NOAA FISHERIES

Three-Year Review of the Individual Bluefin Quota Program

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U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

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List of Acronyms

AR	Artificial Recognition
ATL	Atlantic Ocean
ATCA	Atlantic Tunas Convention Act
BAYS	Bigeye, Albacore, Yellowfin, and Skipjack tunas
BFT	Bluefin Tuna
B_{MSY}	Biomass at Maximum Sustainable Yield
CPUE	Catch per Unit Effort
EM	Electronic Monitoring (video camera system)
FMP	Fishery Management Plan
ERT	Earth Resources Technology, Inc.
FEIS	Final Environmental Impact Statement
F_{MSY}	Fishing mortality rate corresponding to maximum sustainable yield
FR	Federal Register
GOM	Gulf of Mexico
GRA	Gear Restricted Area
HMS	Highly Migratory Species
IBQ	Individual Bluefin Quota
ICCAT	International Convention for the Conservation of Atlantic Tunas
LAPP	Limited Access Privilege Program
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MT	Metric tons
NED	Northeast Distant Area
NMFS	National Marine Fisheries Service
NOVESID	Valid Atlantic Tunas Longline permit, not associated with a vessels
NMFS	Nation Marine Fisheries Service
OY	Optimum Yield
PLL	Pelagic Longline
POP	Pelagic Observer Program
PS	Purse Seine
SAFE	Stock Assessment and Fishery Evaluation Report
SAFIS	Standard Atlantic Fishery Information System
SCRS	Standing Committee on Research and Science (committee of ICCAT)
SEFSC	Southeast Fisheries Science Center (NMFS)
US	United States
VMS	Vessel Monitoring System (satellite based system)

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Executive Summary

Introduction

Atlantic bluefin tuna (bluefin) are highly migratory pelagic fish that range across most of the North Atlantic and its adjacent seas, including the Gulf of Mexico and Mediterranean Sea. The bluefin fishery is a quota-managed fishery, and the annual U.S. bluefin quota is established by binding recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT). The U.S. bluefin quota established through that process is implemented domestically through rulemaking and allocated among seven quota categories, including the Longline category. The non-Longline quota categories include other commercial and recreational gear types and a Reserve category, used for research and inseason quota transfers as warranted. Most of these categories are for directed bluefin fisheries (commercial hand gear, purse seine, and recreational fisheries). The pelagic longline fishery is not authorized to directly fish for bluefin but catches them incidentally while targeting other species, primarily swordfish, yellowfin tuna, and bigeye tuna. The Longline quota category was established to provide the pelagic longline fishery with bluefin quota to account for that incidental catch. Landings and dead discards (i.e., catch) must be accounted for within the available U.S. quota.

Given certain challenges in the management of bluefin tuna, Amendment 7 to the 2006 Consolidated Highly Migratory Species Fishery Management Plan (Amendment 7) revised the conservation and management measures for the stock, including addressing issues regarding bycatch in the pelagic longline fishery. In that Amendment, a catch share program called the Individual Bluefin Quota (IBQ) Program was designed to introduce individual accountability to permitted pelagic longline vessels for bluefin bycatch and incentivize those participating in the pelagic longline fishery to minimize interactions with bluefin as a conservation and management measure for the stock. The IBQ Program and Electronic Monitoring (EM) Program were implemented in the pelagic longline fishery in the Atlantic Ocean (Atlantic) and Gulf of Mexico in 2015 through Amendment 7. The EM Program was implemented to support the IBQ Program by providing a means of verifying vessel-reported data on bluefin catch. Verification of vessel-reported data is important because of the increased individual accountability and potential incentives for vessel operators to misreport.

This review of the IBQ Program was conducted to evaluate its effectiveness in meeting the goals and objectives as specified in Amendment 7. “Catch shares” is a general term used for quota-based management strategies, including Limited Access Privilege Programs (LAPPs) and individual fishing quotas that allocate a specific percentage of the total allowable fishery catch or a specific fishing area to individuals, cooperatives, communities, or other entities. “Formal and detailed” reviews of all LAPPs established after January 12, 2007, such as the IBQ Program, are required to be conducted periodically by the regional Fishery Management Councils and Secretary of Commerce (Secretary) under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)(Section 303(c)(1)(G)). The contents of the review are based on guidance developed by the National Marine Fisheries Service (NMFS) (NMFS Procedural Instruction 01-121-01; Catch Share Policy; Guidance for Conducting Review of Catch Share Programs)(Catch Share Review Guidance). The guidance specifies that the review include the evaluation of whether or not the catch share program objectives were met, as well as evaluation of the various components of the catch share program.

In Amendment 7, NMFS proposed and finalized a plan to formally evaluate the success and performance of the IBQ program in achieving its objectives after three years of operation and provide the HMS Advisory Panel with a publicly-available written document with its findings. NMFS agreed to utilize its standardized economic performance indicators, developed by its Office of Science and Technology, as part of its review. For example, the standardized economic performance indicators include catch and landings, effort, revenues, quota accumulation, and cost recovery. Other indicators would include the number of and distribution of bluefin tuna interactions.

This document compares the Atlantic pelagic longline fishery prior to implementation of the IBQ Program (Baseline period; 2012 through 2014), to the fishery under the initial years of the IBQ Program (IBQ period; 2015 through 2017 or 2018 where data were available). This document also describes the relevant management history of the pelagic longline fishery, and key features and milestones of the IBQ Program. The data reviewed in this document will help NMFS determine whether the program is achieving its objectives, as well as the objectives of the 2006 Consolidated HMS FMP as amended and legal requirements, including those under the Magnuson-Stevens Act, and support consideration of modifications to the program.

A draft of this document was released on May 10, 2019. NMFS presented a summary of the Draft Three-Year Review including key data elements to the HMS Advisory Panel on May 22, 2019. This final version incorporates HMS Advisory Panel suggestions as well as updated information (2018) for several important parameters. The conclusions and the recommendations of this document are the same as those in the Draft Three-Year Review of the IBQ Program.

Evaluation of the IBQ Program Objectives

Amendment 7 outlined five distinct objectives in establishing the IBQ Program:

1. Limit the amount of bluefin landings and dead discards in the pelagic longline fishery.
2. Provide strong incentives for the vessel owner and operator to avoid bluefin tuna interactions, and thus reduce bluefin dead discards.
3. Provide flexibility in the quota system to enable pelagic longline vessels to obtain bluefin quota from other vessels with available individual quota in order to enable full accounting for bluefin landings and dead discards, and minimize constraints on fishing for target species.
4. Balance the objective of limiting bluefin landings and dead discards with the objective of optimizing fishing opportunities and maintaining profitability.
5. Balance the above objectives with potential impacts on the directed permit categories that target bluefin tuna, and the broader objectives of the 2006 Consolidated HMS FMP and MSA.

This section of the Executive Summary summarizes the conclusions about each of these five objectives resulting from this review.

Based on the number of bluefin landings and dead discards during the IBQ period, the IBQ Program was successful in limiting bluefin bycatch in the pelagic longline fishery. Total bluefin catch during the IBQ period was reduced compared to the Baseline period. During the IBQ period, bluefin catch totaled 35 percent, 51 percent, and 45 percent of the adjusted Longline category quota in 2015, 2016, and 2017, respectively. In contrast, during the Baseline period, bluefin catch represented 365 percent, 972 percent, and 210 percent of the adjusted Longline category quota in 2012, 2013, and 2014, respectively. Comparing the amount of bluefin catch (landings and dead discards) with

respect to weight during the Baseline period, the average annual total catch of bluefin by all pelagic longline vessels was 233 mt, whereas during the IBQ Period the average annual total catch was 81.3 mt, which represents a reduction of 65 percent. The annual catch during the IBQ Period was less than the annual baseline quotas (even if compared to what the annual baseline quotas would have been without the additional 62.5 mt amount implemented by Amendment 7). The average amount of dead discards in the pelagic longline fishery during the IBQ period was 89 percent less than during the Baseline period.

The overall catch per unit effort (CPUE) of estimated dead discards declined (based on observer data and logbook data), and the percentage of active vessels with dead discards decreased in the IBQ period (based on logbook data) compared to the Baseline period. Interactions with bluefin in the IBQ period were relatively rare, with the percentage of sets in which bluefin interactions occurred ranging from 4 to 14 percent. The percentage of active vessels landing bluefin was lower during the IBQ period compared to the Baseline period, and the proportion of total bluefin landings from the Gulf of Mexico declined during the IBQ period as compared to the Baseline period. In addition to the IBQ Program, there were other factors contributing to the change in bluefin catch during the IBQ period such as declining fishing effort, and the effects of other regulations such as gear restricted areas. However, this review appears to demonstrate that the Gulf of Mexico gear restricted area (GRA) and the Cape Hatteras GRA had limited roles in the overall reductions in bluefin catch.

The substantial reduction in total bluefin bycatch in the pelagic longline fishery described above is evidence of the effectiveness of the regulatory incentives to avoid bluefin inherent in the IBQ Program. These regulatory incentives to avoid bluefin interactions resulted from the combination of requirements associated with the IBQ Program, including individual shares and subsequent allocations of bluefin, an IBQ allocation leasing program, requirements for minimum balances of IBQ allocation before trips each quarter, accountability for bluefin catch, vessel monitoring system (VMS) reporting, and EM. The specific regulations that provided the most incentives for vessel operators to avoid bluefin were the IBQ accounting requirements. The potential need for vessel owners to lease additional IBQ allocation in order to account for bluefin catch and satisfy the minimum IBQ Program requirements, and the cost of such leasing, provided additional incentive to avoid bluefin tuna during pelagic longline fishing operations. Some vessel owner/operators stated that the IBQ Program made them risk averse and modified their fishing behavior to reduce the likelihood of catching bluefin and the chance of having to shut down their operations or lease quota allocation through the IBQ system. It is difficult to attribute the overall reduction in bluefin catch to a specific fishing behavior, due to the number of factors that affect catch in a commercial fishery and the number of factors affecting fishing behavior in addition to the IBQ Program.

The objective to provide flexibility in the IBQ system and minimize constraints on fishing for target species, was achieved through multiple means: IBQ leasing, inseason distributions of IBQ allocation, and modifications to the regulations, as warranted. A large number of vessel owners leased IBQ allocation and participated in the IBQ leasing market. In general, it appears that quota debt did not present a persistent challenge for vessel operators. It was common for a longline fishery participant to lease IBQ allocation multiple times. The weighted average price per pound (lb) of leased IBQ allocation declined from 2015 through 2017 ($3.46, $2.52, and $1.67, respectively).

During the IBQ period, NMFS took inseason actions to ensure flexibility in the IBQ Program. In each year of the IBQ period, NMFS transferred quota from the Reserve category to the Longline category in order to achieve specific objectives. Notwithstanding the participation in the leasing market,

some vessel owners were hesitant or unwilling to lease quota to other vessel owners because they did not know if they would have sufficient quota to account for their own bluefin catch throughout the year. Inseason quota transfers and subsequent allocations helped reduce this uncertainty and encourage proper functioning of the leasing market.

Overall, balancing the objective of limiting bluefin catch with the objective of optimizing fishing opportunities and maintaining profitability was achieved in the context of the IBQ Program. However, it is difficult to separate out the influence of the IBQ Program from other factors, including the effect of swordfish imports on the market for U.S. product, other regulations such as closed and gear restricted areas, as well as target species availability/price. It is also likely that the IBQ Program contributed to reduced revenue and fishing effort during the IBQ period. The reduction in fishing effort during 2015 compared to 2014 may have been due to uncertainty regarding the new IBQ Program; however, other factors driving the long-term reduction in fishing effort in the pelagic longline fishery were also just as likely contributing to that reduction. The increasing trend in average annual operating income per vessel during the IBQ period supports the contention that the economic situation has stabilized for many of the vessels that fished during the IBQ period, although there is high annual variability in the data. Other factors, such as the relatively high amount of imported swordfish on the U.S. market compared to domestically caught swordfish, may be more significant variables affecting the profitability of the fishery than the IBQ Program.

There was a reduction in the annual total revenue of pelagic longline vessels during the IBQ period compared to the Baseline period, but the annual total revenue during the IBQ period was fairly stable ($27.2 million (M), $25.6 M, and $27.1 M, during 2015, 2016, and 2017, respectively). The average revenue per vessel during the IBQ period was less than during the Baseline period, but increased from 2015 to 2017, and during 2017 approached the level it was during 2014 (i.e., $307,422 in 2017 and $316,055 in 2014). These trends in revenue were calculated fleet-wide (combining all of the vessels together). Fleet-wide calculations of revenue tend to mask underlying trends, however, because the average annual revenue per vessel during the IBQ period depended upon how the revenue was summarized. Slightly different trends in revenue emerged when metrics were calculated for groups of vessels with similar characteristics (i.e., by vessel size or amount of fishing effort expressed as hooks or sets). The differences in revenue metrics reflect the diversity of the pelagic longline fleet (geographically, vessel size, and annual fishing effort), and highlights the challenges of drawing conclusions from the data.

NMFS was able to successfully balance achieving the IBQ Program objectives with impacts on the permit categories that target bluefin and on HMS dealers, as well as the broader objectives of the 2006 Consolidated Atlantic HMS FMP and the Magnuson-Stevens Act. Prior to the implementation of Amendment 7, pelagic longline vessels had large amounts of regulatory dead discards, and the Longline category consistently exceeded its quota by very large amounts (primarily due to dead discards). These exceedances were accounted for by using the under-harvested quota from the directed categories, as well as from the allowable carry-forward of under-harvests (by the bluefin fisheries as a whole) from one year to the next.

In contrast, during the IBQ period, there was a 65 percent reduction in the average annual catch of bluefin, the Longline category no longer overharvested its quota and therefore did not rely upon non-Longline quota (either under-harvests or quota carried-forward from a previous year) to account for dead discards. During the IBQ period, NMFS also transferred Reserve category quota to the directed categories and the Longline category as warranted, and the Longline category did not utilize a disproportionate amount of bluefin quota compared with the directed categories.

Evaluation of IBQ Program Components

The following components of the IBQ Program (standard components of catch share programs, nationally) were evaluated: allocations and accountability rules; eligibility; catch and sustainability; accumulation caps; data collection, reporting, monitoring, and enforcement; duration; new entrants; and cost recovery.

