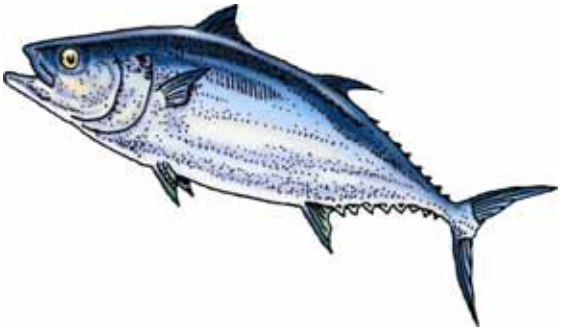
Final Environmental Assessment,
Final Regulatory Impact Review,

and

Final Regulatory Flexibility Analysis

for a

Final Rule to Require the Use of Weak Hooks on Pelagic Longline Vessels in the Gulf of Mexico



United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Sustainable Fisheries
Highly Migratory Species Management Division

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ABSTRACT

Action:	Require the use of weak hooks on all Pelagic Longline Vessels fishing in the Gulf of Mexico
Type of statement:	Environmental Assessment (EA), Regulatory Impact Review (RIR), and Final Regulatory Flexibility Analysis (IRFA)
Lead Agency:	National Marine Fisheries Service (NMFS): Office of Sustainable Fisheries
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Abstract:	Since 2007, NMFS has conducted research on the use of weak hooks by pelagic longline (PLL) vessels operating in the Gulf of Mexico (GOM) to reduce the discards of large Atlantic bluefin tuna (BFT). Research results show that the use of a weak hook can significantly reduce the amount of BFT caught by PLL vessels with some reductions in the amount of target catch of yellowfin tuna (YFT) and swordfish. This action will require the use of weak hooks to reduce bycatch of BFT, allow normal operation of PLL fisheries in the GOM with minimal short-term adverse socio-economic impacts, and have both short and long-term beneficial ecological impacts on the stock status of BFT, a historically overfished species. This measure will be consistent with the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan and the relevant 2010 Recommendation by the International Commission for the Conservation of Atlantic Tunas.

FINDING OF NO SIGNIFICANT IMPACT

Finding of No Significant Impact for a
requirement to use weak hooks by pelagic longline vessels fishing in the Gulf of Mexico

The Highly Migratory Species (HMS) Management Division of the Office of Sustainable Fisheries submits the attached Environmental Assessment (EA) for the Atlantic bluefin tuna (BFT) fishery for Secretarial review under the procedures of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). This EA considers results of research conducted by the NMFS Harvesting Systems and Engineering Branch, Pascagoula, Mississippi, and information contained in the 2006 Consolidated Highly Migratory Species Fishery Management Plan (Consolidated HMS FMP), and was developed as an integrated document that includes a Regulatory Impact Review (RIR) and Final Regulatory Flexibility Analysis (FRFA). The responses in the Finding of No Significant Impact statement are supported by the analyses in the EA as well as in the other NEPA documents referenced. Copies of the EA/RIR/FRFA are available at the following address:

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This action will require the use of weak hooks by pelagic longline (PLL) vessels fishing in the Gulf of Mexico (GOM).

The National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of an action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of context and intensity. Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1. Can the action be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action?

No. The action is not expected to jeopardize the sustainability of YFT or other primary target species of fishing operations affected by this action. This action is intended to affect the incidental catch of BFT in the GOM PLL fishery. The PLL fishery for GOM HMS primarily targets YFT and swordfish, in various areas and seasons. Secondary target species include dolphin; other tunas, such as bigeye and albacore tuna; and, to a lesser degree, sharks. Although

this gear can be modified (*e.g.,* depth of set, hook type, hook size, bait, etc.) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. Fishing patterns and behavior in these fisheries are not expected to change as a result of this action. This final action requires the use of a "weak hook" by PLL vessels fishing in the GOM. A weak hook is a circle hook that meets NMFS' current size and offset restrictions but is constructed of round wire stock that is thinner-gauge than the circle hooks currently used and is no larger than 3.65 mm in diameter. The purpose of the action is to reduce PLL catch of Atlantic BFT in the GOM, the only known spawning area for the western Atlantic BFT stock. The action is intended to provide a new gear technology for PLL vessels that will allow the PLL fleet to continue routine fishing operations in the GOM on directed fisheries such as YFT while increasing the live release of incidentally caught BFT. Weak hooks allow for the live release of incidentally caught BFT because the hooks are more likely to straighten when a large fish is caught, thus releasing the fish.

NMFS has already implemented a successful rebuilding plan and fishing controls for swordfish, a target species in the GOM PLL fishery. With regard to target species, data generally indicate that the experimental hook facilitates the release of BFT, and may decrease YFT catch, but has no significant impact on the number of YFT retained or the number of swordfish or other targeted species caught by number of fish. The results for pelagic and large coastal sharks were not significant; although, observations were mixed with reduction in catch observed for some species and increases in catch for others. The low numbers of observations during the experiment made the results for some species uncertain. Further research will likely be necessary before NMFS can fully analyze the ecological impacts of the experimental hook treatment on pelagic and large coastal sharks.

2. Can the action be reasonably expected to jeopardize the sustainability of any non-target species?

No. The action is not expected to jeopardize the sustainability of any non-target fish species or bycatch because it is not expected to result in a change in fishing effort compared to levels already analyzed in the Consolidated HMS FMP and associated Biological Opinions (BiOps). The impact of the effort for the PLL fleet in the GOM, as analyzed in the Consolidated HMS FMP and associated EIS, was not expected to jeopardize the sustainability of any non-target species.

Research conducted by NMFS found that "weak" circle hooks used on PLL gear in the GOM have a 56.5 percent lower catch of BFT than the standard circle hooks. This difference was statistically significant. The action is expected to reduce the incidental catch of BFT in the GOM PLL fishery by approximately 56.5 percent. This would likely result in a reduction in the number of BFT caught in the GOM from an annual average of 285 individual fish from 2006 - 2009 to approximately 124 individual fish. Reductions in interactions of this magnitude could have positive impacts on the BFT population by reducing the catch of spawning BFT due to incidental interactions with PLL gear. Post-release mortality is expected to be reduced because BFT likely straighten the weak hooks relatively quickly after being caught and likely do not incur as high a level of metabolic stress as when the fish stay on the hook until being retrieved upon haul-back of the gear.

Weak hook use in the GOM PLL fishery may increase the catch of white marlin. Research results from weak hook research conducted by NMFS showed the weak hook caught white marlin at 1.6 times the rate of the standard circle hook used by the GOM PLL fleet; although the results were not statistically significant. White marlin are overfished; although, uncertainty exists about the current population due in part to the lack of accurate identification of white marlin and roundscale spearfish in some databases. Roundscale spearfish is a species previously identified as white marlin. Thus, what was previously recognized as the white marlin population is expected to eventually be distinguished as either white marlin and roundscale spearfish when stock assessments are completed for roundscale spearfish. In the meantime, NMFS is continuing to manage the species as one stock with no distinction for management purposes until additional information is obtained. At this time, NMFS does not expect the white marlin stock status to change due to roundscale spearfish catches having been included in some data bases used to conduct the white marlin stock assessment. White marlin underwent Status Reviews under the Endangered Species Act (ESA) in 2002 and 2007. Following each of these reviews, NMFS determined that listing white marlin as endangered or threatened under the ESA was not warranted. While this action could increase white marlin bycatch, NMFS does not believe that this increase is likely to have population or ecosystem effects for those species because the predicted increase of 144 white marlin (or 1.05 mt in 2009 at 48 lb per fish) dead discards represents less than 0.8 percent of the total amount of international white marlin catch (which includes recreational landings and commercial dead discards) in the North Atlantic (406 mt in 2009). Due to misidentification of roundscale spearfish as white marlin, the total of white marlin international catch also includes some roundscale spearfish and, as such, indicates that any potential increase in roundscale spearfish catch that might occur in the GOM PLL fishery as a result of this action should be very small in relation. Under current regulations, PLL vessels are not allowed to retain white marlin and any that are captured must be released alive or discarded if dead. Additionally, PLL vessels are currently required to possess and use protected species safe handling and release gears and techniques that aid in releasing hooked animals, including white marlin, and maximize post-release survival. Most white marlin that are hooked are released alive. The restrictions on retention of white marlin and the use of protected species safe handling and release gears and techniques may help to mitigate potential adverse effects of this action on white marlin. The results of NMFS' research on weak hooks showed that the difference in catch of white marlin and roundscale spearfish was not statistically significant, although the difference was close to being statistically significant. NMFS would continue research with weak hook technology and closely monitor white marlin and roundscale spearfish catch through observer coverage in the fishery. In 2009, NMFS observers recorded 1,376 PLL sets Atlantic-wide for overall non-experimental fishery coverage of 15.0 percent (Garrison and Stokes, 2010) and the percentage was higher in the GOM (L. Beerkircher pers. com.). Should the increased catches of white marlin and roundscale spearfish continue, NMFS would investigate potential mitigation measures that might be implemented if necessary to reduce the catches and/or reduce the bycatch mortality associated with the catches. The current research does not show a statistically significant increase in bycatch; therefore, it is not clear that mitigation measures would be appropriate at this time. Neither does the research indicate which measures would be effective to address any potential statistically significant white marlin and roundscale spearfish increase in catch. If additional research shows a statistically significant increase in such bycatch, possible measures could include adopting a seasonal application of the weak hook, modification or removal of the weak hook requirement or other measures as

necessary and appropriate. NMFS would closely monitor fleet activities and catch statistics and consider making management measures adjustments, including use of inseason management authority, should the data warrant. There was no significant difference between the standard hook and the experimental hook for blue marlin or sailfish.

A June 2004 BiOp determined that the continued operation of the PLL fishery (for which directed fishing for BFT is prohibited but for which some retention of incidentally caught BFT is permitted) is not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley seas turtles, but is likely to jeopardize the continued existence of leatherback sea turtles. NMFS has implemented the Reasonable and Prudent Alternatives required under the 2004 BiOp. The analyses in the 2001 and 2004 BiOps were relevant for the Consolidated HMS FMP, which serves as the baseline FEIS for regulatory amendments to Consolidated HMS FMP. The requirement to use a weak hook is not expected to significantly alter fishing patterns and/or behavior, and therefore is not expected to affect endangered or threatened species in a manner beyond that considered in the 2001 and 2004 BiOps and the Consolidated HMS FMP.

Goals of the Consolidated HMS FMP include implementing rebuilding plans, minimizing bycatch and bycatch mortality for overfished stocks, and managing healthy stocks for optimum yield. Bycatch reduction measures are in place under the HMS Bycatch Reduction Implementation Plan (discussed in Section 3.8 of the Consolidated HMS FMP), and this action will not change any of the bycatch measures in place under the Consolidated HMS FMP, or the effectiveness of those measures. Section 3.9.9.1 of the Consolidated HMS FMP lists the 22 marine mammal species that are or could be of concern with respect to potential interactions with HMS fisheries. Section 3.9.9.2 discusses interactions and the ESA, including six endangered whale species. The response to Question 5, below, summarizes the finding that marine mammals and ESA-listed species' sustainability will not be jeopardized by this action.

3. Can the action be reasonably expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat (EFH) as defined under the Magnuson-Stevens Act and identified in FMPs?

No, this action is not expected to cause substantial damage to the ocean and coastal habitats and/or EFH, as defined under the Magnuson-Stevens Act. Although EFH is present in the GOM action area, including a Habitat Area of Particular Concern for spawning BFT, this action is not expected to change PLL fishing patterns or impacts on EFH from those analyzed in the Consolidated HMS FMP, or to cause substantial damage to ocean and coastal habitats and/or EFH. As discussed in Chapter 10 of the Consolidated HMS FMP, the PLL gear used to harvest target species in the GOM is fished in the water column and has little impact on coastal resources or bottom substrate. Water column features in the GOM also are identified as EFH; as supported by the Consolidated HMS FMP, there is no evidence that physical effects caused by fishing for HMS are adversely affecting EFH to the extent that detrimental effects can be identified, and this action will not have adverse impacts to EFH.

4. Can the action be reasonably expected to have a substantial adverse impact on public health and safety?

No. The change in the hook requirement to be implemented by this action is not likely to have substantial adverse impacts on public health and safety. Because the action will not change the current fishery practices, no significant effects to public health and safety are anticipated from its implementation.

5. Can the action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

See response to Question 2 regarding findings of the 2001 and 2004 BiOps. As supported by the Consolidated HMS FMP, implementation of reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of those BiOps continues, and this action is withinthe scope of those BiOps. As this action only requires a different hook, and is not expected to change fishing effort or behavior, it would not be reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitat in a manner beyond that already analyzed. PLL gear is generally a multi-species fishery that 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 (MMPA). Any species (or undersized catch of permitted species) that cannot be landed due to fishery regulations is required to be released, regardless of whether the catch is dead or alive. Under this action, PLL vessels will be required to maintain existing possession and use requirements for bycatch mitigation gear, as well as protected species safe handling and release training and guidelines as currently specified by NMFS; and continue to take observers, for monitoring of catch. The bycatch mitigation gear requirements and protected species safe handling and release training and guidelines were implemented to reduce bycatch and bycatch mortality of incidentally captured sea turtles, marine mammals, and other incidentally captured species.

This action is not expected to significantly alter current fishing practices or bycatch mortality rates from the level analyzed in the Consolidated HMS FMP, and therefore should not have adverse impacts on protected species, or have any further impacts on endangered species, listed marine mammals, or critical habitat beyond those considered in the 2001 and 2004 BiOps. In addition, the interactions with non-listed marine mammals are managed in accordance with the MMPA "List of Fisheries" categories for each appropriate sector (including pelagic longline incidental catch of BFT), and this action is not anticipated to change the effort in these fishery sectors in any manner that will increase the potential for interaction with non-listed marine mammals as previously analyzed in the Consolidated HMS FMP.

6. Can the final action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g. benthic productivity, predator-prey relationships, etc.)?

No. The requirement for PLL vessels to use a weak hook in the GOM PLL fishery is not expected to have a significant impact on biodiversity and ecosystem function within the affected area, because the action is not expected to change fishing practices, and/or interactions with non-target (except as discussed in number 2 above) and endangered or threatened species. The

action is also unlikely to affect unique geographic areas or introduce or spread non-indigenous species.

7. Are significant social or economic impacts interrelated with significant natural or physical environmental effects?

No. There are no significant natural or physical environmental effects associated with the action and no significant social or economic impacts interrelated with natural or physical environmental effects that will result from the action. The action is expected to have some short-term negative socio-economic impacts due to the requirement that PLL vessel owners re-stock their hook supplies with the new required thinner weak hook. In the long-term, positive social and economic impacts can be expected as BFT discards decrease and the BFT spawning stock biomass recovery rate increases, thus enhancing the positive socio-economic impacts for directed fisheries by possibly increasing the abundance of BFT in the long-term. In addition, the PLL category may be less constrained from potential quota overages which may help avoid PLL fishery interruptions with associated possible substantial negative impacts. Further, the action is consistent with the Consolidated HMS FMP objectives to reduce bycatch. See Section 6 of this document for an analysis of the predicted economic impacts to the PLL GOM fishery and small business entities.

8. To what degree are the effects on the quality of the human environment expected to be highly controversial?

The effects of this action on the human environment are not expected to be highly controversial. Since 2007, a successful collaborative research experiment conducted by NMFS scientists, who worked with PLL fishermen, had the positive effect of ensuring that the fishermen who participated in the experiment are fully aware of the purpose and possible positive impacts of the research study. Although traditionally PLL fishermen may oppose changes in their fishing techniques due to perceived negative impacts on their livelihoods, it is expected that with experience using the weak hooks they will readily adapt to the new hook. NMFS will conduct education and outreach to ensure impacted PLL fishermen in the GOM understand the change and when and how to purchase the necessary new weak hooks.

9. Can the action be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

No. This action will not result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas because fishing effort will occur in open areas of the ocean. In addition, there is no park land, prime farmlands, wetlands, or wild and scenic rivers within the action area so there are no adverse impacts on these areas.

10. Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

No. Effects on the human environment will be similar to those in similar annual actions since 1999, and have been considered in the Consolidated HMS FMP FEIS. None of the previous actions resulted in highly uncertain effects or unique or unknown risks. This action will only require the use of a new weak hook for PLL vessels operating in the GOM and be consistent with the Consolidated HMS FMP to reduce bycatch.

11. Is the action related to other actions with individually insignificant, but cumulatively significant impacts?

The cumulative impacts of requiring weak hooks in the GOM PLL fishery are expected to be minimal. Vessels in the GOM PLL fishery are currently required to use circle hooks, which have positive ecological impacts for sea turtles, other protected or prohibited species, and released fish, as their design increases instances of mouth-hooking (versus internal hooking) that can reduce post-release mortality. The shape of the weak hook will be the same as the circle hooks currently used in the GOM PLL fishery, therefore, the weak hooks are expected to minimize internal hooking of sea turtles, other protected or prohibited species, and fish in the same manner that the current hooks do. The weak hooks are anticipated to allow a greater number of BFT the opportunity to escape capture than the current circle hooks do, which could lead to a decrease in catch of BFT in the GOM PLL fishery that could provide beneficial ecological impacts to the BFT stock in the long-term.

One of NMFS' goals for Atlantic HMS management has been to create ecologically sustainable harvest levels that provide the greatest economic benefits to the largest number of individuals. While certain actions have resulted in negative socioeconomic impacts, all of the past, present, and reasonably foreseeable future actions are expected to ensure the long-term ecological sustainability and continued economic viability of U.S. Atlantic HMS fisheries consistent with applicable law. Thus, NMFS considers that this action is consistent with past and current actions, and anticipates that it also will be consistent with future actions with no substantial adverse, cumulative impacts on the environment from the measure.

12. Is the action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

No. The management measures will occur in inshore and offshore waters of the GOM and will not occur in any areas listed or eligible for listing in the National Register of Historic Places, and will not cause loss or destruction of significant scientific, cultural or historical resources because there are no significant scientific, cultural or historic resources within the action area.

13. Can the action reasonably be expected to result in the introduction or spread of a non-indigenous species?

No. The final action will only require the use of weak hooks on PLL vessels in the GOM and will not result in any change to fishing patterns previously analyzed in the FEIS for the Consolidated HMS FMP and 1999 FMP. Most vessels in the GOM PLL fishery do not travel between ecologically different bodies of water or exchange ballast water.

14. Is the action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

No. The requirement for PLL vessels to use weak hooks fits under a broad category of routine procedures for gear modifications to avoid negative interactions with non-target and protected species. Over the past several years, numerous gear changes have been proposed and implemented in the PLL fleet with accompanying workshops and training sessions to inform and educate the industry regarding best operational practices. This particular final action is limited and will not set a precedent or represent a decision in principle about future considerations. The management measure in this final action is intended to be in place from the effective date (expected to be by spring of 2011) and in time to have a positive impact on BFT spawners entering the GOM during the spring of 2011.

15. Can the action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

No. The action will be consistent with the Magnuson-Stevens Act, the Atlantic Tunas Convention Act, and the regulations at 50 CFR 635. NMFS has determined that the action will be implemented in a manner consistent with the enforceable policies of those coastal states on the Atlantic (including the GOM and Caribbean) that have approved coastal zone management programs. Letters were sent to the relevant states asking for their concurrence when the proposed rule was filed with the Federal Register and letters of concurrence from the relevant states were received. The final action will not be expected to violate any Federal, state, or local law or requirement imposed for the protection of the environment.

16. Can the action reasonably be expected to result in cumulative adverse effects that could have substantial effect on the target species or non-target species?

No. The action is not expected to result in cumulative adverse effects that could have a substantial effect on target species or non-target species. This final action requires the use of weak hooks by PLL vessels operating in the GOM to decrease the bycatch of BFT and is consistent with the Consolidated HMS FMP's objectives to reduce bycatch. No increase in fishing effort or change in current fishing behavior is expected relative to recent fishing years.

DETERMINATION

In view of the information presented in this document and the analysis contained in the attached EA prepared for the required use of weak hooks in the PLL fishery operating in the GOM, it is hereby determined that this action will not significantly impact the quality of the human environment as described above and in the EA. In addition, all impacts to potentially affected areas, including national, regional and local, have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

APR 0 1 2011

Emily H. Menashes

Emily H. Menashes
Acting Director, Office of Sustainable Fisheries, NOAA

Date

Section 1.0 Purpose and Need for the Action

The National Marine Fisheries Service (NMFS) is preparing a final rule that will require the use of "weak hooks" by PLL vessels fishing in the GOM. A weak hook is a circle hook that meets NMFS' current size and offset restrictions but is constructed of round wire stock that is thinner-gauge (*i.e.,* no larger than 3.65 mm in diameter) than the circle hooks currently used in the PLL fishery. The purpose of the final action is to reduce PLL catch of Atlantic BFT in the GOM, which is the only known BFT spawning area for the western Atlantic stock of BFT. This action will be consistent with the advice of the International Commission for the Conservation of Atlantic Tunas (ICCAT) Standing Committee for Research and Statistics (SCRS) that ICCAT may wish to protect the strong 2003 year class until it reaches maturity and can contribute to spawning. The purpose is also to allow directed fishing for other species to continue within allocated BFT subquota limits. Implementation of weak hooks in the GOM PLL fishery by spring 2011 is important because the strong 2003BFT year class is beginning to enter adulthood, and it is likely that some of them will begin to spawn in the GOM this spring. Also, reducing the incidental BFT catch in the GOM may enable the PLL fishery to continue to participate in directed fisheries (*e.g.*, YFT and swordfish) year-round with less risk of fishery interruption due to insufficient incidental quota availability. The final rule will require a new gear technology that could allow the GOM PLL fleet to continue routine directed fishing operations (*e.g.*, YFT and swordfish) while decreasing the numbers of incidentally caught BFT. Weak hooks can allow incidentally hooked BFT to escape capture because the hooks are more likely to straighten when a large fish is hooked, thus releasing the fish.

Atlantic tunas are managed under the dual authority of the Magnuson-Stevens Fisheries Conservation and Management Act and the Atlantic Tunas Convention Act (ATCA), which authorizes the Secretary of Commerce (Secretary) to promulgate regulations as may be necessary and appropriate to implement recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT). The authority to issue regulations under the Magnuson-Stevens Act and ATCA has been delegated from the Secretary to the Assistant Administrator for Fisheries, NOAA (AA). On May 28, 1999, NMFS published in the Federal Register (64 FR 29090) final regulations, effective July 1, 1999, implementing the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (1999 FMP). On October 2, 2006, NMFS published in the Federal Register (71 FR 58058) final regulations, effective November 1, 2006, implementing the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan (Consolidated HMS FMP).

This action is necessary to further domestic management objectives under the Magnuson-Stevens Act, and to implement the Consolidated HMS FMP, including goals to rebuild stocks and end overfishing. BFT have historically been documented as overfished with overfishing occurring. Since 1998, an ICCAT rebuilding plan, which was implemented in the Consolidated HMS FMP, has been in place with the goal of rebuilding the western BFT stock by 2019. Strict U.S. quotas and domestic regulations were adopted to achieve this goal; including a prohibition on all directed fishing on BFT in the GOM, in recognition that it is the sole known spawning area for the western BFT stock. Although directed fishing for BFT is prohibited in the GOM, the incidental catch of BFT has become an area of heightened concern due to the status of the stock and mortality of incidentally caught spawning BFT bycatch in the directed YFT PLL fishery.

Furthermore, a recent stock assessment conducted by ICCAT's Standing Committee on Research and Statistics (SCRS) in October 2010, shows that a strong 2003 year class is expected to begin to contribute to an increase in spawning biomass after several years. In particular, the SCRS notes:

> "that the 2010 assessment is the first time that this strong 2003 year-class has been clearly demonstrated, likely as a result of age assignment refinements resulting from the growth curve and additional years of data; more observations from the fishery are required to confirm its relative strength. A further concern is that subsequent year-classes, although even less well estimated, are the lowest observed values in the time series. The Commission may wish to protect the 2003 year class until it reaches maturity and can contribute to spawning." (SCRS, 2010)

While the increased presence of spawning BFT in the GOM could provide a positive impact on the stock, PLL interactions with spawning BFT could also be expected to increase beginning this year with the higher number of fish in this year class. This could lead to increased incidental catches (and discards) of BFT, potentially diminishing the reproductive impact of this large year class to the western BFT stock.

Several other factors have also heightened concern about BFT recently such as the April 2010 Deepwater Horizon/BP oil spill in the GOM and potential impacts on BFT, particularly in the GOM. In addition, some environmental groups have called for the suspension of the entire Atlantic BFT fishery and the creation of a permanent BFT sanctuary in the GOM spawning area (Pew Environmental Group, 2010). On May 24, 2010, NMFS received a petition from the Center for Biological Diversity (CBD) to list BFT as threatened or endangered under the ESA and designate critical habitat concurrently with its listing. On September 21, 2010, NMFS announced a 90-day finding (75 FR 57431) that the petition presents substantial scientific information indicating the petitioned action may be warranted, in accordance with delineated procedures in the ESA implementing regulations. NMFS is currently conducting a status review of BFT to determine if the petitioned action is warranted. NMFS is scheduled to publish that determination by May 24, 2011 (*i.e.*, within 12 months of receiving the petition).

Tuna researchers working on tagging projects in the GOM have noted that BFT caught by PLL vessels have a high mortality rate due to the high metabolic stress endured during capture from the warm water (Block *et al*., 2005). Research results, from an experiment (the weak hook study) conducted by the NMFS Harvesting Systems and Engineering Branch, Pascagoula, Mississippi, have found over the past three years that the weak hook, which is designed to bend under pre-determined loads, could potentially result in the quick release of large BFT as well as some large pelagic sharks in PLL fisheries. The PLL vessel operators and owners involved in the study have shown support for use of weak hooks. Initial results show the potential for increasing the biomass of the western BFT stock in the short- and long-term with some potential adverse impacts to directed fisheries (*i.e.,* approximately a seven percent reduction in YFT and forty-one percent reduction in swordfish retained for sale).

On an annual basis, ICCAT issues the United States and other ICCAT Contracting Parties western Atlantic BFT quota, which NMFS later further divides among fisheries under the

allocation scheme established in the Consolidated HMS FMP. Under the Consolidated HMS FMP, PLL vessels are currently allocated 8.1 percent of the baseline annual U.S. quota for the incidental retention of BFT while fishing for other species such as YFT and swordfish in the GOM and swordfish in the North Atlantic. In the last few years however, the total PLL landings and dead discards, all of which must be reported to ICCAT, have exceeded the Consolidated HMS FMP-based PLL allocation (*i.e.*, landings and dead discards comprised 23 percent of the U.S. catch in 2009, substantially more than the 8 percent landings allocation of the U.S. quota assigned for the PLL fishery). Beginning in 2007, to provide quota sufficient for the PLL fleet to operate for the entire fishing year (based on the best available estimates of discards and landings), NMFS has added to the Longline category subquota a substantial portion of quota unharvested by other categories the prior year. In 2008 and 2009, NMFS provided 54 mt and 83 mt, respectively, during the annual quota specification process to cover the Longline category subquota overages. After 2010, the amount of unharvested ICCAT-issued quota that the United States may carry forward to the subsequent year will be substantially reduced (from 50 percent of the total U.S. quota to 10 percent). In addition, if future U.S. quotas remain at current levels, or less, there is the potential that other directed BFT fisheries (*e.g.*, commercial and recreational handgear fisheries) may fully utilize their subquotas. Under these types of quota constraints, NMFS may, in future years, have to consider closing the PLL target fisheries to avoid further incidental catch of BFT or consider closing directed BFT fisheries in order to manage the PLL fishery within the available U.S. quota and FMP-based quota allocations.

