total
CAR	293,109	0	2,180	40	17,722	9,285	2,050	0	324,386
FEC	239,999	9,707	6,630	1,170	220,439	93,449	29,383	0	600,777
GOM	599,710	61,276	10,172	5,973	48,363	2,665,240	7,423	1,770	3,399,927
MAB	435,213	4,854	173,829	93,554	263,120	448,618	98,119	404	1,517,711
NCA	195,501	607	3,451	0	55,600	23,272	17,487	0	295,918
NEC	331,003	6067	37,872	525	82,859	206,734	31,060	0	696,120
NED	620,739	20,627	21,797	0	79,342	1,146	8,759	0	752,410
OTH	3,373	0	272	0	68	2,170	0	0	5,883
SAB	609,184	607	9,627	63,244	2,706	96,404	1,305	0	783,077
SAR	88,708	4,247	1,635	40	22,727	4,883	7,113	0	129,353
TUN	54,617	0	3,360	0	100,784	16,700	6,833	0	182,294
TUS	71,411	0	1,362	0	41,801	15,012	901	0	130,487
Total	3,542,567	107,992	272,187	164,546	935,531	3,582,913	210,433	2,174	8,818,343

Table 6.7 **Average Ex-vessel Prices per lb dw for Atlantic HMS in 2002.** Source: NOAA Fisheries, 2004; Dealer weigh-out slips from the Southeast Fisheries Science Center and Northeast Fisheries Science Center, and bluefin tuna dealer reports from the Northeast Regional Office.

Species	Average for Gulf of Mexico only	Average for S. Atlantic region only	Average for Mid-Atlantic region only	Average for N. Atlantic region only
Bigeye tuna	$4.33	$2.45	$3.81	$4.02
Bluefin tuna	$5.56	$3.77	$4.70	$7.30
Yellowfin tuna	$3.23	$1.73	$2.02	$2.90
Other tunas	$0.84	$0.49	$0.73	$1.17
Swordfish	$2.91	$3.14	$3.24	$3.47
Large coastal sharks	$0.35	$1.27	$1.56	$0.79
Pelagic sharks	$1.11	$0.66	$1.17	$1.00
Small coastal sharks	$0.48	$0.53	$0.48	$0.58
Shark fins	$22.64	$17.09	-	-

Table 6.8 **2002 Gross Revenues ($) by Statistical Region.** Source: Landings to derive dollar values are from the Pelagic Longline Logbook data maintained by the Southeast Fisheries Science Center. CAR: Caribbean, GOM: Gulf of Mexico, FEC: Florida east coast, SAB: South Atlantic Bight, MAB: mid-Atlantic Bight, NEC: Northeast Coastal, NED: Northeast Distant, SAR: Sargasso, NCA: North Central Atlantic, TUN: tuna north, TUS: tuna south

	SWO	BFT	Pelagic Sharks	LCS	BET	YFT	ALB	SKJ	Total
CAR	921,008	0	1,450	50	43,492	16,078	1,011	0	983,089
FEC	754,125	36,624	4,409	1,490	540,985	161,821	14,490	0	1,513,944
GOM	1,746,861	340,811	11,315	2,124	209,647	8,619,240	6,214	873	10,937,086
MAB	1,412,446	22,822	203,333	145,909	1,004,805	905,468	72,014	200	3,766,997
NCA	614,304	2,290	2,296	0	136,450	40,299	8,623	0	804,261
NEC	1,150,159	44,351	37,785	404	333,547	599,813	36,331	0	2,202,360
NED	2,156,925	150,681	21,747	0	319,369	3,324	10,245	0	2,662,292
OTH	10,599	0	181	0	167	3,758	0	0	14,705
SAB	1,914,179	2,290	6,404	80,506	6,640	166,938	643	0	2,177,600

SAR	278,738	16,024	1,087	50	55,775	8,455	3,508	0	363,639
TUN	189,782	0	3,352	0	405,679	48,453	7,993	0	655,259
TUS	224,388	0	906	0	102,585	25,995	444	0	354,318
Total	11,373,514	615,863	294,265	230,533	3,159,141	10,599,643	161,517	1,072	26,435,550

6.3 VARIABLE COSTS AND NET REVENUES OF PELAGIC LONGLINE FISHING

In 2003, NOAA Fisheries initiated mandatory cost earnings reporting for selected vessels to improve the economic data available for all HMS fisheries. Currently, however, there are little additional data or new reports regarding fishing costs and revenues. Most of the studies regarding pelagic longline variable costs and net revenues available to NOAA Fisheries analyze data from 1996 and 1997, which remain the best available estimates on the potential costs of pelagic longline fishing. Where noted, NOAA Fisheries has converted 1996 and 1997 dollars to 2002 dollars using the consumer price index on-line inflation calculator provided by the Bureau of Labor Statistics (http://www.bls.gov/cpi/home.htm).

Larkin *et al.* (2000) examined 1996 logbooks and the 1996 voluntary economic forms and found that net returns to a vessel owner varied substantially depending on the vessel size and the fishing behavior (i.e. sets per trip, fishing location, season, target species). They found that out of 3,255 pelagic longline trips reported in 1996, 642 pelagic longline trips provided the voluntary economic information. Larkin *et al*. (2000) suggest using median values (half of the fleet is less than this value and half is above) instead of mean values (the average of all vessels) given the high degree of skewness to the data. For example, the mean owner's share of a trip is $4,412 while the median is $2,242. Larkin *et al*. (2000) suggest that the median values identify the characteristics of the majority of the fleet better than the mean, which can be influenced by outliers (a few vessels that may not be similar to the rest of the fleet). The mean supply costs per trip for the vessels sampled was $5,959 and median was $3,666 (Table 6.9). This changed depending on area fished with the median ranging from $1,928 in the area between North Carolina and the east coast of Florida (FEC to MAB) and $10,100 in the Caribbean. Vessels in the NED area (Maine to Virginia region in Larkin *et al*. (2000)) had a median supply cost per trip of $2,831 or $3,246 in 2002 dollars. For the entire fleet, Larkin *et al*. (2000) found that the average net revenues per vessel per trip was $7,354 ($8,432 in 2002 dollars). Vessels fishing in the Caribbean and Maine to Virginia areas had the largest average net returns to the vessel owner per trip at $12,188 and $6,672, respectively ($13,975 and $7,650, respectively, in 2002 dollars). Generally, Larkin *et al*. (2000) found that vessels that were between 46 and 64 feet in length, had between 10 and 21 sets per trip, fished in the second quarter, fished in the Caribbean, or had more than 75 percent of their gross revenues from swordfish had the highest net return to the owner (ranging from $3,187 to $13,097 per trip) while vessels that were less than 45 feet in length, had between one and three sets per trip, fished in the first quarter, fished between North Carolina and Miami, FL, or had between 25 and 50 percent of their gross revenues from swordfish had the lowest net return to the owner (ranging from $642 to $1,885 per trip).

Table 6.9 **The Cost-earnings Characteristics of 1996 Pelagic Longline Trips.** Source: Larkin *et al*. 2000. Note: Numbers in the table are in 1996 dollars and denote the median not the mean, unless otherwise noted.

Variable	All trips	Region			
		ME to VA	NC to FL	TX to FL	Caribbean
Number of trips	642	86	189	319	47
Number of crew	4	3	2	4	4
Total Gross Revenues	$8,916	$7,060	$4,826	$9,387	$26,227
Fuel costs	$1,031	$753	$410	$1,266	$1,970
Bait costs	$960	$965	$590	$1,000	$2,705
Ice costs	$256	$185	$150	$330	$300
Light sticks	$360	$94	$198	$597	$1,295
Miscellaneous costs	$305	$171	$42	$821	$1,560
Total costs	$3,666	$2,831	$1,928	$5,230	$10,100
Net return to owner	$2,242	$2,671	$1,740	$2,022	$8,020
Mean net return to owner	$4,412	$6,672	$3,679	$3,099	$12,188

Porter *et al*. (2001) conducted a survey of 147 vessels along the Atlantic and Gulf of Mexico (110 surveys were completed) in 1998 regarding 1997 operations. Survey information was combined with trip tickets and logbook data. They found that on average, vessels received approximately $250,000 annual gross revenues, annual variable costs were approximately $190,000, and annual fixed costs were approximately $50,000. Thus, vessels were left with approximately $8,000 to cover depreciation on the vessel and the vessel owner lost approximately $3,500 per year. On a per trip level, gross revenues averaged $22,000 and trip expenses, including labor, were $16,000. Labor cost the owner the most (43 percent), followed by gear. Generally trip returns were divided so the vessel owner received 43 percent and the captain and crew 57%. Porter *et al*. (2001) noted that 1997 was probably a financially poor year due to a reduction in swordfish quota and a subsequent closure of the fishery (this fishery has not been closed since). Similar to Larkin *et al*. (2000), Porter *et al*. (2001) noted differences between region, vessel size, and target species. While all vessels had an average net return per trip of $5,556 ($6,228 in 2002 dollars), vessels that fished in the New England or Caribbean regions had much higher net returns per trip at $20,772 and $18,940, respectively ($23,283 and $21,229, respectively in 2002 dollars) (Table 6.10).

Table 6.10 **Cost-earnings Characteristics of an Average 1997 Pelagic Longline Trip.** Source: Porter *et al*., 2001. Note: Numbers in the table are in 1997 dollars and denote the mean.

Variable	All vessels	Region				
		New England	Mid-Atlantic	South Atlantic	Gulf of Mexico	Caribbean
Length of trip	13	36	12	8	14	28
Gross revenues	$22,364	$81,569	$20,151	$11,242	$16,437	$67,440
Fuel costs	$2,071	$9,209	$2,154	$717	$1,703	$5,601
Ice costs	$297	$378	$252	$191	$469	$372
Bait costs	$1,559	$4,779	$1,488	$882	$1,406	$3,771
Light sticks	$738	$3,129	$635	$392	$490	$2,164
Food costs	$897	$2,943	$817	$438	$881	$2,270
Gear costs	$2,336	$6,800	$2,147	$1,381	$2,067	$5,808
Other costs	$442	$1,687	$414	$206	$342	$1,293
Total variable costs (not labor)	$9,634	$34,725	$8,839	$5,007	$7,867	$25,880
Total labor costs	$7,173	$26,071	$6,558	$3,670	$4,727	$22,620
Net return	$5,556	$20,772	$4,753	$2,565	$3,843	$18,940

In general, both Larkin *et al*. (2000) and Porter *et al*. (2001) found that the average net return to a vessel is fairly low after all variable costs including labor were accounted for. This was true even of vessels fishing in the northeast region or Caribbean (i.e., regions with relatively high gross revenues). This corresponds with the results of Ward and Hanson (1999) who found that fifty percent of the fleet earns $10,000 or less annually and that each year 20 percent of the fleet actually has a loss. Additionally, as suggested by Larkin *et al*. (2000) in their discussion of mean versus median values, Ward and Hanson (1999) found there were a number of vessels that earned much higher net revenues than the average vessel with 19 percent of the fleet earning $50,000 or more annually and 7 percent earning more than $100,000 annually.

6.4 EXPECTED ECONOMIC IMPACTS OF THE ALTERNATIVES

6.4.1. Expected Economic Impacts of Bycatch and Bycatch Mitigation Measures

NOAA Fisheries analyzed 13 alternatives to reduce bycatch and bycatch mortality of Atlantic sea turtles in the pelagic longline fishery.

Alternative A1 (no action), would maintain existing hook and bait restrictions and time/area closures in the Atlantic pelagic longline fishery; current possession and use requirements for bycatch mitigation gear (dipnets and line clippers), as well as sea turtle handling and release guidelines as currently specified by NOAA Fisheries; and current hook and bait restrictions, including a live bait prohibition in the western Gulf of Mexico. As such, no significant economic impacts would be expected relative to the status quo of the fishery. However, the NED experiment provided positive economic benefits to vessels and shore-side businesses during its three year span that helped to offset the adverse economic impacts of the NED closure. With termination of the experiment on Dec. 15, 2003, the full economic effect of the NED closure will be felt. While not the status quo under a strict interpretation of the term, if the loss of income derived from the NED experiment over the past three years is factored in, vessels and dependent shore-side businesses would likely experience a moderate adverse economic impact. Also, significant, unquantifiable adverse economic impacts could result if no action is taken to address sea turtle bycatch consistent with the ESA.

Alternatives A2 through A5 (b) identify allowable hook and bait combinations in the pelagic longline fishery in all areas outside of the NED. The estimated economic impacts of the hook and bait alternatives can be seen in Table 6.11. These alternatives may result in a range of impacts from substantial positive or negative economic impacts, depending on the hook and bait combination and target species selected by fishermen. Specifically, fishermen may see substantial additional revenues from increased swordfish and tuna catches, by weight, or substantial losses to gross vessel revenues stemming from decreased swordfish and tuna catches, by weight.

Alternatives A7 through A10 (b) re-open the NED to fishing if certain hook and bait combinations are used in this area. The estimated economic impacts of the hook and bait alternatives can be seen in Table 6.11. These alternatives would likely result in increased positive economic impacts, as the NED is currently closed to all pelagic longline fishing. Further, alternatives A7 - A10 (b) would likely result in additional positive economic impacts when viewed from an historical perspective, as these hook and bait combinations have been demonstrated to increase swordfish catches and fishermen typically target swordfish in this area. As discussed in Section 4.1, under alternatives A7, A9, A10 (a), and A10 (b), additional revenues from increased swordfish catches by weight in the NED are projected to more than off-set revenue losses from decreased weight of tuna catches. While alternative A8 would likely be associated with increased swordfish revenues, these increases are not projected to offset lost tuna revenues.

All of the hook and bait alternatives (A2 through A10 (b)) would likely have an initial adverse economic impact as most fishermen may have to purchase new hooks to comply with new regulations; however, these costs would likely be offset in the long run because circle hooks tend to be less expensive than traditional “J”-hooks. Fishermen may also be positively or negatively affected by new bait requirements, depending on fluctuations in bait prices. There may also be a small short-term unquantifiable lost opportunity cost as fishermen learn to maximize efficiency with the new hook and bait types. Please refer to section 4.1 for additional detail on economic impacts of these alternatives.

Alternative A13 would prohibit the use of pelagic longline gear by U.S. flagged vessels targeting HMS in the EEZ in a portion of the central Gulf of Mexico, and would likely have negative economic impacts on most commercial fishermen, communities, buyers, and dealers. Analyses indicate that with redistribution of effort, swordfish and bigeye tuna catches may increase by as much as 17 and 32 percent, respectively, in terms of numbers of fish. Yellowfin tuna catches would likely decrease by approximately 2 percent.

Alternative A14 would prohibit the use of pelagic longline pelagic longline gear in HMS fisheries in portions of the central GOM and the NEC areas year-round, and would likely have substantial negative economic impact on most commercial fishermen who fish in these areas, fishing communities, buyers, and dealers. Analyses indicate that with redistribution of effort, swordfish and bigeye tuna catches may increase by as much as 18 and 33 percent, respectively, in terms of numbers of fish. Yellowfin tuna catches would likely decrease by approximately 2 percent.

Alternative A15 would prohibit the use of pelagic longline gear in HMS fisheries in portions of the central Gulf of Mexico and the Northeast Coastal statistical reporting areas annually from May through October (inclusive), and would likely have negative economic impacts on most commercial fishermen who fish in these areas, fishing communities, buyers, and dealers. Analyses indicate that with redistribution of effort swordfish, yellowfin tuna, and bigeye tuna catches would likely increase by 5, 3, and 17 percent, respectively, in terms of numbers of fish.

As the size of fish caught within and outside the above discussed closures were not known at the time of this rulemaking, it is unclear if the increases in swordfish and tuna catches under alternatives A13 - A15 would result in positive or negative economic impacts. Displaced fishermen may have increased fuel, bait, ice, and crew costs under these alternatives if trips were extended to reach other open fishing grounds. Displacing fishermen to new fishing grounds may also result in a shift of ports selected for off-loading. This shift would have negative economic impacts for those ports and communities that lost business as a result of new port selection, but these adverse impacts would likely be mitigated by positive impacts in communities that may gain business. Please refer to Section 4.1 for additional discussion on the economic impacts of these time and area closure alternatives.

Alternative A16 would require the possession and use of certain bycatch mortality mitigation gear and would likely have an initial slight adverse economic impact, due to the purchase of required equipment. This minor initial impact may be magnified if removal of fishing gear from incidentally caught animals slows fishing operations. Alternatively, this minor initial impact may be mitigated if an increase in efficiency results from the use of dehooking and disentanglement gears. Please refer to section 4.1 for additional detail on economic impacts of this alternative.

6.4.2 Expected Economic Impact of the Preferred Alternatives

The economic impacts of the preferred bycatch and bycatch mortality reduction alternatives (A5 (b), A10 (b), and A16) when combined could result in either positive or negative economic impacts to the fishery as a whole, many of which could be substantial for small entities/vessel owners. This is especially true of alternatives A5 (b) and A10 (b), depending on the hook and bait combination and target species selected by fishermen. Although negative economic impacts could result, NOAA Fisheries anticipates that fishermen will select and utilize hook and bait combinations that will maximize their economic returns. As compared to other alternatives considered, including multiple large-scale time and area closures, alternatives A5 (b) and A10 (b) mitigate undesirable or greater economic impacts by providing fishermen with the ability to continue fishing year-round. The preferred alternatives further attempt to mitigate possible economic impacts by providing flexibility to select, possess, and employ specific hooks and baits, effective at capturing a variety of target species (depending upon availability or market conditions) during a trip. As previously stated, alternative A16 would have relatively minor short-term adverse economic impacts stemming from equipment purchases. Adverse economic impacts stemming from the initial compliance costs would likely be mitigated by potential long-term gains in hook retention and increases operating efficiency. However, if fishing efficiency is lost due to a slowing of fishing operations, potential gains may be smaller than anticipated or not realized.

Table 6.11 Estimated Economic Impacts of Hook and Bait Alternatives.

Alternative	Base Line 2002 Estimated Mean Gross Vessel Revenues (GVR)	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to SWO Landings	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to TUNA Landings	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to SWO and TUNA landings for Vessels Embarking on Mixed SWO/TUNA Target Trips
A1	$178,619	–	–	–
A2	$178,619	+3.57% to +11.72% (+$6,384 to +$20,941)	-47.93% to -51.74% (-$85,610 to $-92,422)	-36.20% to -48.17% ($-64,668 to -$86,037)
A3 Option i	$178,619	+3.57% to +11.72% (+$6,384 to +$20,941)	-47.93% to -51.74% (-$85,610 to $-92,422)	-36.20% to -48.17% ($-64,668 to -$86,037)
Option ii	$178,619	-11.06% to -12.63% ($-19,764 to -$22,561)	+11.95% to +17.25% (+$21,344 to +$30,814)	-0.68% to +6.19% (-$1,217 to +$11,050)
A4 Option i	$178,619	+3.57% to +13.01% (+$6,384 to +$20,941)	-47.93% to -51.74% (-$85,610 to $-92,422)	-36.20% to -48.17% ($-64,668 to -$86,037)
Option ii	$178,619	-11.06% to -12.63% ($-19,764 to -$22,561)	+11.95% to +17.25% (+$21,344 to +$30,814)	-0.68% to +6.19% (-$1,217 to +$11,050)
Option iii	$178,619	+24.58% (+$43,905)	-53.28% (-$95,164)	-28.70% (-$51,259)
A5 (a)	$178,619	-3.88 to -7.75% (-$6,925 to -$13,850)	No Change	-3.87 to -7.75% (-$6,925 to -$13,850)
A5 (b)	$178,619	-3.88 to -7.75% (-$6,925 to -$13,850)	No Change	-3.87 to -7.75% (-$6,925 to -$13,850)
A7	$178,619	+8.13% to +26.65% (+$14,515 to +$47,608)	-9.15% to -9.88% (-$16,342 to -$17,642)	-1.75% to +17.50% (-$3,127 to +$31,266)
A8	$178,619	+5.11% (+$9,131)	-10.47% (-$18,701)	-5.36% (-$9,569)
A9 Option i	$178,619	+55.88 (+$99,814)	-10.17% (-$18,166)	+45.71% (+$81,648)

Alternative	Base Line 2002 Estimated Mean Gross Vessel Revenues (GVR)	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to SWO Landings	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to TUNA Landings	Estimated Change in GVR Resulting From Estimated Changes in Revenues Attributable to SWO and TUNA landings for Vessels Embarking on Mixed SWO/TUNA Target Trips
Option ii	$178,619	+8.13% to +26.65% (+$14,515 to +$47,608)	-9.15% to -9.88% (-$16,342 to -$17,642)	-1.75% to +17.50% (-$3,127 to +$31,266)
A10 (a)Option i	$178,619	+8.13% to +26.65% (+$14,515 to +$47,608)	-9.15% to -9.88% (-$16,342 to -$17,642)	-1.75% to +17.50% (-$3,127 to +$31,266)
Option ii	$178,619	-25.16% to -28.72% (-$44,932 to -$51,292)	+2.23% to +3.29% (+$4,074 to +$5,882)	-21.86% to -26.44% (-$39,050 to -$47,217)
A10 (b)	$178,619	- 28.72% to +26.65% (-$51,292 to +$47,608)	-9.88% to +3.29% (-$17,642 to +$5,882)	-38.59% to +29.95% (-$68,935 to +$53,490)

* All calculations based on fleet wide gross vessel revenues and changes in revenues based on changes in catches of target species (by weight) as identified in the NED experiment.
** Rounding errors are responsible for estimated percent changes in GRV not matching estimated dollar changes exactly.
N/A = Not able to be calculated with information currently available.

References Cited in Chapter 6

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7.0 REGULATORY IMPACT REVIEW

The Regulatory Impact Review (RIR) is conducted to comply with Executive Order 12866 (E.O. 12866) and provides analyses of the economic benefits and costs of each alternative to the nation and the fishery as a whole. Certain elements required in an RIR are also required as part of an environmental impact statement. Thus, this section should be considered only part of the RIR, the rest of the RIR can be found throughout this document.

7.1 DESCRIPTION OF THE MANAGEMENT OBJECTIVES

Please see Chapter 1 for a description of the management objectives associated with this rulemaking.

7.2 DESCRIPTION OF THE FISHERY

Please see Chapter 3 for a description of the fisheries that could be affected by this rulemaking.

7.3 STATEMENT OF THE PROBLEM

Please see Chapter 1 for a description of the problem and need for this rulemaking.

7.4 DESCRIPTION OF EACH ALTERNATIVE

Please see Chapter 2 for a summary of each alternative and Chapter 4 for a complete description of each alternative and its expected ecological, social, and economic impacts. Chapters 6 and 8 provide additional information related to the alternatives.

7.5 ECONOMIC ANALYSIS OF EXPECTED EFFECTS OF EACH ALTERNATIVE RELATIVE TO THE BASELINE

NOAA Fisheries does not believe that the national net benefits and costs would change significantly in the long run as a result of implementation of the preferred alternatives. The benefits and costs for portions of the industry may change and the volume of landings of certain species will likely change somewhat, but the total volume of fish available for consumption is not anticipated to change significantly. Table 7.1 indicates possible net economic benefits and costs of each alternative.

7.6 CONCLUSION

Under E.O. 12866, a regulation is a “significant regulatory action” if it is likely to: 1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights, and obligation of recipients thereof; or, 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order. The preferred alternatives described in this document do not meet the above criteria. Therefore, under E.O. 12866, the preferred alternatives described in this document have been determined to be not significant for the purposes of E.O. 12866. A summary of the expected net economic benefits and costs of each alternative, which are based on supporting text in Chapters 4 and 6, can be found in Table 7.1.

Table 7.1 Summary of the Net Benefits and Costs for Each Alternative

Alternative	Estimated Net Economic Benefits	Estimated Net Economic Costs
Bycatch and Bycatch Mortality Mitigation Measures		
A1	None	None
A2	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 3.57 and 11.72%.	Vessels may experience a decrease in gross revenues of between 47.93 and 51.74%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 36.20 and 48.17%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
A3 Option I	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 3.57 and 11.72%.	Vessels may experience a decrease in gross revenues of between 47.93 and 51.74%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 36.20 and 48.17%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
Option ii	Vessels able to successfully target tuna may realize an increase in gross revenues of between 11.95 and 17.25%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 6.19%.	Vessels may experience a decrease in gross revenues of between 11.06 and 12.63%, stemming from potential declines in swordfish landings. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 0.68%. Vessels would incur an estimated hook compliance cost of approximately $1,044.

Alternative	Estimated Net Economic Benefits	Estimated Net Economic Costs
A4 Option i	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 3.57 and 13.01%.	Vessels may experience a decrease in gross revenues of between 47.93 and 51.74%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 36.20 and 48.17%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
Option ii	Vessels able to successfully target tuna may realize an increase in gross revenues of between 11.95 and 17.25%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 6.19%.	Vessels may experience a decrease in gross revenues of between 11.06 and 12.63%, stemming from potential declines in swordfish landings. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 0.68%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
Option iii	Vessels able to successfully target swordfish may realize an increase in gross revenues of as much as 24.58%.	Vessels may experience a decrease in gross revenues of as much as 53.28%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of 28.70%. Vessels would incur an estimated hook compliance cost of approximately $1,433.
A5 (a)	No change is expected in gross revenues attributable to tuna.	Vessels may experience a decrease in gross revenues of between 3.88 and 7.75%, attributable to potential declines in swordfish catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 3.87 and 7.75%. Vessels would incur an estimated hook compliance cost of approximately $885.
A5 (b)	No change is expected in gross revenues attributable to tuna.	Vessels may experience a decrease in gross revenues of between 3.88 and 7.75%, attributable to potential declines in swordfish catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 3.87 and 7.75%. Vessels would incur an estimated hook compliance cost of approximately $885.

Alternative	Estimated Net Economic Benefits	Estimated Net Economic Costs
A7	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 8.13 and 26.65%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 17.50%.	Vessels may experience a decrease in gross revenues of between 9.15 and 9.88%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 1.75%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
A8	Vessels able to successfully target swordfish may realize an increase in gross revenues of as much as 5.11%.	Vessels may experience a decrease in gross revenues of as much as 10.47%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of 5.36%. Vessels would incur an estimated hook compliance cost of approximately $2,400.
A9 Option i	Vessels able to successfully target swordfish may realize an increase in gross revenues of as much as 55.88%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of 45.71%.	Vessels may experience a decrease in gross revenues of as much as 10.17%, attributable to potential declines in tuna catches. Vessels would incur an estimated hook compliance cost of approximately $1,433.
Option ii	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 8.13 and 26.65%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 17.50%.	Vessels may experience a decrease in gross revenues of between 9.15 and 9.88%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 1.75%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
A10 (a) Option i	Vessels able to successfully target swordfish may realize an increase in gross revenues of between 8.13 and 26.65%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 17.50%.	Vessels may experience a decrease in gross revenues of between 9.15 and 9.88%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 1.75%. Vessels would incur an estimated hook compliance cost of approximately $1,044.

Alternative	Estimated Net Economic Benefits	Estimated Net Economic Costs
Option ii	Vessels able to successfully target tuna may realize an increase in gross revenues of between 2.28 and 3.29%.	Vessels may experience a decrease in gross revenues of between 25.16 and 28.72%, stemming from potential declines in swordfish landings. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of between 21.86 and 26.44%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
A10 (b)	Vessels able to successfully target swordfish may realize an increase in gross revenues of as much as 26.65%. Vessels able to successfully target tuna may realize an increase in gross revenues of as much as 3.29%. Vessels embarking on mixed target trips (swordfish and tuna) may experience an increase in gross revenues of as much as 29.95%.	Vessels may experience a decrease in gross revenues of as much as 28.72%, stemming from potential declines in swordfish landings and a decrease in gross revenues of as much as 9.88%, attributable to potential declines in tuna catches. Vessels embarking on mixed target trips (swordfish and tuna) may experience a decrease in gross revenues of as much as 38.59%. Vessels would incur an estimated hook compliance cost of approximately $1,044.
A13	Vessels would likely increase catches of swordfish by 17% and bigeye tuna by 32% (in numbers of fish).	Vessels would likely experience a 2% decrease in yellowfin tuna catches (in numbers of fish). Vessels may experience increased fuel costs associated with an increase in distances vessels may need to travel to reach open areas.
A14	Vessels would likely increase catches of swordfish by 18% and bigeye tuna by 33% (in numbers of fish).	Vessels would likely experience a 2% decrease in yellowfin tuna catches (in numbers of fish). Vessels may also experience increased fuel costs associated with an increase in distances vessels may need to travel to reach open areas.
A15	Vessels would likely increase catches of swordfish by 5% and yellowfin tuna by 3%, and bigeye tuna by 17% (in numbers of fish).	Vessels may experience increased fuel costs associated with an increase in distances vessels may need to travel to reach open areas.
A16	Minor positive benefit from reduced hook replacement costs (if hooks are retrieved undamaged). May increase profits for suppliers who provide release equipment.	Vessels would incur an estimated compliance cost of approximately $485.00 - $1056.50.

References Cited in Chapter 7

No references cited

8.0 FINAL REGULATORY FLEXIBILITY ANALYSIS (FRFA)

This FRFA is prepared in compliance with the Regulatory Flexibility Act and provides analyses of the economic benefits and costs of the preferred alternatives on small entities. Certain elements required in a FRFA are also required as part of an environmental impact statement. Thus, this section should be considered only part of the FRFA; the rest of the FRFA can be found throughout this document.

8.1 DESCRIPTION OF THE REASONS WHY ACTION IS BEING CONSIDERED

Please see Chapter 1 for a description of the need for and objectives of the final rule.

8.2 A SUMMARY OF THE SIGNIFICANT ISSUES RAISED BY THE PUBLIC COMMENTS IN RESPONSE TO THE INITIAL REGULATORY FLEXIBILITY ANALYSIS, A SUMMARY OF THE ASSESSMENT OF THE AGENCY OF SUCH ISSUES, AND A STATEMENT OF ANY CHANGES MADE IN THE RULE AS A RESULT OF SUCH COMMENTS

NOAA Fisheries received many comments on the proposed rule and the DSEIS during the public comment period. A summary of these comments and the Agency's responses are summarized in Appendix C1 and will be included in the final rule. Some comments were specific to the Initial Regulatory Flexibility Analysis (IRFA), while many comments addressed more general economic impacts associated with the alternatives preferred in the DSEIS.

Specific to the IRFA, one commenter stated that the ex-vessel prices were not up to date. Another commenter stated that increases in target catches were overestimated and losses were underestimated. Commenters also requested that the FRFA consider: (1) increased overhead costs because of the requirement to purchase new hooks and more expensive, non-indigenous baits outside the NED; (2) irretrievable lost costs associated with the measures because existing inventories of fishing hooks would become obsolete; and, (3) the potential for U.S. pelagic longline fishermen to be put at a competitive disadvantage to foreign vessels because of possible increased costs and decreased revenues.

The IRFA utilized 2001 ex-vessel prices that were adjusted to 2002 dollars using the Consumer Price Index on-line adjustment calculator. The FRFA and RIR have been updated using actual 2002 ex-vessel prices. As a result, the annual gross vessel revenue estimate in the final documents ($178,619) is lower than in the initial analyses due to generally lower ex-vessels prices in 2002.

Estimated changes in target species catches were correctly estimated in the IRFA, as well as the FRFA, using information derived directly from the NED research experiment. The Agency presents a range of economic impacts for many alternatives, because it is not possible to predict fishing behavior and because of the high degree of variability in the impacts of different hook and bait combinations on target species catches. Further, a range of impacts is necessary to reflect the flexibility provided in the final regulations, discussed further below, to choose between different gear combinations. Analyses in the FSEIS have been refined to include reduction rates for experimental treatments (hook and bait combinations) that have been standardized to control for several variables, including sea surface temperature, daylight soak time, total soak time, vessel effect, and pairing effect in case of matched-paired hook types per set.

With regard to hook costs, initial compliance costs in the FSEIS are estimated to be between $675.25 - $1,650.00 for 18/0 hooks, and $697.50 - $1,241.75 for 16/0 hooks. After the initial hook purchase, replacement costs for circle hooks are expected to be comparable to, or less than, the replacement costs for "J"-hooks. The DSEIS estimated annual hook costs at approximately $20,176 per vessel for a year's supply. However, this estimate has been removed from the FSEIS because not every hook is expected to be lost on every set. There may be some additional costs due to existing inventories of "J"-hooks becoming obsolete. However, a 30-day delay in the effective date of the final measures outside the NED may help vessel owners retrieve some of the costs associated with the prior purchase of "J"-hooks by allowing the hooks to be utilized.

The IRFA/DSEIS/RIR acknowledged that preferred alternatives A3 and A10 could potentially result in adverse economic impacts for small entities depending upon which hook and bait combination was used for particular target species, and that the impacts were generally more severe for mixed target species trips. A large portion of the public comments confirmed these statements and presented three primary reasons for why the alternatives would result in significant adverse economic impacts. First, the alternatives would not provide flexibility to change hook-types and baits in reaction to changing conditions that may occur on longer trips *(i.e.*, species availability and market prices). Second, the requirement to possess and use only 18/0 or larger circle hooks outside the NED would substantially reduce catches of target species in the south Atlantic and GOM regions (*i.e*., small yellowfin tuna, dolphin and wahoo). Finally, the requirement to possess and use only either whole mackerel or squid baits would be detrimental to vessels fishing in areas outside the NED because Atlantic mackerel is either unavailable, prohibitively expensive, or ineffective at catching target species in the south Atlantic or GOM.

In consideration of these comments, NOAA Fisheries modified the final regulations to allow: (1) the use of 16/0 or larger non-offset circle hooks outside the NED, and (2) the use of both whole mackerel and squid baits inside the NED, and whole finfish and squid outside the NED, regardless of hook type. These modifications mitigate for potential adverse economic impacts, increase flexibility, address geographical differences in the fishery, and ease the compliance burden associated with the purchase and use of non-indigenous bait, while continuing to ensure reductions in sea turtle interactions and mortalities fishery-wide. Because of these modifications, and the fact that the NED research experiment indicated constant, or even increased, catches of target species when using the appropriate hook and bait combinations, domestic pelagic longline vessels are not expected to be at competitive disadvantage relative to foreign vessels.

8.3 DESCRIPTION AND ESTIMATE OF THE NUMBER OF SMALL ENTITIES TO WHICH THE PROPOSED RULE WILL APPLY

The HMS FMP established six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. To reduce bycatch concerns in the pelagic longline fishery, these permits were designed so that swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a swordfish (directed or incidental, not handgear) and a shark permit (directed or incidental). Swordfish handgear and shark permits are valid without another limited access permit. NOAA Fisheries considers all permit holders to be small entities. A description of affected fisheries can be found in Chapter 3 of this document.

The bycatch reduction measures analyzed in this document could potentially affect all vessels currently permitted to participate in the HMS pelagic longline fishery, although only about half of all permit holders are actually active in this fishery. As of November 2003, approximately 235 tuna longline limited access permits had been issued. In addition, approximately 203 directed swordfish limited access permits, 100 incidental swordfish limited access permits, 249 directed shark limited access permits, and 357 incidental shark limited access permits had been issued. Because vessels authorized to fish for swordfish and tunas with pelagic longline gear must possess a tuna longline permit, a swordfish permit (directed or incidental), and a shark permit (directed or incidental), the maximum number of vessels potentially affected by the selected measures is 303 (the number of swordfish permits issued). For additional detail regarding the small entities involved with this fishery, please refer to Chapter 6.

Other sectors of HMS fisheries such as dealers, processors, bait houses, and gear manufacturers, some of which are considered small entities, might be indirectly affected by the preferred alternatives. However, because this action does not apply directly to them, economic impacts on these other sectors are discussed in Chapters 4, 6, and 7, and not here.

8.4 DESCRIPTION OF THE PROJECTED REPORTING, RECORD-KEEPING, AND OTHER COMPLIANCE REQUIREMENTS OF THE PROPOSED RULE, INCLUDING AN ESTIMATE OF THE CLASSES OF SMALL ENTITIES WHICH WILL BE SUBJECT TO THE REQUIREMENTS AND THE TYPE OF PROFESSIONAL SKILLS NECESSARY FOR PREPARATION OF THE REPORT OR RECORD

The preferred alternatives (A5 (b), A10 (b), and A16) will not result in additional reporting or record-keeping requirements but will impose additional compliance requirements (i.e., require possession and use of specific hooks, baits, and release equipment). The alternatives would result in an initial increase in costs but may result in long-term cost savings. Circle hooks required under alternatives A5 (b) and A10 (b) have lower replacement costs than “J”-hooks, and alternative A16 will likely result in increased hook retention. An informal internet and telephone survey of hook suppliers provides a range in price of approximately $0.28 to $0.50 ($0.3539 avg) per hook for 16/0 circle hooks, and $0.26 to $0.66 ($0.4176 avg) per hook for 18/0 commercial grade circle hooks. Large commercial grade “J”-hooks range from approximately $0.26 to $1.00 (avg. $0.5733) per hook. Assuming that an average of 2,500 hooks per vessel are needed to initially comply with hook requirements (equip vessels with enough hooks for one trip), the compliance cost for 16/0 circle hooks, on a per vessel basis, may range from $697.50 to $1241.75 with an anticipated average cost of approximately $884.75. Similarly, assuming that an average of 2,500 18/0 circle hooks per vessel are needed to initially comply with the hook requirements, the compliance cost, on a per vessel basis, may range from $657.25 to $1,650.00, with an anticipated average cost of approximately $1,044.00. The compliance costs for 303 vessels (all permits), 148 (active permits), and individual vessels are detailed in Table 8.1 below. These figures represent the approximate costs to vessels exclusively equipping with the 16/0 and 18/0 circle hook. Actual compliance costs will likely fall somewhere in between these ranges as some vessels may fish with a combination of hook types.

Table 8.1 Initial 16/0 and18/0 Circle Hook Compliance Costs: 2500 Hooks per Vessel

	Minimum Cost ($0.2629 per 18/0 hook) ($0.2790 per 16/0 hook)	Maximum Cost ($0.66 per 18/0 hook) ($0.4967 per 16/0 hook)	Average Cost ($0.4176 per 18/0 hook) ($0.3539 per 16/0 hook)
1 vessel	18/0 = $675.25 16/0 = $697.50	18/0 = $1,650.00 16/0 = $1241.75	18/0 = $1044.00 16/0 = $884.75
148 vessels	18/0 = $97,273.00 16/0 = $103,230.00	18/0 = $244,200.00 16/0 = $183,779.00	18/0 = $154,512.00 16/0 = $130,943.00
303 vessels	18/0 = $204,600.75 16/0 = $211,342.50	18/0 = $499,950.00 16/0 = $376,250.25	18/0 = $316,332.00 16/0 = $268,079.25

Alternatives A5 (b) and A10 (b) should not increase the needed skill level required for HMS fisheries, as the physical act of switching hook types is a normal aspect of commercial fishing operations. However, there probably will be a period of time during which fishing crews adjust, as with any new gear. Circle hooks are not expected to be prohibitively difficult to work with, as some vessels are already utilizing them. Alternative A16 would require additional skills and would impose a compliance cost for the purchase of required release gear of between $485.00 and $1056.50. These costs may be reduced if fishermen are able to construct various pieces of equipment themselves, rather than purchasing pre-assembled gear from a commercial supplier. The equipment specifications and Careful Release Guidelines can be found in Appendix B1 and Appendix B2, respectively.

Traditionally, bait accounts for 16 to 26 percent of the total costs per trip. Any fluctuations in the price and availability of mackerel, whole finfish, or squid baits could have a substantial positive or negative impact on profitability. These baits are generally abundant, but availability will likely depend upon harvesting and distributional capacities. There could also be unquantifiable compliance costs as fishing crews who have not traditionally fished with a particular hook and bait combination familiarize themselves with the most efficient techniques.

8.5 DESCRIPTION OF THE STEPS THE AGENCY HAS TAKEN TO MINIMIZE THE SIGNIFICANT ECONOMIC IMPACT ON SMALL ENTITIES CONSISTENT WITH THE STATED OBJECTIVES OF APPLICABLE STATUES, INCLUDING A STATEMENT OF THE FACTUAL, POLICY, AND LEGAL REASONS FOR SELECTING THE ALTERNATIVE ADOPTED IN THE FINAL RULE AND THE REASON THAT EACH ONE OF THE OTHER SIGNIFICANT ALTERNATIVES TO THE RULE CONSIDERED BY THE AGENCY WHICH AFFECT SMALL ENTITIES WAS REJECTED

The IRFA for this action described alternatives to the proposed rule which accomplish the stated objectives and which minimize any significant economic impacts. These impacts are discussed below and in Chapters 4 and 6 of this document. Additionally, the Regulatory Flexibility Act (5 U.S.C.§ 603 C) (1)-(4)) lists four types of alternatives which should be discussed. These categories of alternatives (all of which assume the proposed action could impact small entities differently than large entities) are:

1. Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
2. Clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
3. Use of performance rather than design standards; and,
4. Exemptions from coverage of the rule for small entities.

As noted earlier, NOAA Fisheries considers all permit holders to be small entities. In order to meet the objectives of this final rule and relevant statutes (i.e., MSA, ESA, etc.) as well as address the management concerns at hand, NOAA Fisheries cannot exempt small entities or change the reporting requirements for small entities. The preferred hook and bait and sea turtle release gear requirements would not be as effective with different compliance requirements. Thus, at this time, there are no alternatives which fall under the first and fourth categories described above. Alternatives under the second and third categories, which could minimize economic impacts, are discussed below with other alternatives that were considered. Analyses relating to the economic impacts of each specific alternative can be found in Chapters 4 and 6.

8.5.1 Bycatch Reduction Measures

The preferred alternatives (A5 (b), A10 (b) and A16) were designed to reduce sea turtle interaction and mortality levels while minimizing adverse economic impacts to the extent practicable, consistent with the ESA, MSA, and other applicable law. Alternatives A5 (b) and A10 (b) provide the flexibility to select and utilize hooks and baits that are effective at catching both swordfish and tunas, and at reducing sea turtle interaction and mortality. Under preferred alternative A5 (b), fishermen may experience little or no change in catches of tunas, and a 10 to 20 percent decrease in catches of swordfish. Based on this, vessel revenues attributable to tunas would likely remain at approximately $104,670. Vessel revenues attributable to swordfish may possibly decrease by 3.88 ($6,925) to 7.75 ($13,850) percent to between $171,694 and $164,769.

However, because fishermen have the option of using a hook and bait combination shown to be effective at catching swordfish, this reduction is not expected to occur. Actual impacts of this alternative would depend on the frequency with which particular hook and bait combinations are employed and species targeted.

NOAA Fisheries expects that approximately 12 vessels will return to the NED under preferred alternative 10 (b), as well as alternatives A7 - A10 (a). Given that no pelagic longline vessels can currently fish in the NED, any revenues generated from fishing in that area under alternatives A7 - A10 (b), will raise gross vessel revenues as compared with the status quo. Under alternative A10 (b), depending on whether fishermen use the 18/0 offset circle hook with whole mackerel bait or the 18/0 non-offset circle hook with squid, respectively, there may be a -32.58 percent to +30.24 percent change in swordfish catches (by weight) and a -87.64 to possibly as much as +29.22 percent (by weight) change in tuna catches. Increases in tuna landings during the NED experiment were substantial but, given limited data were determined to be not statistically significant.

The portion of landings of historically attributable to swordfish may vary by -32.58 percent to +30.24 percent, shifting from 88.54 percent (by weight) of landings to between 59.69 and 115 percent. Gross revenues attributable to swordfish may vary between -28.72 percent (-$51,292) and +26.65 percent ($47,608), resulting in overall gross vessel revenues of between $127,327 and $226,227. The portion of vessel landings historically attributable to tuna may shift by between -87.64 and +29.22 from 9.85 percent of landings to between 1.22 and 12.73 percent. Gross revenues of vessels attributable to tuna may vary by -9.88 percent (-$17,642) to +3.29 percent ($5,882), resulting in overall gross vessel revenues of between $160,997 and $184,501. For vessels engaging in mixed target trips, estimated gross vessel revenues could range between $109,685 and $232,109. These figures likely represent over estimates of both losses and gains. The actual impact would likely fall between these estimates, depending on the frequency with which particular hook and bait combinations are employed and species targeted.

Preferred alternative A16 (release gear and handling guidelines requirement) would likely have only minor initial adverse economic impacts, as there are currently similar requirements in the pelagic longline fishery, with some positive long-term impacts resulting from reduced hook replacement costs. NOAA Fisheries estimates that a full suite of release gear could cost between $485.00 and $1056.50. As stated in Section 8.4, the costs for some of this equipment could be reduced if fishermen were able to construct some pieces themselves, instead of purchasing pre-assembled gear from commercial suppliers. See Chapters 4, 6, and 7 for background, analyses, and additional detail on economic impacts of the preferred alternatives.

Other Alternatives Considered

Alternative A1 (no action) is rejected because it would not provide for any additional sea turtle bycatch and bycatch mortality reduction measures. Further, it would allow the full adverse economic impacts of the NED closure to be realized given the termination of the NED experiment and its attendant economic benefits.

Alternative A2 (limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing excluding the NED, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait) would likely have significant positive ecological impacts. This alternative would likely increase adverse socio-economic impacts on fishermen, compared to preferred alternative A5 (b), by limiting flexibility in selecting a more efficient hook and bait treatment for use in targeting tuna. As such, those fishermen outside the NED unable to successfully target swordfish would be adversely impacted to a greater extent because of the expected loss in tuna revenues associated with this hook and bait treatment. Further, the commenters also stated that 18/0 circle hooks may be too large to catch some target species encountered outside the NED. Therefore, this alternative is rejected at this time.

Alternative A3 (limit vessels with pelagic gear onboard, in areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only one of the following combinations: i)18/0 or larger circle hooks with and offset not to exceed 10 degrees and whole mackerel bait; or ii) 18/0 or larger non-offset circle hooks and squid bait) would likely have significant positive ecological impacts. However, during the public comment period commenters stated that alternative A3 does not provide enough flexibility for fishermen to adjust to changing market conditions, change target species while at sea, or employ traditionally used baits. Further, the commenters also stated that 18/0 circle hooks may be too large to catch some target species encountered outside the NED. Alternative A3 is rejected at this time because it would likely result in greater negative socio-economic impacts than preferred alternative A5 (b).

Alternative A4 (limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing excluding the NED, to possessing onboard and/or using only one of the following combinations: i)18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; or, ii) 18/0 or larger non-offset circle hooks and squid bait; or, iii) 9/0 “J”-hook with an offset not to exceed 25 degrees and whole mackerel bait) may have either greater or lesser adverse economic impacts than the preferred alternative, depending upon the hook and bait combination chosen and the target species of a specific trip. However, this alternative is rejected because “J” hooks are likely to have a higher post-mortality rate than circle hooks. Interactions with “J”-hooks have a higher incidence of deep hooking and tend to result in more serious injuries for sea turtles.

Alternative A5 (a) (limit vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing excluding the NED, to possessing onboard and/or using only 16/0 or larger circle hooks with an offset not to exceed 10 degrees), is rejected because the use of offset 16/0 circle hooks, as opposed to non-offset 16/0 circle hooks, will likely result in higher rates of throat or stomach hooked loggerhead sea turtles and associated mortalities. Alternative A5 (a) would likely have minor to moderate adverse economic impacts on fishermen, given potential decreases in swordfish catch.

Alternative A6 (allow pelagic longline fishing for Atlantic HMS in the NED, maintaining existing restrictions) would have positive social and economic benefits. This alternative would not provide for any additional sea turtle bycatch and bycatch mortality reduction measures or ensure compliance with the ESA, therefore, it is rejected.

Alternative A7 (open the NED to pelagic longline fishing and limit vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait) would be effective at reducing sea turtle interactions, and would have positive social and economic effects as compared to the status quo or historical perspectives. However, it is rejected because allowing only a single hook and bait in the NED would limit the ability of fishermen to target swordfish or tunas more so than alternatives A10 (a) and (b).

While alternative A8 (limit vessels with pelagic longline gear onboard, at all times, in the NED to possessing onboard and/or using only 20/0 or larger circle hooks with an offset not to exceed 10 degrees) would be effective at reducing sea turtle interactions, and would have positive social and economic benefits over the status quo, it would have adverse economic impacts when viewed historically. Please see Chapter 4 for additional details. This alternative is rejected because it would have a greater adverse impact on revenues associated with landings of tuna, and a less positive impact on revenues associated with landings of swordfish compared to preferred alternative A10 (b).

Alternative A9 (limit vessels with pelagic longline gear onboard in the NED, to possessing and/or using no more than one of the following hook and bait combinations: i) 9/0 “J”-hooks with an offset not to exceed 25 degrees and whole mackerel bait; or ii)18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel bait) may provide greater positive or negative economic impacts than alternative A10 (b), given the sizable anticipated changes in both swordfish and tuna catches. This alternative is rejected because, as with alternative A4, the use of “J”-hooks is expected to result in higher post-release mortality rates than circle hooks.

Alternative A10 (a) (limit vessels with pelagic longline gear onboard in the NED, to possessing and/or using no more than one of the following hook and bait combinations: i) 18/0 or larger circle hook with an offset not to exceed 10 degrees and whole mackerel bait; or ii) 18/0 or larger non-offset circle hook and squid bait) would be effective at reducing sea turtle interactions and would have positive social and economic impacts over the status quo. However, during the public comment period commenters stated that alternative A10 (a) does not provide enough flexibility for fishermen to adjust to changing market conditions or change target species while at sea. Alternative A10 (a) is rejected because it would likely result in greater negative socio-economic impacts than preferred alternative A10 (b).

Alternative A11 (prohibit the use of pelagic longline gear in Atlantic HMS fisheries) would afford the greatest protection to sea turtles domestically, but is rejected, at this time, because other bycatch and bycatch mortality reduction alternatives are available and alternative A11 would impose the most significant adverse economic impacts of all the alternatives.

Alternative A12 (close the western GOM year-round) would likely have severe adverse social and economic impacts on a distinct segment of the fishery. Alternative A12 is rejected, at this time, because other bycatch and bycatch mortality reduction alternatives are available. A GOM or alternative closure may be considered in a future rulemaking, as necessary, consistent with the June 1, 2004, BiOp for the fishery. Additional analyses would be necessary to incorporate changes in the environmental baseline resulting from selected circle hook and sea turtle release and disentanglement gear alternatives.

The time/area closures in alternatives A13, A14, and A15 were each analyzed with and without a redistribution of fishing effort. For this reason, the results may indicate increases in target and non-target species catches for certain alternatives.

Alternative A13 (close an area of the central GOM year-round) would likely have substantial economic impacts on a large and distinct segment of the U.S. pelagic longline fleet, communities, buyers, and dealers in the Gulf of Mexico. While data indicate potential increases in catches of swordfish and bigeye tuna of 17 and 32 percent in numbers of fish, respectively, and a decrease of yellowfin tuna catches of two percent in numbers of fish, the actual impacts are unclear as potential changes in weight of landings remain unknown. Loggerhead sea turtle interactions are projected to increase due to relocation of fishing effort under this alternative. While the impacts have not been quantified, NOAA Fisheries anticipates that the overall social and economic impacts of a closure of this size would likely be adverse. Because a high percentage of the historical fishing effort has been located in the area considered for the time/area closure, a substantial number of fishing vessels may need to travel greater distances to reach favorable fishing grounds and spending longer periods at sea, which could potentially increase fuel, bait, ice, and crew costs. In combination with other alternatives, such as hook and bait restrictions, this alternative would have even greater adverse impacts, and more substantial adverse impacts on the GOM segment of the fleet than the preferred alternatives. Alternative A13 is rejected, at this time, because other bycatch and bycatch mortality reduction alternatives are available. A GOM or alternative closure may be considered in a future rulemaking, as necessary, consistent with the June 1, 2004, BiOp for the fishery. Additional analyses would be necessary to incorporate changes in the environmental baseline resulting from selected circle hook and sea turtle release and disentanglement gear alternatives.

Alternative A14 (prohibit the use of pelagic longline gear in HMS Fisheries in areas of the Central GOM and NEC year-round) is rejected, at this time, because other bycatch and bycatch mortality reduction alternatives are available. A GOM or alternative closure may be considered in a future rulemaking, as necessary, consistent with the June 1, 2004, BiOp for the fishery. Additional analyses would be necessary to incorporate changes in the environmental baseline resulting from selected circle hook and sea turtle release and disentanglement gear alternatives. Under alternative A14, swordfish and bigeye tuna catches could potentially increase 18 and 33 percent in numbers of fish, respectively, and catches of yellowfin tuna could potentially decrease by two percent. The actual impacts are unclear because changes in the weight of landings is not known. Because a high percentage of the historical fishing effort has been located in the area considered for the time/area closure, a substantial number of fishing vessels may need to travel greater distances to reach favorable fishing grounds and spending longer periods at sea, which could potentially increase fuel, bait, ice, and crew costs. In combination with other alternatives, such as hook and bait restrictions, alternative A14 would be expected to have even greater adverse impacts, and more substantial adverse impacts than the preferred alternatives.

Alternative 15 (prohibit the use of pelagic longline gear in HMS Fisheries in areas of the Central GOM and NEC from May through October) is rejected, at this time, because other bycatch and bycatch mortality reduction alternatives are available. A GOM or alternative closure may be considered in a future rulemaking, as necessary, consistent with the June 1, 2004, BiOp for the fishery. Additional analyses would be necessary to incorporate changes in the environmental baseline resulting from selected circle hook and sea turtle release and disentanglement gear alternatives. Under alternative A15, swordfish, yellowfin tuna, and bigeye tuna catches could potentially increase five percent, three percent, and 17 percent in numbers of fish, respectively. The actual impacts are unclear because changes in the weight of landings is not known. Because a high percentage of the historical fishing effort has been located in the area considered for the time/area closure, a substantial number of fishing vessels may need to travel greater distances to reach favorable fishing grounds and spending longer periods at sea, which could potentially increase fuel, bait, ice, and crew costs. In combination with other alternatives, such as hook and bait restrictions, alternative A15 would be expected to have even greater adverse impacts, and more substantial adverse impacts than the preferred alternatives.

References Cited in Chapter 8

NOAA Fisheries. 2003. Evaluating bycatch: a national approach to standardized bycatch monitoring programs. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD. 88 pp.

9.0 COMMUNITY PROFILES OF ATLANTIC AND GULF PELAGIC LONGLINE FISHERIES

9.1 INTRODUCTION

The Magnuson-Stevens Act requires all fishery management plans (FMPs) to include a fishery impact statement which shall assess, specify and describe the likely effects of the measures on fishermen and fishing communities (§303(a)). Similarly, the National Environmental Policy Act (NEPA) requires federal agencies to consider the interactions of natural and human environments by using "a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences ... in planning and decision-making" (NEPA §102(2)(a)). Federal agencies should address the aesthetic, historic, cultural, economic, social, or health effects which may be direct, indirect, or cumulative. Consideration of the social impacts associated with fishery management measures is a growing concern as fisheries experience variable participation and/or declines in stocks.

Social impacts are the consequences to human populations that follow from some type of public or private action. Those consequences may include changes in "the ways in which people live, work or play, relate to one another, organize to meet their needs and generally cope as members of a society ... " (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 2003:1). In addition, cultural impacts may involve changes in the values and beliefs that affect the way that people identify themselves within their occupation, their communities, and society in general. Social impact analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Public hearings, scoping meetings, and Advisory Panel meetings provide input from those concerned with the impacts of a proposed management action.

The Magnuson-Stevens Act outlines a set of National Standards (NS) that apply to all fishery management plans and the implementation of regulations. Specifically, NS 8 notes that:

> "Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to: (1) provide for the sustained participation of such communities; and, (2) to the extent practicable, minimize adverse economic impacts on such communities." (§301(a)(8))

"Sustained participation" is defined to mean continued access to the fishery within the constraints of the condition of the resource (50 CFR §600.345(b)(4)). It should be clearly noted that NS 8 "does not constitute a basis for allocation of resources to a specific fishing community nor for providing preferential treatment based on residence in a fishing community" (50 CFR §600.345(b)(2). The Magnuson-Stevens Act further defines a "fishing community" as:

> " ... a community that is substantially dependent upon or substantially engaged in the

harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, crew, and fish processors that are based in such communities." (§3(16))

While geographic location is an important component of a fishing community, management measures often have the most identifiable impacts on fishing fleets that use specific gear types. In addition, since the species (swordfish/tuna) in this FMP are highly migratory, fisheries and the people involved may shift among geographic locations to follow the fish. The geographic concentrations of pelagic longline fisheries can vary from year to year as the behavior of their migratory prey is somewhat unpredictable. Thus, the relationship between these fleets and geographic fishing communities is not always a direct one; however, it is an important variable for understanding social and cultural impacts. Therefore, the definition of community takes into account both geographic factors and the use of pelagic longline gear in domestic swordfish and tuna fisheries.

NOAA Fisheries (1994, 2001) guidelines for social impact assessments specify that the following elements are required in the development of FMPs and FMP amendments:

1) information on distributional impacts, non-quantifiable considerations such as expectations and perceptions of the alternative actions, and the potential impacts of the alternatives on both small economic entities and broader communities;

2) descriptions of the ethnic character, family structure, and community organization of affected communities;

3) descriptions of the demographic characteristics of the fisheries;

4) descriptions of important organizations and businesses associated with the fisheries; and,

5) identification of possible mitigating measures to reduce negative impacts of management actions on communities.

9.2 METHODOLOGY

For the principal states involved in the fishery, a profile of basic sociological information was compiled. Towns were selected, from the 148 communities identified as involved in the 2002 commercial fishery, based on swordfish and tuna landings data, information on the pelagic longline fishing fleet, the relationship between the geographic communities and the fishing fleet, and the existence of other community studies. This work incorporates by reference the studies by Douglas Wilson *et al.* (1998), as incorporated in the HMS Fishery Management Plan; McCay and Cieri (2000) "The Fishing Ports of the Mid-Atlantic" for the Mid-Atlantic Fishery Management Council; and Porter *et al.* (2001) "Cost-Earnings Study of the Atlantic-Based U.S. Pelagic Longline Fleet".

9.3 OVERVIEW OF THE SWORDFISH/TUNA PELAGIC LONGLINE FISHERY

The pelagic longline fisheries for swordfish and tunas of the Atlantic and Gulf coasts extend from Maine to Texas, the Caribbean and distant water areas of the North Atlantic. The geographic extent of the commercial fishery is large, but in 2002, landings were reported in only twelve states. Landings by weight were concentrated in three states; Louisiana (50.8 percent), Massachusetts (16.2 percent) and New Jersey (13.3 percent) (Table 9.1). Three states, North Carolina, New York and Rhode Island jointly contributed a further 16.6 percent of the 2002 pelagic longline landings by weight. The remaining six states, including Florida, contributed 3.1 percent of the landings.

The fishery is notable for the degree of flexibility of the commercial fishing fleet. Fishery permits for HMS pelagic longlining were held by 234 vessels in 2002. Depending on season, size and region, vessels fished in a variety of fisheries to supplement earnings from pelagic longline operations. Some smaller longline vessels switched to bottom longlining or to charter boat fisheries in the South Atlantic and Gulf regions.