Overall, NMFS found that the majority of IBQ Program elements functioned as designed; however, a relatively large number of IBQ shareholders (permitted vessel owners who received an IBQ share based on three defined tiers of "quota share percentiles" for the Longline category through Amendment 7) did not fish (i.e., 23 percent, 37 percent, and 37 percent of shareholders during 2015, 2016, and 2017, respectively). The allocation and use of quota is optimized when it is allocated to vessels that fish and need IBQ allocation to account for bluefin bycatch. The first years of the IBQ Program provided valuable information with which to consider modifications to improve the program elements.

Based on the data collected, vessel owners/operators successfully accounted for bluefin catch using a combination of IBQ share allocation and leased IBQ allocation. The amount of IBQ allocation available to shareholders resulting from the three defined tiers of quota share percentiles of the annual Longline category quota in Amendment 7 was important to a pelagic longline vessel's operation, as evidenced by data about vessels operating under each of three tiers (e.g., amount of bluefin landed, numbers of vessels leasing, percent of total IBQ allocation leased, percent of total quota debt). The amount of IBQ allocation available to either a shareholder or a non-shareholder was important due to the accounting requirements. One of the allocation design principles stated in Amendment 7 (that the quota be used by active vessels to account for bluefin), was only partially achieved, given the relatively large number of shareholders that did not fish.

During each year of the IBQ Program, the baseline Longline category quota was sufficient to account for the total amount of bluefin landings and dead discards by longline vessels. The baseline category quota was augmented by inseason transfers and the previous year's allowed carryover. The amount of IBQ allocation distributed to vessels each year in the IBQ period exceeded the amount of IBQ ultimately needed to account for landings and dead discards. The total amount of quota made available to the Longline category (including through Purse Seine category participants) facilitated a functional IBQ allocation leasing market. The distribution of additional amounts of allocation to IBQ shareholders and active Atlantic Tunas Longline permit holders inseason (on top of the annual allocation distributions) facilitated the leasing market by reducing the risk to a shareholder of leasing allocation to other fishery participants.

A tiered system of distributing catch shares based on historical catch, which is typical of many catch share programs, may have disadvantages or limited relevance when implemented in the context of a catch share program for bycatch species. The distribution of shares, and subsequent allocations to shareholders, may not fully align with the need for quota, given the fact that bluefin catch and the need for quota are variable among the fleet, and bluefin comprises only a small fraction of the total catch of the fishery. The success of the IBQ Program in reducing dead discards likely relates more to the other elements of the IBQ Program than the precise method of catch share distribution and incentives associated with the distinct amounts of annual allocation.

Amendment 7's eligibility criteria for receiving an IBQ share resulted in an initial pool of 136 shareholders, only a subset of which fished during the IBQ period. The intent of the criteria was to create a pool of qualified shareholders comprised of recent fishery participants.

The eligibility criteria were successful at not being excessively restrictive, as indicated by the small number of vessels (6) that fished at some time during the IBQ period but had not met eligibility criteria to receive IBQ shares and had to lease IBQ allocation to fish. Fewer IBQ shareholders fished during the IBQ period than were eligible, although a few of the shareholders that did not fish leased allocation to other fishery participants.

The IBQ Program, in conjunction with other management measures in Amendment 7, resulted in both bluefin catch that did not exceed the Longline category quota, and a reduction in dead discards compared to the Baseline period. The sustainability of the IBQ Program is related to the sustainability of the pelagic longline fishery as a whole, which faces challenges to its viability due to multiple factors, including many outside the scope of the IBQ Program. The IBQ Program imposes constraints and costs on the fishery, but of a magnitude that, absent other factors, likely do not affect the viability of longline vessel businesses (based on the socioeconomic analyses in this document). However, for some individual vessels or businesses, the IBQ Program, in conjunction with other factors facing the fishery, may result in cumulative economic impacts that are not sustainable or a level of uncertainty in operations that is not practical.

Although only Gulf of Mexico IBQ allocation may be utilized to account for bluefin caught in the Gulf of Mexico, both Gulf of Mexico and Atlantic designated IBQ allocation may be leased. Purse Seine category fishery participants also have access to a set amount of quota (designated as "Purse Seine" within the IBQ system) according to a regulatory process adopted in Amendment 7 and subsequent annual calculations. The five Purse Seine category fishery participants may transfer quota to one another, may lease quota to vessels with a valid Atlantic Tunas Longline category permit through the IBQ system, or may lease IBQ allocation from pelagic longline vessels through the IBQ system. There are currently indirect regulatory limits on the amount of IBQ allocation an entity may possess (through accumulation of Atlantic Tunas Longline permits) or through leasing, and the greatest amount of total IBQ allocation that a single entity controlled was less than 12 percent of the total distributed IBQ allocation. A shareholder may not permanently purchase IBQ allocation from another shareholder, but may only lease IBQ allocation from another shareholder for the duration of a given year (i.e., lease expires at the end of a calendar year). The theoretical maximum amount of IBQ allocation an individual permitted vessel owner could lease (under current regulations) would be the combined amount of IBQ allocated to all the IBQ shareholders and Purse Seine category quota. The data from the IBQ Program indicate that non-regulatory factors limited the extent of leasing (e.g., the strong incentives for most active fishing vessels to retain IBQ allocation, cost of leases, etc.). Regulation that is more direct and a more conservative cap on the amount of IBQ allocation that can be accumulated by a single fishery participant or shareholder should be considered to reduce the risk of entities controlling a large percentage of IBQ allocation in the future.

A different method of IBQ share allocation, and/or distribution of IBQ allocation among permit holders may warrant consideration in the future for several reasons. The current distribution of allocation may not align with vessels' need for it. The share distribution method adopted in 2015 through Amendment 7 was based in part on historical participation (2006-2012) and catch (both the amount of target catch landings and the ratio of bluefin bycatch to target catch landings) and may not reflect current fishery participation or current restrictions on species that can be landed (e.g., restrictions placed on shortfin mako and porbeagle landings since Amendment 7).

Additionally, there were costs incurred by many fishery participants due to the need to lease IBQ allocation to account for their bluefin catch. Given the number of shareholders that were inactive (only 77 percent, 63 percent, and 63 percent of shareholders were active during 2015, 2016, and

2017, respectively), a simpler allocation system based on more recent vessel activity could be considered for the future, as was suggested by HMS Advisory Panel members during input on Draft Amendment 7. For example, annual allocations based on the previous year's pelagic longline activity could result in more IBQ allocation per active vessel due to reduced numbers of vessels receiving IBQ allocation, as well as reduce any perceptions that the allocations are not fair.

Compliance with the VMS reporting requirement improved during the IBQ period, based on comparisons to dealer data (landings), and logbook data (number of sets). VMS data tended to under-report the numbers of bluefin retained compared to the dealer data. The numbers of sets reported via VMS tended to be less than the number of sets reported via logbook. Despite the apparent lower accuracy, the data available via VMS enabled real-time management of the Northeast Distant Area (NED) bluefin quota (25 mt) by providing real time data on fishing effort and bluefin interactions. There are typically less than five vessels that fish annually in the NED.

The EM Program achieved the objective of verifying the amount and identification of bluefin reported by vessel operators. The overall frequency of bluefin interactions determined by the EM Program (percent of sets with bluefin interactions) was very similar to the frequency of bluefin interactions determined by observer and VMS data.

A specific duration for the IBQ Program has not been established. The IBQ Program is subject to the restrictions and limitations described in the Magnuson-Stevens Act.

The IBQ Program provides reasonable opportunities for the participation of new entrants in the pelagic longline fishery. The IBQ Program neither precludes new entrants, nor presents unreasonable barriers to new entrants.

Cost recovery, a required element of catch share programs under the Magnuson-Stevens Act, was not implemented at the start of the IBQ Program in 2015 in order to first gather information about the operation of the fishery under the IBQ Program and reduce initial costs and uncertainty given the bycatch dynamic of the program. Implementation of cost recovery for the IBQ Program, based on the recent fishery and incremental costs, would likely provide little or no net value, when looking at the value of bluefin landed. NMFS is in the process of considering a flexible approach to cost recovery that would be designed to address the unique circumstances of this IBQ Program and the pelagic longline fishery.

1 Introduction and Background

1.1 Requirement for Review

This review is intended to evaluate the progress made in meeting the goals and objectives of the Individual Bluefin Quota (IBQ) Program, implemented under Amendment 7 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan (2006 Consolidated HMS FMP). The IBQ Program was designed to provide individual vessel accountability for bluefin catch (landings and dead discards) and incentivize the pelagic longline fishery to minimize interactions with bluefin. The Magnuson-Stevens Act requires regional Fishery Management Councils and the Secretary to periodically conduct "formal and detailed" reviews of all Limited Access Privilege Programs (LAPPs) established after January 12, 2007. This includes those LAPPs established under Secretarial authority, such as the IBQ Program, which is a catch share program for a bycatch species. This program review was conducted according to guidelines developed by National Marine Fisheries Service (NMFS) Procedural Instruction 01-121-01. The guidelines state that the first review should be conducted no later than five years after the establishment of the catch share program. This review is being conducted with three years of data collected after implementation of the IBQ Program. Although the guidelines do not recommend/require an initial programmatic review be completed earlier than the prescribed 5-year interval, NMFS committed to a 3-year review as part of the implementation of Amendment 7 because it was determined that a review after three years was appropriate for the pelagic longline fishery, which had been subject to extensive regulations prior to implementation of the IBQ Program. For this particular program, NMFS felt that a three-year period would provide adequate time for the fishery to operate under the new rules, and would allow for a timely evaluation of its effectiveness, which could enable NMFS to begin the process of modifying the Program, if the review were to indicate modifications are warranted.

A Draft Three-Year Review of the Individual Bluefin Quota Program was released on May 10, 2019, and a summary of the document, including key data parameters, was presented to the HMS Advisory Panel at its May 2019 meeting. This final document incorporates the suggestions of the Advisory Panel and includes new data not contained in the Draft document. Additional details explaining the difference between the draft and the final documents are described further below.

1.2 Management History

Atlantic HMS fisheries are managed under the dual authority of the Magnuson-Stevens Act and the Atlantic Tunas Convention Act (ATCA). Under the Magnuson-Stevens Act, NMFS must manage fisheries to maintain optimum yield (OY) on a continuing basis while preventing overfishing. ATCA authorizes the Secretary to promulgate regulations, as may be necessary and appropriate, to carry out 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, NMFS. A more comprehensive background can be found in the Final Environmental Impact Statement for Amendment 7 to the 2006 Consolidated HMS FMP (Amendment 7 FEIS).

The Atlantic bluefin fishery is a quota-managed fishery, and landings and dead discards must be accounted for within the available U.S. quota. The annual U.S. bluefin quota is allocated among

seven quota categories, including two incidental categories, the Longline and Trap categories, as well as the categories that direct on bluefin (General, Angling, Harpoon, and Purse Seine) and a Reserve category, used for research and inseason quota transfers as warranted. The pelagic longline fishery primarily targets swordfish, yellowfin tuna, and bigeye tuna. Directed fishing on bluefin with pelagic longline gear is prohibited, but the fishery incidentally catches bluefin as bycatch, and the Longline quota category accounts for that bycatch. The amount of quota allocated to each category was expressed in Amendment 7 as a percentage of the U.S. quota (with certain adjustments). The numerical quotas for each category are codified in the regulations (50 CFR part 635) and updated as appropriate if the overall quota changes (e.g., if the ICCAT quota increases).

Prior to 2006, landings were the only portion of catch that counted against the Longline category's percentage share of the overall quota, as at that time dead discards were accounted for under a separate quota allowance (68 mt) per ICCAT Recommendation 98-07 (*The Recommendation by ICCAT to Establish a Rebuilding Program for Western Atlantic Bluefin Tuna*). However, in 2006, the separate dead discard allowance was discontinued, and dead discards since then had to be accounted for within each country's annual quota alone (ICCAT Recommendation 06-06; *Supplemental Recommendation by ICCAT Concerning the Western Atlantic Bluefin Tuna Rebuilding Program*).

Prior to the 2015 implementation of Amendment 7 and its IBQ Program, NMFS allocated the Longline category 8.1 percent of the total U.S. quota for landings. Pelagic longline vessels were limited in the number of bluefin they could retain per trip (based on the amount of target species catch), and only landings counted toward the Longline quota. Vessels could retain one, two, or three bluefin if they had 2,000 lb., 6,000 lb., or 30,000 lb. of target catch, respectively. Bluefin caught in excess of this limit were required to be discarded by the regulations. Dead discards by the pelagic longline fishery were estimated annually and since 2005 were accounted for within the overall U.S. quota (i.e., no longer under a dedicated set-side).

The trend prior to the implementation of the IBQ Program was that catches (landings plus dead discards) of bluefin by pelagic longline vessels had regularly exceeded the Longline quota for several years. Due to the disconnect between the amount of quota allocated to the Longline category, and the larger amount of catch, NMFS had to rely on underharvest from other quota categories and annual quota adjustments to account for pelagic longline dead discards to ensure that the United States remained within its total annual bluefin quota. This approach, however, disincentivized bluefin tuna avoidance by pelagic longline vessels, since they were not directly held accountable for their bluefin bycatch and limits were not placed on the amount of bycatch that could occur. In fact, in some years, the activity of only a few pelagic longline vessels constituted the majority of the Longline category quota overharvests. It became apparent through discussions with the HMS Advisory Panel and various data analyses that measures focused more on individual vessel accountability, versus fleet level accountability, would be needed to help realign the pelagic longline fleet bluefin catch commensurate with the Longline category quota and that the category quota allocations should be re-examined.

In this context, the IBQ Program and Electronic Monitoring (EM) Program were implemented in the pelagic longline fishery in the Atlantic and Gulf of Mexico in 2015. Amendment 7 also implemented other substantial changes to the management of the bluefin tuna fisheries. The most sweeping regulations were those affecting the pelagic longline fishery to reduce interactions with bluefin and provide vessel-level accountability. Measures adopted included two Gear Restricted Areas; required closure of the pelagic longline fishery when annual bluefin tuna quota is reached; the elimination of target catch requirements associated with retention of incidental bluefin tuna in the pelagic

longline fishery; mandatory retention of dead legal-sized bluefin tuna caught as bycatch; expanded monitoring requirements, including EM via cameras and bluefin tuna catch reporting via Vessel Monitoring System (VMS), and transiting provisions for pelagic and bottom longline vessels.