The objectives of this final rulemaking are to:

(1) enhance stock rebuilding by increasing BFT spawning potential and subsequent recruitment into the fishery, (*i.e.*, rapidly implement the final action to increase the survival of spawning BFT in 2011 in the GOM particularly the 2003 year class);
(2) constrain PLL BFT catch to the incidental BFT quota allocation;
(3) allow the PLL fleet to continue to participate in directed fisheries (*e.g.*, YFT and swordfish) year-round with less risk of fishery interruption due to insufficient incidental quota availability (*i.e.*, minimize negative social and economic impacts to the PLL directed fisheries);
(4) reduce the need for BFT quota reallocation from directed fisheries or the Reserve to cover PLL BFT bycatch *(i.e.*, minimize negative and social impacts to BFT directed fisheries); and
(5) minimize negative ecological impacts on non-target or protected species.

As required by current regulations, the retention of BFT in the PLL fishery is allowed only incidentally to the targeted catch of species other than BFT. This incidental catch of BFT must be within the target catch retention limits of one BFT per 2,000 lb of target catch, two BFT per 6,000 lb, and three BFT per 30,000 lb. BFT that are caught in excess of these existing target catch retention limits must be discarded and, for purposes of the discussion in this document, may be considered bycatch. BFT that are discarded dead are counted against the U.S. quota along with landed BFT. In this document and related to BFT in the PLL fishery, the terms "incidental catch" and "bycatch" are used within this context.

Section 1.1 Management history relevant to the final action

A condensed history on the management of the PLL fishery is provided below as it pertains to this final action. A more complete summary of HMS management can be found in the 2006 Consolidated HMS FMP, in the annual HMS Stock Assessment and Fishery Evaluation (SAFE) Reports, and online at http://www.nmfs.noaa.gov/sfa/hms/.

NMFS has implemented a series of management measures designed to regulate the incidental catch of BFT in non-directed Atlantic fisheries. In 1981, NMFS prohibited the use of longlines for any directed BFT fishery, implemented incidental catch limits, and established northern and southern management areas where different catch limits applied (46 FR 8012, January 26, 1981). PLL fishermen were restricted to two BFT per vessel per trip in the southern region and two percent by weight of all other fish on board in the northern region. In 1982, ICCAT recommended a ban on directed fishing for BFT in the GOM. Over the following decade, the value of BFT increased dramatically and fishing practices evolved with respect to incidental catch of BFT. In response, NMFS established various management measures to discourage PLL vessels from developing a directed fishery for this valuable species while allowing for the retention of incidentally caught BFT which included altering target catch requirements and adjusting geographic management areas (57 FR 365, January 6, 1992). Despite these efforts, incidental catch of BFT by U.S. PLL vessels continued. NMFS continued to evaluate management alternatives to achieve a balance between allowing the retention of true incidentally-caught BFT while preventing a directed fishery and reducing discards.

On May 28, 1999, NMFS published in the Federal Register (64 FR 29090) final regulations, effective July 1, 1999, implementing the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (1999 FMP). As part of the 1999 FMP, the regulations for all Atlantic HMS, including billfish, were consolidated into one part of the Code of Federal Regulations, 50 CFR Part 635. The 1999 FMP was the first FMP for Atlantic tunas and included numerous management measures governing all HMS fisheries including the sub-allocation of 8.1 percent of the United States' overall ICCAT allocated quota for BFT landed by PLL vessels incidental to directed fishing operations targeting other species. Other highlights from the 1999 FMP included a measure to close an area of ocean off the Mid-Atlantic Bight to PLL fishing during the month of June in an attempt to minimize bycatch of BFT and ensure compliance with ICCAT recommendations. The HMS FMP also considered, but did not implement, further modifications to target catch requirements because of the difficulty in determining catch levels and landings allowances that would likely reduce dead discards.

NMFS also stated that a comprehensive approach to time/area closures would be undertaken as part of a bycatch reduction strategy after further analysis of the data and consultation with the HMS and Billfish advisory panels. This led to the development of a draft Technical Memorandum, which was made available to the public on November 2, 1999 (64 FR 59162).

Subsequent to the release of the Technical Memorandum, NMFS considered three alternative actions to reduce bycatch and/or bycatch mortality in the Atlantic HMS PLL fishery: status quo, gear modifications that would decrease hook-ups and/or increase survival of bycatch species, and the prohibition of PLL fishing (closures) in areas where rates of bycatch are higher.

A proposed rule was published December 15, 1999 (64 FR 69982), for which alternatives were identified and analyzed in a draft Supplemental Environmental Impact Statement (64 FR 73550, December 30, 1999), that included proposed closed areas for PLL gear in the western GOM and off the southeast coast of the United States.

During the comment period on that proposed rule, NMFS received comments on many issues related to the proposed time/area closures. In particular, commenters asserted that a proposed closure in the western GOM would not adequately address juvenile swordfish bycatch in the DeSoto Canyon area of the eastern portion of the Gulf. Additionally, commenters noted the significant economic impacts associated with large scale area closures on vessel operators and shoreside support services that would need considerable time for adjustment and relocation. Given these comments, NMFS analyzed the potential impacts of an additional closed area in the DeSoto Canyon area. Subsequently, NMFS published supplementary information regarding the potential impacts of closing the DeSoto Canyon Area together with a revised summary of the IRFA prepared for the proposed rule (65 FR 24440, April 26, 2000). The comment period for the proposed rule was reopened through May 12, 2000, and NMFS specifically requested comments on the extent to which delayed effectiveness of the closure could mitigate the economic impacts of area closures. On August 1, 2000, NMFS published a final rule that prohibited live bait longlining in the GOM and prohibited PLL fishing at any time in the DeSoto Canyon area (beginning November 2000) and East Florida Coast (beginning February 2001), and from February through April of each year in the Charleston Bump area (beginning February 2001) (65 FR 47214, August 1, 2000).

In the PLL fishery, some species of sea turtles are sometimes caught or become entangled in the fishing gear. Because the federally-permitted PLL fishery may affect sea turtle species listed as threatened or endangered under the ESA, provisions of the ESA, such as Section 7 consultation, apply. During the course of the August 1, 2000, rulemaking, the PLL fleet exceeded the incidental take statement for sea turtles established during the ESA Section 7 Consultation for the 1999 FMP. That, combined with new information on sea turtles and the uncertainty regarding the effect of the closures on sea turtles, resulted in reinitiation of consultation and issuance of a new BiOp (June 30, 2000) which concluded that the continuation of the PLL fishery as proposed was likely to jeopardize the continued existence of leatherback and loggerhead sea turtles.

As a result of the June 2000 BiOp jeopardy finding, NMFS needed to implement certain measures to reduce sea turtle bycatch in the PLL fishery. NMFS decided that further analyses of observer data and additional population modeling of loggerhead sea turtles would be needed to determine more precisely the impact of the PLL fishery on sea turtles. Because of this, NMFS reinitiated consultation on the HMS fisheries on September 7, 2000. In the interim, NMFS implemented emergency regulations, based on historical data on sea turtle interactions, to reduce the short-term effects of the PLL fishery on sea turtles, including the closure of a portion of the Northeast Distant Statistical Area (NED) and a requirement that dipnets and line clippers be carried and used on PLL vessels to aid in the release of any captured sea turtle. These regulations published on October 13, 2000 (65 FR 60889).

NMFS issued a BiOp on June 8, 2001 (revised on June 14, 2001), which again concluded that the continued operation of the Atlantic PLL fishery was likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. Accordingly, the BiOp provided a reasonable and prudent alternative (RPA) to avoid jeopardy. The RPA included the following elements: closing the NED area effective July 15, 2001, and conducting a research experiment in this area on various PLL gear modifications to reduce sea turtle bycatch and bycatch mortality in the PLL fishery. The BiOp also included a requirement that all vessels permitted for HMS fisheries post sea turtle handling and release guidelines. This requirement was modified to specify its application only to bottom and PLL vessels by an August 31, 2001 memorandum from the Office of Protected Resources.

On July 13, 2001, NMFS published an emergency rule (66 FR 36711) to implement several of the June 2001 BiOp requirements. NMFS published an amendment to the emergency rule to incorporate the change in requirements for the handling and release guidelines that were published in the Federal Register on September 24, 2001 (66 FR 48812).

On July 9, 2002, NMFS 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 rule implemented the NED closure, 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 prohibited vessels from having hooks on board other than corrodible, non-stainless steel hooks. The final rule also required all HMS bottom and PLL vessels to post sea turtle handling and release guidelines in the wheelhouse. NMFS 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.

During this time frame, NMFS again proposed changes to the PLL BFT target catch requirements and other modifications to the Longline category regulations in December 2002 (67 FR 78404, December 24, 2002). The May 2003 final rule set the target catch requirements for retention of incidentally-caught BFT as follows: one large medium or giant BFT per vessel per trip may be landed, provided that at least 2,000 lb (907 kg) of species other than BFT are legally caught, retained, and offloaded from the same trip and are recorded on the dealer weighout slip as sold; two large medium or giant BFT may be landed incidentally to at least 6,000 lb (2,727 kg) of species other than BFT; and three large medium or giant BFT may be landed incidentally to at least 30,000 lb (13,620 kg) of species other than BFT (68 FR 32414 May 30, 2003). The final rule set Longline category BFT allocations such that the allocation for landing in the area south of 31°00' N. lat. would be no more than 60 percent of the Longline category BFT quota. It also allocated 25 mt for incidental catch by pelagic longline vessels fishing in the NED to implement a provision of the 2002 ICCAT recommendation on western Atlantic BFT (ICCAT Recommendation 02-07), that the United States and Canada receive 25 mt and 15 mt, respectively, for retention of BFT by-catch in their longline fisheries in the vicinity of the management area boundary (45 degrees W. long., north of 10 degrees N. lat.). In the rule implementing the 2003 quotas (68 FR 56788, October 2, 2003), NMFS defined the vicinity of the management area boundary as the NED and allowed retention of 25 mt of BFT caught

incidentally to fishing under the NED experimental fishery with no target catch requirements. The rule indicated that that the strict controls of the experiment could have the effect of preventing fishermen from meeting the target catch requirements and, as a result, all BFT incidentally caught during the experiment would have to be discarded if the target catch requirements stood. The rule specified that only once the 25 mt limit is reached would the target catch requirements apply. See the end of this chronology for a recent action proposed to reinstate regarding target catch requirements for pelagic longline vessels fishing in the NED.

On November 28, 2003, based on the conclusion of the NED experiment and based on preliminary data indicating that the Atlantic PLL fishery may have exceeded the ITS established in the June 14, 2001 BiOp, NMFS published a Notice of Intent (NOI) to prepare a Supplemental Environmental Impact Statement (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).

In January 2004, NMFS reinitiated consultation after receiving data that indicated the Atlantic PLL fishery exceeded the ITS for leatherback sea turtles in 2001 – 2002 and for loggerhead sea turtles in 2002. In the spring of 2004, NMFS released a proposed rule to require PLL fishermen to use certain hook and bait types and take other measures to reduce sea turtle takes and mortality. The resulting June 1, 2004 BiOp considered these measures and concluded that operation of the PLL fishery as proposed was not likely to jeopardize the continued existence of loggerhead sea turtles, but was still likely to jeopardize the continued existence of leatherback sea turtles.

On July 6, 2004, NMFS published a final rule (69 FR 40734) pursuant to the 2004 PLL BiOp implementing many gear and bait restrictions and requiring certain sea turtle handling and release tools and methods. Specifically, the 2004 final rule required vessel operators participating in the PLL fishery for Atlantic HMS operating outside of the NED, at all times, to possess onboard and/or use 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 could be possessed and/or utilized with the allowable hooks outside of the NED. The 2004 rule also re-opened the NED to PLL fishing for Atlantic HMS, but required vessels with PLL gear onboard in that area, at all times, to possess and/or use only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Within the NED, only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. Finally, NMFS required specific sea turtle release equipment to be possessed on board PLL vessels and adherence to specific handling and release techniques for sea turtles. The sea turtle handling and release placards and protocols were revised, and a video showing proper sea turtle handling techniques was mailed to all PLL vessel owners. The placards, protocols, and video were made available in English, Spanish, and Vietnamese.

In 2006, NMFS merged the FMP for Atlantic Tunas, Swordfish, and Sharks and the Atlantic Billfish FMP into one Consolidated HMS FMP. The final rule implementing the 2006 Consolidated HMS FMP (71 FR 58058, Oct. 2, 2006) contained several management measures applicable to the PLL fishery. These included: (1) mandatory workshops for the safe release, disentanglement, and identification of protected resources for PLL vessel owners and operators;

(2) implementation of the Madison-Swanson and Steamboat Lumps Marine Reserves to complement Gulf of Mexico Fishery Management Council regulations; and, (3) a clarification of the definitions of bottom longline and PLL gear based upon the species composition of the catch onboard or offloaded.

NMFS also thoroughly considered and analyzed time/area closures as a means to minimize bycatch and bycatch mortality in HMS fisheries in the Environmental Impact Statement that supported the Consolidated HMS FMP. The EIS analyzed the ecological, economic, and social impacts of twelve alternatives and subalternatives for potential PLL closures in the Atlantic and GOM on blue and white marlin, sailfish, spearfish, BFT, pelagic and large coastal sharks, and leatherback, loggerhead, and other sea turtles as part of the management measures considered to reduce bycatch. To evaluate the potential overall conservation benefits of each closure scenario, NMFS analyzed the impacts of the redistribution of fishing effort under various redistribution schemes (*e.g.,* fleet-wide redistribution of effort into all open areas or redistribution of effort only to open areas of the GOM). Redistribution of effort refers to fishing effort that is, or may be, applied in another location due to a closure. Previous research and requests for closures of portions of the GOM to protect BFT did not consider redistribution of effort when proposing a closure. These requests included research that presumed fishermen would simply stop fishing altogether if they could not fish in the closed areas. NMFS analyses were the only analyses at the time that modeled the potential for redistribution of effort related to closures in the GOM.

In the time/area analyses conduced in the 2006 Consolidated HMS FMP, NMFS found that with some level of redistributed effort, no one closure, or combination of closures, would have reduced bycatch of all of the species considered. In addition to implementing complementary HMS management measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, the final 2006 Consolidated HMS FMP established criteria to consider when assessing possible new time/area closures or making modifications to existing time/area closures. Criteria that would be considered may include, but are not limited to, the following: any ESA-related issues, concerns, recommendations, or requirements including those in applicable BiOps; bycatch rates of protected species, prohibited HMS, or non-target species both within the specified or potential closure area(s) and throughout the fishery; bycatch rates and post-release mortality rates of bycatch species associated with different gear types; applicable research; new or updated landings; bycatch and fishing effort data; social and economic impacts; and the practicability of implementing new or modified closures, including consistency with the FMP, Magnuson-Stevens Act, ATCA, and other applicable law. If the species is an ICCAT-managed species, NMFS would consider the effects of domestic and international fisheries on that species before implementing time/area closures. Other factors that NMFS would consider before implementing time/area closures include, but are not limited to, gear types and the location and timing of a closed area. NMFS would attempt to balance the ecological benefits with economic and social impacts. NMFS would also consider alternatives to closed areas, such as reducing quotas, mandatory gear modifications, or alternative fishing practices such as designated fishing days. Thus, before the implementation of a time/area closure, NMFS would determine that such a closure would be the best option for a given set of management goals, consistent with the FMP, the Magnuson-Stevens Act, and applicable law. Although NMFS decided at the time to not move forward with an HMS PLL closure in the GOM given the implications associated with

redistribution of fishing effort, it stated its intent to continue to pursue other alternatives to reduce bycatch in the GOM, especially for BFT.

Since 2006, there have been additional regulatory and management actions potentially affecting PLL vessels in the GOM. These include: Amendment 1 to the Consolidated HMS FMP (74 FR 28018, June 12, 2009) which revised HMS Essential Fish Habitat and designated a new Habitat Area of Particular Concern (HAPC) for BFT spawning areas in the GOM; implementation of a small closure to protect reef species in the GOM named the "Edges 40 Fathom Closure" (74 FR 66585, December 16, 2009). With regard to sea turtles, NMFS has recently proposed to list the Northwest Atlantic loggerhead sea turtle as "endangered" under the ESA (75 FR 12598, March 16, 2010).

In the spring of 2007, observer coverage in the GOM was increased to better characterize the interaction of the PLL fleet with BFT on the spawning ground with coverage approaching 100 percent during the spawning season (April to mid-June). In 2010, approximately 50 percent of trips during the BFT spawning season were observed which provides a reliable estimate of BFT bycatch. Starting in 2007, the NOAA Fisheries, Engineering and Harvesting Branch of the Southeast Fisheries Science Center (SEFSC), Mississippi Laboratories, began conducting scientific research in consultation and cooperation with the domestic PLL fleet in the GOM to develop and assess the efficacy of new technologies for reducing the bycatch mortality of BFT in the directed YFT fishery. During the first year of the research, experiments were conducted aboard the NOAA research vessel R/V Gandy to collect data on the relative force exerted by BFT and YFT when captured on PLL gear. Treatments of three different breaking strengths of monofilament leader were tested to determine which leader strength would effectively release BFT yet retain YFT. Based on promising results that indicated certain monofilament leaders were capable of releasing BFT of the sizes captured, NOAA researchers began working with hook manufacturers to develop a hook design that has less tensile strength than standard hook designs. Research conducted since has continued to evaluate the efficacy of a weaker 16/0 circle hook in reducing the bycatch of BFT by comparing it to a standard 16/0 circle hook used in the PLL fishery during targeted fishing operations. *See Research Experiment: Section 3.5 below*.

Since January 1, 2007, shark limited access and swordfish limited access permit holders who fish with longline or gillnet gear have been required to attend a Protected Species Safe Handling, Release, and Identification Workshops and submit a certificate to NMFS indicating that they have attended a workshop in order to renew their shark and swordfish permits. These mandatory workshops teach longline and gillnet fishermen required techniques for the safe handling, release, and identification of entangled and/or hooked protected species, such as sea turtles, marine mammals, and smalltooth sawfish. The overall goal of the workshops is to provide fishermen with the skills needed to reduce the mortality of protected species to meet the requirements of the 2004 PLL BiOp. Approximately two workshops are held monthly in coastal locations along the Atlantic coast and the GOM. Over 100 workshops have been conducted since 2006.

On April 20, 2010, an explosion and subsequent fire damaged the Deepwater Horizon MC252 oil rig, which capsized and sank approximately 50 miles southeast of Venice, Louisiana. Oil flowed for 86 days into the GOM from a damaged well head on the sea floor. In response to

the Deepwater Horizon/BP oil spill, NMFS issued a series of emergency rules (75 FR 24822, May 6, 2010; 75 FR 26679, May 12, 2010; 75 FR 27217, May 14, 2010) closing a portion of the GOM exclusive economic zone (EEZ) to all fishing and analyzed the environmental impacts of these closures in an Environmental Assessment. The fishery closures ranged in size from 6,817 sq. mi. (<4 percent of the U.S. GOM) on May 2, 2010, to 88,522 sq. mi. (approx. 37 percent of the U.S. GOM) on June 2, 2010. NMFS continues to adjust the spatial dimensions of the fishery closed area as new information becomes available regarding areas affected by oil. Information regarding the current status of the oil spill related fishery closed area may be found at http://sero.nmfs.noaa.gov/.

On May 24, 2010, NMFS received a petition from the Center for Biological Diversity (CBD) to list BFT as threatened or endangered under the ESA and designate critical habitat concurrently with its listing. On September 21, 2010, NMFS announced a 90-day finding (75 FR 57431) that the petition presents substantial scientific information indicating the petitioned action may be warranted. NMFS is currently conducting a status review of BFT to determine if the petitioned action is warranted. NMFS is scheduled to publish that determination by May 24, 2011 (*i.e.*, within 12 months of receiving the petition).

NMFS has recently proposed to reinstate target catch requirements for PLL vessels fishing in the NED (76 FR 13583, March 14, 2011). This action would effectively remove the exemption from target catch requirements that has applied in the NED since November 2003. NMFS would remove the provision that allows unlimited retention of commercial-sized BFT taken incidental to fishing for other species in the NED up to the amount allocated for the NED (currently 25 mt). Instead, the same target catch requirements (described in the first paragraph of this section) would apply in all areas (*i.e.*, both inside and outside of the NED).

Section 2 Summary of Alternatives

NMFS is considering the following alternatives: no action, a requirement that all PLL vessels fishing in the GOM use weak hooks upon the effective date of the action, and additional time/area closures in the GOM. Other alternatives were considered but not further analyzed because they did not meet the objectives and purpose and need of the action. The ecological, economic, and social impacts of the other alternatives are discussed in the following sections.

Alternative 1 Status Quo / No Action

Maintain existing regulations in GOM PLL Fishery. (No Action)

This alternative would maintain existing regulations regarding gear requirements for Atlantic PLL gear in the GOM (such as hook and bait requirements in the Atlantic PLL fishery in the GOM); conduct no additional outreach to vessel operators; maintain existing time/area closures in the GOM PLL fishery; maintain existing possession and use requirements for bycatch mitigation gear, as well as sea turtle handing and release training and guidelines as currently specified by NMFS; and not change BFT incidental catch retention limits. In addition, existing permitting and reporting requirements would remain in place including the deployment of observers, if selected, and NOAA scientists to gather additional data.

Alternative 2 **Require all PLL vessels fishing in GOM to use weak hooks (Preferred Alternative)**

Require vessels with PLL gear onboard, at all times, in all areas of the GOM open to HMS PLL fishing, to possess onboard and/or use only circle hooks meeting current size and offset restrictions as well as being constructed of only round wire stock that is no larger than 3.65 mm in diameter.

This alternative would limit vessel operators participating in the Atlantic HMS PLL fishery in the GOM, at all times, to possess, deploy, and/or use only weak hooks immediately upon the effective date of the final rule. A weak hook is defined as a circle hook, meeting current size and offset restrictions, constructed of only round wire stock that is no larger than 3.65 mm in diameter.

The Agency would conduct simultaneously an outreach program and work with dealers and vessel operators to educate and help ensure the requirement was understood and implemented. Observer programs would continue to determine the effects of these hooks on bycatch and discard mortality of BFT as well as target catches and other bycatch species. Implementation of this alternative is desirable prior to the onset of the spring 2011 spawning season that starts at the beginning of April and lasting through mid-June. Action prior to the spawning season would maximize the survival of spawning BFT and increase potential BFT spawning success. This is particularly important for the 2010 spawning season given the relatively large size of the 2003 year class that is reaching maturity and identified by the SCRS as warranting special management consideration.

Alternative 3 **Additional time/area closures in the Gulf of Mexico**

Close all, or a portion, of the GOM to PLL fishing, for a specified time period.

This alternative would close the GOM to PLL fishing during the spawning season for BFT in the GOM during a specified time-frame such as April to mid-June, or for shorter or longer time frames (*i.e.*, year round). The spatial extent of the closure would strive to include portions of the GOM where particularly high concentrations of spawning BFT have been observed while minimizing inclusion of areas with a high number of directed YFT fishing operations. Finally this alternative would include consideration of adaptive management programs with the temporal/spatial extent of the time/area changes based on real-time information on distribution and abundance of target and non-target species as well as the socio-economic needs of the fishery.

Alternatives considered but not analyzed further

NMFS has considered various options including those that have been raised in the past and discussed under the management history section above. These include consideration of such actions as: prohibition on all retention of BFT in the GOM (*i.e.*, no incidental retention of BFT allowed), adjustment of target catch retention limits (*i.e.*, modify current limits of one BFT per 2,000 lb of target catch, two BFT per 6,000 lb and three BFT per 30,000 lb), and allowing the

retention of all BFT caught during PLL trips. As these alternatives either do not reduce mortality of BFT but rather convert discards to landings, or may have substantial negative social and economic impacts and cannot be implemented by the 2011 spring BFT spawning season, these alternatives do not meet the objectives of the action and were not considered further. Specifically, prohibiting the retention of all BFT caught would substantially increase BFT discards. In contrast, allowing the retention of all BFT caught would cause the PLL category to considerably exceed its quota allowance with potential negative impacts to other directed BFT categories that may fully utilize their own quotas. In addition, allowing retention of all BFT caught may unintentionally provide an incentive for PLL vessels to target BFT, a prohibited activity, and also cause an increase in overall mortality of BFT beyond incidental catch.

Section 3 Affected Environment

Section 3.1 Status of BFT stock and primary target species

Western Atlantic BFT Stock Assessment

ICCAT's Standing Committee on Research and Statistics (SCRS), conducted their latest BFT stock assessments in September 2010. The text below (under the headings of "State of the Stock" through "Management Recommendations") is quoted from the executive summary of the western BFT stock assessment found in the Report of the SCRS, Madrid, Spain, October 4 -8, 2010. It is important to note that in its summary text, the SCRS made reference to only a few specific TAC levels and associated probabilities of success for purposes of illustrating the chances of rebuilding the stock (maintaining B above B_{MSY}) through the rebuilding period and preventing overfishing (maintaining F below F_{MSY}) around certain thresholds, under the low and high recruitment scenarios. However, SCRS considered and presented a broad range of TACs under the low recruitment, high recruitment, and combined scenarios in "Kobe II matrix" tables that were part of the SCRS report. Note that the SCRS uses the abbreviation "t" for tons; it is equivalent to mt.

"*State of the Stock*

"A new assessment was conducted this year, including information through 2009. The most influential change since the 2008 assessment was the use of a new growth curve that assigns fish above 120 cm to older ages than did the previous growth curve. As a result, the base model estimates lower fishing mortality rates and higher biomasses for spawners, but also less potential in terms of the maximum sustainable yield. The trends estimated during the 2010 assessment are consistent with previous analyses in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and has since fluctuated between 21 percent and 29 percent of the 1970 level. In recent years, however, there appears to have been a gradual increase in SSB from the low of 21 percent in 2003 to an estimated 29 percent in 2009. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets. Fishing mortality on spawners (ages 9 and older) declined markedly after 2003.

"Estimates of recruitment were very high in the early 1970s, and additional analyses involving longer catch and index series suggest that recruitment was also high

during the 1960s. Since 1977, recruitment has varied from year to year without trend with the exception of a strong year-class in 2003. The 2003 year-class is estimated to be the largest since 1974, but not quite as large as those prior to 1974. The 2003 year class is expected to begin to contribute to an increase in spawning biomass after several years. The Committee expressed concern that the year-class estimates subsequent to 2003, while less reliable, are the lowest on record.

"A key factor in estimating maximum sustainable yield (MSY)-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2006-2008) is 70 percent of the MSY level and SSB_{2009} is about 10 percent higher than the MSY level. Estimates of stock status are more pessimistic if a high recruitment scenario is considered (F/F_{MSY}=1.9, B/B_{MSY}=0.15).

"One important factor in the recent decline of fishing mortality on large BFT is that the TAC had not been taken during this time period until 2009, due primarily to a shortfall by the United States fisheries (until 2009). Two plausible explanations for the shortfall were put forward previously by the Committee: (1) that availability of fish to the United States fishery has been abnormally low, and/or (2) the overall size of the population in the Western Atlantic declined substantially from the level of recent years. While there is no overwhelming evidence to favor either explanation over the other, the base case assessment implicitly favors the first hypothesis (regional changes in availability) by virtue of the estimated increase in SSB. The decrease indicated by the U.S. catch rate of large fish is matched by an increase in several other large fish indices. Nevertheless, the Committee notes that there remains substantial uncertainty on this issue and more research needs to be done.