The mobility of the vessels is also noteworthy. Many of the New England and North Carolina vessels were reported to fish from the Grand Banks to the Caribbean, and Texas vessels fished across the Gulf of Mexico east to Florida. Other commercial vessels had transferred to Florida and were based in Floridian ports year-round. Of these “commuter”vessels, one Californian community and one community in Indiana were home to permit holders.

The dealers are also highly mobile. Table 9.1 shows the number of dealers who handled swordfish and tuna from the pelagic longline fleet in each state in 2002. Many of the dealers are licensed to trade in two or more states, and thus the actual number of buyers is estimated to be significantly less than the 94 dealer locations would suggest.

Table 9.1 **2002: Commercial Landings, Dealers and Vessel Permits in the Swordfish and Tuna Pelagic Longline Fishery, by State.** Source: NOAA Fisheries Permit Files; December 1, 2003.

State	Pounds Landed	$ Value Landed	Dealer Locations	Vessel N
Alabama	na	na	na	1
California	0	0	0	1
Connecticut	na	na	na	1
Delaware	0	0	0	3
Florida - East	102,976	230,117	7	38
Florida - West	2,433	6,994	7	39
Georgia	0	0	na	1
Indiana	0	0	0	1
Louisiana	2,733,042	8,688,323	11	47
Maine	na	na	na	1
Maryland	6,692	22,848	3	4
Massachusetts	870,348	2,685,952	13	25
Mississippi	0	0	0	1
New Jersey	716,180	1,899,148	17	30

New York	332,720	904,652	15	16
North Carolina	360,839	547,409	7	9
Rhode Island	200,589	596,752	12	6
South Carolina	51,253	89,994	6	2
Texas	0	0	0	11
Virginia	0	0	0	7
Virgin Islands				
Total	**5,378,943**	**15,368,777**	**94**	**234**

na = Data is confidential; there are less than 3 licensed dealers in the state

Characteristics of the Fleet

Regional patterns of activity have changed since the studies by Wilson *et al.* (1998) and Porter *et al.* (2001). Fieldwork for both studies was conducted in 1997 and 1998. In 1997 there were 240 pelagic longline vessels active, but this declined to 200 vessels in 1998. The sample for the cost earnings study was 102 vessels drawn from throughout the fishery, and of those it was determined that 87 vessels were engaged in fishing activities full-time while 15 vessels fished commercially on a part-time basis (Porter *et al.*, 2001). Both studies noted that the longest pelagic longline fishing trips were those for vessels fishing in the North Atlantic distant water fishery and in the Caribbean. Typical trip-lengths were 36 days and 28 days respectively. During the North Atlantic distant water trips typically two-fifths of the trip was spent on the fishing grounds and three-fifths of the trip was travel time. On the Caribbean trips some 11 of the 28 days were spent fishing. Vessels in the North Atlantic fishery typically made seven trips/year in 1997-1998, while those in the Caribbean fishery made nine trips/year (Porter *et al.*, 2001). The vessels from Mid-Atlantic states were usually smaller than those used in the Northeast and Caribbean. Their pelagic longline trips typically lasted 12 days, with seven days of fishing and five days of travel to and from the fishing grounds. The Mid-Atlantic vessels spent about 120 days a year longlining in 1997 and 1998, and their income from other fisheries was approximately $10,000/year (Porter *et al.*, 2001). Vessels based in the Gulf states were similar in size and trip length to the Mid-Atlantic vessels. Porter *et al.* (2001) report that the Gulf vessels in their sample spent some 180 days pelagic longlining each year, or approximately one-third more trips per year, than the Mid-Atlantic vessels, and thus their activity in other fisheries was less. The South Atlantic longliners made the shortest trips (7 days on average) and fished with pelagic gear for some 60 days in 1997 (Porter *et al.*, 2001). Crew size on the trips varied by both size of vessel and by the species targeted. The average crew size for all full-time commercial fishing vessels sampled was 3.92 fishermen/trip including the captain. Porter *et al.* found that for part-time commercial fishing vessels, the average crew size was 3.27 fishermen per trip including the captain. Average crew sizes in the pelagic longline fishery can be seen by target species and by vessel size in Table 9.2.

Table 9.2 **Average Crew Size* on Pelagic Longline Vessels by Species Targeted (1997-8).** Source: Porter *et al.*, 2001.

Target Species	Small Vessels	Medium Vessels	Large Vessels
Swordfish	3.13	3.91	5.20
Mixed tuna/ swordfish	3.35	4.00	4.69
Tuna	3.11	4.20	na

Small vessels, < 50 grt; medium vessels, >50 - <96 grt; large vessels, >96 grt
na = data not available. *Crew size includes captains.

Permit data for 2002 shows that there are 234 pelagic longline vessels in the fleet. If crew sizes have remained constant since 1997, there were at least some 900 fishermen actively fishing as captain or crew on HMS pelagic longline boats during the 2002 season. There may be fewer fishermen in fact. Interviews with fishermen, vessel owners and others in the Fall of 2003 suggest that the narrowing, often non-existent, profit margins of the pelagic longline boats have also reduced the attractiveness of longlining as a fishing strategy to crew and hired captains. The real value of crew shares (wages) in trip profits have declined over the past 15 years. Experienced and reliable crew are said to be difficult to recruit, and owners of vessels have said that they have reduced crew sizes to reduce the insurance costs of the vessel and to provide a larger portion of the crew share to the remaining individuals (Fricke, 2003).

Information Used in this Assessment

As indicated earlier, the commercial fishery involves some 148 communities. This number is based on places for which commercial landings data is available, places in which licensed swordfish and tuna dealers operate, and places declared on HMS pelagic longline fishing permit application forms as the address of the permit holder. From this list of 148 communities, eight are profiled in this study as being representative of the fishery. They were selected on the basis of involvement with HMS pelagic longline fisheries.

To ensure continuity with the 1999 HMS FMP assessment, where a community, selected for study in 1998, had a pelagic longline fishery it was generally selected for this assessment. Because of their relatively minimal involvement in the pelagic longline fisheries, this study does not include places in Maine, New Hampshire, New York, Delaware, Maryland, Virginia, South Carolina, Georgia, Alabama, Mississippi, and Texas. One port each in New Jersey and Florida (Brielle and Islamorada, respectively) which was in the 1998 study has been dropped from this one. One community in Florida, Fort Pierce, has been added to the communities profiled. Ports selected for detailed study are New Bedford, Barnegat Light, Wanchese, Pompano Beach, Fort Pierce, Madeira Beach, Panama City, Dulac, and Venice.

The Southeast Fisheries Science Center does not report fisheries data by port of landing. For this reason, communities involved in the fisheries from North Carolina to Texas are identified by the commercial permit data. Other corroborating data have been developed from use of secondary data and from published reports. Unlike the 1999 HMS FMP, it has not been possible to undertake comprehensive field research for this assessment. Some fieldwork was conducted in North Carolina and South Carolina to verify existing conditions in the HMS pelagic longline fishery in those states (Fricke, 2003).

9.4 SWORDFISH AND TUNA PELAGIC LONGLINE FISHERY PROFILES BY STATE

9.4.1 Maine

Demographic Profile of State of Maine (source: U.S. Census, 2000)

Population:	1,274,923	100%
Education:		
High school graduates (25 years or older)	742,605	85.4%
Employment:		
Labor force (16 years and over)	659,360	51.7%
Unemployed	31,165	3.1%
Employment in some industry sectors:		
Retail	84,412	13.5%
Manufacturing	88,885	14.2%
Education, health & social services	144,918	23.2%
Arts, recreation, lodging & food services	44,606	7.1%
Farming, fishing, forestry & mining	16,087	2.6%

Maine has one pelagic longline vessel and one permit-holder active in the swordfish and tuna fishery. Because of the small numbers of fishermen and dealers/processors in the state, community profiles were not developed.

9.4.2 Massachusetts

Characteristics of Fisheries in Massachusetts

Commercial fisheries in Massachusetts are diverse, and range from small-scale inshore small-boat fisheries for lobster and clams, to off-shore scallops, groundfish dragging, and pelagic longline fishing for HMS species. In 2002, New Bedford ranked 9th in the United States for the weight of fish landed, and 1st for value with ex-vessel sales bringing in $151,400,000.

Demographic profile of Massachusetts (source: U.S. Census 1990, 2000)

	1990	2000
Population:	6,016,425	6,349, 097
Education:		
High school graduates, 25 years or older:	80.0%	84.8%
Employment:		
Percent of civilian workforce unemployed:	6.7%	3.0%
Main sources of employment:		
Retail	16.0%	11.0%
Manufacturing durable goods	12.0%	12.8%
Health, education and social services	21.2%	23.7%
Arts, recreation, lodging & food services	5.1%	6.8%
Farming, forestry, and fisheries	1.0%	0.4%

In 2002, places and ports involved in the HMS pelagic longline fishery included Boston, Chilmark, Gloucester, Hamilton, Menemsha, New Bedford, and South Hamilton. Seven vessels had hail ports in Massachusetts. Also in 2002, the Massachusetts pelagic longline landings of swordfish and tunas occurred in Boston, Chilmark, New Bedford, and Westport. Licensed dealers were active in 13 locations in the Commonwealth. The landings and value of tunas and swordfish in relation to other species landed in Massachusetts commercial fisheries can be seen in Table 9.3.

Table 9.3 **Commercial Fishery Landings in Massachusetts, 2002**. Source: NOAA Fisheries.

Species	Landings Pounds	Landings Value $	Percent Weight	Percent Value
All Species	243,824,000	297,312,000	100	100
Tuna/ Swordfish*	870,348	2,685,952	0.36	0.9

* Fish caught on pelagic longlines. Percentages are rounded

9.4.3 Rhode Island

Demographic Profile of Rhode Island (source: U.S. Census, 2000)

Population:	1,048,319	
Education:		
High school graduates (25 years or older)	541,487	78.0%
Employment:		
Labor force (16 years and over)	534,353	64.6%
Unemployed	29,859	3.6%
Employment by industry:		
Retail	60,426	12.1%
Manufacturing	82,260	16.4%
Education, health & social services	115,236	23.0%
Arts, recreation, lodging & food services	43,230	8.6%
Farming, fishing, forestry, & mining	2,396	0.5%

The pelagic longline fisheries are incidental to other fisheries in Rhode Island. There were six pelagic longline vessels with hail ports in the state. Dealers licensed to handle swordfish and tuna operated in 12 locations in the state, and the total pelagic longline landings in the state were 200,589 pounds in 2002. Communities involved with the pelagic longline fishery included Block Island, Jamestown, Narragansett, New Shoreham, Point Judith, Wakefield, Warwick, and West Kingstown. Because of the small-scale of the pelagic longline fishery in the communities listed, no community profiles have been developed**.** The landings and value of tunas and swordfish in relation to other species landed in Rhode Island can be seen in Table 9.4.

Table 9.4 **Commercial Fishery Landings in Rhode Island, 2002**. Source: NOAA Fisheries

Species	Landings (weight, lbs.)	Landings (value, $)	Percent Weight	Percent Value
All Species	103,656,000	64,250,000	100	100
Tuna/ Swordfish*	200,589	596,752	0.19	0.93

* Fish caught on pelagic longlines. Percentages are rounded.

9.4.4 Connecticut

Connecticut's tuna and swordfish fishery is very small relative to all other commercial fisheries in the state; swordfish predominate in the landings, but the combined tuna total is less than 0.0001 percent. No pelagic longline permit owners reside in Connecticut, and one vessel made occasional landings in New London in 2002**.**

Demographic Profile of Connecticut (source: U.S. Census, 2000)

Population:	3,405,565	
Education:		
High school graduates (25 years or older)	1,927,961	84.0%
Employment:		
Labor force (16 years and over)	1,765,319	66.6%
Unemployed	92,668	3.2%
Employment by industry:		
Retail	185,633	11.2%
Manufacturing	246,607	14.8%
Education, health & social services	366,568	22.0%
Arts, recreation, lodging & food services	111,424	6.7%
Farming, fishing, forestry, & mining	7,445	0.4%

9.4.5 New York

Demographic Profile of New York State (source: U.S. Census, 2000)

Population:	18,976,457	
Education:		
High school graduates (25 years or older)	9,916,212	79.1%
Employment:		
Labor force (16 years and over)	9,046,805	61.1%
Unemployed	640,108	4.3%
Employment by industry:		
Retail	877,430	10.5%
Manufacturing	839,425	10.0%
Education, health & social services	2,039,182	24.3%
Arts, recreation, lodging & food services	611,280	7.3%
Farming, fishing, forestry, & mining	54,372	0.6%

There are 16 vessels with permits in the pelagic longline fishery. Dealers holding swordfish and tuna licenses operate in 37 locations in New York state. The communities involved in the pelagic longline fisheries include Lawrence, Brightwaters, Brooklyn, East Hampton, East Islip, Hampton

Bays, Hauppauge, Islip, Montauk, and Staten Island. Since the pelagic longline fisheries are a small and geographically dispersed sector of New York's fisheries, individual community profiles have not been developed. The landings and value of tunas and swordfish in relation to other species landed in New York can be seen in Table 9.5.

Table 9.5 **Commercial Fishery Landings in New York State, 2002.** Source: NOAA Fisheries.

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	38,665,000	51,334,000	100	100
Tuna/ Swordfish*	332,720	904,652	0.9	1.8

* Caught on pelagic longlines. Percentages are rounded.

9.4.6 New Jersey

Demographic Profile of New Jersey (source: U.S. Census, 1990 and 2000)

	1990	2000
Population:	7,730,188	8,414,350
Education:		
High school graduates (25 years or older)	76.9%	82.1%
Employment:		
Labor force (16 years and over)	64.2%	64.1%
Unemployed	5.7%	5.8%
Employment by industry:		
Retail	5.0%	11.3%
Manufacturing	17.0%	12.0%
Education, health & social services	19.1%	19.8%
Arts, recreation, lodging & food services	6.5%	6.9%
Farming, fishing, forestry, & mining	1.0%	0.3%

New Jersey communities involved with the swordfish and tuna pelagic longline fishery include Erma, Cape May, Cape May Courthouse, Ocean City, Sea Isle City, Seaville and Wildwood, Jersey City, Brielle, Shark River, Brick, Forked River, Barnegat Light, Manahawkin, Point Pleasant, Tom's River, West Creek, and Pompton Plains. Of these communities, Barnegat Light and Sea Isle City had the greatest involvement in the fishery, with 74.2 percent and 20.3 percent of pelagic longline landings of swordfish and tuna respectively in 2001. Of the 30 active pelagic longline vessels with permits and registered in New Jersey, 26 make landings in the state. In 2002, Barnegat Light had 14 vessels making tuna and swordfish landings and was the location of three dealers. In all there were seven places in New Jersey which had at least one dealer, and 12 dealers buying pelagic longline caught swordfish and tuna. The landings and value of tunas and swordfish in relation to other species landed in New Jersey can be seen in Table 9.6.

Table 9.6 **Commercial Fishery Landings in New Jersey, 2002.** Source: NOAA Fisheries.

Species	Landings Pounds	Landings Value $	Percent Weight	Percent Value
All Species	162,175,000	112,733,000	100	100
Tuna/ Swordfish*	716,180	1,899,148	0.44	1.7

* Fish caught on pelagic longlines. Percentages are rounded.

9.4.6.1 Barnegat Light

Barnegat Light has grown and changed in the decade between the 1990 and 2000 Censuses. The changes are reflected in two demographic dimensions. The first is a shift to higher education/higher qualification occupations and the second is a continued shift to an older, retired population. The change in age structure also signifies a change in the workforce and the source of household earnings. In 2000, there were 371 households with an average size of 2.06 persons/household. Of these households, 233 (62.8 percent) received income in the form of earnings, while 202 households (54.4 percent) received income from Social Security. Retirement income was received by 130 households (35.0 percent). For households receiving income from earnings, the average income was $63,373 in 2000. The average Barnegat Light household with

Demographic Profile of Barnegat Light (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	681	764
Education:		
High school graduates (25 years or older)	84.9%	92.1%
Employment:		
Labor force (16 years and over)	51.0%	46.9%
Unemployed	1.0%	2.7%
Employment by Occupation		
Managerial/professional	32.0%	40.8%
Technical/administrative	31.0%	36.3%
Precision production, craft & repair	14.0%	11.3%
Farming, fishing, forestry, & mining	10.2%	6.5%

retirement income received $22,168. In comparison with New Jersey as a whole, employment earnings were less than the state average, while retirement income was above the state average. However, the median household income in Barnegat Light ($52,361) in 2000 was some $2,800 lower than the state-wide median household income.

Barnegat Light is a vacation and retirement destination. Of the 1,207 housing units available in 2000, 64.3 percent (781 units) were vacation homes, and 371 homes were occupied year-round. Some 55 homes were unoccupied at the time of the 2000 census. About one-quarter of the resident population had lived in Barnegat Light for less than five years in 2000, and most of the new residents moved to the town from other parts of New Jersey. Of the population of Barnegat Light in 2000, 55 percent (430 persons) had been born in New Jersey, while 41 percent were born elsewhere in the United States. There is a "community stickiness" factor among

Age structure of the Population of Barnegat Light (source: Census, 1990 & 2000)

Population by Age	1990		2000	
Total population	681	100%	764	100%
Under 15 years	68	10%	92	12.1%
15 - 44 years	225	33%	185	24.2%
Over 44 years	388	57%	487	63.7%

persons resident in Barnegat Light, since 70 percent had lived there prior to 1995, but there is also evidence of change which could affect life-style and the culture of the community. One of the elements of "community stickiness" is that many of the "new" residents are retirees who have converted their former vacation homes to year-round residences.

The Community and Fishing

Prior to 1820, fishing operations and maritime trade were conducted in the small settlements on the mainland inside the chain of islands and sand bars fringing the New Jersey Coast. Barnegat Inlet was one of the important channels to the open ocean, with a sheltered anchorage immediately inside the inlet, and ample resource for a fishing community. A lighthouse was built in 1824 to mark the entrance to the inlet. This lighthouse was replaced in 1855 with the second-tallest lighthouse in the United States which operated until 1927. The building continues as both a community landmark and a navigation mark.

In 1881 the Barnegat City Improvement Company was formed and developed the present-day town as a resort and recreation area, with the town owning all the beaches and dunes. The mix of tourism and fishing has continued to the present. Fishing operations are now linked to their markets by road and there is a tight mesh between the winter and summer economies. Local shops and services are sustained by the fishing activities in the winter months, and it is estimated that the direct employment in fisheries and fishing services was of the order of 52 percent of the civilian workforce of 300 persons in 2000.

Fishery-related organizations in Barnegat Light include: Blue Water Fishermen's Association; Forked River Tuna Club; Jersey Devils Fishing Club; Beach Haven Marlin and Tuna Club; Long Beach Island Fishing Club; and United National Fishermen's Association.

There are four full service marinas in Barnegat Light in addition to 44 municipal boat slips and a municipal ramp. The marinas and slips are on the bayside of Long Beach Island and extend southwards some 18 blocks from the inlet. Commercial fishing docks and fishhouses also line Bayview Avenue, but are clustered towards the southern end of the street. Five bait and tackle shops, three of which also provide boat rentals, provide services to local and visiting fishermen. The charter fleet working from Barnegat Light is estimated to be 20 boats, including 11 vessels with HMS permits. In addition there are six headboats, three of which have HMS permits, working from the port. About half this fleet is active year-round in Barnegat Light, while another four vessels at least fish elsewhere in the winter months. One charter boat fishes for tuna off North Carolina in the winter and spring, while three other vessels fish from November through April from ports in Florida.

The commercial fishing fleet is diverse and targets different species as they move through local waters. In 2001, some 40 inshore and offshore boats were based in Barnegat Light, including boats used in the shellfish fishery. Barnegat Light is known for its pelagic longline fishery. The fleet targets yellowfin and bigeye tunas for most of the year and swordfish for part of the year. Pelagic and large coastal sharks are important incidental catches and some species like mako, porbeagle, and sandbar sharks are usually kept and sold. A few vessels continue to bottom longline for tilefish in the deep waters of the outer continental shelf and canyons. Some captains from this port have begun to fish off the coasts of other countries. Pelagic longline crews are increasingly from other regions, such as Nova Scotia and some of the southern states. Some of the pelagic longline fishermen from Barnegat Light have become distant-water operators, going to the Grand Banks off Newfoundland, the waters off Greenland, as well as the Caribbean, Brazil, and other distant fishing grounds. The owner of one major fleet (six longline vessels) left Barnegat Light in 1999 to fish for HMS in the Pacific Ocean.

Other captains of pelagic longline vessels strongly prefer to work closer to home or to take shorter trips. The options of those who resist going to other ports are far more restricted now than they were three decades ago. Distant water fishing is very disruptive to families and the community. Some local vessels are now converting from pelagic longline fishing to monkfishing, although many who have tried to convert to other fisheries have failed to meet deadlines for limited entry. Another concern of local residents is that the demise of commercial fisheries is likely to transform the use of the waterfront, bringing in condominium development where marinas are now located, an outcome which many long-term residents find undesirable.

9.4.7 Pennsylvania

There are no reported landings of pelagic longline-caught tuna or swordfish in Pennsylvania. Philadelphia is, however, the hail port of nine pelagic longline vessels active in the fishery in

2002. No HMS pelagic longline permit holders reside in the state. Because of the tenuous links with the fishery, no social assessment was carried out for the state or Philadelphia.

9.4.8 Delaware

Demographic Profile of Delaware (source: U.S. Census, 2000)

Population:	783,600	
Education:		
High school graduates (25 years or older)	425,122	82.6%
Employment:		
Labor force (16 years and over)	397,360	65.1%
Unemployed	20,549	3.4%
Employment by industry:		
Retail	43,578	11.6%
Manufacturing	49,720	13.2%
Education, health & social services	73,056	19.4%
Arts, recreation, lodging & food services	28,979	7.7%
Farming, fishing, forestry, & mining	4,042	1.1%

The HMS pelagic longline fishery has a minimal impact in Delaware. There are three permitted vessels in the State, with hail-ports of Dover, Laurel, and Lewes. There were no reported pelagic longline landings of swordfish or tuna in the state in 2002. Two permit holders reside in Delaware. No social assessment was made because of the low level of involvement in the fishery.

9.4.9 Maryland

The pelagic longline fishery for tunas and swordfish in Maryland is small scale. There are

Demographic Profile of Maryland (source: U.S. Census, 2000)

Population:	5,296,486	
Education:		
High school graduates (25 years or older)	2,930,509	83.8%
Employment:		
Labor force (16 years and over)	2,737,359	67.0%
Unemployed	128,902	3.2%
Employment by industry:		
Retail	273,339	10.5%
Manufacturing	189,327	7.7%
Education, health & social services	538,350	20.6%
Arts, recreation, lodging & food services	177,341	6.8%
Farming, fishing, forestry, & mining	16,178	0.6%

licensed dealers operating in three locations, and 4 vessels involved in the fishery. Places involved with the fishery include Berlin, Ocean City, Pasadena, West Ocean City, and Willards. Because of the low level of activity in the fishery, no social assessment was made of impacts on these places. The landings and value of tunas and swordfish in relation to other species landed in Maryland can be seen in Table 9.7.

Table 9.7 **Commercial Fishery Landings in Maryland, 2002.** NOAA Fisheries, 2003**.**

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	53,185,000	49,013,000	100	100
Tuna/ Swordfish*	6,692	22,848	0.013	0.05

* Tuna/swordfish caught on pelagic longlines.

9.4.10 Virginia

Demographic Profile of Virginia (source: U.S. Census, 2000)		
Population:	7,078,515	
Education:		
High school graduates (25 years or older)	3,801,964	81.5%
Employment:		
Labor force (16 years and over)	3,563,762	64.4%
Unemployed	151,125	2.7%
Employment by industry:		
Retail	389,473	11.4%
Manufacturing	387,104	11.3%
Education, health & social services	626,156	18.3%
Arts, recreation, lodging & food services	245,967	7.2%
Farming, fishing, forestry, & mining	43,425	1.3%

There were no landings in Virginia of swordfish or tuna taken with pelagic longline gear in 2002. Seven pelagic longline vessels with HMS permits have hail ports in Virgina and three permit holders reside in the state. Places involved in the fishery include Bloxom, Norfolk, Sanford, and Tangier. Because of the low level of involvement with the fishery, no social assessment of impacts on these places was undertaken.

9.4.11 North Carolina

The pelagic longline fishery has a distinctive split north/south of Cape Hatteras, reflecting the local oceanographic conditions. The Gulf Stream, as it skirts the Cape Hatteras shoals, is twenty

Demographic Profile of North Carolina (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	6,628,637	8,049,313
Education:		
High school graduates (25 years or older)	70.0%	78.2%
Employment:		
Labor force (16 years and over)	72.4%	65.7%
Unemployed	4.9%	3.4%
Employment by industry:		
Retail	18.9%	11.5%
Manufacturing	31.5%	19.7%
Education, health & social services	23.8%	19.2%
Arts, recreation, lodging & food services	4.4%	6.9%
Farming, fishing, forestry, & mining	3.2%	1.6%

miles offshore. This is the closest it approaches land after leaving the Cape Canaveral area. The waters north of Cape Hatteras are influenced by the cold Labrador Current. The area off Dare and Hyde Counties, NC is where these two water bodies mix and provides very rich fishing grounds. South and west of Cape Hatteras, the coast curves away to the west forming the relatively shoal Carolina Bight. Vessels operating in this area have further to travel from shore to the Gulf Stream and do not enjoy the diversity and richness of the fisheries immediately to the north of Cape Hatteras.

North of Cape Hatteras, the 2001 pelagic longline landings of swordfish and tuna in Dare and Hyde Counties were 76 percent of the state catch by weight and 79 percent by value. Licensed dealers operate in seven locations in North Carolina, and nine pelagic longline fishing vessels have hail ports in the state. Of the nine vessels, eight are vessels fishing from Dare County, north of Cape Hatteras, and one vessel is from the Beaufort, NC area.

Places involved in the pelagic longline fishery in Dare and Hyde counties include Englehard, Hatteras, Kill Devil Hills, Kitty Hawk, Manteo, and Wanchese. The landings and value of tunas and swordfish in relation to other species landed in North Carolina can be seen in Table 9.8.

Table 9.8 **Commercial Fishery Landings in North Carolina, 2001.** Source: NOAA Fisheries, 2002.

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	159,557,000	98,723,000	100	100
Tuna/ Swordfish*	360,839	547,409	0.22	0.55

* Tuna/swordfish caught on pelagic longline gear. Percentages are rounded.

9.4.11.1 Wanchese

Wanchese is located on the southern part of Roanoke Island, in the northern Outer Banks. This small fishing village is said to have "changed as little as those who have lived here for generations" (Cutchin, 1997). Wanchese's first seafood dealer was opened in 1936 by a family that still operates two dealers in the community. The village continues to revolve around fishing and fish processing, although boat building has increased in importance in recent years. The Wanchese Seafood Industrial Park was constructed in 1980 by the state; it has 30 acres of leasable land, a 15-acre deep water harbor, 1,500 feet of commercial-style concrete docks, and seven seafood-related businesses (CNCSS, 1993).

There are approximately 117 small businesses in Wanchese, 44 of which are commercial fishing or charter fishing businesses (CNCSS, 1993). Support industries, such as boat builders and seafood packers, are also of great importance to the commercial fisheries and to the North Carolina charter-boat fishery. There are three major seafood dealers/processors in Wanchese and five smaller ones. Of the major dealers, one dealer specializes in scallop and flounder, and has 14 vessels including trawlers, scallop vessels and smaller vessels for gill netting as well as two scallop vessels in Alaska (CNCSS, 1993). They have three packaging and processing houses, a fish-packing house and processing and freezing operations (located in North Carolina, Virginia, and Massachusetts). Seafood is distributed locally and nationally by truck and internationally by air freight. The second dealer, which specializes in hooked fish, is an important seafood distributer. While only operating one vessel, this company buys regularly from 35 local and over 70 non-local vessels. The third dealer, which specializes in bulk fish, packs the fish from its own two vessels. Transportation of their product is set up through an agreement with the Wanchese Fish Company (CNCSS, 1993).

Recent growth in tourism and recreational fishing has sparked competition for finite fishery resources and for dock and harbor-area space. In Wanchese, the east wall of the harbor and more than two/thirds of developed area of the Industrial Seafood Park are now given over to charter and head-boat operations, recreational boat-building and repair and storage. A brewery also operates with the Seafood Industrial Park. However, commercial and recreational fishermen still see themselves as being part of the same fishing-based community and many come from the same families. Members of the non-fishing public are generally supportive of the fishing industry. Unlike the surrounding communities, and in distinct contrast to Hatteras Township, Wanchese has relatively little seasonal variation in employment resulting from tourism; what seasonal fluctuations do exist are caused by the availability of the fisheries resources and are countered by the flexibility and opportunistic nature of the Wanchese fishermen (CNCSS, 1993).

Demographic Profile of Wanchese, NC (source: U.S. Census, 1990 & 2000)		
	1990	2000
Population:	1,374	1,527
Education:		
High school graduates (25 years or older)	67.0%	76.5%
Employment:		
Labor force (16 years and over)	922	799
Unemployed	10.0%	1.8%
Employment by industry:		
Retail	19.0%	11.7%
Manufacturing	16.1%	13.1%
Education, health & social services	23.1%	22.0%
Arts, recreation, lodging & food services	6.1%	7.2%
Farming, fishing, forestry, & mining	20.0%	8.2%

The population of Wanchese is 98 percent Caucasian, and mostly of European ancestry. There is a strong level of "community stickiness" in Wanchese. In 2000, 75 percent of the population had lived in the same house for five years or more, and 89.7 percent had lived in Dare County for five years or more. There has been a shift in the age structure of the population of Wanchese since the 1990 Census. In 1990, 26 percent of the population were under 15 years of age while, in 2000, 18 percent of the population was under 15. The percentage of those between 15 and 44 years of age remained the same, 46 percent, while in 2000 the population of those 45 years and older had risen nine percent to 36 percent.

In 1990, there were 503 households in Wanchese, with an average of 2.69 persons/household. The number of households had grown to 614 in 2000, with an average of 2.49 persons/household. As in Hatteras, this suggests a population with more "empty-nest" and retiree households than before. Some 87.5% of the households received earnings from an occupation or job, while 12.5 percent of the households received retirement income and 20 percent of the households received Social Security payments.

Wanchese is not a community linked to tourism in the way that most other Outer Banks and Dare County communities are. Of the housing stock, only seven percent were vacation properties in 2000. The marinas and boatyards in Wanchese cater to transient boats and the charter boat fleets, but recreational fishing from Wanchese is more likely to be done by local fishermen in the Albemarle, Currituck, or Pamlico Sounds, than by tourists fishing offshore in private or charter boats. The reason for this is the distance to Oregon Inlet, and the presence of the Oregon Inlet Fishing Center with extensive boat docks, facilities for charter boats, and launching ramps with large parking areas close to the inlet.

A large number of commercially important marine fish are landed in Wanchese, including inshore and offshore species. Many fishermen emphasized that they have to be versatile due to quick changes in water temperature and therefore in availability of species in the area (Wilson *et al*., 1998). The species that pelagic longline fishermen target off the mid-Atlantic coast include swordfish, dolphinfish, and tunas (primarily, yellowfin and bigeye). Although targeting bluefin tuna with longline gear is prohibited, there is an incidental catch allowance of bluefin tuna as part of other fishing operations. Fishermen aboard pelagic longline vessels fish for swordfish, tunas, and dolphin. Because of the weather, tunas and swordfish are accessible to the medium-sized vessels that gillnet for other species and longline in the summer. Respondents explained that they also gillnet for dogfish, bluefish, and Spanish mackerel (in spring and fall), and trout and croaker (in winter). They also bottom fish for bass and grouper. There are a number of vessels that gillnet in some seasons and then switch over to charterboat fishing in the summer. Other fishing activities in Wanchese include trawling trips for squid in the summer, and fishing for weakfish, croaker, and flounder in the winter. Market considerations are crucial in deciding which species should be targeted by longline vessels (Wilson *et al*., 1998).

Researchers found pressure on this sector of the longline fishery to be substantial. Hiring and managing crew for pelagic longline vessels is increasingly difficult, especially for the larger vessels that need people to stay on for longer trips. There is a lot of turnover in fishing crews, particularly when vessels shift to other fisheries and revenue drops. Many of the larger vessels have already left, and experienced fishermen are finding work overseas and other captains and vessel owners are searching for alternatives to commercial fishing. Some have switched to carpentry and building and others have gone into the charter fishing business. Finding alternative permanent work may prove difficult for many fishermen who are highly skilled in their profession but have less formal education than the average worker (Wilson *et al*., 1998).

Traditionally, fishermen on larger longline vessels went shark fishing from January until the closure of the first half of the shark season, and then fished with pelagic longline gear for tunas or swordfish. HMS landed by these vessels supplied the restaurants in the local area with fresh products. Commercial fishermen and dealers did not like the fact that closures of the shark fishery caused all fishermen to shift at the same time from species to species, because it caused prices to drop. Some marginal fishermen are driven out of the market by the low prices associated with these shifts. Shifts in targeted species also required changing gear, which could be expensive (Wilson *et al*., 1998).

9.4.12 South Carolina

Demographic Profile of South Carolina (source: U.S. Census, 2000)		
Population:	4,012,012	
Education:		
High school graduates (25 years or older)	1,981,731	76.2%
Employment:		
Labor force (16 years and over)	1,938,195	62.2%
Unemployed	113,495	3.6%
Employment by industry:		
Retail	217,604	11.9%
Manufacturing	354,386	19.4%
Education, health & social services	339,708	18.6%
Arts, recreation, lodging & food services	155,109	8.3%
Farming, fishing, forestry, & mining	20,785	1.1%

The HMS pelagic longline fishery in South Carolina involved two local vessels in 2002, with transient vessels from New Jersey and North Carolina also landing in the state. There were licensed dealers operating in six locations in South Carolina and owners of four permits were resident in the state. Places involved in the pelagic longline fishery were Charleston, Georgetown, Mount Pleasant, and Wadmalaw Island. Because of the small catches and relatively low value of the fishery, no profiles were made of the South Carolina fishing communities. The landings and value of tunas and swordfish in relation to other species landed in South Carolina can be seen in Table 9.9.

Table 9.9 Commercial Fishery Landings in South Carolina, 2002. Source: NOAA Fisheries, 2002.

Species	Landings Pounds	Landings Value $	Percent Weight	Percent Value
All Species	13,458,000	20,760,000	100	100
Tuna/ Swordfish*	51,253	89,994	0.38	0.43

* Tuna/swordfish caught on pelagic longlines. Percentages are rounded.

9.4.13 Georgia

One HMS pelagic longline permit holder was resident in Georgia in 2002, and one pelagic longline vessel had Darien as her hail port. No landings of swordfish or tuna taken on pelagic longlines were reported in Georgia in 2002.

9.4.14 Florida

Demographic Profile of Florida (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	12,937,926	15,982,378
Education:		
High school graduates (25 years or older)	74.0%	79.9%
Employment:		
Labor force (16 years and over)	58.6%	58.1%
Unemployed	6.1%	3.2%
Employment by industry:		
Retail	19.6%	13.5%
Manufacturing	10.5%	7.3%
Education, health & social services	21.4%	18.1%
Arts, recreation, lodging & food services	6.8%	10.5%
Farming, fishing, forestry, & mining	3.1%	1.3%

There were some significant shifts in Florida's economy in the decade between 1990 and 2000. Traditional sectors of the economy, such as retail trade, manufacturing and farming shrank, while employment in the tourist industry, financial and other services grew. In spite of the population growth of nearly 25 percent in the decade, the ratio between those of an age to be in the labor force and those who were active in the labor force did not change significantly. Some 42 percent of those older than 16 years were not in the labor force. This reflects a continuing population of retired persons. In fact Florida has a population with more than 40 percent older than 45, and 19 percent less than 15, years of age. In 2000, 24 percent of Florida's households received retirement income and 33 percent received Social Security income. Households in which income was earned through wages or salary were 74 percent of all households in 2000. Average per capita income in Florida in 1989 was $14,698, and this had increased to $21,557 in 1999.

Florida's fishing industry is one of the largest in the region and it is as diverse as the East and West coasts are different. The pelagic longline fishing fleet consists of 77 vessels with Florida hail ports and HMS permits in 2002. Of these vessels, 39 operated from East Coast ports and 38 from Florida's West Coast ports. Licensed dealers operate in 14 locations in Florida, split evenly between East and West Coast communities. In 2002, the pelagic longline catch of swordfish and tuna was split between the two coasts with 98 percent by weight going to the East Coast ports, and 3 percent by value going to the West Coast ports. The landings and value of tunas and swordfish in relation to other species landed on the East Coast of Florida can be seen in Table 9.10.

Table 9.10 **Commercial Fishery Landings in Florida (East Coast), 2002.** Source: NOAA Fisheries, 2003.

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	32,221,000	38,878,000	100	100
Tunas/ Swordfish*	102,976	230,117	0.32	0.59

* Tunas/Swordfish caught on pelagic longlines. Percentages are rounded

The East Coast fishery extends from the Georgia state line to Biscayne Bay. The greatest amount (63 percent by weight) of pelagic longline landings on the East Coast in 2002 was in St. Lucie County. The second largest landings in 2002 were in Lee County where 16 percent of the pelagic longline swordfish and tunas, by weight, are landed. Brevard County, in the northeast, had 14 percent of the catch. Fort Pierce (St. Lucie County) had the greatest concentration of vessels and permit owners, with nine HMS pelagic longline boats and the owners of eight permits. Miami (Dade County) was the hail port for 10 pelagic longline vessels, but there were no pelagic longline swordfish or tuna landings in Dade County, and no owners of HMS pelagic longline permits were resident in Dade County in 2002. In 2002, there were 22 Florida East Coast places involved in the HMS pelagic longline fishery through landings, vessel hail ports, or the places of residence of permit owners.

The West Coast pelagic longline fishery included all of the Florida Keys, the West Coast, and the Florida Panhandle. Pinellas County and Monroe County ports each handled 45 percent, by weight of swordfish and tunas taken by pelagic longline gear. Monroe County (the Florida Keys) ports handled 63 percent, by value, of the West Coast catch. Ten vessels were based in Panama City which was also home to owners of eleven HMS pelagic longline permits. Pinellas County places were the hail ports for 12 vessels, of which nine were based in Madeira Beach. Madeira Beach was also the home of owners of four HMS pelagic longline permits. Dealers operated in seven locations on the West Coast of Florida. The landings and value of tunas and swordfish in relation to other species landed on the West Coast of Florida can be seen in Table 9.11.

Table 9.11 **Commercial Fishery Landings in West Coast, Florida, Ports; 2002.** NOAA Fisheries, 2003.

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	78,975,000	138,968,000	100	100
Tunas/ Swordfish*	2,433	6,994	0.003	0.005

* Tunas/swordfish caught on pelagic longlines. Percentages are rounded.

9.4.14.1 Pompano Beach

Pompano Beach is small city directly adjacent to Ft. Lauderdale. The Ft. Lauderdale area is known as the “Yachting Capital of the World” and the “Venice of America” because of the vast canal system which extends throughout Broward County and creates 165 miles of waterfront in the region. Recreational fishing is a very important activity in Pompano Beach, mainly targeting billfish. According to Florida's Bureau of Vessel Titling and Registry, in 1996 and 1997 Broward County had 44,151 registered vessels, with 41,393 pleasure and 2,043 commercial vessels. In contrast to many Florida communities, a substantial amount of the recreational industry is supported by local people in addition to tourists; many small fishing tournaments attract about 75 percent local people and 25 percent tourists. Pompano Beach is also a globally important manufacturing center for commercial longlining equipment (Wilson *et al*, 1998).

Since the 1990 Census, there have been shifts in the ethnic and racial population of Pompano Beach. In 1990, the population was 70 percent Caucasian and 29 percent Black-American. Some 20 percent of the population was of Hispanic ancestry. In 2000, the population consisted of 67 percent Caucasians, 25 percent Black-Americans, and 8 percent of people of other ethnicities. The proportion of the population with Hispanic ancestry had dropped to 10 percent.

The age structure of the Pompano Beach population did not, however, change during the decade. Children under 15 years comprise 15 percent of the population, persons between 15 and 44 years of age form 40 percent of the population, and 45 percent are aged 45 years or older.

The number of households increased from 31,891 in 1990 to 35,917 in 2000. The average household size in Pompano Beach decreased from 2.2 persons/household in 1990 to 2.1 persons/household in 2000. Of the households in 2000, some 69 percent were in receipt of earned income. Some 36 percent of the households received Social Security payments, while 16 percent of households were in receipt of retirement income from pensions. This suggests that some 30 percent of households were retired and living on fixed incomes.

Demographic Profile of Pompano Beach (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	72,411	78,191
Education:		
High school graduates (25 years or older)	73.7%	77.2%
Employment:		
Labor force (16 years and over)	55.7%	53.8%
Unemployed	6.3%	3.6%
Employment by industry:		
Retail	18.6%	13.6%
Manufacturing	8.5%	7.1%
Education, health & social services	13.2%	14.9%
Arts, recreation, lodging & food services	8.4%	11.0%
Farming, fishing, forestry, & mining	3.1%	0.5%

The per capita income for Pompano Beach in 1989 was $17,382, and greater than the state average by $2,684 per annum. In 2000, per capita income in Pompano Beach was $23,938, and greater than the state average income by $2,381.

As a community, Pompano Beach owes its current infrastructure and social and economic lifestyle to the coming of the railroad in 1896 to a small coastal settlement. The proximity of good fishing and other natural resources encouraged the town and region's development as tourism and retirement center. The local chamber of commerce sponsors three marine festivals every year, and describes Pompano Beach as a "haven for boating, fishing and outdoor activities with its beautiful sunny weather...".

Pompano Beach has a proud longlining heritage and there are several successful businesses that are still involved to some degree with the fleet (Wilson *et al*., 1998). This gives the current small vessel fleet and other longline business some networks of support. At the same time, Pompano Beach is now increasingly a recreational fishing community. There is a great deal of tension between the recreational fishermen and the longliners. At the present time, researchers found that the longline fleet is not receiving community support beyond that supplied from within their own industry. Both sides acknowledge a problem with overfished stocks, but each often blames the other side.

Pompano Beach has a small pelagic longline fleet, remnant of a much larger fleet, that mainly targets tunas and swordfish. There is also some shark fishing farther north along the coast. Among the vessels that dock in Pompano Beach are five small (40 to 50 feet), short-trip, year-round longline vessels, and six or seven seasonal longline vessels. There are some larger pelagic longline vessels in the nearby town of Dania. The most intensive local fishing takes place December through April. Vessels in the resident fleet stay and are joined by many vessels that come from the north to fish during the winter. From April through the end of June, fishermen on the larger longline vessels fish in the South Atlantic Bight and land most of their catch in Charleston, South Carolina. The smaller longline vessels fish year round in the Gulf of Florida. The longline fleet conducts business with two seafood dealers in Pompano Beach and one in Dania.

Commercial fishermen in Pompano Beach are proud of the role they have played in the development of the longline industry and report that monofilament longline was created and perfected in Pompano Beach. A group of charter vessel captains, the "Mosquito Fleet," began experimenting with longlines and various fish attraction devices in the 1970s. Three of these people opened a dealer to specialize in pelagic fish. A related company built the first distant water swordfish fleet in the southern United States. By the early 1980s, the fleet was developing and the geographical range of operations was increasing. They sold the smaller vessels and acquired 60 to 80-foot vessels that could move north and follow the fish. They moved from short trips to week long trips. By 1983, they were fishing on George's Bank and would be gone for two to three weeks. The Pompano Beach longliners began to invest in even larger vessels in the mid 1980s. This meant, however, that the best captains were gone for longer and longer times. Family problems, divorces and dislocations became issues in the community (Wilson, *et al,* 1998).

By the late 1980s, the eight largest vessels in the Pompano pelagic longline fleet had gone to Hawaii. The better captains began to get out of the business because they had to travel so much. The mates that took over were less skilled and this increased the amount of time that the home offices had to spend on absentee management. There was increased competition from imported fish and ICCAT catch restrictions for swordfish were becoming tighter. With Bahamian independence, the fleet lost access to waters near the Bahamas which had been very important for the smaller longline vessels, less than 50 feet in length. Researchers also found that the small vessel fishery is vulnerable to price pressure from the swordfish boycott that was organized by a coalition of conservation groups, because their main market niche is the high-end users that are responding to the boycott. The development of the Pompano Beach area for yachting and recreational fishing has made dockage and access to the water more expensive (NMFS, 1999). Swordfish closures have reduced income by shifting effort to less valuable species, such as sharks.

Respondents reported that as recently as 1994, crew used to line up for work. All commercial respondents reported increased difficulty in getting quality crew. The smaller vessels take two crew plus the captain. Owner-operators often try to have at least one crew member with them consistently, and then find anyone they can for particular trips. The end result of all of these factors has been a substantial reduction of the Pompano Beach pelagic longline fleet. Pompano Beach's remaining fleet is considered, by both its owners and suppliers, to be in major trouble (Wilson *et al*., 1998). Skilled captains were found to be seeking employment in the Bahamas, as well as with the growing longline fleets in South Africa and South America, while the longline supply business has shifted its emphasis to supplying foreign fleets. In the urban economy of Pompano Beach, non-fishing alternatives for fishermen exist. However, unemployment is moderately high and the work force is fairly well-educated, so finding employment could be competitive. Snapper, king mackerel, and red crab are all limited entry fisheries. Fishing for dolphin, however, can be a profitable alternative to swordfishing (NMFS, 1999).

9.4.14.2 Fort Pierce

Fort Pierce is located in St. Lucie County, a rapidly developing area in South Florida. St. Lucie County is known as a center for citrus growing, particularly grapefruit. Fort Pierce is on the site of an army fort built in 1838, and remained an isolated outpost until the railroad reached the town in 1900. Fort Pierce was incorporated in 1901, and soon developed as a center for industry and agribusiness, and more recently as a place to retire to. At the junction of the Florida Turnpike and Interstate 95, Fort Pierce is a thriving intermodal transportation center, distribution point, and tourist stop-over point.

Fort Pierce's population is 49 percent White and 40 percent Black-American. No other ethnic or racial groups dominate the remaining 11 percent of the population. People of Hispanic ancestry comprise 15 percent of the population of Fort Pierce. Children under 15 years of age form 23 percent of the population, 40 percent are aged between 15 and 44 years, while 37 percent are aged 45 or older.

There were 14,407 households in Fort Pierce, with an average household size of 2.56 persons, in 2001. The population is relatively mobile, since only 46 percent lived in the same house in 1995 as they did in 2000. It is also a relatively poor community, with median household income of $25,121 in 2000, and 31 percent of the population living below poverty level. Per capita income in Fort Pierce in 2000 was $14,345, compared to the state-wide average per capita income of $21,557, or $9,593 less than the per capita income in Pompano Beach.

Locals refer to Fort Pierce as the "gateway to the Bahamas" because of the number of sport fishing and other vessels which use Fort Pierce as their departure point for the Bahamas and its associated Gulf Stream fisheries for HMS and other species of fish, including swordfish and tuna. The city's marina, in conjunction with other marinas and docks along the Indian River, Indian River Lagoon, and Intracoastal Waterway, provides sufficient dockage for recreational boaters and fishermen and for a commercial fishing fleet, principally longliners. The Fort Pierce pelagic longline fleet landed 62 percent, by weight, and 66 percent, by value, of the Florida East Coast swordfish and tunas in 2002, earning some $153,000 in ex-vessel sales.

Demographic Profile of Fort Pierce, FL (source: U.S. Census, 2000)

Population:	28,485	
Education:		
High school graduates (25 years or older)	14,108	59.7%
Employment:		
Labor force (16 years and over)	15,681	55.1%
Unemployed	1,382	4.9%
Employment by industry:		
Retail	1,784	12.5%
Manufacturing	1,139	8.0%
Education, health & social services	2,419	16.9%
Arts, recreation, lodging & food services	1,545	10.8%
Farming, fishing, forestry, & mining	1,119	7.8%

The commercial fishery is similar to the commercial fishery of Pompano Beach, using both pelagic longlines and bottom longlines, and is principally conducted during the fall and winter seasons. Smaller vessels switch gears and target species throughout the year, while larger vessels move with the fish stocks and retain the same gear configurations.

9.4.14.3 Madeira Beach

Madeira Beach is part of the Tampa Bay urban complex, one of several beach suburbs of St. Petersburg. The area is the central port for the Florida shark bottom longline fleet. Madeira

Beach is also home to a thriving recreational HMS fishery. In terms of revenue, tourism is the number one industry in Pinellas County. Annually, four million visitors contribute about two billion dollars to the economy. The tourism industry also employs almost 60,000 of the residents either directly or indirectly, adding up to $720 million in wages (St. Petersburg/Clearwater Visitors Bureau brochure, 1998). The state of the economy since September 2001 has dampened the tourism industry, and Pinellas County Chamber of Commerce reported that the 2002 visitor and expenditure statistics were similar to those of 1998 (PCCC Report, March, 2003).

The population of Madeira Beach was 99.8 percent Caucasian in 1990 and 97.1 percent Causcasian in 2000. During the decade, the number of people in the population claiming German ancestry rose from 11 percent to 19.7 percent in 2000, although 92 percent of the population of Madeira Beach were born in the United States. The Madeira Beach population aged during the decade. In 1990, seven percent of the population were children aged 14 years or less; this proportion had dropped to 6 percent in 2000. The proportion of persons aged 15 to 44 years also dropped from 39 percent in 1990 to 36 percent in 2000. The proportion of persons aged 45 years or more grew from 54 percent of the population to 58 percent.

Demographic Profile of Madeira Beach (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	4,225	4,511
Education:		
High school graduates (25 years or older)	83.8%	87.3%
Employment:		
Labor force (16 years and over)	63.1%	61.5%
Unemployed	2.8%	2.7%
Employment by industry:		
Retail	12.7%	11.4%
Manufacturing	12.2%	11.3%
Education, health & social services	9.2%	7.9%
Arts, recreation, lodging & food services	20.2%	21.6%
Farming, fishing, forestry, & mining	0.2%	0.0%

The number of households in Madeira Beach increased from 2,230 in 1990 to 2,528 in 2000, but the average number of persons in a household declined from 1.88 persons in 1990 to 1.78 in 2000. In 2000, almost 28 percent of the housing units in Madeira were seasonal or recreational units vacant at the time of the Census.

Per capita income in Madeira Beach in 1989 was $17,301; in 1999, per capita income had risen to $30,097, some $8,000 more than the state average per capita income. Individuals living at or below poverty level comprised 9.8 percent of the Madeira Beach population. Some 72 percent of

Madeira Beach's households received earnings from wages or salaries. Twenty-three percent of the households were in receipt of retirement funds or pensions, while 31 percent of the households received income from Social Security.

The offshore fishing industry in Madeira Beach started as a bandit (reel fixed to transom) fishery before it shifted to bottom longlining. Grouper is the traditional fishery for the community. In the 1960s, there were two dealers supported by charterboats selling fish and a small commercial fleet targeting kingfish and grouper. Many species which are now sold, such as amberjack, were considered junk fish. As demand for seafood began to grow, higher prices accompanied by investment programs lead to substantial investment in commercial fishing within this community.

Pelagic longline vessels began to target swordfish in the 1970s, using cloth and nylon line before monofilament longlining became widely used. Local availability of swordfish declined quickly and a group of vessels went north to look for fish. On their way back they set longline gear in deep water and caught a significant amount of tilefish and yellow edge grouper; this was how the bottom longline fishery in Madeira Beach began (Wilson *et al*., 1998). Marginal swordfish vessels began to experiment with various techniques such as straight hooks, auto-baiters and circle hooks. These vessels were now too small to be successful at swordfishing because of the increased steaming distances required. The fleet at Madeira Beach is currently 95 percent longline vessels. In 1997, there were four seafood dealers in this community, two of which bought and sold pelagic fish. One dealer estimated that before restrictions on shark fishing his business used to be 45 percent grouper, 45 percent shark, and ten percent swordfish and tuna; now it is 75 percent grouper, ten percent shark and 15 percent swordfish and tuna (Wilson, *et al*., 1998).

Many longline fishermen have multiple permits and a substantial number are grouper fishing. Different gear is used for the different fisheries. Grouper fishing requires a wire cable while the pelagics use mono-filament, although some fishermen fish grouper with a monofilament mainline using weights to sink it. The maximum number of trips they can make is about 15 trips a year, as a grouper trip lasts 18 to 20 days. Mexican grouper fishing has created a lot of competition in the last decade, and U.S. fishermen are upset by the ineffectiveness of Mexican regulations and the lack of import controls. In the United States, grouper are subject to limited access, a minimum size, area restrictions, and a quota.

Yellowfin tuna is an important Gulf of Mexico commercial fishery species but requires use of pelagic longline gear, rather than the bottom longlines used in the grouper and shark fisheries, as well as a larger vessel because of steaming distances. Currently, few vessels land tunas in Madeira Beach and their catches are low. Yellowfin tuna meat has to be kept on board at a high standard of care as it is sold for steak. A good trip can yield 30,000 pounds of yellowfin tuna. Florida fishermen prefer tuna fishing to grouper fishing because of the shorter hours and better prices (NMFS, 1999).

Overall, the Madeira Beach longliners are becoming fewer and more isolated from the rest of the fishing community (Wilson *et al*., 1998). Respondents say that antagonism and competition among dealers has gotten worse in recent years as vessels drop out of fishing, often being sold outside of the country. Many of these crews are living trip to trip and often need credit for engine repair, ice, fuel and even household and personal items. Both the fishermen and an engine supplier reported that the commercial fleet is spending more on maintaining existing gear and vessels rather than buying new equipment. Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels (NMFS, 1999).

Fishermen in this community have experienced restrictions on gear, harvest, and capacity in many of its important fisheries. Researchers found that alternative employment outside of the fishery is available through expanding opportunities in the tourism and recreational fishing industries. However, researchers found that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. Some reported that the best captains are leaving the country or moving on to other jobs. Like many other fishing communities, the longline fleet in Madeira Beach is experiencing market competition from imports of their target species. Concerns cited by pelagic longline fishermen were the safety of small vessels during winter openings, and the prospect of small vessels having to pay for observers and VMS (Wilson *et al*., 1998; NMFS, 1999).

In 2002, Madeira Beach was the hail port for nine pelagic longliners actively fishing for HMS species, and the home of the owners of four HMS pelagic longline permits. However most pelagic longline landings were made by Madeira Beach boats in Louisiana and on the East Coast of Florida. The renewal and renovation of the town’s waterfront, particularly on John’s Pass, removed many of the berths and infrastructure which supported both the charter boat fleet and the commercial fishing fleet. There are, in 2002, licensed dealers operating from two locations in Pinellas County.

9.4.14.4 Panama City

Panama City is one of the Florida Panhandle’s top fishing centers. It offers surf fishing, pier fishing, and charter/headboat fishing, according to the Panama City Tour Guide. According to the Florida Bureau of Vessel Titling and Registration, the county had a total of 16,865 registered vessels with 15,359 pleasure and 1,433 commercial vessels in 2002.

During the winter, fishermen target bottom fish and bluefish. In March, the season begins for Spanish mackerel, cobia, snapper, bonito, little tunny, amberjack, snapper, red porgies, rudder fish, blue runner, bluefish, and redfish. By summer, they also fish for king mackerel, dolphin fish, wahoo, little tunny, and barracuda. White marlin, blue marlin and sailfish are caught in late summer. Some charterboats will go shark fishing at night for extra income. In September, the fishery is very mixed, and in October, king mackerel and bonito are popular. Tourists are mainly interested in bottom fishing. Motivations have changed; people used to be interested in catching a lot of fish and taking it home to eat or sell, but now people are satisfied to catch anything (Wilson *et al*., 1998; NMFS, 1999).

Demographic Profile of Panama City, FL (U.S. Census, 1990 & 2000)

	1990	2000
Population:	34,378	36,417
Education:		
High school graduates (25 years or older)	70.0%	79.2%
Employment:		
Labor force (16 years and over)	57.0%	53.9%
Unemployed	8.1%	3.1%
Employment by industry:		
Retail	14.4%	13.8%
Manufacturing	8.0%	7.0%
Education, health & social services	23.6%	22.0%
Arts, recreation, lodging & food services	11.8%	14.2%
Farming, fishing, forestry, & mining	1.5%	0.5%

Panama City saw a big change in its demographics in the decade between 1990 and 2000. In 1990, the age profile was typical of a mature society; by 2000, it reflected significant aging of the population. In 2000, 57 percent of the population of Panama City was 45 years or older, in contrast to 37 percent in 1990. The proportion of the population aged between 15 and 44 years declined from 43 percent in 1990 to 24 percent in 2000. The proportion of the population aged 14 years or younger did not change significantly; it remained at approximately 19 percent of the population.

Panama City had 14,033 households in 1990, and the population grew during the decade to 14,819 households in 2000. The average household size decreased from 2.38 persons in 1990 to 2.30 persons in 2000, indicating that there might be an increase in “empty nesters” and retiree households. Some 12 percent of households (17 percent of individuals) were below the poverty level in 2000. In 1990, the per capita income in Panama City was $12,169 and was significantly lower than the state average per capita income of $14, 698. This situation persisted in 2000, when the Panama City per capita income had increased to $17,830, but continued to be less than the Florida average of $21,557 per capita.

In the early 1980s, yellowfin tuna was the main fishery for Panama City from April through December while bluefin tuna were targeted in the winter. Panama City vessels sold bluefin tuna at regular auctions in Dulac, Venice, and Galveston during the early 1990s. They had a quota of 110 tons and they could bring in two fish per day in trips that lasted four to five days; prices averaged $20 per pound during these peak years. This fishery was considerably reduced by the incidental catch requirement to land 2,500 pounds of target catch in order to take a bluefin tuna. Fishermen say they cannot meet the target catch requirement when the yellowfin season is slow and that therefore discarding of bluefin and high grading have become a problem. Some of the longline vessels were shifting from yellowfin tuna fishing to grouper fishing in 1998, since the latter requires fewer crew members.

Panama City had nine offshore pelagic longline vessels in 1998 that targeted yellowfin tuna during most of the year, and one distant water swordfish longline vessel (Wilson *et al*., 1998). Some of these vessels targeted dolphin fish in the summer, and swordfish more rarely. Two of these vessels were owner operated, two were owned by a dealer, three were each owned by a single person who hires a captain, and two others were owned by the same person who hires captains. Some pelagic longline fishermen also participated in the reef fish fishery. There were 16 to 19 grouper vessels operating out of Panama City in 1998. One fish trader interviewed by the researchers in 1998 reported that his current business was 87 percent yellowfin tuna and eight percent snapper, with the remainder being a mix of swordfish, bluefin tuna, dolphin, wahoo, and escolar. He bought from about ten vessels in 1998, but had bought from 30 vessels a few years ago. Many of the larger U.S. vessels are reported to have gone to Mexico, where fishing regulations are more lenient and it is easier to find crew members (Wilson, *et al.*, 1998).