Amendment 7 also implemented changes to the category quotas. Amendment 7 included an increase to the Longline category quota and increased management flexibility for transfers among quota categories through the Reserve category quota, other management measures for the longline fishery, as well as new GRAs in the Atlantic (and performance metrics for accessing this area) and Gulf of Mexico designed to reduce bluefin interactions.

1.3 IBQ Program Objectives

The specific objectives of the IBQ Program, excerpted from Amendment 7, are as follows:

- Limit the amount of bluefin landings and dead discards in the pelagic longline fishery.
- Provide strong incentives for the vessel owner and operator to avoid bluefin interactions, and thus reduce bluefin dead discards.
- Provide flexibility in the quota system to enable pelagic longline vessels to obtain bluefin quota from other vessels with available IBQ allocation in order to enable full accounting for bluefin landings and dead discards, and minimize constraints on fishing for target species.
- Balance the objective of limiting bluefin landings and dead discards with the objective of optimizing fishing opportunities and maintaining profitability.
- Balance the above objectives with potential impacts on the directed permit categories that target bluefin tuna, and the broader objectives of the 2006 Consolidated HMS FMP and Magnuson-Stevens Act.

These IBQ Program objectives are evaluated in the context of compliance with the broader requirements of the Magnuson-Stevens Act and ATCA, including requirements to appropriately conserve and manage the stocks, facilitate achievement of optimum yield, and to minimize bycatch to the extent practicable.

1.4 IBQ Program Key Features and Events

This section provides a summary of the key features of the IBQ Program and noteworthy milestones since its implementation on January 1, 2015. It is not intended to communicate all the operational details of the program or the pertinent regulations. The complete regulations are located at 50 CFR § 635.15: IBQ Regulations.

Initial Eligibility (Active Vessels)

In Amendment 7, vessels had to meet two requirements to be eligible to receive IBQ shares: 1) vessels had to have a valid Atlantic Tunas Longline category permit; and 2) vessels must have been deemed "active." Vessels that made at least one set using pelagic longline gear from 2006 through 2012 (based on pelagic longline logbook data) were considered "active." The 2006–2012 time period was chosen based on several considerations. The last significant action addressing bluefin conservation and management across the entire fishery was the 2006 Consolidated HMS FMP. Therefore, fishing behavior prior to 2006 would have been based on previous management measures and thus would not appropriately reflect the state of the fishery at the time of the Amendment. The end year of the time period (2012) was selected as a recent year for which there was complete logbook data available at the time Amendment 7 was being developed. Amendment 7

stated, “The range of seven years provides a reasonable representation of historical fishing activity, including recent years. Seven years is long enough to prevent short-term circumstances from disproportionately impacting a vessel, but recent enough to reflect current fishery participation.”

For the purpose of IBQ share eligibility, a “valid Atlantic Tunas Longline category permit” was determined to be one held as of the date of publication of the Proposed Rule for Amendment 7, August 21, 2013. The rationale for this measure was to implement criteria that reflected participation in the fishery. Specifically, the premise during the development of the IBQ Program regulations was that by issuing IBQ shares to “active” vessels, versus all permit holders regardless of activity level, the measure facilitated continued participation in the fishery by those vessels that had made relatively recent investments in the fishery. Issuing shares among fewer eligible vessels increased the potential share percentage per vessel. Permitted vessels that did not meet the initial eligibility criteria necessary to receive an IBQ share could still obtain quota through a lease of IBQ allocation (described below under “transferability”).

Quota Share Allocation Formula

The quota share allocation formula that resulted in distribution of shares was based on 2006–2012 vessel data on the amount of target catch, and the amount of bluefin catch relative to target catch, as described in more detail in the paragraphs below. In determining initial quota share eligibility and calculating the initial quota share, NMFS used data associated with a vessel's history. After it is assigned, however, the IBQ share becomes associated with the permit, not the vessel.

An IBQ share is one of three tiered percentages of Longline quota assigned to qualified vessels (and thereafter associated with the permit) through Amendment 7, based on the quota share allocation formula and the relevant vessel history. The three IBQ share tiers assigned are static and do not change on an annual basis. The two factors that are the basis of the allocation formula are: 1) historical bluefin catch from vessel logbook data, expressed as a ratio of the number of bluefin interactions to “designated species” landings; and 2) “designated species” landings for a vessel (from the NMFS dealer data (weigh-out slips) and logbook information). Designated species were defined as swordfish; yellowfin, bigeye, albacore, and skipjack tunas; dolphin; wahoo; and porbeagle, shortfin mako, and thresher sharks.

The use of these two factors in the quota share formula was designed to acknowledge past bluefin avoidance, ensure an equitable initial IBQ share, and consider the diversity in fishing patterns and harvest characteristics of the fleet. Past fishing that resulted in fewer bluefin interactions resulted in larger IBQ shares. Landings of designated species were included as an indicator of both the level of fishing effort and activity as well as success at harvesting targeted species and minimizing bluefin bycatch interactions, recognizing that greater levels of fishing activity are likely to be correlated with greater numbers of bluefin interactions. The end results were three IBQ share tiers: the high tier provided eligible vessels with a share of 1.2 percent of the baseline Longline quota, the medium tier provided eligible vessels with a share of 0.6 percent of the Longline quota, and the low tier provided eligible vessels a share of 0.37 percent of the Longline quota. These percentages are constant from one year to the next, and the amount of quota allocated stemming from these IBQ share percentages depends on the amount of quota available to the baseline Longline category and determinations about how quota transferred to the category inseason will be distributed.

With respect to regional designations, all IBQ shares were designated as “Atlantic” or “Gulf of Mexico” based on the location of each vessel’s catch used to determine the IBQ share. If a vessel had fishing history in both the Gulf of Mexico and the Atlantic, it may have received IBQ shares of both

the Gulf of Mexico and Atlantic, depending upon the amount of IBQ share and the proportion of fishing history in the two areas. If a vessel would receive less than a minimum share amount for a particular area (i.e., less than 0.125 mt for the Atlantic or less than 0.25 mt for the Gulf of Mexico), then no IBQ share was designated for that area and all of the vessel's shares were designated to the primary area (Atlantic or Gulf of Mexico). Vessels are prohibited from using Atlantic allocation to account for bluefin tuna catch in the Gulf of Mexico, thereby limiting potential shifts in effort. Specifically, a vessel with bluefin catch in the Gulf of Mexico may not use Atlantic allocation to account for such catch. However, vessels may use Gulf of Mexico allocation to account for bluefin catch in both the Gulf of Mexico and Atlantic. Allocations may be leased annually by Atlantic Tunas Longline category permit holders or Purse Seine category participants, and a minimum amount of allocation is required for a pelagic longline vessel to depart on a trip in the Atlantic (0.125 mt) using pelagic longline gear. A higher minimum amount of quota (allocation) is required for a pelagic longline vessel to depart on a fishing trip in the Gulf of Mexico (0.25 mt). A pelagic longline vessel may not use Atlantic allocation to satisfy the minimum share requirement for a fishing trip in the Gulf of Mexico.

Annual Distribution of Allocation

Annually, IBQ allocation is distributed to IBQ shareholders on January 1. A shareholder's share percentage is multiplied by the total pounds of Longline category baseline quota available to derive the amount of allocation in pounds. If a permit with IBQ shares is not associated with a vessel, any relevant annual distribution of IBQ allocation will not be released to the shareholder's IBQ account unless/until the permit is associated with a vessel.

Inseason Distribution of Allocation

In contrast to the current annual allocation of quota to IBQ shareholders (as described in the paragraph above), NMFS may transfer bluefin quota from the Reserve category to other quota categories, throughout the year (i.e., an inseason action). Such transfers are based on consideration of regulatory determination criteria (§ 635.27(a)(8)). The criteria relate to the current circumstances in the fishery and the goals and objectives of the 2006 Consolidated HMS FMP, as amended. For each year during the IBQ period, NMFS transferred quota inseason to the Longline category in order to achieve specific objectives. These objectives include the following:

1. Help vessel owners account for bluefin landings and dead discards.
2. Foster conditions in which permit holders become more willing to lease IBQ allocation to one another.
3. Contribute toward full accounting of bluefin catch by vessels that have quota debt (i.e., reduce quota debt).
4. Enhance the likelihood that vessel owners will make the decision to lease IBQ allocation to other vessel owners.
5. Reduce uncertainty in the fishery as a whole.

In 2015 and 2016, NMFS completed inseason transfers of bluefin quota from the Reserve category to the Longline category. These inseason transfers of quota were further subdivided and distributed in equal amounts to IBQ shareholders (and designated as ATL or GOM, as appropriate), provided their Atlantic Tunas Longline permits were associated with a vessel. During 2016, NMFS proposed and then finalized a rule modifying the IBQ regulations regarding the distribution of inseason quota. The final rule became effective on February 10, 2017 (81 FR 95903; December 29, 2016). The rule enabled bluefin quota distributed inseason to be allocated to either *all qualified IBQ share recipients* (*i.e.,* share recipients who have associated their permit with a vessel) or only to permitted

Atlantic Tunas Longline vessels with recent fishing activity, whether or not they are associated with IBQ shares. Under the rule provisions, NMFS determines if a vessel has any recent fishing activity based upon the best available information for the subject and previous year, such as logbook, VMS, or EM data. This approach was taken in order to provide flexibility with respect to which vessels receive IBQ allocation inseason, whether IBQ share recipients or not, and to achieve the objectives of the IBQ Program, such as accounting for bluefin during longline operations and optimizing fishing opportunity for target species. The final rule also clarified that inseason distributions of IBQ allocation to vessels, whether distributed to shareholders or to active vessels, would be made in equal amounts and not based on the IBQ share recipient's quota tier (percentage). For example, there may be fewer active fishing vessels than there are IBQ shareholders, and therefore distribution of an inseason quota transfer to active vessels may be warranted to allocate IBQ allocation more efficiently.

Transferability

Leasing of IBQ allocation is allowed among all Longline category vessels with valid Atlantic Tunas Longline permits, regardless of whether they received their own IBQ share. Sub-leasing of IBQ allocation is also allowed (i.e., IBQ allocation leased from vessel A to vessel B, then re-leased by vessel B to vessel C). For a particular calendar year, an individual lease transaction is valid from the time of the lease until December 31. Atlantic Tunas Longline permit holders may lease IBQ allocation annually from other Atlantic Tunas Longline permit holders with IBQ allocation or may lease quota from Purse Seine category participants through the IBQ. The relationship between the pelagic longline fishery and the Purse Seine category participants in the context of the IBQ Program and Amendment 7 is described in more detail further below.

If a vessel accounts for bluefin tuna using IBQ allocation that it has leased from another permitted vessel, the catch of that bluefin will be associated with the vessel that caught the bluefin not the vessel that leased out the IBQ allocation. While post-Amendment 7 bluefin catch history does not affect the IBQ shares, it potentially could affect the calculation of vessel performance metrics in the future.

The IBQ Program, as implemented in 2015, did not include a provision to allow the permanent sale of IBQ shares to reduce risks for permit holders during the initial stages of the IBQ Program, when the market for IBQ shares was new and uncertain. Amendment 7 stated that measures to allow permanent sale of IBQ shares could be implemented in the future. That strategy allowed time for pelagic longline fishermen to familiarize themselves with the IBQ Program and the market for IBQ shares, and for NMFS to collect relevant data, prior to the agency's consideration of authorizing permanent sale.

Purse Seine Category Leasing and Modifications to Category Quota under Amendment 7

Amendment 7 also made changes to the Purse Seine fishery for bluefin, including changes to how quota is distributed to Purse Seine category participants. These changes reflected changes in the fishing activity of the Purse Seine category over time, while recognizing the historic participation of fishery participants in the category. The measures were intended to balance the need to provide the Purse Seine category participants a reasonable amount of fishing opportunity in a predictable manner, while making use of quota that may otherwise be unused.

Specifically, as a result of Amendment 7, NMFS annually adjusts the Purse Seine category quota, using a formula based on the weights of reported bluefin landings and estimated weights of dead

discards by Purse Seine category participants in the previous year. This allows each participant's Purse Seine quotas to be adjusted upward or downward based on recent fishing activity. Currently, 25 percent of each Purse Seine category participant's base quota is available annually as a minimum. Any quota that is not allocated to the Purse Seine category participants is reallocated to the Reserve category for possible redistribution consistent with specified regulatory criteria to other quota categories (including the Longline category), and to support other objectives of the 2006 Consolidated HMS FMP as amended. Amendment 7 provided the opportunity for Purse Seine category participants to lease quota to (and/or from) pelagic longline vessel owners in order to ensure that the IBQ leasing market met the needs of the pelagic longline fishery to account for bluefin catch, and provide additional flexibility for the Purse Seine category participants in the context of new regulations. In order to enable a robust leasing market for IBQ allocation, pelagic longline vessels may lease Purse Seine quota through the IBQ system from Purse Seine category participants. Purse Seine quota is treated as Atlantic regional IBQ allocation within the IBQ system, given where purse seine fishing has historically occurred, and therefore can only be applied against Atlantic regional bluefin landings and dead discards.

The Northeast Distant Area (NED) Fishery and the IBQ Program

Under the IBQ Program, the rules regarding fishing in the NED are different because the NED is managed as a distinct area.

The NED is the Atlantic Ocean area bounded by straight lines connecting the following coordinates in the order stated: 35°00′ N. lat., 60°00′ W. long.; 55°00′ N. lat., 60°00′ W. long.; 55°00′ N. lat., 20°00′ W. long.; 35°00′ N. lat., 20°00′ W. long.; 35°00′ N. lat., 60°00′ W. long. This fishing ground covers virtually the entire span of the western north Atlantic, as far east as the Azores and the Mid-Atlantic Ridge. Under ICCAT recommendations, the United States is allocated a baseline quota of bluefin, plus an additional 25-mt quota to account specifically for bluefin bycatch of pelagic longline vessels fishing in the NED.