"The SCRS cautions that the conclusions of this assessment do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Limited analyses were conducted of the two stocks with mixing in 2008, but little new information was available in 2010. Based on earlier work, the estimates of stock status can be expected to vary considerably depending on the type of data used to estimate mixing (conventional tagging or isotope signature samples) and modeling assumptions made. More research needs to be done before mixing models can be used operationally for management advice. Another important source of uncertainty is recruitment, both in terms of recent levels (which are estimated with low precision in the assessment), and potential future levels (the "low" vs. "high" recruitment hypotheses which affect management benchmarks). Improved knowledge of maturity at age will also affect the perception of changes in stock size. Finally, the lack of representative samples of otoliths requires determining the catch at age from length samples, which is imprecise for larger BFT.

"*Outlook*

"A medium-term (10-year) outlook evaluation of changes in spawning stock size and yield over the remaining rebuilding period under various management options was conducted. Future recruitment was assumed to fluctuate around two alternative scenarios: (i) average levels observed for 1976-2006 (85,000 recruits, the low recruitment scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 270,000 recruits, the high recruitment scenario). The Committee has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.

"The outlook for BFT in the West Atlantic with the low recruitment scenario (is more optimistic with respect to current stock status than that from the 2008 assessment (owing to the use of improved information on the growth of BFT). A total catch of 2,500 t is predicted to have at least a 50 percent chance of achieving the convention objectives of preventing overfishing and maintaining the stock above the MSY level. The outlook under the high recruitment scenario is more pessimistic than the low recruitment scenario since the rebuilding target would be higher; a total catch of less than 1,250 t is predicted to maintain F below F_{MSY}, but the stock would not be expected to rebuild by 2019 even with no fishing.

"[The Kobe II matrices] summarize the estimated chance that various constant catch policies will allow rebuilding under the high and low recruitment scenarios for the base-case. The low recruitment scenario suggests the stock is above the MSY level with greater than 60 percent probability and catches of 2,500 t or lower will maintain it above the MSY level. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,100 t or less are predicted to have a 60 percent chance to immediately end overfishing and initiate rebuilding. The Committee notes that considerable uncertainties remain for the outlook of the western stock, including the effects of mixing and management measures on the eastern stock.

"Effects of current regulations

"The Committee previously noted that Recommendation 06-06 was expected to result in a rebuilding of the stock towards the convention objective, but also noted that there has not yet been enough time to detect with confidence the population response to the measure. This statement is also true for Recommendation 08-04, which was implemented in 2009. Some of the available fishery indicators as well as the current assessment suggest the spawning biomass of western BFT may be slowly rebuilding.

"*Management recommendations*

"In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve B_{MSY} with at least 50 percent probability. In response to recent assessments, in 2008 the Commission recommended a total allowable catch (TAC) of 1,900 t in 2009 and 1,800 t in 2010 [Rec. 08-04].

"The current (2010) assessment indicates similar historical trends in abundance as in previous assessments. The strong 2003 year class has contributed to stock productivity such that biomass has been increasing in recent years.

"Future stock productivity, as with prior assessments, is based upon two hypotheses about future recruitment: a 'high recruitment scenario" in which future recruitment has the potential to achieve levels that occurred in the early 1970's and a "low recruitment scenario" in which future recruitment is expected to remain near present levels. Results in previous assessments have shown that long term implications of future biomass are different between the two hypotheses and this research question remains unresolved. However, the current (2010) assessment is also based on new information on western BFT growth rates that has modified the Committee's perception of the ages at which spawning and maturity occur. Maturity schedules remain very uncertain, and, thus, the application of the new information in the current (2010) assessment accentuates the differences between the two recruitment hypotheses.

"Probabilities of achieving B_{MSY} within the Commission rebuilding period were projected for alternative catch levels. The "low recruitment scenario" suggests that biomass is currently sufficient to produce MSY, whereas the "high recruitment scenario" suggests that B_{MSY} has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the long term future productivity of the stock, under either recruitment scenario current catches (1,800 t) should allow the biomass to continue to increase. Also, catches in excess of 2,500 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future.

"The SCRS notes that the 2010 assessment is the first time that this strong 2003 year-class has been clearly demonstrated, likely as a result of age assignment refinements resulting from the growth curve and additional years of data; more observations from the fishery are required to confirm its relative strength. A further concern is that subsequent year-classes, although even less well estimated, are the lowest observed values in the time series. The Commission may wish to protect the 2003 year class until it reaches maturity and can contribute to spawning. Maintaining catch at current levels (1,800 t) may offer some protection.

"As noted previously by the Committee, both the productivity of western Atlantic BFT and western Atlantic BFT fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West."

ICCAT's 2010 Western Atlantic BFT Recommendation

At its November 2010 meeting, ICCAT adopted a conservation and management recommendation for western Atlantic BFT that, among other things, reduced the TAC from 1,800 mt to 1,750 mt annually for 2011 and 2012, a 2.8 percent reduction overall. The Kobe II matrices show that, under the low recruitment scenario, the new TAC has a 99 percent probability of maintaining the fishing mortality of western BFT for 2011 and 2012 below the fishing mortality associated with MSY and a 95 percent probability of maintaining the stock above the biomass that will support MSY (B_{MSY}) through the end of the rebuilding period, *i.e.*, by 2019 (*i.e.*, ends overfishing and the stock is rebuilt). Under the combined scenario, the TAC has a 54 percent probability of ending overfishing within two years and a 48 percent probability of rebuilding the stock to the B_{MSY} level by the end of the rebuilding period. Under the high recruitment scenario, the TAC has an 8 percent probability of ending overfishing within two years and a zero chance of rebuilding the stock to the B_{MSY} level by the end of the rebuilding period. Under any scenario, the agreed TAC is expected to support continued stock growth if compliance with agreed rules remains strong. For the western BFT fishery, compliance with ICCAT measures has typically been very high over the years.

The 2010 ICCAT western Atlantic BFT recommendation is scheduled to enter into force in June 2011. NMFS plans to implement the U.S. portion of the TAC in the spring of 2011 via proposed and final rulemaking to set quotas for the domestic fishing categories.

BFT and the Gulf Oil Spill

Data are not available, at this time, to demonstrate any specific effects of the Deepwater Horizon/BP oil spill on the BFT, YFT, swordfish, or other HMS resources. However, it is possible that the oil spill could have impacts on fish eggs and larval stages of species (including BFT, YFT, swordfish, and other highly migratory species that occur in the GOM). Oil from the spill has dispersed on the surface as well as deep within the water column, but in the time since the well head was capped, oil has disappeared from some areas. BFT spawn from April to mid-June. Oil that was present in surface waters could have affected the survival of eggs and larvae and affected recruitment. Effects on the physical environment such as low oxygen and the inter-related effects that culminate and magnify through the food web could lead to impacts on the ability of larvae and post-larvae to survive, even if they never encountered oil. In addition, effects of oil exposure may not always be lethal, but can create sub-lethal effects on the eggs, larva, and early life stages of fish. There is the potential that the stressors can be additive, and each stressor may increase the susceptibility to the harmful effects of the other. Conversely, juvenile BFT, YFT, swordfish, and most other HMS are pelagic in nature, have a fast growth rate, and quickly gain the ability to swim over long distances. This capability may allow juvenile HMS to avoid areas of concentrated oil. In addition, there would be less potential impacts to HMS juveniles and adults if oil remains on the surface, continues to wash ashore, or continues to decompose to non-lethal levels.

<u>Yellowfin tuna</u>

As described above, the GOM PLL fishery targets YFT and, to a lesser extent, swordfish. These species, along with BFT and others are managed by ICCAT. The ICCAT SCRS

conducted a full stock assessment for YFT in 2008, applying both an age-structured model and a non-equilibrium production model to the available catch data through 2006. In summary, 2006 catches were estimated to be well below MSY levels, stock biomass was estimated to be near the Convention Objective (near B_{MSY} or the level of biomass that can sustain MSY) and fishing mortality rates somewhat below F_{MSY}. Trends through 2006 indicate declining effective effort and some recovery of stock levels. However, when the uncertainty around the point estimates from both models is taken into account, there was still about a 60 percent chance that stock status was not consistent with Convention Objectives.

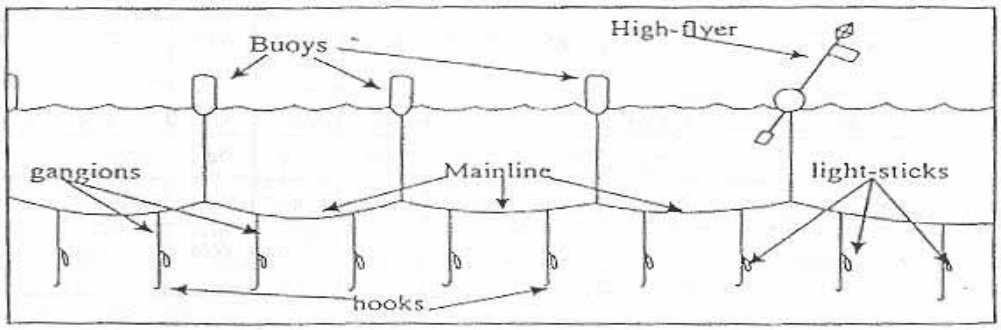
North Atlantic Swordfish

The current SCRS results indicate that the stock is at or above B_{MSY}. The estimated relative biomass trend shows a consistent increase since 2000. The relative trend in fishing mortality shows that the level of fishing peaked in 1995, followed by a decrease until 2002, followed by small increase in the 2003-2005 period and downward trend since then. Fishing mortality has been below F_{MSY} since 2005. The results suggest that there is a greater than 50 percent probability that the stock is at or above B_{MSY}, and thus ICCAT's rebuilding objective has been achieved. However, it is important to note that since 2003 the catches have been below the TAC's greatly increasing the chances for a fast recovery. Overall, the stock was estimated to be somewhat less productive than the previous assessment, with the intrinsic rate of increase, *r*, estimated at 0.44 compared to 0.49 in 2006.

Section 3.2 Fishery Participants and Gear

The PLL fishery for Atlantic HMS primarily targets swordfish, YFT, and bigeye tuna in various areas and seasons. Secondary target species include dolphin (fish), albacore tuna, and, to a lesser degree, sharks. Although PLL gear can be modified (*e.g.*, depth of set, hook type, hook size, bait, 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 fish providing the most economic benefit for each individual trip. PLL gear sometimes attracts and hooks non-target finfish with little or no commercial value as well as species that cannot be legally retained by commercial fishermen, such as billfish. PLL gear 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 (MMPA). Any species (or undersized catch of permitted species) that cannot be legally landed is required to be released, regardless of whether the catch is dead or alive.

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



PLL gear is composed of several parts (Figure 3.1). The primary fishing line, or mainline of the PLL system, can vary from five to 40 miles in length, with approximately 20 to 30 hooks per mile. Based upon observer reports from 1992 – 2004, the shortest length of a mainline set on an observed trip was 4.4 nautical miles (nm) while the longest set during a trip was 46.6 nm (Keene, et al., 2006). 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, or gangion, to the mainline. Lightsticks, which contain light emitting chemicals, are often used, particularly when targeting swordfish. When attached to the hook and suspended at a certain depth, lightsticks attract baitfish, which may, in turn, attract pelagic predators (NMFS, 1999).

When targeting swordfish, PLL gear is generally deployed at sunset and hauled at sunrise to take advantage of swordfish nocturnal near-surface feeding habits (NMFS, 1999). In general, longlines targeting tunas are set in the morning, fished deeper in the water column, and hauled back 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 species (NMFS, 1999).

Figure 3.2 illustrates basic differences between swordfish (shallow) and tuna (deep) longline sets. Swordfish sets are buoyed to the surface, have fewer hooks between floats, and are relatively shallow. This same type of gear arrangement is used for mixed target species 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 believed that tuna sets hook fewer turtles than the swordfish sets because of the difference in fishing depth. In addition, tuna sets use bait only, while swordfish sets use a combination of bait and lightsticks. Compared with vessels targeting swordfish or mixed species, vessels specifically targeting tuna are typically smaller and fish different grounds.

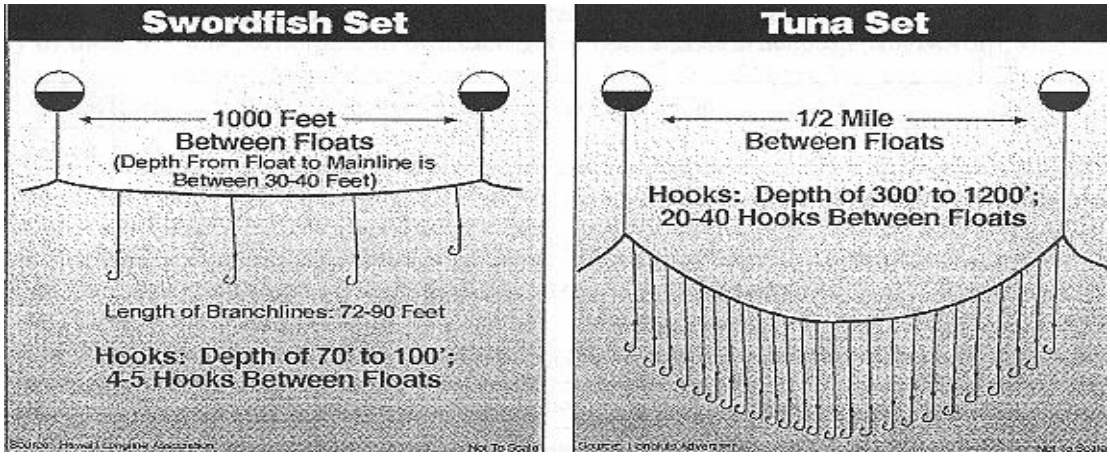


Figure 3.2. Different PLL Gear Deployment Techniques. Source: Hawaii Longline Association and Honolulu Advertiser.

Regional U.S. Pelagic Longline Fisheries Description

The U.S. PLL fishery has historically been comprised of five relatively distinct segments with different fishing practices and strategies. These segments are: 1) the GOM YFT fishery; 2) the South Atlantic-Florida east coast to Cape Hatteras swordfish fishery, which has been greatly affected by the Florida East Coast and Charleston Bump time/area closures; 3) the Mid-Atlantic and New England swordfish and bigeye tuna fishery; 4) the U.S. distant water swordfish fishery; and, 5) the Caribbean Islands tuna and swordfish fishery. See Table 3.1 for a comparison of effort in the GOM PLL fishery versus other regions over the past 5 years. In addition to geographical area, these segments have historically differed by percentage of various target and non-target species, gear characteristics, and deployment techniques. Some vessels fish in more than one fishery segment during the course of a year (NMFS, 1999). Due to the various changes in the fishery, *i.e.*, regulations, operating costs, market conditions, species availability, etc., the fishing practices and strategies of these different segments may change over time.

Table 3.1. Effort data for vessels reporting at least one PLL set by year, for all US vessels compared to GOM only, 2006-09. (Source: HMS Pelagic Logbook data)

	Number of Vessels		Number of Trips		Number of Sets		Number of Sets/Trip		Number of Hooks Set	
Year	US	GOM	US	GOM	US	GOM	US	GOM	US	GOM
2006	101	47	1,288	479	7,585	3,336	5.9	7.0	5,647,195	2,575,231
2007	117	55	1,504	574	8,810	3,978	5.9	6.9	6,281,242	2,914,475
2008	121	53	1,399	417	8,838	3,206	6.3	7.7	6,489,296	2,368,381
2009	112	46	1,232	428	8,294	3,646	6.7	8.5	6,263,023	2,766,824

The Gulf of Mexico Yellowfin Tuna Fishery

GOM vessels primarily target YFT year-round; however, a handful of these vessels directly target swordfish, either seasonally or year-round. PLL fishing vessels that target YFT in the GOM also catch and sell dolphin (fish), swordfish, other tunas, and sharks. During YFT fishing, few swordfish are captured incidentally. Many of these vessels participate in other GOM fisheries (targeting shrimp, shark, and snapper/grouper) during allowed seasons. Home ports for this fishery include, but are not limited to, Madeira Beach, Florida; Panama City, Florida; Dulac, Louisiana; and Venice, Louisiana (NMFS, 1999).

For catching tuna, the longline gear is configured similarly to swordfish longline gear but is deployed differently (see Figures 3.1 and 3.2). The gear is typically set in the morning (between 2 a.m. and 12 p.m.) and retrieved in the evening or night (4 p.m. to 12 a.m.). Fishing occurs in varying water temperatures; however, YFT are generally targeted in the western GOM during the summer when water temperatures are high. In the past, fishermen have used live bait;, however, NMFS prohibited the use of live bait in the GOM in an effort to decrease bycatch and bycatch mortality of billfish (65 FR 47214, August 1, 2000). This rule also closed the Desoto Canyon area (year-round closure) to PLL gear. In the GOM, and all other areas, except the Northeast Distant Gear Restricted Area (NED), circle hooks (16/0 or larger non-offset and

18/0 or larger with an offset not to exceed 10 degrees) are currently required, as are whole finfish and squid baits.

Section 3.3 PLL Catch and discard patterns in GOM

Landings and Bycatch of PLL Target and Non-Target Species (except BFT)

U.S. PLL catch (including bycatch, incidental catch, and target catch) is largely related to vessel characteristics and gear configuration. The reported catch is summarized for the entire PLL fishery in Table 3.2, including a comparison to catches in the GOM. Additional information regarding U.S. PLL landings and discards is available in the 2010 U.S. National Report to ICCAT (NMFS, 2010a). From 2006 through 2009, YFT was the primary target species in the GOM, exceeding 20,000 fish, except for 2008. In 2009, the GOM YFT tuna fishery exceeded all other geographic areas combined in terms of YFT landed. Swordfish are landed secondarily to YFT in the GOM although the vast majority of the swordfish landed are caught outside of the GOM.

Table 3.2. GOM and Non-GOM PLL landings and discards (numbers), 2006-09. Source: HMS Logbook data.

Species	Area	Disposition	2006	2007	2008	2009
BFT	GOM	Kept	73	116	100	114
		Live discards	26	83	84	91
		Dead discards	49	103	170	131
		Total	148	302	354	336
	Non-GOM	Kept	188	221	243	438
		Live discards	523	875	919	720
		Dead discards	253	284	244	249
		Total	946	1,380	1,406	1,407
Swordfish	GOM	Kept	5,669	8,051	6,155	7,638
		Live discards	1,239	1,587	1,195	868
		Dead discards	1,973	2,815	2,388	1,667
		Total	8,881	12,453	9,738	10,173
	Non-GOM	Kept	32,339	37,694	36,545	30,889
		Live discards	2,786	3,599	3,526	1,822
		Dead discards	2,830	3,757	4,063	1,791
		Total	37,955	45,050	44,134	34,502
YFT	GOM	Kept	23,090	23,917	14,640	20,915
		Live discards	325	344	333	363
		Dead discards	191	510	395	306
		Total	23,606	24,771	15,368	21,584
	Non-GOM	Kept	32,655	32,125	19,109	15,411
		Live discards	487	226	600	337
		Dead discards	422	370	389	235
		Total	33,564	32,721	20,098	15,983

Species	Area	Disposition	2006	2007	2008	2009
Other Tunas (Bigeye, Albacore, Skipjack)	GOM	Kept	1,060	1,100	704	667
		Live discards	256	349	394	599
		Dead discards	807	763	723	513
		Total	2,123	2,212	1,821	1,779
Other Tunas (Bigeye, Albacore, Skipjack)	Non-GOM	Kept	16,022	13,203	15,593	13,547
		Live discards	198	192	388	258
		Dead discards	175	274	201	241
		Total	16,395	13,669	16182	14,046
Other Finfish (dolphin, wahoo, etc.)	GOM	Kept	6,027	10,620	11,170	9,865
		Live discards	84	113	96	161
		Dead discards	79	73	128	108
		Total	6,190	10,806	11,394	10,134
	Non-GOM	Kept	23,220	60,550	34,871	52,582
		Live discards	230	268	154	93
		Dead discards	861	78	121	127
		Total	24,311	60,896	35,146	52,802
Large Coastal Sharks	GOM	Kept	88	16	28	51
		Live discards	459	965	1,586	916
		Dead discards	185	278	546	264
		Total	732	1,259	2,160	1,231
	Non-GOM	Kept	1,680	530	87	352
		Live discards	3,897	4,783	3,718	3,759
		Dead discards	785	1,097	867	986
		Total	6,362	6,410	4,672	5,097
Pelagic Sharks	GOM	Kept	75	129	81	257
		Live discards	98	222	244	225
		Dead discards	27	60	78	58
		Total	200	411	403	540
	Non-GOM	Kept	2,018	3,374	3,418	2,440
		Live discards	20,675	24,532	25,758	23,513
		Dead discards	3,310	2,660	2,699	2,933
		Total	26,003	30,566	31,875	28,886
Blue Marlin	GOM	Live discards	161	238	114	352
		Dead discards	31	44	50	105
		Total	292	282	264	457
	Non-GOM	Live discards	203	283	340	416
		Dead discards	43	46	62	74
		Total	246	329	402	490
White Marlin	GOM	Live discards	157	166	156	403
		Dead discards	51	35	68	163

Species	Area	Disposition	2006	2007	2008	2009
		Total	206	201	224	566
	Non-GOM	Live discards	268	424	332	310
		Dead discards	81	119	111	64
		Total	349	543	443	374
Sailfish	GOM	Live discards	128	118	205	344
		Dead discards	34	39	71	120
		Total	162	157	276	464
	Non-GOM	Live discards	59	114	170	213
		Dead discards	56	50	55	43
		Total	115	164	225	256

In recent years, although the North Atlantic stock is rebuilt, the United States has been landing well below the ICCAT quota. NMFS has therefore taken a number of steps to modify swordfish management measures to improve opportunities to catch the allowable quota. In 2007, a final rule was published (72 FR 31688, June 7, 2007) to change PLL vessel upgrading requirements, increase incidental swordfish landing limits, and increase recreational (Angling and Charter/Headboat) landing limits. Additionally, NMFS implemented regulations in 2008 (73 FR 38144, July 3, 2008) to allow Atlantic tunas Longline permits that had been expired for more than one year to be renewed. This action enabled some PLL fishermen to renew permits which previously could not be renewed for administrative reasons, because they did not have a vessel to which the permit could be assigned.

In the U.S. PLL fishery, fish may be discarded for a variety reasons. Swordfish, yellowfin tuna, and bigeye tuna may be discarded because they are undersized or unmarketable (*e.g.*, bitten by sharks). Blue sharks, as well as other species, are discarded because of limited markets (resulting in low prices) and the perishable nature of the product. Large coastal sharks are discarded when the shark season is closed. BFT may be discarded because catch requirements for target species have not been met and retention is therefore prohibited. All billfish are required to be released. In the past, swordfish have been discarded when the swordfish season was closed.

Amendment 1 to the 1999 FMP prohibited the use of live bait on PLL gear in the GOM due to concerns over the bycatch of billfish. Based on logbook data, the number of hooks reported set with live bait or a combination of live and dead bait in the GOM decreased from 22.7 percent in 2000, to less than 0.1 percent in 2003. However, the number of hooks reported set with no bait type specified increased from zero in 1999 – 2001 to 3.7 percent in 2003, declining to less than one percent in 2004. Nearly all of the hooks reported set in the GOM in the past two years have been set with dead bait.

The time/area closures and live bait prohibition in the GOM have been relatively successful at reducing bycatch of a number of species in the HMS PLL fishery. Reported discards of all species of billfish have declined. The reported number of turtles caught, swordfish discarded, and pelagic and large coastal shark discards have also declined. However,

the reported numbers of target species kept, such as swordfish and non-BFT tuna, have decreased more than was predicted (NOAA Fisheries 2010b).

Incidental Catch and Landing of BFT

Although the PLL fleet is not allowed to target BFT, an allocation of 8.1 percent of the baseline annual U.S. quota is available for the incidental retention of BFT while fishing on other (target) species, primarily YFT in the GOM. PLL vessels are allowed to retain BFT in accordance with target catch requirements in the regulations (one BFT for 2,000 lb of species other than BFT; two for 6,000 lb; and three for 30,000 lb, as described in detail in Section 1.1). A separate quota allocation of 25 mt is provided for the NED where PLL vessels primarily target swordfish. A separate BFT discard allocation is not included in the FMP allocations, although until 2006, ICCAT had provided a separate quota allowance to account for PLL discards in the western Atlantic. Thus, dead discards must be accounted for, along with landings, against the U.S. quota.

In 2009, PLL BFT landings represented 12 percent of U.S. BFT landings, and PLL landings and dead discards of BFT represented 23 percent of U.S. reported BFT catch (Table 3.3). NMFS observer coverage has been approximately 50 percent of PLL vessels in the GOM which provides a reliable estimate of BFT byatch. NMFS estimates PLL dead discards of BFT by extrapolating PLL vessel logbook tallies from pooled observer data. In 2008 and 2009, landings in the GOM were less than off the east coast of the United States but discards were higher (Table 3.4). Incidental landings of BFT in the GOM contribute to the economic viability of the GOM PLL fleet that targets YFT, sometimes as much as the PLL fleet outside of the GOM that primarily targets swordfish (Table 3.5). The Pelagic Observer Program (POP) monitors a mobile U.S. PLL fleet ranging from the Grand Banks to the Atlantic off of Brazil and in the GOM. Vessels range in size from 35-90 feet and trips typically last 2-45 days. During an average year, the observer corps will spend about 900 days at sea, encompassing 70-75 vessel trips and about 500 longline sets. The distance of a longline set can range from 10-40 miles fishing between 200-1,000 baited hooks about 100 yards apart. Observer personnel record fish species, length, weight, sex, location, and other environmental information. The information collected is used to estimate catch rates of target and bycatch species and to estimate discard levels, and this information is used by the SCRS for stock assessment purposes.

Table 3.3. 2009 results of PLL catch and quota compared to U.S. total

	Metric tons (rounded)				
2009	Base Quota[1]	Adjusted Quota[1]	Landings[2]	Dead Discards[2]	Total Catch
PLL	107	99	131	160	291
U.S. Total	1,035	1,462	1,068	160	1,228

[1] Quotas include the ICCAT-recommend 25-mt set aside for PLL bycatch in the NED
[2] Landings and dead discards as reported in 2010 U.S. Report to ICCAT

The original target coverage of the program was five percent of the longline fishing sets deployed by the U.S. fleet within the North Atlantic (waters north of 5° N. latitude) consistent with a 1996 ICCAT recommendation. In 2004, the target coverage of the U.S. program increased to eight percent to comply with certain domestic requirements. Achieved observer coverage of the U.S. PLL fleet during the period 2004-09 ranged from 7.3 to 15 percent of the fishing sets deployed. Fishery observer effort is allocated among eleven large geographic areas and calendar quarter. The observer effort is allocated based upon reported fishing effort during the previous year in each quarter/fishing area stratum. Observer coverage in the GOM was increased beginning in the spring of 2007 to better characterize the interaction of the longline fleet with BFT within the spawning grounds. Coverage has been 72 percent (of all longline sets in the GOM) or greater since that time during spawning season, with approximately 85 percent coverage in 2009.

Table 3.4. BFT FMP longline category quota, landings and estimated discards by area, 2008 and 2009 (Source: BFT dealer database)

		Metric tons (rounded) - MT			
Year	Area	Adjusted Quota[1]	Landings [2]	Discards[2]	Catch
2009	NED[3]	25	51	5	56
	East Coast ~ "North"	30	46	77	123
	GoM ~ "South"	45	33	78	111
	Total	100	131	160	291
2008	NED	25	9	5	14
	East Coast ~ "North"	23	40	67	107
	GoM ~ "South"	34	26	86	112
	Total	82	75	158	233

[1] Adjusted quota as published for longline north and longline south in annual quota specifications (N & S of 31° N. lat.)
[2] Landings and dead discards as reported by ICCAT Statistical Area in 2010 U.S. Report to ICCAT
[3] NMFS applied target catch requirements when 2009 NED set-aside met, effective October 20-31.