While Panama City was developing tourist and recreational fishing industries, the longline fishermen were becoming fewer and more isolated from the rest of the fishing community. The competition among dealers was perceived as becoming more aggressive in 1997-1998. Traditional patterns of dealers building relationships by extending services and credit to vessels were giving way to price-based competition to gain access to vessels. Fishermen in this community had experienced restrictions on gear, harvest, and capacity in many important fisheries. Researchers found in 1998 that alternative employment outside of the fishery was available in the developing tourism and recreational fishing industries. However, researchers concluded that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998).

Some of the pelagic longline vessels in Panama City switch their gear to target sharks when the shark fishery was open. The Florida bottom longline fleet primarily targeted sandbar sharks for their valuable fins. Researchers in 1998 questioned fishermen about the possibility of implementing a minimum size for sharks. The main desire in the shark fleet appeared to be avoiding disturbances in supply. Members of the fishing and supply industries reported price fluctuations in the shark fishery, which they attributed to the difficulty in maintaining steady supplies under derby-style quota management. Other concerns cited in 1998 were safety of small vessels during winter openings, and the prospect of small vessels having to pay for observers and VMS.

Researchers concluded that the overall effect of increased restrictions on the bottom longline fleet would be increased pressure on grouper and yellowfin tuna, increased difficulty in finding and retaining employees, and an acceleration in the rate at which the fleet’s vessels and experienced fishermen are moving overseas, especially to Mexico. Increased restrictions on commercial fishing would likely accelerate the decline of that sector relative to the recreational fishery in Florida (Wilson *et al*, 1998).

In 2002, the pelagic longline fishery for swordfish and tuna operating from Bay County ports of Panama City, Lynn Haven, Panama City Beach and Southport made no landings in the County. Bay County has the hail ports for 11 HMS pelagic longline vessels and is the home of the owners of 12 active permits. This fleet of vessels made swordfish and tuna landings in Louisiana ports in 2002, and also participated in the grouper and shark fisheries.

9.4.15 Alabama

There were small pelagic longline landings in Mobile County, Alabama in 2002, but, because there was only one dealer involved, the weight and value of the landings are confidential as required under the MSA and NOAA Administrative Orders. Places involved in the pelagic longline fishery were Elba, Elberta and Orange Beach. Alabama is the home of the owners of two HMS pelagic longline permits and has the hail port of one pelagic longline vessel. Because of the smallness of the fishery, no social assessment or profiles of places was undertaken.

9.4.16 Mississippi

Mississippi had no HMS pelagic longline landings in 2002. One pelagic longline vessel had Pascagoula as her hail port, and the owner of an HMS pelagic longline permit lived in the state. No social assessment of impacts or community profiles were undertaken for Mississippi.

9.4.17 Louisiana

Demographic Profile of Louisiana (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	4,219,973	4,468,976
Education:		
High school graduates (25 years or older)	68.0%	74.8%
Employment:		
Labor force (16 years and over)	57.8%	58.9%
Unemployed	9.0%	4.3%
Employment by industry:		
Retail	17.5%	11.9%
Manufacturing	12.5%	10.1%
Education, health & social services	25.3%	21.7%
Arts, recreation, lodging & food services	4.7%	9.1%
Farming, fishing, forestry, & mining	5.7%*	4.2%*

* Mining in Louisiana includes the oil industry; in 1990, mining employed 3.2% of all workers, while in 2000, mining employed 2.6% of all workers.

Louisiana was second only to Alaska in the quantity and value of its commercial fisheries in the United States in 2002. Venice, LA, ranked third in the United States for quantity of commercial landings, while Dulac, LA, ranked fourth in the nation for value of landings. The menhaden fishery is based in Venice, while shrimping is the principal fishery in Dulac. Both of these fisheries have declined during the past two decades, from the peak year of Louisiana commercial landings in 1984 when 1,931,027,000 pounds of fish were landed in the state.

Pelagic longline landings, principally of tunas, were the largest of any state. Landings in 2002, of 2,733,042 pounds, had a value of $8,688,323. In 2002, tuna and swordfish dealers were operating from 11 locations in Louisiana, and the pelagic longline fishing fleet numbered 47 vessels. The communities involved in the pelagic longline fishery in 2002 included Boothville-Venice, Chalmette, Cut-Off, Dulac, Gretna, Harvey, Houma, Kenner, and New Orleans. The largest concentrations of pelagic longline vessels were homeported in New Orleans (68 percent), and Dulac (19 percent). In 2002, Louisiana was the home to the owners of 43 HMS pelagic longline permits. The landings and value of tunas and swordfish in relation to other species landed in Louisiana can be seen in Table 9.12.

Table 9.12 Commercial Fishery Landings in Louisiana, 2002. Source: NOAA Fisheries, 2003.

Species	Landings	Landings	Percent	Percent
	Pounds	Value $	Weight	Value
All Species	1,308,531,000	305,534,000	100	100
Tunas/ Swordfish*	2,733,042	8,688,323	0.21	2.8

* Tunas/swordfish caught on pelagic longlines. Percentages are rounded.

The center of fishing activity is off the Mississippi delta, and ports like Boothville-Venice, Port Fourchon and Grand Isle with good road access to the metropolitan areas of Baton Rouge and New Orleans, benefit from their access to good bottom-fishing areas and to "blue-water" areas offshore.

9.4.17.1 Venice

Boothville-Venice is a "census designated place" following locally agreed boundaries for unincorporated places, and the Census statistics include both small communities. Similarly, NOAA Fisheries links Empire and Venice as a single port. We will refer to both the port and community as Venice.

Venice is located about 30 miles south of the Parish seat, Point à la Hache, which is flanked by eroding wetlands and levees that border the Mississippi River. The unemployment rate is low compared to that of Dulac, perhaps because Venice has been the epicenter of oil industry activity in Louisiana. The main job opportunities in Venice are oil, seafood , and increasingly, recreational fishing. Venice extends into the Gulf of Mexico close to billfish areas that are frequented by recreational fishermen. Recreational fishing increased steadily there during the 1990s. Animosity regarding competition for fish extends to the political arena, as commercial and recreational fishermen oppose each other on regulatory issues. Commercial fishery participants claim that they are harassed by law enforcement agents, while recreational fishery participants claim that regulations are not enforced in Venice because there are simply not enough agents to cover the area. Among local commercial fishermen, there is a sense that recreational fishermen have helped create a regulatory environment that is pushing commercial fishermen out of business (Wilson *et al*., 1998).

Two pelagic longline vessels have Venice as hail port, and one HMS pelagic longline permit owner lives in Venice. Most pelagic longline fishermen who sustain the yellowfin tuna industry in Venice are Vietnamese-Americans who live in New Orleans or a suburb of that city. Shrimp is the largest commercial catch bought and sold in Venice, although this fishery has become less profitable since the late 1980s (Wilson *et al*., 1998). The longline fleet is not well integrated into the Louisiana community of Venice. They are commuters and most of them are from a different ethnic background, including many Vietnamese-Americans. Due to the language barrier, many of these fishermen do not participate in public fisheries meetings (NMFS, 1999).

Venice's population decreased by 24 percent in the decade between 1990 and 2000. In 2000 there were 2,220 residents of the community. The age structure of the population shows, in 2000, that 26 percent of the residents were under 15 years old, 44 percent were between the ages of 15 and 44 years, and 30 percent were 45 years of age or older. In 1990 there were 844 households with an average size of 3.25 people. The number of households had decreased to 746 in 2000 and the average household size had dropped to 2.96 people.

Per capita income in Venice in 1990 was $6,949. This was higher than the per capita income of

Dulac ($4,946) but much lower than the state average ($10,635). Thirty-six percent of the population of Venice lived below the poverty level. The median household income was $16,250. Eighteen percent of the households in Venice in 1990 received Social Security, averaging $5,433 per year, and 11 percent of the households received public assistance income, averaging $3,301 per year. In 2000, the per capita income of Venice residents was $13,123, while the per capita income for the state of Louisiana had increased to $16,912. Of the households in Venice, some 18 percent remained below the poverty level in 2000.

By the late 1980s, the domestic market for fresh tuna developed and prices for yellowfin tuna rose. Locals say some longline vessels from Florida and New Jersey fished for swordfish and bluefin tuna in the area near Venice during the late 1980s and early 1990s. Vietnamese and American fishermen re-rigged their vessels from shrimping to pelagic longlining for tuna. At an estimated cost of $1,000 per mile of line; most outfitted their vessels with 20 to 40 miles of line. The oil industry was also in decline at this time which resulted in the outfitting of some oil vessels with longline gear (Wilson *et al*., 1998). As a result of fluctuating prices for yellowfin

Demographic Profile of Venice (Source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	2,743	2,220
Education:		
High school graduates (25 years or older)	43.5%	48.4%
Employment:		
Labor force (16 years and over)	50.0%	53.0%
Unemployed	6.4%	2.0%
Employment by industry:		
Retail	12.5%	13.1%
Manufacturing	7.1%	4.8%
Education, health & social services	8.9%	14.4%
Arts, recreation, lodging & food services	6.9%	10.4%
Farming, fishing, forestry, & mining	22.5%	22.7%

tuna, some pelagic longline vessels went back to shrimping and others left for the Pacific Ocean. The industry has reached an equilibrium in terms of vessels and in terms of yellowfin tuna price, which fluctuates but is generally $4.00 to $5.00 per pound for the highest grade (Wilson *et al*., 1998).

In 1998, several dealers in Venice drew 40 percent of their business from the longline fleets. Another dealer drew only about 20 percent from longline vessels. A large wholesaler dealt only in longline catches and purchased fish from three of the four local dealers. In 1997, 60 percent of this business was tuna, 30 percent shark, and 10 percent swordfish. The competition between dealers in 1998 was perceived as becoming more aggressive (Wilson *et al*., 1998). Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels.

While pelagic longline fishermen with large vessels work year-round, pelagic longlining in the area tends to intensify in May and ease up during the wintertime. There are four docks in Venice where pelagic longline vessels unload. Docks in Venice employ between five and 15 workers on a seasonal basis for unloading vessels and packing seafood, as well as five to eight people year-round. The docks purchase tuna year round, shrimp from May through December, bottom fish such as drum, catfish, and sheepshead, from January through May, and mullet (for the roe) from October through December (NMFS, 1999).

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, the oil industry hired unskilled labor from this area in recent years, and employed 3 percent of the civilian labor force in 2000. The agricultural sector also provides employment opportunities during the off-season for fishing, as reported by one Vietnamese-American captain. However, researchers found that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. The Vietnamese-American community has avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying, although they did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new longline vessels. Concerns cited by the fishermen in Venice included the safety of small vessels during winter openings, and the prospect of small vessels having to pay for observers and VMS.

Other commercial fisheries in the area that could provide alternative employment include pompano in October, mullet from October to January, shrimp from May to December and oysters from January to May (Wilson *et al*., 1998). Researchers concluded that the overall effect of increased restrictions on this fleet would be increased pressure on grouper and yellowfin tuna, increased difficulty in finding and retaining employees, and an acceleration in the rate at which the fleet’s vessels and experienced fishermen are moving overseas, especially to Mexico.

Recreational fishermen fish from Venice year-round, but are affected by inclement weather during the winter. There are 22 charter and headboats with HMS permits operating out of Venice in 2003. The larger vessels can fish for yellowfin tuna year round, in addition to inshore species like redfish, snapper and speckled trout. Bluefin tuna are found too far away (100 miles offshore) and recreational fishermen are prohibited from directing effort on bluefin tuna anyway. They fish for billfish, particularly blue marlin, from May through November. Blacktip shark was once a popular catch, but recreational fishermen say they are now too small to be an enjoyable catch. There is some animosity between recreational and commercial fishermen which seems to arise from competition for particular species.

There are only two marinas in Venice that cater to recreational fishermen, although a third parish-run marina offers vessel slips to both recreational and commercial fishermen. One opened in the mid-1980s and offers boat slips, launches, a hoist, a couple of condominiums, baitshop, fuel, and ice. It employs 13 people during peak summer months. Most of the marina's business comes from private vessels from New Orleans and border states. Less than one percent of this business consists of charterboats. The other marina opened only a few years ago, offering 120 pre-paid boat slips, a 64-room two-story hotel, condominiums, a dry dock storage facility, fuel and ice. It employs 12 to 15 people in its newly opened hotel and another 15 to 25 in the marina. Eight charterboats operate from the marina, and there is room for ten more.

Researchers in 1998 reported that the catch and release ethic for billfish was strong among recreational fishermen in Venice, but local billfishing tournaments require that trophy fish be brought to the dock and weighed. Sportfishermen prefer to catch and retain tunas, dolphin fish, and wahoo for consumption, although they voiced support for tag and release programs (NMFS, 1999).

9.4.17.2 Dulac

Dulac is located in the center of Terrebonne Parish, about 15 miles south of Houma, LA. Houma lies at the intersection of the Houma Navigational Canal and the Intercoastal Waterway and serves as the parish seat and a locale of employment opportunities in offshore equipment building for Dulac residents. Terrebonne Parish government is a consolidated government so most data are gathered on a parish-wide basis.

According to the Terrebonne Parish Planning Department in 1998, the Parish had not spent much time tracking the importance of the commercial fishing industry, but anecdotal evidence suggested that it is a long-standing and significant part of the community economy. Landings of tunas, swordfish, and sharks indicate that Dulac is among the most important fishing ports in the state. However, many of the fishermen who target highly migratory species are a commuter population; they land fish in Dulac or purchase fish in Dulac, but they live elsewhere. Three dealers purchase fish from longline vessels; two are owned and operated by first-generation Vietnamese immigrants, and the other is run by a New Orleans native whose father operates a large tuna wholesale company in Venice.

In 1990, the population of Dulac was about 50 percent Caucasian and almost half of the population was Native American (Houma Indian), a tribe not recognized by the U.S. government. Less than two percent of the population was African-American or Hispanic, and less than two percent of the population was Asian/Pacific islander, despite the fact that most of the longline captains who sustain the Dulac commercial industry for tunas, swordfish, and sharks were Vietnamese. Many of the Caucasians in Dulac are of French or French-Canadian ancestry. By 2000, the population of Dulac had declined significantly, and was composed of 54 percent Caucasians, 40 percent Native Americans (Houma), less than one percent Asian, and a smattering of people of other ethnic groupings. Some 31 percent of the population claimed French or French-Canadian ancestry in 2000.

At the time of the Census in 2000, 26 percent of the population of Dulac were children under the age of 15. Some 33 percent of Dulac's population were 45 years of age or older, and 41 percent were between 15 and 44 years of age.

There were 910 households in Dulac in 1990, with an average size of 3.59 persons/household. By 2000 the number of households had decreased to 768 and the average size of each household had dropped to 3.20 persons. At the time of the 1990 Census nearly half of the households in Dulac were living below the poverty level, with a median household income of $12,653. In 2000, median household income in Dulac had increased to $22,900, but more than 30 percent of households continued to live below poverty level.

Per capita income in Dulac in 1990 was $4,946; for the state of Louisiana, average per capita income was $10,635. By 2000, per capita income in Dulac had risen to $8,785, while for the state as a whole, per capita income had risen to $16,912.

Demographic Profile of Dulac, LA (source: U.S. Census, 1990 & 2000)

	1990	2000
Population:	3,273	2,458
Education:		
High school graduates (25 years or older)	27.0%	39.1%
Employment:		
Labor force (16 years and over)	46.0%	44.9%
Unemployed	17.5%	3.0%
Employment by industry:		
Retail	12.0%	10.3%
Manufacturing	14.0%	10.0%
Education, health & social services	9.8%	8.5%
Arts, recreation, lodging & food services	9.9%	10.7%
Farming, fishing, forestry, & mining	23.6%	25.9%

Employment in Dulac was principally in the fisheries in 2000 with approximately 160 persons (21 percent of all those with employment) working full time or seasonally in fishing activities.

Pelagic longline fishermen in Dulac target yellowfin tuna all year. In 1997 there was no established quota or season for yellowfin, but rough winter weather shortened the fishing season slightly. Reported prices for yellowfin tuna landed by longline vessels in Dulac range from $3.50 to $5.00 per pound for the highest grade. Bluefin tuna is caught in this fishery but can only be landed if target catch requirements are met. Swordfish is not targeted by Dulac longline vessels, and incidentally-caught sharks are often discarded (Wilson *et al*., 1998). A typical trip for the pelagic longline vessels in Dulac is two weeks. Vessels range in size from 60 to 100 feet and set between 35 and 40 miles of longline rigging.

The competition between dealers was perceived as becoming more aggressive in 1998. Traditional patterns of dealers building relationships by extending services and credit to vessels were giving way to price-based competition to gain access to vessels. Researchers reported, in 1998, that one dock in Dulac employed three to four people, but laid them all off in 1998. That dealer purchased tuna (50 percent), shark (30 percent), swordfish (20 percent), and dolphin, wahoo, and amber jack (20 percent combined). Another dealer employed six or seven people in 1998, all of whom lived in Dulac. Of this dealer's purchases, 60 percent were tuna, 20 percent were swordfish and 20 percent were divided among other pelagic species like shark, wahoo, and amberjack. A third dealer employed six Mexican workers, supplemented by local residents on a seasonal basis (Wilson *et al*, 1998). The pelagic longline fleet are not well integrated into the Louisiana communities of Dulac and Venice. They are commuters and most of them are from a different ethnic background, including many Vietnamese.

In 2002, Dulac was home to the owners of four HMS pelagic longline permits, and nine pelagic long line vessels had Dulac as their hail port.

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, while unemployment in Louisiana fishing communities has been high in the past, the oil industry hired unskilled labor from this area in recent years. In 1990, 33 residents of Dulac worked in the oil fields and a similar number were employed by the oil industry in 2000. The agricultural sector also provides employment opportunities, as reported by one Vietnamese-American captain, particularly during the off-season for fishing. However, this supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998). This was true for both captain and crew positions, particularly among the non-Vietnamese-American population. The Vietnamese-American community avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying. The Vietnamese-Americans, however, did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new pelagic longline vessels. In Louisiana, the impacts of regulation may be felt more intensely by the Vietnamese-American community given the extent of their investment in this fishery (NMFS, 1999).

Almost all vessels that sell in Dulac are owner-operated. Owners are usually their own captains or they hire a close relative to captain their vessel. Good first mates try to acquire their own vessels. At least five longline vessels were built in 1997 and have been added to the fleet in Dulac. Some participants in the longline fishery for sharks also participated in the reef fish fishery. It would be difficult for shark fishermen to switch into the yellowfin tuna fishery (Wilson *et al*., 1998).

9.4.18 Texas

No data is available for swordfish and tuna landings in the NOAA Fisheries data files for 2002. There are 11 vessels with Texas hail ports holding HMS pelagic longline permits and the owners of 10 permits are residents of Texas. Communities involved in the fishery include Channelview, Corpus Christi, Friendswood, Galveston, Houston, Kemah, La Porte, and Lumberton. The greatest concentration of vessels is in Kemah, which is the homeport for three vessels. Because of the small size of the fishery, no community profiles were undertaken of Texas ports.

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10.0 ESSENTIAL FISH HABITAT

As discussed in Section 3.3 of this document, Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq*., as amended by the Sustainable Fisheries Act in 1996, requires that FMPs describe and identify essential fish habitat (EFH), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. § 1802 (10)). The EFH regulations (at 50 C.F.R. 600 Subpart J) provide additional interpretation of the definition of essential fish habitat: "'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle."

A thorough review and identification of EFH for all HMS was completed in the 1999 Fishery Management Plan (FMP) for Atlantic Tunas, Swordfish, and Sharks. Please refer to Chapter 6 in the HMS FMP (NMFS, 1999a) for the review and identification of EFH for species managed under that plan. Amendment 1 to the Atlantic Billfish Fishery Management Plan provides a description of EFH and related issues in Chapter 4 (NMFS, 1999b). In addition, Amendment 1 to the HMS FMP updated some EFH information for certain shark species (NOAA Fisheries, 2003). As discussed in Section 3.3 of this document, HMS fishing gears and methods do not appear to have adverse impacts on EFH. This action, which would require the possession and use of certain hooks and baits, mandate possession and use of equipment to remove fishing hooks and lines from sea turtles, require the possession of new sea turtle handling and release guidelines, and reopen the NED to pelagic longline fishing, also would not have adverse impacts on EFH.

References Cited in Chapter 10

NMFS. 1999a. Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. Public Document.

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11.0 OTHER CONSIDERATIONS

11.1 NATIONAL STANDARDS

The analyses in this document are consistent with the National Standard (NS) guidelines set forth in the 50 CFR part 600 regulations. The preferred alternatives are anticipated to reduce the incidental capture and post-release mortality of sea turtles and marine mammals and may also benefit other bycatch species by reducing hook trauma and post hooking mortality. NOAA Fisheries continues to work in the international community to protect highly migratory species in the Atlantic Ocean throughout their range, while also implementing domestic measures that are consistent with domestic legislation.

This rule is consistent with NS 1, which provides that conservation and management measures shall prevent overfishing while achieving on a continuing basis, the optimum yield from the fishery. This rule would not increase fishing effort on target species beyond ICCAT-adopted quotas. It is consistent with international efforts to rebuild, manage, and conserve the target species. The analyses contained in this document are based on the best scientific information available (NS 2), including NED research experiment results and self-reported, observer, and stock assessment data, which facilitate the management of these species throughout their ranges (NS 3). With respect to NS 4, none of the preferred alternatives discriminate between residents of different states or allocate or assign fishing privileges. Gear modifications, release gear, and release and disentanglement protocols are necessary as sea turtle conservation measures throughout the pelagic longline fishery for Atlantic HMS. The reopening of the NED area will have positive impacts for fishermen and associated businesses in the northeast United States, as well as have positive impacts for fishermen living in other areas who choose to fish in the NED. Consistent with NS 5, the preferred alternatives consider efficiency where practicable, specifically in that they address distinct geographical segments of the fishery and incorporate needed flexibility in the choice of hooks and baits. NOAA Fisheries believes that vessel operators will be able to select efficient hooks and baits appropriate for target species. Moreover, reopening the NED may increase the efficiency of the distant water fleet in that vessels will be able to return to familiar fishing grounds with hook treatments that may increase catches over historical averages. With regard to NS 6, the preferred alternatives take into consideration variations among, and contingencies in, the fishery, fishery resources, and catches by providing needed flexibility in allowable hooks and baits. These alternatives can be changed under the FMP framework to accommodate biological, social, and economic variability. NOAA Fisheries would continue data collection programs with respect to this fishery in order to assess the effectiveness of management measures. As required by NS 7 and NS 8, NOAA Fisheries also considered the costs and benefits of the alternatives using social and economic inputs in Chapters 4, 6, 7, 8, and 9 of this document. As reflected in those chapters, the preferred alternatives would impose costs upon the industry and have potential administrative and enforcement costs. In analyzing and comparing the ecological, economic, and social impacts of various alternatives, including the no action alternative, NOAA Fisheries has concluded that the benefits of the preferred alternatives are real and substantial relative to the costs. The preferred alternatives do not result in unnecessary duplication and, where practicable, NOAA Fisheries has considered ways to minimize costs while addressing conservation and management needs. Specifically, NOAA Fisheries is preferring gear modification alternatives, that are expected to reduce sea turtle interaction and mortality consistent with the ESA and minimize economic impacts to the extent practicable, and not preferring alternatives with greater costs, such as time and area closures. Closures may be considered in a future rulemaking, as necessary, per the June 1, 2004, BiOp for this fishery. See Section 4.3 for further information on the BiOp. Consistent with NS 8, NOAA Fisheries has considered the impacts of these actions on fishing communities in Chapter 9 and has minimized those impacts to the extent practicable. This rulemaking specifically focuses on NS 9. As reflected in Chapters 4, 6, and 9, NOAA Fisheries has analyzed the ecological impacts of various bycatch and bycatch mortality reduction alternatives on bycatch and protected species and related economic and social impacts, as well as administrative, enforcement, and management considerations. Based on these analyses and in consideration of the other national standards, NOAA Fisheries has concluded that the preferred alternatives minimize bycatch and mortality of such bycatch to the extent practicable, as required under NS 9, and are consistent with the ESA. Consistent with the June 1, 2004, BiOp, described in detail in Section 4.3, additional actions will be taken to provide further protection for sea turtles. This action would not require fishermen to travel greater distances, work in bad weather, or otherwise, fish in an unsafe manner (NS 10).

11.2 CONSIDERATION OF MAGNUSON-STEVENS ACT SECTION 304 (G) MEASURES

11.2.1 Evaluation of Possible Disadvantage to U.S. Fishermen in Relation to Foreign Competitors

The U.S. pelagic longline fleet in the Atlantic captures sea turtles at a rate estimated to average 912 loggerheads and 846 leatherbacks per year, based on observed takes and total reported effort from 1992 to 2002. The U.S. fleet is a small part of the international fleet that competes on the high seas for catches of tunas and swordfish. Although the U.S. fleet landed as much as 35 percent of the swordfish from the North Atlantic (north of 5° N. latitude) in 1990, this proportion decreased to 24.27 percent of regional catches by 2001. For tunas, the U.S. proportion of total Atlantic landings was 23 percent in 1990, decreasing to 9.28 percent by 2001. In recent years, the proportion of U.S. pelagic longline landings of HMS has remained relatively stable in proportion to international landings. The U.S. fleet accounts for virtually none of the landings of swordfish (0.3 percent) and tuna (0.005 percent) from the Atlantic Ocean south of 5° N. latitude, and does not operate at all in the Mediterranean Sea. Tuna and swordfish landings by foreign fleets operating in the tropical Atlantic and Mediterranean, are greater than the catches from the north Atlantic area where the U.S. fleet operates. Even within the area where the U.S. fleet operates, the U.S. portion of fishing effort, in numbers of hooks fished is less than 10 percent of the entire international fleet's effort, and likely less than that due to differences in reporting effort between ICCAT countries (NMFS, 2001). Since other ICCAT nations do not monitor incidental catches of sea turtles, an exact assessment of their impact is not possible. High absolute numbers of sea turtle catches in the foreign fleets have been reported from other sources, however (NMFS, 2001). See Section 3.4.1 for recent estimates of international takes. If the sea turtle catch rates of foreign fleets, per hook, or even per pound of swordfish landed, are similar to the catch rates of the American fleet, then the American fleet may represent less than one-tenth and certainly no more than one-third of the total catch and mortality of sea turtles in North Atlantic longline fisheries.

Many sources of anthropogenic mortality of sea turtles are outside of U.S. jurisdiction and control. Mortality in the domestic and foreign longline fisheries is just one of the numerous factors affecting sea turtle populations in the Atlantic. There is a concern that reduced U.S. catch of Atlantic swordfish may eventually result in increased sea turtle interactions with foreign longline vessels. U.S. vessels fishing the NED area have landed approximately 20 percent of the U.S. swordfish quota in recent years. Thus, reopening the NED area could result in an increased U.S. swordfish catch as compared to landings from recent years, and may potentially allow the U.S. to retain its allocation of swordfish. A reduction in U.S. fishing effort could eventually result in a reduced allocation for U.S. vessels under the ICCAT catch allocation scheme and could make the implementation of international conservation efforts more difficult if the U.S. role in swordfish management is diminished. A reduced presence in the fishery might also eliminate the option of gear or other experimentation with the U.S. longline fleet, making it difficult to find incidental take reduction solutions which could be transferred to other longlining nations to effect a global reduction in sea turtle takes by pelagic longline gear. NOAA Fisheries is not aware of any foreign fleets that are currently employing sea turtle conservation measures. In the absence of a domestic fishing fleet subject to sea turtle conservation measures, foreign vessels could possibly increase their fishing effort in the NED area, presumably resulting in increased overall sea turtle mortality.

U.S. fishermen could be directly disadvantaged by the preferred alternatives in this document compared to foreign competitors in that they will be limited by hook and bait requirements while foreign competitors will not. Additionally, U.S. fishermen currently have other regulations modifying their gear and their methods of fishing while foreign competitors do not. Increased flexibility associated with the selected measures is expected to mitigate any competitive disadvantage. In fact, if fishermen select the optimal combination of hooks and baits, NED research experimental results indicate constant, or even increased, catches may result. NOAA Fisheries anticipates that the preferred measures will prove to be effective at reducing sea turtle interaction and mortality and that other nations will adopt these modifications, thereby eliminating any competitive disadvantage.

11.2.2 Provide U.S. Fishing Vessels Reasonable Opportunity to Harvest Quota

The preferred alternatives provide U.S. commercial fishermen with a reasonable opportunity to land the quotas allocated to them, consistent with the ESA, MSA, and other applicable law. To protect sea turtles, pelagic longline fishermen would need to possess and use only specific hooks and baits and possess and use additional release and disentanglement gear. The preferred alternatives were crafted, in part, to minimize disruptions to fishing activities, such as those that could occur with large scale area closures, and allow fishermen continuing opportunities to harvest quotas.

As of November 2003, approximately 235 tuna longline limited access permits had been issued. In addition, approximately 203 directed swordfish limited access permits, 100 incidental swordfish limited access permits, 249 directed shark limited access permits, and 357 incidental shark limited access permits had been issued. Because vessels authorized to fish for swordfish and tunas with pelagic longline gear must possess a tuna longline permit, a swordfish permit (directed or incidental), and a shark permit (directed or incidental), the maximum number of vessels permitted to use pelagic longline gear to fish for HMS is 303 (the number of swordfish permits issued). Only a few of these fishermen actually report fishing with pelagic longline gear in logbooks (considered "active"). In 2002, 148 fishermen reported fishing for HMS with pelagic longline in the pelagic logbook. These data indicate that there is still an opportunity for fishermen with permits to increase effort in HMS fisheries and thus fully land the quotas allocated to U.S. fishermen.

11.2.3 Pursue Comparable International Fishery Management Measures

Section 202(h) of the Magnuson-Stevens Act calls for the Secretary of State, in cooperation with the Secretary of Commerce, to seek international agreements to establish standards and measures for bycatch reduction that are comparable to the standards and measures applicable to U.S. fishermen if they conclude that it is necessary and appropriate. On September 18, 2000, NMFS determined that seeking international agreements with foreign nations conducting pelagic longline fishing operations for Atlantic and Pacific highly migratory species was necessary to protect endangered and threatened sea turtles. Furthermore, both the June 14, 2001, BiOp, and the June 1, 2004, BiOp recommend that NOAA Fisheries pursue bilateral or multilateral agreements for the protection and conservation of sea turtles with other nations and translate sea turtle handling and release guidelines into several languages.

Dominant fisheries in the Atlantic are conducted by vessels from Brazil, Canada, Japan, Portugal, Spain, Taiwan, the United States, Uruguay and the nations of the Caribbean. The United States is at the forefront of conservation on this issue. NOAA Fisheries currently requires U.S. pelagic longliners to cut away the line as close to the hook as possible on any sea turtle that is caught during fishing operations. A preferred alternative in this document will require additional gear that will facilitate the removal of all fishing gear from sea turtles and other incidentally caught species which may significantly increase their chances of survival after being released. Current regulations also require pelagic longline vessels to move one nm when a marine mammal or sea turtle is hooked or entangled. The United States hopes to transfer some of these techniques and fishing methods to other countries with longline fleets that incidentally capture sea turtles. To support this goal, the United States supported a workshop in February 2003 consisting of technical experts on sea turtle biology and longline fishery operations from interested nations in order to share information and discuss possible solutions to reduce incidental capture of marine turtles in these fisheries. The U.S. introduced the results of its NED sea turtle bycatch mitigation research at the November 2003, ICCAT meeting in Dublin, Ireland, and co-sponsored ICCAT Resolution 03-11 which encouraged other nations to improve data collection and reporting on sea turtle bycatch and promote the safe handling and release of incidentally captured sea turtles. A poster and video describing the NED research experiment and preliminary results were displayed, as well as many of the experimentally tested release gears. In January 2004, the Northeast Distant Waters Longline Research ad hoc advisory group met in Miami, Florida. The purpose of this meeting was to present a summary of the 2001 and 2002 NED pelagic longline sea turtle bycatch mitigation research and the preliminary results for the 2003 research, and to discuss future research needs. Also in January 2004, the IATTC-CIAT Bycatch Working Group met in Kobe, Japan. The purpose of U.S. attendance at this meeting was to present results of sea turtle mitigation research by the U.S, to hear research results on bycatch mitigation from other countries, to encourage IATTC countries to evaluate or adopt sea turtle mitigation technology in their fisheries, and to address other bycatch issues in longline fisheries.

Additionally, the Inter-American Convention for the Protection and Conservation of Sea Turtles ("Inter-American Convention") was concluded on September 5, 1996, in Salvador, Brazil, and entered into force in May 2001. This is the first international agreement devoted solely to the protection of sea turtles. The Inter-American Convention calls for the Parties to establish national sea turtle conservation programs. Each party will agree to implement broad measures for the conservation of sea turtles, including the use of turtle excluder devices in commercial shrimp trawl vessels and the mitigation of impacts on sea turtles from other fisheries.

11.2.4 Consider Traditional Fishing Patterns and the Operating Requirements of the Fisheries

In the late 1800s, commercial fishermen in New England were pursuing swordfish, primarily with harpoons and targeting the large swordfish then available in surface waters. Pelagic longline fishing, both domestic and international, began in earnest in the North Atlantic Ocean in the early 1960s. The introduction of this gear enabled access to swordfish in deeper waters and opened new fishing areas. U.S. pelagic longline vessels follow the fish throughout their migratory range along the East Coast of the United States and up to the Grand Banks, and now catch approximately 98 percent of the U.S. Atlantic swordfish landings.

To the extent that the preferred hook and bait alternatives will require the use of specific hooks and baits, they may alter traditional fishing patterns. However, because the preferred alternatives provide flexibility with regard to allowable hooks and baits, NOAA Fisheries does not expect a significant impact to fishing patterns. The required release gear and handling protocols are not expected to affect traditional fishing patterns or disrupt the operations of the HMS fisheries.

References Cited in Chapter 11

NOAA Fisheries. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, FL, SEFSC Contribution PRD-00/01-08.

NOAA Fisheries. 2003. 2003 Stock assessment and fishery evaluation for Atlantic highly migratory species. U.S. Department of Commerce, National Marine Fisheries Service, Silver Spring, MD.

12.0 LIST OF PREPARERS

This final document was prepared by individuals from the Office of Sustainable Fisheries, Highly Migratory Species Management Division. Major contributors, in alphabetical order, include but are not limited to the following:

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The development of this final document also involved considerable input from other staff members and Offices throughout NOAA including the Office of Protected Resources, the Southeast Fisheries Science Center, and the Office of General Counsel for Fisheries.

References Cited in Chapter 12

No references cited

13.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS CONSULTED AND TO WHOM COPIES OF THE SEIS WILL BE SENT

Discussions relevant to the formulation of the preferred measures involved input from several scientific groups: NOAA Fisheries Office of Protected Resources, NOAA Fisheries Southeast Fisheries Science Center, and NOAA Fisheries Southeast Regional Office.

During the public comment period for the draft document and associated proposed rule, NOAA Fisheries held three public hearings (N. Dartmouth, MA; New Orleans, LA; Manteo, NC). NOAA Fisheries also sent copies of the DSEIS and associated proposed rule to all consulting parties, members of the HMS Advisory Panel, the Atlantic States and Gulf States Fishery Management Commissions, NOAA Offices of Protected Resources and Law Enforcement, the U.S. Coast Guard, and any interested members of the public. Additionally, NOAA Fisheries sent copies to the Environmental Protection Agency and its regions for review. To more rapidly reduce sea turtle interactions and to mitigate the economic impacts of sea turtle bycatch mitigation measures, NOAA Fisheries requested and was authorized to execute alternative procedures for the preparation and completion of an SEIS. The Council on Environmental Quality authorized a waiver of 14 of the standard 45 days for the DSEIS comment period. Comments on the draft document and associated proposed rule were accepted from February 11, 2004 through March 15, 2004. NOAA Fisheries received 46 written comments, which are summarized in Appendix C1 of this document.

References Cited in Chapter 13

No references cited

APPENDIX A1

Table 1 **Summary of percentage changes in loggerhead, leatherback, and other sea turtle interactions, swordfish, yellowfin tuna, bigeye tuna, and blue and white marlin catches based on three different alternatives.** Source: Pelagic Longline Observer Program and Pelagic Longline Logbook data 2001-2002. Blue and white marlin data are for combined live and dead discards.

	Without redistribution of effort					
	Alternative 13		Alternative 14		Alternative 15	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
Leatherback	-41%	-47%	-43%	-58%	-35%	-35%
Loggerhead	-17%	-9%	-34%	-56%	-29%	-44%
Other Sea Turtles	-100%	-100%	-100%	-50%	0%	0%
Swordfish		-21%		-21%		-15%
Yellowfin Tuna		-38%		-38%		-25%
Bigeye Tuna		-12%		-12%		-8%
Blue Marlin		-37%		-38%		-34%
White Marlin		-30%		-34%		-31%

	With redistribution of effort					
	Alternative 13		Alternative 14		Alternative 15	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
Leatherback	-16%	-19%	-10%	-37%	-14%	-24%
Loggerhead	+5%	+38%	-7%	-35%	-18%	-34%
Other Sea Turtles	-100%	-100%	-100%	-28%	0%	+11%
Swordfish		+17%		+18%		+5%
Yellowfin Tuna		-2%		-2%		+3%

Bigeye Tuna		+32%		+33%		+17%
Blue Marlin		-1%		+3%		-8%
White Marlin		+10%		-3%		-1%

Table 2 Percent change in loggerhead, leatherback, and other sea turtle takes with the central Gulf of Mexico time/area closure in effect. Based on data from the Pelagic Longline Observer Program and Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from 2001-2002		With redistribution of effort based on data from 2001-2002	
	Observer Data	Logbook Data	Observer Data	Logbook Data
Leatherback	-41%	-47%	-16%	-19%
Loggerhead	-17%	-9%	5%+	38%+
Other*	-100%	-100%	-100%	-100%

*** Other sea turtles include Kemp's Ridley, Hawksbill, and Green.**

+ indicates an increase in catch

Table 3 **Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on leatherback sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number of leatherbacks observed caught inside the time/area closure		Number of leatherbacks observed caught outside the time/area closure		Percentage reduction in leatherbacks caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	1	3	6	12	14%	20%
February	0	3	7	19	0%	14%
March	2	8	5	14	29%	36%
April	2	7	8	17	20%	29%
May	8	11	4	5	67%	69%
June	4	11	5	20	44%	35%
July	13	33	4	20	76%	62%
August	0	8	3	24	0%	25%
September	2	11	0	6	100%	65%
October	2	14	2	8	50%	64%
November	1	12	4	16	20%	43%
December	1	34	4	15	20%	69%
Total	**36**	**155**	**52**	**176**	**41%**	**47%**

Table 4 **Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on loggerhead sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number of loggerheads observed caught inside the time/area closure		Number of loggerheads observed caught outside the time/area closure		Percentage reduction in loggerheads caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	0	1	3	7	0%	13%
February	0	0	6	11	0%	0%
March	0	0	5	8	0%	0%
April	2	0	3	3	40%	0%
May	3	5	0	2	100%	71%
June	0	0	7	23	0%	0%
July	1	1	1	10	50%	9%
August	0	0	0	5	0%	0%
September	0	1	0	4	0%	0%
October	1	0	5	6	17%	0%
November	0	0	2	6	0%	0%
December	0	1	2	2	0%	0%
Total	**7**	**9**	**34**	**87**	**17%**	**9%**

Table 5 **Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on other sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of other sea turtles observed caught inside the time/area closure		Number of other sea turtles observed caught outside the time/area closure		Percentage reduction in other sea turtles caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	0	0	0	0	0%	0%
February	0	0	0	0	0%	0%
March	0	0	0	0	0%	0%
April	1	2	0	0	100%	100%
May	0	0	0	0	0%	??
June	0	0	0	0	0%	0%
July	0	0	0	0	0%	0%
August	0	0	0	0	0%	0%
September	0	0	0	0	0%	0%
October	0	0	0	0	0%	0%
November	0	0	0	0	0%	0%
December	1	3	0	0	0%	0%
Total	**2**	**5**	**0**	**0**	**100%**	**100%**

Table 6 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/88)	Cumulative percent of total sea turtle interactions avoided by closure (J/88)
Jan	53,531	7	16,182	1	6	1.61e-04	3	9	-2	(2)	-1.8%	-2.3%
Feb	40,163	7	7,278	0	7	2.13e-04	2	9	-2	(4)	-1.8%	-4.0%
Mar	41,457	7	9,359	2	5	1.56e-04	1	6	1	(3)	0.6%	-3.4%
Apr	79,944	10	14,137	2	8	1.22e-04	2	10	0	(3)	0.3%	-3.1%
May	59,689	12	41,818	8	4	2.24e-04	9	13	-1	(4)	-1.5%	-4.6%
June	47,708	9	14,916	4	5	1.52e-04	2	7	2	(2)	2.0%	-2.7%
July	112,631	17	24,369	13	4	4.53e-05	1	5	12	10	13.5%	10.8%
Aug	150,119	3	14,721	0	3	2.22e-05	0	3	0	10	-0.4%	11.4%
Sept	225,159	2	18,648	2	0	0.00e+00	0	0	2	12	2.3%	13.6%
Oct	261,587	4	13,140	2	2	8.05e-06	0	2	2	14	2.2%	15.8%
Nov	56,929	5	9,161	1	4	8.37e-05	1	5	0	14	0.3%	16.1%
Dec	32,673	5	6,773	1	4	1.54e-04	1	5	0	14	-0.1%	16.0%
Total	**1,161,590**	**88**	**190,502**	**36**	**52**	**0**	**22**	**74**	**14**			

Table 7 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/331)	Percent of total sea turtle interactions avoided by closure (J/331)
Jan	1,082,142	15	335,798	3	12	1.61e-05	5	17	-2	-2	-0.7%	-0.6%
Feb	763,566	22	193,916	3	19	3.34e-05	6	25	-3	-5	-1.0%	-1.7%
Mar	897,001	22	142,441	8	14	1.86e-05	3	17	5	0	1.6%	0.0%
Apr	1,267,139	24	277,002	7	17	1.72e-05	5	22	2	2	0.7%	0.6%
May	1,317,311	16	411,194	11	5	5.52e-06	2	7	9	11	2.6%	3.3%
June	1,414,291	31	489,547	11	20	2.16e-05	11	31	0	11	0.1%	3.4%
July	1,563,985	53	712,007	33	20	2.35e-05	17	37	16	28	4.9%	8.3%
Aug	1,555,525	32	608,595	8	24	2.53e-05	15	39	-7	20	-2.2%	6.1%
Sept	1,221,082	17	550,770	11	6	8.95e-06	5	11	6	26	1.8%	7.9%
Oct	1,119,064	22	392,775	14	8	1.10e-05	4	12	10	36	2.9%	10.8%
Nov	1,020,819	28	368,359	12	16	2.45e-05	9	25	3	39	0.9%	11.7%
Dec	898,269	49	352,223	34	15	2.75e-05	10	25	24	63	7.3%	19.1%
Total	**14,120,194**	**331**	**4,834,627**	**155**	**176**	**2.33e-04**	**92**	**268**	**63**			

Table 8 Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/41)	Percent of total sea turtle interactions avoided by closure (J/41)
Jan	53,531	3	16,182	0	3	8.03e-05	1	4	-1	(1)	-3.2%	-2.4%
Feb	40,163	6	7,278	0	6	1.82e-04	1	7	-1	(2)	-3.2%	-5.7%
Mar	41,457	5	9,359	0	5	1.56e-04	1	6	-1	(4)	-3.6%	-9.2%
Apr	79,944	5	14,137	2	3	4.56e-05	1	4	1	(2)	3.3%	-5.9%
May	59,689	3	41,818	3	0	0.00e+00	0	0	3	1	7.3%	1.4%
June	47,708	7	14,916	0	7	2.13e-04	3	10	-3	(3)	-7.8%	-6.4%
July	112,631	2	24,369	1	1	1.13e-05	0	1	1	(2)	1.8%	-4.6%
Aug	150,119	0	14,721	0	0	0.00e+00	0	0	0	(2)	0.0%	-4.6%
Sept	225,159	0	18,648	0	0	0.00e+00	0	0	0	(2)	0.0%	-4.6%
Oct	261,587	6	13,140	1	5	2.01e-05	0	5	1	(1)	1.8%	-2.8%
Nov	56,929	2	9,161	0	2	4.19e-05	0	2	0	(2)	-0.9%	-3.8%
Dec	32,673	2	6,773	0	2	7.72e-05	1	3	-1	(2)	-1.3%	-5.0%
Total	**1,161,590**	**41**	**190,502**	**7**	**34**	**0**	**9**	**43**	**(2)**			

Table 9 **Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/96)	Percent of total sea turtle interactions avoided by closure (J/96)
Jan	1,082,142	8	335,798	1	7	9.38e-06	3	10	-2	-2	-2.2%	-2.1%
Feb	763,566	11	193,916	0	11	1.93e-05	4	15	-4	-6	-3.9%	-6.0%
Mar	897,001	8	142,441	0	8	1.06e-05	2	10	-2	-7	-1.6%	-7.6%
Apr	1,267,139	3	277,002	0	3	3.03e-06	1	4	-1	-8	-0.9%	-8.4%
May	1,317,311	7	411,194	5	2	2.21e-06	1	3	4	-4	4.3%	-4.2%
June	1,414,291	23	489,547	0	23	2.49e-05	12	35	-12	-16	-12.7%	-16.9%
July	1,563,985	11	712,007	1	10	1.17e-05	8	18	-7	-24	-7.7%	-24.5%
Aug	1,555,525	5	608,595	0	5	5.28e-06	3	8	-3	-27	-3.3%	-27.9%
Sept	1,221,082	5	550,770	1	4	5.97e-06	3	7	-2	-29	-2.4%	-30.2%
Oct	1,119,064	6	392,775	0	6	8.26e-06	3	9	-3	-32	-3.4%	-33.6%
Nov	1,020,819	6	368,359	0	6	9.20e-06	3	9	-3	-36	-3.5%	-37.2%
Dec	898,269	3	352,223	1	2	3.66e-06	1	3	0	-36	-0.3%	-37.5%
Total	**14,120,194**	**96**	**4,834,627**	**9**	**87**	**1.14e-04**	**45**	**132**	**-36**			

Table 10 Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/7)	Percent of total sea turtle interactions avoided by closure (J/7)
Jan	53,531	0	16,182	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Feb	40,163	0	7,278	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Mar	41,457	0	9,359	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Apr	79,944	1	14,137	1	0	0.00e+00	0	0	1	1	50.0%	50.0%
May	59,689	0	41,818	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
June	47,708	0	14,916	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
July	112,631	0	24,369	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Aug	150,119	0	14,721	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Sept	225,159	0	18,648	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Oct	261,587	0	13,140	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Nov	56,929	0	9,161	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Dec	32,673	1	6,773	1	0	0.00e+00	0	0	1	2	50.0%	100.0%
Total	**1,161,590**	**2**	**190,502**	**2**	**0**	**0**	**0**	**0**	**2**			

Table 11 Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atl. & the Gulf of Mexico	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/5)	Percent of total sea turtle interactions avoided by closure (J/5)
Jan	1,082,142	0	335,798	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Feb	763,566	0	193,916	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Mar	897,001	0	142,441	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Apr	1,267,139	2	277,002	2	0	0.00e+00	0	0	2	2	40.0%	40.0%
May	1,317,311	0	411,194	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
June	1,414,291	0	489,547	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
July	1,563,985	0	712,007	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
Aug	1,555,525	0	608,595	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
Sept	1,221,082	0	550,770	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
Oct	1,119,064	0	392,775	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
Nov	1,020,819	0	368,359	0	0	0.00e+00	0	0	0	2	0.0%	40.0%
Dec	898,269	3	352,223	3	0	0.00e+00	0	0	3	5	60.0%	100.0%
Total	**14,120,194**	**5**	**4,834,627**	**5**	**0**	**0.00e+00**	**0**	**0**	**5**			

Table 12 **Percent change in catch of swordfish, yellowfin and bigeye tuna with the central Gulf of Mexico time/area closure in effect.** Based on Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
	Logbook Data	Logbook Data
Swordfish	-21%	17%*
Yellowfin	-38%	-2%
Bigeye	-12%	32%*

* positive sign indicates an increase in catch

Table 13 **Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on swordfish, yellowfin and bigeye tuna without redistribution of effort.** Source: Pelagic Logbook Data 2001-2002.

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye
January	1,056	3,316	177	7,495	3,401	1,831	12%	49%	9%
February	663	813	95	6,447	1,533	2,311	0%	35%	4%
March	446	729	38	7,191	2,262	3,459	6%	24%	1%
April	449	3,076	11	7,182	5,139	2,343	6%	37%	0%
May	532	3,232	15	7,055	6,958	604	7%	32%	2%
June	2,332	3,916	685	4,983	10,352	811	32%	27%	46%
July	3,308	5,924	421	3,816	9,535	696	46%	38%	38%
August	2,746	6,565	349	3,705	8,870	2,419	43%	43%	13%
Septembe	2,462	5,742	466	3,274	5,765	3,485	43%	50%	12%
October	1,242	3,235	356	5,244	8,424	3,022	19%	28%	11%
Novembe	866	2,724	622	4,744	4,716	3,468	15%	37%	15%
December	1,065	3,376	378	4,681	3,552	1,823	19%	49%	17%
Total	**17,167**	**42,648**	**3,613**	**65,817**	**70,507**	**26,272**	**21%**	**38%**	**12%**

Table 14 Redistribution of fishing effort and swordfish catch in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of swordfish caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of swordfish caught in time/area closure	Number of swordfish caught in open Atl. & Gulf of Mexico (B-D)	Swordfish CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional swordfish caught in open Atl. & GOM by displaced effort (C*F)	Swordfish catch from open Atl & GOM with displaced fishing effort (E+G)	Number of swordfish avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total swordfish avoided by month (I/82,984)	Percent of total swordfish avoided by closure (J/82,984)
Jan	1,082,142	8,551	335,798	1,056	7,495	1.00e-02	3,372	10,867	-2316	-2316	-2.8%	-2.8%
Feb	763,566	7,110	193,916	663	6,447	1.13e-02	2,195	8,642	-1532	-3848	-1.8%	-4.6%
Mar	897,001	7,637	142,441	446	7,191	9.53e-03	1,357	8,548	-911	-4759	-1.1%	-5.7%
Apr	1,267,139	7,631	277,002	449	7,182	7.25e-03	2,009	9,191	-1560	-6319	-1.9%	-7.6%
May	1,317,311	7,587	411,194	532	7,055	7.79e-03	3,202	10,257	-2670	-8989	-3.2%	-10.8%
June	1,414,291	7,315	489,547	2,332	4,983	5.39e-03	2,638	7,621	-306	-9295	-0.4%	-11.2%
July	1,563,985	7,124	712,007	3,308	3,816	4.48e-03	3,189	7,005	119	-9176	0.1%	-11.1%
Aug	1,555,525	6,451	608,595	2,746	3,705	3.91e-03	2,381	6,086	365	-8811	0.4%	-10.6%
Sept	1,221,082	5,736	550,770	2,462	3,274	4.88e-03	2,690	5,964	-228	-9039	-0.3%	-10.9%
Oct	1,119,064	6,486	392,775	1,242	5,244	7.22e-03	2,836	8,080	-1594	-10633	-1.9%	-12.8%
Nov	1,020,819	5,610	368,359	866	4,744	7.27e-03	2,678	7,422	-1812	-12445	-2.2%	-15.0%
Dec	898,269	5,746	352,223	1,065	4,681	8.57e-03	3,019	7,700	-1954	-14400	-2.4%	-17.4%
Total	**14,120,194**	**82,984**	**4,834,627**	**17,167**	**65,817**	**8.77e-02**	**31,567**	**97,384**	**-14400**			

Table 15 Redistribution of fishing effort and yellowfin tuna catch in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/113,155)	Percent of total tunas avoided by closure (J/113,155)
Jan	**1,082,142**	**6,717**	**335,798**	**3,316**	**3,401**	4.56e-03	1,530	4,931	1786	1786	1.6%	1.6%
Feb	**763,566**	**2,346**	**193,916**	**813**	**1,533**	2.69e-03	522	2,055	291	2077	0.3%	1.8%
Mar	**897,001**	**2,991**	**142,441**	**729**	**2,262**	3.00e-03	427	2,689	302	2379	0.3%	2.1%
Apr	**1,267,139**	**8,215**	**277,002**	**3,076**	**5,139**	5.19e-03	1,438	6,577	1638	4017	1.4%	3.6%
May	**1,317,311**	**10,190**	**411,194**	**3,232**	**6,958**	7.68e-03	3,158	10,116	74	4092	0.1%	3.6%
June	**1,414,291**	**14,268**	**489,547**	**3,916**	**10,352**	1.12e-02	5,480	15,832	-1564	2528	-1.4%	2.2%
July	**1,563,985**	**15,459**	**712,007**	**5,924**	**9,535**	1.12e-02	7,969	17,504	-2045	483	-1.8%	0.4%
Aug	**1,555,525**	**15,435**	**608,595**	**6,565**	**8,870**	9.37e-03	5,701	14,571	864	1347	0.8%	1.2%
Sept	**1,221,082**	**11,507**	**550,770**	**5,742**	**5,765**	8.60e-03	4,737	10,502	1005	2353	0.9%	2.1%
Oct	**1,119,064**	**11,659**	**392,775**	**3,235**	**8,424**	1.16e-02	4,556	12,980	-1321	1032	-1.2%	0.9%
Nov	**1,020,819**	**7,440**	**368,359**	**2,724**	**4,716**	7.23e-03	2,663	7,379	61	1093	0.1%	1.0%
Dec	**898,269**	**6,928**	**352,223**	**3,376**	**3,552**	6.50e-03	2,291	5,843	1085	2178	1.0%	1.9%
Total	**14,120,194**	**113,155**	**4,834,627**	**42,648**	**70,507**	**8.88e-02**	**40,470**	**110,977**	**2178**			

Table 16 Redistribution of fishing effort and bigeye tuna catch in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/29,885)	Percent of total tunas avoided by closure (J/29,885)
Jan	1,082,142	2,008	335,798	177	1,831	2.45e-03	824	2655	-647	-647	-2.2%	-2.2%
Feb	763,566	2,406	193,916	95	2,311	4.06e-03	787	3098	-692	-1339	-2.3%	-4.5%
Mar	897,001	3,497	142,441	38	3,459	4.58e-03	653	4112	-615	-1954	-2.1%	-6.5%
Apr	1,267,139	2,354	277,002	11	2,343	2.37e-03	655	2998	-644	-2598	-2.2%	-8.7%
May	1,317,311	619	411,194	15	604	0.00e+00	0	604	15	-2583	0.1%	-8.6%
June	1,414,291	1,496	489,547	685	811	8.77e-04	429	1240	256	-2327	0.9%	-7.8%
July	1,563,985	1,117	712,007	421	696	8.17e-04	582	1278	-161	-2488	-0.5%	-8.3%
Aug	1,555,525	2,768	608,595	349	2,419	2.55e-03	1555	3974	-1206	-3694	-4.0%	-12.4%
Sept	1,221,082	3,951	550,770	466	3,485	5.20e-03	2863	6348	-2397	-6091	-8.0%	-20.4%
Oct	1,119,064	3,378	392,775	356	3,022	4.16e-03	1634	4656	-1278	-7370	-4.3%	-24.7%
Nov	1,020,819	4,090	368,359	622	3,468	5.32e-03	1958	5426	-1336	-8706	-4.5%	-29.1%
Dec	898,269	2,201	352,223	378	1,823	3.34e-03	1176	2999	-798	-9503	-2.7%	-31.8%
Total	**14,120,194**	**29,885**	**4,834,627**	**3,613**	**26,272**	**3.57e-02**	**13116**	**39388**	**-9503**			

Table 17 **Percent change in catch of blue and white marlin dead and live discards with the central Gulf of Mexico time/area closure in effect.** Based on Pelagic Longline Logbook data with and without redistribution of effort.