It is important to note that it is the annual U.S. *baseline* quota (i.e., not including the 25 mt NED amount) that NMFS divides among the established regulatory domestic bluefin quota categories, including the Longline category. Relatively few of the pelagic longline vessels routinely fish in the NED (4, 7, and 6 vessels, during 2015, 2016, and 2017, respectively; VMS data), and those that do frequently use Canadian ports as ports of departure and landing (provided they have the appropriate authorization from Canada).

The NED quota is unique in that it is a distinct, small quota allocated to the United States under ICCAT recommendation to account for bluefin bycatch. Therefore, under the IBQ Program rules, vessels fishing in the NED are not required to account for bluefin retained or discarded dead from this geographic area using the IBQ system until the 25 mt NED quota has been caught. Vessels fishing in the NED report bluefin catch via VMS, including information on fishing location, so NMFS is able to monitor the NED quota in real-time. After the NED set-aside quota has been met, any additional bluefin landings or dead discards must be accounted for with IBQ.

Accountability for Catch under the IBQ Program

The cornerstone of the IBQ Program is individual vessel accountability for bluefin catch. Since implementation of Amendment 7, NMFS has used three approaches to when and how longline vessels must account for bluefin catch using IBQ allocation. Vessels first had to account for their catch using IBQ allocation annually, then at the trip level, and, finally (and currently) by quarter. These adjustments were made to balance the goals of providing flexibility for the fishery and

ensuring that quota debt is reconciled in a timely manner, especially as the fishery adjusted to the new program.

NMFS annually distributes IBQ allocation (lb whole weight) to IBQ shareholders based on their specific tier of IBQ shares. Pelagic longline vessels are required to account for any bluefin retained or discarded dead, using IBQ allocation, and are required to retain all legal-sized commercial bluefin that are dead at haul-back. Legal-sized commercial bluefin that are alive at haul-back can either be retained or released; however, if retained they must be accounted for using IBQ allocation.

Year 1 (2015): Annual Level Accountability

During 2015, the first year of the IBQ Program, there was "annual accountability" for bluefin catch through use of IBQ allocation, such that at the end of 2015 vessels were responsible for reconciling any quota debt that may have accrued during the year (by using IBQ allocation or by leasing allocation from other permit holders). Trip-level accountability was anticipated in Amendment 7 but delayed (effective January 2016) to provide time for permitted vessel owners or operators to adapt to fishing under the various new Amendment 7 regulations, including the IBQ Program, VMS reporting, and EM system requirements. If a vessel had quota debt at the end of 2015, the quota debt carried over into 2016, and the debt was automatically subtracted from the IBQ allocation distributed for 2016.

Years 2 and 3 (2016 Through 2017)

As of January 1, 2016, in order to fish with pelagic longline gear an Atlantic Tunas Longline permitted vessel was required to have a minimum IBQ allocation before embarking on a trip ("trip-level accountability"). The minimum IBQ allocation required in order to depart on a trip in the Gulf of Mexico is 0.25 mt whole weight (approximately 551 lb.), and is 0.125 mt whole weight (approximately 276 lb.) if fishing in the Atlantic, (including the NED GRA). If a vessel had insufficient IBQ allocation to account for bluefin that they caught on a particular trip, they could complete that trip (i.e., were not required to terminate the trip once the IBQ allocation had been fully used) but were required to obtain additional IBQ allocation (via lease) prior to departing on a subsequent trip. Allowing a vessel on a given trip to retain bluefin for which it did not yet have adequate IBQ allocation provided flexibility for vessels and reduced dead discards and waste of marketable fish.

If an IBQ shareholder vessel had quota debt at the end of 2016 or 2017, the quota debt carried over into the subsequent year, and the debt was automatically subtracted from the shareholder's IBQ allocation distribution for 2017 or 2018. For non-shareholders, the debt remained until addressed via lease or via inseason distributions of Reserve quota made to active vessels in the Longline category.

Year 4 (2018)

As of January 27, 2018, in order to provide additional flexibility as suggested by the HMS Advisory Panel and in an effort to meet the various objectives of the IBQ Program, NMFS implemented quarterly accountability to replace trip-level accountability (82 FR 61489; December 28, 2017). Under this approach to accountability, vessels are allowed to fish with a low IBQ allocation balance or with quota debt during a calendar quarter, provided they hold the minimum amount of IBQ allocation necessary for trip departure prior to the first trip of each quarter. Vessels are still required to report bluefin catch at the end of each trip (and account for it with IBQ allocation), but this regulatory change provided the flexibility to fish even if the vessel had less than the minimum amount of IBQ allocation or quota debt, until the first fishing trip in the subsequent calendar quarter. The change provides flexibility for two important operational business decisions made by

vessel owners: decisions regarding quota balance and any level of quota debt to maintain (subject to full accounting quarterly), and decisions regarding the timing and price at which they lease additional quota.

Reporting and Monitoring

Vessel Monitoring System (VMS)

The reporting and monitoring requirements applicable to pelagic longline vessels increased with implementation of Amendment 7 and the IBQ Program. Amendment 7 implemented multiple reporting and monitoring requirements in support of the IBQ Program. Prior to the IBQ Program, vessel owners or operators were required to submit logbook reports, and to submit VMS declarations prior to starting and ending fishing trips. To support the IBQ Program, vessel owners or operators also became subject to the additional requirements of VMS set reports after each longline set. Vessels fishing with pelagic longline gear must report the number of hooks and the date and area of the sets through VMS within 12 hours of completion of each pelagic longline haul-back. For those pelagic longline sets with bluefin interactions, vessel operators must report the length of all bluefin retained or discarded dead (by standardized size ranges) within 12 hours of completion of the pelagic longline haul-back.

Electronic Monitoring (EM) System (i.e., Video Camera System)

Vessels fishing with pelagic longline gear must have an installed and fully functional EM system on the vessel. The objective of the EM system is to provide NMFS a means with which to verify the accuracy of counts and identification of bluefin reported by the vessel owner/operator. The principal elements of the EM system are video cameras (two to four); control box (computer) and monitor; Global Positioning System receiver; and hydraulic and drum rotation sensors (as well as power source, etc.). The required cameras must be installed to provide a view of the area where the longline gear is retrieved and catch is removed from the hook, prior to placing the fish in the hold or discarding them boatside. Vessels are required to have at least one camera to record close-up images of the deck near the haul back or processing station (i.e., for species identification/length estimation) and must have at least one camera to record activity along the side of the vessel at the water line of the haul back station (i.e., to document fish that are caught and discarded but not brought aboard, as well as the disposition of that catch (released alive/dead)).

At the start of a fishing trip, the vessel owner/operator is responsible for turning on the EM system and verifying that it is functioning properly. The vessel owner/operator is responsible for ensuring that the EM system remains powered-on for the duration of each trip, that cameras are cleaned routinely to ensure unobstructed views, and that the EM system components are not tampered with. During the trip, the vessel owner/operator is responsible to ensure that all bluefin are handled in a manner that enables the EM system to record such fish.

Within 48 hours of completion of a fishing trip, the vessel owner/operator must mail the removable EM system hard drive containing all data and a pre-paid, return addressed mailing envelope, to the NMFS-contractor that manages the hard drives and data, and conducts audits of the videos. Prior to departing on a subsequent trip, the vessel owner/operator must install their replacement EM system hard drive to enable data and video recording. The vessel owner/operator is responsible for contacting NMFS, or the NMFS contractor, if they have not received a replacement hard drive(s). NMFS or the second NMFS-contractor (responsible for maintenance and repair), with the vessel owner/operators' input, must also develop and provide a written Vessel Monitoring Plan to document the standardized procedures relating to EM and facilitate communication of such procedures to the vessel crew. The NMFS contractor would contact vessels regarding late

submission of hard drives, and if a pattern of non-compliance developed for a particular vessel, HMS staff would refer the vessel to NOAA's Office of Law Enforcement.

If the EM system is not functioning properly, the vessel owner/operator is required to contact NMFS or the NMFS-contractor, to inform them of the status of the EM system and coordinate the necessary logistics to fix the system. NMFS staff worked closely with the two NMFS-contractors to ensure all aspects of the EM system were functioning/performing as designed. EM system service calls or visits were initiated by vessel owners and operators, and technicians. The second contractors also conducted preventative maintenance of EM systems. Upon request by the vessel operator, under certain circumstances NMFS may issue a waiver for a vessel to fish without a fully operable EM system, to account for events beyond a vessel operator's control, and minimize disruptions to vessel fishing operations. Factors that NMFS considers when considering issuance of a waiver include timely communication by the vessel operator with NMFS and/or the contractors, previous compliance with the EM regulations, and documented reasonable efforts to maintain an operable EM system and comply with all relevant EM regulations.

IBQ System and Dealer Reporting

Vessel owners and operators, and seafood dealers are required to use the online IBQ system, including secure login, input of catch data, and leasing IBQ among shareholders. At the end of a pelagic longline trip, any bluefin landings from that trip must be entered into the IBQ system by the dealer purchasing the bluefin, in conjunction with the vessel operator. Both the dealer and vessel owner/operator have designated accounts in the IBQ system, with secure passwords and personal identification numbers. During the first three years of use, NMFS made improvements to the online IBQ system regularly in order to improve the ease and efficiency of the system for the end user. Additionally, NMFS has a dedicated IBQ Customer Service phone line during business hours to facilitate prompt responses to questions about the use of the IBQ system and related regulatory questions.

Cost Recovery

The Magnuson-Stevens Act, section 303A(e), requires a program of fees paid by LAPP holders that will cover the costs of management, data collection and analysis, and enforcement activities. Such fees may not exceed 3 percent of the ex-vessel value of fish harvested under the LAPP. Section 303A(e) requires development of cost recovery in establishing a LAPP.

In Amendment 7, NMFS stated that it planned to implement cost recovery after the IBQ Program evaluation (i.e., after 3 years). NMFS felt that this step-wise approach to the cost recovery element was consistent with the purpose of section 303A(e) and appropriate given the nature of the LAPP being proposed (the IBQ Program). The purpose of section 303A(e) is to collect fees to cover management, data collection and analysis, and enforcement activities.

Amendment 7, which implemented the IBQ Program, did not implement cost recovery in 2015, because NMFS determined that without obtaining further information about the operation of the fishery under the IBQ Program, it would be extremely difficult to properly assess the costs to which the recovery percentage would be applied. There was neither information regarding the incremental costs of managing the pelagic longline fishery under the IBQ Program, nor information about the revenue from bluefin under the program. Furthermore, it was determined that immediate implementation of a cost recovery program would increase the costs and uncertainty for fishing vessel owners during a time period when the fishery would be bearing other new costs and sources of uncertainty. Thus, when Amendment 7 was implemented, NMFS decided not to implement cost

recovery until after it conducted the 3-year program evaluation. NMFS stated it would implement a cost recovery program through separate rulemaking after the 3-year review. A cost recovery discussion and recommendation for consideration is included below.

Share Caps

As implemented by Amendment 7, the initial limit on the amount of IBQ allocation an individual Atlantic Tunas Longline permit holder or Purse Seine category participant may lease annually was the combined Longline and Purse Seine category allocations. The reason for this initial decision was to provide maximum flexibility for vessels to lease quota in a manner that could accommodate various levels of unintended catch of bluefin and enable the development of an active IBQ allocation market, understanding that additional review would occur after three years. Amendment 13 will include consideration of share caps.

1.5 IBQ Program Review—Summary of Methods

This document compares data collected from the pelagic longline fishery prior to implementation of the IBQ Program (Baseline period; 2012 through 2014) to data collected from the fishery under the IBQ Program (IBQ period; 2015 through 2017) to determine if the IBQ Program is achieving its objectives, and determine if any modifications to the IBQ Program may be warranted. The data reviewed for this three-year review include standardized metrics developed by NMFS' Office of Science and Technology for NMFS to evaluate all catch share programs (NMFS Procedural Instruction 01-121-01; Catch Share Policy; Guidance for Conducting Review of Catch Share Programs)(Catch Share Review Guidance).

Amendment 7 specified a review after the first three years of operation in order to evaluate the program after a duration of time that balanced the need for adequate time to allow the program to operate and mature, with the goal of providing a formal opportunity to evaluate the IBQ Program in the not-too-distant future. Although the Catch Share Review Guidance recommends waiting five years prior to evaluating a new catch share program, it was determined that a review after three years was appropriate for the pelagic longline fishery, which had been subject to extensive regulations prior to implementation of the IBQ Program. For this situation, NMFS decided that a three-year period would provide adequate time for the fishery to operate under the IBQ Program, and allow for a timely evaluation, which could enable NMFS to begin the process of modifying the Program, if the review indicated modifications were warranted.

For some metrics, 2018 data is included in this analysis order to enable a more complete evaluation of a particular aspect of the program, such as quarterly accountability, which was implemented in 2018 and is an integral part of the program. Other available data from 2018, such as dead discards and bluefin landings are included, because they are key indicators with respect to any substantial changes in the fishery that may have occurred in 2018 that might be relevant to the evaluation of the program. Most tables and figures provide data only through 2017.

The analytical section of the document provides tables and figures of data, as well as narratives comparing the IBQ period to the Baseline period if analogous data exists. Some data from the IBQ period, which are relevant to the evaluation of the IBQ Program, are not compared to the Baseline period because analogous data do not exist during the Baseline period, such as IBQ allocation leasing data.

In addition to the standardized metrics from the Catch Share Review Guidance, NMFS presents data specific to the IBQ Program, which are intended to evaluate achievement of the objectives of the IBQ Program and/or provide other insights into the Program, such as possible changes to the IBQ Program or associated rules that may be considered. In addition, this data was used to evaluate the catch share program components, which is required by the Catch Share Review Guidance but not readily linked to the individual objectives of the IBQ Program.

Landings data were principally derived from dealer landing reports and IBQ system data entries. In most cases, landings data and references to ICCAT-recommended quotas and IBQ allocations are expressed in whole weight (ww) are also referred to as "round weight." In contrast, dressed weight is the weight of the fish after removal of the head, fins, and viscera.

With respect to dead discards, the United States applies the ICCAT-approved methodology to calculate and report dead discards for both stock assessment purposes and U.S. quota compliance purposes. The amount of dead discards is generated by estimating discard rates from data collected by NMFS' Pelagic Observer Program and extrapolating these estimates using the effort (number of hooks) reported in the Pelagic Logbooks. This methodology is applied within each time/area stratum (e.g., catch rates from the Gulf of Mexico are used to estimate discards from the Gulf of Mexico, not the NED). Changes to the approved method likely would require consideration and approval by ICCAT's Standing Committee on Research and Statistics (SCRS) prior to U.S. implementation.