Table 3.5. GOM and Non-GOM PLL landings and discards (number (#) and metric tons (MT) of whole weight (ww) of fish), 2006-2009. Source: BFT dealer data base and SEFSC (discards as reported to ICCAT – *i.e.* after extrapolation).

Species	**Area**	**Disposition**	**2006**		**2007**		**2008**		**2009**	
			#	MT	#	MT	#	MT	#	MT
BFT	GOM	Kept	62	21.9	125	40.1	89	32.1	118	41.5
		Value ($)	148,131.15		324,085.66		198,941.25		258,755.25	
		Dead discards		33.07		49.28		86.05		78.13
	Non-GOM	Kept	189	49.8	208	52.5	264	61.6	487	121.7
		Value ($)	465,291.80		483,868.92		549,137.79		1,002,298.30	
		Dead discards		58.23		61.99		71.63		82.26

Section 3.4 Habitat

It is believed that there are probably certain features of the BFT larval habitat in the GOM which determine growth and survival rates, and that these features show variability from year to year, perhaps accounting for a significant portion of the fluctuation in yearly recruitment success (McGowan and Richards, 1989). The habitat requirements for larval success are not known, but larvae have been collected within narrow ranges of temperature and salinity - approximately 26° C and 36 ppt. Along the coast of the southeastern United States onshore meanders of the Gulf Stream can produce upwelling of nutrient rich water along the shelf edge. In addition, compression of the isotherms on the edge of the Gulf Stream can form a stable region which, together with upwelling nutrients, provides an area favorable to maximum growth and retention of food for the larvae (McGowan and Richards, 1989). Size classes used for habitat analysis for BFT are based on the sizes at which they shift from a schooling behavior to a more solitary existence.

In 2009, NMFS completed the five year review and update of EFH for Atlantic HMS with the publishing of the Final Amendment 1 to the Consolidated HMS FMP (June 12, 2009, 74 FR 288018). As a result of the 2009 Amendment 1 to the Consolidated Atlantic HMS FMP, EFH was updated for all federally managed Atlantic HMS. As part of this analysis, NMFS established a new HAPC in the GOM for spawning BFT while maintaining the current HAPCs for sandbar sharks along the Atlantic coast. Most HMS EFH is comprised of the water column. As water column characteristics such as temperature, salinity, and dissolved oxygen are unlikely to be affected by fishing gears, NMFS concluded that fishing gears are not having a negative effect on most HMS EFH.

The Magnuson-Stevens Act requires NMFS to identify and describe EFH, minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. The HAPC meets at least one, and possibly more, of the requirements for HAPC designation, including "the importance of the ecological function provided by the habitat," "whether and to what extent, development activities are, or will be, stressing the habitat" and the "rarity of the habitat type." The area includes a majority of the locations where BFT larval collections have been documented, overlaps with both updated and existing adult and larval BFT EFH, and incorporates portions of an area identified as a primary spawning location by Teo *et al.* (2007a and b). The GOM is the only

known spawning area for western BFT, and the HAPC designation highlights the importance of the area for BFT spawning.

Section 3.5 Research Experiment

The following information is gathered from the "2009 Project Report - Update on Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research" (NOAA Fisheries 2009b) and updated with information from the "2010 Interim Project Report - Update on Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research" (NOAA Fisheries 2010a). For more detail, see Appendix A for the referenced report.

Introduction

NOAA Fisheries, Engineering and Harvesting Branch of the Southeast Fisheries Science Center (SEFSC), Mississippi Laboratories, started working with the GOM PLL fleet in 2007, to collaboratively develop technology to address a growing concern about bycatch mortality of spawning BFT. Research efforts focused on how to take advantage ofthe difference in the relative larger size of spawning BFT as compared to the target species,YFT. NMFS researchers worked with hook manufacturers to develop a hook design that has less tensile strength than standard hook designs. Research conducted in 2008 evaluated the efficacy of a weaker 16/0 circle hook in reducing the bycatch of BFT by comparing it to a standard 16/0 circle hook used in the PLL fishery. Results from the fishery dependent research conducted in 2008 were encouraging and in order to improve the statistical precision and confidence of the results, additional research was conducted in 2009 and in 2010.

Materials and methods

Researchers collaborated with two commercial PLL vessels in 2008, five vessels in 2009, and four vessels in 2010 to evaluate a new hook design. The control treatment was an industry standard Mustad 16/0 circle hook (model 39960D) with 0° of offset, constructed of 4.0 mm steel wire with Duratin coating. The experimental treatment was a custom made Mustad 16/0 circle hook (model 39988D) with 0° of offset, constructed from 3.65 mm steel wire with Duratin coating. Experimental hooks and standard 16/0 circle hooks were alternated on the longline. Other than the experimental design requirements, captains were allowed to fish normally and chose the location of fishing, length of trips, total number of hooks fished, etc.

All vessels participating in the experiment carried NOAA trained observers who collected fishery data as described by the SEFSC Pelagic Longline Observer Program (POP) (Beerkircher et al., 2002), with minor modifications to accommodate the experiment. Hooks that had been straightened with no catch were recorded as species "unknown" and the hook condition was documented. Control and experimental hooks that caught YFT, BFT and swordfish were tagged and retained. These hooks were compared to an unused hook in order to evaluate the effects that result from the physical forces that these fish exert on the experimental hook design. The relationship between the catch rate (or catch probability) and the explanatory variables (hook type, mean sea surface temperature, vessel, and year) was investigated using generalized linear models. The hypothesis of equality of catch rates for control and experimental hook was tested for each taxa using the Fisher's Exact Test with resulting P-values (Tables 3.6 and 3.7).

Results

From 2008 - 2010, six different commercial PLL vessels completed 34 trips with 311 PLL sets and a total of 198,606 hooks set (99,303 of each type hook). Vessels fished an average of 639 hooks per set. Table 3.6 shows a summary of the organisms caught and Table 3.7 shows a summary of analysis of additional species categories during the experiment. A total of 6,869 animals were caught, representing 50 taxa. A total of 33 BFT were caught during the experiment, of which 10 were caught on the experimental hook for a statistically significant reduction of 56.5 percent compared to the control hook (95 percent Confidence Interval (CI) = 8.7 percent to 79.3 percent).

Vessels landed a total of 2,065 YFT of which 1,016 were caught on the experimental hook for a reduction of 3.2 percent (95 percent CI = 11.2 percent to -5.6 percent; a negative number denotes an increase) which was not statistically significant. Not all YFT caught are retained for sale mainly due to some fish not meeting the minimum size limit. The difference in YFT retained for sale between the control and experimental hooks was analyzed and showed a reduction of 7.0 percent (95 percent CI = 15.6 percent to -2.5 percent), which was not statistically significant.

Data analysis of seasonal catch rate differences of YFT between the experimental hook and the control hook were conducted by NMFS researchers. This analysis showed a higher catch rate of YFT with the experimental hook in the late summer months of July, August, and September when compared to the spring and early summer months of March, April, May, and June (D. Foster pers. com.) (Figure 3.3). This seasonal difference was statistically significant. Due to this seasonal effect on weak hook performance, the results for YFT are dependent on when data is collected. Because this experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. If more data had been collected after the spawning period, it is likely that the YFT reduction rate would have been less than what was observed (as described above).

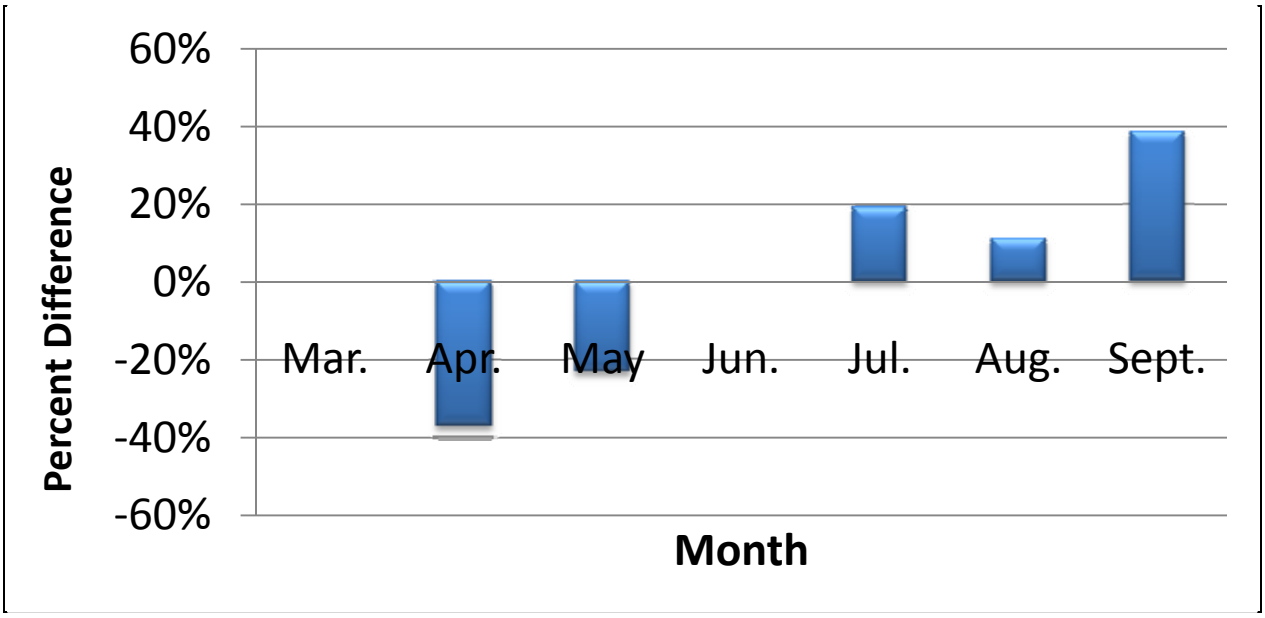


Figure 3.3. Difference in yellowfin tuna marketable catch (yellowfin tuna kept) by hook type and month of the GOM PLL BFT Mitigation Research (Source: NOAA Fisheries SEFSC Engineering and Harvesting Branch).

The experimental hook results for individual vessels participating in the experiment were highly variable. The two vessels with the highest reduction of YFT also had the highest rate of fish escapement due to straightened experimental hooks. It is possible that variability in YFT retention rates were a result of the variability in individual fishing practices. As with many other mitigation measures (*i.e.* TEDs, BRDs, circle hooks in the NED) there is a learning curve associated with maintaining target catch.

Four other species that are commonly retained for sale in the GOM PLL fishery are swordfish (*Xiphias gladius*), wahoo (*Acanthocybium solandri*), dolphin fish (*Coryphaena spp),* and escolar (*Lepidocybium flavobrunneum)*. The total swordfish catch per unit effort (CPUE) (number of fish per 1,000 hooks) for the control and experimental hooks (1.21 and 1.15 respectively) were not significantly different (p = 0.7437). The difference in the catch of swordfish retained for sale (0.34 control and 0.20 experimental) was not statistically significant (p = 0.0759). The difference in CPUEs for the control and experimental hooks for wahoo (1.48 and 1.09, respectively) was statically significant (CI = 5.8 percent - 42.7 percent, p = 0.0171). The difference in CPUEs for dolphin fish (4.25 and 3.93, respectively) and escolar (1.81 and 1.78, respectively) were not significantly different (p> 0.27).

Of the 6,869 animals caught during the experiment, 3861 were discarded. The most common bycatch species was lancetfish (*Alepisauridae spp)* which made up approximately 40 percent of the discards. The lancet fish was the only bycatch species that exhibited a significant reduction in catch rate with the experimental hook (CI = 5.8 percent - 23.0 percent, p = 0.0019). One hundred and fifty-six (156) sharks were caught during the experiment. The analysis was unable to detect a significant difference in the catch rates for any of the shark species. Additionally, grouping sharks by "pelagics" and "large coastal" failed to detect a significant difference in catch rates between the control and experimental hooks. A total of 288 billfish were caught during the experiment. The difference in the catch rates between the control and

experimental hook for all taxa of billfish were not significant. A total of 96 white marlin and roundscale spearfish combined were caught and discarded with 38 and 58 fish caught on the control and experimental hook, respectively, for an increase of 52.7 percent (95 percent Confidence Interval of 1.4 percent 129.8 percent) that was marginally significant.

Table 3.6. Total catch of fish, sharks, sea turtles and marine mammals caught during the 2008 - 2010 GOM BFT pelagic longline experiment as recorded by POP observers. For meaningful interpretations of results, NMFS analyzed the data where at least 10 individuals were caught on one of the two hook types. (NOAA Fisheries, 2010a)

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus albacares	YELLOWFIN TUNA	1049	1016	3.2	0.479	11.2 to -5.6*
Alepisauridae	LANCETFISH SPP	829	707	14.8	0.0019**	5.8 to 23.0
Coryphaena	DOLPHIN SPP	422	390	7.6	0.2757	19.5 to -6.1*
Lepidocybium flavobrunneum	ESCOLAR	180	177	1.7	0.9156	20.1 to -21.0*
Euthynnus pelamis	SKIPJACK TUNA	169	169	0.0	1	19.2 to -23.8*
Thunnus atlanticus	BLACKFIN TUNA	168	171	-1.8*	0.9134	17.7 to -26.0*
Acanthocybium solandri	WAHOO	147	108	26.6	0.0171**	5.8 to 42.7
Xiphias gladius	SWORDFISH	120	114	5.0	0.7437	26.5 to -22.8*
Pteroplatytrygon violacea	PELAGIC RAY	81	65	19.8	0.2141	42.1 to -11.2*
Makaira nigricans	BLUE MARLIN	57	56	1.8	1	32.1 to -42.1*
Sarda sarda	BONITO	36	30	16.7	0.5385	48.7 to -35.3*
Sphyraenidae	BARRACUDA	26	37	-42.3*	0.2073	13.8 to -135.0*
Auxis thazard	FRIGATE MACKEREL	30	32	-6.7*	0.8991	35.2 to -75.5*
Bramidae	POMFRET SPP	33	22	33.3	0.1769	61.1 to -14.3*
Istiophorus platypterus	ATLANTIC SAILFISH	27	25	7.4	0.8899	46.3 to -59.5*
Tetrapturus albidus	WHITE MARLIN	19	30	-57.9*	0.1524	11.1 to -180.6*
Tetrapturus albidus/georgii	WHITE MARLIN / ROUNDSCALE SPEARFISH	19	28	-47.4*	0.2429	17.7 to -163.9*
Thunnus thynnus	BLUEFIN TUNA	23	10	56.5	0.0351**	8.7 to 79.3
Chondrichthyes	SHARK	18	12	33.3	0.3616	67.9 to -38.4*
Carcharhinus falciformis	SILKY SHARK	15	12	20.0	0.7011	62.6 to -70.9*
Carcharhinus plumbeus	SANDBAR SHARK	14	13	7.1	1	56.4 to -97.6*
Istiophoridae	BILLFISH	12	11	8.3	1	59.6 to -107.8*
Galeocerdo cuvier	TIGER SHARK	12	11	8.3	1	59.6 to -107.8*
Ruvettus pretiosus	OILFISH	6	7	-	-	-
Carcharhinidae	REQUIEM SHARK	8	3	-	-	-
Myliobatidae	RAY MANTA	6	4	-	-	-
Isurus oxyrinchus	MAKO SHORTFIN	3	6	-	-	-
Thunnus	TUNA	7	1	-	-	-
Dermochelys coriacea	LEATHERBACK	3	4	-	-	-
Alopias superciliosus	THRESHER BIGEYE	5	2	-	-	-
Carcharhinus obscurus	DUSKY SHARK	4	2	-	-	-

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus obesus	BIGEYE TUNA	4	1	-	-	-
Isurus paucus	MAKO LONGFIN	4	1	-	-	-
Masturus lanceolatus	SUNFISH SHARPTAIL	1	3	-	-	-
Lampris guttatus	OPAH	3	1	-	-	-
Tetraodontidae	PUFFER SPP	3	0	-	-	-
Alopias	THRESHER SHARK	3	0	-	-	-
Carcharhinus longimanus	WHITETIP OCEANIC	2	0	-	-	-
Isurus	MAKO SPP	1	2	-	-	-
Molidae	SUNFISH SPP	1	1	-	-	-
Tetrapturus pfluegeri	SPEARFISH LONGBILL	1	1	-	-	-
Thunnus alalunga	ALBACORE TUNA	1	1	-	-	-
Mola mola	SUNFISH OCEAN	2	0	-	-	-
Tetrapturus spp	SPEARFISH SPP	1	1	-	-	-
Stenella attenuata	DOLPHIN PANTROPIC SPOTTED	1	1	-	-	-
Tursiops truncatus	DOLPHIN BOTTLENOSE	0	1	-	-	-
Sphyrna lewini	HAMMERHEAD SCALLOPED	0	1	-	-	-
Gempylus serpens	MAKERAL SNAKE	0	1	-	-	-
Prionace glauca	BLUE SHARK	0	1	-	-	-
Alopias vulpinus	THRESHER COMMON	1	0	-	-	-

* Negative value denotes an increase
** Statistically significant at $\alpha < 0.05$ level

Table 3.7. Additional species categories included in the 2008 - 2010 GOM BFT pelagic longline analysis. For yellowfin and swordfish retained for sale, the category represents the number of fish from the total catch that were landed and sold. The total white marlin/roundscale spearfish category is a sum of the catch from the white marlin and white marlin/roundscale spearfish rows in Table 1. The other tuna category is the sum of albacore, bigeye and skipjack tuna caught. The large coastal sharks category is the sum of dusky, sandbar, silky, tiger, and scalloped hammerhead sharks caught. The pelagic sharks category is the sum of blue, thresher, shortfin mako, and oceanic whitetip sharks caught. (NOAA Fisheries, 2010a)

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus albacares	YELLOWFIN Retained for Sale	848	789	7.0	0.15	15.6 to -2.5*
Xiphias gladius	SWORDFISH Retained for Sale	34	20	41.2	0.0759	66.1 to -2.2*
Tetrapturus albidus/georgii	TOTAL WHITE MARLIN / ROUNDSCALE SPEARFISH	38	58	-52.7*	0.0519	-1.4 to -129.8*
	OTHER TUNAS	174	171	1.7	0.9142	20.4 to -21.4*
	LARGE COASTAL SHARKS	45	37	17.8	0.4396	46.8 to -27.0*
	PELAGIC SHARKS	14	9	35.7	0.4048	72.2 to -48.5*

* Negative value denotes an increase
** Statistically significant at $\alpha < 0.05$ level

Discussion

The data presented suggest a circle hook designed to have less tensile strength (*i.e.*, a "weaker hook") may have the potential to mitigate bycatch mortality of BFT with minimal reduction in the retention of the YFT target catch and some potential reduction in swordfish retained. The 56.5 percent reduction observed in incidental catch of BFT was constant for each year of the experiment and is consistent with NMFS' expectations of the new hook design. The evaluation of the condition of hooks that caught BFT shows that BFT interaction with control hooks (the currently required hook/industry standard) commonly results in deformation of the hook. These observations suggest some portion of the straightened control hooks that resulted in fish escapement were likely due to BFT interactions.

There are several factors that contribute to the application of the level of force necessary to straighten a hook during the interactions with animals. It would be difficult to assess all of these factors. This research has shown that YFT weight is a contributing factor. It is reasonable to suspect the same is true for BFT. Other factors which may influence the level of force exerted on a hook by an animal during an interaction include: water temperature; currents; fishing depth; hooks between floats; distance to the nearest float; interaction with other animals on the longline; configuration of the gear and knots used to splice the mainline; and, vessel hauling practices.

The retention rate of YFT with the experimental hook was highly variable among the vessels participating in the experiment. The two vessels with the highest reduction of YFT also had the highest rate of fish escapement due to straightened experimental hooks. NMFS researchers attempted to standardize the gear configurations as much as possible during this

fishery dependant research. Therefore, it is probable that variability in YFT retention rates was a result of the variability in hauling practices. NMFS researchers anticipate that this variability in the performance of the new hook design will be reduced over time. As with any new conservation technology, minor adjustments in fishing practices are often needed in order to optimize the gear performance.

However, the majority of the vessels involved with the study continue to use the new hook design voluntarily. Additional vessels, not involved in the study, have purchased the experimental hook for use. Additional research will improve the statistical precision and confidence of the results, and if conducted on a year round basis, may help evaluate possible temporal effects of the weak hook on target catch species.

Section 3.6 Management of the PLL Fishery

Regulations

ICCAT adopts conservation and management recommendations for the two recognized bluefin tuna stocks (western Atlantic and eastern Atlantic/Mediterranean). ICCAT has set and allocated western Atlantic BFT quotas by country since 1982 and eastern Atlantic BFT quotas since 1994. The Secretary of Commerce delegates to NMFS management of the U.S. portion of the fishery. Under the dual authority of the Magnuson-Stevens Act and ATCA, (which requires U.S. implementation of ICCAT recommendations as may be necessary and appropriate) and consistent with a variety of other domestic mandates, NMFS manages the fishery in federal waters from Maine through Texas and the U.S. Caribbean through a variety of output and input controls (quotas, seasons, fish size, time/area closures, etc.). Implementing regulations at 50 CFR part 635 include fishery regulations governing quotas, seasons, time/area and gear restrictions, limits on fish landed per trip, and size limits.

The U.S. BFT quota is divided among five commercial quota categories (General (uses handgear), Harpoon, Purse Seine, Longline, Trap) and the recreational category (Angling, which uses handgear) consistent with the allocations in the Consolidated HMS FMP. A small amount of quota (2.5 percent) is held in Reserve as well. NMFS is authorized to transfer quota between the quota categories and Reserve.

Consistent with ICCAT Recommendations since 1982 (the active Recommendation is 10-03) that there "be no directed fishery on the bluefin tuna spawning stocks in the western Atlantic in spawning areas such as the Gulf of Mexico," NMFS prohibits fishing for, catching, possessing, or retaining a BFT from the GOM [50 CFR § 635.71(b)(23)], except for the incidental catch of BFT over 73 inches (185 cm) by PLL vessels that meet specific target catch requirements while fishing for other species (such as YFT and/or swordfish) (§ 635.23(f)(1)), or during recreational fishing by private and charter/headboat vessels (§ 635.23(b) and (c)). PLL vessels must retain specific quantities of target species in order to retain BFT (2,000; 6,000; and 30,000 lb for one, two, or three BFT, respectively). Recreational fishermen are limited to retaining a single "trophy" BFT per vessel per year in the GOM that is 73 inches or greater, which, as noted, may only be taken incidental to fishing for other species (§ 635.23(b)(1)).

Permits and Reporting

NMFS has implemented a vessel logbook requirement for its PLL fisheries and has regulatory authority to require logbooks for any commercial HMS fishery. The primary mechanism for collecting BFT landings by the United States is through a mandatory data management program, which includes permitting vessels and dealers, tagging each landed BFT, and daily and biweekly landings reports.

Each vessel fishing commercially for BFT must be permitted by NMFS (§ 635.4(d)) and must have the permit aboard while fishing for BFT (§ 635.4(a)). All sales must be made to NMFS-permitted BFT dealers (§ 635.31(a)). The operator of the vessel must present the vessel's permit upon offloading. Each dealer that purchases or sells BFT must be permitted by NMFS (§635.4(g)), and may only purchase BFT from a vessel with a valid permit (§635.31(a)). Immediately upon offloading a BFT, the dealer must affix a tag to the carcass. This tag has a unique numerical identifier and is issued exclusively to that dealer by NMFS (§ 635.5(b)). The tag number must stay with the fish until it is distributed to its final retail outlet. Within 24 hours of landing a BFT, the dealer must fax a landings report to NMFS that includes vessel and trip related information (§ 635.5(b)). The dealer must also submit a follow-up biweekly report which verifies the previously submitted information and includes further information such as whether the fish was exported or used domestically.

Fishermen must record fishing activities in an approved fishing vessel logbook within 48 hours of each day's fishing activities, or before offloading for one-day trips, whichever is sooner, and submit the logbook along with dealer weighout slips to NMFS within 7 days of offloading (§ 635.5(a)). Under this program, longline vessels are required to submit detailed information of each longline set deployed that includes gear configuration (*e.g.*, mainline length, depth of hooks, number of floats, bait used, etc.), total number of hooks deployed, time of day of the fishing operations, location, and number of target fish caught by species and bycatch including the disposition of the bycatch (*e.g.*, released alive or discarded dead) (§ 635.5(a)). Although U.S. longline vessels with HMS permits are prohibited from directed fishing for BFT, they are permitted to retain a limited number of BFT taken incidentally while fishing for other species, provided specified levels of target catch are retained.

As is required for all commercial BFT landings, each fish landed incidentally in the PLL fishery in the GOM must be tagged and a landing card (including the tag number, vessel name, and permit number, date of landing, and other information) must be completed by a licensed fish dealer and submitted to NMFS within 24 hours of landing (§ 635.5(b)). Recreational anglers that land a BFT are required to report their landings within 24 hours to NMFS (§ 635.5(c)) and must participate in NMFS sponsored recreational angler surveys when requested (§ 635.5(f)).

VMS is used to track the location and fishing activity of PLL vessels year-round. VMS regulations are found at (§ 635.69). If a suspicious fishing activity is detected through a fishing vessel's VMS signal (including the sudden turning off of a fishing vessel's VMS unit), NMFS Office of Law Enforcement and/or the U.S. Coast Guard may investigate, including at sea boarding, over-flight, or meeting the fishing vessel once it returns to port.

Observers

NMFS also monitors PLL fishing activity through a national observer program (under which selected vessels must carry an observer on every trip unless notified otherwise) (§ 635.7) and through a mandatory logbook requirement (described above). The PLL observer program has been in place since 1992 to document finfish bycatch, characterize the behavior of the PLL fleet, collect catch and effort data for highly migratory species, and quantify interactions with protected species. NMFS has the authority (under 50 CFR § 635.7) to select for at-sea observer coverage any vessel that has an Atlantic HMS tunas, sharks or swordfish permit (§ 635.4 and § 635.32). The program is mandatory for selected vessels, and all vessels with directed and incidental swordfish permits are eligible for selection. The original target coverage of the program was five percent of the PLL fishing sets deployed by the U.S. fleet within the North Atlantic (waters north of 5^{o} N. latitude) consistent with ICCAT recommendation 96-1. In 2004, the target coverage of the U.S. program increased to eight percent to comply with certain domestic requirements. Achieved observer coverage of the U.S. PLL fleet during the period 2005-08 ranged from 7.5-13.6 percent of the fishing sets deployed. Observer coverage in the GOM was increased in the spring of 2007 to better characterize the interaction of the PLL fleet with BFT within the spawning grounds. During the period April 15 – June 15, 2007, 72 percent of all PLL sets were observed. NMFS has attempted to attain 100 percent observer coverage in the GOM during April through June 2007-2009 to monitor BFT interactions.

Fishery observer effort is allocated among eleven large geographic areas and by calendar quarters. The observer effort is allocated based upon reported fishing effort during the previous year in each quarter/fishing area stratum. As described above, in recent years, NMFS has undertaken efforts to increase observer coverage levels in certain areas, such as the GOM. Data collected from the observer program are used regularly by NMFS scientists to estimate catch rates of target and bycatch species and to estimate discard levels, and this information is used by the SCRS for stock assessment purposes.

Section 3.7 Economic and Social Aspects of the GOM PLL Fishery

The review of each rule, and of Atlantic HMS fisheries as a whole, is facilitated when there is an economic baseline against which the rule or fishery may be evaluated. In this analysis, NMFS used the past four years of data to facilitate the analysis of trends. It also should be noted that all dollar figures are reported in nominal dollars (*i.e.*, current dollars).