Species	Disposition	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
		Logbook Data	Logbook Data
Blue Marlin	Dead Discards	-57%	-30%
	Live Discards	-29%	10%*
	All Discards	-37%	-1%
White Marlin	Dead Discards	-39%	-5%
	Live Discards	-26%	17%*
	All Discards	-30%	10%*

* positive sign indicates an increase in catch

Table 18 Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on blue marlin discards without redistribution of effort. Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
January	6	9	15	9	71	80	40%	11%	16%
February	0	4	4	4	49	53	0%	8%	7%
March	0	1	1	16	111	127	0%	1%	1%
April	1	10	11	17	87	104	6%	10%	10%
May	9	19	28	14	66	80	39%	22%	26%
June	35	49	84	35	73	110	50%	40%	43%
July	174	150	324	60	156	216	74%	49%	60%
August	23	30	53	32	129	161	42%	19%	25%
Septembe	22	52	74	23	82	108	49%	39%	41%
October	10	35	45	6	27	33	63%	56%	58%
Novembe	12	12	24	1	34	35	92%	26%	41%
December	4	5	9	10	43	53	29%	10%	15%
Total	**296**	**376**	**672**	**227**	**928**	**1160**	**57%**	**29%**	**37%**

Table 19 **Redistribution of fishing effort and blue marlin dead discards in the central Gulf of Mexico time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of dead discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of dead discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/523)	Percent of total marlin discards avoided by closure (J/523)
Jan	1,082,142	15	335,798	6	9	1.21e-05	4	13	2	2	0.4%	0.4%
Feb	763,566	4	193,916	0	4	7.02e-06	1	5	-1	1	-0.3%	0.1%
Mar	897,001	16	142,441	0	16	2.12e-05	3	19	-3	-2	-0.6%	-0.5%
Apr	1,267,139	18	277,002	1	17	1.72e-05	5	22	-4	-6	-0.7%	-1.2%
May	1,317,311	23	411,194	9	14	1.55e-05	6	20	3	-3	0.5%	-0.7%
June	1,414,291	70	489,547	35	35	3.78e-05	19	54	16	13	3.1%	2.5%
July	1,563,985	234	712,007	174	60	7.04e-05	50	110	124	137	23.7%	26.2%
Aug	1,555,525	55	608,595	23	32	3.38e-05	21	53	2	139	0.5%	26.6%
Sept	1,221,082	45	550,770	22	23	3.43e-05	19	42	3	142	0.6%	27.2%
Oct	1,119,064	16	392,775	10	6	8.26e-06	3	9	7	149	1.3%	28.5%
Nov	1,020,819	13	368,359	12	1	1.53e-06	1	2	11	161	2.2%	30.7%
Dec	898,269	14	352,223	4	10	1.83e-05	6	16	-2	158	-0.5%	30.2%
Total	**14,120,194**	**523**	**4,834,627**	**296**	**227**	**2.77e-04**	**138**	**365**	**158**			

Table 20 Redistribution of fishing effort and blue marlin live discards in the central Gulf of Mexico time/area closure alternative.
Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1304)	Percent of total marlin discards avoided by closure (J/1304)
Jan	1,082,142	80	335,798	9	71	9.51e-05	32	103	-23	-23	-1.8%	-1.8%
Feb	763,566	53	193,916	4	49	8.60e-05	17	66	-13	-36	-1.0%	-2.7%
Mar	897,001	112	142,441	1	111	1.47e-04	21	132	-20	-56	-1.5%	-4.3%
Apr	1,267,139	97	277,002	10	87	8.79e-05	24	111	-14	-70	-1.1%	-5.4%
May	1,317,311	85	411,194	19	66	7.28e-05	30	96	-11	-81	-0.8%	-6.2%
June	1,414,291	122	489,547	49	73	7.89e-05	39	112	10	-71	0.8%	-5.4%
July	1,563,985	306	712,007	150	156	1.83e-04	130	286	20	-51	1.5%	-3.9%
Aug	1,555,525	159	608,595	30	129	1.36e-04	83	212	-53	-104	-4.1%	-8.0%
Sept	1,221,082	134	550,770	52	82	1.22e-04	67	149	-15	-119	-1.2%	-9.1%
Oct	1,119,064	62	392,775	35	27	3.72e-05	15	42	20	-99	1.6%	-7.6%
Nov	1,020,819	46	368,359	12	34	5.21e-05	19	53	-7	-106	-0.6%	-8.1%
Dec	898,269	48	352,223	5	43	7.87e-05	28	71	-23	-129	-1.7%	-9.9%
Total	**14,120,194**	**1304**	**4,834,627**	**376**	**928**	**1.18e-03**	**505**	**1433**	**-129**			

Table 21 Redistribution of fishing effort and blue marlin dead and live discards combined in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1832)	Percent of total marlin discards avoided by closure (J/1832)
Jan	1,082,142	95	335,798	15	80	1.07e-04	36	116	-21	-21	-1.1%	-1.1%
Feb	763,566	57	193,916	4	53	9.30e-05	18	71	-14	-35	-0.8%	-1.9%
Mar	897,001	128	142,441	1	127	1.68e-04	24	151	-23	-58	-1.3%	-3.2%
Apr	1,267,139	115	277,002	11	104	1.05e-04	29	133	-18	-76	-1.0%	-4.2%
May	1,317,311	108	411,194	28	80	8.83e-05	36	116	-8	-84	-0.5%	-4.6%
June	1,414,291	194	489,547	84	110	1.19e-04	58	168	26	-59	1.4%	-3.2%
July	1,563,985	540	712,007	324	216	2.54e-04	181	397	143	85	7.8%	4.6%
Aug	1,555,525	214	608,595	53	161	1.70e-04	103	264	-50	34	-2.8%	1.9%
Sept	1,221,082	182	550,770	74	108	1.61e-04	89	197	-15	20	-0.8%	1.1%
Oct	1,119,064	78	392,775	45	33	4.54e-05	18	51	27	47	1.5%	2.6%
Nov	1,020,819	59	368,359	24	35	5.36e-05	20	55	4	51	0.2%	2.8%
Dec	898,269	62	352,223	9	53	9.71e-05	34	87	-25	26	-1.4%	1.4%
Total	**14,120,194**	**1832**	**4,834,627**	**672**	**1160**	**1.46e-03**	**646**	**1806**	**26**			

Table 22 Example of temporal variation in effectiveness of the central Gulf of Mexico time/area closure on white marlin discards without redistribution of effort. Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data).

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
January	1	12	13	25	69	94	4%	15%	12%
February	0	4	4	9	43	52	0%	9%	7%
March	0	3	3	29	60	89	0%	5%	3%
April	0	8	8	38	120	158	0%	6%	5%
May	9	31	40	34	105	139	21%	23%	22%
June	43	53	96	78	159	240	36%	25%	29%
July	161	170	331	78	162	240	67%	51%	58%
August	23	48	71	80	242	322	22%	17%	18%
Septembe	13	33	46	27	128	149	33%	20%	24%
October	15	16	31	11	43	54	58%	27%	36%
Novembe	13	20	33	6	19	25	68%	51%	57%
December	1	12	13	18	33	51	5%	27%	20%
Total	**279**	**410**	**689**	**433**	**1,183**	**1613**	**39%**	**26%**	**30%**

Table 23 **Redistribution of fishing effort and white marlin dead discards in the central Gulf of Mexico time/area closure alternative**. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/712)	Percent of total marlin discards avoided by closure (J/712)
Jan	1,082,142	26	335,798	1	25	3.35e-05	11	36	-10	-10	-1.4%	-1.4%
Feb	763,566	9	193,916	0	9	1.58e-05	3	12	-3	-13	-0.4%	-1.8%
Mar	897,001	29	142,441	0	29	3.84e-05	5	34	-5	-19	-0.8%	-2.6%
Apr	1,267,139	38	277,002	0	38	3.84e-05	11	49	-11	-29	-1.5%	-4.1%
May	1,317,311	43	411,194	9	34	3.75e-05	15	49	-6	-36	-0.9%	-5.0%
June	1,414,291	121	489,547	43	78	8.43e-05	41	119	2	-34	0.2%	-4.8%
July	1,563,985	239	712,007	161	78	9.16e-05	65	143	96	62	13.5%	8.7%
Aug	1,555,525	103	608,595	23	80	8.45e-05	51	131	-28	34	-4.0%	4.7%
Sept	1,221,082	40	550,770	13	27	4.03e-05	22	49	-9	24	-1.3%	3.4%
Oct	1,119,064	26	392,775	15	11	1.51e-05	6	17	9	33	1.3%	4.7%
Nov	1,020,819	19	368,359	13	6	9.20e-06	3	9	10	43	1.4%	6.0%
Dec	898,269	19	352,223	1	18	3.30e-05	12	30	-11	32	-1.5%	4.5%
Total	**14,120,194**	**712**	**4,834,627**	**279**	**433**	**5.22e-04**	**247**	**680**	**32**			

Table 24 Redistribution of fishing effort and white marlin live discards in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of live discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1593)	Percent of total marlin discards avoided by closure (J/1593)
Jan	1,082,142	81	335,798	12	69	9.25e-05	31	100	-19	-19	-1.2%	-1.2%
Feb	763,566	47	193,916	4	43	7.55e-05	15	58	-11	-30	-0.7%	-1.9%
Mar	897,001	63	142,441	3	60	7.95e-05	11	71	-8	-38	-0.5%	-2.4%
Apr	1,267,139	128	277,002	8	120	1.21e-04	34	154	-26	-64	-1.6%	-4.0%
May	1,317,311	136	411,194	31	105	1.16e-04	48	153	-17	-80	-1.0%	-5.0%
June	1,414,291	212	489,547	53	159	1.72e-04	84	243	-31	-111	-2.0%	-7.0%
July	1,563,985	332	712,007	170	162	1.90e-04	135	297	35	-77	2.2%	-4.8%
Aug	1,555,525	290	608,595	48	242	2.56e-04	156	398	-108	-184	-6.8%	-11.6%
Sept	1,221,082	161	550,770	33	128	1.91e-04	105	233	-72	-256	-4.5%	-16.1%
Oct	1,119,064	59	392,775	16	43	5.92e-05	23	66	-7	-264	-0.5%	-16.6%
Nov	1,020,819	39	368,359	20	19	2.91e-05	11	30	9	-254	0.6%	-16.0%
Dec	898,269	45	352,223	12	33	6.04e-05	21	54	-9	-264	-0.6%	-16.6%
Total	**14,120,194**	**1593**	**4,834,627**	**410**	**1183**	**1.44e-03**	**674**	**1857**	**-264**			

Table 25 Redistribution of fishing effort and white marlin dead and live discards combined in the central Gulf of Mexico time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/2302)	Percent of total marlin discards avoided by closure (J/2302)
Jan	1,082,142	107	335,798	13	94	1.26e-04	42	136	-29	-29	-1.3%	-1.3%
Feb	763,566	56	193,916	4	52	9.13e-05	18	70	-14	-43	-0.6%	-1.9%
Mar	897,001	92	142,441	3	89	1.18e-04	17	106	-14	-57	-0.6%	-2.5%
Apr	1,267,139	166	277,002	8	158	1.60e-04	44	202	-36	-93	-1.6%	-4.0%
May	1,317,311	179	411,194	40	139	1.53e-04	63	202	-23	-116	-1.0%	-5.0%
June	1,414,291	336	489,547	96	240	2.60e-04	127	367	-31	-147	-1.3%	-6.4%
July	1,563,985	571	712,007	331	240	2.82e-04	201	441	130	-16	5.7%	-0.7%
Aug	1,555,525	393	608,595	71	322	3.40e-04	207	529	-136	-152	-5.9%	-6.6%
Sept	1,221,082	195	550,770	46	149	2.22e-04	122	271	-76	-229	-3.3%	-9.9%
Oct	1,119,064	85	392,775	31	54	7.44e-05	29	83	2	-227	0.1%	-9.9%
Nov	1,020,819	58	368,359	33	25	3.83e-05	14	39	19	-208	0.8%	-9.0%
Dec	898,269	64	352,223	13	51	9.34e-05	33	84	-20	-228	-0.9%	-9.9%
Total	**14,120,194**	**2302**	**4,834,627**	**689**	**1613**	**1.96e-03**	**917**	**2530**	**-228**			

Figure 1. Map showing location and coordinates of proposed central Gulf of Mexico time/area closure.

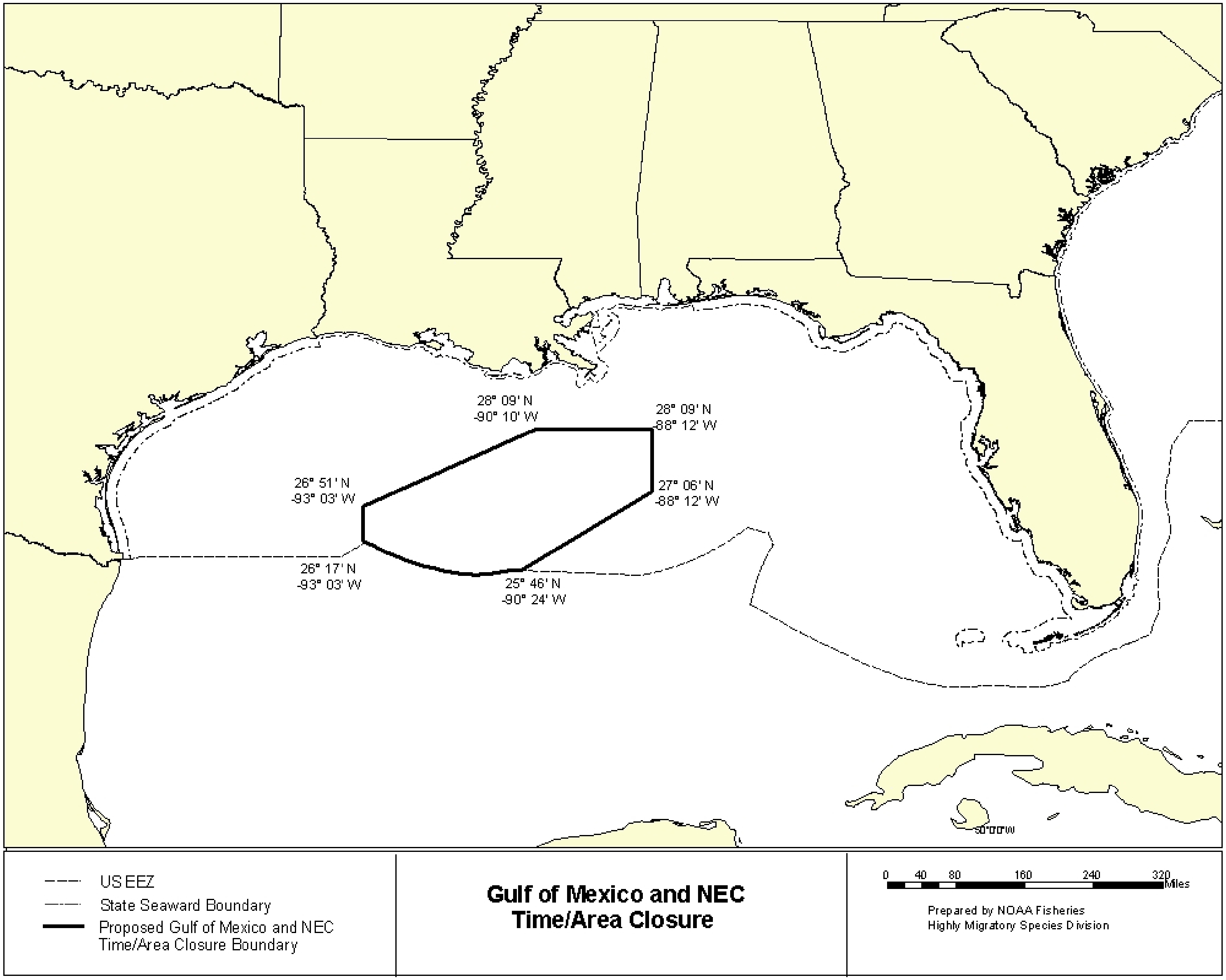


Figure 2 Map showing all observed sets and sea turtle interactions. Source: Pelagic Observer Program 2001-2002.

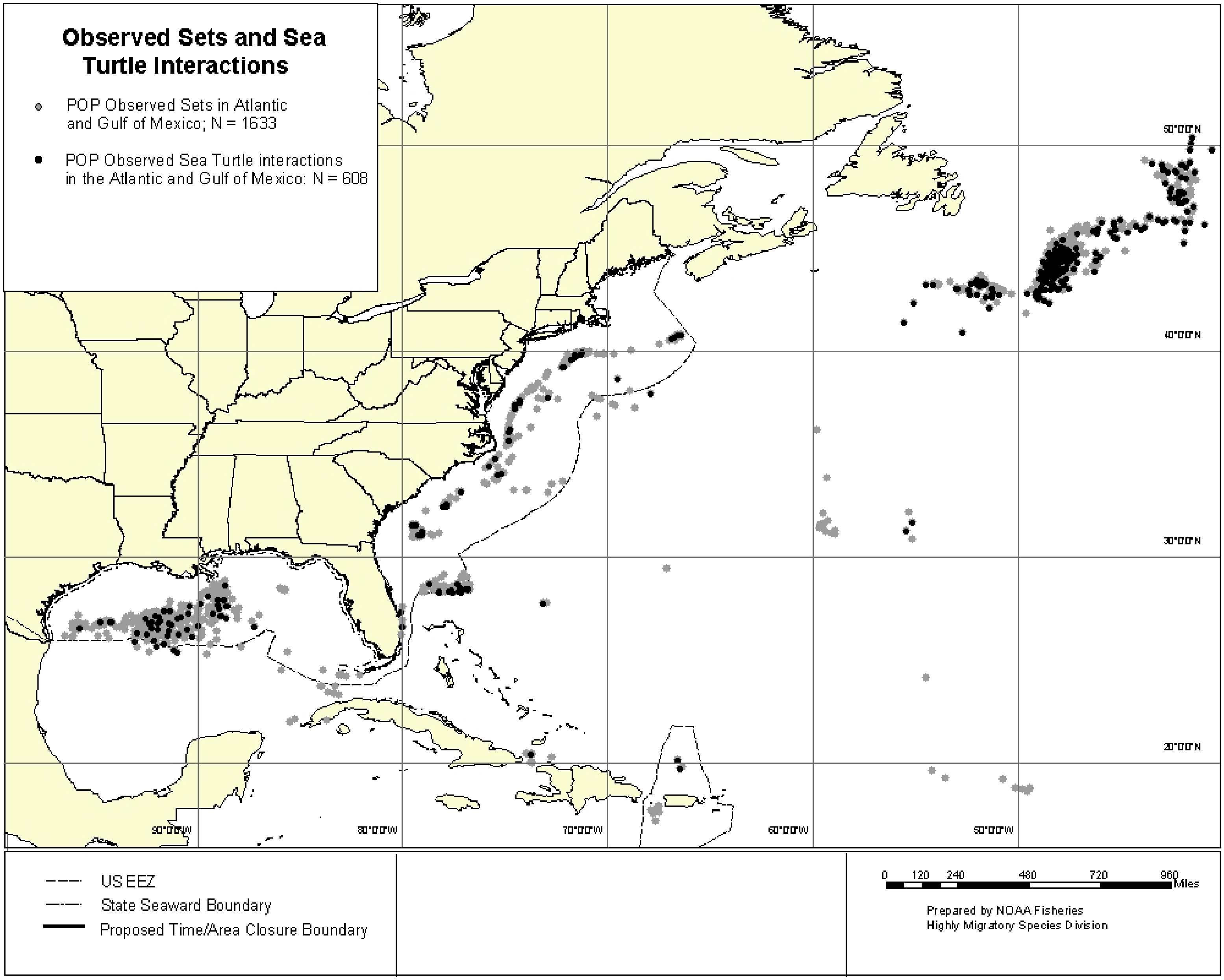


Figure 3 Map showing all reported sets and sea turtle interactions. Source: Pelagic Longline Logbook 2001-2002.

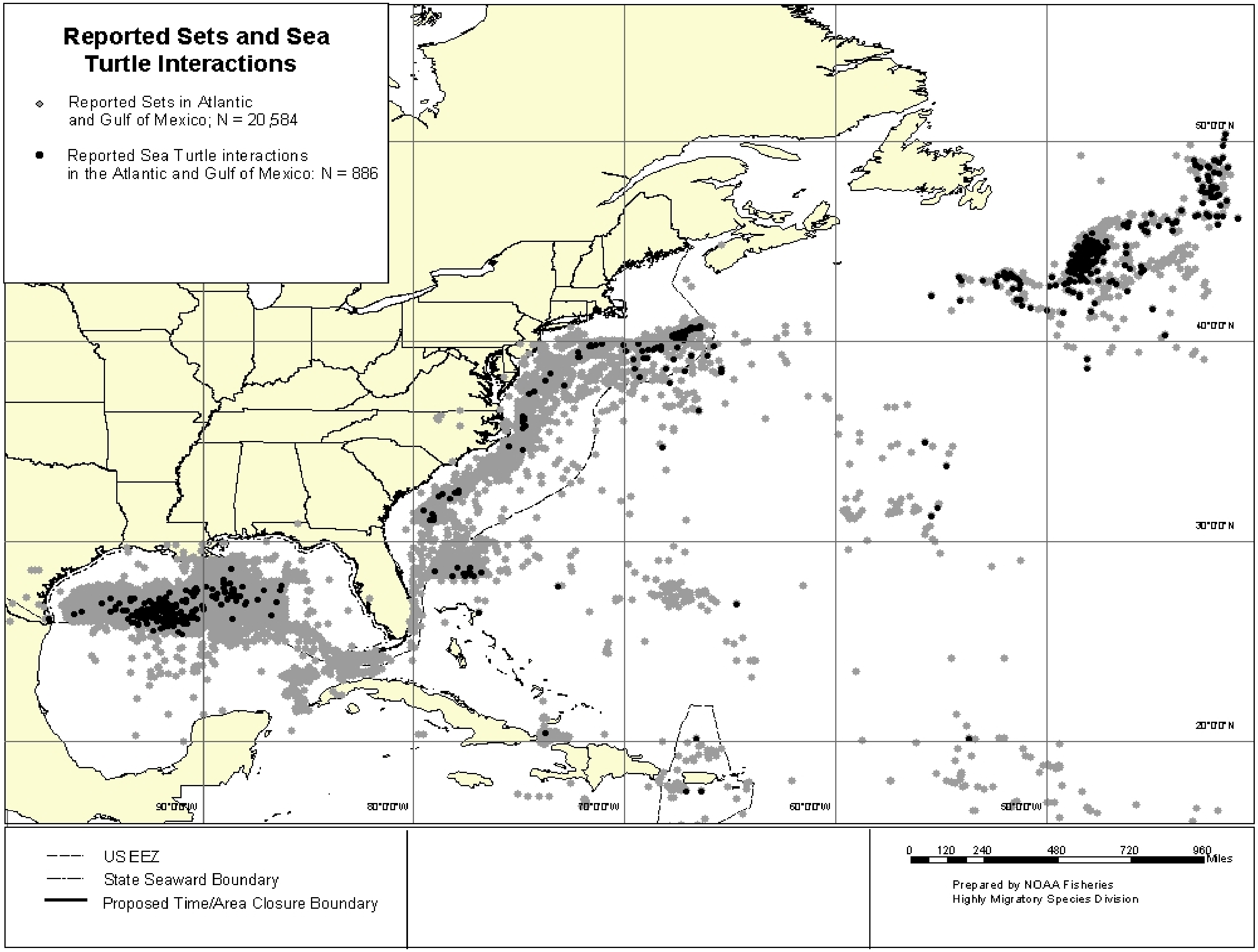


Figure 4 **Map showing all observed sets and sea turtle interactions in the Gulf of Mexico Time/Area closure.** Source: Pelagic Observer Program 2001-2002**.**

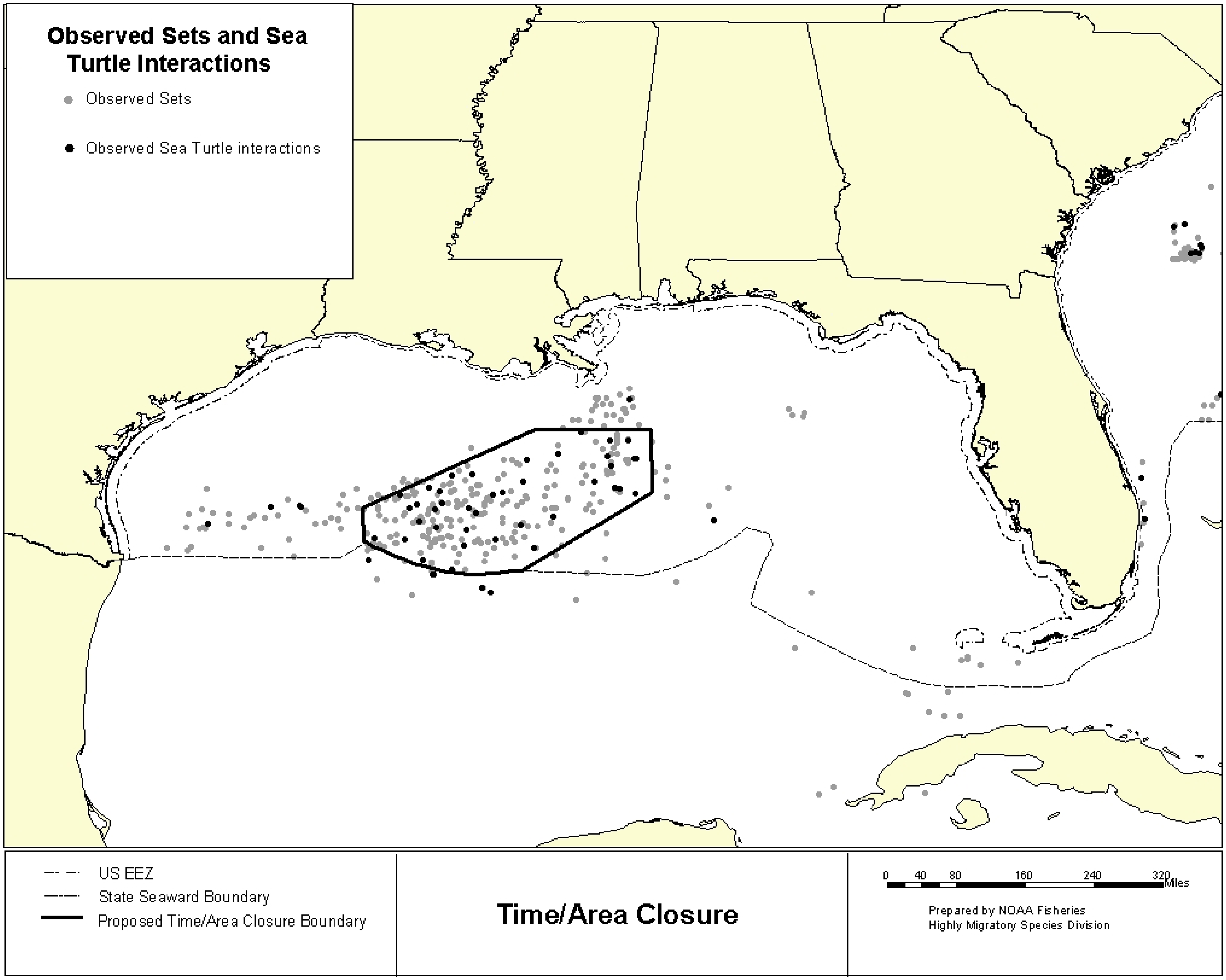


Figure 5 **Map showing all reported sets and sea turtle interactions in the Time/Area closure compared to the rest of the Gulf of Mexico.** Source: Pelagic Longline Logbook 2001-2002**.**

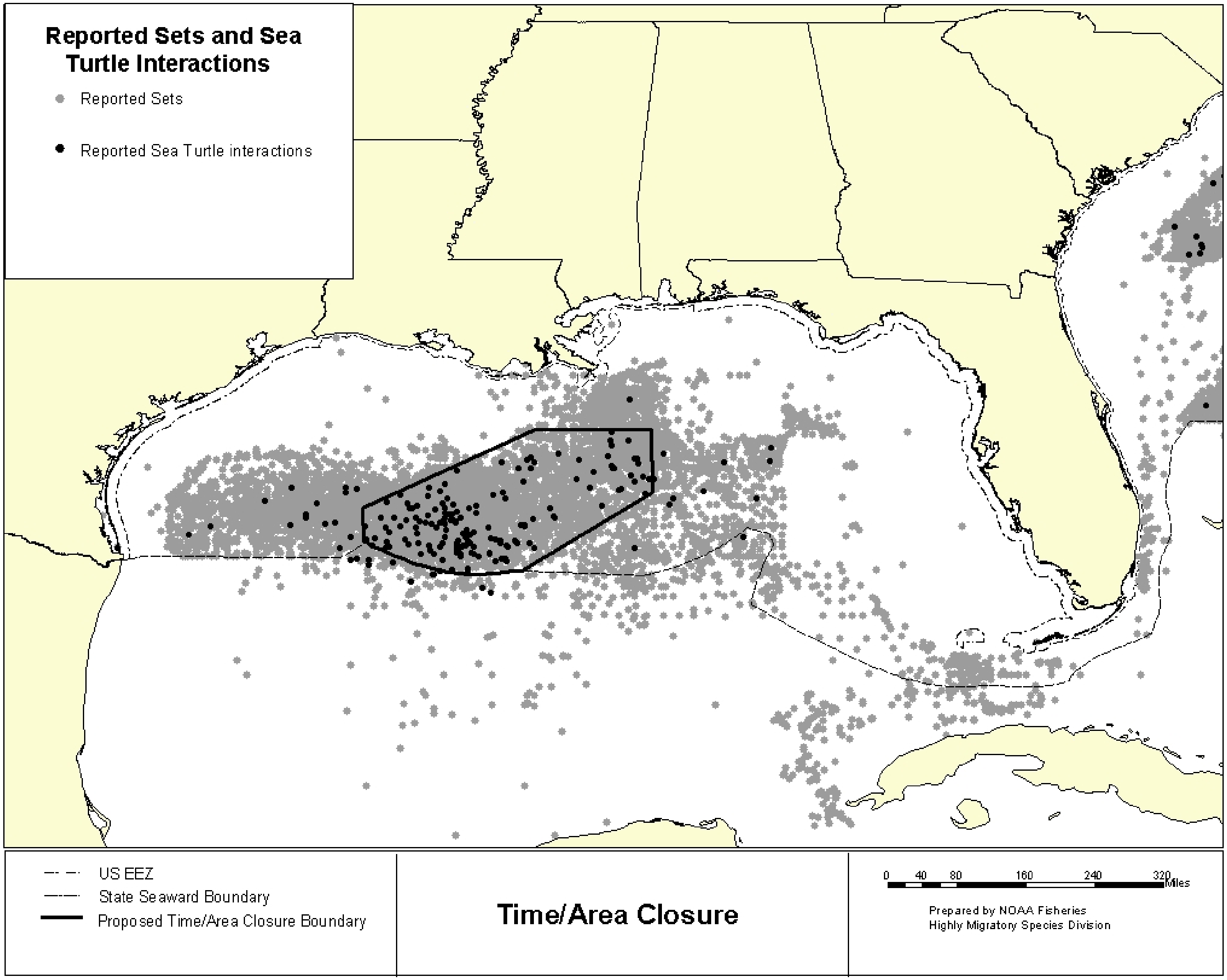
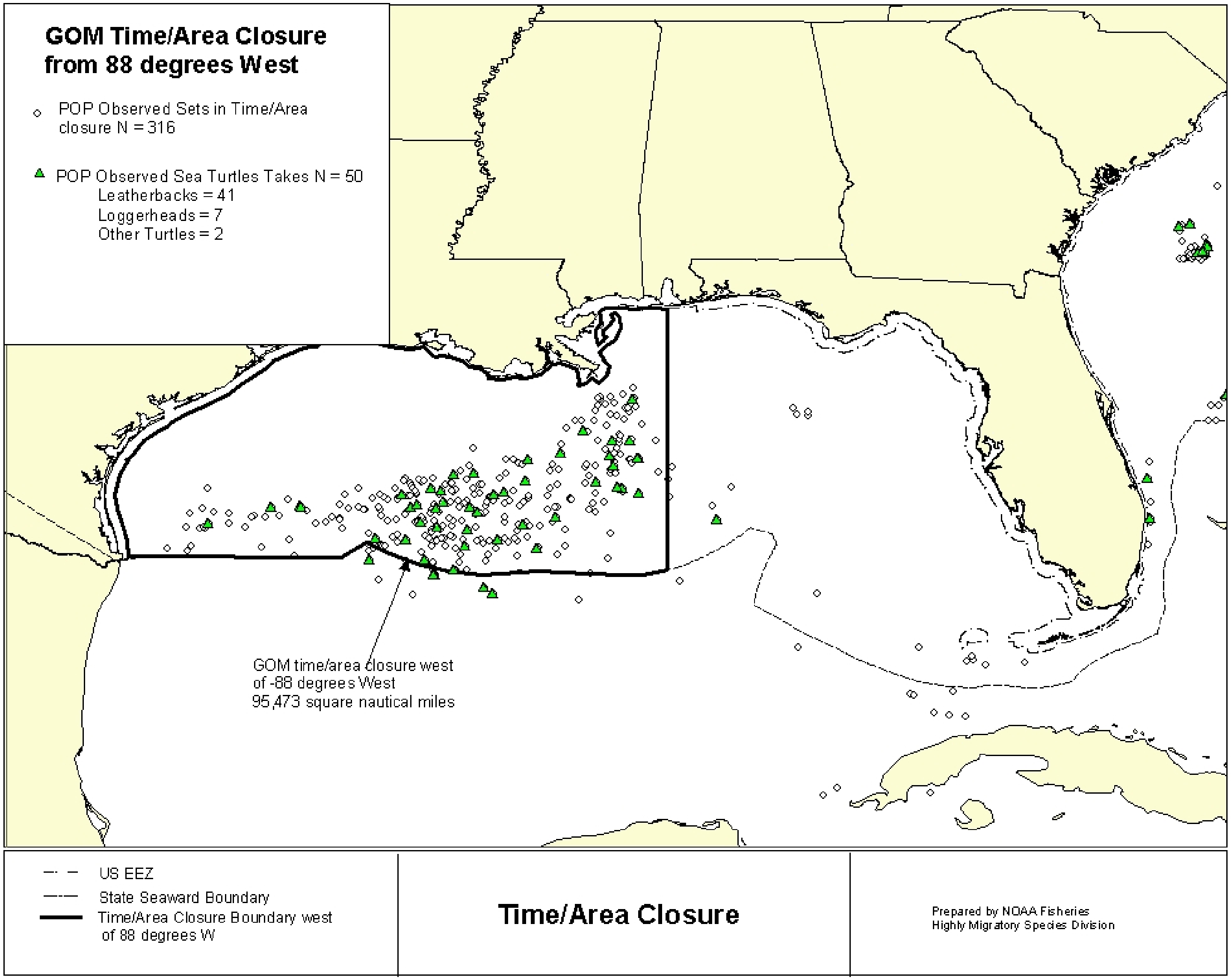


Figure 6 **Map showing all observed sets and sea turtle interactions in the time/area closure west of 88 degrees West. Source: Pelagic Observer Program 2001-2002.**



APPENDIX A2

Table 1 **Percent change in loggerhead, leatherback, and other sea turtle interactions with the combined Gulf of Mexico and NEC time/area closure in effect.** Based on data from the Pelagic Longline Observer Program and Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from 2001-2002		With redistribution of effort based on data from 2001-2002	
	Observer Data	Logbook Data	Observer Data	Logbook Data
Leatherback	-43%	-58%	-10%	-37%
Loggerhead	-34%	-56%	-7%	-35%
Other*	-100%	-50%	-100%	-28%

*** Other sea turtles include Kemp's Ridley, Hawksbill, and Green.**

Table 2 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure on leatherback sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of leatherbacks observed caught inside the time/area closure		Number of leatherbacks observed caught outside the time/area closure		Percentage reduction in leatherbacks caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	1	3	6	12	14%	20%
February	0	3	7	19	0%	14%
March	2	8	5	14	29%	36%
April	2	8	8	16	20%	33%
May	9	11	3	5	75%	69%
June	5	22	4	9	56%	71%
July	13	41	4	12	76%	77%
August	0	15	3	17	0%	47%
September	2	12	0	5	100%	71%
October	2	14	2	8	50%	64%
November	1	18	4	10	20%	64%
December	1	37	4	12	20%	76%
Total	**38**	**192**	**50**	**139**	**43%**	**58%**

Table 3 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure on loggerhead sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of loggerheads observed caught inside the time/area closure		Number of loggerheads observed caught outside the time/area closure		Percentage reduction in loggerheads caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	0	2	3	6	0%	25%
February	0	3	6	8	0%	27%
March	0	3	5	5	0%	38%
April	2	0	3	3	40%	0%
May	3	5	0	2	100%	71%
June	7	21	0	2	0%	91%
July	1	9	1	2	50%	82%
August	0	2	0	3	0%	40%
September	0	2	0	3	0%	40%
October	1	3	5	3	17%	50%
November	0	2	2	4	0%	33%
December	0	2	2	1	0%	67%
Total	**14**	**54**	**27**	**42**	**34%**	**56%**

Table 4 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure on other sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of other sea turtles observed caught inside the time/area closure		Number of other sea turtles observed caught outside the time/area closure		Percentage reduction in other sea turtles caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
January	0	0	0	0	0%	0%
February	0	0	0	1	0%	0%
March	0	0	0	1	0%	0%
April	1	2	0	0	100%	100%
May	0	0	0	0	0%	0%
June	0	0	0	0	0%	0%
July	0	0	0	0	0%	0%
August	0	0	0	0	0%	0%
September	0	0	0	0	0%	0%
October	0	0	0	2	0%	0%
November	0	0	0	1	0%	0%
December	1	3	0	0	0%	100%
Total	**2**	**5**	**0**	**5**	**100%**	**50%**

Table 5 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in the open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from the open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/88)	Cumulative percent of total sea turtle interactions avoided by closure (J/88)
Jan	53,531	7	16,182	1	6	1.61e-04	3	9	-2	(2)	-1.8%	-2.3%
Feb	40,163	7	7,278	0	7	2.13e-04	2	9	-2	(4)	-1.8%	-4.0%
Mar	41,457	7	9,359	2	5	1.56e-04	1	6	1	(3)	0.6%	-3.4%
Apr	79,077	10	14,137	2	8	1.23e-04	2	10	0	(3)	0.3%	-3.1%
May	59,689	12	41,818	9	3	1.68e-04	7	10	2	(1)	2.3%	-0.9%
June	47,708	9	21,221	4	5	1.89e-04	4	9	0	(1)	0.0%	-0.9%
July	52,635	17	24,369	13	4	1.42e-04	3	7	10	9	10.9%	10.0%
Aug	40,605	3	14,721	0	3	1.16e-04	2	5	-2	7	-1.9%	8.0%
Sept	20,872	2	18,648	2	0	0.00e+00	0	0	2	9	2.3%	10.3%
Oct	36,570	4	15,896	2	2	9.67e-05	2	4	0	9	0.0%	10.2%
Nov	49,280	5	11,229	1	4	1.05e-04	1	5	0	9	-0.2%	10.0%
Dec	32,673	5	6,773	1	4	1.54e-04	1	5	0	9	-0.1%	10.0%
Total	**554,260**	**88**	**201,631**	**37**	**51**	**1.62e-03**	**27**	**78**	**9**			

Table 6 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/331)	Percent of total sea turtle interactions avoided by closure (J/331)
Jan	1,082,142	15	336,728	3	12	1.61e-05	5	17	-2	-2	-0.7%	-0.6%
Feb	763,566	22	194,816	3	19	3.34e-05	7	26	-4	-6	-1.1%	-1.7%
Mar	897,001	22	143,341	8	14	1.86e-05	3	17	5	0	1.6%	-0.1%
Apr	1,267,139	24	280,984	8	16	1.62e-05	5	21	3	3	1.0%	1.0%
May	1,317,311	16	416,920	11	5	5.55e-06	2	7	9	12	2.6%	3.6%
June	1,414,291	31	492,897	22	9	9.77e-06	5	14	17	29	5.2%	8.8%
July	1,563,985	53	714,807	41	12	1.41e-05	10	22	31	60	9.3%	18.1%
Aug	1,555,525	32	611,565	15	17	1.80e-05	11	28	4	64	1.2%	19.3%
Sept	1,221,082	17	551,720	12	5	7.47e-06	4	9	8	72	2.4%	21.7%
Oct	1,119,064	22	392,775	14	8	1.10e-05	4	12	10	82	2.9%	24.6%
Nov	1,020,819	28	368,359	18	10	1.53e-05	6	16	12	94	3.7%	28.4%
Dec	898,269	49	353,073	37	12	2.20e-05	8	20	29	123	8.8%	37.2%
Total	**14,120,194**	**331**	**4,857,985**	**192**	**139**	**1.88e-04**	**69**	**208**	**123**			

Table 7 Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico and NEC time/area closure

alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/41)	Percent of total sea turtle interactions avoided by closure (J/41)
Jan	53,531	3	16,182	0	3	8.03e-05	1	4	-1	(1)	-3.2%	-2.4%
Feb	40,163	6	7,278	0	6	1.82e-04	1	7	-1	(2)	-3.2%	-5.7%
Mar	41,457	5	9,359	0	5	1.56e-04	1	6	-1	(4)	-3.6%	-9.2%
Apr	79,077	5	14,137	2	3	4.62e-05	1	4	1	(2)	3.3%	-5.9%
May	59,689	3	41,818	3	0	0.00e+00	0	0	3	1	7.3%	1.4%
June	47,708	7	21,221	7	0	0.00e+00	0	0	7	8	17.1%	18.4%
July	52,635	2	24,369	1	1	3.54e-05	1	2	0	8	0.3%	18.8%
Aug	40,605	0	14,721	0	0	0.00e+00	0	0	0	8	0.0%	18.8%
Sept	20,872	0	18,648	0	0	0.00e+00	0	0	0	8	0.0%	18.8%
Oct	36,570	6	15,896	1	5	2.42e-04	4	9	-3	5	-6.9%	11.8%
Nov	49,280	2	11,229	0	2	5.26e-05	1	3	-1	4	-1.4%	10.4%
Dec	32,673	2	6,773	0	2	7.72e-05	1	3	-1	3	-2.4%	7.3%
Total	**554,260**	**41**	**201,631**	**14**	**27**	**8.72e-04**	**11**	**38**	**3**			

Table 8 **Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico and NEC time/area closure**

alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/96)	Percent of total sea turtle interactions avoided by closure (J/96)
Jan	1,082,142	8	336,728	2	6	8.05e-06	3	9	-1	-1	-0.7%	-1.0%
Feb	763,566	11	194,816	3	8	1.41e-05	3	11	0	-1	0.3%	-0.8%
Mar	897,001	8	143,341	3	5	6.63e-06	1	6	2	1	2.1%	1.4%
Apr	1,267,139	3	280,984	0	3	3.04e-06	1	4	-1	0	-0.9%	0.5%
May	1,317,311	7	416,920	5	2	2.22e-06	1	3	4	5	4.2%	4.7%
June	1,414,291	23	492,897	21	2	2.17e-06	1	3	20	24	20.8%	25.5%
July	1,563,985	11	714,807	9	2	2.36e-06	2	4	7	32	7.6%	33.1%
Aug	1,555,525	5	611,565	2	3	3.18e-06	2	5	0	32	0.1%	33.2%
Sept	1,221,082	5	551,720	2	3	4.48e-06	2	5	0	31	-0.5%	32.7%
Oct	1,119,064	6	392,775	3	3	4.13e-06	2	5	1	33	1.4%	34.1%
Nov	1,020,819	6	368,359	2	4	6.13e-06	2	6	0	32	-0.3%	33.8%
Dec	898,269	3	353,073	2	1	1.83e-06	1	2	1	34	1.4%	35.2%
Total	**14,120,194**	**96**	**4,857,985**	**54**	**42**	**5.83e-05**	**20**	**62**	**34**			

Table 9 Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/2)	Percent of total sea turtle interactions avoided by closure (J/2)
Jan	53,531	0	16,182	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Feb	40,163	0	7,278	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Mar	41,457	0	9,359	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Apr	79,077	1	14,137	1	0	0.00e+00	0	0	1	1	50.0%	50.0%
May	59,689	0	41,818	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
June	47,708	0	21,221	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
July	52,635	0	24,369	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Aug	40,605	0	14,721	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Sept	20,872	0	18,648	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Oct	36,570	0	15,896	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Nov	49,280	0	11,229	0	0	0.00e+00	0	0	0	1	0.0%	50.0%
Dec	32,673	1	6,773	1	0	0.00e+00	0	0	1	2	50.0%	100.0%
Total	**554,260**	**2**	**201,631**	**2**	**0**	**0.00e+00**	**0**	**0**	**2**			

Table 10 Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/10)	Percent of total sea turtle interactions avoided by closure (J/10)
Jan	1,082,142	0	336,728	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Feb	763,566	1	194,816	0	1	1.76e-06	0	1	0	0	-3.4%	-3.4%
Mar	897,001	1	143,341	0	1	1.33e-06	0	1	0	-1	-1.9%	-5.3%
Apr	1,267,139	2	280,984	2	0	0.00e+00	0	0	2	1	20.0%	14.7%
May	1,317,311	0	416,920	0	0	0.00e+00	0	0	0	1	0.0%	14.7%
June	1,414,291	0	492,897	0	0	0.00e+00	0	0	0	1	0.0%	14.7%
July	1,563,985	0	714,807	0	0	0.00e+00	0	0	0	1	0.0%	14.7%
Aug	1,555,525	0	611,565	0	0	0.00e+00	0	0	0	1	0.0%	14.7%
Sept	1,221,082	0	551,720	0	0	0.00e+00	0	0	0	1	0.0%	14.7%
Oct	1,119,064	2	392,775	0	2	2.75e-06	1	3	-1	0	-10.8%	3.9%
Nov	1,020,819	1	368,359	0	1	1.53e-06	1	2	-1	0	-5.6%	-1.8%
Dec	898,269	3	353,073	3	0	0.00e+00	0	0	3	3	30.0%	28.2%
Total	**14,120,194**	**10**	**4,857,985**	**5**	**5**	**7.37e-06**	**2**	**7**	**3**			

Table 11 **Percent change in catch of swordfish, yellowfin and bigeye tuna in the central Gulf of Mexico and NEC time/area closure alternative.** Based on Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
	Logbook Data	Logbook Data
Swordfish	-21%	18%*
Yellowfin	-38%	-2%
Bigeye	-12%	33%*

* positive sign indicates an increase in catch

Table 12 Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure alternative on swordfish, yellowfin and bigeye tuna in the Gulf of Mexico without redistribution of effort. Source: Pelagic Logbook Data 2001-2002.

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye
January	1,058	3,320	177	7,493	3,397	1831	12%	49%	9%
February	665	814	95	6,445	1,532	2311	0%	35%	4%
March	446	735	38	7,191	2,256	3459	6%	25%	1%
April	452	3,089	11	7,179	5,126	2343	6%	38%	0%
May	537	3,270	15	7,050	6,920	604	7%	32%	2%
June	2,335	3,953	685	4,980	10,315	811	32%	28%	46%
July	3,308	5,947	421	3,816	9,512	696	46%	38%	38%
August	2,749	6,589	349	3,702	8,846	2419	43%	43%	13%
Septembe	2,462	5,747	466	3,274	5,760	3485	43%	50%	12%
October	1,242	3,235	356	5,244	8,424	3022	19%	28%	11%
November	865	2,724	622	4,745	4,716	3468	15%	37%	15%
December	1,066	3,387	378	4,680	3,541	1,823	19%	49%	17%
Total	**17,185**	**42,810**	**3,613**	**65,799**	**70,345**	**26,272**	**21%**	**38%**	**12%**

Table 13 Redistribution of fishing effort and swordfish catch in the central Gulf of Mexico and NEC time/area closure alternative.
Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of swordfish caught in the Atlantic & Gulf of Mexico	Number of hooks in the time/area closure	Number of swordfish caught in time/area closure	Number of swordfish caught in open Atl. & Gulf of Mexico (B-D)	Swordfish CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional swordfish caught in open Atl. & GOM by displaced effort (C*F)	Swordfish catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of swordfish avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total swordfish avoided by month (I/82,984)	Percent of total swordfish avoided by closure (J/82,984)
Jan	1,082,142	8,551	336,728	1,058	7,493	1.01e-02	3,385	10,878	-2327	-2327	-2.8%	-2.8%
Feb	763,566	7,110	194,816	665	6,445	1.13e-02	2,208	8,653	-1543	-3870	-1.9%	-4.7%
Mar	897,001	7,637	143,341	446	7,191	9.54e-03	1,368	8,559	-922	-4791	-1.1%	-5.8%
Apr	1,267,139	7,631	280,984	452	7,179	7.28e-03	2,046	9,225	-1594	-6385	-1.9%	-7.7%
May	1,317,311	7,587	416,920	537	7,050	7.83e-03	3,264	10,314	-2727	-9112	-3.3%	-11.0%
June	1,414,291	7,315	492,897	2,335	4,980	5.40e-03	2,664	7,644	-329	-9441	-0.4%	-11.4%
July	1,563,985	7,124	714,807	3,308	3,816	4.49e-03	3,212	7,028	96	-9345	0.1%	-11.3%
Aug	1,555,525	6,451	611,565	2,749	3,702	3.92e-03	2,398	6,100	351	-8995	0.4%	-10.8%
Sept	1,221,082	5,736	551,720	2,462	3,274	4.89e-03	2,699	5,973	(237)	-9231	-0.3%	-11.1%
Oct	1,119,064	6,486	392,775	1,242	5,244	7.22e-03	2,836	8,080	-1594	-10825	-1.9%	-13.0%
Nov	1,020,819	5,610	368,359	865	4,745	7.27e-03	2,679	7,424	-1814	-12639	-2.2%	-15.2%
Dec	898,269	5,746	353,073	1,066	4,680	8.58e-03	3,031	7,711	-1965	-14604	-2.4%	-17.6%
Total	**14,120,194**	**82,984**	**4,857,985**	**17,185**	**65,799**	**8.78e-02**	**31,789**	**97,588**	**(14,604)**			

Table 14 **Redistribution of fishing effort and yellowfin tuna catch in the central Gulf of Mexico and NEC time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/113,155)	Percent of total tunas avoided by closure (J/113,155)
Jan	1,082,142	6,717	336,728	3,320	3,397	4.56e-03	1,535	4,932	1785	1785	1.6%	1.6%
Feb	763,566	2,346	194,816	814	1,532	2.69e-03	525	2,057	289	2074	0.3%	1.8%
Mar	897,001	2,991	143,341	735	2,256	2.99e-03	429	2,685	306	2380	0.3%	2.1%
Apr	1,267,139	8,215	280,984	3,089	5,126	5.20e-03	1,461	6,587	1628	4009	1.4%	3.5%
May	1,317,311	10,190	416,920	3,270	6,920	7.69e-03	3,204	10,124	66	4074	0.1%	3.6%
June	1,414,291	14,268	492,897	3,953	10,315	1.12e-02	5,518	15,833	-1565	2509	-1.4%	2.2%
July	1,563,985	15,459	714,807	5,947	9,512	1.12e-02	8,007	17,519	-2060	450	-1.8%	0.4%
Aug	1,555,525	15,435	611,565	6,589	8,846	9.37e-03	5,731	14,577	858	1307	0.8%	1.2%
Sept	1,221,082	11,507	551,720	5,747	5,760	8.61e-03	4,748	10,508	999	2307	0.9%	2.0%
Oct	1,119,064	11,659	392,775	3,235	8,424	1.16e-02	4,556	12,980	-1321	986	-1.2%	0.9%
Nov	1,020,819	7,440	368,359	2,724	4,716	7.23e-03	2,663	7,379	61	1048	0.1%	0.9%
Dec	898,269	6,928	353,073	3,387	3,541	6.49e-03	2,293	5,834	1094	2142	1.0%	1.9%
Total	**14,120,194**	**113,155**	**4,857,985**	**42,810**	**70,345**	**8.88e-02**	**40,668**	**111,013**	**2,142**			

Table 15 Redistribution of fishing effort and bigeye tuna catch in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/29,885)	Percent of total tunas avoided by closure (J/29,885)
Jan	1,082,142	2,008	336,728	177	1831	2.46e-03	827	2658	-650	-650	-2.2%	-2.2%
Feb	763,566	2,406	194,816	95	2311	4.06e-03	792	3103	-697	-1347	-2.3%	-4.5%
Mar	897,001	3,497	143,341	38	3459	4.59e-03	658	4117	-620	-1966	-2.1%	-6.6%
Apr	1,267,139	2,354	280,984	11	2343	2.38e-03	668	3011	-657	-2623	-2.2%	-8.8%
May	1,317,311	619	416,920	15	604	6.71e-04	280	884	-265	-2888	-0.9%	-9.7%
June	1,414,291	1,496	492,897	685	811	8.80e-04	434	1245	251	-2637	0.8%	-8.8%
July	1,563,985	1,117	714,807	421	696	8.20e-04	586	1282	-165	-2801	-0.6%	-9.4%
Aug	1,555,525	2,768	611,565	349	2419	2.56e-03	1567	3986	-1218	-4020	-4.1%	-13.5%
Sept	1,221,082	3,951	551,720	466	3485	5.21e-03	2873	6358	-2407	-6426	-8.1%	-21.5%
Oct	1,119,064	3,378	392,775	356	3022	4.16e-03	1634	4656	-1278	-7704	-4.3%	-25.8%
Nov	1,020,819	4,090	368,359	622	3468	5.32e-03	1958	5426	-1336	-9040	-4.5%	-30.3%
Dec	898,269	2,201	353,073	378	1823	3.34e-03	1181	3004	-803	-9843	-2.7%	-32.9%
Total	**14,120,194**	**29,885**	**4,857,985**	**3,613**	**26,272**	**3.64e-02**	**13,456**	**39,728**	**(9,843)**			

Table 16 **Percent change in catch of blue and white marlin dead and live discards in the central Gulf of Mexico and NEC time/area closure alternative.** Based on Pelagic Longline Logbook data with and without redistribution of effort.

Species	Disposition	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
		Logbook Data	Logbook Data
Blue Marlin	Dead Discards	-57%	+31%
	Live Discards	-30%	-8%
	All Discards	-38%	+3%
White Marlin	Dead Discards	-42%	+10%
	Live Discards	-30%	-9%
	All Discards	-34%	-3%

Table 17 Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure alternative on blue marlin discards without redistribution of effort. Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
January	6	9	15	9	71	80	40%	11%	16%
February	0	4	4	4	49	53	0%	8%	7%
March	0	1	1	16	111	127	0%	1%	1%
April	1	10	11	17	87	104	6%	10%	10%
May	9	19	28	14	66	80	39%	22%	26%
June	36	51	85	34	73	107	51%	40%	44%
July	174	151	325	60	155	215	74%	49%	60%
August	24	34	58	31	125	156	44%	21%	27%
Septembe	24	57	81	21	77	98	0.533333	43%	45%
October	10	37	47	6	25	31	63%	60%	60%
November	12	13	25	1	33	34	92%	28%	42%
December	4	5	9	10	43	53	29%	10%	15%
Total	**300**	**389**	**689**	**223**	**915**	**1138**	**57%**	**30%**	**38%**

Table 18 **Redistribution of fishing effort and blue marlin dead discards in the central Gulf of Mexico and NEC time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of dead discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of dead discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/523)	Percent of total marlin discards avoided by closure (J/523)
Jan	1,082,142	15	336,728	6	9	1.21e-05	4	13	2	2	0.4%	0.4%
Feb	763,566	4	194,816	0	4	7.03e-06	1	5	-1	1	-0.3%	0.1%
Mar	897,001	16	143,341	0	16	2.12e-05	3	19	-3	-2	-0.6%	-0.5%
Apr	1,267,139	18	280,984	1	17	1.72e-05	5	22	-4	-6	-0.7%	-1.2%
May	1,317,311	23	416,920	9	14	1.55e-05	6	20	3	-4	0.5%	-0.7%
June	1,414,291	70	492,897	36	34	3.69e-05	18	52	18	14	3.4%	2.7%
July	1,563,985	234	714,807	174	60	7.07e-05	51	111	123	138	23.6%	26.3%
Aug	1,555,525	55	611,565	24	31	3.28e-05	20	51	4	141	0.7%	27.1%
Sept	1,221,082	45	551,720	24	21	3.14e-05	17	38	7	148	1.3%	28.3%
Oct	1,119,064	16	392,775	10	6	8.26e-06	3	9	7	155	1.3%	29.6%
Nov	1,020,819	13	368,359	12	1	1.53e-06	1	2	11	166	2.2%	31.8%
Dec	898,269	14	353,073	4	10	1.83e-05	6	16	-2	164	-0.5%	31.3%
Total	**14,120,194**	**523**	**4,857,985**	**300**	**223**	**2.73e-04**	**136**	**359**	**164**			

Table 19 **Redistribution of fishing effort and blue marlin live discards in the central Gulf of Mexico and NEC time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1304)	Percent of total marlin discards avoided by closure (J/1304)
Jan	1,082,142	80	336,728	9	71	9.52e-05	32	103	-23	-23	-1.8%	-1.8%
Feb	763,566	53	194,816	4	49	8.62e-05	17	66	-13	-36	-1.0%	-2.7%
Mar	897,001	112	143,341	1	111	1.47e-04	21	132	-20	-56	-1.5%	-4.3%
Apr	1,267,139	97	280,984	10	87	8.82e-05	25	112	-15	-71	-1.1%	-5.4%
May	1,317,311	85	416,920	19	66	7.33e-05	31	97	-12	-82	-0.9%	-6.3%
June	1,414,291	122	492,897	51	71	7.71e-05	38	109	13	-69	1.0%	-5.3%
July	1,563,985	306	714,807	151	155	1.83e-04	130	285	21	-49	1.6%	-3.7%
Aug	1,555,525	159	611,565	34	125	1.32e-04	81	206	-47	-96	-3.6%	-7.3%
Sept	1,221,082	134	551,720	57	77	1.15e-04	63	140	-6	-102	-0.5%	-7.8%
Oct	1,119,064	62	392,775	37	25	3.44e-05	14	39	23	-79	1.8%	-6.0%
Nov	1,020,819	46	368,359	13	33	5.06e-05	19	52	-6	-84	-0.4%	-6.5%
Dec	898,269	48	353,073	5	43	7.89e-05	28	71	-23	-107	-1.8%	-8.2%
Total	**14,120,194**	**1304**	**4,857,985**	**391**	**913**	**1.16e-03**	**498**	**1411**	**-107**			

Table 20 **Redistribution of fishing effort and blue marlin dead and live discards combined in the central Gulf of Mexico and NEC time/area closure alternative.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1832)	Percent of total marlin discards avoided by closure (J/1832)
Jan	1,082,142	95	336,728	15	80	1.07e-04	36	116	-21	-21	-1.2%	-1.1%
Feb	763,566	57	194,816	4	53	9.32e-05	18	71	-14	-35	-0.8%	-1.9%
Mar	897,001	128	143,341	1	127	1.69e-04	24	151	-23	-58	-1.3%	-3.2%
Apr	1,267,139	115	280,984	11	104	1.05e-04	30	134	-19	-77	-1.0%	-4.2%
May	1,317,311	108	416,920	28	80	8.89e-05	37	117	-9	-86	-0.5%	-4.7%
June	1,414,291	194	492,897	87	107	1.16e-04	57	164	30	-56	1.6%	-3.1%
July	1,563,985	540	714,807	325	215	2.53e-04	181	396	144	88	7.9%	4.8%
Aug	1,555,525	214	611,565	58	156	1.65e-04	101	257	-43	45	-2.4%	2.4%
Sept	1,221,082	182	551,720	81	101	1.51e-04	83	184	-2	42	-0.1%	2.3%
Oct	1,119,064	78	392,775	47	31	4.27e-05	17	48	30	73	1.7%	4.0%
Nov	1,020,819	59	368,359	25	34	5.21e-05	19	53	6	79	0.3%	4.3%
Dec	898,269	62	353,073	9	53	9.72e-05	34	87	-25	53	-1.4%	2.9%
Total	**14,120,194**	**1832**	**4,857,985**	**691**	**1141**	**1.44e-03**	**638**	**1779**	**53**			

Table 21 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure on white marlin discards in the Gulf of Mexico without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
January	1	12	13	25	69	94	4%	15%	12%
February	0	4	4	9	43	52	0%	9%	7%
March	0	3	3	29	60	89	0%	5%	3%
April	0	8	8	38	120	158	0%	6%	5%
May	9	31	40	34	105	139	21%	23%	22%
June	47	66	113	74	146	223	39%	31%	34%
July	165	192	357	74	140	214	69%	58%	63%
August	33	72	105	70	218	288	32%	25%	27%
Septembe	17	48	65	23	113	130	43%	30%	33%
October	15	16	31	11	43	54	58%	27%	36%
November	13	20	33	6	19	25	68%	51%	57%
December	1	12	13	18	33	51	5%	27%	20%
Total	**301**	**484**	**785**	**411**	**1,109**	**1,517**	**42%**	**30%**	**34%**

Table 22 Redistribution of fishing effort and white marlin dead discards in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of dead discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of dead discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/712)	Percent of total marlin discards avoided by closure (J/712)
Jan	1,082,142	26	336,728	1	25	3.35e-05	11	36	-10	-10	-1.4%	-1.4%
Feb	763,566	9	194,816	0	9	1.58e-05	3	12	-3	-13	-0.4%	-1.8%
Mar	897,001	29	143,341	0	29	3.85e-05	6	35	-6	-19	-0.8%	-2.6%
Apr	1,267,139	38	280,984	0	38	3.85e-05	11	49	-11	-29	-1.5%	-4.1%
May	1,317,311	43	416,920	9	34	3.78e-05	16	50	-7	-36	-0.9%	-5.1%
June	1,414,291	121	492,897	47	74	8.03e-05	40	114	7	-29	1.0%	-4.0%
July	1,563,985	239	714,807	165	74	8.71e-05	62	136	103	74	14.4%	10.4%
Aug	1,555,525	103	611,565	33	70	7.42e-05	45	115	-12	62	-1.7%	8.7%
Sept	1,221,082	40	551,720	17	23	3.44e-05	19	42	-2	60	-0.3%	8.4%
Oct	1,119,064	26	392,775	15	11	1.51e-05	6	17	9	69	1.3%	9.6%
Nov	1,020,819	19	368,359	13	6	9.20e-06	3	9	10	78	1.4%	11.0%
Dec	898,269	19	353,073	1	18	3.30e-05	12	30	-11	67	-1.5%	9.5%
Total	**14,120,194**	**712**	**4,857,985**	**301**	**411**	**4.97e-04**	**234**	**645**	**67**			

Table 23 Redistribution of fishing effort and white marlin live discards in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1593)	Percent of total marlin discards avoided by closure (J/1593)
Jan	1,082,142	81	336,728	12	69	9.26e-05	31	100	-19	-19	-1.2%	-1.2%
Feb	763,566	47	194,816	4	43	7.56e-05	15	58	-11	-30	-0.7%	-1.9%
Mar	897,001	63	143,341	3	60	7.96e-05	11	71	-8	-38	-0.5%	-2.4%
Apr	1,267,139	128	280,984	8	120	1.22e-04	34	154	-26	-64	-1.6%	-4.0%
May	1,317,311	136	416,920	31	105	1.17e-04	49	154	-18	-82	-1.1%	-5.1%
June	1,414,291	212	492,897	66	146	1.58e-04	78	224	-12	-94	-0.8%	-5.9%
July	1,563,985	332	714,807	192	140	1.65e-04	118	258	74	-20	4.7%	-1.2%
Aug	1,555,525	290	611,565	72	218	2.31e-04	141	359	-69	-89	-4.3%	-5.6%
Sept	1,221,082	161	551,720	48	113	1.69e-04	93	206	-45	-134	-2.8%	-8.4%
Oct	1,119,064	59	392,775	16	43	5.92e-05	23	66	-7	-142	-0.5%	-8.9%
Nov	1,020,819	39	368,359	20	19	2.91e-05	11	30	9	-132	0.6%	-8.3%
Dec	898,269	45	353,073	12	33	6.05e-05	21	54	-9	-142	-0.6%	-8.9%
Total	**14,120,194**	**1593**	**4,857,985**	**484**	**1109**	**1.36e-03**	**626**	**1735**	**-142**			

Table 24 Redistribution of fishing effort and white marlin dead and live discards combined in the central Gulf of Mexico and NEC time/area closure alternative. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Gulf of Mexico (B-D)	Marlin CPUE in the open Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open GOM by displaced effort (C*F)	Marlin discards from open GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/2302)	Percent of total marlin discards avoided by closure (J/2302)
Jan	1,082,142	107	336,728	13	94	1.26e-04	42	136	-29	-29	-1.3%	-1.3%
Feb	763,566	56	194,816	4	52	9.14e-05	18	70	-14	-43	-0.6%	-1.9%
Mar	897,001	92	143,341	3	89	1.18e-04	17	106	-14	-57	-0.6%	-2.5%
Apr	1,267,139	166	280,984	8	158	1.60e-04	45	203	-37	-94	-1.6%	-4.1%
May	1,317,311	179	416,920	40	139	1.54e-04	64	203	-24	-118	-1.1%	-5.1%
June	1,414,291	336	492,897	113	223	2.42e-04	119	342	-6	-124	-0.3%	-5.4%
July	1,563,985	571	714,807	357	214	2.52e-04	180	394	177	52	7.7%	2.3%
Aug	1,555,525	393	611,565	105	288	3.05e-04	187	475	-82	-29	-3.5%	-1.3%
Sept	1,221,082	195	551,720	65	130	1.94e-04	107	237	-42	-71	-1.8%	-3.1%
Oct	1,119,064	85	392,775	31	54	7.44e-05	29	83	2	-69	0.1%	-3.0%
Nov	1,020,819	58	368,359	33	25	3.83e-05	14	39	19	-51	0.8%	-2.2%
Dec	898,269	64	353,073	13	51	9.35e-05	33	84	-20	-71	-0.9%	-3.1%
Total	**14,120,194**	**2302**	**4,857,985**	**785**	**1517**	**1.85e-03**	**856**	**2373**	**-71**			

Figure 1 Map showing closeup of NEC closure area and coordinates.