In contrast to the Pelagic Observer Program and logbook-derived estimates of dead discards, which are available only after the end of the fishing year, VMS data provide "real-time" information on dead discards used for in-season monitoring and management. VMS-reported data on dead discards are accounted for in the IBQ system and are deducted from vessels' IBQ allocation balances.

NMFS coordinated with the HMS Advisory Panel to seek input throughout the development of this review. The HMS Advisory Panel, comprised of representatives of commercial, recreational, and other interests, was established under Sec. 302(g)(4) of the Magnuson-Stevens Act to assist in the development of any FMP or amendment for Atlantic HMS fisheries. NMFS presented information to the HMS Advisory Panel regarding plans for the three-year review at its May 2017 meeting. At that time, NMFS presented a draft timeline, elements of the three-year review, and draft metrics for use in evaluating the objectives of the IBQ Program. NMFS also presented a progress report, a draft outline of the document, and a timeline. At the March 2018 HMS Advisory Panel meeting, NMFS presented draft data from 2015 through 2016 relevant to the IBQ Program and made available more extensive data not presented verbally. At the September 2018 HMS Advisory Panel meeting, NMFS presented additional draft data, and a draft Executive Summary of the Three-Year Review document. The Draft Three-Year Review of the Individual Bluefin Quota Program was released on May 10, 2019, and a summary of the document, including key data parameters, was presented to the HMS Advisory Panel at its May 2019 meeting. At each of the four Advisory Panel meetings, NMFS staff solicited input from Advisory Panel members regarding their suggested ideas for the review. This final document incorporates the suggestions of the Advisory Panel

2 Description of the Environment

2.1 Biological, Ecological, and Environmental

This section includes a brief summary of the relevant environment and status of the bluefin stock and focuses on information that has been updated since the publication of the Amendment 7 FEIS. Chapter 3 of the Amendment 7 FEIS included a description of the habitat, fishery participants, gear types, and the affected area as of August 2014 (NMFS August 2014).

For a complete description of the biology and status of bluefin and of related U.S fisheries, including operations, catches, and discards, please see Section 3.2 of the Amendment 7 FEIS. Other relevant information can be found in the Bluefin Stock Assessment (SCRS 2017); the 2017 HMS Stock Assessment and Fishery Evaluation (SAFE) Report (NMFS 2017); and the Environmental Assessment for the Atlantic Bluefin Tuna and Northern Albacore Quota Rule (NMFS September 2018). Also, for information on interactions and concerns with protected species and the Atlantic tuna fisheries, please see Section 8 of the 2017 SAFE Report.

Status of the BFT Stock

ICCAT's SCRS conducts assessments of the western and eastern Atlantic bluefin stocks, with the most recent stock assessment occurring in 2017. The assessment indicated similar historical trends in abundance as in previous assessments, with an observed increase since 2004. The strong 2003 year-class and recent reduction in fishing mortality have contributed to this increase in recent years. However, the 2003 year-class is past its peak biomass, recruitment has been declining for a number of years, and there are no signs of a strong year class coming into the fishery. The SCRS stated in the 2017 assessment report that, despite considerable efforts to improve the historical data for the western Atlantic stock, it has not gained any further insights into future recruitment potential. The SCRS indicated that it is not possible to calculate biomass-based reference points (e.g., biomass at maximum sustainable yield (B_{MSY}) and fishing mortality rate corresponding to maximum sustainable yield (F_{MSY})) apart from knowledge (or assumptions) about how future recruitment potential relates to spawning stock biomass. The 2017 SCRS stock assessment update is the best scientific information available. That stock assessment update was subject to rigorous analysis and review by a panel of experts from participating ICCAT countries. Based on the stock assessment, and applying domestic stock status criteria, NMFS determined that the western Atlantic stock's status should be changed from "overfished" to "unknown" and that the status of "not subject to overfishing" should be maintained. For detailed information, see the executive summary of the bluefin stock assessment, or full relevant report at:

http://iccat.int/Documents/SCRS/ExecSum/BFT_ENG.pdf); and
https://www.iccat.int/Documents/SCRS/DetRep/BFT_SA_ENG.pdf

Deepwater Horizon

In 2010, prior to the implementation of Amendment 7, the Deepwater Horizon oil spill had occurred, and any lasting impacts were unknown. In contrast, at the time of this document, more than eight years have passed since the oil spill. During those years, various recovery and mitigation programs have begun to contribute to recovery, and studies have yielded new data. A 2014 study showed that the embryos of several warm water pelagic species, including bluefin, are sensitive to

crude oil cardiotoxicity (Incardona, et. al. 2014). A 2015 article regarding the status of the Gulf of Mexico noted "both damage and remarkable resilience" (Cornwall, 2015). New research about the Gulf of Mexico, motivated by the oil spill may assist with future evaluations of resiliency (Murawski et. al. 2018).

The *Deepwater Horizon* Oceanic Fish Restoration Project was designed to help restore fish species that were injured as a result of the Deepwater Horizon oil spill. The Oceanic Fish Restoration Project intends to reduce fishing mortality during a temporary, voluntary, six-month repose period each year during which participating vessel owners agree to refrain from pelagic longline fishing in the Gulf of Mexico. The project began in 2017 and will continue annually for an estimated five to 10 years. Voluntary participants are compensated to help offset any loss in revenue during the repose and, if desired, are provided with alternative gear that specifically target yellowfin tuna and swordfish with fewer interactions with bluefin tuna anticipated. By fishing with the alternative gear (greenstick, buoy gear, and/or deep-drop rod and reel), participating vessel owners may continue to fish, hire a crew, purchase fuel and supplies from shore-side businesses, and bring fish to market. In addition, fishing with alternative gear supports research on the efficiency of alternative gears (alternatives to pelagic longline gear, with the intent of reducing bycatch).

2.2 Description of the Pelagic Longline Fishery

The pelagic longline fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons. Secondary target species include dolphin and albacore tuna. While pelagic longline fishermen used to include sharks as a secondary target, recent ICCAT recommendations restrict the landings of sharks incidentally caught by pelagic longline gear, including silky, oceanic whitetip, hammerhead (scalloped, smooth, and great), porbeagle, and shortfin mako sharks, necessarily resulting in decreased landings. Although this gear can be modified (e.g., depth of set, hook type, hook size, bait type, time of day) to target specific species, it is generally a multi-species fishery. Pelagic longline vessel operators are opportunistic, switching gear style and making subtle changes to target the species that present the best available economic opportunity on each individual trip. Pelagic longline gear sometimes attracts and hooks non-target finfish with little or no commercial value as well as species that cannot be retained by commercial fishermen due to regulations, such as billfish. Pelagic longline 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 that cannot be landed due to fishery regulations is required to be released, regardless of whether the catch is dead or alive.

Other conservation and management measures in the fishery include long-standing regulations such as closed areas, and gear and bait restrictions. In addition to the IBQ Program, Amendment 7 implemented GRAs in the Mid-Atlantic Bight and the Gulf of Mexico. During communication with HMS staff during telephone conversations or Advisory Panel meetings since the start of the IBQ Program, vessel owners, while acknowledging the success of the IBQ Program in reducing bluefin catch, have noted the cumulative impacts of the constraints on the fishery that result from the regulations, especially the closed areas and GRAs.

In addition to compliance with conservation and management measures, one of the challenges for the U.S. pelagic longline fishery has been imported swordfish, which impacts the market share for the U.S. fishery and frequently provides the domestic market with lower-priced swordfish. Imports of swordfish have been increasing, with a shift in the countries of origin, such as Ecuador, which has increased imports to the United States markedly over the past few years.

Fishing effort in the pelagic longline fishery has been declining (e.g., number of vessels fishing with pelagic longline gear, and other metrics of fishing effort). In recent years, swordfish landings peaked in 2012 and declined each year subsequently. Revenue in the pelagic longline fishery has also been declining.

Another variable affecting the pelagic longline fleet is the demographics of the fishery participants. Based on permit data as well as discussions with vessel owners, the average age of vessel owner/operators is increasing, and owners are often challenged to find reliable crews, or crew that are willing to fish on extended trips. Changing societal norms may be contributing to this labor dynamic. The implementation of Amendment 7 in 2015 created some additional uncertainty in the fishery due to the scope of the revised regulations applicable to pelagic longline vessels, but some of that uncertainty has decreased with time, as vessel owner/operators have learned how to operate under the new rules.

Shore-Based Cooperatives and Owners of Multiple Permits or Vessels

Although the majority of pelagic longline vessels are owner operated, in 2017 there were 10 entities that owned more than one permit, and several shore-based organizations that functioned as cooperatives, facilitating or providing various support services to local vessels including dock space, fuel, ice, mechanical support, dealer services, and technical support for complying with regulations. Such cooperatives may also facilitate the leasing of allocation. The principal cooperative activities appear to occur in the New Orleans, LA area and Fort Pierce, FL.

Based on industry feedback, participation in these cooperatives has increased since the implementation of the IBQ Program, in part as a response to financial pressure and logistics associated with the need to lease IBQ allocation. It is difficult to anticipate the nature of these cooperatives and any potential impacts their existence may have on the IBQ Program, because NMFS is only able to make inferences about their membership and operations due to a lack of information about the nature of any cooperative agreements and reasons why vessel owners participate in alternative business models. Cooperatives usually involve close relationships with bluefin dealers, with multiple vessels. Anecdotal information suggests that vessels may accrue benefits in addition to the sale of their catch, including the facilitation of the leasing market, and assistance with data entry and the use of the online IBQ system.

The cooperative in Fort Pierce, FL, provided information regarding its operation to NMFS for use in this document. The cooperative is a vertically integrated company that operates a full service commercial fishing dock out of Fort Pierce. It owns a fleet of thirteen Longline vessels and services an additional six to eight vessels seasonally, and provides provisioning and the marketing of product for this combined fleet of vessels. The provisioning includes fuel, tackle, ice, bait, and food. Vessel maintenance, mechanical repairs, and fabrication are also available.

A fish dealer in Houma, LA, that works with about 12 vessels noted that their business “fronts” fishing supplies (fuel, bait, tackle) to vessels for all their trips, as well as facilitates obtaining IBQ allocation and completing required paperwork for fishing permits, etc. Operating in this manner, the dealer assumes a portion of the risk of the trips, and may lose revenue of trips with little or no catch.

A New England dealer facilitates communication among IBQ shareholders and assists them in the process of obtaining IBQ allocation in exchange for exclusive sale of fish to them.

The role of cooperative behavior in the fishery under the IBQ Program may be important for some vessels, based on the above information.

Pelagic Observer Program

The Pelagic Observer Program observes the pelagic longline fishery and has a set target level of observing eight percent of sets. In 2007, the Pelagic Observer Program increased observer coverage in the Gulf of Mexico to as close to 100 percent of trips as practicable, and targeted the full months of April and May, and parts of March and June. The start dates of the increased Gulf of Mexico coverage are usually dictated by the timing of the departure of the fleet, which tends to all start at the same time, coinciding with the full moon. The objectives of the increased Gulf of Mexico coverage are to validate and/or refine bluefin discard estimates from the pelagic longline fleet during the spring bluefin spawning period and collect numerous and diverse biological samples from bluefin. In 2010, the target rate of observer coverage for the Gulf of Mexico during the spawning period was reduced to 40 percent. In 2016, available funding made it possible to target 50 percent coverage in the Gulf of Mexico and added the month of February. The 2016-increased observer coverage addressed the same objectives, but also intended to contribute to the evaluation of management measures such as the Gulf of Mexico Spring GRAs (implemented in 2015). In the Gulf of Mexico, from 2012 through 2017, the percent of sets observed were 44, 59, 55, 64, 49, and 18 percent, respectively.

As a result of the 2003 settlement agreement between NMFS and the Center for Biological Diversity and pursuant to the MMPA, NMFS convened the Pelagic Longline Take Reduction Team in 2005. In 2009, NMFS implemented the Pelagic Longline Take Reduction Plan, which included a recommendation to increase observer coverage to 12–15 percent for all pelagic longline fisheries that interact with marine mammals, particularly pilot whales and Risso's dolphins (74 FR 23349; May 19, 2009). Available funding also influenced the level of observer coverage in all areas during 2017, resulting in a lack of increased coverage in both the Gulf of Mexico and Cape Hatteras areas. During 2012, 2013, and 2014, 9.5 percent, 14.4 percent, and 12.5 percent of pelagic longline sets were observed, respectively. During 2015, and 2016, 14 percent and 17.9 percent, of pelagic longline sets were observed, respectively.

Increased Observer Coverage in the Mid-Atlantic Bight (2015–2016; 2016–2017)

NMFS increased the mandatory observer coverage for pelagic longline vessels in the Mid-Atlantic Bight, including the Cape Hatteras GRA from December 1, 2015 through April 30, 2016. The purpose of the increased coverage was to supplement scientific research on bycatch in the pelagic longline fishery, as well as provide data on the effectiveness of management measures, including the Cape Hatteras GRA. One of the research questions was whether there was a difference in catch rates of bluefin by pelagic longline vessels between the area inside the GRA and the areas outside of the GRA (within the Mid-Atlantic Bight). Analysis of the data by NMFS indicated that there was insufficient data to answer this question. Specifically, there was not enough data from outside of the GRA, and most of the fishing that did take place outside of the GRA took place during the month of December, when there were low catches of bluefin. The Mid-Atlantic Bight was defined for the study as the area bounded by straight lines connecting the Mid-Atlantic states' internal waters and extending to 71° west longitude, between 35° north latitude and 43° north latitude. Similarly, NMFS increased the observer coverage in the Mid-Atlantic Bight from December 1, 2016 to April 30, 2017, but shifted the affected area southward, based on the distribution of pelagic longline fishing during the previous year. The revised area of coverage was between 33° north latitude and 38° north latitude. NMFS has not analyzed this data.

Quotas

The Longline category quotas remained relatively stable during the period from 2012 through 2017, with an increasing pattern. The category was allocated a greater percentage of the overall U.S. quota in 2015 through Amendment 7, and slight increases have occurred to the U.S. quota overall (and thus to the quota categories) because of ICCAT recommendations (Table 3.1).