Number of Commercial Permit Holders and Dealers in GOM

In 2010, there were 248 Atlantic tuna longline limited access permit holders (Table 3.7.1). Of these, 136 were registered in states along the coast of the GOM, including the Florida coast where most of the vessel permit holders are located. In addition to Atlantic tuna PLL permits, there are 97 directed swordfish, 43 incidental swordfish, 37 swordfish handgear, 145 directed shark, and 171 incidental shark permits registered in the GOM (Table 3.7.2). In total, NMFS estimates there are 360 Atlantic HMS limited access permit holders in the GOM.

Table 3.7.1. The number of Atlantic tuna PLL permit holders, 2006 through 2010. Permit numbers for 2010 are as of October 2010. The actual number of 2010 permit holders in each category is subject to change as individuals renew or allow their permits to expire.

Category	2006	2007	2008	2009	2010
Atlantic tuna PLL permits	214	218	241	259	248

Table 3.7.2. 2010 Distribution of Shark, Swordfish, and Atlantic Tuna longline Limited Access Permits. Permit numbers as of October 2010.

State	# Directed Swordfish	# Incidental Swordfish	# Swordfish Handgear	# Directed Shark	# Incidental Shark	# Tuna Longline	# Permit Holders/# Permits
FL	68	35	36	133	128	105	300/505
AL	-	-	-	6	1	-	7/7
MS	-	-	-	-	4	-	4/4
LA	29	3	-	3	32	26	37/93
TX	-	5	1	3	6	4	12/19
Total	97	43	37	145	171	136	360/628

Those Atlantic HMS limited access commercial fishing permit holders likely sell their catch to the 25 Atlantic tuna dealers (Table 3.7.3), 86 Atlantic swordfish dealers, and the 49 Atlantic shark dealers permitted in the GOM region (Table 3.7.4).

Table 3.7.3. Number of Atlantic tuna dealer permits by state as of October 2010. Dealers may obtain a permit to sell and purchase only BFT, only BAYS tunas, or both bluefin and BAYS tunas.

State	Bluefin Only *	BAYS Only	Bluefin and BAYS	Total Atlantic Tunas Dealer Permits
AL	-	-	1	1
FL	2	-	12	14
LA	-	-	7	7
TX	-	2	1	3
Total	2	2	21	25

Table 3.7.4. Number of domestic Atlantic shark and swordfish dealer permits issued in each State between 2003 and 2010. Permits for 2010 are as of October 2010. The actual number of permits per state may change as permit holders move or sell their businesses.

State/Country	Atlantic swordfish	Atlantic sharks	# of permits
AL	3	3	6
FL	70	35	105
LA	9	8	17
TX	4	3	7
Total	86	49	135

Ex-Vessel Prices

The average ex-vessel prices per pound for Atlantic HMS landed in the GOM for 2006 through 2009 are provided in Table 3.7.5. The ex-vessel price depends on a number of factors including the quality of the fish, the weight of the fish, the supply of fish, and consumer demand. The average ex-vessel price for BFT in the GOM has ranged between $4.39 and $5.87/lb.

Table 3.7.5. Average Ex-vessel Prices per lb dw for Atlantic HMS in the GOM. Source: Pelagic Dealer Compliance system (PDC) and BFT database.

Species	2006	2007	2008	2009
Bigeye tuna	$5.37	$5.66	$6.12	$5.80
Bluefin tuna	$4.39	$5.87	$4.52	$4.65
Yellowfin tuna	$2.89	$3.02	$3.51	$3.04
Albacore tuna	$0.62	$0.53	$0.49	$0.55
Swordfish	$2.90	$3.07	$2.93	$2.69
Large coastal sharks	$0.75	$0.42	$1.58	$0.66
Pelagic Sharks	NA	NA	$0.56	$0.75
Shortfin mako	$1.21	$1.29	$1.28	$1.27
Shark fins	$16.40	$13.22	$14.94	$15.09

Costs and Revenues

NMFS has collected operating cost information from commercial permit holders via logbook reporting. Each year, 20 percent of active Atlantic HMS commercial permit holders are selected to report economic information along with their Atlantic HMS logbook or Coast Fisheries logbook submissions. In addition, NMFS also receives voluntary submissions of the trip expense and payment section of the logbook form from non-selected vessels.

The primary expenses associated with operating an Atlantic HMS permitted commercial vessel include labor, fuel, bait, ice, groceries, other gear, and light sticks on swordfish trips. Unit costs are collected on some of the primary variable inputs associated with trips. The unit costs for fuel, bait, and light sticks are reported in Table 3.7.6. Fuel costs have increased 56 percent from 2004 to 2009 with a peak of $3.59 in 2008. The cost/lb for bait has remained fairly constant. The unit cost per light sticks has declined over this same period.

Table 3.7.6. Median Unit Costs for Fuel, Bait, and Light Sticks 2004 - 2009. Source: Atlantic HMS logbooks.

Input Unit Costs	2004	2005	2006	2007	2008	2009
Fuel	$1.27	$1.90	$2.20	$2.29	$3.59	$1.98
Bait	$0.80	$0.85	$0.85	$0.85	$0.85	$0.85
Light Sticks*	$0.52	$0.50	$0.50	$0.40	$0.37	$0.37

*Cost per light stick.

Table 3.7.7 provides the median total cost per trip for the major variable inputs associated with Atlantic HMS trips. Fuel costs are one of the largest variable expenses. The total costs of fuel per trip increased substantially in 2008, but decreased in 2009.

Table 3.7.7. Median Input Costs for HMS Trips 2004 - 2009. Source: Atlantic HMS logbooks.

Input Costs	2004	2005	2006	2007	2008	2009
Fuel	$1,871	$2,341	$1,728	$2,144	$3,031	$2,303
Bait	$960	$920	$750	$858	$1,080	$1,320
Light Sticks	$650	$500	$500	$520	$444	$446
Ice Costs	$465	$480	$400	$540	$520	$600
Grocery Expenses	$675	$610	$470	$600	$600	$800
Other Trip Costs	$800	$1,250	$920	$1,236	$1,293	$1,500

Labor costs are also an important component of operating costs for HMS commercial vessels. Table 3.7.8 lists the amount of crew on a typical trip. The median number of crew members has been consistently three from 2004 to 2009. Most crew and captains are paid based on a lay system. According to Atlantic HMS logbook reports, owners are typically paid 50 percent of revenues. Captains receive a 20 percent share and the crew share increased from 15 percent in 2007 and 2008 to 22.5 percent in 209. These shares are typically paid out after costs are netted from gross revenues. Median total shared costs per trip have ranged from $4,493 to $5,000 from 2004 to 2009. In 2009, median reported total trip sales were $9,731 (gross revenue). In 2008, median reported total trip sales were $10,970. In 2007, the median reported total trip sales were $12,064.

Table 3.7.8. Median Labor Inputs and Costs for HMS Trips 2004 - 2009. Source: Atlantic HMS logbooks.

Labor	2004	2005	2006	2007	2008	2009
Number of Crew	3	3	3	3	3	3
Owner Share	50%	50%	50%	50%	50%	50%
Captain Share	20%	20%	20%	20%	20%	20%
Crew Share	13%	11%	12%	15%	15%	22.5%
Total Shared Costs	$4,493	$4,550	$4,500	$4,500	$5,000	$4,689

It should be noted that operating costs for the Atlantic HMS commercial fleet vary considerably from vessel to vessel. The factors that impact operating costs include unit input costs, vessel size, target species, and geographic location among other things.

The profitability of the fishery is difficult to estimate given the high fixed costs associated with PLL vessels. However, it is possible to estimate operating profits by examining the net earnings per trip for PLL vessels. Median net earnings per trip were estimated to be $3,214 in 2008 for vessels reporting in the HMS logbook and selected for cost earnings reporting. Median net earnings per trip in 2009 increased by 35 percent to $4,340. Given that the annual cost earnings selection only requires reporting from 10 percent of the active fleet,

there is currently insufficient data to report on the net earnings per trip by region. It is expected that PLL vessels operating in the GOM likely have somewhat different earnings that PLL vessels operating in other regions of the Atlantic.

Social and Community

Pelagic longline fleet homeports in the GOM are located in Texas, Louisiana and on the west coast of Florida. Below is a brief description of these fleets and their communities.

Florida:

In 2002 the PLL fishing fleet consisted of 77 permitted vessels total. Of these vessels, 39 operated from East Coast ports and 38 from Florida's West Coast ports. The West Coast PLL fishery included all of the Florida Keys, the West Coast, and the Florida Panhandle. In 2009 there were 106 PLL vessels total with 42 on the west coast. Eleven of these vessels are concentrated at Panama City, with the next largest congregation at Madeira Beach (6) and Destin (4). Over a dozen other ports host one or two vessels along the remainder of the coast. Licensed dealers operate in 14 locations in Florida, split evenly between East and West Coast communities. In 2002, the PLL 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 West Coast of Florida can be seen in Table 3.7.9.

Table 3.7.9. 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.

Louisiana:

In Louisiana during 2002, PLL 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 PLL fishing fleet numbered 47 vessels. In 2002, Louisiana was the home to the owners of 43 HMS PLL permits, whereas in 2009 the number of permit holders had dropped to 41. Most of the concentration of the fleet is based in Dulac (21) and in New Orleans (17) with two vessels hailing from Venice and one from Chalmette. Most PLL fishermen who sustain the YFT industry in these Louisiana cities are Vietnamese-Americans. The Vietnamese-American longline fleet owners are often not well integrated into the Louisiana communities and often commute from suburbs of the towns. Due to the language barrier, many of these fishermen do not participate in public fisheries meetings and may encounter difficulty understanding and integrating new management measures into their fishing operations. The landings and value of tunas and swordfish in relation to other species landed in Louisiana can be seen in Table 3.7.10.

Table 3.7.10. 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.

Texas:

Five PLL permit holders hail from Texas homeports with most in Galveston (3) and one each in Aransas Pass and Houston.

Section 4 Environmental Consequences of the Alternatives

Reducing bycatch, bycatch mortality, and incidental catch in HMS fisheries, particularly the Atlantic PLL fishery, was identified in the 2006 Consolidated HMS FMP as a priority management goal that needed to be addressed pursuant to National Standard 1 and 9 of the Magnuson-Stevens Act.

The National Standard 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 2006 Consolidated HMS FMP provides detailed discussions of bycatch and incidental catch issues associated with the various HMS commercial and recreational fisheries. Further, this document also notes that additional actions beyond those included in the 2006 Consolidated HMS FMP or final rule may be necessary to address these concerns. The recently completed GOM PLL BFT Mitigation Research (NMFS, 2010a), prepared in response to concerns for spawning age BFT PLL post release survivability in the GOM , provides information that may help to reduce bycatch and bycatch mortality of spawning age BFT. The following sections evaluate alternatives which may mitigate the incidental catch and mortality of

BFT in the GOM and consider the wide range of National Standard guideline factors listed above. All of the alternatives described in this document apply only to vessels and vessel operators participating in the GOM PLL fishery.

As described in Chapter 2, the following are the alternatives considered for BFT bycatch reduction measures. Alternative 2.4 was considered but not further analyzed.

Alternative 1 **Status Quo / No Action**

Alternative 2 **Require all PLL vessels fishing in GOM to use weak hooks (preferred)**

Alternative 3 **Additional time/area closures in the GOM**

Analyses in this chapter draw heavily upon the results of the experiments conducted by the NMFS SEFSC to evaluate the impacts of weak hooks on interactions, bycatch and bycatch mortality of BFT while attempting to preserve retention rates for target species. Except where indicated otherwise, the basis for the analyses contained in this chapter was derived directly from the GOM PLL BFT Mitigation Research (NMFS, 2010a)(the weak hook study).

Section 4.1 Ecological Impacts

The no action alternative, alternative 1, would maintain existing hook and bait requirements in the Atlantic PLL fishery; conduct no additional outreach to vessel operators; maintain existing PLL time/area closures; maintain existing possession and use requirements for bycatch mitigation gear, as well as protected species safe handling and release training and guidelines as currently specified by NMFS; and continue to conduct the experiment on design and results of use of weak hooks. The bycatch mitigation gear requirements and protected species safe handling and release training and guidelines were implemented to reduce bycatch and bycatch mortality of incidentally captured sea turtles, marine mammals, and other incidentally captured species and were thouroughly analyzed in the Final Environmental Impact Statement for the 2006 Consolidated HMS FMP. Thus, alternative 1 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 species caught as bycatch. 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).

The no action alternative, alternative 1, would maintain current ecological impacts in the short term, as fishermen would continue to catch target and non-target species (*i.e.* bycatch) at current rates. In the medium to long term, alternative 1 could have long term negative ecological impacts on BFT by allowing the bycatch and bycatch mortality of spawning age individuals to continue at current rates in the GOM, especially as a large cohort of BFT begins to reach maturity and spawns in the GOM (Figure 4.1). As discussed in section 1.0, BFT caught by PLL vessels have a high mortality rate due to the high metabolic stress endured during capture in the warm water of the GOM (Block *et al*., 2005). The GOM is the only known spawning area for

western BFT and the high mortality rate of spawning BFT caught on PLL gear in the GOM may slow the rebuilding of BFT, relative to the preferred alternative.

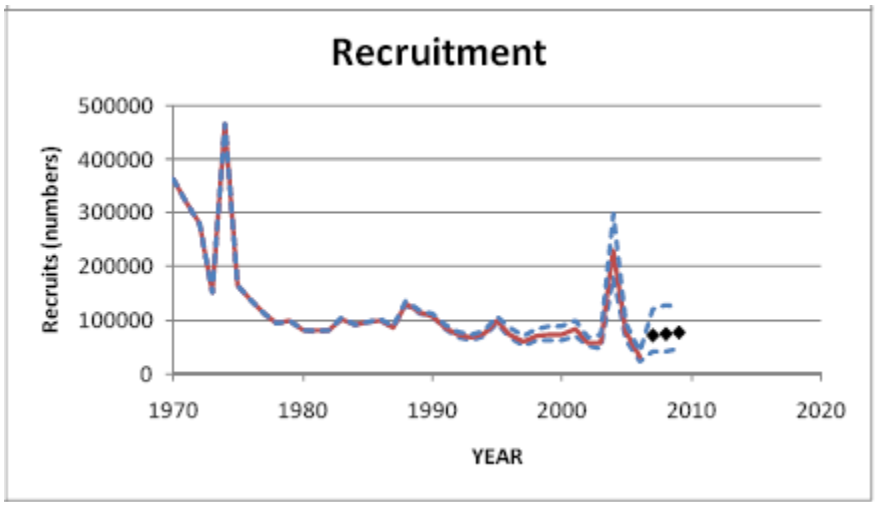


Figure 4.1. Median estimates of recruitment for the base Virtual Population Analysis (VPA) model. The 80 percent confidence intervals are indicated with dotted lines. The recruitment estimates for the last three years of the VPA are considered unreliable by the SCRS and have been replaced by the median levels corresponding to the low recruitment scenario (SCRS, 2010). VPA estimates of recruitment for the last 3 years are considered unreliable because there are a very limited number of estimates of annual abundance available for the assessment model to estimate recruitment for those 3 last year classes.

Catches, landings, discards, and bycatch of both target and non-target species are discussed in the Affected Environment section of this document (section 3), as well as in the 2006 Consolidated HMS FMP and the 2010 Atlantic HMS Safe Report (NOAA Fisheries, 2010b).

Alternative 2 will limit vessels with PLL gear onboard, at all times and, in all areas of the GOM, to possess onboard and/or use only circle hooks meeting current size and offset restrictions as well as being constructed of only round wire stock that is no larger than 3.65 mm in diameter. Assuming similar reductions from gear modifications as reflected in the GOM PLL BFT Mitigation Research (NOAA Fisheries, 2010a), alternative 2 could reduce the bycatch of BFT in the GOM PLL fishery by approximately 56.5 percent. This would likely result in a reduction in the number of BFT caught in the GOM from an annual average of 285 individual fish from 2006 - 2009 (Table 4.1 below) to approximately 124 individual fish. Reductions in interactions of this magnitude could have positive impacts on the BFT population by minimizing bycatch of spawning BFT, and thus bycatch mortality due to incidental interactions with PLL gear. Post-release mortality is expected to be reduced because BFT likely straighten the weak hooks relatively quickly after being caught and likely do not incur as high a level of metabolic stress as when the fish stay on the hook until being retrieved upon haul-back of the gear. Due to the fact that BFT have the highest level of energy available at the moment when the fish becomes hooked, NMFS suspects that escapement occurs soon after hook-up (Dan Foster, Pers. Comm.). Years of observer data and research fishing have shown that BFT caught on PLL gear in the GOM have a high mortality rate. Use of the weak hook by PLL operations in the GOM, would reduce BFT bycatch substantially by approximately halving the amount of BFT discarded annually (*i.e.* reduce bycatch on average from approximately 285 to 124 animals). Some

positive ecological impacts may be realized in the near future if the weak hook is implemented prior to the 2011 spawning season. Rapid implementation could aid in the survival of and subsequent spawning by the large 2003 year class identified by the ICCAT SCRS as warranting particular management attention. Enhanced survival of spawners from this year class, may improve spawning success and size of subsequent year classes, ultimately increasing stock biomass.

Table 4.1. Number of fish and percentage of total caught and retained in the GOM PLL fishery from 2006 - 2009. Source: Atlantic PLL Logbook Data

Species	GOM PLL Catch		GOM PLL Catch Retained	
	Avg. #/Yr.	% Total Catch	Avg. #/Yr.	% Total Retained
Bluefin Tuna	285	1%	101	<1%
Swordfish	10,311	22%	6,878	18%
Yellowfin Tuna	21,332	46%	20,641	54%
Other Tunas (Bigeye, Albacore, Skipjack)	1,984	4%	883	2%
Large Coastal Sharks	1,346	3%	45	<1%
Pelagic Sharks	389	1%	136	<1%
Blue Marlin	324	1%	-	-
White Marlin	299	1%	-	-
Sailfish	265	1%	-	-
Other Finfish (dolphin, wahoo, etc.)	9,631	21%	9,421	25%

While research results indicated a reduction in BFT bycatch, the results indicated a 52.7 percent increase in bycatch of white marlin and roundscale spearfish, combined, with the use of weak hooks as compared to the catch rate of the standard circle hook currently used by the GOM PLL fleet. The weak hook research indicated an increase of 52.7 percent in white marlin/roundscale spearfish catch, and this analysis assumes that the increase in catch would be proportionally the same for live discards and dead discards, thus representing a 52.7 percent increase in each. For the purposes of this analysis, NMFS assumes a 52.7 percent increase in dead discards. On September 22, 2010, NMFS added the recently recognized species, roundscale spearfish, to the definition of terms in the implementing regulations of the Magnuson-Stevens Act and the Atlantic HMS regulations (75 FR 57699). Roundscale spearfish are difficult to distinguish from white marlin, thus the two species are, at times, intentionally or unintentionally grouped in fisheries data. White marlin are overfished, although uncertainty exists about the current population due in part to the lack of accurate identification of white marlin and roundscale spearfish in some databases. At this time, NMFS does not expect the white marlin stock status to change due to roundscale spearfish catches having been included in some data bases used to conduct the white marlin stock assessment. White marlin underwent status reviews under the ESA in 2002 and 2007 (White Marlin Status Review Team, 2002 and

2007). Following each of these reviews, NMFS determined that listing white marlin as endangered or threatened under the ESA was not warranted.

According to logbook data, the average annual bycatch of white marlin in the GOM PLL fishery from 2006 - 2009 was 299 individual fish. Under alternative 2, the expected catch of white marlin in the GOM PLL fishery could increase by 158 to approximately 457 individual white marlin, annually. Due to the difficulty of distinguishing roundscale spearfish from white marlin, it is likely that some roundscale spearfish are included in the reporting of white marlin catches. Therefore the estimate of additional white marlin catch would likely be a combination of white marlin and roundscale spearfish.

According to observer data, white marlin dead discards in the GOM PLL fishery in 2009 were 13,200 lbs which equates to 275 individual fish (using the 2008 average white marlin dead discard weight of 48 lbs) (Guillermo Diaz, Pers. Comm.). NMFS fishery observers are trained to distinguish white marlin from roundscale spearfish; therefore, it is likely that roundscale spearfish are not included in the white marlin dead discard data for 2009. If the observed white marlin dead discards are increased by 52.7 percent (as found during the research) an additional 144 white marlin could be discarded dead. There may also be some additional roundscale spearfish dead discards that could occur with the use of weak hooks; however, NMFS is unable to provide an estimate at this time. NMFS found no significant difference in bycatch of blue marlin or sailfish while using industry standard circle hooks and the experimental weak hook on PLL gear in the GOM.

Under alternative 2, with regard to target species and other marketable catch, data from NMFS, (2010), generally indicate that the experimental weak hook facilitates the release of BFT but also decreases YFT and swordfish catch by 3.2 percent and 5.0 percent, respectively. The reduction in catch for YFT and swordfish was not statistically significant. Further, use of the weak hook under alternative 2 may decrease the number of YFT and swordfish retained for sale (meaning fish equal to or larger than the minimum size) by 7.0 percent and 41.2 percent, respectively. The reductions in fish retained for sale was also not statistically significant. Under alternative 2, the number of wahoo caught may decrease by 26.6 percent. The results for pelagic and large coastal sharks were not significant; although, observations were mixed with reduction in catch observed for some species and increases in catch for others. These varying results are likely due to low numbers of observations during the experiment.

Under alternative 2, potential decreases in YFT, swordfish, and wahoo catches, by number of fish, may have positive ecological benefits for all three species by leaving more large, sexually mature individuals in the ecosystem. Decreased YFT and swordfish catches may have negative ecological impacts for species known to interact with PLL gear if an increase in fishing effort occurs in order to offset reduced YFT catches. Increased effort may result in an increase in bycatch and bycatch mortality of non-target species, including billfish and protected resources. Under alternative 2, potential decreases in lancetfish bycatch by 14.8 percent (which was statistically significant) may have positive ecological benefits for lancetfish by leaving more fish in the ecosystem to reproduce. If some reduction in catch of pelagic or large coastal sharks actually occurs with the use of weak hooks, some unquantifiable positive ecological benefits for pelagic and large coastal sharks may occur due to the reduction in marketable sharks retained.

As discussed under alternative 1, alternative 2 will continue to provide positive ecological impacts, similar to the existing required standard circle hook, by facilitating the removal of fishing gear which is expected to increase post-hooking survival of species caught incidentally to target fishing operations, including protected species. Additionally, anecdotal reports from scientists that conducted the weak hook study, indicated that the weak hook was easier to dislodge from incidentally captured/foul hooked leatherback sea turtles than the current, required standard circle hook.

Magnuson-Stevens Act National Standard 9 was identified in the 2006 Consolidated HMS FMP along with National Standard 1 as priority management goals for HMS fisheries, particularly the Atlantic PLL fishery. National Standard 9 states that "conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided minimize the mortality of such bycatch." National Standard 9 applies to all species and fisheries. National Standard 1 states that "conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. The 2006 HMS FMP analysis of alternatives for time area closures and combinations of closures showed higher bycatch levels for some species and lower for others. NMFS did not prefer any new closures in the 2006 Consolidated HMS FMP, except the complementary measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, and did not modify any closures at that time primarily because no closure alternative or combination of alternatives would substantially reduce the bycatch of all species considered, assuming redistribution of effort, and address other goals of the FMP, including minimizing any negative impacts.

Alternative 2 is expected to reduce BFT bycatch. The recent NMFS weak hook study was conducted in response to concerns for spawning age BFT PLL post release survivability in the GOM and provides information that may help to reduce bycatch and bycatch mortality of spawning age BFT. Results of the study showed a reduction, no change, or inconclusive results in the bycatch of species caught on PLL gear in the GOM except for an increase in bycatch of white marlin and roundscale spearfish. The research results showed that the increase in catch of white marlin and roundscale spearfish was not statistically significant, although the difference was close to being statistically significant. NMFS does not believe that this increase, if it actually occurs, is likely to have population or ecosystem effects for those species because the predicted increase of 144 white marlin (or 1.05 mt in 2009 at 48 lb per fish) dead discards represents less than 0.8 percent of the total amount of international white marlin catch (which includes recreational landings and commercial dead discards) in the North Atlantic (406 mt in 2009). Due to misidentification of roundscale spearfish as white marlin, the total of white marlin international catch also includes some roundscale spearfish and, as such, indicates that any potential increase in roundscale spearfish that might occur in the GOM PLL fishery as a result of this final action should be very small in relation. In addition, NMFS already has comprehensive regulations in place to conserve these species in its domestic fisheries. Under current regulations, PLL vessels are not allowed to retain white marlin/roundscale spearfish and any that are captured must be released alive or discarded if dead. Additionally, PLL vessels are currently required to possess and use protected species safe handling and release gears and techniques that aid in releasing hooked animals, including white marlin, and maximize post-release survival

without removing the fish from the water. Most white marlin/roundscale spearfish that are hooked are released alive. Beyond PLL vessels, current regulations also include a ban on retention on all commercial fishing vessels, observer coverage and mandatory reporting on commercial fishing vessels, a recreational size limit, and an annual 250 marlin landings limit in recreational fisheries.

Under Alternative 2, NMFS would continue research with weak hook technology and closely monitor white marlin and roundscale spearfish catch through observer coverage in the fishery. Should the increased catches of white marlin and roundscale spearfish continue, NMFS would investigate potential mitigation measures that might be implemented if necessary to reduce the catches and/or reduce the bycatch mortality associated with the catches. The current research does not show a statistically significant increase in bycatch; therefore, it is not clear that mitigation measures would be appropriate at this time. Neither does the research indicate which measures would be effective to address any potential statistically significant white marlin and roundscale spearfish increase in catch. If additional research shows a statistically significant increase in such bycatch, possible measures could include adopting a seasonal application of the weak hook, modification or removal of the weak hook requirement or other measures as necessary and appropriate. NMFS would closely monitor fleet activities and catch statistics and consider making management measures adjustments, including use of inseason management authority, should the data warrant. Given the conservation and management measures in place and continued research and monitoring, and taking into account the National Standard 9 Guidelines, NMFS believes that this final rule minimizes bycatch and bycatch mortality to the extent practicable.

Under alternative 3, a wide range of negative and positive biological impacts are possible depending on the extent and type of time/area closure considered. This analysis incorporates by reference the methodology and results discussed in the 2006 Consolidated HMS FMP for time/area closures to reduce bycatch. In the 2006 Consolidated HMS FMP, NMFS established criteria for regulatory framework adjustments to implement new time/area closures or make modifications to existing time/area closures, as discussed in Section 1.1 above, and conducted a comprehensive analysis, using best available data from a variety of sources, to analyze a wide range of options to achieve bycatch objectives for particular species or groups of species. For all alternatives, NMFS compared monthly observed and reported catch and CPUE in each of the potential time/area closures to catch and CPUE fleet-wide and evaluated the impacts of the closures assuming both with and without redistribution of effort.