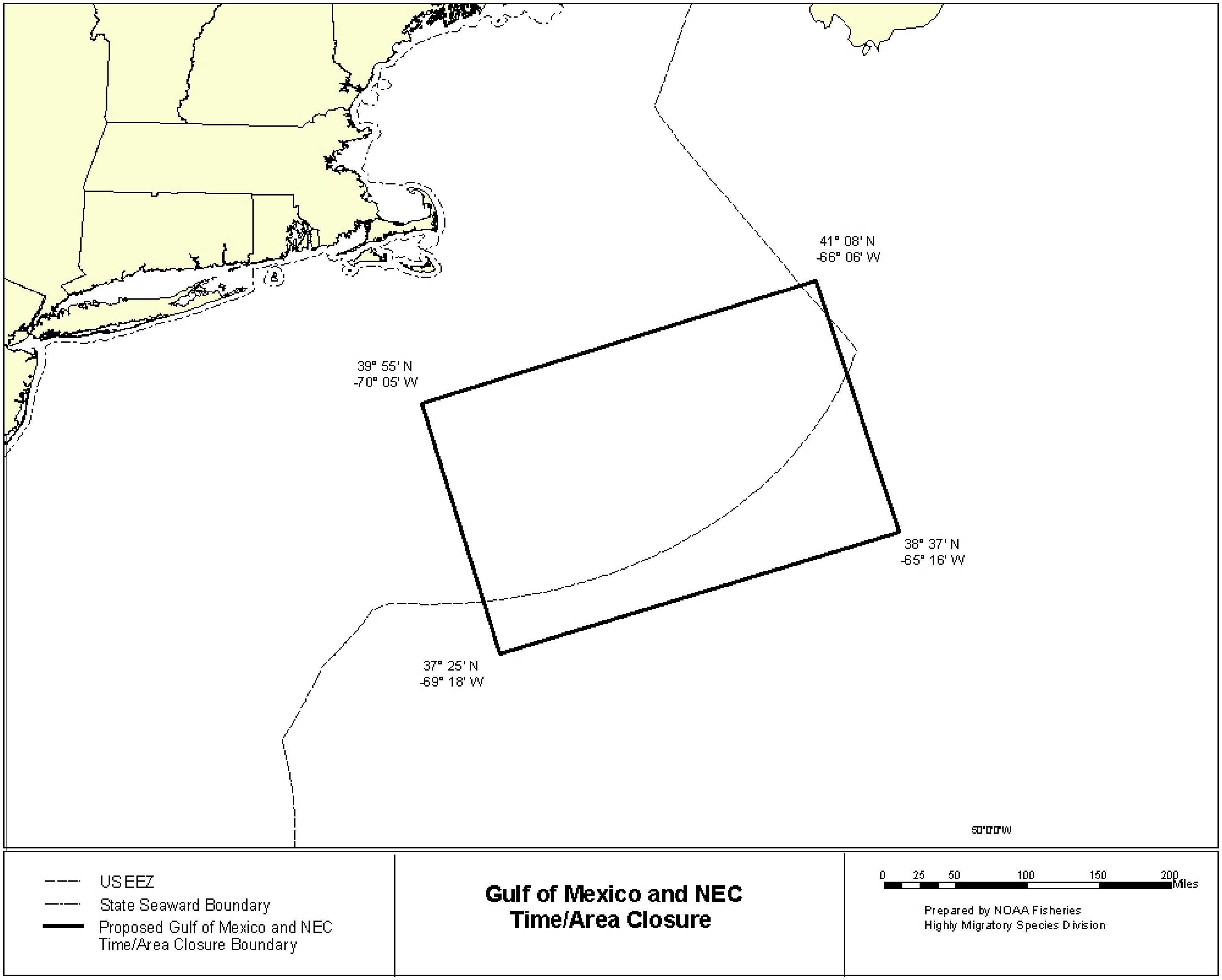


Figure 2 **Map showing all reported sets, sea turtle interactions, and the proposed Gulf of Mexico and NEC time/area closure. Source: Pelagic Longline Logbook 2001-2002.**

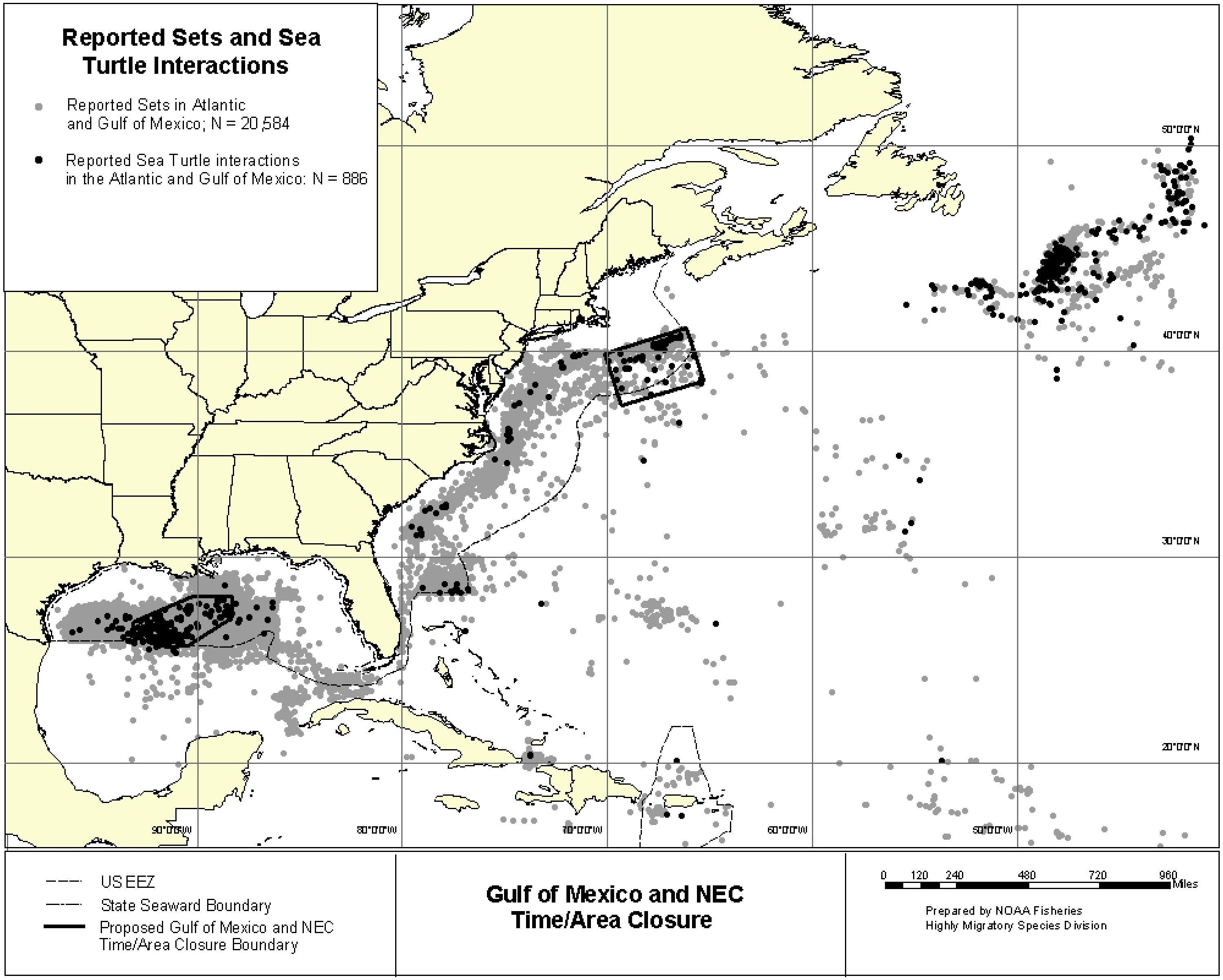


Figure 3 **Map showing all observed sets and sea turtle interactions in the NEC time/area closure. Source: Pelagic Observer Program 2001-2002.**

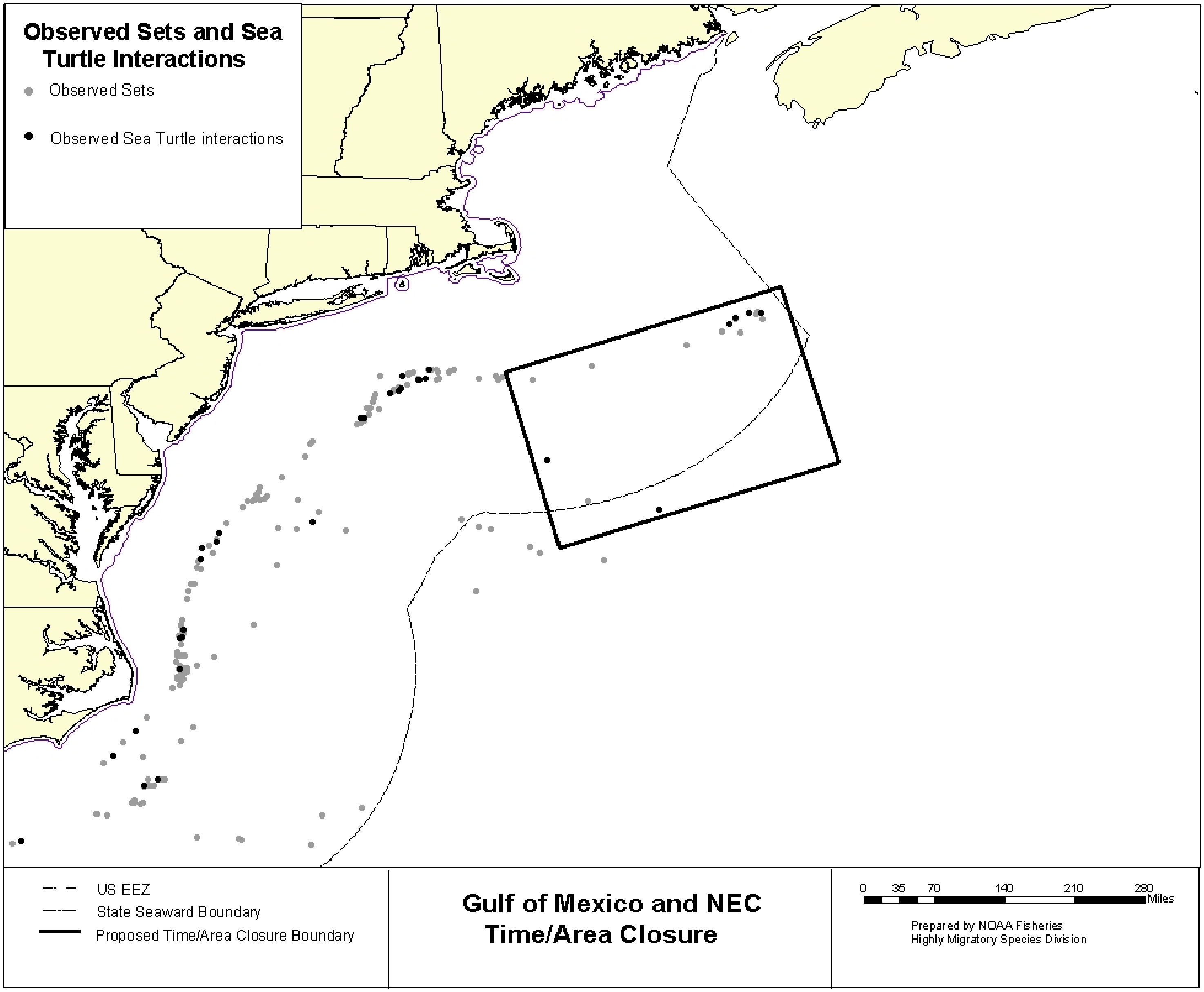
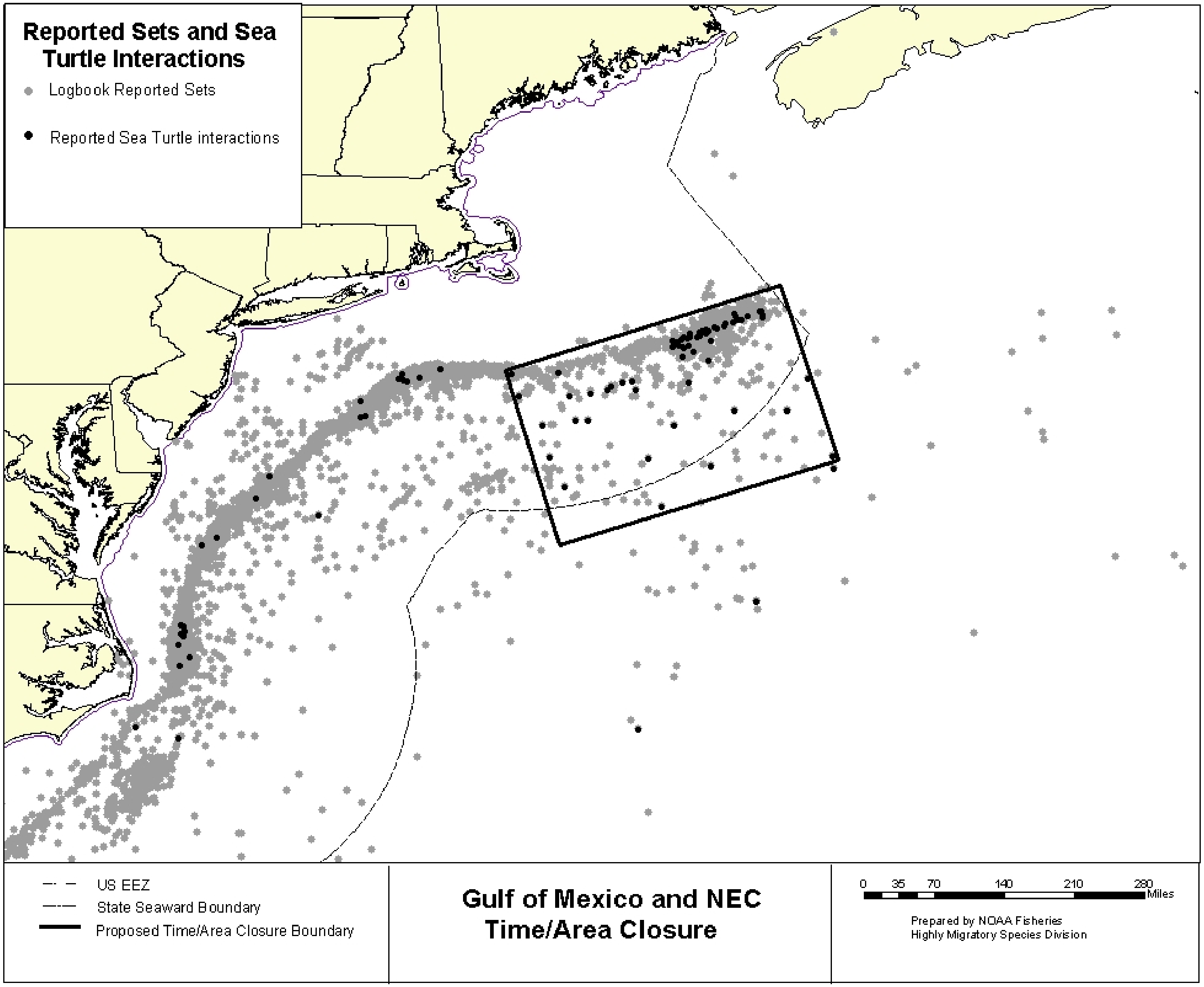


Figure 4 **Map showing all logbook reported sets and sea turtle interactions in the NEC time/area closure. Source: Pelagic Longline Logbook 2001-2002.**



APPENDIX A3

Table 1 **Percent change in loggerhead, leatherback, and other sea turtle interactions with the combined Gulf of Mexico and NEC time/area closure in effect from May through October.** Based on data from the Pelagic Longline Observer Program and Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from May-Oct 2001-2002		With redistribution of effort based on data from May-Oct 2001-2002	
	Observer Data	Logbook Data	Observer Data	Logbook Data
Leatherback	-35%	-35%	-14%	-24%
Loggerhead	-29%	-44%	-18%	-34%
Other*	0%	0%	0%	11%

*** Other sea turtles include Kemp's Ridley, Hawksbill, and Green.**

Table 2 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure from May through October on leatherback sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of leatherbacks observed caught inside the time/area closure		Number of leatherbacks observed caught outside the time/area closure		Percentage reduction in leatherbacks caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
May	9	11	3	5	75%	69%
June	5	22	4	9	56%	71%
July	13	41	4	12	76%	77%
August	0	15	3	17	0%	47%
September	2	12	0	5	100%	71%
October	2	14	2	8	50%	64%
Total May-Oct	**31**	**115**	**16**	**56**	**35%***	**35%***
Total	**38**	**192**	**50**	**139**		

* calculated by dividing the number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001-2002 (88 leatherbacks based on observer data and 331 leatherbacks based on logbook data).

Table 3 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure from May through October on loggerhead sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of loggerheads observed caught inside the time/area closure		Number of loggerheads observed caught outside the time/area closure		Percentage reduction in loggerheads caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
May	3	5	0	2	100%	71%
June	7	21	0	2	0%	91%
July	1	9	1	2	50%	82%
August	0	2	0	3	0%	40%
September	0	2	0	3	0%	40%
October	1	3	5	3	17%	50%
Total May-Oct	**12**	**42**	**6**	**15**	**29%***	**44%***
Total	**14**	**54**	**27**	**42**		

* calculated by dividing the number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001 - 2002 (41 loggerheads based on observer data and 96 loggerheads based on logbook data).

Table 4 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure from May through October on other sea turtle bycatch without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2001-2002 (Logbook Data)

Month	Number of other sea turtles observed caught inside the time/area closure		Number of other sea turtles observed caught outside the time/area closure		Percentage reduction in other sea turtles caught if time/area is closed	
	Observer Data	Logbook Data	Observer Data	Logbook Data	Observer Data	Logbook Data
May	0	0	0	0	0%	0%
June	0	0	0	0	0%	0%
July	0	0	0	0	0%	0%
August	0	0	0	0	0%	0%
September	0	0	0	0	0%	0%
October	0	0	0	2	0%	0%
Total May-Oct	**0**	**0**	**0**	**2**	**0%***	**0%***
Total	**2**	**5**	**0**	**5**		

* calculated by dividing the number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001 - 2002 (2 other sea turtles based on observer data and 10 other sea turtles based on logbook data).

Table 5 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in the open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from the open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/88)	Cumulative percent of total sea turtle interactions avoided by closure (J/88)
May	59,689	12	41,818	9	3	1.68e-04	7	10	2	2	2.3%	2.3%
June	47,708	9	21,221	4	5	1.89e-04	4	9	0	2	0.0%	2.3%
July	52,635	17	24,369	13	4	1.42e-04	3	7	10	12	10.9%	13.1%
Aug	40,605	3	14,721	0	3	1.16e-04	2	5	-2	10	-1.9%	11.2%
Sept	20,872	2	18,648	2	0	0.00e+00	0	0	2	12	2.3%	13.5%
Oct	36,570	4	15,896	2	2	9.67e-05	2	4	0	12	0.0%	13.5%
Total May-Oct	**258,079**	**47**	**136,673**	**30**	**17**	**7.11e-04**	**18**	**35**	**12**			
Total	**554,260**	**88**	**201,631**	**37**	**51**	**0**	**27**	**78**	**9**			

Table 6 Redistribution of fishing effort and leatherback sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic and Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/331)	Percent of total sea turtle interactions avoided by closure (J/331)
May	1,317,311	16	416,920	11	5	5.55e-06	2	7	9	9	2.6%	2.7%
June	1,414,291	31	492,897	22	9	9.77e-06	5	14	17	26	5.2%	7.9%
July	1,563,985	53	714,807	41	12	1.41e-05	10	22	31	57	9.3%	17.2%
Aug	1,555,525	32	611,565	15	17	1.80e-05	11	28	4	61	1.2%	18.5%
Sept	1,221,082	17	551,720	12	5	7.47e-06	4	9	8	69	2.4%	20.8%
Oct	1,119,064	22	392,775	14	8	1.10e-05	4	12	10	79	2.9%	23.8%
Total May-Oct	**8,191,258**	**171**	**3,180,684**	**115**	**56**	**6.59e-05**	**37**	**93**	**79**			
Total	**14,120,194**	**331**	**4,857,985**	**192**	**139**	**1.88e-04**	**69**	**208**				

Table 7 Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October. Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/41)	Percent of total sea turtle interactions avoided by closure (J/41)
May	59,689	3	41,818	3	0	0.00e+00	0	0	3	3	7.3%	7.3%
June	47,708	7	21,221	7	0	0.00e+00	0	0	7	10	17.1%	24.4%
July	52,635	2	24,369	1	1	3.54e-05	1	2	0	10	0.3%	24.7%
Aug	40,605	0	14,721	0	0	0.00e+00	0	0	0	10	0.0%	24.7%
Sept	20,872	0	18,648	0	0	0.00e+00	0	0	0	10	0.0%	24.7%
Oct	36,570	6	15,896	1	5	2.42e-04	4	9	-3	7	-6.9%	17.8%
Total May-Oct	**258,079**	**18**	**136,673**	**12**	**6**	**2.77e-04**	**5**	**11**	**7**			
Total	**554,260**	**41**	**201,631**	**14**	27	**8.72e-04**	**11**	**38**	**3**			

Table 8 Redistribution of fishing effort and loggerhead sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/96)	Percent of total sea turtle interactions avoided by closure (J/96)
May	1,317,311	7	416,920	5	2	2.22e-06	1	3	4	4	4.2%	4.2%
June	1,414,291	23	492,897	21	2	2.17e-06	1	3	20	24	20.8%	24.9%
July	1,563,985	11	714,807	9	2	2.36e-06	2	4	7	31	7.6%	32.5%
Aug	1,555,525	5	611,565	2	3	3.18e-06	2	5	0	31	0.1%	32.6%
Sept	1,221,082	5	551,720	2	3	4.48e-06	2	5	0	31	-0.5%	32.1%
Oct	1,119,064	6	392,775	3	3	4.13e-06	2	5	1	32	1.4%	33.6%
Total May-Oct	**8,191,258**	**57**	**3,180,684**	**42**	**15**	**1.85e-05**	**10**	**25**	**32**			
Total	**14,120,194**	**96**	**4,857,985**	**54**	**42**	**5.83e-05**	**20**	**62**	**34**			

Table 9 **Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October.** Source: Pelagic Observer Program data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/2)	Percent of total sea turtle interactions avoided by closure (J/2)
May	59,689	0	41,818	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
June	47,708	0	21,221	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
July	52,635	0	24,369	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Aug	40,605	0	14,721	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Sept	20,872	0	18,648	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Oct	36,570	0	15,896	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Total May-Oct	**258,079**	**0**	**136,673**	**0**	**0**	**0**	**0**	**0**	**0**			
Total	**554,260**	**2**	**201,631**	**2**	0	**0**	**0**	**0**	**2**			

Table 10 Redistribution of fishing effort and other sea turtle interactions in the central Gulf of Mexico and NEC time/area closure alternative from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of sea turtles caught in the Atlantic and GOM	Number of hooks in the time/area closure	Number of sea turtles caught in time/area closure	Number of sea turtles caught in open Atl. & Gulf of Mexico (B-D)	Sea turtle CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional sea turtles caught in open Atl. & GOM by displaced effort (C*F)	Sea turtles catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of sea turtles avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total sea turtle interactions avoided by month (I/10)	Percent of total sea turtle interactions avoided by closure (J/10)
May	1,317,311	0	416,920	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
June	1,414,291	0	492,897	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
July	1,563,985	0	714,807	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Aug	1,555,525	0	611,565	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Sept	1,221,082	0	551,720	0	0	0.00e+00	0	0	0	0	0.0%	0.0%
Oct	1,119,064	2	392,775	0	2	2.75e-06	1	3	-1	-1	-10.8%	-10.8%
Total	**8,191,258**	**2**	**3,180,684**	**0**	**2**	**2.75e-06**	**1**	**3**	**-1**			
Total	**14,120,194**	**10**	**4,857,985**	**5**	**5**	**7.37e-06**	**2**	**7**	**3**			

Table 11 **Percent change in catch of swordfish, yellowfin and bigeye tuna in the central Gulf of Mexico and NEC time/area closure alternative from May through October.** Based on Pelagic Longline Logbook data with and without redistribution of effort.

	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
	Logbook Data	Logbook Data
Swordfish	-15%	5%*
Yellowfin	-25%	3%*
Bigeye	-8%	17%*

* positive sign indicates an increase in catch

Table 12 Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure from May through October on swordfish, yellowfin and bigeye tuna in the Gulf of Mexico without redistribution of effort. Source: Pelagic Logbook Data 2001-2002.

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye	Swordfish	Yellowfin	Bigeye
May	537	3,270	15	7,050	6,920	604	7%	32%	2%
June	2,335	3,953	685	4,980	10,315	811	32%	28%	46%
July	3,308	5,947	421	3,816	9,512	696	46%	38%	38%
August	2,749	6,589	349	3,702	8,846	2419	43%	43%	13%
Septembe	2,462	5,747	466	3,274	5,760	3485	43%	50%	12%
October	1,242	3,235	356	5,244	8,424	3022	19%	28%	11%
Total May-Oct	**12,633**	**28,741**	**2,292**	**28,066**	**49,777**	**11,037**	**15%***	**25%***	**8%***
Total	**17,185**	**42,810**	**3,613**	**65,799**	**70,345**	**26,272**			

* calculated by dividing the total number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001 - 2002.

Table 13 Redistribution of fishing effort and swordfish catch in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of swordfish caught in the Atlantic & Gulf of Mexico	Number of hooks in the time/area closure	Number of swordfish caught in time/area closure	Number of swordfish caught in open Atl. & Gulf of Mexico (B-D)	Swordfish CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional swordfish caught in open Atl. & GOM by displaced effort (C*F)	Swordfish catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of swordfish avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total swordfish avoided by month (I/82,984)	Percent of total swordfish avoided by closure (J/82,984)
May	1,317,311	7,587	416,920	537	7,050	7.83e-03	3,264	10,314	-2727	-2727	-3.3%	-3.3%
June	1,414,291	7,315	492,897	2,335	4,980	5.40e-03	2,664	7,644	-329	-3056	-0.4%	-3.7%
July	1,563,985	7,124	714,807	3,308	3,816	4.49e-03	3,212	7,028	96	-2960	0.1%	-3.6%
Aug	1,555,525	6,451	611,565	2,749	3,702	3.92e-03	2,398	6,100	351	-2610	0.4%	-3.1%
Sept	1,221,082	5,736	551,720	2,462	3,274	4.89e-03	2,699	5,973	-237	-2846	-0.3%	-3.4%
Oct	1,119,064	6,486	392,775	1,242	5,244	7.22e-03	2,836	8,080	-1594	-4440	-1.9%	-5.4%
Total May-Oct	**8,191,258**	**40,699**	**3,180,684**	**12,633**	**28,066**	**3.38e-02**	**17,074**	**45,140**	**-4440**			
Total	**14,120,194**	**82,984**	**4,857,985**	**17,185**	**65,799**	**8.78e-02**	**31,789**	**97,588**	**-14604**			

Table 14 Redistribution of fishing effort and yellowfin tuna catch in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/113,155)	Percent of total tunas avoided by closure (J/113,155)
May	1,317,311	10,190	416,920	3,270	6,920	7.69e-03	3,204	10,124	66	66	0.1%	0.1%
June	1,414,291	14,268	492,897	3,953	10,315	1.12e-02	5,518	15,833	-1565	-1499	-1.4%	-1.3%
July	1,563,985	15,459	714,807	5,947	9,512	1.12e-02	8,007	17,519	-2060	-3559	-1.8%	-3.1%
Aug	1,555,525	15,435	611,565	6,589	8,846	9.37e-03	5,731	14,577	858	-2701	0.8%	-2.4%
Sept	1,221,082	11,507	551,720	5,747	5,760	8.61e-03	4,748	10,508	999	-1702	0.9%	-1.5%
Oct	1,119,064	11,659	392,775	3,235	8,424	1.16e-02	4,556	12,980	-1321	-3022	-1.2%	-2.7%
Total May-Oct	**8,191,258**	**78,518**	**3,180,684**	**28,741**	**49,777**	**5.97e-02**	**31,764**	**81,541**	**-3022**			
Total	**14,120,194**	**113,155**	**4,857,985**	**42,810**	**70,345**	**8.88e-02**	**40,668**	**111,013**	**2,142**			

Table 15 Redistribution of fishing effort and bigeye tuna catch in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of tuna caught in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of tuna caught in time/area closure	Number of tuna caught in open Atl. & Gulf of Mexico (B-D)	Tuna CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional tuna caught in open Atl. & GOM by displaced effort (C*F)	Tuna catch from open Atl. & GOM with displaced fishing effort (E+G)	Number of tuna avoided by area closure (B-H)	Cumulative catch avoided by month (sum of I)	Percent of total tunas avoided by month (I/29,885)	Percent of total tunas avoided by closure (J/29,885)
May	1,317,311	619	416,920	15	604	6.71e-04	280	884	-265	-265	-0.9%	-0.9%
June	1,414,291	1,496	492,897	685	811	8.80e-04	434	1245	251	-14	0.8%	0.0%
July	1,563,985	1,117	714,807	421	696	8.20e-04	586	1282	-165	-179	-0.6%	-0.6%
Aug	1,555,525	2,768	611,565	349	2419	2.56e-03	1567	3986	-1218	-1397	-4.1%	-4.7%
Sept	1,221,082	3,951	551,720	466	3485	5.21e-03	2873	6358	-2407	-3803	-8.1%	-12.7%
Oct	1,119,064	3,378	392,775	356	3022	4.16e-03	1634	4656	-1278	-5082	-4.3%	-17.0%
Total May-Oct	**8,191,258**	**13,329**	**3,180,684**	**2,292**	**11,037**	**1.43e-02**	**7,373**	**18,410**	**-5082**			
Total	**14,120,194**	**29,885**	**4,857,985**	**3,613**	**26,272**	**3.64e-02**	**13,456**	**39,728**	**-9843**			

Table 16 Percent change in catch of blue and white marlin dead and live discards in the central Gulf of Mexico and NEC time/area closure from May through October. Based on Pelagic Longline Logbook data with and without redistribution of effort.

Species	Disposition	Without redistribution of effort from 2001-2002	With redistribution of effort based on data from 2001-2002
		Logbook Data	Logbook Data
Blue Marlin	Dead Discards	-53%	-31%
	Live Discards	-27%	1%*
	All Discards	-34%	-8%
White Marlin	Dead Discards	-40%	-14%
	Live Discards	-27%	5%*
	All Discards	-31%	-1%

Table 17 Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure alternative from May through October on blue marlin discards without redistribution of effort. Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
May	9	19	28	14	66	80	39%	22%	26%
June	36	51	85	34	73	107	51%	40%	44%
July	174	151	325	60	155	215	74%	49%	60%
August	24	34	58	31	125	156	44%	21%	27%
September	24	57	81	21	77	98	53%	43%	45%
October	10	37	47	6	25	31	63%	60%	60%
Total May-Oct	**277**	**347**	**624**	**166**	**521**	**687**	**53%***	**27%***	**34%***
Total	**300**	**389**	**689**	**223**	**915**	**1138**			

* calculated by dividing the total number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001 - 2002.

Table 18 **Redistribution of fishing effort and blue marlin dead discards in the central Gulf of Mexico and NEC time/area closure from May through October.** Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of dead discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of dead discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/523)	Percent of total marlin discards avoided by closure (J/523)
May	1,317,311	23	416,920	9	14	1.55e-05	6	20	3	3	0.5%	0.6%
June	1,414,291	70	492,897	36	34	3.69e-05	18	52	18	21	3.4%	4.0%
July	1,563,985	234	714,807	174	60	7.07e-05	51	111	123	144	23.6%	27.6%
Aug	1,555,525	55	611,565	24	31	3.28e-05	20	51	4	148	0.7%	28.3%
Sept	1,221,082	45	551,720	24	21	3.14e-05	17	38	7	155	1.3%	29.6%
Oct	1,119,064	16	392,775	10	6	8.26e-06	3	9	7	162	1.3%	30.9%
Total May-Oct	**8,191,258**	**443**	**3,180,684**	**277**	**166**	**1.96e-04**	**116**	**282**	**162**			
Total	**14,120,194**	**523**	**4,857,985**	**300**	**223**	**2.73e-04**	**136**	**359**	**164**			

Table 19 Redistribution of fishing effort and blue marlin live discards in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1304)	Percent of total marlin discards avoided by closure (J/1304)
May	1,317,311	85	416,920	19	66	7.33e-05	31	97	-12	-12	-0.9%	-0.9%
June	1,414,291	122	492,897	51	71	7.71e-05	38	109	13	1	1.0%	0.1%
July	1,563,985	306	714,807	151	155	1.83e-04	130	285	21	22	1.6%	1.7%
Aug	1,555,525	159	611,565	34	125	1.32e-04	81	206	-47	-25	-3.6%	-2.0%
Sept	1,221,082	134	551,720	57	77	1.15e-04	63	140	-6	-32	-0.5%	-2.4%
Oct	1,119,064	62	392,775	37	25	3.44e-05	14	39	23	-8	1.8%	-0.6%
Total May-Oct	**8,191,258**	**868**	**3,180,684**	**349**	**519**	**6.15e-04**	**357**	**876**	**-8**			
Total	**14,120,194**	**1,304**	**4,857,985**	**391**	**913**	**1.16e-03**	**498**	**1411**	**-107**			

Table 20 Redistribution of fishing effort and blue marlin dead and live discards combined in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1832)	Percent of total marlin discards avoided by closure (J/1832)
May	1,317,311	108	416,920	28	80	8.89e-05	37	117	-9	-9	-0.5%	-0.5%
June	1,414,291	194	492,897	87	107	1.16e-04	57	164	30	21	1.6%	1.1%
July	1,563,985	540	714,807	325	215	2.53e-04	181	396	144	165	7.9%	9.0%
Aug	1,555,525	214	611,565	58	156	1.65e-04	101	257	-43	122	-2.4%	6.6%
Sept	1,221,082	182	551,720	81	101	1.51e-04	83	184	-2	119	-0.1%	6.5%
Oct	1,119,064	78	392,775	47	31	4.27e-05	17	48	30	150	1.7%	8.2%
Total May-Oct	**8,191,258**	**1,316**	**3,180,684**	**626**	**690**	**8.17e-04**	**476**	**1166**	**150**			
Total	**14,120,194**	**1,832**	**4,857,985**	**691**	**1141**	**1.44e-03**	**638**	**1779**	**53**			

Table 21 **Example of temporal variation in effectiveness of the central Gulf of Mexico and NEC time/area closure from May through October on white marlin discards in the Gulf of Mexico without redistribution of effort.** Source: Pelagic Observer Program data 2001-2002 (Observer Data) and Pelagic Logbook Data 2002 (Logbook Data)

Month	Number reported caught inside the time/area closure			Number reported caught outside the time/area closure			Percentage reduction in number caught if time/area is closed		
	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards	Dead Discards	Live Discards	Combined Discards
May	9	31	40	34	105	139	21%	23%	22%
June	47	66	113	74	146	223	39%	31%	34%
July	165	192	357	74	140	214	69%	58%	63%
August	33	72	105	70	218	288	32%	25%	27%
Septembe	17	48	65	23	113	130	43%	30%	33%
October	15	16	31	11	43	54	58%	27%	36%
Total May-Oct	**286**	**425**	**711**	**286**	**765**	**1,048**	**40%***	**27%***	**31%***
Total	**301**	**484**	**785**	**411**	**1,109**	**1,517**			

* calculated by dividing the total number caught from May-Oct by the total number caught in the Atlantic and Gulf of Mexico for the combined years 2001 - 2002.

Table 22 Redistribution of fishing effort and white marlin dead discards in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of dead discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of dead discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/712)	Percent of total marlin discards avoided by closure (J/712)
May	1,317,311	43	416,920	9	34	3.78e-05	16	50	-7	-7	-0.9%	-1.0%
June	1,414,291	121	492,897	47	74	8.03e-05	40	114	7	0	1.0%	0.1%
July	1,563,985	239	714,807	165	74	8.71e-05	62	136	103	103	14.4%	14.5%
Aug	1,555,525	103	611,565	33	70	7.42e-05	45	115	-12	91	-1.7%	12.7%
Sept	1,221,082	40	551,720	17	23	3.44e-05	19	42	-2	89	-0.3%	12.5%
Oct	1,119,064	26	392,775	15	11	1.51e-05	6	17	9	98	1.3%	13.7%
Nov	1,020,819	19	368,359	13	6	9.20e-06	3	9	10	107	1.4%	15.1%
Dec	898,269	19	353,073	1	18	3.30e-05	12	30	-11	96	-1.5%	13.6%
Total May-Oct	**10,110,346**	**610**	**3,902,116**	**300**	**310**	**3.71e-04**	**203**	**513**	**96**			
Total	**14,120,194**	**712**	**4,857,985**	**301**	**411**	**4.97e-04**	**234**	**645**	**67**			

Table 23 Redistribution of fishing effort and white marlin live discards in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of live discards in Atl. & Gulf of Mexico	Number of hooks in the time/area closure	Number of live discards in time/area closure	Number of discards in open Atl. & Gulf of Mexico (B-D)	Marlin CPUE in the open Atl. & Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open Atl. & GOM by displaced effort (C*F)	Marlin discards from open Atl. & GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/1593)	Percent of total marlin discards avoided by closure (J/1593)
May	1,317,311	136	416,920	31	105	1.17e-04	49	154	-18	-18	-1.1%	-1.1%
June	1,414,291	212	492,897	66	146	1.58e-04	78	224	-12	-30	-0.8%	-1.9%
July	1,563,985	332	714,807	192	140	1.65e-04	118	258	74	44	4.7%	2.8%
Aug	1,555,525	290	611,565	72	218	2.31e-04	141	359	-69	-25	-4.3%	-1.6%
Sept	1,221,082	161	551,720	48	113	1.69e-04	93	206	-45	-70	-2.8%	-4.4%
Oct	1,119,064	59	392,775	16	43	5.92e-05	23	66	-7	-78	-0.5%	-4.9%
Total May-Oct	**8,191,258**	**1,190**	**3,180,684**	**425**	**765**	**8.99e-04**	**502**	**1267**	**-78**			
Total	**14,120,194**	**1,593**	**4,857,985**	**484**	**1109**	**1.36e-03**	**626**	**1735**	**-142**			

Table 24 Redistribution of fishing effort and white marlin dead and live discards combined in the central Gulf of Mexico and NEC time/area closure from May through October. Source: Pelagic Longline Logbook data from 2001-2002.

	A	B	C	D	E	F	G	H	I	J	K	L
Month	Number of hooks in the Atlantic & Gulf of Mexico	Number of discards in Gulf of Mexico	Number of hooks in the time/area closure	Number of discards in time/area closure	Number of discards in open Gulf of Mexico (B-D)	Marlin CPUE in the open Gulf of Mexico (E/(A-C))	Number of additional marlin discards in open GOM by displaced effort (C*F)	Marlin discards from open GOM with displaced fishing effort (E+G)	Number of marlin discards avoided by area closure (B-H)	Cumulative discards avoided by month (sum of I)	Percent of total marlin discards by month (I/2302)	Percent of total marlin discards avoided by closure (J/2302)
May	1,317,311	179	416,920	40	139	1.54e-04	64	203	-24	-24	-1.1%	-1.0%
June	1,414,291	336	492,897	113	223	2.42e-04	119	342	-6	-30	-0.3%	-1.3%
July	1,563,985	571	714,807	357	214	2.52e-04	180	394	177	147	7.7%	6.4%
Aug	1,555,525	393	611,565	105	288	3.05e-04	187	475	-82	65	-3.5%	2.8%
Sept	1,221,082	195	551,720	65	130	1.94e-04	107	237	-42	23	-1.8%	1.0%
Oct	1,119,064	85	392,775	31	54	7.44e-05	29	83	2	25	0.1%	1.1%
Total	**8,191,258**	**1759**	**3,180,684**	**711**	**1048**	**1.22e-03**	**687**	**1735**	**25**			
Total	**14,120,194**	**2302**	**4,857,985**	**785**	**1517**	**1.85e-03**	**856**	**2373**	**-71**			

APPENDIX B1

REQUIREMENTS AND EQUIPMENT NEEDED FOR THE CAREFUL RELEASE OF SEA TURTLES CAUGHT IN HOOK AND LINE FISHERIES

NOAA FISHERIES
JUNE, 2004

Introduction

The following requirements and specifications have been prepared in consultation with NOAA Fisheries Southeast Fisheries Science Center. As specified in 50 CFR 635.21(c)(5)(I), they are intended to be used by all Atlantic vessels that have pelagic longline gear onboard and have been issued, or are required to have, Federal HMS limited access permits. The equipment specified in this document must be used in accordance with NOAA Fisheries' "Careful Release Protocols for Sea Turtle Release With Minimal Injury" (Epperly et al., 2004), which is required to be onboard all vessels issued a limited access swordfish, shark or tuna longline category permit. The purpose of this equipment is to increase post-release survival of incidentally-captured sea turtles by releasing them with minimal injury.

All U.S. pelagic longline vessels with Federal HMS permits have been required to carry dip nets and line clippers on board that meet NOAA Fisheries design and performance standards, and to comply with the equipment use standards for the handling of incidentally caught sea turtles (65 FR 60889, October 13, 2000, and 66 FR 17370, March 30, 2001). These requirements have been revised and expanded, based upon field-testing of equipment, user feedback, and product design updates resulting from recent experiments in the Northeast Distant (NED) statistical reporting area. Mandatory requirements and design specifications for the revised and newly required items are outlined below. All items identified as mandatory, for both boated and non-boated turtles, must be onboard HMS pelagic longline vessels.

This document contains the approved design standards for release gears. Example models of certified commercially available products are listed. Any item meeting the design standards may be constructed or purchased and used, as long as the design is first certified by the NMFS Pascagoula Laboratory. When new items are certified, a notice in the Federal Register will be published. Although these product design standards have been developed primarily with sea turtles in mind, many of the devices and techniques also are effective on other species of fish, marine mammals and seabirds and should be used, whenever possible, on all catch to be released.

Mandatory Equipment and Design Standards for Use with Sea Turtles that are not Boated

In circumstances where a sea turtle is too large to be boated, or conditions preclude the safe boarding of the animal, vessels are required to possess, maintain, and utilize the following equipment and release the turtle with minimal injury:

A) Long-handled line clipper/cutter. Line clippers or cutters are designed to cut high test monofilament line as close as possible to the hook and to assist in removing line from entangled sea turtles, in an effort to minimize remaining gear upon release. NOAA Fisheries has established minimum design standards for the line clippers (65 FR 16347, March 28, 2000, and 66 FR 17370, March 30, 2001) that can be purchased or fabricated using available and low cost materials. One long-handled line clipper or cutter and a set of replacement blades are required to be onboard. These minimum design standards for line clippers or cutters have been modified based on experiments in the Northeast Distant statistical reporting area, and are as follows:

(1) Design Standards:

(i) *A protected and secured cutting blade*. The cutting blade(s) must be capable of cutting 2.0-2.1 mm monofilament line (400 # test) or polypropylene multi strand material, known as braided or tarred mainline, and should be maintained in working order. The blade must be curved, recessed, contained in a holder, or otherwise designed to facilitate its safe use so that direct contact between the cutting surface and the sea turtle or the user is prevented. The cutting instrument must be securely attached to an extended reach handle and easily replaced. One extra set of replacement blades meeting these standards must also be carried on board to replace all cutting surfaces on the line cutter or clipper;

(ii) *Extended reach handle*. The line cutter blade must be securely fastened to an extended reach handle or pole with a minimum length equal to or greater than 150% of the freeboard or a minimum of 6’, whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water’s surface and will vary based on the vessel design. For flexibility of configuration during use and for storage purposes, it is recommended that the handle break down into sections, although this is not a requirement. There is no restriction on the type of material used to construct this handle as long as it is sturdy and facilitates the secure attachment of the cutting blade.

(2) Models meeting current design standards:

(i) *NOAA/Arceneaux Line Clipper (Figure 1)*. The NOAA/Arceneaux line clipper can be fabricated by securely attaching a flat hardened stainless steel seat belt cutter with recessed cutting blades (such as the Emergency Seat Belt Cutter, Lifesaver Seat Belt Cutter™ or similar) to an extended reach handle using bolts and/or cable ties. A replacement blade set would require one additional seat belt cutter for the NOAA/Arceneaux Line Clipper;

(ii) *NOAA/Laforce Line Cutter (Figure 2)*. The Laforce Line Cutter has a cutting end manufactured from a 6” long ½” aluminum rod with a 4 1/8” end at a 45° angle with (2) 420 C stainless steel serrated cutting blades secured inside the angle. It must be attached to an extended reach handle. A set of replacement blades would require (2) stainless steel serrated cutting blades for the NOAA/Laforce Line Cutter.

B) ***Long-handled dehooker for internal hooks.*** A long-handled dehooking device designed to remove internal hooks from sea turtles that cannot be boated is required. Because this design shields the barb of the hook and prevents it from re-engaging, this device is also to be used to engage a loose hook when the turtle is entangled, but not hooked, and line is being removed. One long handled device to remove internal hooks is required onboard. Minimum design standards are as follows:

1) Design Standards:

(i) *Hook removal device.* The hook removal device should be constructed of 5/16" 316 L stainless steel and have a dehooking end no larger than 1 7/8" outside diameter. This device must securely engage and control the leader while shielding the barb to prevent the hook from re-engaging during removal. It cannot have any unprotected terminal points (even blunt ones), as these could cause injury to the esophagus during hook removal. The device must be of a size appropriate to secure the range of hook sizes and styles observed to date in the pelagic longline fishery targeting swordfish and tuna, or those having anticipated use in the future (7/0-11/0 J hooks and 13/0-22/0 circle hooks);

(ii) *Extended reach handle*. The dehooking end must be securely fastened to an extended reach handle or pole with a minimum length equal or greater than 150% of the freeboard or a minimum of 6', whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water's surface and will vary based on the vessel design. For flexibility of configuration during use and for storage purposes, it is recommended that the handle break down into sections, although this is not a requirement. There is no restriction on the type of material used to construct this handle as long as it is sturdy and facilitates the secure attachment of the hook removal device.

2) Models meeting current design standards:

(i) *ARC Pole Model Deep-Hooked Dehooker Model BP11 (Figure 8A).* This device is constructed of a 5/16" 316 L stainless steel rod curled into a pigtail spiral loop end with no exposed terminal point. The rod is 7" from point of attachment to the end of the loop, and includes a 13° angle offset to create a 1/8" gap between rod and loop to facilitate line engagement. The loop is designed at a 24° angle bend from the rod and has an inside diameter of 1 ¼ " and an outside diameter of 1 7/8". It may be purchased with a 3-part anodized aluminum pole (12') that breaks down into 4' sections for storage. This item is covered under U.S. Patent # 4,914,853 and U.S. Design Patent # 382,628 held by Aquatic Release Conservation of Ormond Beach, FL;

(ii) *ARC 6' Pole Big Game Dehooker Model P610.* See Section (B)(2)(i) above for a description of this item and patent information. This model has a fixed length 6' anodized aluminum handle with a "T" handle.

C) *Long-handled dehooker for external hooks.* A long-handled dehooker is required for use on externally hooked sea turtles that cannot be boated. One of these types of long- handled devices to remove external hooks is required onboard. The long-handled dehooker for internal hooks used for Item B will also satisfy this requirement. Minimum design standards are as follows:

(1) Design Standards:

(i) *Hook removal device.* The dehooker should be constructed of 5/16" 316 L stainless steel rod. A 5" tube T-handle of 1" outside diameter is recommended. The design should be such that the hook can be rotated out without pulling it out at an angle. The dehooking end should be blunt and all edges rounded. The device must be of a size appropriate to secure the range of hook sizes and styles observed to date in the pelagic longline fishery targeting swordfish and tuna, or those having anticipated use in the future (7/0-11/0 J hooks and 13/0-22/0 circle hooks);

(ii) *Extended reach handle.* The handle must be a minimum length equal to the freeboard of the vessel or 6', whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water's surface and will vary based on the vessel design.

(2) Models meeting current design standards:

(i) *Any 6' or greater J-Style Dehooker or "Flip Stick" [e.g., ARC Model LJ6P (6') (Figure 3 and 8A)].* This item is constructed according to the specifications above [Section (C)(1)(I)] with a 1" dehooking end at a 45° angle to the rod forming a "J" shape;

(ii) *ARC Pole Model Deep-Hooked Dehooker Model BP11 (Figure 8A).* See Section (B)(2)(I) for description;

(iii) *ARC 6' or greater Pole Big Game Dehooker Model P610.* See Section (B) (2) (ii) for description;

(iv) *Scotty's Dehooker (Figure 4 and 8B).* This device has (2) 1 ¼" long prongs at the end to form a ¾" wide fork.

D) *Long-handled device to pull an "Inverted V."* The primary use for this tool is to pull a "V" when implementing the "Inverted V" dehooking technique for disentangling and dehooking entangled sea turtles. One long-handled device to pull "Inverted V" is required onboard. If 6' J-Style Dehooker is used for Item C, it will also satisfy this requirement. Minimum design standards are as follows:

(1) Design Standards:

(i) *Hook end.* The device, such as a boat or gaff hook, should be constructed of stainless steel or aluminum. The semicircular or "J" shaped end must be securely attached to a handle. A sharp point, such as a gaff hook, is only to be used in holding the monofilament line and should never contact the sea turtle;

(ii) *Extended reach handle.* The handle must be a minimum length equal to the freeboard of the vessel or 6', whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water's surface and will vary based on the vessel design.

(2) Example models meeting current design standards:

(i) *Any 6' or greater long-handled J-Style Dehooker or "Flip Stick" [e.g., ARC Model LJ6P (6') (Figure 3 and 8A)]* See Paragraph (C)(2)(I) above for a description;

(ii) *Any standard boat hook (e.g., Davis Telescoping Boat Hook to 96" Model 85002A;*

(iii) *Any standard fishing gaff [e.g., West Marine # F6H5 hook and # F6-006 Handle (Figure 8A)]*.

Mandatory Equipment and Design Standards for Use with Sea Turtles That Are Boated.

Whenever possible, sea turtles must be brought on board immediately and handled in accordance with the procedures outlines in the standards for the handling of incidentally caught sea turtles [50 CFR 223.206 (d)(1)], unless extreme sea conditions prevent the crew from safely boating the turtle. Generally, all turtles < 3' straight carapace length should be boated. Vessels are required to possess, maintain, and utilize the following equipment and release the turtle with minimal injury. The following gears are required:

(E) *Dip net*. A dip net is required to facilitate safe handling of sea turtles by allowing them to be brought onboard for gear removal without causing further injury to the animal. The turtle should never be brought onboard without a net. Using the line to raise the turtle may result in serious injury and impact post-release survivorship, especially in cases where the turtle has ingested the hook. NMFS has established minimum design standards for the dip nets (65 FR 16347, March 28, 2000 and 66 FR 17370, March 30, 2001). These minimum design standards for dip nets are as follows and are modified based on experiments in the Northeast Distant statistical reporting area. One dip net is required onboard. Minimum design standards are as follows:

(1) Design Standards:

(i) *Size of dip net*. The dip net must have a sturdy net hoop of at least 31" inside diameter and a bag depth of at least 38" to accommodate turtles below 3' carapace length. The bag mesh openings may not exceed 3" x 3". There should be no sharp edges or burrs on the hoop or where it is attached to the handle. There is no requirement for the hoop to be circular as long as it meets the minimum specifications;

(ii) *Extended reach handle.* The dip net hoop must be securely fastened to an extended reach handle or pole with a minimum length equal to or greater than 150% of the freeboard or a minimum of 6', whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water's surface and will vary based on the vessel design. For flexibility of configuration during use and for storage purposes, it is recommended that the handle break down into sections, although this is not a requirement. There is no restriction on the type of material used to construct this handle, as long as it is sturdy enough to support a minimum of 100 lbs without bending or breaking, and facilitates the sturdy attachment of the net hoop.

(2) Example models meeting current design standards:

(i) *ARC 12' Breakdown Lightweight Dip Net Model DN6P (6'), DN08 (8') or DN14 (12') or ARC Net Assembly (hoop, net, coupling-DNIN) and handle (Figure 5 and 8D).* This dip net is constructed of a hollow heavy duty aluminum tubing to form a 97" circumference hexagonal frame, and the 38" bag is 2 ½" square nylon mesh;

(ii) *Lindgren-Pitman, Inc. Model NMFS-Turtle Net.* This dip net is constructed of heavy duty stainless steel tubing to form a 31" diameter circular frame with a 45" bag of 2" square nylon mesh.

(F) *A standard automobile tire*. A tire is required for supporting the turtle while it is onboard. If the turtle is too large for the tire, it must be contained and supported on a cushioned surface. A minimum of one tire is required onboard, although an assortment of sizes is recommended to accommodate a range of turtle sizes.
Minimum design standards are as follows:

(1) Design Standards

(i) The tire should be a standard passenger vehicle tire, not from a truck or heavy equipment, and should be free of exposed steel belts.

(2) Example models meeting current design standards:

(i) *Any standard automobile tire that is free of exposed steel belts*.

(G) *Short-handled dehooker for internal hooks.* This dehooker is designed to remove internal hooks from boated sea turtles, including hooks in the front of the mouth, as well as external hooks. One short-handled device for removing internal hooks is required onboard. Minimum design standards are as follows:

(1) Design Standards:

(i) *Hook removal device.* The 1/4" 316 L stainless steel end must allow the hook to be secured and the barb to be shielded without re-engaging during the removal process. It must be no larger than 1 5/16" outside diameter. It cannot have any unprotected terminal points (even blunt ones) as this could cause injury to the esophagus during hook removal. A sliding PVC bite block must be used to protect the beak and facilitate hook removal if the turtle bites down on the dehooking device. The bite block should be constructed of a ¾" inside diameter high impact plastic cylinder (*e.g.*, Schedule 80 PVC) that is 10" long to allow for 5" of slide along the shaft. The device must be of a size appropriate to secure the range of hook sizes and styles observed to date in the pelagic longline fishery targeting swordfish and tuna, or those having anticipated use in the future (7/0-11/0 J hooks and 13/0-22/0 circle hooks);

(ii) *Handle length*. The handle should be 16”- 24” long with a ~ 5” long tube T-handle of ~ 1” diameter recommended.