3 Analysis of Effects of IBQ Program by Objective

This section of the review evaluates the IBQ Program success in meeting its objectives, as outlined in Amendment 7, during its first three years of implementation. Although one of the recommendations of the Catch Share Review Guidance for evaluating catch share programs is performance metrics, the IBQ Program as implemented did not contain performance metrics. However, the applicability of potential performance metrics is discussed below. The objectives of the IBQ Program (listed sequentially), discussion of each objective, and relevant data are included in the following subsections. Each of the sections that follow are based on an objective.

3.1 Objective 1: Limit the Amount of Bluefin Tuna Landings and Dead Discards in the Pelagic Longline Fishery

Summary

The objective of limiting the amount of bluefin catch in the pelagic longline fishery was evaluated based on the amount of catch during the IBQ period, with comparisons to the relevant annual quotas and comparison to the Baseline period. Other relevant metrics were the location, scope, distribution among vessels, and rate of bluefin catch. Based on the landings and dead discards during 2015 through 2017, the IBQ Program was successful in limiting bluefin catch in the pelagic longline fishery (Table 3.1, Figure 3.1). There was a decrease in dead discards and a stable trend in landings, resulting in a decrease in total bluefin catch by the pelagic longline fleet, along with a decrease in the percentage of base and adjusted quota caught.

Specifically, bluefin catch (landings and dead discards, mt, not including the NED) was reduced compared to the baseline period. Bluefin catch during the IBQ period was 63.5 mt in 2015, 92.7 mt in 2016, and 87.7 mt in 2017 (representing 35 percent, 51 percent, and 46 percent of the adjusted quota in 2015, 2016, and 2017, respectively). In contrast, during the Baseline period, bluefin catch was 286.4 mt in 2012, 204.1 mt in 2013, and 208.7 mt in 2014 (representing 365 percent, 972 percent, and 210 percent of the adjusted quota in 2012, 2013, and 2014, respectively). Including the catch from the NED, the average annual total catch of bluefin was reduced by 57 percent from the Baseline period (Table 3.2). The number of vessels landing bluefin and the percentage of active vessels landing bluefin declined during the IBQ period compared to the Baseline period (Table 3.5). During 2018, the bluefin total catch including the NED remained low (58 percent less than the average during the Baseline period (Table 3.2).

Table 3.1 PLL BFT Landings, Dead Discards, Quota, and Adjusted Quota, Not Including NED

Year	PLL Landings (mt)	PLL Dead Discards (mt)	Total PLL Catch (mt)	PLL Base Quota (mt)	Percent of PLL Base Quota (%)	PLL Adjusted Quota (mt)	Percent of Adjusted PLL Quota (%)
2012	81.2	205.2	286.4	74.8	382	78.4	365
2013	57.9	146.2	204.1	74.8	273	21.0	972
2014	78.7	130.0	208.7	74.8	279	99.2	210
2015	46.4	17.1	63.5	137.3	46	182.3	35
2016	68.4	24.3	92.7	148.3	63	182.3	51
2017	78.8	8.9	87.7	148.3	59	193.3	45
2018	84.0	14.6	98.6	148.3	67	208.1	47

Note: Adjustments due to carry forward of unused quota from previous year, inseason quota transfers, and revised ICCAT base quota.
Source: Landings from dealer data; Dead discard estimates based on observer and logbook data.

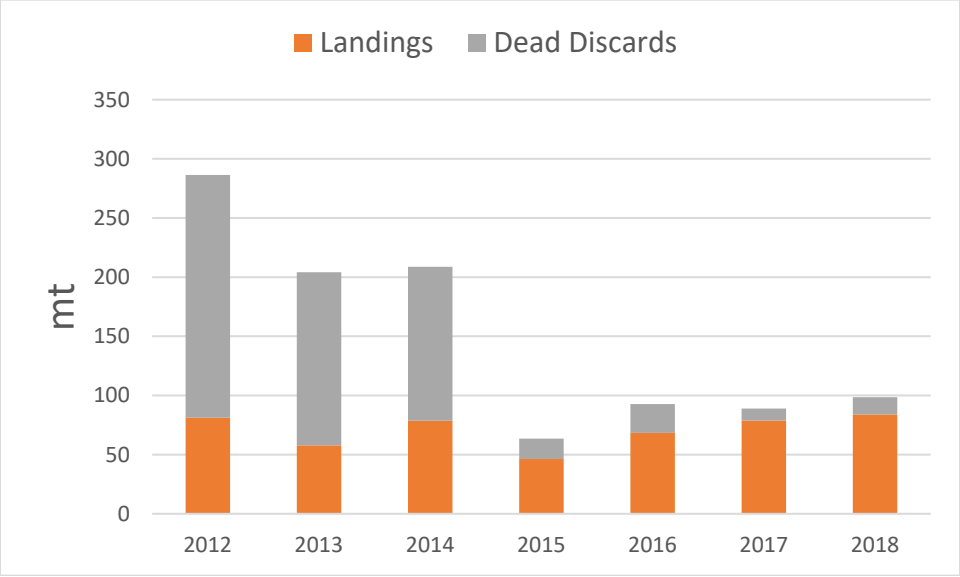

Figure 3.1 2012–2018 BFT Landings and Dead Discards, Not Including NED

Dead discard estimates based on observer and logbook data.
Sources: Landings from dealer data.

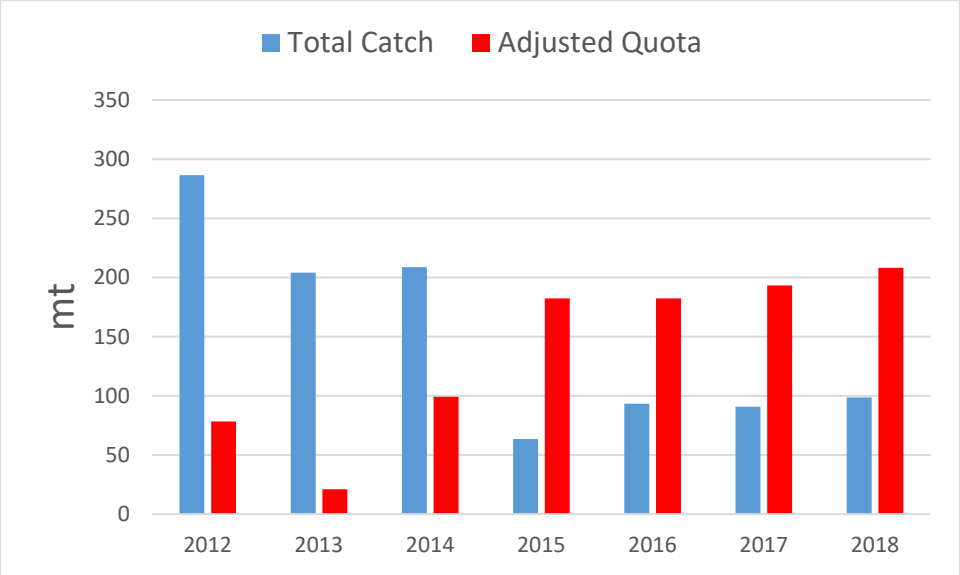

Figure 3.2 Total BFT Catch† and Adjusted Quota, Not Including NED

†Landings and dead discards.
Sources: Landings from dealer data; dead discard estimate based on observer and logbook data.

Landings

Table 3.2 summarizes the bluefin landings and dead discard information by year, and in contrast to the data above, includes bluefin catch from the NED. Total bluefin landings rose slightly during the IBQ period, and were eleven percent higher than during the Baseline period. Total landings during the Baseline period and the IBQ period were 235 mt and 262 mt, respectively. Average annual landings during the Baseline and IBQ periods were 78.3 mt and 87.2 mt, respectively.

The increase in landings was the result of bluefin being landed instead of discarded during the IBQ period, as required under the Amendment 7 measures, and due to an increase in the amount of landings from the NED (Figure 6.6, Appendix 6.3). Bluefin landings from the NED represented 50 percent, 22 percent, and 39 percent of the total bluefin landings from the Atlantic during 2015, 2016, and 2017, respectively (not including the Gulf of Mexico). In contrast, during the Baseline period, bluefin landings from the NED represented 15 percent, 8 percent, and 5 percent of the bluefin landings from the Atlantic during 2012, 2013, and 2014, respectively. The relative amount of fishing effort in the NED did not increase during the IBQ Period (Figure 6.6, Appendix 6.3). Additional details on fishing effort in the NED in 2012 through 2017 are in Appendix 6.3.

The average annual total bluefin catch by pelagic longline vessels during the Baseline period was 245.5 mt, and the average annual total bluefin catch during the IBQ period was 105.1 mt, a reduction of 57 percent. Table 3.3 shows landings of bluefin expressed as numbers of fish. The total numbers of bluefin landed during the Baseline and IBQ periods were 1,098 and 1,261 bluefin, respectively.

Table 3.2 2012–2018 Landings, Dead Discards, and Total Catch of BFT, Including the NED

Year	Landings (mt)	Dead Discards (mt)	Total Catch (mt)
2012	89.6	205.8	295.4
2013	62.9	156.4	219.3
2014	82.5	139.2	221.7
2015	71.4	17.1	88.5
2016	86.2	25.0	111.3
2017	104.1	10.3	114.4
2018	88.0	14.6	102.6

Source: Landings: SAFIS data; Dead discard estimates based on Observer and Logbook data.

Table 3.3 2012–2018 Landings of BFT in Numbers, Including the NED

Year	Number of BFT
2012	407
2013	299
2014	392
2015	323
2016	437
2017	501
2018	467

Sources: Landings dealer data.

Table 3.4 provides the percent of total pelagic longline bluefin landings and dead discards that occurred in the Atlantic and Gulf of Mexico based on weight (not including the NED). Note that if these percentages were analyzed and shown by number of fish (not shown) instead of weight, the percentage splits would differ from those in this table, due to the difference in average weight of bluefin between the Atlantic and the Gulf of Mexico. Landings and dead discards in the Atlantic and Gulf of Mexico appear to exhibit different patterns. As of 2015, the percentage of landings in the Atlantic increased (and the percentage in the Gulf of Mexico decreased), whereas the distribution of dead discards between the Atlantic and Gulf of Mexico did not shift. The percentage of total bluefin landings that were caught in the Gulf of Mexico declined from 41 percent in 2012 to 4 percent in 2018. The percentage of overall dead discards that occurred in the Gulf of Mexico has increased slightly since implementation of Amendment 7 and the IBQ Program.

Bluefin landings from the Gulf of Mexico declined, which is notable due to the importance of the Gulf of Mexico in the life history of Western Atlantic bluefin (i.e., the primary spawning area for the western Atlantic stock). Both the proportion and amount of total bluefin landings from the Gulf of Mexico declined. During the Baseline period, an average of 26 percent of the total bluefin landings were from the Gulf of Mexico. During the IBQ period an average of 7 percent of the total bluefin landings were from the Gulf of Mexico (Table 6.24, and Figure 6.19 in Appendix 6.4). This change in distribution in bluefin landings did not appear to be caused by a change in the distribution in fishing effort, since fishing effort distribution remained constant across both periods. The proportion of the total number of sets occurring in the Gulf of Mexico only declined slightly during the IBQ period (Figure 6.5; Appendix 6.3). The numbers of bluefin landed from the Gulf of Mexico were low (15, 13, 21, and 14 during 2015, 2016, 2017, and 2018 respectively). In contrast, 308, 424, 481, and 453 bluefin were landed from the Atlantic during 2015, 2016, 2017, and 2018 respectively. The Oceanic Fish Restoration Project, which had the effect of reducing fishing effort

with pelagic longline gear in the Gulf of Mexico, did not begin until 2017. The number of monthly bluefin landings from the Gulf of Mexico during 2015 to 2017 (combined) was less than during the Baseline period, for each month (Table 6.33 in Appendix 6.3).

Table 3.4 2012–2018 Percent of Total PLL BFT Landings and Dead Discards† in ATL and GOM, Not Including NED Quota

Year	Percent of Total PLL BFT Landings in ATL (%)	Percent of Total PLL BFT Landings in GOM (%)	Percent of Total PLL BFT Dead Discards in ATL (%)	Percent of Total PLL BFT Dead Discards in GOM (%)
2012	59	41	66	34
2013	79	21	84	16
2014	85	15	77	23
2015	92	8	67	33
2016	95	5	70	30
2017	93	7	36	64
2018	96	4	25	75

†By weight.
Note: 2017 first year of DWH Oceanic Fish Restoration Project in Gulf of Mexico.
Sources: Landings: Dealer Data; Dead discard estimates based on observer and logbook data.

The seasonality of bluefin landings changed, as detailed in Appendix 6.4 (Figure 6.20, Figure 6.21, and Figure 6.22). During the Baseline period, the combined landings from the Atlantic and Gulf of Mexico were concentrated from January through June, whereas during the IBQ period landings were more evenly distributed across all months, with the exception of a June/July peak. In the Gulf of Mexico, the peak landings shifted from March through May during the Baseline period to February and March during the IBQ period (Table 6.33, Appendix 6.8). The shift may have been due to the Spring Gulf of Mexico GRA. The Oceanic Fish Restoration Project did not begin until 2017.

The amount of landings by vessels during the IBQ period was highly variable, with some vessels landing few or no bluefin and some landing relatively large numbers (Figure 3.3). Appendix 6.5 shows the distribution of bluefin landings among vessels during the IBQ period on an annual basis (Figure 6.34, Figure 6.35, and Figure 6.36). High variability for bluefin landings among the pelagic longline fleet also occurred during the Baseline period (Figure 6.31, Figure 6.32, Figure 6.33, and Appendix 6.5). The precise pattern of distribution of bluefin landings among vessels during the IBQ period is a contrast from the Baseline period; during the IBQ period, fewer vessels landed between 2 and 10 bluefin annually, and more vessels landed over 10 bluefin. The change is explained in part by the uniform retention limit that existed prior to the IBQ Program. During the IBQ period, some vessels landed notably higher amounts than during the Baseline period. The number of vessels landing between 11 and 90 bluefin increased from 2015 to 2017 (five, 10, and 12 vessels, respectively; Figure 6.34, Figure 6.35, Figure 6.36, Appendix 6.5). Under regulations before the IBQ Program was adopted, most of these bluefin would have been discarded. The variable amount of bluefin landings reflects the diversity of the pelagic longline fleet (vessel size, nature of operation, and geographic location of the fishery), as well as the variable spatial and seasonal distribution of

bluefin. As noted previously, the percentage of active vessels landing bluefin was lower during the IBQ period than during the Baseline period (Table 3.5).