Considering redistribution of fishing effort is important because HMS and protected species are not uniformly distributed throughout the ocean and tend to occur in higher concentrations in certain areas. Therefore, a closure in one area might reduce the bycatch of one or two species, but may increase bycatch of others. NMFS considered a number of redistribution of effort scenarios (*i.e.*, redistribution of effort into all remaining open areas, redistribution of effort into the GOM only, and redistribution of effort in the GOM). In all cases, NMFS found the closures in the GOM could result in an increase in bycatch for some of the species being considered. No one closure in these analyses would have resulted in a decrease in discards or bycatch of all the species considered when the redistribution of fishing effort was considered. When the redistribution of effort was considered, the purpose of a GOM closure (reducing

bycatch and discards of spawning BFT) may not be fully realized and may have effects on BFT outside the closed area. For instance, after examining a potential closure in the GOM from April through June in order to protect spawning BFT, the analysis predicted an increase in the number of BFT bycatch and discards elsewhere once displaced fishing effort was considered. In the 2006 Consolidated HMS FMP, NMFS' did not prefer any new time/area closures (except the Madison-Swanson and Steamboat Lumps Marine Reserves for other purposes), and did not modify any existing closures at that time because no single closure or combination of closures would reduce the bycatch of all species considered, assuming there is some redistribution of effort. NMFS believes the closure analysis conducted in 2006 remains the best available science and reflects the substantial impacts that would likely occur under the time/area closures analyzed because the underlying principle of fishing effort redistribution that was used in the analysis is still likely to occur. Additionally, NMFS is not aware of other peer reviewed and published time/area closure analyses that consider fishing effort redistribution for the GOM PLL fishery since the NMFS 2006 closure analyses. Therefore, NMFS does not prefer alternative 3 for the same reasons as described above and in the 2006 Consolidated HMS FMP.

The 2006 Consolidated HMS FMP established criteria for considering the implementation of new time/area closures or modification to existing time/area closures (discussed in Section 1.1 above). It is not feasible to conduct extensive, new analysis per these criteria and to meet the objectives of this action (*i.e.*, to rapidly implement the final action to increase the survival of spawning BFT in 2011 in the GOM particularly the 2003 year class). NMFS believes that the 2006 analysis remains valid for the purposes of this rulemaking. However, NMFS intends to review time/area closure analyses, in light of the events of the past few years such as hurricanes and the DWH/BP oil spill, in the near future. At that time, NMFS will consider other methodologies that have been proposed to consider effects of effort redistribution, such as Powers and Abeare (2009) or others, for time/area analysis as appropriate.

Section 4.2 Social and Economic

Under alternative 1 (No Action), NMFS 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 would not change current fishing practices. However, adverse economic impacts in the medium and long-term could result if no action is taken to address the incidental catch of BFT in the GOM PLL fishery. Adverse economic impacts could occur if the Longline category incidental quota for BFT is exceeded and a partial or total closure of the PLL fishery is implemented.

Alternative 2 would be expected to have moderate negative social and economic impacts for those vessels able to successfully utilize the weak hook when fishing with PLL for YFT and other species in the GOM and greater, temporary negative economic impacts for those vessels that are unable to quickly alter their fishing techniques to successfully utilize the weak hook technology. NMFS gear researchers have found that fishermen participating in research tend to work through a learning curve with new technology and generally improve their performance with a particular gear over time (Dan Foster, Pers. Comm.). The species composition of landings for PLL trips conducted in the GOM and outside the GOM can be seen Section 3.

The economic analysis of the potential impact of switching to weak hooks is based on the GOM PLL BFT mitigation research results reported in the 2010 Interim Report (NOAA, 2010a). That report indicated that utilizing weak hooks resulted in statistically significant (at the 95 percent confidence level) reductions in the catch of two economically valuable species in the PLL fishery in the GOM: BFT and wahoo. In addition, when examining the results at the 85 percent confidence level, the results also indicated that there were potential impacts to the retention rates of YFT and swordfish. Based on these results, the economic analysis focuses on the potential change in revenues for these four species.

The average gross revenue per trip for GOM PLL vessels for 2006 - 2009 attributed to YFT, swordfish, wahoo, and BFT landings is estimated to be $15,314 (see Table 5.2, in section 5 below). This baseline trip revenue is estimated to be reduced by approximately 14.8 percent ($2,265) due to reductions in catch found during experimental fishing with weak hooks. A 14.8 percent reduction would reduce trip revenues attributed to the four species listed above, to approximately $13,049.

A review of NMFS logbook data indicates that GOM vessels average approximately 9.7 trips per year. Using 9.7 trips per year and the revenue based on the four species listed above, NMFS estimates that individual GOM PLL vessels average approximately $148,546in baseline revenue per year using the industry standard circle hook (9.7 trips x $15,314 = $148,546) . NMFS estimates that this annual baseline revenue per vessel could be reduced by approximately $21,974annually, to $126,572 if weak hooks are implemented.

NMFS estimates the GOM PLL fleet to average approximately 50.4 active vessels in recent years. Using 50.4 active vessels and 9.7 trips per year, NMFS estimates that there are approximately 489 PLL trips completed in the GOM on a yearly basis (50.4 vessels x 9.7 trips = 489). On 489 trips, each with baseline revenue of approximately $148,546, NMFS estimates that the total GOM PLL baseline revenue attributed to the four species listed above equals approximately $7,488,550under current fishing conditions. The total GOM revenue attributed to the four species listed above would be estimated to decrease by $1,107,746 to $6,380,804 with the implementation of weak hooks.

A reduction in catch of some pelagic and large coastal sharks did occur with the experimental hook; although only a few observations were recorded and the reduction was not statistically significant. If some reduction in catch of pelagic or large coastal sharks actually does occur, some unquantifiable negative economic impacts may occur due to the reduction in marketable sharks retained. Conversely, some unquantifiable economic benefits may result if fishing efficiency increases and fishermen lose less fishing time clearing lines and handling large unmarketable sharks and giant BFT that otherwise cannot be retained due to insufficient amount of target catch. Fishermen may experience a reduction in economic losses due to damaged or lost fishing gear. Analysis of research data after the publication of the draft EA found a seasonal difference in the catch of YFT. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. If more data had been collected after the BFT spawning period, it is likely that the YFT reduction rate would have been less than what was observed, thus the potential economic impact due to decreases in YFT catch may be less than described above.

A probability analysis, of the potential change in numbers of BFT incidentally caught, but allowed to be retained due to target catch tolerances, showed only a small reduction with the use of the weak hook. Because only a small portion of the BFT caught are available for landing, the 56.5 percent reduction in catch observed with the weak hook design will not likely result in a 56.5 percent reduction in landings. The majority of trips that landed BFT actually caught more than twice as many BFT as they landed. Therefore, for a majority of trips, the new hook design will not affect the opportunity for vessel to land the allowable number of BFT under existing regulations. The probability analysis used observer data from 2009 and 2010 and estimated any changes in landings that might have occurred if the weak hook had been used. There were 68 observed trips in 2009 and 34 trips observed in 2010 during the BFT tuna observer coverage period. The estimates are based on 2009 and 2010 non-experimental data where 320 BFT were caught with 47 landed during observed trips in 2009 and 115 BFT were caught with 12 landed during observed trips in 2010. The maximum number of BFT caught during a trip was 18 and the maximum number of BFT landed from a trip was two. Results show that use of the weak hook is predicted to decrease the number of BFT retained by only 14 percent (*i.e.* from 59 observed landings to 51 predicted) with the use of weak hooks. This minor reduction in landings would likely result in minimal negative economic impacts.

Alternative 2 is predicted to have indirect positive economic and social impacts to both the PLL fishery and on the targeted BFT fishery. In past years the PLL fishery has landed and discarded dead BFT substantially in excess of its allocated quota. If landings and discards can be brought more into alignment with FMP subquotas, then management actions with likely substantial negative impacts, such as closure of the PLL fishery, may not need to be considered for quota management purposes. Exceeding PLL allocated incidental quotas (landings and dead discards) has also meant that the BFT subquotas have had to be reallocated from prior year underage, reserve or directed categories with underharvest; to ensure the United States does not exceed its total ICCAT allocated quota. In the near future, however, NMFS' may not have the same ability to reallocate quota if ICCAT quotas decrease and directed BFT categories fully land the individual quota allocations. The anticipated increased availability of adult (and greater than or equal to the commercial minimum size limit of 73 inches curved fork length) BFT as the strong 2003 year class continues to mature increases the likelihood of, not only increased landings from directed fishing categories, but increased incidental interactions with PLL gear as well. Unless incidental BFT catch is brought into alignment with the available BFT incidental PLL quota, it is possible that quota may need to be transferred from directed quota categories resulting in early closures and negative social and economic impacts to these directed BFT fisheries or that the PLL fishery would have to be closed prior to the end of the fishing year.

Under alternative 2, direct cost of purchasing weak hooks is anticipated to increase by $.02 per hook. An informal telephone survey of hook suppliers provides a price of approximately $0.34 per hook for 16/0 commercial grade circle hooks and approximately $0.36 per hook for 16/0 circle hooks constructed of 3.65 mm diameter wire. Assuming that an average of 1,600 hooks per vessel are needed initially to equip vessels with enough required hooks for one trip, the compliance cost, on a per vessel basis, would be approximately $576. Researchers estimate a replacement increase of 4.41 weak hooks per 1,000 due to straightened hooks and YFT hook deformation. The researchers anticipated that this rate was an underestimate;

however, they estimated the cost of additional hooks to be less than $3.00 per 1,000 weak hooks set. The standard 16/0 circle hooks currently in use will continue to be used in the U.S. Atlantic and inventories of unused standard 16/0 hooks could be sold to vessels fishing in the Atlantic, but outside of the GOM.

With regard to PLL vessels fishing in the Atlantic, but outside the GOM, NMFS solicited specific comment on gear stowage procedures that could allow vessels entering or exiting the GOM with hooks not meeting the weak hook requirement. Such stowage procedures would need to allow vessels to transit the GOM while ensuring the enforceability of weak hook requirements. There were no public comments received about gear stowage procedures.

Predicting fishermen's behavior is difficult, especially as some factors that may determine whether to stay in the fishery, relocate, or leave the fishery are beyond NMFS' control (fuel prices, infrastructure, hurricanes, etc.). While some fishermen will continue to fish in the remaining open areas of the Atlantic, Caribbean, and Gulf of Mexico, others may be forced to leave the fishery entirely, such as selling their permits and going out of business, as a result of the closure. Alternative 3 may cause some fishermen to shift effort to fishing areas outside the GOM and there could be changes in the distribution of the fleet with some fishermen 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. NMFS conducted a detailed, comprehensive socio-economic analysis for the time / area alternatives considered in the 2006 Consolidated HMS FMP and found that the economic impacts of each of the closures considered may be substantial, ranging in losses of up to several million dollars annually, depending upon the closure and displacement of a significant number of fishing vessels (Wilson *et al.*, 2007). Since the data analysis conducted in the 2006 Consolidated HMS FMP, several events have affected the GOM including Hurricane Katrina, Hurricane Rita, and the DWH/BP oil spill among other events. While social and economic impacts have likely occurred due to these events, NMFS believes the closure analysis in 2006 still reflects the substantial social and economic impacts that would be likely to occur under the time/area closures analyzed.

Section 4.3 Mitigation

Under the preferred alternative, NMFS will implement the weak hook requirement on all PLL vessels operating in the GOM in accordance with domestic legislation and the 2006 Consolidated HMS FMP, and its implementing regulations.

The preferred alternative will have a substantial conservation benefit by potentially reducing BFT mortality from PLL interactions in the GOM. Overall, NMFS anticipates substantial positive ecological impacts due to the reductions in mortality of BFT, especially as fishermen become more adept at using the weak hook technology. Experimental results have shown that fishermen can adapt to the new gears quickly, with catches returning to normal levels

once fishermen have made the needed adjustments to their fishing practices. As with many other bycatch mitigation measures (Turtle Excluder Devices, Bycatch Reduction Devices, large circle hooks in the Northeast Distant area), there is a learning curve associated with maintaining target catch. In almost all cases, the ability of fishermen to maintain target catch with any bycatch mitigation measures improves over time. The fact that some vessels claim to have experienced improved catch rates of YFT with the weak hook indicates that fishers can learn to use the new hook effectively. As with any new conservation technology, minor adjustments in fishing practices are often needed in order to optimize the gear performance. Outreach and technology transfer will be important for successful transitioning of this mitigation technology to the GOM PLL fishery. Moderate negative economic impacts are expected to occur with the requirement to purchase and use the weak hook. NMFS anticipates that these negative impacts will lessen over time. At the same time, this action would increase the likelihood that PLL vessels could continue to operate directed PLL fisheries in the GOM while reducing the incidental capture and mortality of spawning BFT relative to the status quo.

As described in the previous sections of this document, the preferred alternative is expected to have moderate negative social and economic impacts in the short term but potentially sizeable positive biological impacts in both the short and long term.

NMFS intends to explore opportunities to mitigate costs for PLL fishermen with their initial purchase of the required supply of weak hooks once the weak hook gear is finalized as a requirement. Opportunities might include third party sponsorship of a voucher program where eligible PLL vessels that actively fish in the GOM would be eligible for their initial supply of weak hooks. NMFS received public comments in favor of such a potential voucher program.

In an attempt to help fishers adjust to the use of the new weak hook technology, NMFS has launched an will continue an outreach campaign both during and after implementation of this requirement. Such a campaign could mitigate the negative social impacts and compliance costs to the industry. Elements of this outreach program could include, but would not be limited to:

1) Public meetings and/or workshops with technical experts and scientists to discuss the scientific experiments and the need for the weak hook and what to expect;
2) Preparation and publication of a brochure/fact sheet about weak hook research in several languages including English and Vietnamese;
3) Direct mailing to permit holders and industry leaders of an information packet explaining weak hook use, desired results and need for implementation;
4) Outreach through mailings, e-mail, direct phone calls, use of local media and posters (as well as the Federal Register) to notify fishermen and dealers of the final action and its background and need;
5) Public hearings on the proposed rule, in main GOM fishing ports, to include presence of scientists, managers, industry leaders and enforcement officials to answer questions;
6) Publication of updated compliance guides and preparation of roll-out packages in several languages including instructions on where to purchase hooks; and,
7) Possible follow-up workshops with industry and government staff to discuss implementation results and possible next steps to build on successes and mitigate possible negative impacts.

NMFS attempted to mitigate the economic and social impacts as much as possible in designing the weak hook by working closely with manufacturers and fishermen during the research experiment to determine the efficacy of the weak hook technology in the GOM PLL fishery. The design standards of the weak hook are identical to the current standards already in place albeit with the additional requirement for a thinner wire stock. Some of the fishermen that worked with NMFS scientists during the experiment expressed a preference for the weak hook due to its lighter weight and easier handling. NMFS researchers have also facilitated enforcement of the hook by designing a gauge that can easily be used by law enforcement officers by sliding the gauge over the shank of the hook. Only legal width hooks that are thinner than industry standard circle hooks can pass into the slot of the gauge. The use of the weak hook may result not only in positive ecological impacts but may also reduce fishing costs by reducing the incidence of lost or sunken gear during interactions with heavy BFT. The incidental target catch requirements that allow PLL vessels to retain one to three BFT depending on amount of target catch onboard also provide ex-vessel revenue to PLL vessels. The probability analyses discussed above, show a reduction in the number of incidentally landed BFT which would likely result in minor negative economic impacts from lost revenue. It is possible that short-term negative impacts to fishermen from the initial purchase of required weak hooks may be mitigated in communities where manufacturers may incur short-term positive impacts from generation and sale of a newly required hook. Long-term negative impacts to fishermen due to the need to more frequently replace 'failed' hooks depend on the frequency with which hooks would need to be replaced under the standard fishing conditions of the status quo.

Mitigation measures for white marlin/roundscale spearfish under Alternative 2 (preferred) are discussed in Section 4.1 above. NMFS would continue research with weak hook technology and closely monitor white marlin and roundscale spearfish catch through observer coverage in the fishery. Should the increased catches of white marlin and roundscale spearfish continue, NMFS would investigate potential mitigation measures that might be implemented if necessary to reduce the catches and/or reduce the bycatch mortality associated with the catches. The current research does not show a statistically significant increase in bycatch; therefore, it is not clear that mitigation measures would be appropriate at this time. Neither does the research indicate which measures would be effective to address any potential statistically significant white marlin and roundscale spearfish increase in catch. If additional research shows a statistically significant increase in such bycatch, possible measures could include adopting a seasonal application of the weak hook, modification or removal of the weak hook requirement or other measures as necessary and appropriate. NMFS would closely monitor fleet activities and catch statistics and consider making management measures adjustments, including use of inseason management authority, should the data warrant. Should catches of target species decrease under the preferred alternative, minor adverse impacts may occur if fishermen increase effort to offset decreased catches; however these potential adverse ecological impacts are uncertain and may not actually be realized. The preferred alternative may have adverse economic and/or social impacts but is necessary to reduce the incidental take and mortality of BFT associated with the operation of the PLL fleet in the GOM. The preferred alternative is consistent with the 2006 Consolidated HMS FMP, the Magnuson-Stevens Act, ATCA, the ESA, and other applicable law.

Section 4.4 Comparison of Alternatives

Based on the analyses here, and graphically presented in Table 4.2, the No Action alternative would not have any ecological, social or economic impacts other than those already considered in the 2006 Consolidated HMS FMP. Over time, however, the continued rate of discards of BFT may not only negatively impact the stock but potentially require the agency to take additional action that might cumulatively negatively impact the PLL fleet socioeconomically, including possibly closing the PLL fishery. In contrast, for the immediate and long-term future, the preferred alternative would have moderate positive ecological impacts both directly from the release of BFT otherwise discarded dead and indirectly by reducing the possibility that the PLL fleet will exceed its BFT incidental quota. The preferred alternative could have moderate negative socio-economic impacts in the short term as vessel owners re-equip with new hooks with a predicted decrease in target catches of YFT. However, in the long-term, and as fishermen gain experience with the new hook, the amount of the decrease is likely to diminish. In addition the predicted decrease in BFT discards should allow PLL fishermen the ability to continue normal fishing operations in the GOM while staying within allocated incidental BFT quota. The third alternative considers additions to existing time/area closures and would need to be carefully analyzed to avoid potential negative impacts to target and non-target species due to displacement of the fleet with potentially corresponding negative socio-economic impacts.

Table 4.2. Comparison of alternatives considered.

Alternative	Quality	Timeframe	Environmental	Protected Resources	Socioeconomic
1: No Action. Maintain existing hook and other requirements in the GOM PLL fishery	Direct	Short-term	○	○	○
		Long-term	⊙₋	○	⊙₋
	Indirect	Short-term	○	○	○
		Long-term	○	○	⊙₋
	Cumulative	Short-term	○	○	○
		Long-term	⊙₋	○	⊙₋
2: Require all PLL vessels fishing in GOM to use weak hooks – *Preferred Alternative*	Direct	Short-term	⊙₊	○	⊙₋
		Long-term	⊙₊	○	⊙₊
	Indirect	Short-term	⊙₊	○	⊙₋
		Long-term	⊙₊	○	⊙₋
	Cumulative	Short-term	○	○	⊙₋
		Long-term	⊙₊	○	⊙₊
3: Implement additional time/area closures in the GOM	Direct	Short-term	⊙₋	⊙₋	⊙₋
		Long-term	⊙₋	⊙₋	⊙₋
	Indirect	Short-term	⊙₋	⊙₋	⊙₋
		Long-term	⊙₋	⊙₋	⊙₋
	Cumulative	Short-term	⊙₋	⊙₋	⊙₋

Alternative	Quality	Timeframe	Environmental	Protected Resources	Socioeconomic
		Long-term	⊙−	⊙−	⊙−

Symbol Key:

- ◯ Neutral Impacts
- ⊙+ Minor Beneficial Impacts
- ⊘+ Moderate Beneficial Impacts
- ⊙− Minor Adverse Impacts
- ⊘− Moderate Adverse Impacts

Section 4.5 Cumulative Impacts

Cumulative impacts are the impacts 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 GOM PLL fishery. NMFS has implemented regulations in the past and expects to implement more in the future to address the management and conservation of target and non-target species in HMS fisheries. The following ongoing or past actions are considered as part of the cumulative impacts.

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. Swordfish were and continue to be targeted in the GOM PLL fishery. 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. These measures have contributed to the rebuilding of north Atlantic swordfish populations which is now considered to be fully rebuilt. In the long-term, the rebuilt swordfish population has provided social and economic benefits to the GOM PLL fishery.

Since 1999, management actions pertaining to BFT have had minor positive ecological impacts by continuing to limit BFT mortality by U.S. fishermen in accordance with the strict quota limits set by ICCAT. The 1999 FMP adopted ICCAT's 20-year stock rebuilding program for western Atlantic BFT, which includes, among other things, authority for NMFS to implement ICCAT's BFT quota allocation on a yearly basis through a framework procedure. The FEIS for the 2006 Consolidated HMS FMP (NMFS, 2006) concluded that the cumulative long-term

impact of the final implementing actions, including the ICCAT BFT rebuilding program and annual quota allocation process, would be to establish sustainable fisheries for Atlantic HMS.

On August 1, 2000, NMFS published a final rule that prohibited live bait longlining in the GOM, prohibited PLL fishing at any time in the DeSoto Canyon area (beginning November 2000), and required corrodible hooks to reduce bycatch, bycatch mortality, and incidental catch in the PLL fishery. These management measures had a positive ecological impact by reducing the bycatch of juvenile swordfish that was occurring in the DeSoto Canyon area, thus increasing the ability of these fish to grow to maturity and reproduce. This in turn contributed to the rebuilding of the north Atlantic swordfish population. The management measures also had positive ecological impacts by reducing other HMS bycatch and increasing the bycatch mortality of animals caught on PLL gear by requiring the use of hooks that corrode. The management measures had negative social and economic impacts in the short-term by requiring a bait type other than the preferred bait type of some fishermen, displacing some fishing effort to other areas, and requiring that fishermen purchase and use corrodible hooks in the PLL fishery. The management measures have had an positive economic impact in the long-term by contributing to the rebuilding of the north Atlantic swordfish population.

On July 6, 2004, NMFS published a final rule (69 FR 40734) pursuant to the 2004 PLL BiOp implementing many gear and bait restrictions and requiring certain sea turtle handling and release tools and methods that applied to PLL fishermen in the GOM and elsewhere. Specifically, the 2004 final rule required vessel operators participating in the PLL fishery for Atlantic HMS operating outside of the NED, at all times, to possess onboard and/or use 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 could be possessed and/or utilized with the allowable hooks outside of the NED. The 2004 rule also re-opened the NED to PLL fishing for Atlantic HMS, but required vessels with PLL gear onboard in that area, at all times, to possess and/or use only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Within the NED, only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks. Finally, NMFS required specific sea turtle release equipment to be possessed on board PLL vessels and adherence to specific handling and release techniques for sea turtles. The sea turtle handling and release placards and protocols were revised, and a video showing proper sea turtle handling techniques was mailed to all PLL vessel owners. The placards, protocols, and video were made available in English, Spanish, and Vietnamese. There were short-term negative social and economic impacts of these management measures related to the initial costs of compliance with the regulations. However, the long-term economic impacts were positive because these management measures allowed the U.S. PLL fleet to continue to operate within the restrictions of the 2004 PLL BiOp. The management measures have had a positive ecological impact by reducing the bycatch and bycatch mortality of sea turtles, other ESA listed species (such as marine mammals), and other species that are not allowed to be retained (such as billfish).

A requirement for PLL vessel owners and operators to possess and use several sea turtle handling and release gears and attend workshops for the safe release, disentanglement, and identification of protected resources was implemented by the final rule for the 2006 Consolidated HMS FMP (71 FR 58058, Oct. 2, 2006). The sea turtle handling and release gear and workshops

have had positive ecological impacts by educating fishermen about effective and required techniques for releasing and disentangling protected resources, thus reducing bycatch mortality of these species. The required sea turtle handling and release gears and workshops have had negative social and economic impacts related to the purchase of the gears, opportunity cost of attending the workshops, and cost of travel; however, the workshops have also had positive economic impacts by contributing to improved post-release survival of sea turtles and the operation of the PLL fleet below the acceptable level of sea turtle mortality provided for in the 2004 BiOp.

Time-area closures in the GOM have been utilized to reduce bycatch and incidental catch of overfished and protected species by PLL fishermen who target HMS while minimizing economic impacts. Areas in the GOM that are closed to PLL fishing include the previously mentioned DeSoto Canyon (65 FR 47214; effective November 1, 2000) and the Madison-Swanson and Steamboat Lumps (71 FR 58058; Effective November 1, 2006) closed areas, which are closed year-round, as well as the Edges 40 Fathom Contour closed area (74 FR 66585; effective January 15, 2010).

VMS requirements have been implemented for PLL vessels in the GOM and elsewhere with short term negative social and economic impacts stemming from the purchase and installation of VMS units; however there are positive social and economic impacts associated with increased safety at sea when vessels are monitored.

Reasonably foreseeable future actions include the development of final rules or proposed rules related to an international trade permit and additional trade tracking requirements for swordfish, bigeye tuna, and BFT import prohibitions; implementation of ICCAT management measures and quotas for BFT; swordfish quotas; and shark management measures.

In October 2009, Monaco submitted a proposal to list Atlantic bluefin tuna in Appendix I of the Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES), which would prohibit international trade of the species. The United States supported the listing of both the western Atlantic and eastern Atlantic/Mediterranean stocks of BFT in CITES Appendix I. At the March 2010 CITES 15th Conference of Parties meeting in Doha, Qatar, the proposal was not adopted. The U.S. Department of the Interior, which is the lead Federal agency on CITES issues, subsequently issued a press release indicating that the United States will continue to work with ICCAT parties to conserve and recover BFT.

On May 24, 2010, NMFS received a petition from the Center for Biological Diversity (CBD) to list BFT as threatened or endangered under the ESA and designate critical habitat concurrently with its listing. On September 21, 2010, NMFS announced a 90-day finding (75 FR 57431) that the petition presents substantial scientific information indicating the petitioned action may be warranted. NMFS is currently conducting a status review of BFT to determine if the petitioned action is warranted. NMFS is scheduled to publish that determination by May 24, 2011 (*i.e.*, within 12 months of receiving the petition). If NMFS determines that listing is warranted, NMFS will publish a proposed rule and solicit public comments before developing and publishing a final determination. If NMFS determines that listing is not warranted, NMFS would publish a Federal Register notice announcing the end of the consideration process.

ICCAT's SCRS reviewed the status of Atlantic BFT stocks in 2010 and the Commission met in November, 2010 in Paris, France to negotiate new management measures. Regarding the overall western TAC the Commission reduced the 2010 TAC from 1,800 to 1,750 mt for 2011 and 2012. Any future domestic management actions taken in regard to the BFT fishery would be consistent withICCAT recommendations and BFT TACs, and implemented consistently with the Magnuson-Stevens Act and ATCA.

Gulf of Mexico PLL fishery participants have experienced some negative impacts from non-federal actions that include the year-round availability of low-priced imported HMS, fluctuating fuel prices, consumer boycotts, extreme tropical weather, and recent area closures due to the Deep Water Horizon/BP oil spill. Hurricane Katrina also significantly impacted the GOM PLL fleet. Vessels that survived the storm likely lost significant fishing time as well as their shore–based infrastructure and access to national and worldwide markets. The recent Deep Water Horizon/BP oil spill kept many GOM PLL vessels at port for many months or had them engaged as vessels of opportunity during clean-up activities. Even if vessels were participating in the oil spill clean-up and generating some revenue, they may have lost market share and experienced negative economic impacts. At the same time concern from environmental groups regarding the status of BFT (Center for Biological Diversity, 2010), and the GOM spawning area in particular (Pew Environmental Group, 2010) has heighted focus on PLL activity in the GOM raising the potential for additional Agency action in the future.