(2) Example models meeting current design standards:

(i) *16” Hand Held (sleeved) Bite Block Deep-Hooked Turtle ARC Dehooking Device Model ST08 (Figure 8B).* This device is constructed of a ¼” 316 L stainless steel rod curled into a pigtail spiral loop end. The loop is placed at a 13° angle offset to create a 1/8” gap between rod and loop to facilitate line engagement. The loop is designed at a 24° angle bend from the rod, and an inside diameter of 13/16” and an outside diameter of 1 5/16”. This item is covered under U.S. Patent Pending # 10/712, 731, International Patent Pending # PCT/US2003/036233 held by Aquatic Release Conservation of Ormond Beach, FL.

(H) *Short-handled dehooker for external hooks.* These dehookers are designed for use when the hook is external, or when hooks are located in the front of the mouth. One of these types of short handled devices for removing external hooks is required onboard. The short handled dehooker for internal hooks used for Item G will also satisfy this requirement. Minimum design standards are as follows:

(1) Design Standards:

(i) Hook removal device. The dehooker should be constructed of 5/16” 316 L stainless steel, and the design should be such that the hook can be rotated out without pulling it out at an angle. The dehooking end should be blunt and all edges rounded. The device must be of a size appropriate to secure the range of hook sizes and styles observed to date in the pelagic longline fishery targeting swordfish and tuna, or those having anticipated use in the future (7/0-11/0 J hooks and 13/0-22/0 circle hooks);

(ii) *Handle length.* The handle should be 16”-24” long with a ~5” long tube T-handle of ~1” diameter recommended.

(2) Example models meeting current design standards:

(i) *The “J-Style Dehooker” [e.g., ARC Hand Held Large J-Style Dehooker Model LJ07 or LJ24 (Figure 3, 8A & B)]*. See description in Section (C)(2)(I) above;

(ii) *16” Hand Held (sleeved) Bite Block Deep-Hooked Turtle ARC Dehooking Device Model ST08 (Figure 8B).* See description in Section (G)(2)(I) above;

(iii) *The “Scotty’s Dehooker (Figure 4 and 8B).”* See description in Section (C)(2)(iv) above.

(I) *Long-nose or needle-nose pliers.* Long-nose or needle-nose pliers can be used to assist in removal of hooks that are deeply embedded in the animal's flesh and must be twisted during removal, or for removing hooks from the front of the mouth. They are also useful in holding PVC splice couplings in place when used as mouth openers. One pair of pliers is required onboard. Minimum design standards are as follows:

(1) Design Standards:

(i) *General.* They should be ~ 12" in length. It is recommended that these be of stainless steel material.

(2) Example models meeting current specifications:

(i) *Any 12" Long-nose or Needle-nose pliers* [*e.g., 12" S.S. NuMark Model #030 281 109 871 (Figure 8C)]*.

(J) *Bolt cutter*. Bolt cutters are essential for removing hooks, and must be of a size practical to be used inside the turtle's mouth. They are used to cut off the eye or barb so that the hook can be pushed through easily without causing further injury to the sea turtle. They also are used to cut off as much of the hook as possible when the remainder cannot be removed. One pair of bolt cutters is required onboard. Minimum design standards are as follows:

(1) Design Standards:

(i) *General*. They should be ~ 14-17" in total length, 4" long blades that are 2 ¼" wide (closed) with 10-13" long handles. They must be able to cut hard metals such as stainless or carbon steel hooks up to 1/4" diameter.

(2) Example models meeting current design standards:

(i) *Any bolt cutters meeting design standards [e.g., H.K. Porter Model 1490 AC (Figure 8C)]*.

(K) *Monofilament line cutter.* Monofilament line cutters must be used to remove line as close as possible to the eye of the hook in the event that the hook was swallowed, or when the hook cannot be removed. This reduces the amount of gear retained by the animal in the event that the hook cannot safely be removed. One pair of monofilament cutters is required onboard. Minimum design standards are as follows:

(1) Design Standards:

(i) *General*. These should be ~ 7 ½" in length with 1 ¾" long, 5/8" wide (closed) blades, preferably Teflon ® (a trademark owned by E.I. Dupont de Nemours and Company Corp.) coated.

(2) Example models meeting current design standards:

(i) *Any monofilament cutters meeting design standards [e.g., Jinkai Model MC-T (Figure 8C)]*.

(L) Mouth openers and mouth gags (Figure 8E). In many cases, a mouth opener or gag must be used in order to remove internal hooks from boated turtles. It must be designed to allow access to the hook or line without causing further injury to the turtle. It is recommended that at least one type allow for hands-free operation of the gear removal devices once the gag is in place (only the canine mouth gag satisfies this recommendation, see item (2) below). Design standards are included in the item description. A minimum of 2 of the 7 different types/categories of mouth openers/gags from the following list is required onboard:

(1) *A block of hard wood*. A smooth block of hard wood is an inexpensive, effective and practical mouth-gagging device that meets these requirements and is readily available on most vessels. Placed in the corner of the jaw, it is used to gag open the mouth. The wood should be of a type that does not splinter (e.g., maple) with rounded edges, and it should be sanded smooth, if necessary, and soaked in water to soften the wood. The dimensions should be approximately 11” x 1” x 1”. Any block of hard wood meeting these specifications is acceptable. A long-handled, wire shoe brush with a wooden handle and the wires removed is an inexpensive, effective and practical device that meets these requirements (e.g., *Olympia Tools Long-Handled Wire Brush and Scraper #974174);*

(2) *A Set of (3) Canine mouth gags*. The use of canine mouth gags is highly recommended as one of the categories used to hold the mouth open, as the gag locks into the open position and allows for hands free operation once it is in place. A set of canine mouth gags must include one of each of the following sizes: small (~5"), medium (~6"), and large (~7"). They must be constructed of stainless steel. A set includes one of each size and can be purchased through veterinary supply businesses. An example set meeting these specifications is *Jorvet Model #4160, 4162, and 4164;*

(3) *A set of (2) sturdy dog chew bones.* These “chew toys” are inexpensive, easy to handle, and sold in several sizes in pet stores. Placed in the corner of the jaw, it is used to gag open the mouth. They should be designed of durable nylon or thermoplastic polymer, strong enough to withstand biting without splintering. One large (e.g., “Giant” 8” or “Wolf” 5 ½”) and one small (e.g., “Regular” 4 ½” or “Petite” 3 ½”) are required to accommodate a variety of beak sizes. Example models meeting current specifications include: Nylabone® (a trademark owned by T.F.H. Publications, Inc.); Gumabone® (a trademark owned by T.F.H. Publications, Inc.); and Galileo® dog chew (a trademark owned by T.F.H. Publications, Inc.);

(4) *A set of (2) rope loops covered with hose*. A set consists of two pieces of poly braid rope covered with light duty garden hose each tied or spliced into a loop to provide a one-handed method for keeping the mouth open. The upper loop gives the user control using one hand, and the second rope/hose length is secured on lower beak using the user’s foot for extra control.

This keeps the mouth open to allow access to the hook and/or line. Two 36” lengths of poly-braid rope (3/8” diameter suggested) should be covered with an 8” section of ½” or ¾” light duty garden hose and each tied or spliced into 2 loops. Any set of rope loops covered with hose meeting these specifications is acceptable;

(5) *A hank of rope.* A lanyard of braided nylon rope can be folded to create a hank of rope. Placed in the corner of the jaw, it is used to gag open the mouth. A 6’ lanyard of approximately 3/16” braided nylon rope can be folded to create a hank of rope. Any size soft braided nylon rope is acceptable, provided it creates a hank of approximately 2-4” thickness;

(6) *A set of (4) PVC splice couplings.* Inexpensive PVC couplings can be positioned inside the mouth to allow access to the back of the mouth. They should be held in place with the needle-nose pliers. Standard Schedule 40 PVC couplings in a variety of sizes (1”, 1 ¼”, 1 ½”, and 2”) are required to ensure proper fit and access. A set includes all 4 sizes;

(7) *A large avian oral speculum*. An avian oral speculum gives you the ability to hold the mouth open and control the head with one hand while removing the hook with the other hand. This tool is for use only on small turtles, as larger turtles may be able to crush the speculum. The avian oral speculum must be 9" long, and constructed of 3/16" wire diameter surgical stainless steel (Type 304). It must be covered with 8" of clear vinyl tubing (5/16" outside diameter, 3/16" inside diameter) . These can be purchased through veterinary supply businesses. Example models meeting these specifications include: Model # 85408 from Webster Vet Supply; VSP # 216-08 from Veterinary Specialty Products; Jorvet Model J-51z; and Krusse Model 273117.

Recommended, but not Required, Equipment and Design Standards

M) ***Turtle tether (also know as a “Flipper Gripper”)***. A turtle tether is highly recommended to reduce any safety risks associated with removing gear from an active sea turtle not boated, particularly leatherbacks. Its function is to “noose” the front flipper of the sea turtle so that the animal can be controlled at the side of the vessel while the gear is removed. This will facilitate rapid gear removal from the animal while reducing the chances that taut monofilament line could snap under the strain of the active sea turtle and recoil towards the crew members on deck. One tether is recommended onboard. Recommended minimum design standards are as follows:

(1) Design Standards:

(i) *Line.* 20’ of ½” hard lay negative buoyancy line is used to make a ~30” loop to slip over the flipper. A 19” section of hollow plastic tubing with an inside diameter of 5/8” and an outside diameter of ¾” should be placed on the line adjacent to the pole to help stabilize the loop in the water. The line is fed through a ¾” fair lead at the end of a pole, and through (2) ¾” eye bolts in the midsection to control the line so that it can be held securely in the cleat. A ½” quick release clam cleat holds the line in place near the end of the handle;

(ii) *Extended reach handle.* A handle is needed with a minimum length equal to or greater than 150% of the freeboard or a minimum of 6', whichever is greater. Freeboard is defined here as the working distance between the top rail of the gunwale to the water's surface and will vary based on the vessel design. There is no restriction on the type of material used to construct this handle as long as it is sturdy. The handle must include a tag line to attach the tether to the vessel, preventing the turtle from breaking away with the tether still attached.

(2) Example models meeting current design standards:

(i) *ARC Turtle Tether Model TT08 (8') or TT12 (12') (Figure 6 and 8A).*

(N) *Large turtle hoist.* A hoist is recommended to bring turtles onboard that cannot be boated using a smaller dip net. Recommended minimum design standards are as follows:

(1) Design Standards:

(i) *General*. The hoist should be designed so that when onboard, the turtle is suspended above the deck on a platform of mesh netting supported by a rigid ring, and contained within a webbing fence a minimum of 18" high. The top 2 rings (1 ¾" 50 series aluminum round bar) should be ~7'6" in diameter, and the bottom ring (1 ½" 50 series aluminum round bar) should be ~4' in diameter. The middle and bottom rings are connected using 12 angled (~25°) spoke braces of ~23" (1" 50 series aluminum round bar or 6061 T6 1" Schedule 40 pipe) welded in place with an appropriate welding wire (5052, 6061 or 3003 wire). Knotless polypropylene 8 mm 600 ply netting, 6.5" stretch is stretched across the middle ring. The fence is supported by the top and middle rings, which are connected by a 3mm, 4.7" stretch mesh braided polyethylene webbing to create a fence a minimum of 18" high, wrapped along the top ring with ½" polypropelene rope. 8" x 2 ½" rubber cookies (4 per each of 12 sections) can be used on the middle ring to facilitate rolling the hoist up the side of the vessel and to cushion impact of hoist against the side of the vessel. In rough seas, a vang is necessary to hold the hoist close to side of vessel. A 3 or 4 point bridle is attached to the top ring using pairlinks and 3/4" nylon 3 strand line, and a hydraulic lift is used to bring hoist aboard. The hoist needs to be capable of lifting a minimum of ½ ton.

(2) Example models meeting current design standards:

(i) *Leatherback Hoist (Figure 7).* This hoist was designed to bring leatherbacks onboard following the above specifications. Modifications to the vessel will likely be necessary to install the hoist, including: a platform to house the lift, alterations to the boom including strongback, pivoting gooseneck, hydraulic ram attachment & reinforcement, hydraulic ram, hydraulic runs, or a duel winch arrangement, and for safe lifting, a 2200 PSI planetary hydraulic winch with hydraulic runs, control and rigging (SS wire and blocks). A patent application has been filed for this hoist.

References Cited in Appendix B1

Epperly, S., L. Stokes, and S. Dick. 2004. Careful Release Protocols for Sea Turtle Release with Minimal Injury**.** National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center Technical Memorandum # 524.

Hataway, D. and S. Epperly. 2004. Removing Fishing Gear from Longline Caught Sea Turtles. http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. Video. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, FL.

VESSEL EQUIPMENT LIST

REQUIRED FOR TURTLES NOT BOATED:

A- (1) Long-handled line cutter.
B- (1) Long-handled dehooker for internal hooks.
C- (1) Long-handled dehooker for external hooks (The long-handled dehooker for internal hooks used for Item B will also satisfy this requirement).
D- (1) Long-handled device to pull an “Inverted V” (If 6’ J-Style Dehooker is used for Item C, it will also satisfy this requirement).

REQUIRED FOR TURTLES BOATED:

E- (1) Dip net.
F- (1) Standard automobile tire.
G- (1) Short-handled dehooker for internal hooks.
H- (1) Short-handled dehooker for removing external hooks (The short- handled dehooker for internal hooks used for Item G will also satisfy this requirement).
I- (1) Long-nose or needle-nose pliers.
J- (1) Bolt cutter.
K- (1)Monofilament line cutter.
L- (2) Types of mouth openers/mouth gags from the following list:

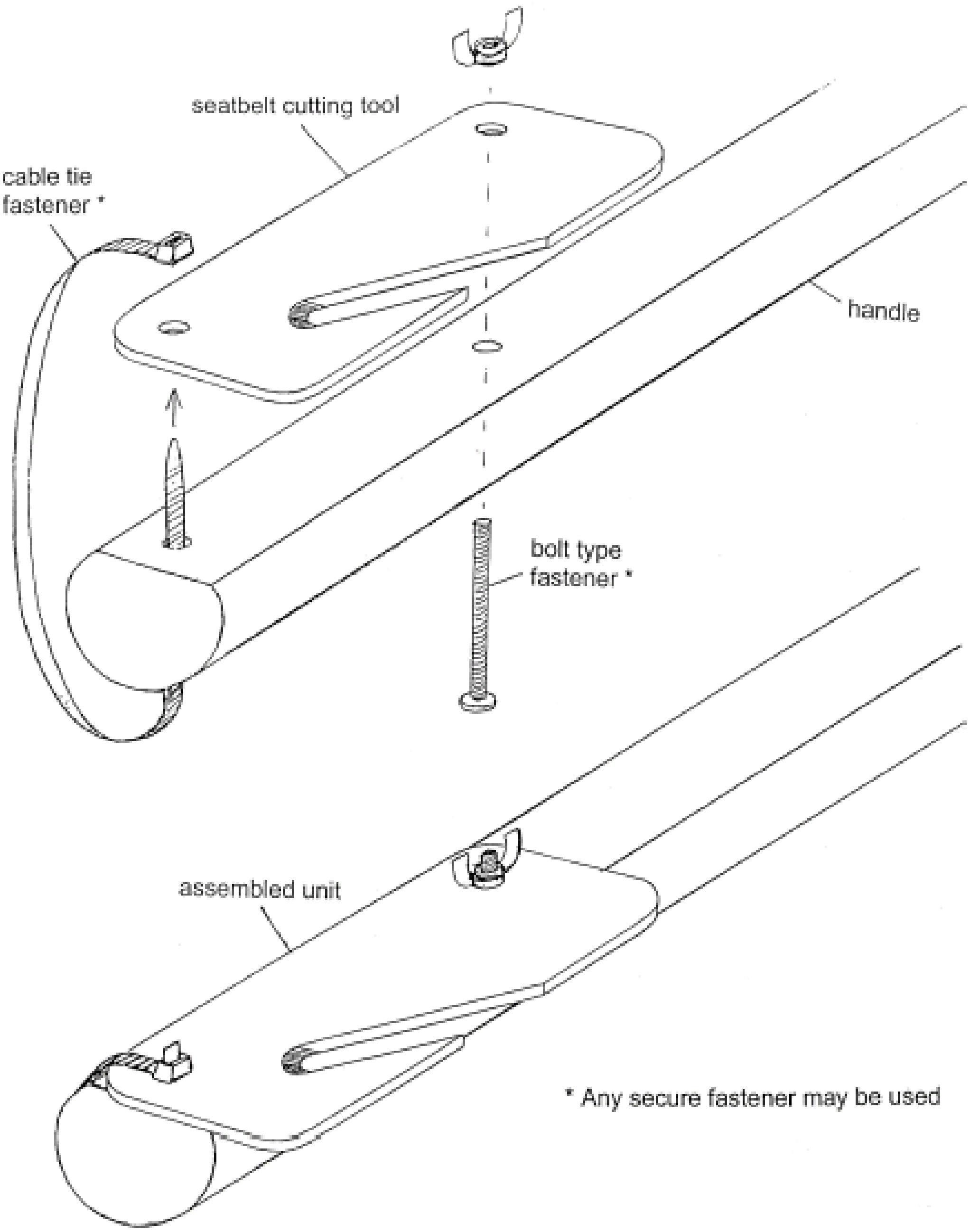
1) A block of hard wood;
2) A set of (3) canine mouth gags;
3) A set of (2) sturdy dog chew bones;
4) (2) rope loops covered with hose;
5) A hank of rope;
6) A set of (4) PVC splice couplings;
7) A large avian oral speculum.

RECOMMENDED EQUIPMENT:

(M)-(1) Turtle tether.
(N)- (1) Turtle hoist.

FIGURE 1

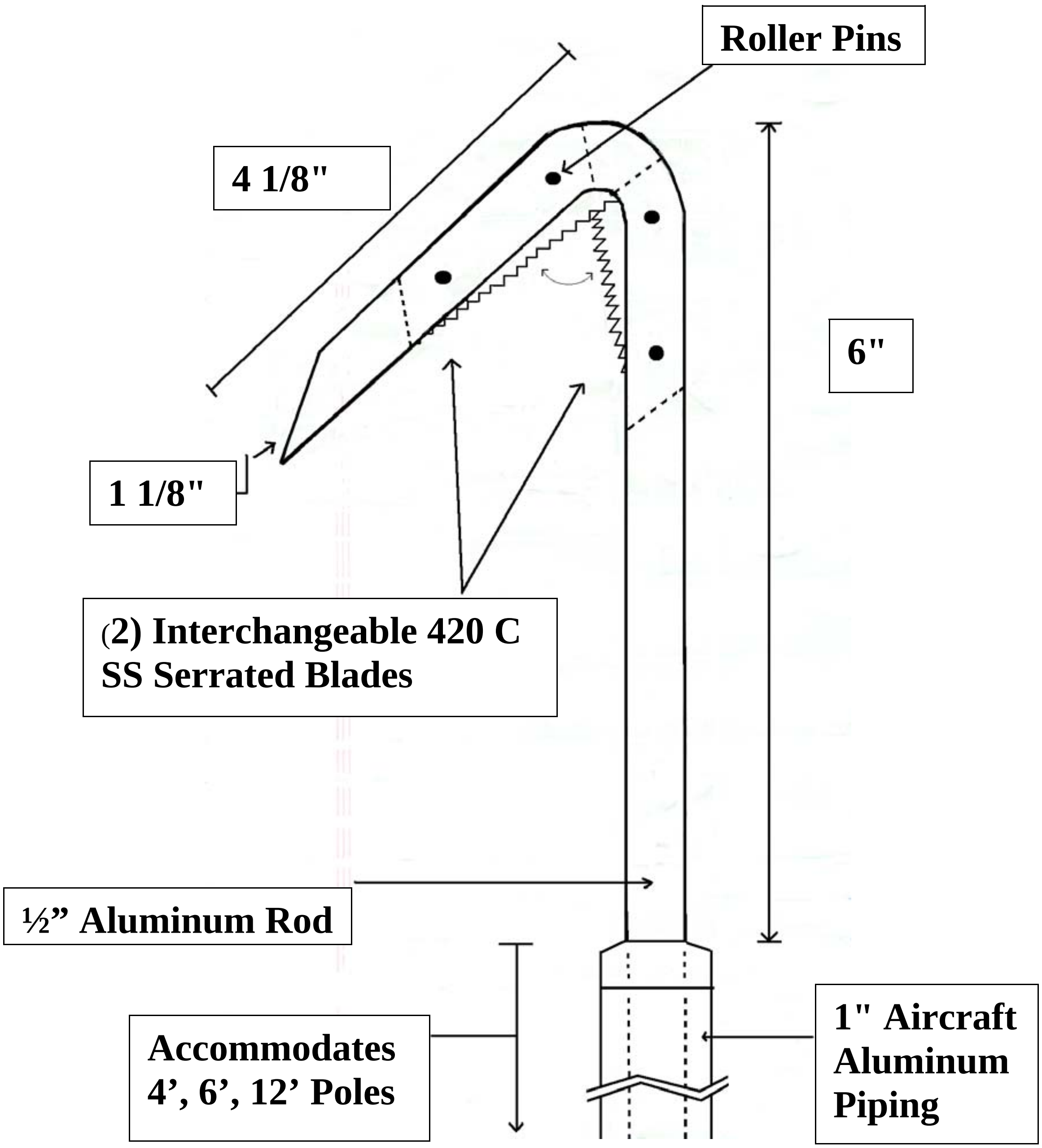
NOAA/ARCENEAUX LINE CLIPPER



50 CFR 660.33 Ch. VI (10-1-02 Edition)
[65 FR 16347, Mar. 28, 2000, as amended at 67 FR 40236, June 12, 2002; 67 FR 48576, July 25, 2002]

FIGURE 2

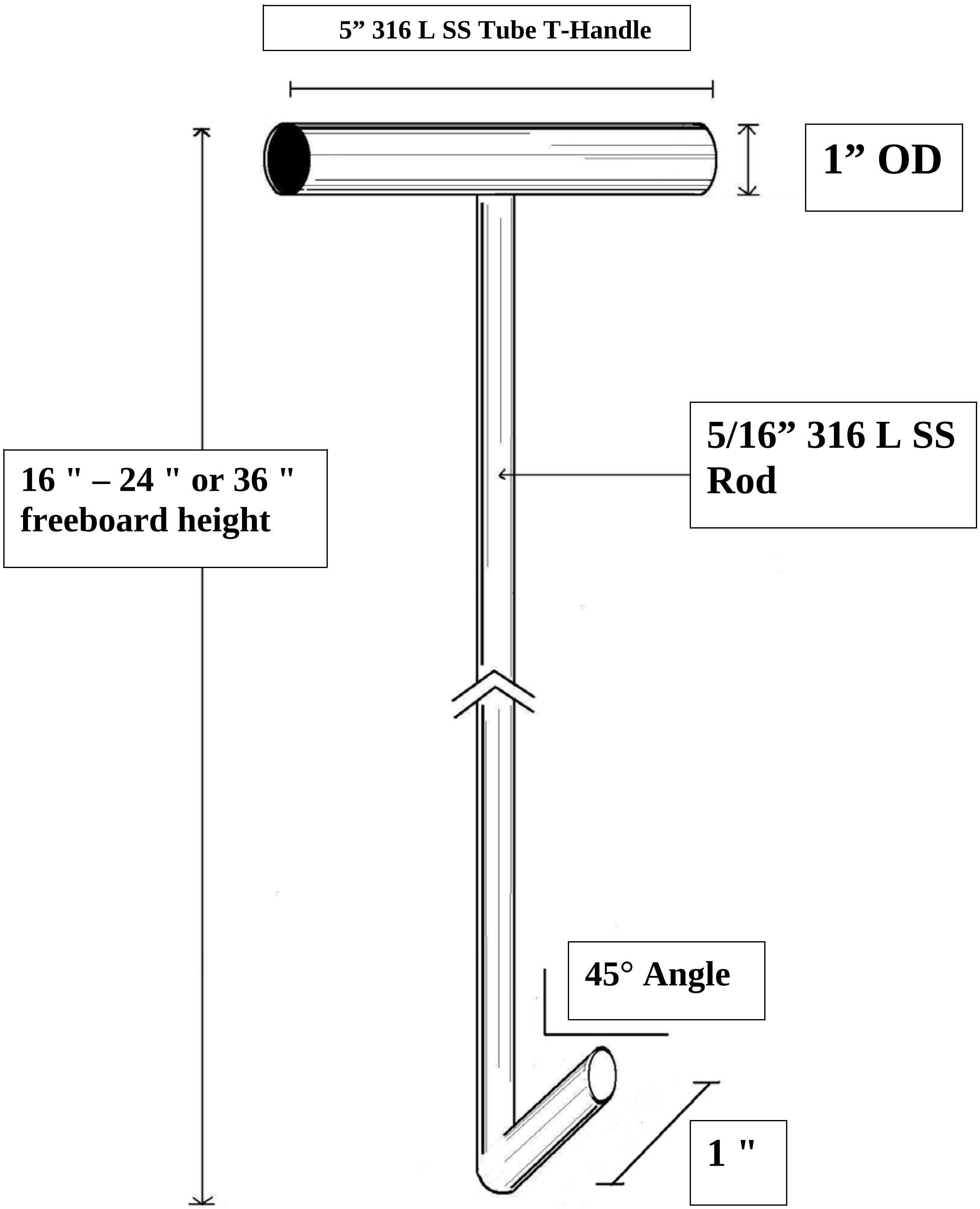
NOAA/LAFORCE LINE CUTTER



Drawn by S. Dick

FIGURE 3

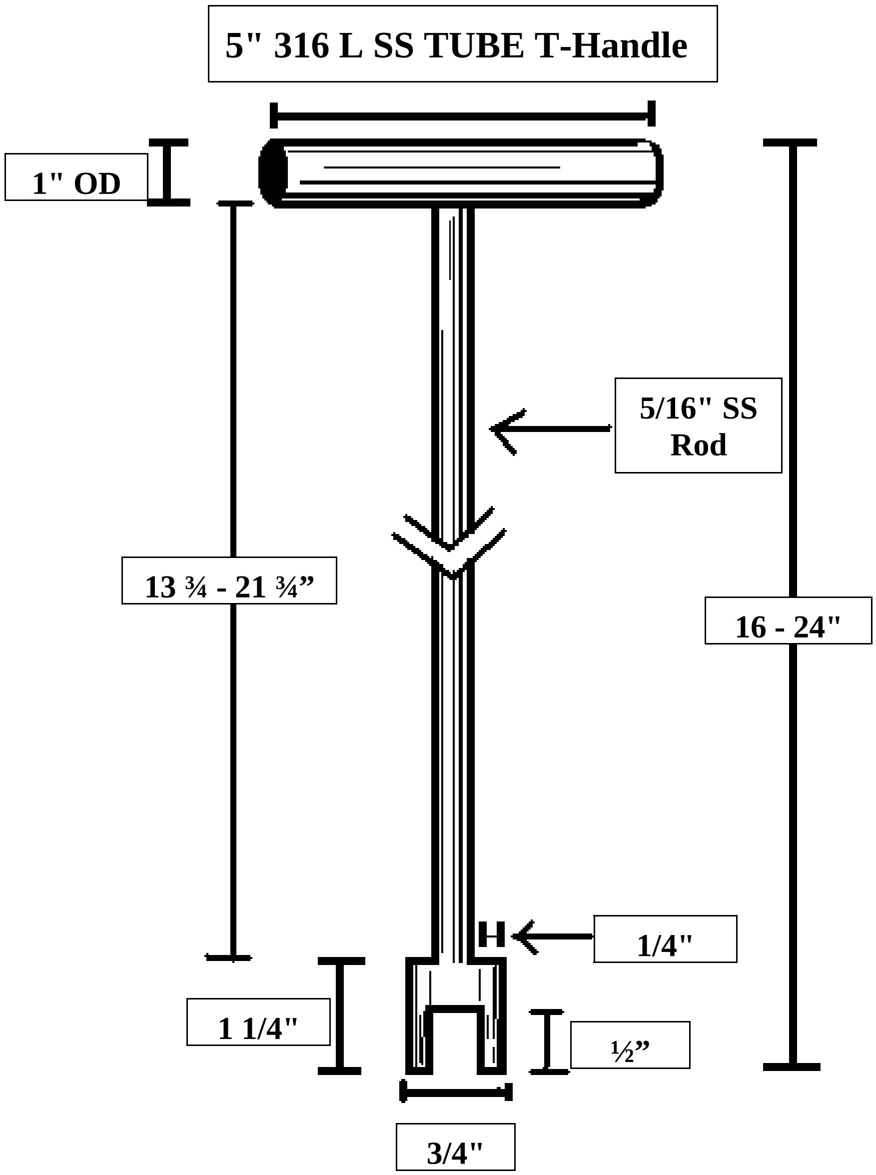
J- STYLE DEHOOKER



Drawn by S. Dick

FIGURE 4

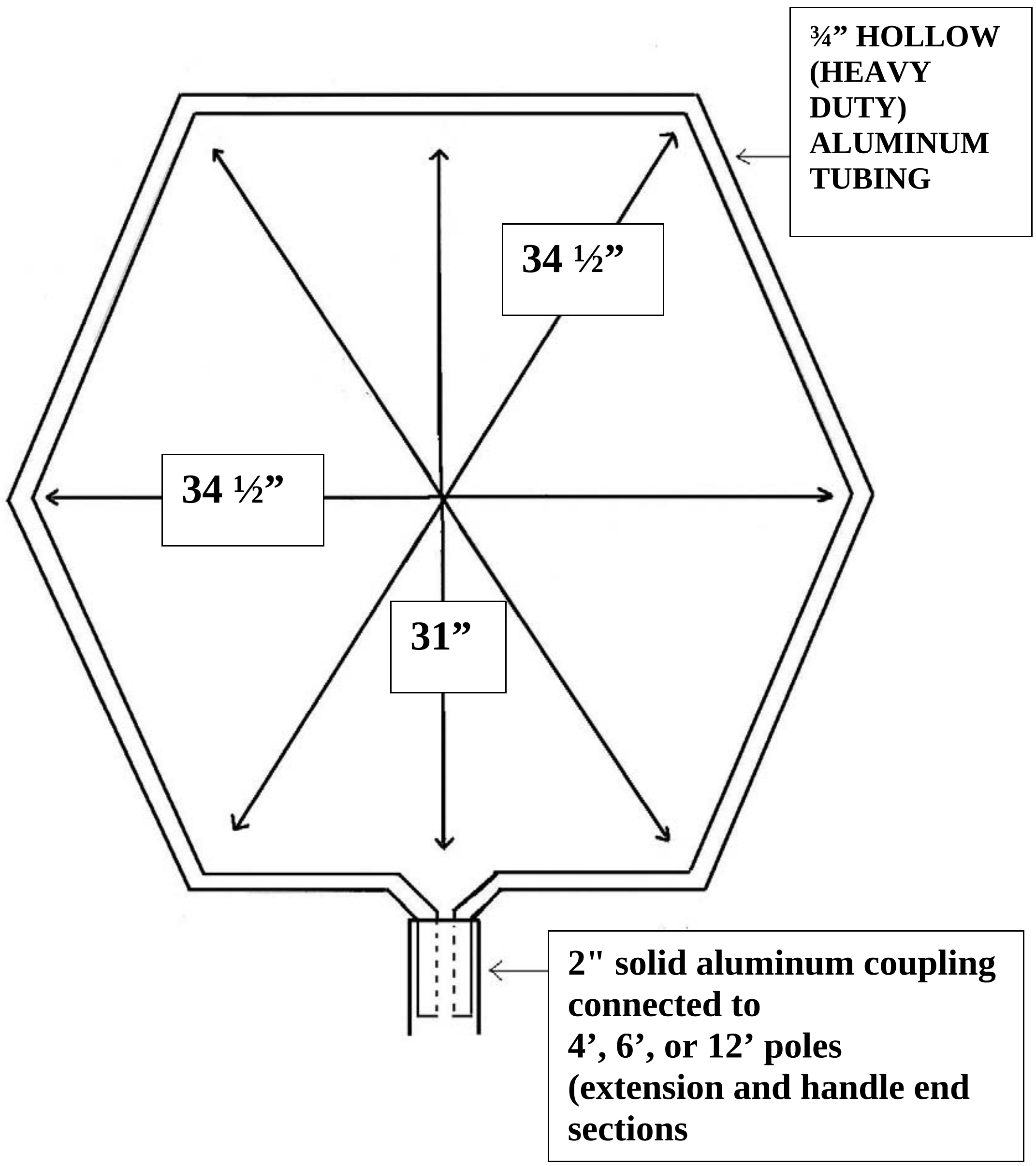
SCOTTY'S DEHOOKER



Drawn by S. Dick

FIGURE 5

LIGHTWEIGHT DIP NET



97"circumference 2 ½” square nylon mesh, with 38" bag depth (coated/dipped) knotless webbing

Drawn by S. Dick

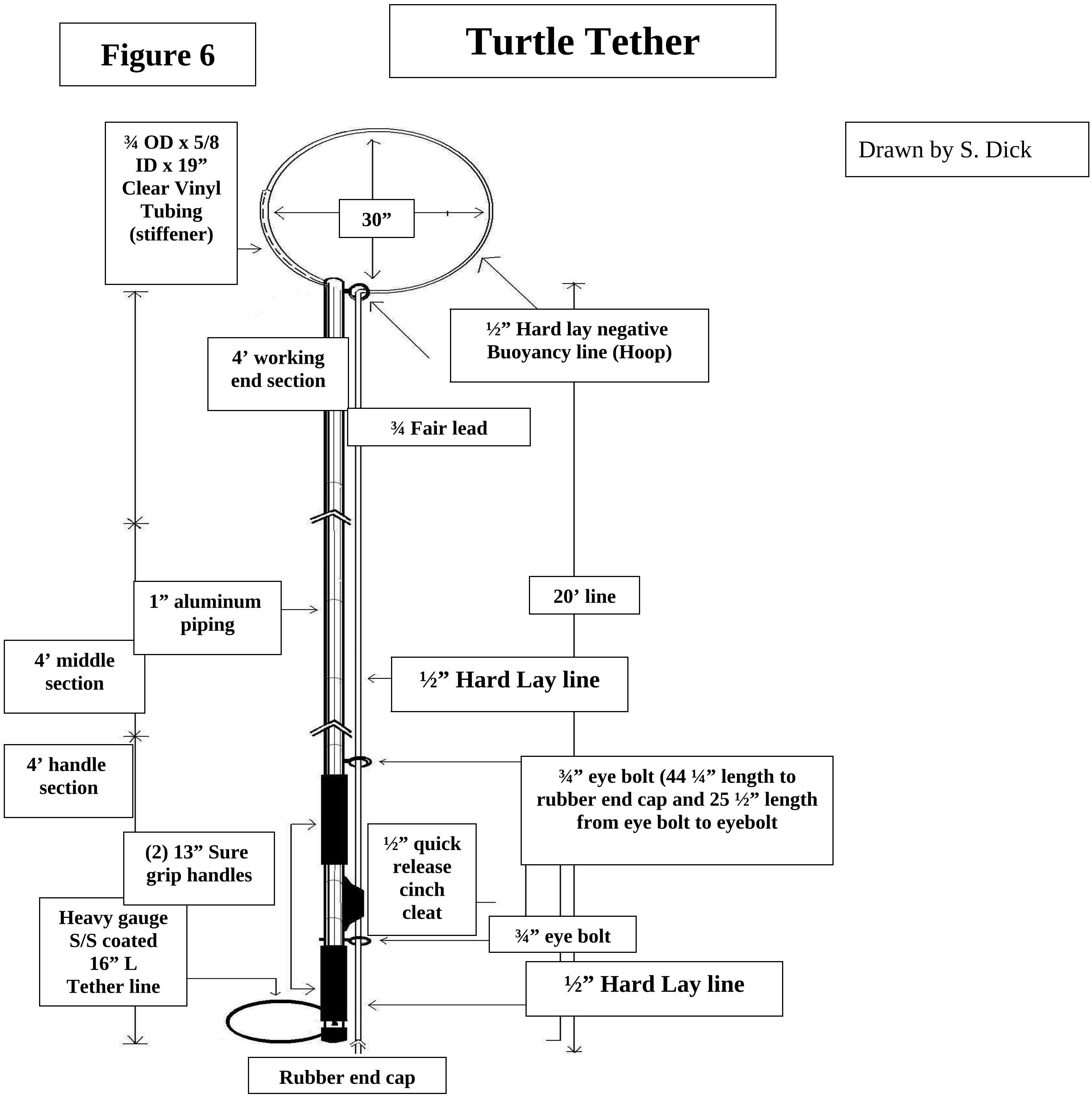


Figure 6
Turtle Tether
Drawn by S. Dick
¾ OD x 5/8 ID x 19" Clear Vinyl Tubing (stiffener)
30"
½" Hard lay negative Buoyancy line (Hoop)
4' working end section
¾ Fair lead
1" aluminum piping
20' line
4' middle section
½" Hard Lay line
4' handle section
¾" eye bolt (44 ¼" length to rubber end cap and 25 ½" length from eye bolt to eyebolt
(2) 13" Sure grip handles
½" quick release cinch cleat
Heavy gauge S/S coated 16" L Tether line
¾" eye bolt
½" Hard Lay line
Rubber end cap

FIGURE 7

LARGE TURTLE HOIST

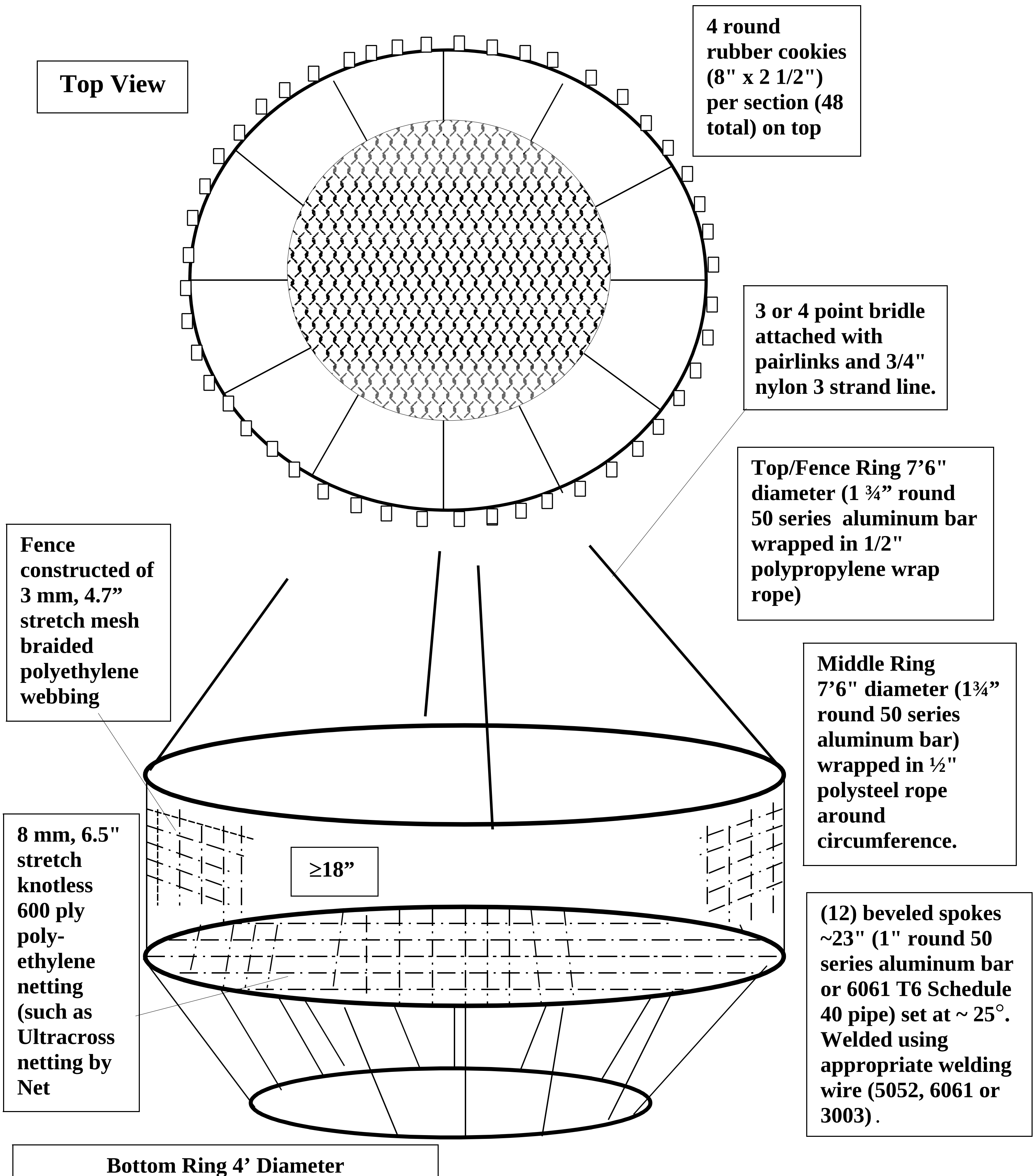
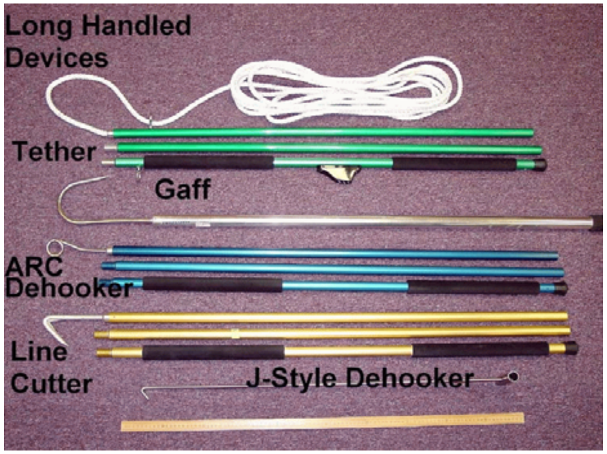


Figure 8

A



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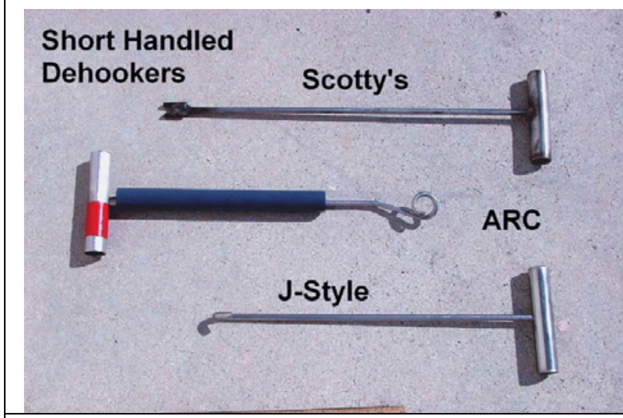
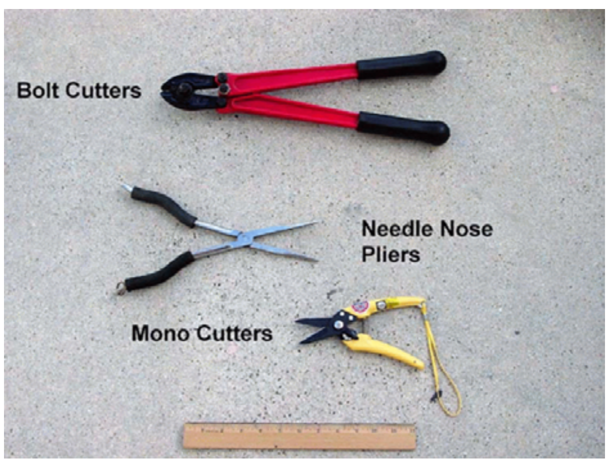
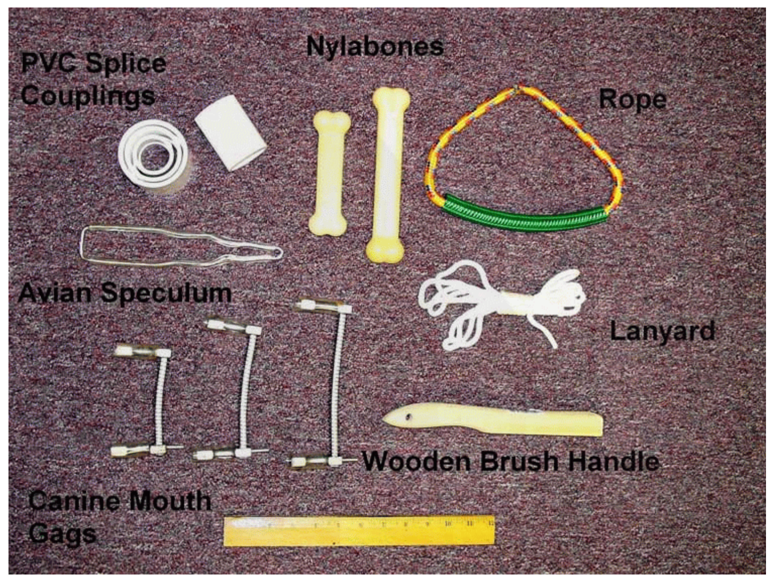


C



D

E



		REQUIRED FOR TURTLES NOT BOATED			
Equipment	***Design Standards***	***Example Model***	***Example Source***	***Requirement***	***Estimated Retail Cost***
(A) Long-handled line cutter	Section (A)(1)	*NOAA/Laforce Line Cutter ARC Model NL12* ***or*** *NOAA/Arceneaux Line Clipper*	Local machine shop **or** Aquatic Release Conservation (ARC) P.O. Box 730248 Ormond Beach, FL 32173-0248 (877) 411-4272 www.dehooker4arc.com Seat Belt cutters: goldenhourmed.com **or** allmed.net	1 required for turtles not boated 1 set of replacement blades also required	*$160-250 (NL12 Laforce 6'-12' breakdown model)* *$140 (4' working end)* *$90 (6" insert)* *$15 replacement blades* *~$3-$10 (6'-12' wooden poles)* *~$40 (8' aluminum pole)* *~$5 seat belt cutter*
(B) Long-handled dehooker for internal hooks	*Section (B)(1)*	*12' ARC Pole Dehooker Model BP11* ***or*** *ARC Model BPIN 9" long 5/16" pigtail insert and suitable handle*	Aquatic Release Conservation (877) 411-4272	1 required for turtles not boated	$120-210 (6'-12' breakdown model) $100 (4' working end) $40 (9" long insert) ~$3-$10 (6'-12' wooden poles) ~$40 (8' aluminum pole)
(C) Long-handled dehooker for external hooks	Section (C)(1)	*12" ARC Pole Dehooker Model BP11* ***or*** *ARC J-Style Dehooker Model LJ6P (6')* ***or*** *ARC 6' Pole Big Game Dehooker Model P610*	local machine shop (J-style dehooker) **or** Aquatic Release Conservation (877) 411-4272	1 required for turtles not boated	$100 (6') $30 (3')
(D) Long-handled device to pull "Inverted V"	Section (A)(1)	*West Marine #F6H5 Gaff hook and #F6-006 handle* ***or*** *Davis Telescoping Boat Hook to 96" Model 85002A* ***or*** *ARC J-Style Dehooker Model LJ6P*	West Marine (800) 262-8464 **or** www.boatersworld.com (877) 690-0004 **or** local machine shop	1 required for turtles not boated	$50-$200

		REQUIRED FOR TURTLES NOT BOATED (continued)			
Equipment	***Design Standards***	***Example Model***	***Example Source***	***Requirement***	***Estimated Retail Cost***
(E) Dip Net	Section (E)(1)	*ARC 12' Breakdown Lightweight Dip Net Model DN6P (6'), DN08 (8')* ***or*** *DN14 (12')* ***or*** *Net Assembly (hoop, net, coupling) DNIN and suitable handle* ***or*** *Lindgren-Pitman Model NMFS-Turtle Net*	local machine shop **or** Aquatic Release Conservation (877) 411-4272 **or** Lindgren-Pitman, Inc. (954) 943-4243	1 required for turtles boated	$275 (ARC 12' breakdown) $225 (ARC 8' breakdown) $210 (ARC 6' breakdown) $160 (ARC Net assembly) ~$3-$10 (6'-12' wooden pole) ~$40 (8' aluminum pole) $249.95 Lindgren-Pitman
(F) Standard Automobile Tire	Section (F)(1)		local tire store	1 required for turtles boated	~$20
(G) Short-handled dehooker for internal hooks	Section (G)(1)	*16" ARC Hand Held (sleeved) Bite Block Deep Hooked Turtle Dehooker Model ST08*	Aquatic Release Conservation (877) 411-4272	1 required for turtles boated	$50
(H) Short-handled dehooker for external hooks	Section (H)(1)	*Hand held large J-Style Dehooker [e.g., ARC Model LJ07 (16")* ***or*** *LJ24 (24')]* ***or*** *Scotty's Dehooker [e.g., ARC Model SC16 (16") or SC24 (24")]*	Aquatic Release Conservation (877) 411-4272 **or** local machine shop	1 required for turtles boated	$14-$20 (ARC 16") $22-$28 (ARC 24")
(I) Long-nose/needle-nose pliers	Section (I)(1)	*12" S.S. NuMark Model #030 281 109 871*	Boat's USA (800) 937-2628 **or** JD's Big Game Tackle © (800) 660-5030 **or** local boat supply **or** hardware store	1 required for turtles boated	$20

		REQUIRED FOR TURTLES BOATED (continued)			
Equipment	***Design Standards***	***Example Model***	***Example Source***	***Requirement***	***Estimated Retail Cost***
(J) Bolt cutter	Section (J)(1)	*Manufacturer H.K. Porter 1490 AC*	Grainger (888) 361-8649 www.grainger.com **or** Ben Meadows www.benmeadows.com (800) 356-0783 **or** Lab Safety Supply www.LSS.com (800) 356-0783	1 required for turtles boated	$40
Monofilament Cutter (K)	Section (K)(1)	*Jinkai model MC-T*	Tackle Direct (888) 354-7335 **or** www.captharry.com (800) 327-4088 **or** local boat supply store	1 required for turtles boated	$21
(L) Mouth openers/mouth gags	Section (L)	**Minimum of 2 different categories (#1-7) of mouth openers/gags from the list below (all items in category required):**			
(1) Block of hard wood	Section (L)(1)	*Wire brush wooden shoe handle e.g., Olympia Tools Long Handled Wire Brush and Scraper #974174*	Home Depot www.homedepot.com (800) 553-3199 **or** Lowes www.lowes.com (800) 445-6937 **or** local hardware store	Minimum of 2 different categories (# 1-7)	$2.50
(2) Set of (3) canine mouth gags	Section (L)(3)	*Jorvet #4160 (small), #4162 (medium), and #4164 (large)*	Webster Vet Supply (800) 225-7911 **or** www.cotrancorp.com (800) 345-4449 **or** Jorgensen Laboratories jorvet.com (800) 525-5614	Minimum of 2 different categories (# 1-7)	$12.60 each = $37.80/set

		REQUIRED FOR TURTLES BOATED (continued)			
Equipment	***Design Standards***	***Example Model***	***Example Source***	***Requirement***	***Estimated Retail Cost***
		Minimum of 2 different categories (#1-7) of mouth openers/gags from the list below (all items in category required):			
(3) Set of (2) sturdy dog chew bones	Section (L)(3)	*Nylabone™ Gumabone™ Galileobone™*	Pet Supermarket (954) 351-0834 **or** www.petsmart.com (888) 839-9638 **or** local pet supply store	Minimum of 2 different categories (# 1-7)	$3.70-$5.00 each= $8.70/set
(4) Set of (2) rope loops covered with hose	Section (L)(4)		Home Depot www.homedepot.com (800) 553-3199 **or** Lowes www.lowes.com (800) 445-6937 **or** local hardware store	Minimum of 2 different categories (# 1-7)	$0.50
(5) Hank of rope	Section (L)(5)	*6' lanyard ~ 3/16" braided nylon rope*	Home Depot www.homedepot.com (800) 553-3199 **or** Lowes www.lowes.com (800) 445-6937 **or** local hardware store	Minimum of 2 different categories (# 1-7)	$0.75
(6) Set of (4) PVC splice couplings	Section (L)(6)		Home Depot www.homedepot.com (800) 553-3199 **or** Lowes www.lowes.com (800) 445-6937 **or** local hardware store	Minimum of 2 different categories (# 1-7)	$0.25-$0.60 each = $1.50/set

		REQUIRED FOR TURTLES BOATED (continued)			
Equipment	***Design Standards***	***Example Model***	***Example Source***	***Requirement***	***Estimated Retail Cost***
(7) Large avian oral speculum	Section (L)(7)	*Webster Vet Supply #85408* ***or*** *Veterinary Specialty Products # 216-08* ***or*** *Jorvet Model J-51z*	Webster Vet Supply (800) 225-7911 **or** Veterinary Specialty Products Vet-products.com (800) 362-8138 **or** jorvet.com	Minimum of 2 different categories (# 1-7)	$0.50 vinyl tubing $15 avian speculum
		RECOMMENDED, BUT NOT REQUIRED, FOR TURTLES			
(M) Turtle tether	Section (M)(1)	*ARC Turtle Tether Model TT08 (8') or TT12 (12')*	Aquatic Release Conservation (877) 411-4272 **or** local machine shop	Recommended for turtles not boated	$250 (12' ARC breakdown) $200 (8' ARC breakdown) ~$3-$10 (6'-12' wooden poles) ~$40 (8' aluminum pole) ~$30 negative buoyancy line
(N) Large turtle hoist	Section (N)(1)	*Leatherback Hoist*	Eagle Eye II Corporation 240 Causeway Lawrence, NY 11559 (516) 239-3085 (516) 239-2287 fax	Recommended for turtles too large for smaller dip net	~$5000 (plus potential costs for vessel modifications)

		ESTIMATED COSTS PER VESSEL			
		Lowest estimate (inserts only and constructed handles, least expensive mouth openers)	**Highest Estimate** [(1) 12' aluminum breakdown pole purchased retail: interchangeable with dip net, line cutter, long dehooker; most expensive mouth opener options]		
Required for turtles not boated		~$115	~$550		
Required for turtles boated		~$366	~$454		
Mouth openers		~$4	~$52.50		
Recommended (excluding the turtle hoist)		~$40	~$200		
Total cost per vessel		**~$525**	**~$1256.50**		*Note: These costs are rough estimates and do not account for equipment that vessels may already have (Dip nets, tires, line and monofilament cutters, etc.) Some items may be constructed to specifications using inexpensive materials and/or local machine shops*

APPENDIX B2

CAREFUL RELEASE PROTOCOLS FOR SEA TURTLE RELEASE WITH MINIMAL INJURY

(TO BE POSTED IN WHEELHOUSE)

NOAA FISHERIES
JUNE, 2004

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3.6 Releasing the turtle

Part 4 Flow chart - Sea Turtles Not Boated

Part 5 Flow chart - Sea Turtles Boated

Careful Release Protocols for Sea Turtle Release with Minimal Injury

Introduction

The following sea turtle handling protocols, prepared by NOAA Fisheries Southeast Fisheries Science Center, describe the tools and techniques for removing fishing gear from incidentally captured sea turtles and other bycatch species. They should be followed whenever an interaction, such as a hooking and/or an entanglement, with a sea turtle occurs. The survival benefit of removing gear from animals before release has been clearly demonstrated. The required and recommended equipment and techniques described here are intended to reduce sea turtle injury and promote post-release survival. A demonstration of the use of these tools and techniques can been seen in the video "Removing Fishing Gear from Longline Caught Sea Turtles" (Hataway and Epperly 2004). Although these guidelines were written for sea turtle release, this equipment should also be used for all bycatch species to reduce mortality.

These protocols synthesize the results of scientific research involving sea turtle mitigation measures and post-hooking mortality criteria developed for pelagic longline fisheries. In 2001-2003, experiments were conducted in the Western Atlantic Northeast Distant Waters statistical reporting area (NED) to evaluate sea turtle mitigation measures in the pelagic longline fisheries (Watson et al. 2004). Interviews with all of the captains and observers were conducted after each trip to specifically discuss the efficacy of various tools provided to remove gear from sea turtles. Based on the field-testing and user feedback from these experiments, gear removal tools have been updated, and equipment design standards, requirements and recommendations have been revised accordingly.

Previously, all U.S. pelagic longline vessels with Federal HMS permits have been required to carry on board dip nets and line clippers meeting NOAA Fisheries' design standards, and to comply with handling and release guidelines for the handling of incidentally-caught sea turtles (65 FR 60889, October 13, 2000, and 66 FR 17370, March 30, 2001). The revised gear recommended or required in "Requirements and Equipment Needed for the Careful Release of Sea Turtles Caught in Hook and Line Fisheries," (Appendix B1, NOAA Fisheries, 2004) must now be used in accordance with the following protocols to ensure that sea turtles are released with minimal injury. As specified in CFR 50 635.21(a)(3) and 50 CFR 635(c)(5)(ii), these protocols are required to be inside the wheelhouses of all Atlantic vessels that have pelagic longline gear onboard and have been issued, or are required to have, Federal HMS limited access permits.

Part 1 Vessel's Responsibilities Upon Sighting a Sea Turtle

Captains and crews are required to scan the main line as far ahead as possible during gear retrieval to sight turtles in advance, and to avoid getting ahead of the main line while retrieving gear. Upon sighting a turtle, the vessel and main line reel speed will be slowed and the vessel direction will be adjusted to move toward the turtle, minimizing tension on the main line and the branch line with the turtle. When the snap of the branch line is in hand, the vessel will continue to move toward the turtle as slowly as possible. If slow speed is not possible, the vessel will stop with the engine out of gear, and the turtle will be brought along side the vessel. The branch line will be retrieved slowly while a crew member keeps a gentle, consistent tension on the line with enough slack to keep the turtle near the vessel and in the water. A laminated instruction card for sea turtle handling/release guidelines will be provided to each vessel to be prominently displayed in the wheelhouse for instant reference (66 FR 48813, September 24, 2001).

Once the turtle is brought alongside the vessel, stop and put the vessel in neutral. Do not use gaffs or other sharp objects in direct contact with the turtle to retrieve or control it, although a gaff may be used to control the line (refer to Section 2.1.4.1). Assess the turtle's condition and size and determine if it is hooked or entangled and, if hooked, the location of the hook. There are 3 possible sea turtle interactions with the fishing gear: 1) Entangled animal but not hooked, 2) Hooked animal but not entangled, and 3) Hooked and entangled animal. The vessel must be stopped in order to respond to these interactions, and a decision must be made whether the turtle can be brought onboard safely.