Table 3.5 2012–2018 PLL Vessels Landing BFT

Year	Number of Vessels Landing BFT	Number of Active Vessels	Percent of Active Vessels Landing BFT (%)
2012	94	122	77
2013	81	115	70
2014	87	110	79
2015	59	104	57
2016	56	86	64
2017	58	89	66
2018	50	76	66

Note: Number of active vessels based on logbook data (2012-2015, 2018); logbook and VMS data (2016-2017). 85 and 88 active vessels in 2016 and 2017 based only on logbook data.
Sources: Landings based on dealer data.

The distribution of bluefin landings among vessels is shown below (Figure 3.3).

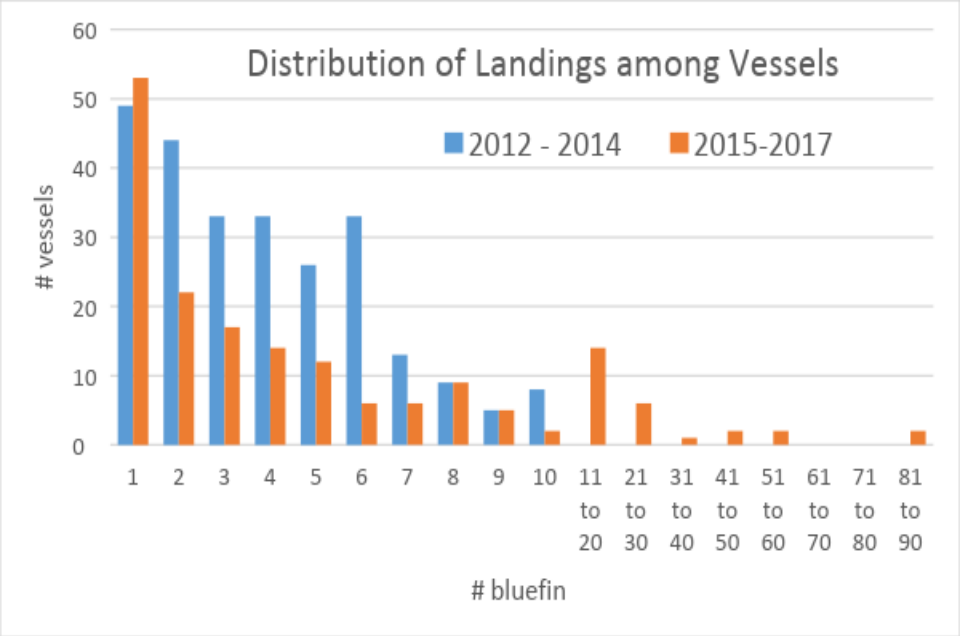

Figure 3.3 2012–2014 and 2015–2017 Distribution of Total BFT Landings Among Vessels

Note: The distributions were calculated on an annual basis and then added together. For example, the number of vessels landing one bluefin during 2012, 2013, and 2014 was 13, 20, and 16, respectively (total of 49). The number of vessels landing one bluefin during 2015, 2016, and 2017 was 26, 17, and 12 respectively (total 53).
Source: Dealer data.

Dead Discards

The lower total catch of bluefin during the IBQ period is predominantly the result of reduced dead discards (both total amount, rate, and scope of dead discards among vessels), and contrasts with the large amount of dead discards during the Baseline period, in which the quota was substantially

exceeded (Table 3.1). Total dead discards declined substantially during the IBQ period compared to the Baseline period. The percentage of dead discards in the Gulf of Mexico has increased slightly during the IBQ period (Table 3.4). The estimated total number of bluefin discarded dead (Table 3.6) and the overall catch per unit effort of estimated dead discards (Figure 3.4) both declined. The number of bluefin reported as discarded on observed trips declined; while the rate of observer coverage over the same period was relatively stable (Table 3.6). The average percentage of active vessels reporting dead discards via logbook decreased (Table 3.7). Details on the estimated total number of bluefin discarded dead and catch per unit effort of estimated dead discards (by ICCAT) area can be found in Appendix 6.4.

Interactions with bluefin during the IBQ period were relatively rare, with observer, VMS, and EM data yielding similar results in the frequency of interactions (percent of sets in which bluefin interactions occurred), ranging from 4 to 10 percent (Table 3.18). Although there was no VMS or EM data on the frequency of interactions during the Baseline period (because the data was not required), there were decreased numbers of total interactions on observed trips during the IBQ period compared to the Baseline period (Figure 3.5). Figure 3.5 also shows the number and type of bluefin interactions on observed trips. The percentage of vessels with no bluefin interactions (based on logbook data) increased during the IBQ period compared to the Baseline period (Figure 6.38; Appendix 6.6). The amount of dead discards estimated using logbook and observer data (i.e., the final amount of dead discards reported to ICCAT for U.S quota monitoring) was higher than the amount of dead discards reported by vessel operators via VMS, and that was accounted for within the IBQ system. The real-time accounting for IBQ was based upon the real-time VMS data. The annual number of bluefin discarded dead, as reported through VMS during the IBQ period were 37, 175, 35, and 44 for 2015, 2016, 2017, and 2018, respectively (Table 6.27, Appendix 6.7).

Discussion

The pattern of decreased total catch and decreased dead discards within that catch, and slight increase in landed bluefin compared to the Baseline period supports the conclusion that the objective is being met. The reduction in dead discards is likely due to a combination of factors including changes to the regulations regarding retention of bluefin, and incentives of the IBQ Program (discussed below). Prior to the IBQ Program, the regulations severely restricted the landings of bluefin by associating allowable retention with the amount of directed catch, which resulted in large numbers of regulatory discards. Under the IBQ Program, much of the bluefin catch that in the past would have been discarded, was instead retained. For example, the increase in landings in the NED during the IBQ period reflects the situation where a geographic area with high bluefin Catch Per Unit Effort (CPUE) historically (Figure 6.29, Appendix 6.4), had notable landings during the IBQ period (Table 6.26, Appendix 6.4).

Under the IBQ Program there were modifications in fishing practices/behavior including modified times and areas fished. There were also overall reductions in fishing effort. It is not possible to determine whether reductions in fishing effort during the IBQ period were due to the IBQ Program, or were part of the reduction in fishing effort that has been occurring in the longline fleet over time and is related to other factors, noted above under the "Description of the Fishery" (Section 2.2 "Social"). Various metrics of fishing effort in the fishery can be found in Appendix 6.3.

On an annual basis, the number of vessels that did not qualify for access to the Cape Hatteras GRA because of their bluefin interactions was 12, 4, 1, and 6 (for 2015, 2016, 2017, and 2018, respectively). The conservation benefit of the GRA on the bluefin stock was likely relatively small because the majority of the pelagic longline fleet retained access to the GRA. The Gulf of Mexico GRA

also had an impact on the reduction in dead discards during the IBQ period. The extent of impacts is difficult to assess, and is compounded by many variables. These other variables include the overall trend in reduction in pelagic longline fishing effort and the reductions in pelagic longline effort due to participation in the Oceanic Fish Restoration Project. The data indicates decreases in bluefin landings in all months of the year during the IBQ period (compared to the Baseline period). Additional information on the Cape Hatteras and Gulf of Mexico GRAs can be found in Appendix 6.8. Additional information on the Oceanic Fish Restoration Project can also be found in Appendix 6.10.

Performance Indicators

Evaluation of the achievement of the IBQ Program objectives that focus on bluefin catch should be conducted in the context of the other IBQ Program objectives that address the human elements of the fishery, as well in the context of all the Amendment 7 objectives and the objectives of the 2006 Consolidated HMS FMP, as described below.

The IBQ objectives did not include numeric targets for bluefin catch to serve as precise performance indicators, but instead used the qualitative terms "limit catch" and "reduce dead discards." One performance indicator of the IBQ Program is the level of bluefin catch in comparison to the Longline category bluefin quota. Although the Longline category quota was higher during the IBQ period than it was during the Baseline period, bluefin catch during the IBQ period is nonetheless greatly reduced from what it was during the Baseline period, to an extent. The Longline category quota established as a portion of the U.S. bluefin quota, which is a portion of a science-based overall TAC that was based on the best scientific information available through ICCAT (ICCAT quota recommendations based on ICCAT scientific recommendations/stock assessments). The allocation of a percentage of the overall quota to the Longline category was also informed by conservation and management needs for the stock and current and historical management decisions (ICCAT and U.S.). The relative size of the Longline category quota compared to the total bluefin quota (U.S. baseline quota) reflects U.S. historical allocation decisions among various user groups that take into account traditional differences among the domestic fisheries. The relatively small size of the Longline category quota reflects the fact that it is only to account for incidental catch in the directed fishery for other species (e.g., swordfish and yellowfin tunas). The past regulations relied upon retention limits in relation to directed catch amounts to control total bluefin catch in the pelagic longline fishery but were not successful due to bluefin that were discarded dead and a lack of individual vessel accountability.

Under the IBQ Program, this approach to retention limits has been replaced by the IBQ Program, which provides strict individual vessel accountability, but also includes flexibility. The amount of bluefin catch is limited by IBQ allocation at the individual vessel level, and by the Longline category quota at the fishery level. The amount of bluefin caught in the NED is limited by the 25 mt of NED quota associated with that geographic area, as well as by IBQ Program limits once that level has been reached. The amount of bluefin caught in the Gulf of Mexico is limited by the amount of IBQ allocation designated as Gulf of Mexico IBQ in conjunction with the accounting rule that bluefin caught in the Gulf of Mexico must be accounted for using Gulf of Mexico IBQ allocation. Given the complexity and variability of the pelagic longline fishery, as well as the restrictions and incentives in the IBQ Program (as discussed below), and the limiting nature of the Longline category quota itself, a target number of overall landings or dead discards is not needed as a performance indicator. This Review looked instead at evidence of upward or downward trends in the amount of dead discards and landings before and after the implementation of the IBQ Program as well as whether the catch was less than the applicable quota.

The tables and figures on the next six pages and in the Appendices as noted above, contain information relevant to the above objective.

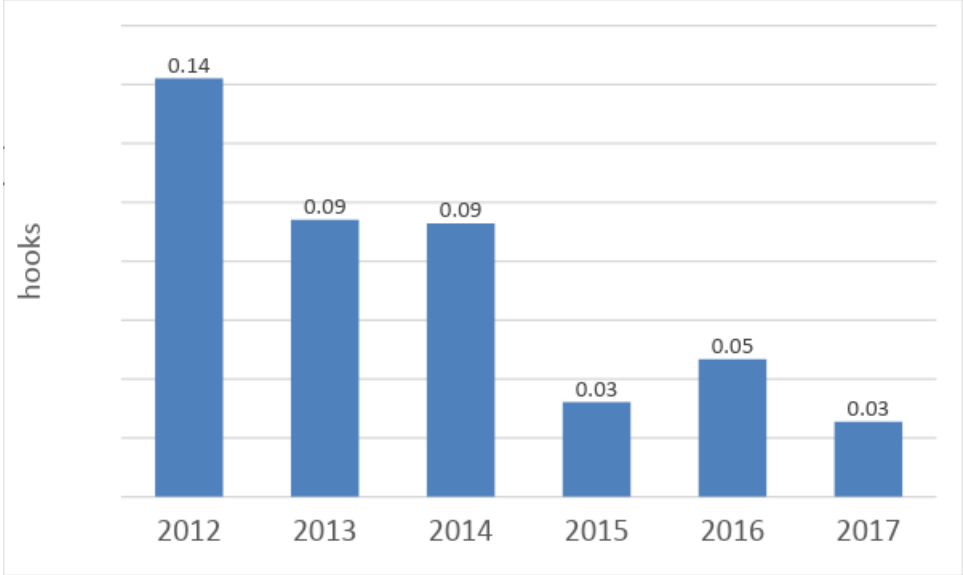

Figure 3.4 2012–2017 BFT Dead Discards per 1,000 Hooks for All Areas

Source: Observer data on the number of dead discards, and logbook data on fishing effort.

Table 3.6 Observed BFT Dead Discards† and Extrapolated Numbers of Dead BFT Discards Based on Observed Dead Discards and Self-Reported Effort‡

Year	Number of Dead Discards during Observed Trips	Number of sets Observed	Extrapolated Number of Dead Discards
2012	131	945	1,110
2013	105	1,474	684
2014	115	1,230	649
2015	25	1,142	184
2016	41	1,229	225
2017	13	903	93

† During observed trips.
‡ Based on observer and logbook data.
Sources: 2017 SAFE Report (number of sets observed 2012–2014 within non-experimental fishing); Observer Program (2015-2017).

Table 3.7 2012–2018 Number of Active Vessels Reporting BFT Dead Discards

Year	Number Vessels Reporting BFT Dead Discards	Number Active Vessels	Percent of Active Vessels Reporting BFT Dead Discards
2012	39	122	32%
2013	34	115	30%
2014	30	110	27%
2015	16	104	15%
2016	29	85	34%
2017	15	88	17%
2018	16	76	21%

Source: Logbook data. "Active" defined as reporting use of pelagic longline gear.