The initial social and economic impacts of requiring weak hooks in the GOM PLL fishery are expected to be negative for fishermen who participate in the GOM PLL fishery. However, weak hooks are anticipated to allow a greater number of spawning BFT to escape capture than the current industry standard circle hooks allow. This could lead to a decrease in bycatch and bycatch mortality of spawning BFT in the GOM PLL fishery which, in turn, could provide beneficial ecological impacts to the BFT stock in the short and long-term. A reduction in the catch of BFT in the GOM PLL fishery may also reduce the likelihood of NMFS promulgating more restrictive measures (including closing the PLL fishery) in the future due to BFT landings and dead discards exceeding the Longline category subquota. Therefore, requiring weak hooks in the GOM may have positive short and long-term social and economic benefits to the GOM and entire PLL fishery.

While certain past, present, and reasonably foreseeable future actions have resulted or may result in negative social and economic impacts, the cumulative impacts of these actions have also resulted in positive social and economic impacts through the continued operation of the PLL fishery in the GOM and elsewhere in the Atlantic. Additionally, the cumulative ecological impacts of past management measures have resulted in the rebuilding of north Atlantic swordfish populations, which in turn, have contributed to positive social and economic impacts to fishermen in the GOM PLL fishery and other domestic swordfish fisheries. The cumulative impacts of the requirement to use only weak hooks in the GOM PLL fishery, when considered along with the aforementioned management measures and other factors, are expected to enhance stock rebuilding by increasing BFT spawning potential and subsequent recruitment into the fishery; increase the survival of spawning BFT in 2011 in the GOM particularly the 2003 year class; constrain PLL BFT catch to the incidental BFT quota allocation; and minimize negative

ecological impacts on non-target or protected species. These positive ecological benefits result from the management measures' contribution to rebuilding of BFT populations and the social and economic benefits stemming from the continued operation of the PLL fishery in the GOM and elsewhere in the Atlantic.

Section 5 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. The information contained in Section 4, taken together with the data and analysis incorporated by reference, comprise the complete RIR.

The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following statement from the Order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits should be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

E.O. 12866 further requires Office of Management and Budget review of proposed regulations that are considered to be "significant." A significant regulatory action is one that is likely to:

- 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, local or tribal governments of communities;
- Create serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the president's priorities, or the principles set forth in this Executive Order.

Section 5.1 Description of Management Objectives

Please see Section 1 for a full description of the management objectives for this final action. The purpose of the final action is to reduce PLL catch of BFT in the GOM, which is the only known BFT spawning area for the western Atlantic stock of BFT. The final action will provide a new gear technology that could allow the GOM PLL fleet to continue routine directed fishing operations (*e.g.*, on YFT) while decreasing the numbers of incidentally caught BFT.

Weak hooks can allow incidentally caught BFT to escape capture because the hooks are more likely to straighten when a large fish is caught.

Section 5.2 Description of Fishery

Please see Section 3 of this EA/RIR/IRFA for a description of fishery and environment that could be affected by this rulemaking.

Section 5.3 Statement of the Problem

Please see Section 1 for a full discussion of the problem and need for this management action. The management measures are necessary to achieve domestic management objectives under the Magnuson-Stevens Act, and to implement the Consolidated HMS FMP, including goals to rebuild stocks and end overfishing. BFT have historically been documented as overfished with overfishing occurring. Under the Consolidated HMS FMP, the U.S. PLL fleet is quota limited for the incidental retention of BFT. PLL vessels are currently allocated 8.1 percent of the baseline annual U.S. BFT for the incidental retention of BFT while fishing on other (target) species such as YFT in the GOM and swordfish in the North Atlantic. In the last few years however, the total PLL landings and dead discards, which must be reported to ICCAT, have exceeded the FMP-based PLL allocation. In addition, if future U.S. quotas remain at current levels, or less, there is the potential that other directed BFT fishery (*e.g.*, commercial and recreational handgear fisheries) may become quota limited. Constraining the landings of BFT to the Longline category quota serves to allow the fleet to continue to participate in directed fisheries (e.g., Atlantic yellowfin tuna (YFT) and swordfish) year-round with less risk of fishery interruption due to insufficient BFT quota availability. Further, it would reduce the need for BFT quota reallocation from directed fisheries or the Reserve to cover excess pelagic longline BFT landings. The final action will provide a new gear technology that could allow the GOM PLL fleet to continue routine directed fishing operations (e.g., on YFT) while decreasing the numbers of incidentally caught BFT. Weak hooks can allow incidentally caught BFT to escape capture because the hooks are more likely to straighten when a large fish is caught.

Section 5.4 Description of Each Alternative

Please see Sections 2 and 4 for a summary of the preferred and No Action alternatives and a complete description of each alternative and its expected impacts.

Section 5.5 Economic Analysis of Expected Effects of Each Alternative Relative to the Baseline

Alternative 1, the no action alternative, is not expected to result in any significant change in economic benefits in the short-term. However, there could be significant adverse economic impacts in the medium to long-term if the incidental catch of BFT in the GOM PLL fishery exceeds the available incidental quota potentially resulting in a partial or total closure of the fishery.

Alternative 2, requiring all PLL vessels fishing in the GOM to use weak hooks, would result in moderate positive social and economic benefits if this measure is able to reduce the bycatch of BFT in the GOM sufficiently to allow the PLL fishery to continue operating in the

GOM. However, there will likely be some increased economic costs associated with switching to the weak hook.

This alternative will result in some minor increases in equipment costs associated with acquiring the new weak hooks. Direct cost of purchasing weak hooks is anticipated to increase expenses by $0.02 per hook. An informal telephone survey of hook suppliers provides a price of approximately $0.34 per hook for 16/0 commercial grade circle hooks and approximately $0.36 per hook for 16/0 circle hooks constructed of 3.65 mm diameter wire. Assuming that an average of 1,600 hooks per vessel are needed initially to equip vessels with enough required hooks for one trip, the compliance cost, on a per vessel basis, would be approximately $576. NMFS is considering a voucher program to purchase an initial supply of weak hooks to outfit vessels that actively fish in the GOM PLL fishery. This possibility is discussed in the mitigation section above. Hook replacement rates are anticipated to increase with use of the weak hook. Researchers during the GOM PLL BFT mitigation research (NOAA 2010a), estimated that with the experimental weak hook, a 4.41 hooks per 1,000 hooks increase in the rate of hook replacement due to straightened hooks and YFT hook deformation. The researchers anticipated that this rate was an underestimate; however, they estimated the cost of additional hook replacement with the experimental hook to be less than $3.00 per 1,000 hooks set. The standard 16/0 circle hooks currently in use will continue to be used in the U.S. Atlantic and inventories of unused standard 16/0 hooks could be sold to vessels fishing Atlantic outside of the GOM.

Alternative 2 will also potentially affect vessel catch rates, and thus potentially reduce vessel revenues. Based on the research results reported in "2010 Interim Project Report - Update on Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research" (NOAA Fisheries 2010a), catch rates for several commercially important species were found to be lower using the new weak hooks versus the standard 16/0 circle hooks. The researchers found a statistically significant (at the 5 percent level) reduction in the total catch of BFT and wahoo when weak hooks were used compared to conventional circle hooks (See Section 3.5, Table 1). The total catch of BFT was reduced 56.5 percent when weak hooks were used in the experiment. This reduction includes both discards and BFT retained for sale. Based on observer reports of the number of BFT discarded versus retained in the GOM, the researchers estimate that the experimental results indicate that the use of weak hooks would result in approximately a 14 percent reduction in BFT retained for sale given the BFT incidental retention limits. The total catch of wahoo using the weak hook was reduced by 26.6 percent.

The research also observed reduction in the number of YFT and swordfish retained for sale. While these results were not statistically significant at the 5 percent level, the reductions in YFT and swordfish retained did have p-values ≤ 0.15. Weak hooks in the experimental trips in a 7 percent reduction in YFT retained for sale and 41.2 percent reduction in swordfish retained for sale. No other commercially targeted species observed during the research exhibited catch rate differences between weak hooks and conventional circle hooks with p-values of ≤ 0.15. Therefore, given that YFT is often the target catch for PLL trip in the GOM and the heterogeneous nature of fishing vessel operations, this analysis conservatively includes the observed reductions in YFT and swordfish. Analysis of research data after the publication of the draft EA found a seasonal difference in the catch of YFT. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during

March-June. If more data had been collected after the BFT spawning period, it is likely that the YFT reduction rate would have been less than what was observed, thus the potential economic impact due to decreases in YFT catch may be less than described above. In addition, NMFS also ran the analysis with just BFT and wahoo which exhibited statistically significant differences in catch at the 5 percent level to help illustrate the range of possible outcomes.

In order to translate the reductions in catch observed in the research experiment into the potential fishery revenue impacts that may result from requiring the use of weak hooks in the GOM, information on the average catch composition of trips taken and the number of trips taken in the GOM were required. Data from the HMS logbook program was utilized to estimate the average species composition of trips taken in the GOM from 2006 to 2009. Table 5.1 lists the average catch per trip in the GOM for 2006 through 2009 for each of the four species of interest.

Table 5.1. Gulf of Mexico Catch Per Trip in Number of Fish Kept. Source: HMS Logbook data.

Year	BFT	YFT	Swordfish	Wahoo
2006	0.15	48.20	11.84	6.22
2007	0.20	41.67	14.03	4.25
2008	0.24	35.11	14.76	5.02
2009	0.24	47.80	17.33	4.67
Average	**0.21**	**43.19**	**14.49**	**5.04**

The average weight of the catch was then estimated using average weights for each species by using weighout data from the Domestic Longline Data Base (DSL) for 2006 to 2009. The average weight for BFT was 484.9 lb dw per fish, for YFT it was 86.3 lb dw, for swordfish it was 83.0 lb dw, and for wahoo it was 33.6 lb dw. These weights were then multiplied by the average number of fish retained per trip on PLL vessels in the GOM to estimate the approximate total landings weight for each species. Finally, the average ex-vessel price received in the GOM for each species was applied to the total landings to estimate the baseline revenue per trip. The average ex-vessel prices were obtained from the Quota Monitoring System (QMS) and the BFT Database. The estimated trip revenue from just BFT, YFT, swordfish, and wahoo is $15,314 per trip for vessel using conventional circle hooks.

Table 5.2. Baseline Trip Revenue Estimate. Source: DLS, Dealer Logbook Forms, and HMS Logbook

Species	Average Trip Catch Retained (# of fish)	Average Weight (lb dw)	Total Landing (lb dw)	Ex-Vessel Price (lb dw)	Baseline Revenue
BFT	0.21	484.9	102	$4.65	$474
YFT	43.19	86.3	3,727	$3.04	$11,331
Wahoo	5.04	33.6	169	$1.62	$274
Swordfish	14.49	83.0	1,203	$2.69	$3,235
Total					**$15,314**

Based on the research results, the per trip revenues under Alternative 2 are expected to be reduced. Using the estimated reductions previously discussed, and using the probability level of ≤ 0.15 or 15 percent, Table 5.3 details the calculations used to estimate the potential change in PLL trip revenues. The estimated per trip reduction in revenues that would potentially result from requiring the use of weak hooks in the GOM is approximately $2,265.

Table 5.3 Estimated Change in Trip Revenues with Switch to Weak Hooks where p <0.15 .
Source: 2010 Interim Report (NOAA Fisheries, 2010).

Species	Baseline Trip Revenues	% Reduction Retained	Revenues with Weak Hook	Change in Revenue
BFT	$474	14%	$407	-$66
YFT	$11,331	7.0%	$10,538	-$793
Wahoo	$274	26.6%	$201	-$73
Swordfish	$3,235	41.2%	$1,902	-$1,333
Total	**$15,314**	**14.8%**	**$13,049**	**-$2,265**

Based on HMS logbook reports from 2006 to 2009, the average number of PLL trips taken per year in the GOM is 489. Multiplying 489 trips by the estimate $2,265 per trip reduction in catch revenues results in an estimated reduction of $1,107,746 in commercial fishing revenues annually for Alternative 2. Alternatively, if the analysis only considers the statistically significant reductions in catch at the five percent level in the research study, the estimated reduction in annual catch revenues in the GOM for Alternative 2 would be $68,100 (489 trips x $139) (Table 5.4). This lower estimate may also represent the potential improvements in catch rates that may occur over time as fishermen adapt to the new weak hook technology.

Table 5.4. Alternative Estimate of Change in Trip Revenues with Weak Hooks where p < 0.05.

Species	Baseline Trip Revenues	% Reduction Retained	Revenues with Weak Hook	Change in Revenue
BFT	$474	14%	$407	-$66
Wahoo	$274	26.6%	$201	-$73
Total	**$748**	**18.6%**	**$609**	**-$139**

NMFS does not foresee that the national net benefits and costs would change significantly in the long term as a result of implementation of the final action.

Alternative 3 may cause a significant portion of fishermen to shift effort to fishing areas outside the GOM. 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. NMFS conducted a detailed, comprehensive socio-economic analysis for the time / area alternatives considered in the 2006 HMS Consolidated FMP and found that the economic impacts of each of the closures considered may be substantial, ranging in losses of up to several million dollars annually, depending upon the closure and displacement of a significant number of fishing vessels (Wilson *et al.*, 2007).

Table 5.5. Net Economic Benefits and Costs of Alternatives

Alternatives	Net Economics Benefits	Net Economic Costs
Alternative 1 Status Quo/No Action	No significant change in economic benefits in the short-term.	There could be significant adverse economic impacts in the medium to long-term if the incidental catch of BFT in the GOM PLL fishery if the longline category for BFT is exceeded and a partial or total closure of the fishery is implemented.
Alternative 2 Require all PLL vessels fishing in GOM to use weak hooks (preferred)	Moderate positive social and economic impacts would potentially result if vessels are able to successfully utilize the experimental hook when fishing for YFT in the GOM.	There could be negative economic costs for vessels that are unable to successfully utilize the experimental hook to fish for YFT in the GOM. PLL revenues are estimated to decline by approximately $68,100 to $1,107,746.
Alterative 3 Additional time/area closures in the GOM	There could be benefits to protected species, and thus increase total existence value of these species. Additional reductions in bycatch of HMS and other fisheries should aid in rebuilding of stocks in general. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from - $10.9 million to + $6.2 million. [Based on Alt B2(d) Consolidated HMS FMP]

Section 5.6 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 action described in this EA/RIR/IRFA does not meet the above criteria. For example, the economic impacts as reflected in this final rule are under the $100 million threshold (see Table 5.5). The preferred alternative will also not create an inconsistency or interfere with an action taken by another agency. Furthermore, the preferred alternative will not materially alter the budgetary impact of entitlements, grants, user fees, the President’s priorities, or the principles set forth in E.O. 12866. Nor will the regulations raise any unique legal or policy issues. The Secretary, through NMFS, has been managing BFT since 1975 via fishery management plans and amendments and implementing regulations to modify management measures. In addition, NMFS has participated in international efforts to develop management measures for stocks affected by multiple nations. The preferred alternative and other alternatives do not materially depart from this management approach. 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. The Office of Management and Budget (OMB) concurred with this determination provided in the listing memo for this management action.

Section 6 Final Regulatory Flexibility Analysis

The Final Regulatory Flexibility Analysis (FRFA) is conducted to comply with the Regulatory Flexibility Act (5 USC 601 et. seq.) (RFA). The goal of the RFA is to minimize the economic burden of federal regulations on small entities. To that end, the RFA directs federal agencies to assess whether the proposed regulation is likely to result in significant economic impacts to a substantial number of small entities, and identify and analyze any significant alternatives to the proposed rule that accomplish the objectives of applicable statutes and minimize any significant effects on small entities. Certain data and analysis required in a FRFA are also included in other chapters of this EA. Therefore, the FRFA incorporates the economic impacts identified in the EA by reference as supporting data for this analysis.

When developing this action, NMFS considered different ways to reduce the regulatory burden on and provide flexibility to the regulated community, consistent with the recent Presidential Memorandum on Regulatory Flexibility, Small Business, and Job Creation (January 18, 2011). In order to meet the objectives of this rule, consistent with legal obligations NMFS continues to investigate a third-party sponsored voucher program to assist fishermen with the purchase of an initial supply of weak hooks. NMFS has also considered seasonal implementation of weak hooks in the GOM PLL fishery, however this approach is not preferred because BFT are also present in the GOM outside of the spawning season in lower numbers and seasonal application of the weak hook requirement would increase the difficulty of enforcing the weak hook requirement. NMFS also considered a phased-in approach to implementation of the weak hook requirement, however this approach is not preferred because it would not rapidly provide additional protection for spawning BFT (especially the strong 2003 year class) as early as possible in the spring 2011 spawning season.

Section 6.1 Statement of the Need for and Objectives of this Final Rule

Please see Section 1 for a full discussion of the need for action.

Section 6.2 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

There are no changes from the proposed rule.

NMFS received more than 57,000 comments on the proposed rule and draft EA during the public comment period. A summary of these comments and the Agency's responses will be included in the final rule. The specific economic concerns raised in the comments are also summarized here and the numbering of individual comments below matches with the comment numbering in the final rule.

Comment 3: NMFS should implement weak hooks in the GOM PLL fishery seasonally when BFT are present. Seasonal application of the weak hook requirement would allow fishermen to use currently required standard circle hooks when BFT are not present in the GOM

to mitigate potential economic impacts due to reductions in YFT and swordfish catch that might occur with year-round use of weak hooks.

Response: NMFS disagrees that the weak hook requirements should be implemented seasonally. BFT are also present in the GOM outside of the spawning season, although in lower numbers, and use of weak hooks year-round will ensure that protection is provided for these BFT.

Research data showed a higher catch rate of YFT with the experimental hook in the late summer months of July, August, and September when compared to the spring and early summer months of March, April, May, and June. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. Although it is unknown why YFT catch rates were higher in the late summer months after BFT spawning season, if more data had been collected after the BFT spawning period, NMFS believes it likely that the YFT reduction rate would have been less than what was observed (*i.e.*, the amount of YFT caught with the weak hook may not have decreased as much as the overall study showed). Thus the potential economic impact due to decreases in YFT catch may actually be less than described in the proposed rule.

Seasonal application of the weak hook requirement would increase the difficulty of enforcing the rule's requirement for vessels in the GOM with PLL gear on board to possess, use, and deploy only weak hooks. This is because vessels on trips spanning the beginning or end of the period of time during which weak hooks are required might not have removed all of the hooks with wire greater than 3.65 mm in diameter from their vessels, thus possessing both hooks on board. Requiring weak hooks year-round reduces such enforcement concerns because no other type of circle hook would be allowed on vessels fishing with PLL gear in the GOM. There would also be some negative economic impacts to fishermen if standard hooks are allowed to be used outside of BFT spawning season due to higher costs and lost fishing time due to re-rigging of fishing gear.

Comment 4: Implementing weak hooks in the GOM PLL fishery will have negative economic impacts including the potential for significant loss of catch and revenue by some vessels. This loss in revenue may make it more difficult for some vessels to maintain the hire of captains and crew members who may be able to fine more lucrative employment elsewhere. Negative economic impacts also include the initial cost of outfitting GOM PLL vessels with weak hooks and an increased replacement rate of weak hooks due to the ease with which the hooks bend. NMFS should provide reimbursement to fishermen for the cost of initially outfitting their vessels with weak hooks.

Response: As described in the EA, NMFS expects negative economic impacts to occur in the short-term for PLL vessels fishing in the GOM. These negative economic impacts include a potential reduction of vessel gross revenue of approximately 14.8 percent, a minor increase in the cost of weak hooks compared to the currently required standard circle hook, and a slight increase in gear cost due to an increased replacement rate of weak hooks compared to the standard circle hook.

As described in the response to comment 3 above, analysis of research data after the publication of the draft EA found a seasonal difference in the catch of YFT. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. If more data had been collected after the BFT spawning period, it is likely that the YFT reduction rate would have been less than what was observed, thus the potential economic impact due to decreases in YFT catch may be less than described in the proposed rule. NMFS continues to investigate a third party sponsored voucher program to assist fishermen with the purchase of an initial supply of weak hooks.

Comment 5: Gulf of Mexico PLL fishermen need a reasonable amount of time to comply with the new weak hook requirement prior to active enforcement of the new requirement and NMFS should ensure that there is a sufficient supply of weak hooks available for the GOM PLL fleet in advance of the effective date.

Resonse: NMFS agrees and intends to provide 30 days after publication of the final rule for fishermen to prepare for and comply with the weak hook requirement. NMFS has begun to investigate manufacturer and distributor inventories of weak hooks and believes that enough weak hooks are currently available to initially outfit PLL vessels in the GOM with weak hooks. NMFS cannot delay implementation for longer than 30 days because, as described above, it is important to have these regulations in place as early in the 2011BFT spawning season as possible to provide additional protections for the strong 2003 year class as it enters adulthood and begins to contribute to spawning in the GOM this spring.

Comment 7: NMFS should conduct education and outreach programs for the entire GOM PLL fleet, including reaching Vietnamese fishermen, to help fishermen understand the benefits and costs of weak hook use and fishery management priorities for the future of the fishery. This effort should include fishing techniques learned through the weak hook research to reduce BFT catch and maintain or improve directed catch.

Response: NMFS agrees and intends to conduct outreach and education workshops around the Gulf of Mexico to help fishermen learn the benefits of and techniques for fishing with weak hooks.

Comment 9: The weak hook research indicates that the number of swordfish retained by GOM PLL vessels may decrease. If this occurs, fishermen may increase their fishing effort to make up for lost revenue, which may result in increased bycatch of undersized swordfish and other bycatch species.

Response: NMFS agrees that the possibility exists for PLL fishing effort in the GOM to increase if fishermen attempt to make up for lost revenue due to reductions in targeted catch. NMFS will continue to monitor fishing effort in the GOM PLL fleet through logbooks and catch through the pelagic observer program in order to determine potential effects on target and non-target species. Bycatch mitigation measures such as closed areas (DeSoto Canyon), use of circle hooks, possession and use of protected species safe handling and release gears, and limits on sea turtle interactions implemented through the incidental take statement in the 2004 BiOp will remain in affect. However, fishermen may not experience reductions in targeted catch or

reduced revenue. Some fishermen that participated in the weak hook research experienced increased targeted catch and are voluntarily using weak hooks year-round. As other fishermen learn the fishing techniques that work well with the weak hooks, those fishermen may not experience reductions in targeted catch or revenue.

As described in the response to comment 3 above, analysis of research data after the publication of the draft EA found a seasonal difference in the catch of YFT. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. If more data had been collected after the BFT spawning period, it is likely that the YFT reduction rate would have been less than what was observed, thus the potential economic impact due to decreases in YFT catch may be less than described in the proposed rule. If this occurs, the incentive to increase fishing effort may not be realized.

Section 6.3 Description and Estimate of the Number of Small Entities to Which the Proposed Rule Will Apply

This final action will apply to holders of Atlantic tuna limited access pelagic longline permits, all of which are considered small entities. As of October 2010, there were 248 Atlantic tuna longline limited access permit holders. Of these, 136 were registered in states along the coast of the GOM (including Florida vessels) as shown in Table 3.7.2. However, based on logbook records from 2006 to 2009, only 51 PLL vessels, on average, were actively operating in the GOM annually ranging from a high of 55 vessels in 2007 to a low of 47 in 2006 and 2009. . During the summer of 2010, preliminary vessel monitoring system information indicated that the number of active PLL vessels in the GOM decreased by more than 79 percent due to the Deepwater Horizon/BP oil spill and associated fishery closures. In response to comment, NMFS also considered a modified version of alternative 2 – seasonal application of the weak hook requirement. However, NMFS did not prefer this approach because BFT are also present in the GOM outside of the spawning season in lower numbers and seasonal application of the weak hook requirement would increase the difficulty of enforcing the weak hook requirement.

Section 6.4 Description of the Projected Reporting, Record-Keeping, and Other Compliance Requirements of the Final Rule, Including an Estimate of the Classes of Small Entities which will be Subject to the Requirements of the Report or Record

This final rule does not contain any new reporting or recordkeeping requirements, but will require a new compliance requirement (5 U.S.C. 603 (b)(4)). Fishing vessels with PLL gear onboard will be required, at all times, in all areas of the GOM open to HMS PLL fishing, to possess onboard and/or use only circle hooks meeting current size and offset restrictions as well as being constructed of only round wire stock that is no larger than 3.65 mm in diameter.

Section 6.5 Description of the Steps the Agency Has Taken to Minimize the Significant Economic Impact on Small Entities Consistent with the Stated Objective 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

One of the requirements of a FRFA is to describe any alternatives to the proposed rule which accomplish the stated objectives and which minimize any significant economic impacts. These impacts are discussed below and in Sections 3, 4, and 5 of this document. Additionally, the Regulatory Flexibility Act (5 U.S.C. § 603 (c) (1)-(4)) lists four general categories of "significant" alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives 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.

In order to meet the objectives of this final rule, consistent with legal obligations, NMFS cannot exempt small entities or change the reporting requirements only for small entities. Thus, there are no alternatives discussed that fall under the first and fourth categories described above. In addition, none of the alternatives considered would result in additional reporting requirements (category two above). Fishing vessels with PLL gear onboard will be required, at all times, in all areas of the GOM open to HMS PLL fishing, to possess onboard and/or use only circle hooks meeting current size and offset restrictions as well as being constructed of only round wire stock that is no larger than 3.65 mm in diameter. NMFS does not know of any performance or design standards that would satisfy the aforementioned objectives of this rulemaking while, concurrently, complying with the Magnuson-Stevens Act. Perhaps there are performance or design standards that could be designed for weak hooks and BFT bycatch reduction, but they are not practical given the current understanding of this new technology.

NMFS considered and analyzed three main alternatives for this proposed rule. The first alternative was the status quo, no action alternative. This alternative would maintain existing hook and bait requirements in the Atlantic PLL fishery in the GOM. The second alternative will require all PLL vessels fishing in GOM to use weak hooks and is the preferred alternative. Finally, the third alternative would consider establishing additional time/area closures in the GOM. Under this alternative an area of the GOM would be closed to PLL fishing and could extend over the entire GOM or a subarea. Temporal extents of a closure could be timed to the spawning season for BFT in the GOM, April to mid-June, or for shorter or longer time frames (*i.e.*, year round). Areal extents of a closure could be restricted to portions of the GOM where particularly high concentrations of spawning BFT have been observed while minimizing inclusion of areas with high directed YFT fishing operations. Adaptive management programs might also be considered with the temporal/spatial extent of the time/area changes based on real-time information on distribution and abundance of target and non-target species as well as the socio-economic needs of the fishery. In addition to these three alternatives, NMFS also considered other options such as prohibition on all retention of BFT in the GOM (*i.e.*, no incidental retention of BFT allowed), and adjustment of target catch retention limits (*i.e.*, modify current limits of one BFT per 2,000 lbs of target catch, two BFT per 6,000 lbs and three BFT per

30,000 lbs). As these alternatives either do not reduce mortality of BFT but rather convert discards to landings (or vice versa), or may have substantial negative social and economic impacts and cannot be implemented in short time frames, these alternatives were determined to not meet the objectives of the action and were not considered further.

Alternative 1, the status quo, no action alternative would not result in any additional economic impacts to small entities in the short-term. NMFS does not anticipate a significant change in landings, ex-vessel prices, or operating costs relative to the "status quo" for small entities under this alternative. However, adverse economic impacts in the medium and long-term could result if no action is taken to address the incidental catch of BFT in the GOM PLL fishery. Adverse economic impacts could occur if the longline quota for BFT is exceeded and a partial or total closure of the fishery is implemented.

The preferred alternative, Alternative 2, will require vessels with PLL gear onboard, at all times, in all areas of the GOM open to PLL fishing, to possess onboard and/or use only circle hooks meeting current size and offset restrictions as well as being constructed of only round wire stock that is no larger than 3.65 mm in diameter. This alternative will result in some minor increases in equipment costs for the new hooks, it could also impact vessel operations, and the alternative would also potentially impact catch rates and thus potentially reduce vessel revenues. Alternative 2, requiring all PLL vessels fishing in the GOM to use weak hooks, would result in moderate positive social and economic benefits if this measure is able to reduce the bycatch of BFT in the GOM sufficiently to allow the PLL fishery to continue operating in the GOM. However, there would likely be some increased economic costs associated with switching to the weak hook.