It is expected that all turtles less than 3 ft in straight carapace length generally can be boated safely if sea conditions permit; larger turtles should also be boated when conditions and equipment permit. If it is determined that the turtle cannot be brought aboard without causing further injury to the turtle, or if conditions are such that the turtle cannot be safely brought aboard, then protocols for turtles not boated should be followed (Part 2). Whenever possible, turtles should be brought onboard to make gear removal easier and safer, following the handling guidelines for turtles boated (Part 3). The vessel must attempt to remove all of the gear, line and hooks from the turtle. The vessel is responsible for the turtle's safety from first sighting until release, and all efforts should be made to release the turtle with minimal injury and minimal remaining gear.

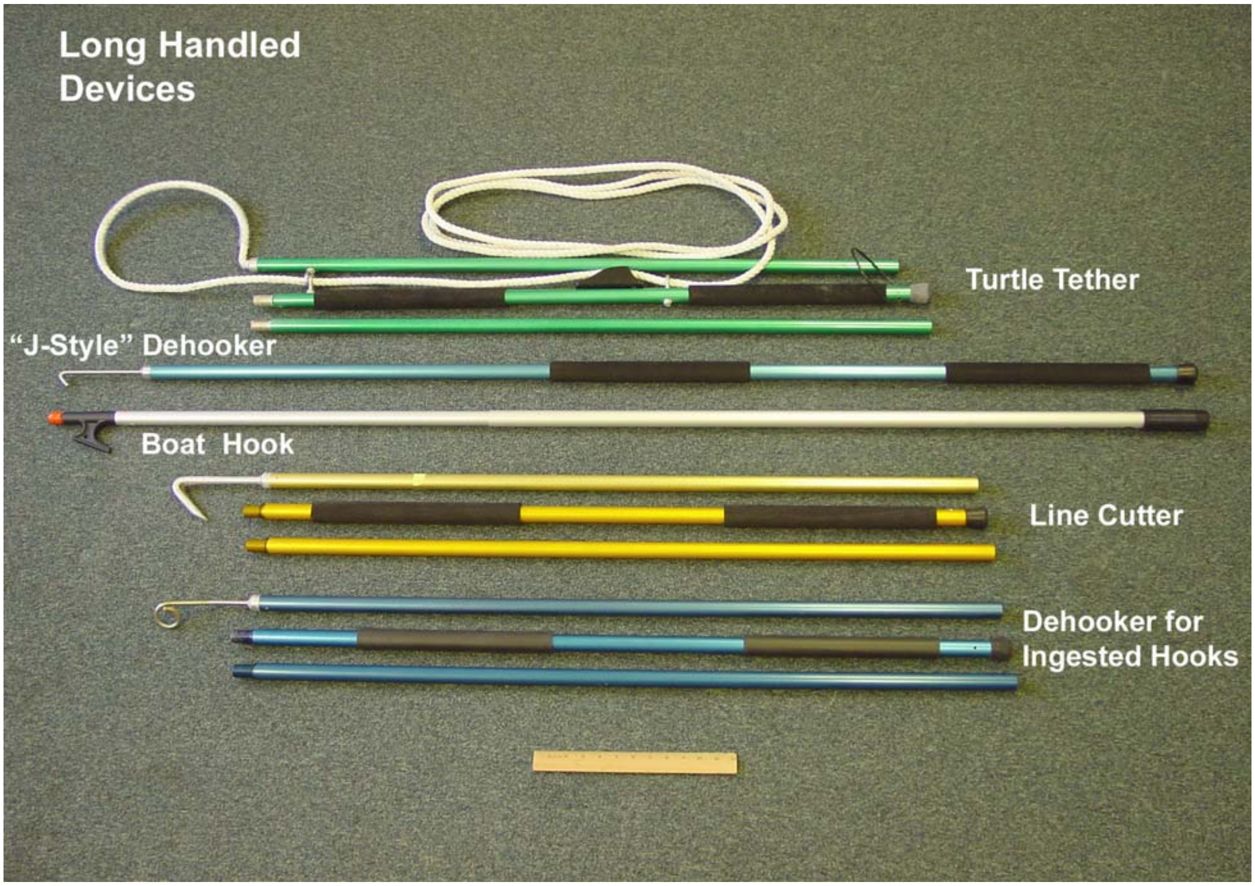
Part 2 Sea Turtles Not Boated

When a turtle is too large to be boated, or if sea conditions prevent the safe boating of turtles, vessels must remove the gear while the turtle remains in the water. The turtle should be brought as close as possible, but it may need a short time to calm down before being brought fully alongside, where gear removal must be conducted as quickly as possible. The first section in this chapter details the tools and techniques to be used for gear removal. Next, different possible scenarios involving 3 types of potential gear interactions will be described, outlining the combination of tools best adapted for each scenario. For a quick reference for the equipment used with sea turtles not boated, see the flow chart in Part 4.

2.1 <u>Equipment and techniques</u>

2.1.1 Turtle tether

A "Turtle tether" is used to help control the animal near the side of the boat, minimizing the possibility for injury to the crew and the turtle. The tether is used to take pressure off the involved branch line and help stabilize the animal. The end of the negatively buoyant tether line should be threaded through an eyebolt at the end of the tether, then through two eyebolts farther down the pole. A tag line threaded through the end of the tether must be attached to the vessel to ensure that the turtle cannot escape with the tether attached. Loop the stiff rope around the front flipper up to the shoulder region, tighten and cinch the rope in the cleat. Keep a firm hold of the tether pole to keep the animal near the vessel, allowing for dehooking and disentanglement. Use dehookers and line cutters as needed, depending on the type of gear interaction as described in Sections 2.2.1 - 2.2.3.



2.1.2 Equipment to cut monofilament line

a) Long-handled line clipper/cutter

A line clipper or cutter is designed to cut high-test monofilament line to assist in removing line from entangled sea turtles. It may also be used to cut the line as close as possible to the hook, minimizing remaining gear when hook removal is not possible. Carefully slide the blunt end of the line cutter under the line that you wish to remove and pull the line cutter to capture the line within the recessed blade(s) of the device.

b) Monofilament cutters

If the turtle is close to the vessel, hand-held monofilament cutters may be used to remove line from entangled turtles. Turtles should be released with as little line as possible remaining.

2.1.3 Equipment to remove hooks

a) Long-handled dehooker for internal hooks

1) ARC Pole Model Deep-Hooked Dehooker (Refer to Plate 2.1.3.a.1)

The ARC Pole Model Deep-Hooked Dehooker is one example of a NOAA Fisheries certified piece of equipment. The dehooker is used to remove internal hooks from sea turtles that cannot be boated, but is also effective on external hooks. This device engages and secures the leader, allowing the hook to be secured within an offset loop without re-engaging the barb during the removal process.

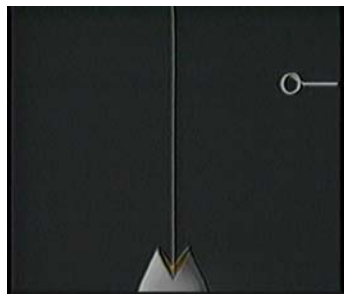
1) The leader person (person controlling the branch line) must carefully bring the animal alongside the vessel, using a tether to help control the turtle if possible. They should stay to the left of the dehooking person and maintain a taut leader.
2) The dehooking person should be to the right of the leader person to capture the leader, and no one should get in between the leader and the dehooking device in case the line breaks or the hook dislodges.
3) There is only one correct way to place the pigtail over the branch line. The leader person must maintain leader tension. The dehooking person places the dehooker on the leader at a 90° angle with the open end of the curl facing them, and the tail end of the curl facing up. Pull until the curl of the dehooking device captures the line (like a bow and arrow), and rotate the device ¼ turn clockwise. When placed correctly, the leader will be in the center of the pigtail curl.
4) Slide the dehooker down the leader until it engages the shank of the hook and bottoms out. Slightly rotate the device back and forth to ensure proper engagement on the hook.
5) When the hook is engaged, the dehooking device must be brought together with the leader, parallel to the line. If the line is not parallel with the dehooking device, the point of the hook will have a tendency to turn out and allow for possible re-engagement after release.
6) Working together, the leader person and the dehooking person must communicate, keeping the line taut until the exact moment that the dehooking person disengages the hook with a short, sharp jab downward. The leader person must give a little slack when the dehooking person is jabbing downward, so timing and communication are important. After the hook is removed, the point of the hook will rotate and stop on the offset bend of the dehooker, protecting the point and preventing re-engagement of the hook.

Plate 2.1.3.a.1

Instructions for ARC Deep-hooked (pigtail curl) Dehooker

This dehooker is designed for removing hooks that are swallowed and are lodged in the mouth, throat, or esophagus of fish, sea turtles, marine mammals, and sea birds without touching or removing the catch from the water. It also can be used for removing hooks that are embedded in the body, flippers, beak, or lip of larger fish, marine mammals, sea turtles, and sea birds. The illustrations depict fish, but the technique is the same for other animals.

Step 1



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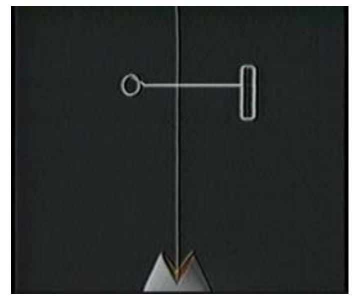

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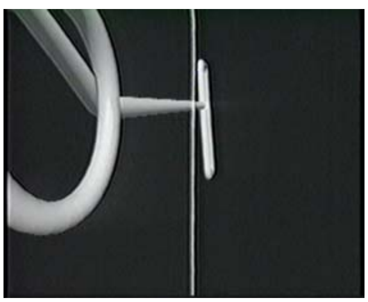

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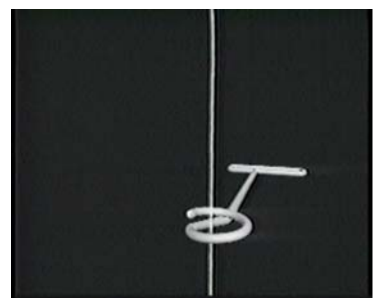
Step 5



Step 6

(1) Grab the leader with your left hand.

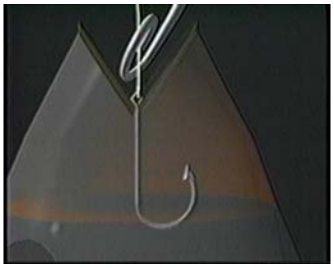
(2) Hold the dehooker in your right hand, making sure the open end of the pigtail is facing up.

(3) Place the rod of the dehooker on the leader perpendicular to the leader as you would a bow and arrow.

(4&5) Draw the dehooker back towards you until you engage the line.

(6) Turn the dehooker 1/4 turn clockwise. This puts the leader in the center of the curl.

Plate 2.1.3.a.1 Continued



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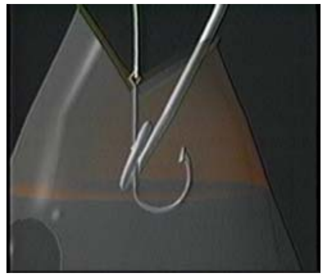

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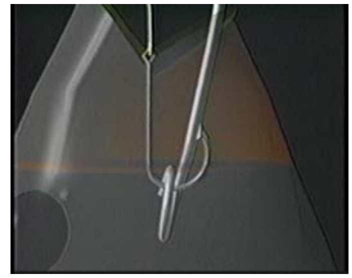

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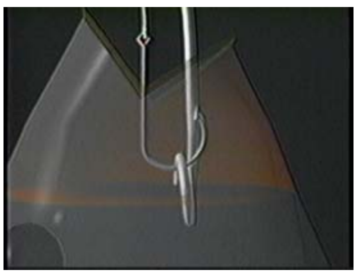
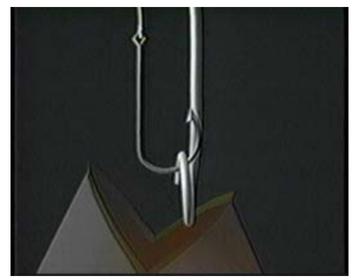


Step 10

Step 11



Step 12

(7-9) Keeping your hands apart, follow the leader down until the dehooker bottoms out on the hook.

(10) Bring your hands together making sure the leader is tight and parallel with the dehooking device.

(11&12) Give a slight thrust downward with the dehooking device until the hook disengages, then pull out the dehooker with the hook. The point of the hook will be hidden by the offset bend (so that the hook does not re-engage). The animal is safely and instantly released.

b) Long-handled dehooker for external hooks

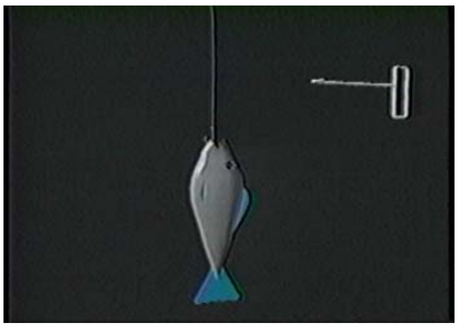
1) "J-Style" dehooker (Refer to Plate 2.1.3.b.1)

This long-handled dehooking device may be used for dehooking in circumstances where the animal is hooked externally. Hold the leader in your left hand with tension and hold the "J-style" dehooker in your right hand. Place the dehooker on the leader and follow the leader down until it bottoms out on the shank of hook. With tension on the leader, lower the left hand (the hand with the leader) to the 8 o'clock position, the right hand with the dehooker to the 2 o'clock position; twist the dehooker slightly and pull until the hook is dislodged. Be cautious not to allow the hook to re-engage once removed.

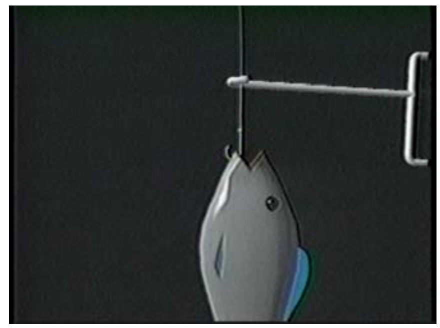
Plate 2.1.3.b.1

Instructions for the "J-Style" Dehooker

This dehooker is designed for removing smaller hooks, jigs, and lures that are embedded in the lip, body, flippers, and beak of fish, marine mammals, sea turtles, and sea birds.



Step 1



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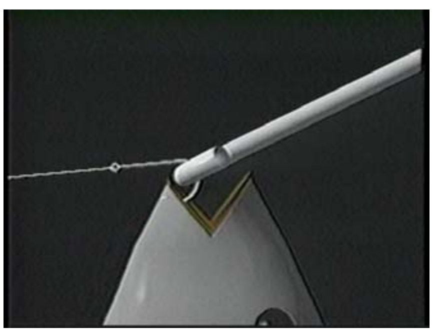

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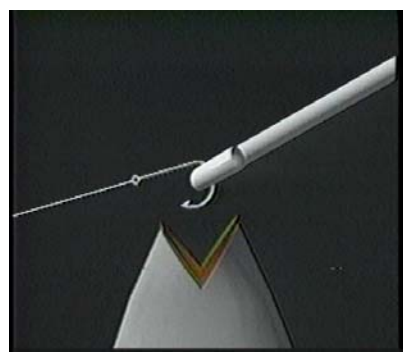


Step 4

(1) Grab the leader with your left hand and hold the dehooking device with your right hand (with the J bend facing toward you).
(2) Place the dehooking device on the leader.
(3) Follow the leader down until you engage the hook.
(4) Pull the dehooking device and leader apart with constant pressure until your right hand (dehooking device) is at the two o'clock position, and your left hand (leader) is at the eight o'clock position. With a slight twist and shake the hook will be disengaged.

2.1.4 Long-handled device to pull an "Inverted V" during disentanglement

A standard fishing gaff, long-handled "J-Style" dehooker or standard boat hook may be used to assist in disentanglements and to pull a "V" for dehooking entangled sea turtles, as described in the "Inverted V" dehooking technique below.

2.1.4.1 "Inverted V-Style" technique

1) Once at the surface, the animal may have a tendency to entangle itself more. After the first inspection, let the turtle calm down for a short period of time (in some cases up to 10 minutes) then gently draw it to the boat, using the tether when practical to control the animal.
2) An additional crew member should carefully engage the monofilament leader closest to the embedded hook with a gaff, boat hook or long-handled "J-style" dehooker, depending on the distance to the hook. If using a gaff, care should be taken to ensure that the point of the gaff does not ever contact the turtle. The gaff person should pull the line upward into an "inverted V" to enable engagement of the dehooking device on the line closest to the hook.
3) Follow the instructions in Section 2.1.3 to remove the hook from the turtle using a long-handled dehooking device. The gaff person would serve the same function as the leader person.
4) After the hook is removed and secured by the dehooker, carefully remove all line with the line cutter to disentangle the animal (Section 2.1.2).

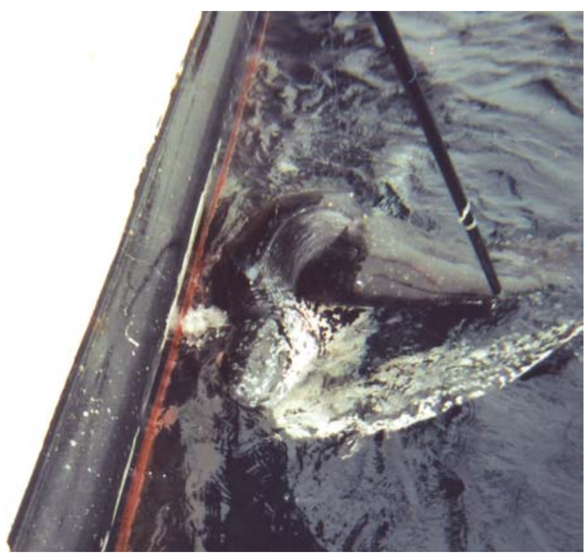
2.2 Possible Scenarios Encountered

2.2.1 When a turtle is entangled but not hooked (2 crew / dehooker/ line cutter/gaff, boat hook, or long-handled "J-style" dehooker)

Control the turtle at the side of the boat using the branch line, or preferably with a turtle tether (Section 2.1.1). Secure the loose hook with the long-handled dehooker for internal hooks and carefully slide the blunt end of the line cutter under the line that you wish to remove. Pull the line cutter and the line will be captured within the recessed blade(s) of the device. The long-handled "J-style" dehooker, gaff, or boat hook may be carefully used to manage the line while cutting with the line cutters. Monofilament cutters may also be useful if the turtle is close to the side of the vessel.

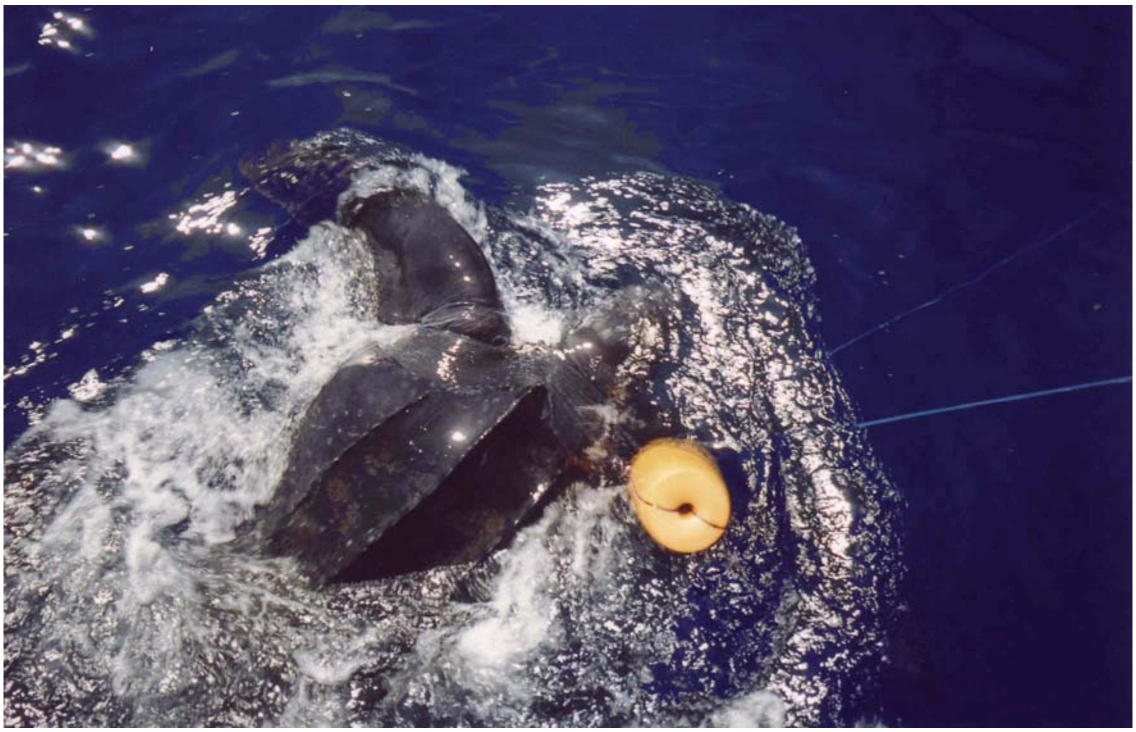
2.2.2 When a turtle is hooked but not entangled (at least 2 crew, turtle tether and long-handled dehooker or "J-style" dehooker).

Control the turtle at the side of the boat using the branch line, or preferably with a turtle tether (Section 2.1.1). The choice of dehooker will depend on the location and depth of the hook. Do not ever attempt to remove hooks that have been swallowed beyond where the insertion point of the barb is visible, or when it appears that hook removal will cause further serious injury to the turtle. If the hook cannot be removed, ensure that as much line as possible is removed and, if possible, remove some of the hook with bolt cutters. The long-handled dehooker for internal hooks may be used when the hook is more deeply embedded; the long-handled dehooker for external hooks may be used when the turtle is lightly hooked, and hooks are easily removed using a simple pushing or pulling motion.



2.2.3 When a turtle is hooked and entangled (multiple crew /turtle tether/ dehooker/ line cutter /gaff or long-handled "J-style" dehooker)

Control the turtle at the side of the boat using the branch line, or preferably with a turtle tether (Section 2.1.1). For turtles wrapped in line or hooked in the armpit or shoulder with the line running under, not over the turtle, the "Inverted V-Style" technique is necessary for release (See Section 2.1.4.1). Follow the instructions in Sections 2.2.1 and 2.2.2 for removing hooks and line.



Part 3 Sea Turtles Boated

3.1 Boating the turtle

It is very important that the turtle is never pulled out the water, even partially or for a short distance, using the branch line. This could cause serious injury to the turtle, especially when the turtle has swallowed the hook. Once boated, the turtle will be handled according to the procedures for boated turtles (Section 3.2 – 3.6). For a quick reference for the equipment used with sea turtles boated, see the flow chart in Part 5.

3.1.1 Dip net

If the turtle is small enough, and if conditions are such that it can be brought aboard the vessel safely, a crew member will use a dip net (meeting standards specified in NMFS regulations) to carefully bring the turtle aboard. The net will be placed under the turtle, and it will be safely lifted out of the water and onto the deck. If the vessel is equipped with "cut out doors," use this door to minimize the distance from the water for the turtle to be retrieved.

3.1.2 Large turtle hoist

A hoist is recommended to bring turtles onboard that cannot be boated using a smaller dip net. This is particularly useful when removing gear from leatherback sea turtles. The hoist is lowered into the water using a hydraulic lift and brought near the turtle. Once the lift is in the water, the turtle can be guided into the device using the branch line and/or turtle tether. Once the turtle is positioned within the hoist, release tension on the line, and the turtle will descend deeper into the lift. The hoist and turtle are then raised slowly back onto the deck. The device is designed so that when onboard, the turtle is suspended above the deck on a platform of mesh netting supported by a rigid ring and contained within a webbing fence. The turtle is immobilized in this lift, facilitating safe and rapid gear removal. Once all gear has been removed, the hoist and turtle are lowered back into the water deep enough for the turtle to swim out of the frame. Orient the hoist so that the turtle is facing away from the boat upon release. The use of this device is demonstrated in the video "Leatherbacks Aboard" (Epperly and Hataway 2004).

3.2 <u>Holding the turtle</u>

While onboard, the turtle must be kept moist and in the shade, maintaining its body temperature above 60° F, similar to water temperatures at capture. It must be safely isolated and immobilized on a cushioned surface. The large turtle hoist serves this purpose; smaller turtles will need to be placed on an automobile tire. If you encounter a turtle with a tag, note the tag number and species and report the find to the address on the tag. All gear should be removed immediately. If possible, and especially if the turtle appears lethargic, leave the turtle on deck from some time (up to 24 hours) and monitor its condition, allowing stress toxins to dissipate.

3.2.1 Standard automobile tire

The vessel is responsible for providing a standard automobile tire to safely isolate and immobilize the animal once it is onboard. It is important to place the turtle in its normal orientation whenever possible while immobilized on the tire, unless there is a specific reason to have it temporarily resting on its back.

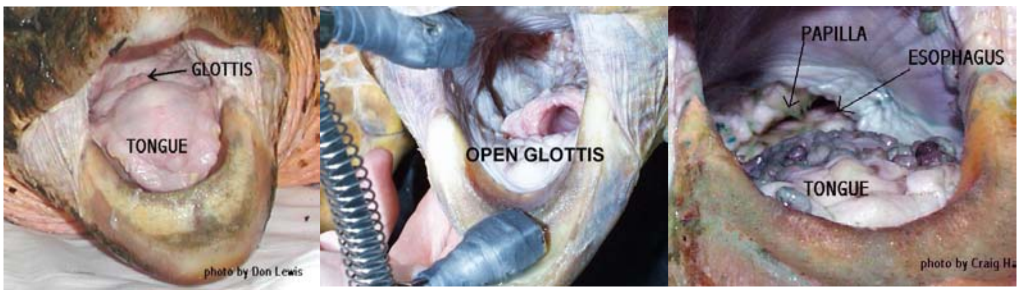
3.2.2 Comatose turtles

If a turtle appears to be comatose (unconscious), you should attempt to revive it before release per 66 FR 67495, December 31, 2001. Place the turtle on its plastron (lower shell) and elevate the hindquarters several inches to permit the lungs to drain off water. A comatose but live sea turtle may, in some cases, exhibit absolutely no movement or signs of life (no muscle reflexes). In other cases, an unconscious turtle may show some evidence of eyelid or tail movement when touched. Sea turtles may take some time to revive; do not give up too quickly. Regulations allow a fisherman to keep a turtle on deck up to 24 hours for resuscitation purposes without a permit. Even turtles successfully resuscitated benefit from being held on deck as long as possible to allow toxins that built up as a result of stress to dissipate from the body. Keep the skin, and especially the eyes, moist while the turtle is on deck by covering the animal's body with a wet towel, periodically spraying it with water, or by applying petroleum jelly to its skin and carapace.

A turtle that has shown no sign of life after 24 hours on deck (held in the shade, kept moist and its body temperature maintained above 60° F) may safely be considered dead. If the turtle cannot be revived before returning to port, it should be returned to the water, preferably in a non-fishing area.

3.2.3 When to remove hooks

The decision whether to remove a hook is very important, and may directly affect the turtle's chances for survival. If you are unsure whether hook removal will cause further serious injury to the turtle, do not remove the hook. All externally embedded hooks should be removed. Hooks in the mouth should be removed when they are visible in part or whole, but judgment should be used in each case. If the hook is in the braincase, glottis, or otherwise deeply embedded, and where you believe removal will cause more damage, do not remove the hook. The glottis is located in the middle of the tongue (large muscular organ fixed to the floor of the mouth), and consists of the opening to the trachea and the valve to open and close the airway.



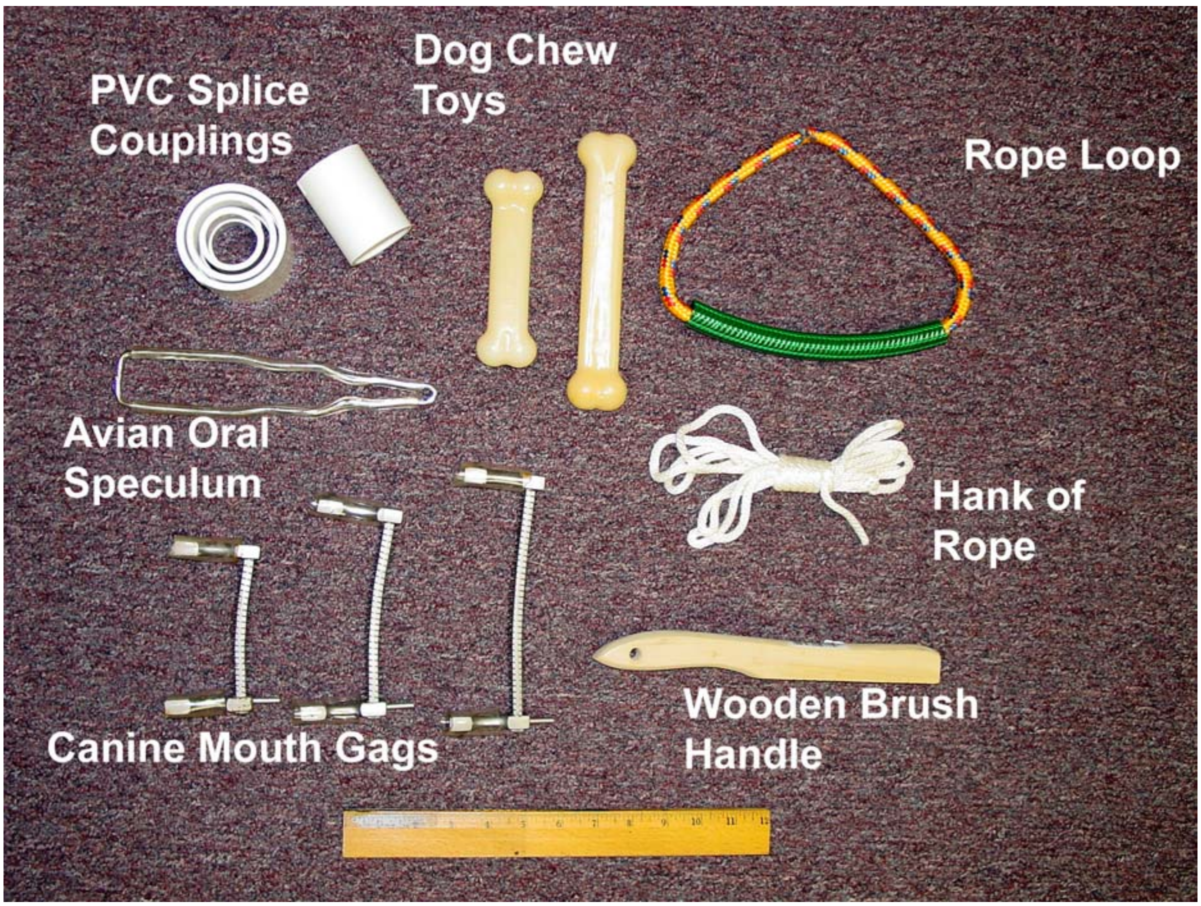
The esophagus begins at the back of the mouth and is lined with papillae. Only remove hooks from the esophagus when the insertion point of the barb is clearly visible, and exercise extreme caution during hook removal. Never attempt to remove a hook that has been swallowed when the insertion point is not visible, as removal may cause more damage to the turtle than leaving the hook in place. When a hook cannot safely be removed, monofilament cutters should be used to cut the line as close as possible to the eye of the hook. If part of the hook is visible and accessible, but cannot be removed (e.g., hook in glottis), bolt cutters should be used to cut off and remove the visible part of the hook.

3.3 <u>Opening the mouth</u>

When a turtle with an internal hook injury is brought on board, it will more than likely have its mouth open. If the animal is not voluntarily opening its mouth, there are a few mouth-opening techniques you can apply:

1) Block the turtle's nostrils to make the turtle breath through its mouth.
2) Tickle the throat or pull outward on the throat skin.
3) Cover the nostrils and carefully apply light pressure to the anterior corner of the eye socket (not the eye itself) with one hand and apply firm pressure in the throat area with your other hand.

If you still cannot open the mouth, use the rope loops covered with protective tubing or the avian speculum as mouth openers. The mouth openers will enable you to open the turtle's mouth, and the mouth gags will maintain your access inside a turtle's mouth so you can remove any hooks and/or line. Keep in mind that different mouth gags will block your view inside the mouth in various ways. Therefore, select which mouth gag will best suit the dehooking or disentanglement procedure that you need to perform. You can improve your visibility at the back of the turtle's mouth and upper esophagus by using the needlenose pliers. After securing the mouth open, gently slide the pliers in the closed position forward into the upper esophagus and separate the pliers' jaws to open the "throat."



The following devices can be used to open the mouth and/or maintain the mouth in an open position:

3.3.1 Loops of rope with protective tubing (both a mouth opener and mouth gag)

Slide the rope with the protected tubing in between the jaws and move it away from the front of the mouth to gain the greatest leverage. Care should be taken to avoid contact with the eyes. With the free ends of the rope knotted together to form a loop, you can hold the lower rope loop with your foot and the other with one hand, leaving one free hand.

3.3.2 Large avian oral speculum (both a mouth opener and mouth gag)

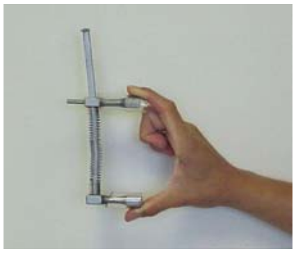
Slide the avian speculum flat inside the turtle's mouth and rotate it. Notice that the speculum is stepped and can be used for different sized turtles by selecting for its different widths. This mouth opener can be used only on the smallest of the animals.

3.3.3 Block of hard wood (mouth gag)

Soak the wood block/handle first to soften it and decrease damage to the beak. Position it in the posterior corner of the jaw to keep the mouth open.

3.3.4 Set of (3) canine mouth gags (mouth gag)

This type of gag locks into the open position and allows for hands free operation once it is in place. The canine mouth gag's arms are compressible when they are perpendicular to the main axis. The rubber feet on the gag lock nicely into the groove on the upper and lower beak. When the turtle bites down on the extremity of the arms, they will shift from being perpendicular and therefore will lock. Use the smallest one possible that will not crush. Compress the gag and insert it in the turtle's mouth. As the turtle opens its mouth, the gag will expand. Maintain your hold on the gag until it has locked in place. Do not force the turtle's mouth open all the way; let the spring tension on the gag and turtle's own mouth movement set the maximum open position. Position the mouth gag at the front center of the jaw with the axis off to one side to provide the maximum open working area in the mouth and the surest footing for the gag.


3.3.5 Set of (2) nylon dog chew bones (mouth gag)

Position the proper size dog bone in the posterior corner of the jaw to keep the mouth open. The larger bones are easy to hold, but block access to much of the mouth. Smaller bones do not reduce your view inside the turtle's mouth and work equally well.

3.3.6 Hank of rope (mouth gag)

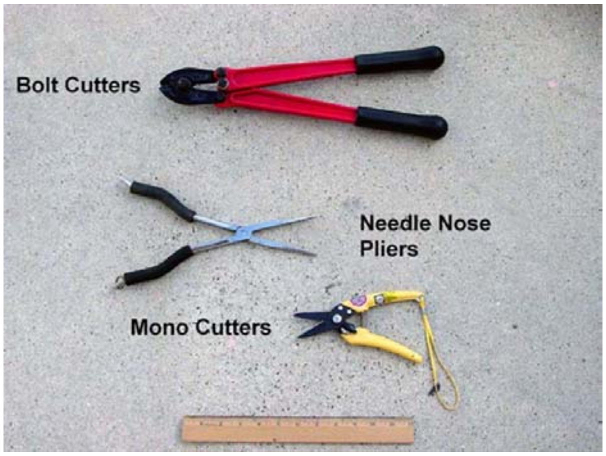
Position the lanyard in the posterior corner of the jaw to keep the mouth open. Alternatively, you can place the rope across the entire width of the mouth and block both sides of the jaw, but this blocks your view of the back of the mouth.

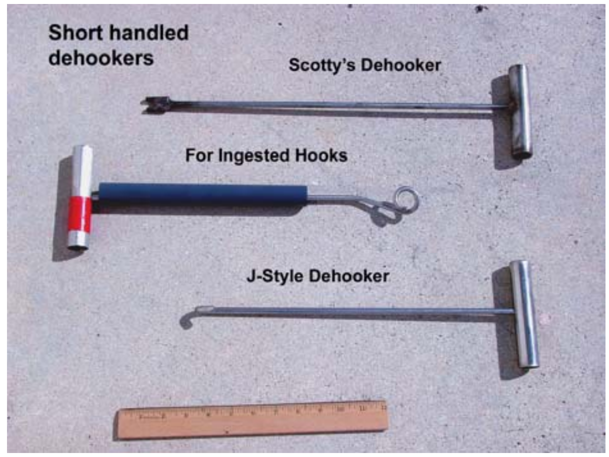
3.3.7 Set of (4) PVC splice couplings (mouth gag)

Insert the appropriate size PVC splice coupling (chosen by considering both the size of the turtle and the tools to be used) inside the turtle's mouth. Hold it steady with a pair of pliers to stabilize it inside the mouth. In order to prevent the coupling from interfering with the dehooking devices, thread the line through the coupling before inserting it.

3.4 Equipment to remove hooks

When dehooking is possible, several devices may be used to remove hooks depending on the depth and location. Some hooks that are lightly hooked externally may be easily removed using your hand. The following hand-held devices may also be used.





3.4.1 Needle-nose or long-nose pliers

The needle-nose pliers can be used to remove hooks that are deep in the animal's flesh and must be twisted during removal. They are also useful in holding PVC splice couplings in place when used as mouth openers, and can be used to remove hooks in the mouth in some situations.

3.4.2 Bolt cutters

Bolt cutters are essential for removing hooks, as the easiest way to remove a hook may be to cut off the eye or barb so that the hook can be pushed through or backed out without causing further injury to the sea turtle. If the hook cannot be removed, bolt cutters should be used to cut off as much of the hook as possible.

3.4.3 Short-handled dehooker for internal hooks

a) 16” Hand Held Bite Block Deep-Hooked Turtle ARC Dehooking Device (Refer to Plate 3.4.3.a)

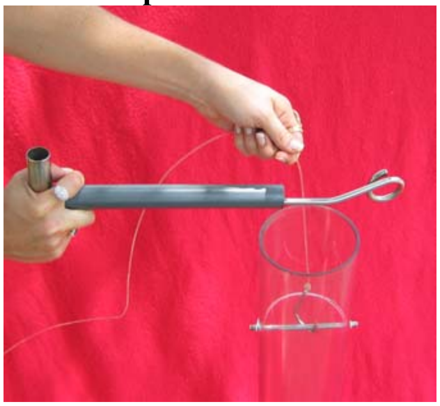
This device has been designed to prevent sea turtles from biting down on the dehooking device during internal hook removal. The PVC bite block also reduces the damage on the sea turtle’s beak if the turtle bites down.

a) To correctly use this dehooking device you must keep the PVC bite block pulled up along the handle when engaging the leader to allow for proper leader and hook engagement.
b) Maintain leader tension and place the dehooker on the leader at a 90^0 angle with the open end of the curl up.
c) Pull the dehooker towards you (like a bow and arrow) until the open end of the curl engages (captures) the leader.
d) Turn the dehooker ¼ turn clockwise. The leader is now in the center of the pigtail.
e) Release the bite block allowing it to fall to the bottom of the dehooker. Following the leader, insert the curl and PVC end into the mouth as far as the animal will allow before it bites down.
f) Once the sea turtle bites down, the dehooker will still slide up to 5” in and out.
g) With the sliding motion allowed by the bite block, continue to follow the leader down to the shank of the hook.
h) After the dehooker is seated on the shank of the hook, (leader tight) give a sharp jab downward with the dehooker. The hook is removed, and the point of the hook will rotate and stop on the offset bend of the dehooker, protecting the point and preventing re-engagement of the hook.
i) After hook is dislodged, keep the leader tight and pull the dehooker out until it stops at the PVC bite block.
j) The bite block will cover the hook and further prevent re-engagement.
   Wait for the turtle to open its mouth and remove the entire dehooking device and hook.

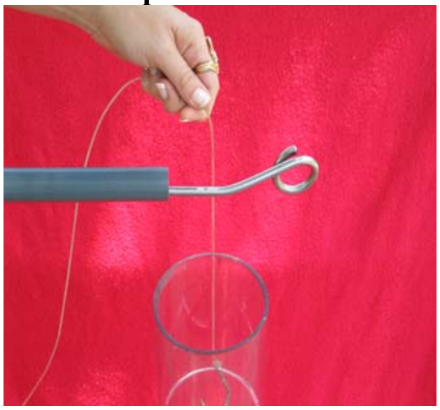
Plate 3.4.3.a

Instructions for the ARC Dehooker with Turtle Bite Block

Step 1



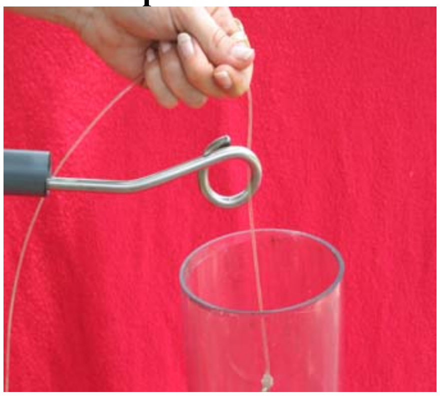
Step 2



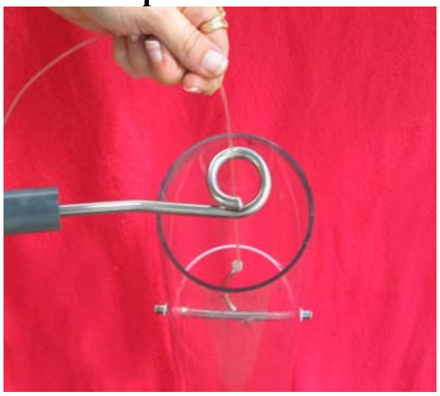
(1) To correctly use this dehooking device you must keep the PVC bite block pulled up along the handle when engaging the leader, to allow for proper leader and hook engagement.

(2) Maintain leader tension and place the dehooker on the leader at a 90 degree angle with the open end of the curl up.

Step 3



Step 4

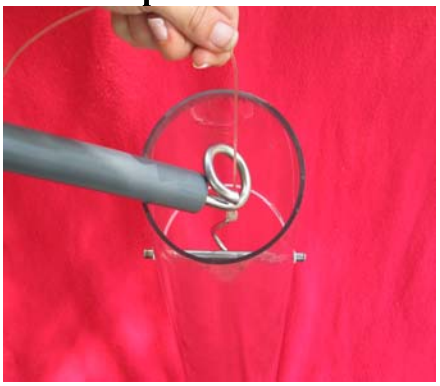


(3) Pull the dehooker towards you (like a bow & arrow) until the open end of the curl engages/captures the leader.

(4) Turn the dehooker ¼ turn clockwise. The leader is now in the center of the pigtail.

Plate 3.4.3.a Continued

Step 5



Step 6

(5) Release the bite block allowing it to slide to the bottom of the dehooker, following the leader, insert the curl and PVC end into the mouth as far as the animal will allow.

(6) Should the sea turtle bite down, the dehooker will slide up to 5" in and out.

Step 7

Step 8

(7) With the sliding motion allowed by the bite block, continue to follow the leader down the shank of the hook.

(8) After the dehooker is seated on the shank of the hook, (leader tight) give a sharp, short jab downward with the dehooker. As the hook is removed, the point of the hook will rotate and stop on the offset angle of the dehooker, protecting the point and preventing re-engagement of the hook

Plate 3.4.3.a Continued

Step 9

Step 10

(9) After the hook is dislodged, keep the leader tight and pull the dehooker out until it stops at the PVC bite block.

(10) The bite block will cover the hook and further prevent re-engagement.

Step 11

(11) Wait for the turtle to open its mouth and remove the entire dehooking device and hook.

3.4.4 Short-handled dehooker for external hooks

a) Short-handled "J-style" dehooker or "Flipstick" (refer to Plate 2.1.3.b.1)

This dehooker is designed for use only when the hook is visible in the front of the mouth or beak (and the barb is not visible), or is external. Use of the "J-style" dehooker requires a pulling motion to be employed; consider hook location and placement prior to use. Hold the leader in your left hand with tension and hold the "J-style" dehooker in your right hand. Place the dehooker on the leader and follow the leader down until it bottoms out on the shank of hook. With tension on the leader, lower the left hand (the hand with the leader) to the 8 o'clock position, and lower the right hand with the dehooker to the 2 o'clock position. Twist the dehooker slightly and pull until the hook is dislodged, and be cautious not to allow the hook to re-engage once removed.

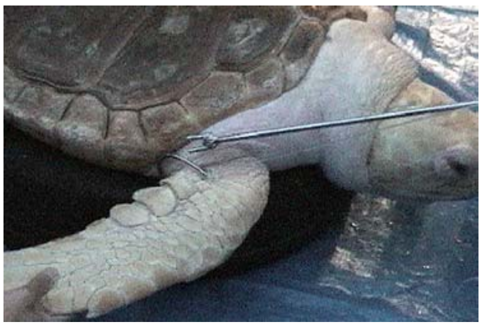
b) Scotty's dehooker (Refer to Plate 3.4.4.b)

This dehooker is designed for use only when the hook is visible in the front of the mouth or beak (and the barb is not visible), or is external. Use of the Scotty's dehooker requires a pushing motion to be employed, consider hook location and placement prior to use. Hold the leader in your left hand with tension, and hold the Scotty's dehooker in your right hand. Position the dehooker to where it is firmly seated against the shank of the hook. Bring both hands together (leader and dehooker parallel with each other) while maintaining tension on the leader. With the leader and dehooker together, give a short, sharp jab to dislodge the hook and remove it from the animal. Be cautious not to allow the hook to re-engage once removed.

Plate 3.4.4.b

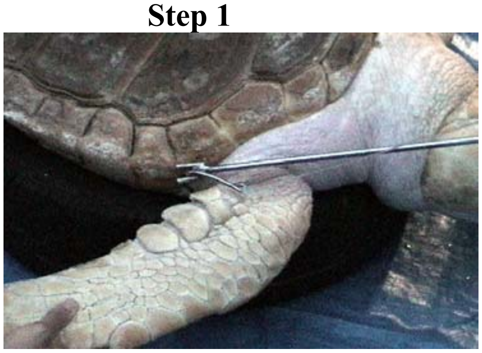
Instructions for Scotty's Dehooker

This dehooker is designed for removing hooks visible in the front of the mouth or beak, or external hooks. Use of Scotty's dehooker requires a pushing motion, and hook location should be considered when choosing this tool.

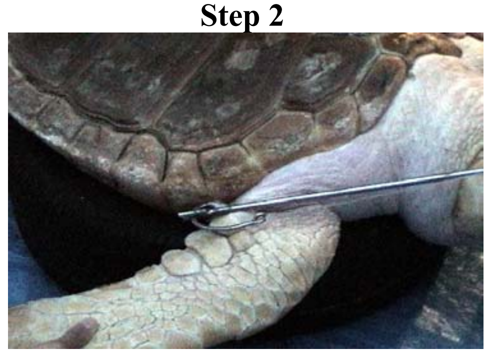


Step 1

Step 2



Step 3



Step 4

Step 5

(1) Hold leader in left hand with tension and hold Scotty's dehooker in right hand.
(2) Position the dehooker so that it is firmly seated against the shank of the hook.
(3) Bring both hands together (leader and dehooker parallel with each other) while maintaining tension on the leader. With the leader and dehooker together, give a short, sharp jab to dislodge the hook and remove it from the animal.
(4) Rotate or twist slightly if necessary to remove the hook.
(5) Be careful not to allow the hook to re-engage once removed.

3.5 <u>Equipment to cut monofilament line</u>

See Section 2.1.2.b.

3.6 <u>Releasing the turtle</u>

Once gear is removed and the turtle recovered, boated turtles should be released in waters of similar temperature as at capture, preferably in a non-fishing area. Release the turtle by lowering it over the aft portion of the vessel, close to the water's surface, when gear is not in use and the engines are in neutral. The turtle's behavior and swimming and diving abilities should be monitored after release and recorded in the daily logbook.

References

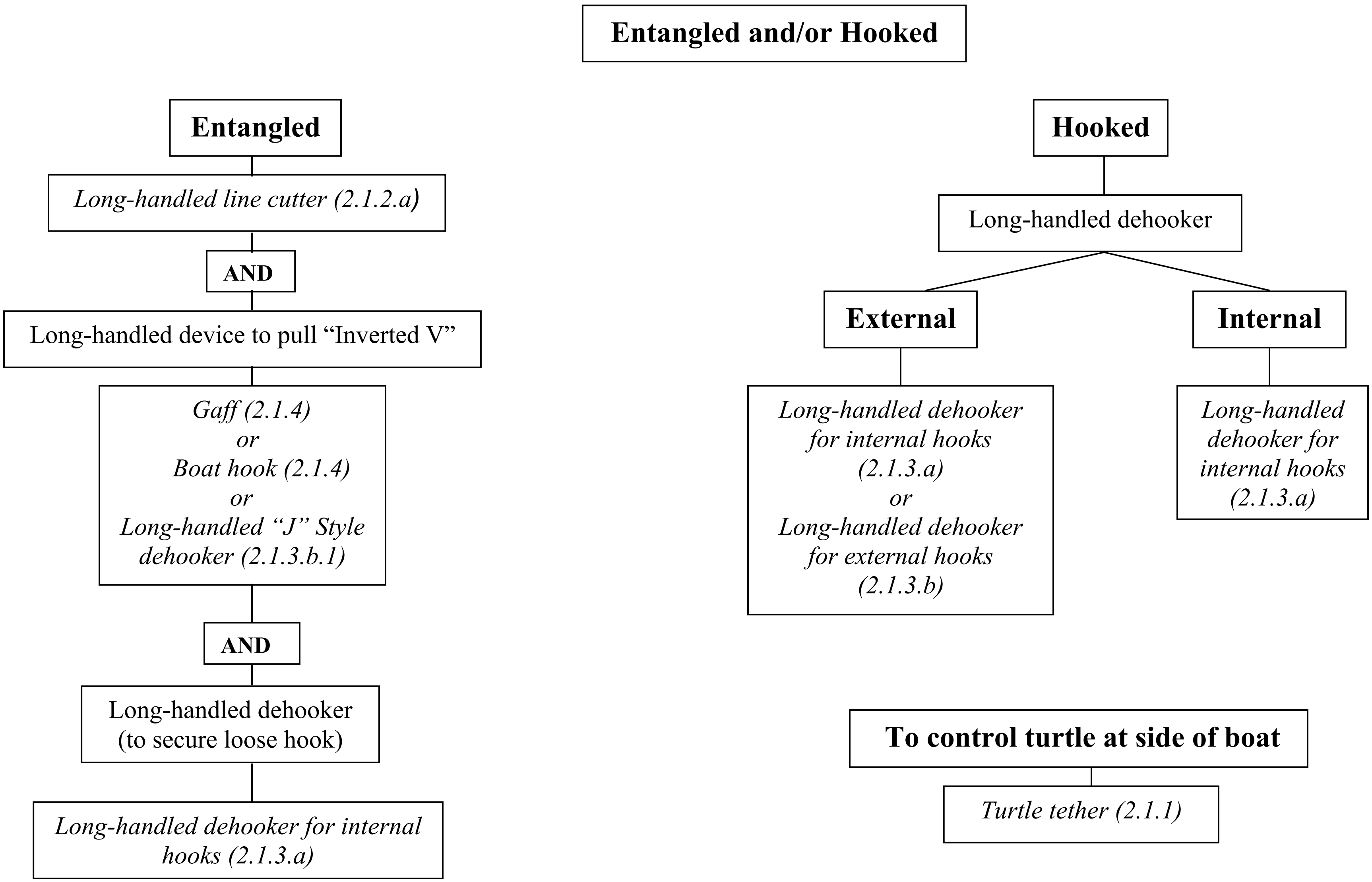
Epperly, S., and D. Hataway. 2004. Leatherbacks Aboard. Video. http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, FL.

Hataway, D., and S. Epperly. 2004. Removing Fishing Gear from Longline Caught Sea Turtles. Video. http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, FL.

Watson, J.W., D.G. Foster, S. Epperly, and A. Shah. 2004. Experiments in the Western Atlantic Northeast Distant Waters to Evaluate Sea Turtle Mitigation Measures in the Pelagic Longline Fishery. Report on Experiments Conducted in 2001-2003. http://www.mslabs.noaa.gov/mslabs/docs/pubs.html. National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi Laboratory.

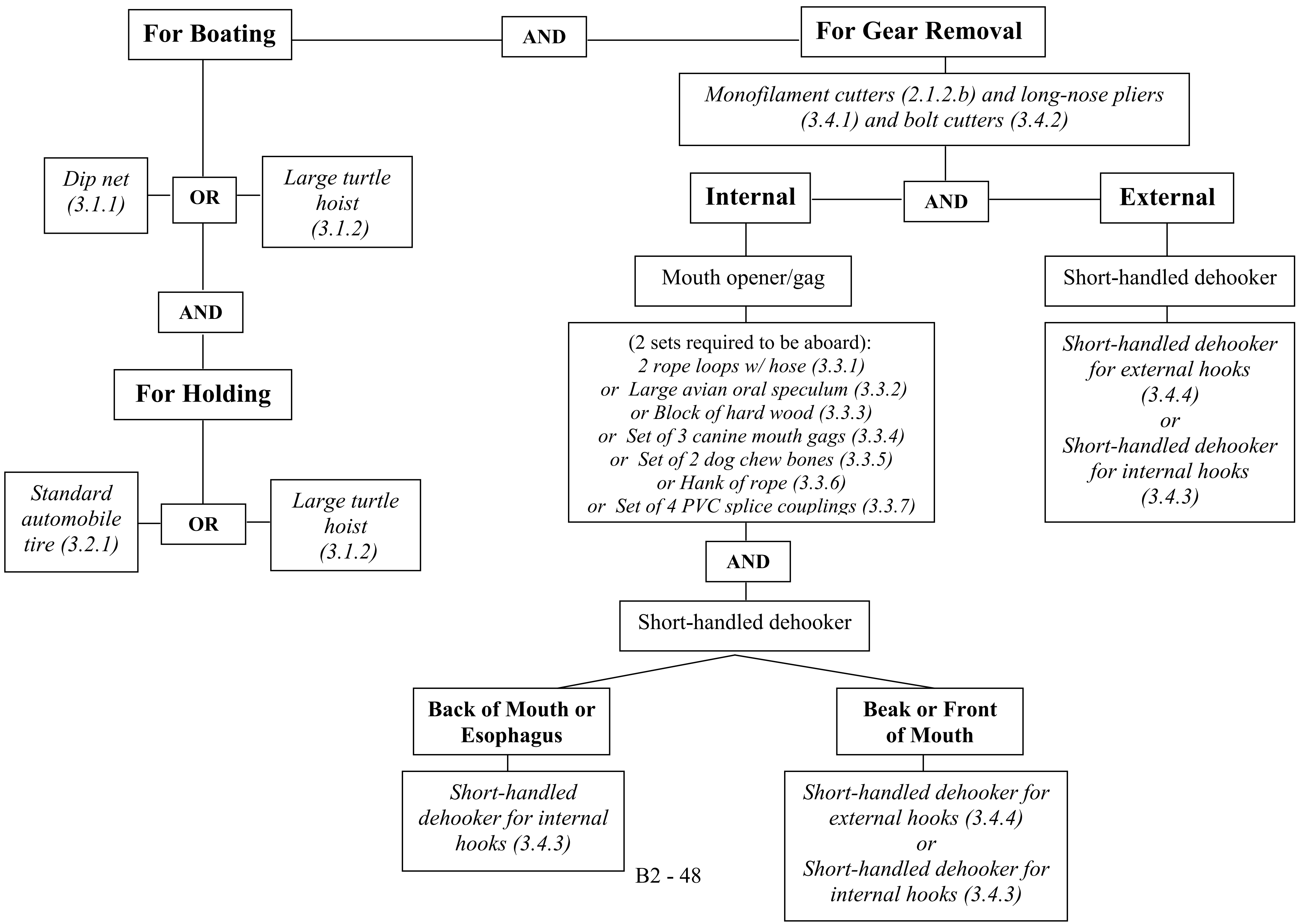
Part 4

Sea Turtles Not Boated



Part 5

Sea Turtles Boated



APPENDIX C1

Comments and Responses to Public Comments Received on Draft Supplemental Environmental Impact Statement (DSEIS) and Proposed Rule for the Reduction of Sea Turtle Bycatch and Bycatch Mortality in the Atlantic Pelagic Longline Fishery

Numerous comments were received on this proposed rule and associated DSEIS, draft Regulatory Impact Review (RIR), and Initial Regulatory Flexibility Analysis (IRFA). Comments received were submitted either via letter, fax, E-mail, or at public hearings. This appendix contains a summary of the major comments received and NOAA Fisheries' response. NOAA Fisheries would like to thank all people and agencies who took time to prepare written comments or attend public hearings. A list of persons and agencies who submitted written comments are below.

<u>E-Mail Comments</u>

1. 2/18/2004 E-Comment from B. Sachau
2. 2/25/2004 E-Comment from Sarah Lambert
3. 2/25/2004 E-Comment from Steven Carl, Hi-Liner Fishing Gear & Tackle, Inc.
4. 2/25/2004 E-Comment from Andy Peters
5. 2/25/2004 E-Comment from Scotty Warren
6. 2/26/2004 E-Comment from Aaron Small, Wright and McGill Mfg.
7. 2/26/2004 E-Comment from Scott Bean, Technical Consultant, Jungle Laboratories Corporation
8. 2/27/2004 E-Comment from Randy Pence
9. 3/6/2004 E-Comment from Capt. Mike Carden, F/V Adam-C
10. 3/7/2004 E-Comment from Mark Nicholas
11. 3/11/2004 E-Comment from Ronald B. Hamlin, Dixie Fish Company, Inc.
12. 3/11/2004 E-Comment from Captain Woody Davis, F/V Sea Angel
13. 3/11/2004 E-Comment from Robert J. Jansenius, F/V Shearwater
14. 3/14/2004 E-Comment from Alan B. Bolten, Archie Carr Center for Sea Turtle Research, University of Florida
15. 3/14/2004 E-Comment from Gail Johnson, F/V Seneca, Pocahantas, Inc.
16. 3/14/2004 E-Comment from David Kaszer, F/V Rebel Lady
17. 3/15/2004 E-Comment from Al Mercier, F/V Kristen Lee
18. 3/15/2004 E-Comment from Stephen S. Boynton, President, International Foundation for the Conservation of Natural Resources
19. 3/15/2004 E-Comment from Roderic B. Mast, Co-Chair, IUCN-Species Survival Commission - Marine Turtle Specialist Group
20. 3/15/2004 E-Comment from Lou Orsini, Chief, U.S. Coast Guard Office of Law Enforcement
21. 3/15/2004 E-Comment from Jerry Schill, President, NC Fisheries Association, Inc.

<u>Written Comments</u>

HC1.	3/4/2004	Letter from Michael Nguyen, Commercial Longline Tuna Fishermen Group (124 copies of signed originals)
HC2.	3/15/2004	Letter from Al Mercier, Captain, F/V Kristen Lee
HC3.	3/13/2004	Letter from Glen A. Hopkins, F/V Watersport
HC4.	3/12/2004	Letter from Carol Bickmeyer, Robert W. Borden, Joseph Sadorski, Catherine Barrier, and Ed B.
HC5.	3/12/2004	Letter from Captain Rich Wight
HC6.	3/10/2004	Letter from Mark & Suzanne Bodick, Gulfport Seafood Co. Inc., F/V Rebel Queen
HC7.	3/2/2004	Letter from James Levy, Sales & Purchasing, MacLean's Seafoods
HC8.	3/3/2004	Letter from Captain Dana Kaiser
HC9.	3/9/2004	Letter from Shawn Dick, President and CEO, Aquatic Release Conservation
HC10.	3/9/2004	Letter from James Fletcher, United National Fishermen's Association
HC11.	3/3/2004	Letter from Don Nehls, Lindgren-Pitman, Inc.
HC12.	3/10/2004	Letter from Don Nehls, Lindgren-Pitman, Inc.
HC13.	3/7/2004	Letter from Steven Hoang
HC14.	3/15/2004	Letter from Beau "Butch" Midgett, Etheridge Fishing Supply Co. Inc.
HC15.	3/5/2004	Letter from Daniel J. Shoudear, Captain, F/V Sea Hawk
HC16 .	3/15/2004	Letter from Captain Rick Ross, President, Offshore Harvesters, Inc.
HC17.	3/15/2004	Letter from Sierra B. Weaver and Marydele Donnelly, The Ocean Conservancy
HC18.	3/15/2004	Letter from James Budi
HC19.	3/15/2004	Letter from Nelson R. Beideman, Executive Director, Blue Water Fishermen's Association
HC20.	3/15/2004	Letter from Charlotte Gray Hudson, Todd Steiner, and Brendan Cummings, Oceana
HC21.	3/15/2004	Letter from Heinz J. Mueller, Chief, NEPA Program Office, U.S. EPA
HC22.	3/2/2004	Letter from Tobey Denault, General Manager, MacLean's Seafoods
HC23.	3/2/2004	Letter from David Horton, MacLean's Seafoods

Written Comments Received at Public Hearings

PH1.	3/2/2004	Submittal from James Goncalo, MacLean's Seafoods
PH2.	3/4/2004	Submittal from Nils Stolpe, Fisheries Research Institute
PH3.	3/4/2004	Submittal from Woody Davis, F/V Sea Angel
PH4.	3/4/2004	Submittal from Phillip Rush, Jensen Tuna, Inc.

Summary of Comments Received on Proposed Rule and DSEIS/RIR/IRFA

General Comments

Comment 1: Commenters indicated that oceanographic, biological and physical differences between the Northeast Distant (NED) area, south Atlantic, and Gulf of Mexico (GOM) must be taken into consideration. Specifically, commenters stated that the results of an experiment in the NED should not be used to project impacts or implement management measures in other areas, because there are differences in oceanographic conditions, water temperature, currents, thermoclines, turtle abundance, turtle sizes, fish abundance and fish sizes.

Response: For three years, the Agency committed substantial resources to evaluating fishing gear modifications and strategies to reduce and mitigate interactions between endangered and threatened sea turtles and pelagic longline (PLL) fishing gear. The area for the research was the NED statistical reporting area in the Western Atlantic Ocean. Between 2001 and 2003, over 1,200 pelagic longline sets were made to test, among other things, the benefits of using large circle hooks. The research yielded robust and promising results. Based on that research, consideration of geographical differences, and other available information on sea turtle bycatch reduction efforts, described more in responses to Comments 2-5, the use of large circle hooks (as compared to "J"-hooks) and careful release techniques are expected to be successful in reducing sea turtle interactions and mortality rates throughout the whole fishery.

Comment 2: Several commenters stated that the Agency must recognize differences in the prosecution of the PLL fishery in the NED, south Atlantic, and GOM. PLL vessels in the GOM frequently target yellowfin tuna (YFT) and other tuna species; PLL vessels in the mid-Atlantic often engage in mixed trips for smaller tunas (YFT and albacore), swordfish, dolphin, and wahoo; and, PLL vessels in the NED primarily fish for larger swordfish and bigeye tuna (BET). Commenters noted that there may be differences in the fishing gears used, fishing techniques, depth of gear deployed, prey species, target species, and socio-economic factors. For vessels fishing outside the NED, many of these comments opposed preferred alternative A3 in the DSEIS (18/0 offset circle hook with mackerel of 18/0 non-offset circle hook with squid) and were supportive of non-preferred alternative A5 (16/0 hook with an offset not to exceed 10 degrees). Many commenters supported preferred alternative A10 in the DSEIS (18/0 offset or non-offset circle hook with mackerel or squid bait, respectively) for fishing in the NED.

Response: The U.S. PLL fishery for Atlantic HMS is a far-ranging fishery that targets swordfish, YFT, or BET tuna in different areas and in different seasons. Secondary target species include dolphin, albacore tuna, pelagic sharks, and several species of large coastal sharks. Permit holders range from Maine to Texas, and fishing techniques vary by region according to target species. Vessel operators may be opportunistic, switching gear style and making subtle changes, oftentimes during the same trip, to maximize economic opportunities. In addition, the economic characteristics of vessels fishing in New England (including the NED) and the Carribean regions differ from those fishing predominantly in the mid-Atlantic, south Atlantic and Gulf of Mexico regions. Economic studies confirm that PLL vessels fishing predominantly in New England and the Carribean regions generate approximately five times the amount of net revenues per trip when compared to vessels fishing predominantly in the mid-Atlantic, south Atlantic, and GOM regions (Porter *et al*, 2001).

Extensive public comment indicated that the proposed measures could cause severe economic hardship, leading to possible business foreclosures in the mid-Atlantic, south Atlantic, and GOM. Based upon public comment and a re-examination of data pertaining to reductions in bycatch and bycatch mortalities associated with various hooks and baits (see responses to Comments 3 and 5), the Agency has modified the final regulations to address geographical differences by allowing, outside the NED, either 18/0 circle hooks with an offset not to exceed ten degrees, or 16/0 non-offset circle hooks, and either squid or whole finfish bait. These modifications will provide additional flexibility to target species that are more frequently encountered outside the NED. The final circle hook and bait regulations, and the requirements to possess and use sea turtle handling and release gears, are expected to significantly reduce sea turtle interactions and mortalities throughout the PLL fishery. Therefore, to the extent practicable, this final rule minimizes adverse economic impacts on fishing communities, as required by National Standard 8 of the M-S Act, and complies with other applicable Federal law. However, as described in a Biological Opinion issued on June 1, 2004 (2004 BiOp), if the management measures contained in this final rule do not achieve certain specified levels of reductions in leatherback mortalities, the Agency must initiate a future rulemaking to consider other additional measures, consistent with the 2004 BiOp.

Comment 3: Additional research on circle hooks and baits, including their subsequent effects on turtle interactions, post-hooking mortality rates, and target species catches, should be undertaken in areas that more closely exemplify conditions in the south Atlantic and GOM, and the final regulations should be based on these studies.

Response: Existing scientific studies, including the NED research experiment, and GOM observer data support the use of large circle hooks and careful release techniques to reduce sea turtle interaction rates and mortality rates throughout the PLL fishery. Based upon a review of available information, the Southeast Fishery Science Center's (SEFSC) principal investigators for the NED research experiment have advised allowing the use of a 16/0 non-offset circle hook in the GOM and other areas outside the NED. Available data indicate potential adverse impacts of a larger hook on target species (particularly, yellowfin tuna) catches.

A significant reduction in loggerhead sea turtle mortality is anticipated through use of the 16/0 non-offset circle hook. Studies in the Azores PLL fishery in 2000 and 2001 (Bolten *et al.*, 2002) and in Canada (Javitech Ltd., 2002) showed a significant percentage of 16/0 circle hooks hooking loggerhead turtles in the mouth. Circle hooks improve the probability of survival after an interaction, relative to "J"-hooks, because they usually hook in the jaw and are not swallowed; this appears to be true for many marine species and circle hook sizes (Lucy and Studholme, 2002). Observer data from the GOM (Garrison, 2003b), showing no loggerhead turtles observed captured on circle hooks, and a lower average catch rate of leatherback turtles on 15/0 and 16/0 circle hooks compared to 7/0 and 8/0 "J"-hooks, support this conclusion.

Leatherback sea turtle interactions primarily result from "foul hooking," i.e., hooking in the flipper, shoulder, or armpit. Circle hooks are expected to reduce foul hooking because the point turns in towards the shank and is effectively shielded. The NED experiment demonstrated that

18/0 and 20/0 circle hooks reduce the number of turtles foul hooked by PLL gear. Canadian observer data (Javitech Ltd., 2002) and GOM observer data (Garrison, 2003b) also show reductions in catch rates of leatherback turtles on 16/0 circle hooks as compared to “J” hooks. SEFSC scientists expect that a 16/0 non-offset circle hook will be just as efficient as an 18/0 circle hook at reducing foul hooking of leatherback turtles, and possibly more efficient, because the gap between the point and the shank on a 16/0 hook is smaller than that of an 18/0 hook. The requirement that 16/0 circle hooks be non-offset is an additional precautionary measure to reduce the likelihood that the smaller hooks will get swallowed or lodged in a turtle’s throat or esophagus, or result in foul-hooking.

This final rule, which allows the use of 16/0 or larger non-offset circle hooks outside the NED, is based upon the above-described studies and other data, which constitute the best available scientific information at this time. These measures are expected to have significant benefits for sea turtles. However, the Agency will continue to monitor and conduct research to evaluate bycatch mitigation techniques and impacts on target and non-target species. In fact, there is research currently underway in the GOM to compare target catches using 16/0 and 18/0 circle hooks, but that information is preliminary and is not sufficiently developed to be considered in this rule. The 2004 BiOp also requires additional research and/or analysis on the effects of different offsets, evaluation of the leatherback bycatch reduction, confirmation of the effectiveness of the hook and bait combinations, and improved data collection and reporting from observed trips to aid in completing these analyses.

Comment 4: Some commenters indicated that portions of the GOM and the Northeast Coastal (NEC) area should be closed to PLL fishing (as described in non-preferred alternatives A12, A13, A14, and A15 of the DSEIS) because sea turtles taken in those regions are larger than those taken in the NED, and because the hook and bait treatments tested in the NED are unproven in warmer waters.

Response: This final rule will require the use of large circle hooks and the possession and use of specific gear removal equipment. In addition, the Agency will engage in outreach and education efforts, and pursue training and certification in sea turtle handling and release protocols throughout the PLL fishery. These management actions are expected to provide significant conservation benefits to sea turtles of all sizes. Additional adaptive management measures, including consideration of a Gulf of Mexico or alternative closure(s), would be instituted if monitoring indicates that requirements set forth in the 2004 BiOp for this fishery are not being met. Because this action would require circle hooks throughout the fishery, any such closure(s) would involve further rulemaking to account for the changed baseline due to the application of circle hooks. Potential redistribution of effort, impacts on sea turtles and other target and non-target species, and costs and benefits of any future closures would, similarly, need to be assessed using this new baseline. Please refer to the response to Comment 3 for information regarding the anticipated effects of circle hook and bait treatments outside of the NED.

Comment 5: Several comments relating to the data used to develop the DSEIS and proposed rule included: (1) Other studies such as the Azores study (Bolten *et al.*, 2002) and the Garrison analysis (2003) should have been included; (2) the NED data are preliminary and should not be relied upon; (3) the number of observed sea turtle interactions is probably too low; and, (4) there is no information in the DSEIS regarding the number of sea turtle mortalities. Several other data comments are discussed under "protected resources issues" below.

Response: The best scientific information available has been used in developing the final rule, including information from Bolten et al. (2002) and Garrison (2003). Hook and bait treatments that were found to be effective during the three-year NED research experiment will be directly applied to PLL fishing in the NED closed area. The NED experimental data are robust, and measures to be applied in the NED are expected to replicate the impressive bycatch reduction results that were obtained there. In other areas, slightly smaller (16/0 or larger), non-offset circle hooks, or 18/0 circle hooks with an offset not to exceed 10 degrees, will be required. These measures are supported by the studies and recommendations described in the response to Comment 3.

The number of observed sea turtle interactions is derived directly from trips with observers onboard (3.7 percent of sets were observed with 273 observed interactions in 2001; 8.9 percent of sets were observed with 335 interactions in 2002). The total estimated number of interactions is calculated by determining sea turtle catch per hook using observed sets, and then expanding that by the total number of hooks fished as reported in the mandatory PLL logbook. A total of 1,208 leatherback interactions were estimated during 2001, and 962 during 2002. A total of 312 loggerhead interactions were estimated during 2001, and 575 during 2002. Potential sources of bias and uncertainty in these estimates are provided in "Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2001 - 2002," (Garrison, 2003a). That report estimates 13 loggerhead instantaneous mortalities (*i.e.*, dead when brought to the boat) and 0 leatherback instantaneous mortalities in 2001. For 2002, 0 loggerhead instantaneous mortalities and 33 leatherback instantaneous mortalities are estimated. Post-interaction mortality estimates are discussed in the 2004 BiOp.

Proposed Restrictions on Allowable Baits

Comment 6: Many commenters stated that requiring only Atlantic mackerel or squid bait, depending upon whether the hook is offset or not, would not provide enough flexibility to adapt to changing conditions that may occur during longer PLL fishing trips. Commenters stated that both types of baits should be allowed to be possessed and used. One commenter requested that there be no bait restrictions, stating that hook type, and not bait, is the most important factor in reducing sea turtle interactions. Several commenters stated that PLL vessels in the GOM typically utilize thread herring and Spanish sardines for bait, thus, requiring non-indigenous bait could result in adverse economic impacts due to the non-availability of such bait or potential reductions in the catches of target species. Other commenters stated the use of any finfish other than whole Atlantic mackerel could significantly reduce turtle conservation benefits.

Response: The final rule has been modified to allow the use of both Atlantic mackerel and squid bait inside the NED, and whole finfish and squid bait outside the NED, with specified circle hooks. The NED research experiment demonstrated that significant sea turtle conservation benefits may be obtained using large circle hooks with certain baits (Watson *et al.* March 2, 2004). Relative to the 9/0 "J"-hook baited with squid, the combination of 18/0 circle hooks and mackerel bait reduced the loggerhead interaction rate by 86 - 90 percent, and the leatherback interaction rate by 65 percent. The 18/0 circle hooks baited with squid reduced the loggerhead interaction rate by 65 - 87 percent, and the leatherback interaction rate by 64 - 90 percent. In 2002, mackerel bait and squid bait were both tested on 9/0 "J" hooks to investigate the effect of bait on turtle interaction rates. When compared to squid bait, mackerel bait reduced loggerhead interactions by 71 percent, and leatherback interactions by 66 percent. Mackerel bait also increased swordfish catch but significantly reduced tuna catch on the control 9/0 "J"-hooks, compared to squid. Because both mackerel and squid are effective at reducing turtle interactions, and there are differences in the effectiveness of the baits with regard to the target species catches, the final rule allows either mackerel or squid to be possessed and used in the NED, but only with 18/0 or larger circle hooks with an offset not to exceed 10 degrees. This modification will allow fishermen to adapt to changing conditions, and replicate the impressive bycatch and bycatch mortality reductions that were achieved in the NED experiment.

The response to Comment 3 explains the significant sea turtle conservation benefits that are anticipated by requiring the use of either 16/0 or larger non-offset circle hooks, or 18/0 circle hooks with an offset not to exceed 10 degrees outside the NED. To provide additional flexibility and to mitigate for potential adverse economic impacts associated with non-availability of Atlantic mackerel or reduced catches due to the use of non-indigenous baits, the final rule allows both whole finfish and squid bait to be used outside the NED, with either of the specified hook types. This rule, along with outreach, education, training and other related actions, are expected to have significant conservation benefits for sea turtles. See the response to Comment 4 for further explanation.

Comment 7: One commenter stated that observed PLL sets in the GOM for 1992 - 2002 showed that circle hooks with squid produced the highest interactions with leatherback sea turtles whereas circle hooks with fish (primarily dead Spanish sardines) had the lowest catch rates.

Response: While circle hooks baited with squid in the GOM did show higher leatherback interactions than circle hooks baited with fish, there were a very low number of circle hook sets that were baited with squid. Consequently, it is not possible to draw a statistically significant conclusion regarding bait effects from the GOM data (Garrison, 2003). The Agency will continue to examine the effects of bait type throughout the PLL fishery.

Comment 8: One commenter indicated that specifying only Atlantic mackerel or squid bait could result in the overfishing of these species.

Response: Atlantic mackerel (Scomber scombrus), shortfin squid (Illex illecebrosus), and longfin squid (Loligo pealeii) are managed by the Mid-Atlantic Fishery Management Council under the provisions of the Atlantic Mackerel, Squid and Butterfish Fishery Management Plan (FMP). Any landings of these species for bait in the PLL fishery must be in accordance with the provisions of this FMP. Atlantic mackerel are managed using an annual quota. Management measures for shortfin squid include limited entry, annual quota specifications, and trip limits when 95 percent of the annual quota is reached. Management measures for longfin squid include limited entry, seasonal quota specifications, and gear restrictions. As of January 2000, the Atlantic mackerel resource was not overfished, and overfishing was not occurring. The stock status of shortfin squid was unknown through 2002; however, overfishing was not likely to be occurring (NEFSC 37th SARC). Longfin squid were not likely to be overfished, nor was it likely that overfishing was occurring, as of 2001 (NEFSC 34th SARC). Because squid and mackerel are currently being effectively managed through the existing FMP, the Agency does not expect the management measures in this final rule to result in an appreciable increase in fishing effort for these species, or cause overfishing.

Proposed Restrictions on Allowable Hooks

Comment 9: The Agency received a wide range of comments regarding circle hooks, in general. One commenter stated that circle hooks will not reduce sea turtle bycatch or bycatch mortality, and that the existing data are too preliminary to be relied upon. Another comment stated that the recent increase in turtle interactions in the GOM was attributable to many vessels switching from circle hooks to small "J"-hooks following the prohibition on live bait, and that the proper solution is to require circle hooks. Several commented that the most significant benefits to sea turtles would be realized by using circle hooks rather than "J"-hooks, and that the size of hooks is a less important factor. One commenter opposed the use of circle hooks because they are ineffective at catching fish, are difficult to work with, take more time to remove, and may cause more injury to leatherback turtles than "J"-hooks when they are removed. Finally, one commenter applauded the move away from "J"-hooks towards circle hooks and requested that the Agency act as quickly as possible.

Response: Requiring the use of circle hooks throughout the PLL fishery is an important step that will have significant conservation benefits for sea turtles. Several studies described above, including three years of research in the NED, have documented the effectiveness of circle hooks at reducing bycatch and/or bycatch mortality of sea turtles. In addition, in the GOM, PLL fishermen deployed an appreciable amount of circle hooks for several years, and observer data from that area show that estimated leatherback and loggerhead turtle interactions were generally lower when circle hooks (16/0) were most frequently used (1992, 1998, and 1999), and generally higher when circle hooks (16/0) were least frequently used (1996, 1997, 2000, 2001, and 2002).

The NED experiment conducted 29 sets during 2003 to compare offset 16/0 circle hooks with 18/0 offset circle hooks. Although the results indicated higher interactions with the 16/0 offset hooks than with the 18/0 offset hooks, the Agency anticipates that allowing 16/0 hooks without any offset outside the NED will significantly reduce turtle mortalities and could result in fewer turtle interactions involving foul hooking. The NED experiment additionally demonstrated that catches of target species can be increased or, at least, remain constant using circle hooks.

As with any new gear, there probably will be period of time during which fishing crews adjust to circle hooks. However, these hooks are not expected to be prohibitively difficult to work with, as some vessels already use them. The final rule additionally requires that pelagic longline vessels possess and use several pieces of sea turtle release gear, and adhere to careful handling and release protocols. When properly used, these gears will facilitate hook removal and reduce turtle injuries occurring as a result of interactions. Fishing crews should familiarize themselves with the proper use of the release gear and the careful release protocols, because the final rule requires removal of as much fishing gear as possible without causing further injury to a sea turtle prior to its release.

Comment 10: A large proportion of comments were opposed to the use of 18/0 circle hooks outside the NED, primarily because they are too large to catch some target species, including small YFT, albacore tuna, dolphin, wahoo and other pelagics. For this reason, the commenters stated that requiring 18/0 circle hooks outside the NED would reduce catches and create adverse economic impacts. Many of these comments were supportive of a requirement to use 16/0 circle hooks, as contained in non-preferred alternative A5 of the DSEIS. Some cited studies conducted in the Azores (Bolten et al., 2002) and observer data in the GOM as evidence that a 16/0 hook would be effective at reducing turtle mortalities. Others stated that a 16/0 hook would pose less risk than an 18/0 hook at foul-hooking leatherback turtles, the species most commonly interacted with in the GOM, because of the smaller gap between the barb and the shank.

Response: As described in the responses to comments 1-5, the final management measures have been modified to allow the use of 16/0 or larger non-offset circle hooks outside the NED.

Comment 11: Many commented that requiring the use of only either flat or offset circle hooks, depending upon whether squid or mackerel bait is used, would not provide flexibility to adapt to changing conditions on longer PLL trips, thus both types of hooks should be allowed. One commenter stated that maintaining the sharpness of a flat (non-offset) circle hook is more difficult than with offset hooks and could potentially reduce catches if flat hooks (with squid) are used. To the contrary, others stated that offsetting a circle hook greatly reduces its design advantages and that the use of large mackerel bait may have confounded the results obtained with the offset 18/0 circle hook in the NED experiment. These commenters stated that, until a robust experimental design is established to test the impact on loggerheads of the 18/0 non-offset circle hook vs. the 18/0 offset circle hook, the final regulations should only allow for the use of 18/0 non-offset circle hooks.

Response: The NED research experiment concluded that there is no significant difference in model-based reduction rates due to non-offset 18/0 circle hooks with squid baits and offset 18/0 circle hooks with squid baits for loggerhead and leatherback sea turtles. Therefore, the final regulations require vessels within the NED to possess and use only 18/0 or larger circle hooks with an offset not to exceed 10 degrees, and either Atlantic mackerel or squid bait. Vessels fishing outside the NED must possess and use 18/0 or larger circle hooks with an offset not to exceed 10 degrees or 16/0 circle hooks, but only if the hook is flat (non-offset). The requirement that 16/0 circle hooks be non-offset is a precautionary measure to reduce the likelihood that the smaller hooks will get swallowed or lodged in a turtle's throat or esophagus, or result in foul-hooking.

Comment 12: Commenters requested that the requirement to use corrodible hooks in the PLL fishery be removed, because there is no scientific or biological rationale to justify their use.

Response: The requirement to use corrodible hooks and crimps was implemented as part of the Reasonable and Prudent Alternative (RPA) in the June 14, 2001 BiOp (2001 BiOp). It is intended to improve the survival of sea turtles that are hooked when external hooks cannot be removed, or when hooks are deeply embedded and no attempt to remove the hook can be made. The Agency intends to collect and analyze additional information on hook removal rates resulting from implementation of this final rule and, depending upon those rates, will consider removal of the requirement to use corrodible hooks in a future rulemaking.

Sea Turtle Release Gear and Careful Handling Protocols

Comment 13: Most of the comments received concerning the requirements to possess sea turtle release gear and to adhere to careful handling protocols (alternative A16) were supportive of the proposed measures. Several commenters suggested either voluntary or mandatory training (in-person, online, or via other media such as CD, DVD, or videotape) for captains and/or crew members to improve the effectiveness of the gear and compliance with the protocols. Another suggestion was that the Agency provide either a certificate of completion or attendance and that a person or persons possessing the certificate be required onboard all PLL vessels.

Response: The requirements to possess and use sea turtle release gear and to adhere to careful handling protocols are important components of this final rule. Under this rule, an Agency-approved document describing sea turtle careful release protocols is required to be onboard each PLL vessel. Fishing captains and crew members should familiarize themselves with the proper use of release gear and the protocols, as the final rule requires removal of as much gear as possible without causing further injury to a sea turtle prior to its release. Consistent with the 2004 BiOp, the Agency has established a Point of Contact (POC) to, among other things, answer questions that fishermen may have regarding the release gear and handling protocols. POC information is provided in the final rule, and also on the HMS website at http://www.nmfs.noaa.gov/sfa/hms. In addition, an educational video mpeg file entitled "Removing Fishing Gear from Longline Caught Sea Turtles" is currently available at: www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp, and will be distributed to PLL vessels during the summer of 2004. This video mpeg demonstrates the proper use of the required and recommended release turtle gear in the rule. The Agency will conduct additional education and outreach efforts and pursue mandatory training and certification for the fishery. Workshops or other training programs are already under consideration in the development of Amendment 2 to the HMS FMP.

Comment 14: Several commenters stated that the "turtle tether" should be required onboard all PLL vessels in the final regulations, rather than only recommended in the protocols.

Response: Further refinements in the design standards and procedural protocols for use of the "turtle tether" are still being developed. After further development and testing, the Agency may reconsider requiring the turtle tether in a future rulemaking.

Comment 15: Commenters stated that the proposed regulations only generally address the removal of hooks from sea turtles, and do not specify how to bring turtles onboard, how to restrain them, and how to release them.

Response: Because of the many contingencies that may arise when a turtle is encountered, the final rule does not attempt to address every possible contingency. The rule specifies certain important requirements, such as removing as much gear as possible and releasing the turtle without causing further injury, and refers to the "Careful Release Protocols" for additional guidance and requirements. As noted in the response to Comment 13, the Agency will conduct outreach and other educational efforts relating to safe handling and release of turtles.

Comment 16: Some commenters wrote that the proposed requirements to possess and utilize sea turtle handling and release gears (alternative A16) were not reasonable, because the gear is difficult to obtain and costly.

Response: Sea turtle handling and release equipment will impose initial compliance costs estimated to range from $485.00 - $1056.50, depending upon whether the equipment is fabricated from available materials or purchased from suppliers. The design standards for line clippers have changed only slightly, and one model that meets the existing standards also meets the new design standards. The design standards for dipnets have similarly only been slightly modified, by specifying the length and carrying capacity of the handle. Other required equipment, including bolt cutters, monofilament cutters, boat gaffes, and needle-nosed pliers are relatively inexpensive and available at most hardware or boating supply stores. Dehookers are also available from commercial suppliers. A standard automobile tire to hold boated turtles should not be difficult to obtain. Finally, a variety of mouth openers/gags have been approved, specifically to reduce costs. For example, the two required mouth openers/gags could consist of a block of hard wood and two pieces of rope covered with hose, provided they meet the design specifications in the final rule. Some of the release equipment can be fabricated from readily available materials in order to reduce costs. The Agency acknowledges that the requirements to possess and use this equipment according to the "Careful Release Protocols" impose both financial and logistical burdens on the public; however they are essential for the PLL fleet to reduce sea turtle mortalities.

Environmental Impacts and Analyses

Comment 17: Several commenters requested that the Agency prohibit pelagic longlines (alternative A11), implement large "no-fishing" areas for pelagic longlines (alternatives A12, A13, A14, & A15), prohibit swordfishing in the Atlantic basin, or allow only rod and reel or handline fishing for HMS, to provide greater protection for sea turtles and other marine life.

Response: Prohibition of PLL gear was considered but not further analyzed because other effective sea turtle bycatch and bycatch mortality reduction alternatives are available. See response to Comment 4 regarding possible, future consideration of closures. In addition, prohibition of PLL fishing is not needed to rebuild the Atlantic swordfish stock. Overfishing is not occurring, and the stock is in recovery with biomass at the beginning of 2002 estimated to be at 94 percent (range: 75 to 124 percent) of the biomass needed to produce maximum sustainable yield (MSY). This estimate is up from an estimate of 65 percent of MSY, as provided in the 1998 assessment. The 2001 fishing mortality rate was estimated to be 0.75 times the fishing mortality rate at MSY (range: 0.54 to 1.086) (SCRS, 2002).

It is important to emphasize that unilateral efforts by the U.S. to protect sea turtles and HMS in the Atlantic Ocean would likely be insufficient to rebuild populations of these species, because the U.S. fleet constitutes only a small part of the international fleet that competes on the high seas for catches of swordfish and tunas. In fact, U.S. PLL landings account for approximately 5.4 percent of total Atlantic landings of HMS (SCRS, 2003). Therefore, the successful adoption and timely implementation of circle hook and release gear technology by the U.S. PLL fleet is of paramount importance. U.S. industry support in demonstrating the success of these technologies, both in reducing turtle mortalities and in maintaining catches of target species, will be vital in future efforts to convince other foreign fishing nations to implement similar management measures.

Comment 18: Several commenters stated that the "exportability" of circle hook and release gear technology is the most important aspect of this rule, because U.S. PLL turtle bycatch is relatively small compared to that of foreign vessels Atlantic-wide. If the proposed one hook-type/one bait requirements cause U.S. business foreclosures or economic losses, the technology would likely not be "exportable" to foreign nations. The unintended consequence of the proposed regulations could be increased sea turtle interactions as foreign PLL vessels, which currently account for the largest percentage of sea turtle interactions, increase fishing effort. Similarly, if some U.S. PLL vessels go out of business or reflag to foreign nations, the U.S. could lose part of its ICCAT swordfish quota to foreign nations that do not have such protective requirements, and sea turtle interactions by foreign PLL vessels could increase. Therefore, these commenters stated that it is imperative to implement a final rule that does not result in business closures and is transferable to other ICCAT nations. Some commenters suggested that non-preferred alternative A5 in the DSEIS (16/0 circle hook with an offset not to exceed 10 degrees, outside the NED) would provide an acceptable compromise for both domestic and foreign vessels.

Response: As discussed above, international cooperation is critical to reduce overall Atlantic sea turtle interactions and mortalities. For this reason, the Agency committed substantial financial resources and scientific expertise to the NED research experiment to develop cost-effective technologies to reduce sea turtle interactions and mortalities, without negatively impacting catches of target species. The U.S. already has shared the experimental results at ICCAT and in other international fora to promote and encourage sea turtle bycatch reduction measures in international fisheries. In response to public comment, the Agency re-examined the preferred alternatives and modified the final management measures to provide flexibility regarding the use of offset and non-offset hooks, bait requirements, and hook sizes outside the NED. These modifications are expected to reduce turtle interactions and mortalities significantly, and demonstrate to foreign nations that adoption of circle hook technologies is feasible and will have positive benefits for both sea turtles and the PLL fishery.

Comment 19: Several commenters stated that the PLL fishery is only one of many factors affecting the continued existence of sea turtles. Other factors include: chemical water pollution; habitat loss; poaching of nesting sites; artificial beach lighting; shrimp trawling; predation by pets; driving on beaches; beach sweeping activities; outboard motor emissions, and speeding motor boats. Commenters noted that these other factors receive little regulatory attention, yet the PLL fishery is being required to comply with perceived unnecessarily strict proposed regulations. One commenter suggested that turtle hatcheries should be used to augment turtle populations.

Response: This Agency and the U.S. Fish and Wildlife Service (USFWS) share responsibility for threatened and endangered sea turtles under a Memorandum of Understanding implementing the ESA. In general, marine-related activities, such as fishing, are within the purview of this agency, whereas terrestrial activities are within the purview of the USFWS. The ESA requires that federal agencies ensure that the actions that they authorize, fund or carry out do not jeopardize the continued existence of listed species. If there is no federal agency nexus to a proposed action, the action is not subject to section 7 consultation and the production of biological opinions under the ESA. Thus, this final rule focuses upon the protection of adult and sub-adult turtle populations in the marine environment that are affected by fishing activities authorized by this Agency. Other provisions of the ESA, or other laws, may be applicable to other actions that pose threats to sea turtles. For example, recovery plans for leatherback and loggerhead sea turtles have been in place for several years. Many of the activities mentioned by the commenters are addressed within these recovery plans, including marine pollution, habitat protection, beach lighting, beach nourishment, protection of nesting sites, egg poaching, beach driving, and beach sweeping. The management measures contained in this final rule are expected to reduce significantly mortality attributable to pelagic longlines, both domestically and, through export of circle hook technologies, internationally.

Comment 20: One commenter raised concerns that the sea turtle incidental take statement (ITS) was exceeded, even with the NED closed.

Response: Recent increases in sea turtle interactions occurred mainly in the GOM and other areas outside the NED. This final rule would prohibit “J”-hooks and require gear modifications and the use of release gear throughout the entire fishery, and is expected to have significant conservation benefits for sea turtles. Because of the conclusion of the NED experiment, this rulemaking, and the exceedance of the ITS from the 2001 BiOp, the Agency reinitiated consultation on the fishery. The new consultation, finalized in the 2004 BiOp, analyzed the circumstances and potential causes of the exceedance, as well as the expected impacts of the fishery on sea turtle populations, and is incorporated into this final rule.

Comment 21: A commenter stated that the number of boats fishing in the NED could increase beyond the 12 vessels that were analyzed in the DSEIS, because of a recent bilateral agreement that would allow U.S. vessels to land their catch in Canada.

Response: Data over the last six years indicate that less than 12 vessels, on average, have fished in the NED. The Agency will continue to monitor changes in the fishery and, if a significant increase in the number of vessels occurs in the NED, will take other action as needed. Moreover, sea turtle interactions have been documented throughout the PLL fishery. As overall effort in the PLL fishery is restricted by limited access permits, any additional fishing effort in the NED would necessarily result in less fishing effort elsewhere. Furthermore, vessels fishing in the NED will be required to use larger circle hooks than vessels fishing outside the NED.

Social/Economic Impacts and Analyses

Comment 22: Many commenters stated that there would be potentially reduced revenues from the preferred alternatives due to: (1) the lack of flexibility for fishermen to select various hook and bait combinations; (2) potentially reduced catches of target species, both inside and outside the NED, due to the proposed 18/0 circle hooks; and, (3) potentially reduced catches outside the NED due to the proposed "exotic" baits (*i.e.*, squid or Atlantic mackerel only). Several commenters stated that more concern should be focused on the potential loss of jobs and social costs. Regarding the economic analyses in the DSEIS/RIR/IRFA, two commenters stated that the ex-vessel prices presented in the analyses were not up to date. Another commenter stated that the analyses overstate potential increases in target catches and understates potential losses in target catches. Commenters also requested that the following additional factors be considered: (1) overhead costs will increase because of the need to buy new hooks and more expensive, non-indigenous baits outside the NED; (2) there would be irretrievable lost costs because existing inventories of fishing hooks would become obsolete; and, (3) U.S. PLL fishermen could be put at a competitive disadvantage to foreign vessels because of potentially increased costs and decreased revenues.

Response: As explained in the responses to Comments 1-12, the Agency has modified the final rule, in response to public comment, to provide more flexibility regarding baits, offset and non-offset circle hooks, and minimum hook sizes outside the NED. However, pursuant to the 2004 BiOp, additional rulemaking may be necessary to consider a new time and area closure(s) , which could have adverse economic impacts. The economic impacts of such a closure, if necessary, would be analyzed and addressed in that rulemaking.

In response to the comment that the IRFA used outdated ex-vessel price information, the Agency has updated the RIR and FRFA using actual 2002 ex-vessel prices. The IRFA utilized 2001 ex-vessel prices adjusted to 2002 dollars, using the Consumer Price Index on-line adjustment calculator. The result of this adjustment is that the 2002 annual gross vessel revenue estimate used in the economic analyses has been lowered from 187,074 to $178,619, due to generally lower ex-vessel prices received in 2002.

With regard to estimated potential losses or gains in target species catches and ex-vessel revenue, the estimated changes in catches were derived directly from the results of the NED research experiment and then multiplied by ex-vessel prices to estimate changes in ex-vessel revenue. The DSEIS/RIR/IRFA and final documents each provide a range of impacts to illustrate the variability associated with the different hook and bait combinations and their effects on catches of target species. A range of economic impacts is necessary because the final regulations provide flexibility in the choice of different hook and bait combinations. The ranges of impacts associated with each alternative in the FSEIS have changed somewhat from the ranges that were provided in the DSEIS. This is because, since publication of the DSEIS, the reduction rates associated with experimental treatments (hook and bait combinations) have been standardized to control for several variables, including sea surface temperature, daylight soak time, total soak time, vessel effect, and pairing effect in case of matched-paired hook types per set. Also, as described above, the estimate of annual gross vessel revenue changed.

This action would result in initial compliance costs associated with the purchase of new hooks (between $675.25 - $1,650.00 for 2,500 18/0 hooks, and $697.50 - $1,241.75 for 2,500 16/0 hooks). However, after initial hook purchase, replacement costs for circle hooks are expected to be comparable to, or less than, the replacement costs for "J"-hooks. The DSEIS originally estimated annual hook costs at approximately $20,176 per vessel for a years supply. However, this estimate has been removed from the FSEIS because not every hook is expected to be lost on every set. NOAA Fisheries acknowledges that there may be irretrievable lost costs due to existing inventories of "J"-hooks becoming obsolete. However, a 30-day delay in the effective date of the final measures outside the NED may help vessel owners retrieve some of the costs associated with the prior purchase of "J"-hooks. The compliance costs for the purchase of release equipment are estimated to range from $485.00 to $1056.50. As discussed in the response to Comment 16, some of the release equipment can be fabricated from readily available materials in order to reduce costs.

While there are short term costs associated with the final rule, this action is not expected to place U.S. PLL vessels at a competitive disadvantage relative to foreign vessels. If fishermen choose an appropriate combination of circle hooks and bait, the NED research has shown that catches of target species can be increased or, at least, remain constant by using circle hooks.

<u>Comment 23</u>: Several commenters stressed that it is important for NOAA Fisheries to reopen the NED to PLL fishing (as contained in alternatives A6, A7, A8, A9, and preferred alternative A10 of the DSEIS), because several vessels are very dependent upon income derived from fishing in that area.

<u>Response</u>: This final rule will allow PLL vessels to fish in the NED closed area, provided that they use specified hook and bait treatments that were proven to be effective at reducing sea turtle interactions and mortalities during the three-year NED research experiment.

Comment 24: One commenter stated that the Community Profiles section of the DSEIS relies upon old data. For example, an annual Blessing of the Fleet no longer occurs in one fishing community.

Response: The Community Profiles sections of the DSEIS and FSEIS (Chapter 9) draw upon a variety of sources, including census data, logbook data, local Chamber of Commerce information, academic studies, and professional observations. Information contained in the DSEIS and FSEIS constitute the best available information at this time.

Comment 25: A commenter stated that the cost-earning analyses are outdated and should be corrected so that the Agency can properly evaluate the economic impacts of its regulations.

Response: The economic analyses in the DSEIS and FSEIS use the best available information. The Agency strives to improve its information collection, and in 2003, initiated mandatory cost-earnings reporting for selected vessels, specifically to improve the economic data available for all HMS fisheries. However, this new economic information was not available at the time of preparation of the DSEIS or FSEIS because the data are still being collated and checked for accuracy. Additional economic data, including cost and earnings information, will continue to be collected from vessels to further evaluate the impacts of this final rule.

Additional Comments Regarding the Alternatives and Other Management Measures

Comment 26: Several commenters expressed support for the proposed regulations (preferred alternatives A3, A10, and A16 in the DSEIS), stating that they would be effective at reducing sea turtle bycatch and post-hooking mortality. One commenter stated that the measures provide the most environmentally advantageous and socially just approach to lessening impacts on sea turtles while safeguarding human interests. The proposed regulations are based upon three years of meticulous research and should provide a commonsense and practical model for both domestic and foreign PLL fleets.

Response: As discussed above, the proposed measures have been modified after considering public comment, the NED experiment, and other available information. The final rule is expected to have significant ecological benefits while mitigating for potentially adverse economic impacts. Successful implementation of this rule will provide a catalyst for promoting the adoption of similar measures by foreign fishing nations.

Comment 27: Many commenters opposed the continued use of traditional “J”-hooks (contained in alternatives A1, A4, and A9 of the DSEIS), because they do not reduce the bycatch and bycatch mortality of sea turtles.

Response: Under this final rule, “J”-hooks will no longer be allowed in the U.S. Atlantic PLL fishery.

Comment 28: Several commenters indicated that other, more general, fishery-related factors should have been examined in the DSEIS, such as further efforts to eliminate overfishing of swordfish and tunas and an overall reduction in the number of PLL permits.

Response: The purpose of this rulemaking is to reduce interactions with, and post-release mortality of, threatened and endangered sea turtles in the PLL fishery. Addressing overfishing of HMS and the permitting of PLL vessels is beyond the scope of this action; however, these issues are being addressed in other actions. Management and conservation of Atlantic HMS requires international cooperation. The U.S. participates in negotiations at the International Commission for the Conservation of Atlantic Tunas (ICCAT) to develop recommendations on quota allocations and other measures. As part of the international rebuilding efforts, the U.S. implements ICCAT-adopted recommendations. The Agency has issued a proposed rule to implement an ICCAT swordfish quota recommendation (68 Fed. Reg. 36967 (June 30, 2003)), and in Amendment 2 to the HMS FMP, currently in development, will examine additional HMS management measures, including permitting issues.

Comment 29: Several commenters suggested that other alternatives should have been considered in the DSEIS including: (1) allowing nighttime longline sets only; (2) using water temperature guidelines to restrict PLL fishing activity; (3) implementing 100-percent observer coverage and a hard cap on turtle takes, whereby the PLL fishery would be closed if the turtle cap is reached; (4) "real time" observer reporting to monitor for ITS exceedances; and (5) implementing effort controls in the NED on numbers of vessels, trips, sets, or hooks. One commenter stated that effort controls are needed because of the possibility of increased effort in the NED resulting from a recent agreement that would allow U.S. vessels to land fish in Canada.

Response: Several alternatives mentioned in this comment, including 100 percent observer coverage, a hard cap on turtle takes, and limits on numbers of sets, were recently implemented in the shallow-set component of the Hawaii-based longline fishery. There are notable differences between the Hawaii-based and Atlantic PLL fisheries. For example, the Hawaii-based shallow-set fishery is predominantly a swordfish fishery. In the Atlantic Ocean, however, swordfish and tuna PLL fishing is generally managed as a single fishery, with the exception of quotas, size limits, retention limits, and other species-specific measures, because the Atlantic PLL fleet is mobile and may target a variety of species on the same trip. Because sea turtles are regularly captured on both swordfish sets and tuna sets in the Atlantic Ocean and GOM, management measures are necessary for the PLL fishery as a whole, regardless of target species. Another difference is that the Atlantic fishery is managed under certain species- and country-specific ICCAT quotas, whereas the Hawaii fishery is not.

An alternative prohibiting daytime sets was not considered because the NED research experiment and the Azores study ((Bolten *et al.*, 2002) both found that loggerheads are becoming hooked mainly during daylight, and the NED experiment found that leatherbacks become hooked during the night. A prohibition on either daylight or nightime sets would not be effective at protecting both of these species. Therefore, this alternative was not included in the DSEIS, especially when other measures (*i.e*., circle hooks) are available.

For enforcement, operational, administrative, and other reasons, the other suggested alternatives were not included in the DSEIS. Although turtle catch rates can be influenced by water temperature, it would be extremely difficult to enforce regulations restricting vessels to fishing within certain specified temperatures. In addition, a "real time" hard cap on the number of turtle takes is not practicable without 100 percent observer coverage. At this time, it would be operationally difficult, and expensive, to implement 100 percent observer coverage for the 148 active PLL vessels fishing in the Atlantic Ocean and GOM, because this is a large geographical area with several remote ports. In 2002, observer coverage averaged 8.9 percent (NED - 100 percent, non-NED - 3.7 percent), and coverage has averaged 3.6 percent for the years 1995 - 2001. The Agency is continuing to explore options in Amendment 2 to the HMS and Billfish FMPs to enhance existing observer coverage, including industry funding, increased permit fees, and quota set-asides. The Agency also will endeavor to improve its monitoring in other ways. The VMS requirement for all PLL vessels, implemented in September 2003, may provide the ability to gather more timely information about apparent effort. In addition, the Agency will take steps to enhance its monitoring of turtle interactions.

Fishing effort controls are not currently being implemented in the NED because sea turtle interactions occur throughout the Atlantic basin. The final regulations requiring circle hooks and release equipment throughout the fishery are anticipated to have significant turtle conservation benefits. As discussed in the response to Comment 4, the Agency also will engage in outreach, education, and training activities and take further action, as necessary, to conserve and protect sea turtles.

<u>Comment 30</u>: A commenter indicated that there was no alternative in the DSEIS that would keep the NED closed and require circle hooks, bait requirements, and release equipment in the remainder of the fishery.

<u>Response</u>: The DSEIS and FSEIS include alternatives that would impose hook and bait and release gear requirements on the Atlantic pelagic longline fishery and keep the NED closed. Specifically, in Section 4.0 of the FSEIS, the analyses for alternatives A2 - A5(b) indicate the ecological, economic, and social impacts of requiring circle hook and bait requirements for the fishery, excluding the NED.

<u>Comment 31</u>: A commenter suggested that a small number of "J"-hooks (less than 30) should be allowed to accommodate a handline fishery by PLL vessels when fish are schooling.

<u>Response</u>: The final regulations do not allow any "J"-hooks to be possessed or used onboard HMS PLL vessels. To allow any "J"-hooks would compromise the enforceability and effectiveness of this rule. The final regulations have been modified to provide more flexibility with regards to allowable circle hook and bait combinations, and circle hook sizes outside the NED. The required use of circle hooks throughout the PLL fishery is a significant and important step that will have significant conservation benefits for sea turtles.

Comment 32: One commenter stated that the Agency had indicated that the goal of the rulemaking is to reduce interactions below the ITS, yet the June 14, 2001, BiOp stated that the objective is to reduce mortalities of sea turtles. Because there were no dead sea turtles in the NED experiment, alternative A5 in the DSEIS (16/0 hooks outside the NED) should be adopted because it would be effective at reducing mortalities.

Response: Because of the recently concluded NED experiment and the exceedance of the ITS in the 2001 BiOp, the Agency reinitiated consultation and began developing a proposed rule using the ITS as an initial guide in developing its alternatives. Management actions should first try to eliminate or reduce the likelihood of interactions between the fishery and sea turtles. For interactions that cannot be avoided, management actions should reduce the likelihood of sea turtles being injured or killed during, or as a result of, the interaction. These reductions must be made so that the fishery is not jeopardizing the continued existence of listed species. The mandatory possession and use of circle hooks and careful release gear, along with training and certification programs are expected to accomplish these objectives in the long-term, while the adaptive management strategies outlined in the RPA in the 2004 BiOp are expected to help ensure that these objectives are met in the short-term. As noted above, the final rule has been modified to allow the use of 16/0 or larger, non-offset circle hooks outside the NED.

Bycatch Issues

Comment 33: Many commenters recommended circle hooks, bait restrictions, release gear requirements, and other similar or equivalent management measures for recreational fisheries to reduce bycatch.

Response: The bycatch of fishery resources, marine mammals, sea turtles, sea birds and other living marine resources has become a central concern of the commercial and recreational fishing industries, resource managers, conservation organizations, scientists and the public, both nationally and globally. Accordingly, the Agency recently announced a National Bycatch Strategy to reduce bycatch through fishing gear improvements, standardized reporting, education and outreach. As part of that strategy, the HMS Management Division has identified the improvement of recreational fishery data and angler education as items to be considered in Amendment 2 to the HMS and Billfish FMPs. In addition, the Agency has established an angler outreach program to promote the use of circle hooks in the recreational fishery.

Comment 34: Several commenters stated that requiring an 18/0 circle hook with squid and/or mackerel could increase the bycatch of other non-target species, including billfish, bluefin tuna and large coastal sharks. There was also a concern that levels of bycatch in the PLL fishery, including seabirds and marine mammals, are too high regardless of hook and bait treatments, and that these interactions should be further considered before implementing final regulations.

Response: As described above, the Agency recently announced a National Bycatch Strategy to further reduce bycatch through fishing gear improvements, standardized reporting, education and outreach. Other initiatives underway include the U.S. Plan of Action for Reducing the Incidental Catch of Sea Birds in Longline Fisheries, which was jointly developed by this agency, the U.S. Fish and Wildlife Service, and the Department of State. The plan involves conducting an assessment of longline fisheries to determine if a seabird bycatch problem exists, and implementing measures to reduce impacts on seabirds to the maximum extent practicable. Because interactions with seabirds appear to be relatively low in Atlantic HMS longline fisheries, measures have not been implemented. This Agency will continue to monitor bycatch in the PLL fishery to determine if any of the measures contained in this final rule contribute to increased levels of bycatch of billfish, bluefin tuna, large coastal sharks, seabirds, or marine mammals.

Technical and Implementation Issues

Comment 35: Some commenters recommended redefining circle hooks by specifying the allowable gap between the hook point and the hook shank, providing a minimum length, specifying that the hook should be generally circular in shape, and not including a reference to the gauge of the wire (e.g., 16/0 or 18/0) used in the hook.

Response: The final rule has been clarified to specify the allowable gap between the hook point and the shank and a minimum length, and to specify that the required hooks should be generally circular or oval-shaped from point to shank. A gauge specification is being retained in the final regulations because the NED research experiment tested hooks of different gauges, and because fishing hooks are typically referred to by their gauge size. However, in recognition that there may be some variability, the final rule provides clarification of overall size dimensions, and the preamble of the final rule identifies circle hooks by manufacturer and model number that are known to meet the dimensions.

Comment 36: Numerous fishermen commented that they would not be able to obtain an adequate supply of the proposed circle hooks in a timely manner.

Response: The Agency considered delaying the effective date of the final regulations beyond 30 days, for vessels fishing outside the NED. However, due to the urgent need to reduce turtle interactions, an additional delay is not possible. An adequate supply of circle hooks for at least a few trips is expected to be available by the effective date of this rule. Hook manufacturers have recently increased production of circle hooks in response to the recent implementation of a similar rule in Hawaii.

Protected Resources Issues

Comment 37: Commenters stated that the June 14, 2001, BiOp and its associated incidental take statement (ITS) are not based upon the best available science. One commenter stated that the BiOp should be based upon the population status of southern loggerhead turtles, rather than the northern population which the Agency is trying to protect. Also, the 2001 BiOp incorrectly states that 100 percent of sea turtle interactions in the NED are with the northern nesting population. Recent DNA testing shows that over 80 percent of NED loggerhead interactions were with turtles originating from the southern nesting population, which is increasing at 4 percent a year. In addition, loggerhead sea turtle population data should not be used to develop the leatherback sea turtle ITS. Some commenters stated there is no modeling of loggerhead and leatherback sea turtle populations, so the population estimates are uncertain.

Response: As reflected in comments 37-40, the Agency received public comments directed at the 2004 BiOp. The Agency is not required to provide for or respond to public comments while developing a BiOp. However, to the extent that these comments relate to the analyses required under the National Environmental Policy Act (NEPA), responses are provided below.

The June 1, 2004, BiOp and associated ITS supercede the previous opinion and analyze pertinent information related to this rulemaking. The information in the 2004 BiOp represents the latest, best available science, and has undergone numerous levels of review. The opinion analyzes potential impacts on the loggerhead species as a whole, with attention paid to the impacts on the individual subpopulations, each of which are important to the survival and recovery of the species and require protections in order to ensure the species' future. Based upon data from the NED research experiment, and the fact the fishery is widespread throughout the pelagic waters of the Atlantic and GOM, it is assumed that the overall interaction of loggerhead sea turtles with the pelagic longline fishery is in proportion with the overall stock sizes of each nesting aggregation. That is, the fishery is not believed to be affecting any stock disproportionately, which was a factor considered when the threat of any individual stock being extirpated was examined. In addition, the latest nesting trend data for the South Florida nesting assemblage indicate that there is no discernible trend in the population. The uncertainty of population estimates and trends are acknowledged and taken into account.

Comment 38: Several commenters stated that post-hooking mortality estimates of sea turtles were overestimated in the ITS, and should be revised based upon more recent data from a mortality workshop that the Agency held. Other commenters stated that the use of Spanish research studies to develop post-hooking mortality estimates in the BiOp is not appropriate. The current estimates of post-hooking mortality are based upon the use of "J"-hooks, which are more likely to cause gut-hooking than circle hooks. Circle hooks will better ensure that hooked and entangled sea turtles survive. These factors should be considered in the new BiOp.

Response: The 2004 BiOp uses refined post-interaction mortality estimates from the January 2004, Workshop on Marine Turtle Longline Post-Interaction Mortality. These estimates take into consideration hooking locations, which are largely a function of the hook type. The Spanish mortality studies were only one of many data sources considered by the participants of the workshop, and any potential limitations of those studies were understood and taken into account.

Comment 39: Commenters stated that sea turtle interactions are increasing because their populations are increasing. Therefore, the BiOp and proposed regulations should consider this as baseline information.

Response: The baseline information analyzed in this rulemaking and the 2004 BiOp includes the latest sea turtle population and trends data.

Comment 40: Commenters questioned how the PLL fleet could be found to be jeopardizing the continued existence of leatherback and loggerhead sea turtles when the fleet accounts for hundreds of interactions, while the shrimp fleet accounts for over 100,000 turtle interactions.

Response: Fisheries may impact life stages of sea turtles in different ways and have varying bycatch and bycatch mortality reduction measures available depending on the gear used. This rulemaking focuses on the impacts of the PLL fishery on protected sea turtles and expected reductions in interactions and mortality from the preferred alternatives. The Southeast shrimp trawl fishery underwent a separate consultation which resulted in a December 2, 2002, biological opinion. Although the shrimp fishery interacts with more sea turtles, the December 2002 biological opinion determined that revised regulations on Turtle Excluder Devices (68 Fed. Reg. 8456, February 21, 2003) would be expected to reduce related mortality significantly in that fishery. See the December 2002 biological opinion for specifics of the shrimp trawl consultation. The June 1, 2004 BiOp for this rulemaking found jeopardy for leatherbacks only, as a result of the expected levels of mortality. The RPA in the June 20034 BiOp is expected to reduce mortality to levels which will not jeopardize the continued existence of the species.

Other Comments

Comment 41: Commenters stated that the proposed regulations violate National Standard 4 of the M-S Act, because they discriminate between residents of different states, especially North Carolina, where there are few sea turtle interactions off the coast and residents catch smaller fish.

Response: The proposed and final management measures consist of conservation measures that are intended to protect threatened and endangered sea turtles. These measures are consistent with National Standard 4 because they apply bycatch reduction and mitigation requirements throughout the whole PLL fishery, are not direct allocations of fishing privileges, and do not discriminate between residents of different states. Circle hooks are necessary for U.S. PLL vessels for the entire Atlantic basin because turtle interactions can, and do, occur over this entire area, albeit at different rates. The PLL fleet is generally mobile, so vessels may opportunistically choose to fish in areas where any potential adverse impacts are lower. Fishery management actions often have inherently differential geographic impacts, and these are largely due to differences in species composition and abundance. In consideration of this, the Agency has modified the final rule to account for some geographical variation in the PLL fishery.

Comment 42: One commenter stated that the Agency has not adequately analyzed the cumulative effects of this action on PLL vessels, as required by NEPA.

Response: The DSEIS and FSEIS have adequately analyzed the cumulative effects of this action on PLL vessels. The analyses describe all major management actions that have occurred since 1985 and the potential effects of this action when added to other past, present or reasonably foreseeable future actions.

Comment 43: Commenters stated that there was no scoping process as required under NEPA and that the rulemaking was proceeding too quickly with little consideration being given to public concerns. One commenter requested consideration as an "applicant" in the development of the BiOp. Other commenters requested more public involvement in the ESA consultation, specifically, copies of the draft and final BiOp for the proposed rule

Response: Although scoping hearings can be beneficial, they are not required under NEPA. Because of the urgent need to implement sea turtle bycatch mitigation measures, scoping hearings were not held. However, the Agency has provided ample opportunity for public participation throughout the rulemaking. The Agency published a Notice of Intent of Proposed Rulemaking (NOI) in the Federal Register on November 28, 2003 (68 FR 66783), identifying significant issues related to the action and requesting public comment through December 29, 2003. The Agency also distributed a FAX notice on December 3, 2003, to solicit comment. Taking public comment into consideration, the Agency published a proposed rule in the Federal Register on February 11, 2004 (69 FR 6621), then held public hearings in North Dartmouth, MA (March 2, 2004), New Orleans, LA (March 4, 2004), and Manteo, NC (March 9, 2004). Over 100 people attended these public hearings. The comment period on the proposed rule closed on March 15, 2004, and the Agency received approximately 175 written and electronic comment letters. With regard to the ESA consultation, the Agency does not consider there to be an applicant for this action. Moreover, the Agency is not required to provide for public comment on a draft or final biological opinion. Copies of the final, 2004 BiOp are available upon request from the NOAA Fisheries Southeast Regional Office, Division of Protected Resources (9721 Executive Center Drive North, St. Petersburg, FL 33702. 727-570-5312). The BiOp may also be obtained online at: http://sero.nmfs.noaa.gov/pr/rulings/hmsbo060104.pdf.

Comment 44: One commenter stated that the impacts of the proposed regulations on "other important organizations," including trade associations, have not been fully analyzed in the Community Profiles section of the DSEIS.

Response: Chapters 4, 6, 7, 8, and 9 of the DSEIS and the FSEIS identify affected entities and provided an assessment of the likely economic impacts associated with each of the alternatives. The analysis primarily focuses upon fishing vessels, as they would be most directly impacted by the action. The analysis was very complete and indicated a range of potential economic impacts on vessels, from negative to positive, depending upon a variety of factors including target species and hook and bait choices. In addition, potential impacts on dealers, processors, bait houses, and gear manufacturers who might be indirectly affected by the measures are identified.

By providing information on these direct and indirect impacts, with a focus on those most directly impacted by the action, other entities, including trade associations, should be able to reasonably assess the impacts in consideration of their unique situations.

Comment 45: Commenters noted that the Atlantic Tunas Conservation Act (ATCA) provides that the U.S. PLL fleet should have a reasonable opportunity to catch its full ICCAT quota of swordfish; however, the fleet is currently harvesting only 29 percent of its quota. The proposed regulations would further prevent full utilization of the quota.

Response: The final management measures are expected to provide the U.S. PLL fleet with a reasonable opportunity to catch its ICCAT quota allocation, consistent with the ATCA, Magnuson-Stevens Act, ESA, and other domestic law. The NED experiment demonstrated that target species catches can be increased, or at least remain constant, using circle hooks if an appropriate combination of hooks and bait is deployed. The DSEIS noted that the proposed measures are most likely to impact adversely mixed target trips, and that impacts on catches in warmer waters are not fully known. Public comment affirmed these potential impacts, and in response, the final rule provides more flexibility in hook and bait choices and hook sizes to minimize adverse impacts, to the extent practicable.

Comment 46: A commenter stated that the Secretary of Commerce does not have the jurisdictional authority to apply the Magnuson-Stevens Act to HMS fisheries outside the U.S. exclusive economic zone (EEZ), including the NED.

Response: The Secretary of Commerce does have the authority to regulate U.S.-permitted vessels fishing outside the U.S. EEZ.

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