This alternative will result in some minor increases in equipment costs associated with acquiring the new weak hooks. Direct cost of purchasing weak hooks is anticipated to increase by $.02 per hook. An informal telephone survey of hook suppliers provides a price of approximately $0.34 per hook for 16/0 commercial grade circle hooks and approximately $0.36 per hook for 16/0 circle hooks constructed of 3.65 mm diameter wire. Assuming that an average of 1,600 hooks per vessel are needed initially to equip vessels with enough required hooks for one trip, the compliance cost, on a per vessel basis, would be approximately $576. NMFS will investigate possibilities to purchase an initial supply of weak hooks to outfit each vessel that actively fishes in the GOM with PLL gear to mitigate compliance costs. If funds are secured and potential partnerships are successfully developed, the hook purchase may be conducted through a voucher program with hook vendors that supply the GOM PLL fleet. Hook replacement rates are anticipated to increase with use of the weak hook. Researchers during the GOM PLL BFT mitigation research (NOAA Fisheries, 2010a), estimated that requiring the weak hook would result in, a 4.41 hooks per 1,000 hooks increase in hook replacement due to straightened hooks and YFT hook deformation can be expected. The researchers anticipated that this rate was an underestimate; however, they estimated the cost of additional hook replacement with the weak hook to be less than $3.00 per 1,000 hooks set. The standard 16/0 circle hooks currently in use will continue to be used in the U.S. Atlantic and inventories of unused standard 16/0 hooks could be sold to vessels fishing Atlantic outside of the GOM.

Alternative 2 would also potentially impact vessel catch rates, and thus potentially reduce vessel revenues. Based on the research results reported in "2010 Interim Project Report - Update on GOM Pelagic Longline Bluefin Tuna Mitigation Research" (NOAA Fisheries, 2010a), catch rates for several commercially important species were found to be lower using the new weak hooks versus the standard 16/0 circle hooks. The researchers found a statistically significant (at the 5 percent level) reduction in the total catch of BFT and wahoo when weak hooks were used compared to conventional circle hooks (See Section 3.5, Table 1). The total catch of BFT was reduced 56.5 percent when weak hooks were used in the experiment. This reduction includes both discards and BFT retained for sale. Based on observer reports of the number of BFT discarded versus retained in the GOM, the researchers estimate that the experimental results indicate that the use of weak hooks would result in approximately a 14 percent reduction in BFT retained for sale given the BFT incidental retention limits. The total catch of wahoo using the weak hook was reduced by 26.6 percent.

The research also observed reduction in the number of YFT and swordfish retained for sale. While these results were not statistically significant at the five percent level, the reductions in YFT and swordfish retained did have p-values ≤ 0.15 (or 15 percent). Weak hooks in the experiment resulted in a seven percent reduction in YFT retained for sale and 41.2 percent reduction in swordfish retained for sale. No other commercially targeted species observed during the research exhibited catch rate differences between weak hooks and conventional circle hooks with p-values of ≤ 0.15. Therefore, given that YFT is often the target catch for PLL trip in the GOM and the heterogeneous nature of fishing vessel operations, this analysis conservatively includes the observed reductions in YFT and swordfish. Analysis of research data after the publication of the draft EA found a seasonal difference in the catch of YFT. Because the experiment focused on collecting data during the BFT spawning season, the majority of data was collected during March-June. If more data had been collected after the BFT spawning period, it is likely that the YFT reduction rate would have been less than what was observed, thus the potential economic impact due to decreases in YFT catch may be less than described above. In addition, NMFS also ran the analysis with just BFT and wahoo which exhibited statistically significant differences in catch at the five percent level to help illustrate the range of possible outcomes.

In order to translate the reductions in catch observed in the research experiment into the potential fishery revenue impacts that may result from requiring the use of weak hooks in the GOM, information on the average catch composition of trips taken and the number of trips taken in the GOM were required. Data from the HMS logbook program was utilized to estimate the average species composition of trips taken in the GOM from 2006 to 2009. Table 6.1 lists the average catch per trip in the GOM for 2006 through 2009 for each of the four species of interest.

Table 6.1. Gulf of Mexico Catch Per Trip in Number of Fish Kept. Source: HMS Logbook data.

Year	BFT	YFT	Swordfish	Wahoo
2006	0.15	48.20	11.84	6.22
2007	0.20	41.67	14.03	4.25
2008	0.24	35.11	14.76	5.02
2009	0.24	47.80	17.33	4.67
Average	**0.21**	**43.19**	**14.49**	**5.04**

The average weight of the catch was then estimated using average weights for each species by using weighout data from the Domestic Longline Data Base (DSL) for 2006 to 2009. The average weight for BFT was 484.9 lb dw per fish, for YFT it was 86.3 lb dw, for swordfish it was 83.0 lb dw, and for wahoo it was 33.6 lb dw. These weights were then multiplied by the average number of fish retained per trip on PLL vessels in the GOM to estimate the approximate total landings weight for each species. Finally, the average ex-vessel price received in the GOM for each species was applied to the total landings to estimate the baseline revenue per trip. The average ex-vessel prices were obtained from the Quota Monitoring System (QMS) and the BFT Database. The estimated trip revenue from just BFT, YFT, swordfish, and wahoo is $15,314 per trip for vessel using conventional circle hooks.

Table 6.2. Baseline Trip Revenue Estimate. Source: DLS, Dealer Logbook Forms, and HMS Logbook

Species	Average Trip Catch Retained (# of fish)	Average Weight (lb dw)	Total Landing (lb dw)	Ex-Vessel Price (lb dw)	Baseline Revenue
BFT	0.21	484.9	102	$4.65	$474
YFT	43.19	86.3	3,727	$3.04	$11,331
Wahoo	5.04	33.6	169	$1.62	$274
Swordfish	14.49	83.0	1,203	$2.69	$3,235
Total					**$15,314**

Based on the research results, the per trip revenues under Alternative 2 are expected to be reduced. Using the estimated reductions previously discussed Table 6.2 details the calculations used to estimate the potential change in PLL trip revenues. The estimated per trip reduction in revenues that would potentially result from requiring the use of weak hooks in the GOM is approximately $2,265.

Table 6.3. Estimated Change in Trip Revenues with Switch to Weak Hooks. Source: 2010 Interim Report (NOAA Fisheries, 2010).

Species	Baseline Trip Revenues	% Reduction Retained	Revenues with Weak Hook	Change in Revenue
Bluefin tuna	$474	14%	$407	-$66
YFT	$11,331	7.0%	$10,538	-$793
Wahoo	$274	26.6%	$201	-$73
Swordfish	$3,235	41.2%	$1,902	-$1,333
Total	**$15,314**	**14.8%**	**$13,049**	**-$2,265**

Based on HMS logbook reports from 2006 to 2009, the average number of PLL trips taken per vessel per year in the GOM is 9.7. Multiplying 9.7 trips per vessel by the estimate $2,265 per trip reduction in catch revenues results in an estimated reduction of $21,974 in commercial fishing revenues per vessel per year in the GOM resulting from switching to weak hooks. Alternatively, if we only consider the statistically significant reductions in catch at the five percent level in the research study, the estimated reduction in annual catch revenues per vessel in the GOM for Alternative 2 would be $1,351 (9.7 trips x $139). This lower estimate may also represent the potential improvements in catch rates that may occur over time as fishermen learn to better work with the new weak hook technology. NMFS does not foresee that the national net benefits and costs would change significantly in the long term as a result of implementation of the proposed action.

Table 6.4. Alternative Estimate of Change in Trip Revenues with Weak Hooks.

Species	Baseline Trip Revenues	% Reduction Retained	Revenues with Weak Hook	Change in Revenue
BFT	$474	14%	$407	-$66
Wahoo	$274	26.6%	$201	-$73
Total	**$748**	**18.6%**	**$609**	**-$139**

Alternative 3 may cause some fishermen to shift effort to fishing areas outside the GOM and there could be changes in the distribution of the fleet with some fishermen possibly exiting the fishery. Predicting fishermen's behavior is difficult, especially as some factors that may determine whether to stay in the fishery, relocate, or leave the fishery are beyond NMFS' control (fuel prices, infrastructure, hurricanes, etc.). While some fishermen will continue to fish in the remaining open areas of the Atlantic, Caribbean, and Gulf of Mexico, others may be forced to leave the fishery entirely, such as selling their permits and going out of business, as a result of the closure. 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. NMFS conducted a detailed, comprehensive socio-economic analysis for the time/area alternatives considered in the 2006 Consolidated HMS FMP and found that the economic impacts of each of the closures considered may be substantial, ranging in losses of up to several million dollars annually, depending upon the closure and displacement of a significant number of fishing vessels (Wilson et al., 2007). Since the data analysis conducted in the 2006 Consolidated HMS FMP, several events have affected the GOM including Hurricane Katrina, Hurricane Rita, and the DWH/BP oil spill among other events. While social and economic impacts have likely occurred due to these events, NMFS believes the closure analysis in 2006 still reflects the substantial social and economic impacts that would be likely to occur under the time/area closures analyzed. Additionally, Alternative 3 in this document doesn't meet all of the objectives of this proposed rule because it doesn't rapidly enhance BFT stock rebuilding by increasing BFT spawning potential and subsequent recruitment into the fishery (*i.e.* rapidly implement the proposed action to increase the survival of spawning BFT by spring 2011 in the GOM).

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Appendix A 2010 Interim Report: Update on the GOM PLL BFT Mitigation Research

2010 Interim Report
Update on Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research

NOAA Fisheries
Engineering and Harvesting Branch
Southeast Fisheries Science Center
P.O. Drawer 1207
Pascagoula, MS 39568

November, 2010

Executive Summary

Research was conducted in 2008 -2010 by the Engineering and Harvesting Branch of NOAA Fisheries, Southeast Fisheries Science Center, Mississippi Laboratories to evaluate the efficacy of a new 16/0 "weak" circle hook design in reducing the bycatch of bluefin tuna in the Gulf of Mexico yellowfin tuna fishery. Six commercial vessels completed 311 pelagic longline sets. Experimental hooks and standard 16/0 circle hooks were alternated on the longline, with a total of 198,606 hooks set. A total of 33 bluefin were caught during the experiment, of which 10 were caught on the experimental hook (56.5% reduction). The difference in bluefin catch was statistically significant. Vessels caught a total of 2,065 yellowfin tuna. The difference in the yellowfin catch rate for standard and experimental hooks was not significant.

Background

Atlantic bluefin tuna (*Thunnus thynnus*) are widely distributed across the Atlantic Ocean and Mediterranean Sea. The presence of two distinct spawning areas, the Gulf of Mexico (GOM) and the Mediterranean, has led the International Commission for the Conservation of Atlantic Tunas (ICCAT) to divide the Atlantic bluefin into east and west management units.

The GOM is the spawning area for the western Atlantic bluefin tuna stock and has become an area of concern due to the bycatch mortality of spawning bluefin tuna associated with the yellowfin tuna (*Thunnus albacares*) pelagic longline fishery. Starting in 2007, the NOAA Fisheries, Engineering and Harvesting Branch of the Southeast Fisheries Science Center (SEFSC), Mississippi Laboratories conducted scientific research in consultation and cooperation with the domestic pelagic longline fleet in the GOM. Research efforts focused on the development of selective gear, utilizing the difference in the relative size of spawning bluefin as compared to the target species, yellowfin tuna.

NOAA researchers worked with hook manufacturers to develop a hook design that has less tensile strength than standard hook designs. Research started in 2008 to evaluate the efficacy of a weaker 16/0 circle hook in reducing the bycatch of bluefin tuna by comparing it to a standard 16/0 circle hook used in the pelagic longline fishery. Results from the fishery dependent research conducted in 2008 and 2009 were encouraging. In order to improve the statistical precision and confidence of the results, additional research was conducted in 2010.

Figure 1: Control and experimental hooks used in 2008 - 2010 bluefin tuna mitigation research

Materials and methods

2010 Experimental Design

Four commercial pelagic longline vessels were used to evaluate the new hook design in reducing the incidental bluefin tuna catch rate associated with pelagic longline gear in the GOM. The control treatment was an industry standard Mustad 16/0 circle hook (model 39960D) with 0° of offset, constructed of 4.0 mm steel wire with Duratin coating. The experimental treatment was a custom made Mustad 16/0 circle hook (model 39988D) with 0° of offset, constructed from 3.65 mm steel wire with Duratin coating. Control and experimental hooks were alternated on the longline for a minimum of 400 total hooks. Five hooks were deployed between each float. Hook spacing was consistent within a trip. Buoy lines, leader lengths and size, mainline, and leader color were consistent within a trip. Spanish sardine (75-125 g) was the primary bait used. A few sets incorporated squid bait. However, bait type was consistent within each section of gear. Other than the experimental design requirements, captains were allowed to fish normally and chose the location of fishing, length of trips, total number of hooks fished, etc.

Data Collection

All vessels participating in the experiment carried NOAA trained observers. Both the observers and the captains were well versed in the experimental design. Each observer was trained in; safety at sea; fish, marine mammal, and seabird identifications; data collection; and the operation of a pelagic longline fishing vessel. Observers collected fishery data as described by the SEFSC Pelagic Longline Observer Program (POP) (Beerkircher et al. 2002), with minor modifications to accommodate the experiment. The time and location of each section of gear was recorded as it was deployed and retrieved, as was the sea surface temperature. These data were obtained from the vessel's existing wheelhouse equipment. The section number, treatment (hook model), time of fish landed on deck, and species were recorded for each animal captured. Animal length was measured in centimeters. Length was estimated for animals which were not boated. A carcass tag applied to each fish kept was used to match the dressed weight (carcass with head and fins removed and animal eviscerated) of the fish during unloading at the dock to the particular data collected on that animal at sea.

Hooks that had been straightened with no catch were recorded as species "unknown" and the hook condition was documented. Control and experimental hooks that caught yellowfin tuna, bluefin tuna and swordfish were tagged and retained. These hooks were compared to an unused hook in order to evaluate hook deformation, if any, resulting from the physical forces exerted by the fish.

Statistical Methods

The hypothesis of equality of catch rates for control and experimental hook was tested for each taxa using the Fisher's Exact Test with resulting P-values. The unadjusted odds ratios and corresponding exact confidence intervals are also computed. The estimate of reduction rate and related confidence limits are derived by subtracting the odds ratio (and 95% confidence limits (CIs)) from one and multiplying the result by 100. For meaningful interpretations of results, we analyzed the data where at least 10 individuals were caught on one of the two hook types. Statistical significance was assessed at $\alpha < 0.05$ level.

Results

2010 Experimental Effort

As a continuation of the bluefin mitigation research which began in 2008, four commercial pelagic longline vessels made 114 research sets in the northern GOM during the period of March 17, 2010 to September 28, 2010. A total of 74,734 hooks (37,367 of each hook type) were deployed. Vessels fished an average of 656 hooks per set.

2008 - 2010 Cumulative Results

From 2008 to 2010, six vessels completed 34 trips. Three hundred and eleven (311) sets have been conducted with a total of 198,606 hooks set (99,303 of each hook type. Vessels fished an average of 639 hooks per set. A total of 6,869 animals were caught, representing 50 taxa (Table 1). During the course of the experiment, seven leatherback turtles, two pantropic spotted dolphins, and one bottlenose dolphin were captured and released alive. Due to the small sample size, a statistical analysis of the effect of hook type on the catch rates of sea turtles and marine mammals was not conducted.

Bluefin tuna

A total of 33 bluefin were caught during the experiment, of which 10 were caught on the experimental hook. The mean dressed weight for the three bluefin retained for sale was 215 kg (range 142-265 kg). Of the 33 bluefin caught, 16 were landed alive. The 56.5% reduction in bluefin observed with the experimental hook was statistically significant (CI = 8.7%-79.3%, p = 0.0351).

Yellowfin tuna

Yellowfin tuna, which is the primary target species in the GOM pelagic longline fishery, comprised 30% of the total catch. Vessels landed a total of 2065 yellowfin tuna, of which 1637 were retained for sale. The mean weight of fish retained was 39.8 kg (range 11.4–83.2 kg). The total yellowfin CPUE (per 1000 hooks) for the control and experimental hooks (10.6 and 10.2 respectively) was not significantly different (p = 0.4790). The difference in the catch of fish retained for sale (8.5 control and 7.9 experimental) was not significant (p = 0.1500) (Table 2).

Other Marketable Catch

Four other species that are commonly retained for sale in the GOM pelagic longline fishery are swordfish (*Xiphias gladius*), wahoo (*Acanthocybium solandri*), dolphin fish (*Coryphaena spp)* and escolar (*Lepidocybium flavobrunneum)*. The total swordfish CPUE for the control and experimental hooks (1.21 and 1.15 respectively) was not significantly different (p = 0.7437). The difference in the catch of swordfish retained for sale (0.34 control and 0.20 experimental) was not significant (p = 0.0759). The difference in CPUEs for the control and experimental hooks for wahoo (1.48 and 1.09 respectively) was statically significant (CI = 5.8%-42.7%, p = 0.0171). The difference in CPUEs for dolphin fish (4.25 and 3.93 respectively) and escolar (1.81 and 1.78 respectively) were not significantly different (p> 0.27).

Bycatch

Of the 6,869 animals caught during the experiment, 3861 were discarded. The most common bycatch species was lancetfish (Alepisauridae spp) which made up approximately 40% of the discards. The lancet fish was the only bycatch species that exhibited a significant reduction in catch rate with the experimental hook (CI = 5.8%-23.0%, p = 0.0019). One hundred and fifty-six (156) sharks were caught during the experiment. The analysis was unable to detect a significant difference in the catch rates for any of the shark species. Additionally, grouping sharks by "pelagics" and "large coastal" failed to detect a significant difference in catch rates between the control and experimental hooks (p>0.40). A total of 288 billfish were caught during the experiment. The difference in the catch rates between the control and experimental hook for all taxa of billfish were not significant (p>0.05).

Hook Condition

During the experiment, observers recorded 63 control hooks and 287 experimental hooks that had been straightened to the degree for which the animal escaped. These results show a 2.26 hooks per 1000 increase in straightened hooks with the experimental hook design.

Discussion

The estimated takes of spawning size bluefin tuna by the GOM pelagic longline fishery have raised concerns that this fishery may be impacting efforts to recover the western Atlantic bluefin tuna stocks. Data presented suggest that a weaker circle hook design may have the potential to mitigate bluefin bycatch without significantly affecting the catch rate for yellowfin tuna.

A total of 33 bluefin tuna were caught during the experiment. The 56.5% reduction rate observed is consistent with expectations of the new hook design. In addition to bluefin tuna, two other species (lancetfish and wahoo) demonstrated a significant reduction in catch rate with the experimental hook.

The retention rate of yellowfin tuna with the experimental hook was highly variable among the vessels participating in this experiment (NMFS, 2009). The two vessels with the highest reduction of yellowfin also had the highest rate of fish escapement due to straightened experimental hooks. We attempted to standardize the gear configurations as much as possible during this fishery dependant research. Therefore, it is probable that variability in yellowfin retention rates were a result of the variability in individual fishing practices. As with many other mitigation measures (*i.e.* TEDs, BRDs, circle hooks in the NED) there is a learning curve associated with maintaining target catch. In almost all cases, the ability of fisheries to maintain target catch with mitigation measures improves over time. The fact that some vessels claim to experience improved catch rates of yellowfin tuna with the experimental hook indicate that fishers can learn to use the new hook effectively. As with any new conservation technology, minor adjustments in fishing practices are often needed in order to optimize the gear performance. With sufficient outreach and technology transfer we believe that this mitigation technology can be successfully transitioned into the GOM yellowfin tuna fishery.

The new hook design is currently available on the market with a price that is comparable to the standard hook. Fishers regularly replace hooks due to corrosion. However, results of this experiment indicate the experimental hooks will have to be replaced at a slightly higher rate due to the increased damage by fish. As shown in this report, the experimental hooks are straightened at an increased rate of 2.26 per 1000 hooks. Additionally, analysis of the 2009 experimental results shows that yellowfin are capable of deforming the experimental hook at a rate that is 26.7% higher than the control hooks. With a yellowfin CPUE of 8.04 per 1000 hooks (2009 GOM logbook data), the resulting deformation of experimental hooks by yellowfin can be estimated at 2.15 hooks per 1000. From these two estimates, we can expect a 4.41 hooks per 1000 increase in experimental hook replacement due to straightened hooks and yellowfin hook deformation. This estimate is likely a slight underestimate of total hook replacement due to the fact that we did not record hook deformation from other large pelagic species. However, we expect the cost of additional hook replacement with the experimental hook to be less than $3.00 per 1000 hooks set.

The directed fishing of large bluefin tuna by commercial fleets in the GOM has been prohibited since the early 1980s. As a result, fishers tend to avoid concentrations of bluefin tuna due to the loss of gear, time and target catch associate with large catches of bluefins. This study has not addressed the potential economic benefit that may result from reducing the interactions with bluefin on pelagic longlines. However, the majority of the vessels involved with the study continue to use the new hook design. Additional vessels, not involved in the study, have purchased the experimental hook for use.

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Table 1: Total catch of fish, sharks, sea turtles and marine mammals caught during the 2008 - 2010 GOM bluefin tuna pelagic longline experiment as recorded by POP observers. For meaningful interpretations of results, we analyzed the data where at least 10 individuals were caught on one of the two hook types.

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus albacares	YELLOWFIN TUNA	1049	1016	3.2	0.479	11.2 to -5.6*
Alepisauridae	LANCETFISH SPP	829	707	14.8	0.0019**	5.8 to 23.0
Coryphaena	DOLPHIN SPP	422	390	7.6	0.2757	19.5 to -6.1*
Lepidocybium flavobrunneum	ESCOLAR	180	177	1.7	0.9156	20.1 to -21.0*
Euthynnus pelamis	SKIPJACK TUNA	169	169	0.0	1	19.2 to -23.8*
Thunnus atlanticus	BLACKFIN TUNA	168	171	-1.8*	0.9134	17.7 to -26.0*
Acanthocybium solandri	WAHOO	147	108	26.6	0.0171**	5.8 to 42.7
Xiphias gladius	SWORDFISH	120	114	5.0	0.7437	26.5 to -22.8*
Pteroplatytrygon violacea	PELAGIC RAY	81	65	19.8	0.2141	42.1 to -11.2*
Makaira nigricans	BLUE MARLIN	57	56	1.8	1	32.1 to -42.1*
Sarda sarda	BONITO	36	30	16.7	0.5385	48.7 to -35.3*
Sphyraenidae	BARRACUDA	26	37	-42.3*	0.2073	13.8 to -135.0*
Auxis thazard	FRIGATE MACKEREL	30	32	-6.7*	0.8991	35.2 to -75.5*
Bramidae	POMFRET SPP	33	22	33.3	0.1769	61.1 to -14.3*
Istiophorus platypterus	ATLANTIC SAILFISH	27	25	7.4	0.8899	46.3 to -59.5*
Tetrapturus albidus	WHITE MARLIN	19	30	-57.9*	0.1524	11.1 to -180.6*
Tetrapturus albidus/georgii	WHITE MARLIN / ROUNDSCALE SPEARFISH	19	28	-47.4*	0.2429	17.7 to -163.9*
Thunnus thynnus	BLUEFIN TUNA	23	10	56.5	0.0351**	8.7 to 79.3
Chondrichthyes	SHARK	18	12	33.3	0.3616	67.9 to -38.4*
Carcharhinus falciformis	SILKY SHARK	15	12	20.0	0.7011	62.6 to -70.9*
Carcharhinus plumbeus	SANDBAR SHARK	14	13	7.1	1	56.4 to -97.6*
Istiophoridae	BILLFISH	12	11	8.3	1	59.6 to -107.8*
Galeocerdo cuvier	TIGER SHARK	12	11	8.3	1	59.6 to -107.8*
Ruvettus pretiosus	OILFISH	6	7	-	-	-
Carcharhinidae	REQUIEM SHARK	8	3	-	-	-
Myliobatidae	RAY MANTA	6	4	-	-	-
Isurus oxyrinchus	MAKO SHORTFIN	3	6	-	-	-
Thunnus	TUNA	7	1	-	-	-
Dermochelys coriacea	LEATHERBACK	3	4	-	-	-
Alopias superciliosus	THRESHER BIGEYE	5	2	-	-	-
Carcharhinus obscurus	DUSKY SHARK	4	2	-	-	-

* Negative value denotes an increase

** Statistically significant at $\alpha < 0.05$ level

Table 1: Continued

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus obesus	BIGEYE TUNA	4	1	-	-	-
Isurus paucus	MAKO LONGFIN	4	1	-	-	-
Masturus lanceolatus	SUNFISH SHARPTAIL	1	3	-	-	-
Lampris guttatus	OPAH	3	1	-	-	-
Tetraodontidae	PUFFER SPP	3	0	-	-	-
Alopias	THRESHER SHARK	3	0	-	-	-
Carcharhinus longimanus	WHITETIP OCEANIC	2	0	-	-	-
Isurus	MAKO SPP	1	2	-	-	-
Molidae	SUNFISH SPP	1	1	-	-	-
Tetrapturus pfluegeri	SPEARFISH LONGBILL	1	1	-	-	-
Thunnus alalunga	ALBACORE TUNA	1	1	-	-	-
Mola mola	SUNFISH OCEAN	2	0	-	-	-
Tetrapturus spp	SPEARFISH SPP	1	1	-	-	-
Stenella attenuata	DOLPHIN PANTROPIC SPOTTED	1	1	-	-	-
Tursiops truncatus	DOLPHIN BOTTLENOSE	0	1	-	-	-
Sphyrna lewini	HAMMERHEAD SCALLOPED	0	1	-	-	-
Gempylus serpens	MAKERAL SNAKE	0	1	-	-	-
Prionace glauca	BLUE SHARK	0	1	-	-	-
Alopias vulpinus	THRESHER COMMON	1	0	-	-	-

* Negative value denotes an increase
** Statistically significant at $\alpha < 0.05$ level

Table 2: Additional species categories included in the 2008 - 2010 GOM bluefin tuna pelagic longline analysis. For yellowfin and swordfish retained for sale, the category represents the number of fish from the total catch that were landed and sold. The total white marlin/roundscale spearfish category is a sum of the catch from the white marlin and white marlin/roundscale spearfish rows in Table 1. The other tuna category is the sum of albacore, bigeye and skipjack tuna caught. The large coastal sharks category is the sum of dusky, sandbar, silky, tiger, and scalloped hammerhead sharks caught. The pelagic sharks category is the sum of blue, thresher, shortfin mako, and oceanic whitetip sharks caught.

Scientific Name	Common Name	Control	Exp.	Reduction %	*p*	Reduction 95% CI
Thunnus albacares	YELLOWFIN Retained for Sale	848	789	7.0	0.15	15.6 to -2.5*
Xiphias gladius	SWORDFISH Retained for Sale	34	20	41.2	0.0759	66.1 to -2.2*
Tetrapturus albidus/georgii	TOTAL WHITE MARLIN / ROUNDSCALE SPEARFISH	38	58	-52.7*	0.0519	-1.4 to -129.8*
	OTHER TUNAS	174	171	1.7	0.9142	20.4 to -21.4*
	LARGE COASTAL SHARKS	45	37	17.8	0.4396	46.8 to -27.0*
	PELAGIC SHARKS	14	9	35.7	0.4048	72.2 to -48.5*

* Negative value denotes an increase

** Statistically significant at $\alpha < 0.05$ level