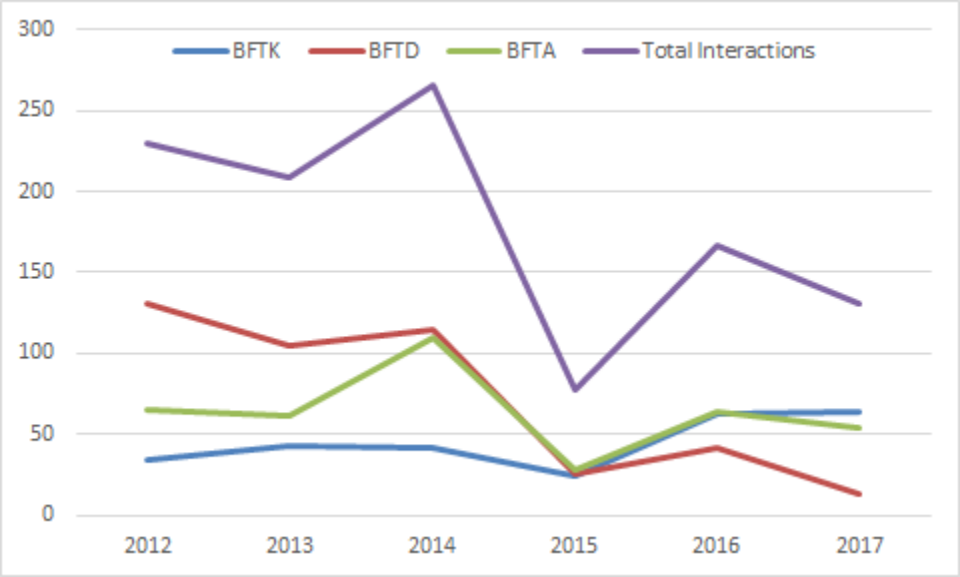

Figure 3.5 2012–2017 Interactions on Observed Trips

Bluefin kept (BFTK), bluefin discarded dead (BFTD), bluefin discarded alive (BFTA).
Source: Observer data.

3.2 Objective 2: Incentives for the Vessel Owner and Operator to Avoid Bluefin Tuna Interactions

The complete objective is, "Provide strong incentives for the vessel owner and operator to avoid bluefin interactions, and reduce bluefin dead discards." The incentives to avoid bluefin interactions result from the combination of requirements associated with the IBQ Program including individual allocations of bluefin, accountability for bluefin catch, restrictions on fishing ability if IBQ Program provisions are not satisfied, VMS reporting, and EM. Because incentives are behavioral, describing or quantifying a particular incentive is challenging. NMFS relied upon metrics to quantify adherence to the regulatory incentives, and changes in the fishery that are likely evidence of such incentives. For example, the substantial reduction in total catch of bluefin described above is evidence of the effectiveness of the regulatory incentives inherent in the IBQ Program as a whole. The decline in the percentage of active vessels landing bluefin provides evidence of these incentives to avoid bluefin, despite the flexibility to retain bluefin under the IBQ Program regulations and the availability of quota for most vessels (via allocations and/or leasing). The metrics described below provide additional evidence of the strong incentives for the vessel owner and operator to avoid bluefin interactions and reduce bluefin dead discards.

Accountability Incentives

The specific regulations most closely linked to incentives to avoid bluefin interactions are the IBQ Program catch accounting requirements. All bluefin retained or discarded dead must be accounted for, and an initial, limited amount of quota is allocated to the IBQ Program consistent with the Longline category quota, as adjusted. Dealers and pelagic longline participants are legally required (incentivized) to report electronically via the IBQ system. Atlantic tuna dealers were compliant in entering bluefin landings data into the IBQ system, in coordination with vessel operators that must provide confirmation to complete a landing transaction (based on comparisons of the Standard Atlantic Fishery Information System (SAFIS) dealer data and IBQ system data). Bluefin electronic IBQ system landings data corresponded closely with dealer data after implementation. Missing data from either data source were subsequently added to correct the omissions. In contrast, data regarding bluefin dead discards were rarely entered by the dealer into the IBQ system (as required), but were reported by the vessel operator via VMS. NMFS staff subsequently entered these data into the IBQ system to account for the dead discards (specific to a particular vessel account). In order to correct the lack of bluefin dead discard data being entered in the IBQ system, during 2018, NMFS linked the VMS database to the IBQ database and developed the software necessary to implement automated accounting in the IBQ system for dead discards reported via VMS.

The total IBQ allocations are shown in Table 3.8. Specific allocations by year and IBQ tier are shown in Table 6.5, Table 6.6, Table 6.7, and Table 6.8, in Appendix 6.2. In 2015 and 2016, inseason quota transfers from the Reserve to the Longline category were distributed as IBQ allocation only (and equally) to eligible IBQ shareholders. In 2017, inseason quota transfers from the Reserve to the Longline category were distributed as IBQ allocation only (and equally) to active vessels (i.e., vessels with pelagic longline fishing activity between 1/1/16 and 2/22/17), whether shareholders or not based on the Amendment 7 IBQ share qualification criteria, 136 vessels were eligible for a share, which, once assigned, became associated with the relevant permit. The number of vessels assigned high, medium, and low shares was 43, 62, and 31 respectively. Throughout each year, vessels depleted their available IBQ allocation (due to accounting for their bluefin catch and/or leasing), and the number of shareholders with a positive balance of IBQ allocation in their accounts declined (Figure 3.6). From January through December the number of vessels with IBQ allocation

available declined by 15 percent and 18 percent, during 2016 and 2017, respectively. Figure 3.7 shows the change in the distribution of IBQ allocation balances among vessels over the course of 2017. In contrast to the vessels that had little or no IBQ allocation, approximately 45 percent of vessels had an IBQ allocation balance of at least two bluefin at the end of the year (including both Atlantic and Gulf of Mexico fish, and accounting for the different standardized weights of 276 lb. and 551 lb. for Atlantic and Gulf of Mexico fish, respectively).

The costs associated with the requirement to account for bluefin with IBQ allocation resulted from the limited allocations of bluefin (based on the available Longline category quota) and the need for many vessels to lease IBQ allocation in order to account for their bluefin catch and/or satisfy the minimum IBQ allocation requirements before departing on a fishing trip. Some vessel owner/operators were risk averse, and modified their fishing behavior to reduce the likelihood of catching bluefin. Some vessels reduced the number of fishing trips, or modified the location of trips, to avoid bluefin tuna bycatch and in the process also reduced their target catch to some degree.

A summary of the numbers of lease transactions, numbers of participants, and the number of pounds leased is shown in Table 3.9. The percent of active vessels that leased IBQ were 42 percent, 74 percent, and 60 percent, during 2015, 2016, and 2017, respectively (Table 3.9). Costs associated with IBQ allocation leasing are one of the drivers of the incentives to avoid bluefin. The costs and the strength of the incentive to avoid bluefin were variable among vessels in the pelagic longline fleet and depended upon the amount of bluefin quota allocation available to a vessel and the price and availability of quota for leasing. Despite the variability of the fleet and of the precise impacts of the IBQ Program on individual vessels, a strong incentive to reduce bluefin interactions across the fleet remains. The average cost of a lease transaction as a percent of the average revenue per trip was 34, 13, and 10 percent during 2015, 2016, and 2017, respectively (Table 3.14). Because this calculation is based on the average revenue *per trip*, it likely represents an overestimate of the relative cost of leasing, because vessels did not need to lease for each trip. On the whole, vessels leased quota on an intermittent and infrequent basis, and not for each trip. This downward trend in the cost of lease transactions was associated with a decline in the weighted average price per pound of a lease ($3.46, $2.52, and $1.67, during 2015, 2016, and 2017, respectively; Table 3.14).

The number of lease transactions varied seasonally, with the greatest number of leases occurring during the months of January, June, and July for 2016 and 2017, and during December for 2015 (Figure 3.12). The seasonality of the IBQ allocation leases primarily reflects the seasonality of bluefin catch, but also reflects the method of IBQ catch accountability, especially during 2015, as discussed below under the topic of IBQ accountability (Evaluation of IBQ Program Components).

The share amount (tier) of IBQ mattered, as evidenced by the relationship between the quota shares and the amount of leasing, landings and quota debt, shown in Figure 3.8, Figure 3.9, Figure 3.10, and Figure 3.11. Of the IBQ shareholders actively fishing, the medium and high tier shareholders' vessels landed the majority of the bluefin, with the high tier increasing in the percentage of total pelagic longline bluefin landings it landed during 2017. In each of the years of the IBQ Program, the medium tier had the greatest percentage of the total quota debt accumulated in a given year. The medium tier also tended to land the highest percentage of its quota allocation. Lessees in the medium tier had the largest percentage of the total IBQ allocation leased (by weight) during 2015 and 2016, and lessees in the high tier had the largest percent of leases in 2017.

Monitoring and Reporting Incentives

Closely linked to the functioning of the IBQ Program and the associated incentives, are the reporting and monitoring requirements, including VMS reporting, EM, and IBQ accounting. These reporting and monitoring requirements were implemented by Amendment 7 to support the IBQ Program. The successful compliance of the majority of vessel operators with these requirements supported the achievement of the IBQ Program objective to provide incentives to avoid bluefin interactions and reduce dead discards.

VMS Reporting Incentives

Pelagic longline vessel operators were required to comply with the regulations regarding VMS set reports, which included various data elements that are comparable to other data sources. VMS data received by NMFS in real-time enable timely quota management. Comparison of VMS data to both logbook and dealer data indicated that compliance for several metrics improved from 2015 to 2017. Table 6.29, Appendix 6.7, compares the number of vessels fishing with pelagic longline gear (based on logbook data) to the number of vessels submitting VMS bluefin set reports, on an annual basis. In 2015, the number of vessels submitting VMS reports was notably lower than the number of vessels using pelagic longline gear; however, there was little discrepancy between the two data sources during 2016 and 2017. Comparisons of the total number of sets per month (logbook data) to the number of VMS set reports (a proxy for number of sets), showed that the VMS data tended to under-report the number of sets, but the discrepancy reduced substantially from 2015 to 2017 (Figure 6.53, Figure 6.54, Figure 6.55, Table 6.30, Appendix 6.7). Comparison of VMS set reports on the number of bluefin retained to dealer data on the number of bluefin landed (by month and year) are shown in Figure 6.56, Figure 6.57, and Figure 6.58, Appendix 6.7. The two data sources were a close match on a monthly basis, with the exception of 2015, the first year of the VMS reporting requirement.

Compared on an annual level, the total numbers of retained bluefin reported via VMS are less than the numbers reported in logbooks, which are in turn, less than the numbers of bluefin reported landed by dealers (Table 6.31, and Appendix 6.7). The VMS data regarding percentage of sets with bluefin interactions corresponds generally to the EM and observer bluefin interaction data, but the VMS data shows slightly lower percentages of sets with bluefin interactions (Table 3.18).

NMFS was able to effectively monitor and manage the NED set-aside quota inseason during 2015 and 2016 in part due to the real-time VMS data NMFS received. The data on the number and size of bluefin retained and discarded, as well as the area where the bluefin were caught enabled NMFS to communicate with the fleet when the NED set-aside quota was reached and when IBQ allocation would be required to account for bluefin catch. Also important to the monitoring of the NED set-aside quota was the prompt reporting of bluefin purchased by dealers.

Logbook Reporting Incentives

The IBQ Program and the Cape Hatteras GRA likely had a beneficial effect on logbook reporting. The number of vessels not qualified to fish in the GRA due to compliance scores (logbook or observer metrics), declined since 2015 (Figure 6.59, Appendix 6.8). The timeliness of logbook submissions improved over time. The average number of days from the vessel offload of catch to NMFS' opening the mailed logbook went from 28 days, to 25, to 23, to 21 (for the relevant three-year data ranges associated with the GRAs during 2015, 2016, 2017, and 2018, respectively). The regulations require the owner or operator of the vessel to submit the logbook postmarked within 7 days of offloading Atlantic HMS (50 CFR § 635.5(a)(1)).

IBQ System Reporting Incentives

Data on bluefin landings were successfully entered into the IBQ system by purchasing dealers, in coordination with the vessel operators. Bluefin landings data from the IBQ system was compared monthly to the dealer data and there was very close correspondence. Missing data from either data source was subsequently added to correct the omissions. In contrast, data regarding bluefin dead discards was rarely entered by the dealer into the IBQ system (as required), but was reported by the vessel operator via VMS. NMFS staff subsequently entered this data into the IBQ system to account for the dead discards (specific to a particular vessel account). During 2018, NMFS successfully linked the VMS database to the IBQ database and developed the software necessary to implement automated accounting in the IBQ system. This allows bluefin dead discards reported via VMS to automatically be accounted for in the IBQ system. This was the original design of the system, however, it took a few years to work through the IT systems to bring it to fruition.

Electronic Monitoring (EM) Incentives

Overview

The objective of the EM Program is verification of the species identification and counts of bluefin reported by the vessel operator. Operators were made aware that self-reported logbook and VMS set data would be compared to EM data. A NMFS contractor audits between approximately four and fifteen percent of pelagic longline sets, but the fact that vessels are required to record all pelagic longline hauls and do not know which of the recorded hauls will be audited results in strong incentives for accurate reporting by the vessel operator. Based on the data, the EM Program was able to verify the counts and identification of bluefin reported by vessel operators, with the exception of during the first phase of program implementation during 2015. The principal verification of vessel reported bluefin was through comparison of EM and VMS data. Installation of EM systems on vessels, funded by NMFS and installed by NMFS contractors under the provisions in Amendment 7, was very successful, resulting in operational EM systems that met all system requirements. Vessel operators were also cooperative in mailing hard drives to approved NMFS contractors for analysis at the end of trips and communicating with NMFS and the contractor to troubleshoot and maintain systems. Upon request by vessel operators, under certain circumstances NMFS authorized vessels to fish despite the fact that the vessels' EM systems were not fully functional (i.e., grant a "waiver" to individual vessels to allow them to fish). Waivers were intended to provide a case-by-case means to prevent situations where the EM requirements would result in a vessel being prevented from fishing due to circumstances beyond their control. Considerations in granting a waiver included whether or not the vessel operator reported the EM operational issue to NMFS or its contractor, vessel operator efforts to troubleshoot the EM system, level of functionality of the EM system, past level of compliance with the EM regulations, and other factors intended to evaluate factors relevant to the status of the EM System. Although some vessels experienced delayed trip departures because of the need to fix EM systems, or request NMFS permission for a waiver to fish (23 vessels, making 30 trips from 2015 to 2017), no vessels were required to cancel a planned fishing trip, or cut a fishing trip short as a result of non-functional/non-compliant EM systems. The most substantial logistical constraint was hard drives that were mailed late or not mailed in at all.

Ten vessels (of the total of 113 vessels with EM systems) had third cameras installed. Eight of those vessels haul their gear back on both sides of the vessel, and therefore needed a third camera to record both haul back stations. Two of the vessels with third cameras had deck configurations that required the installation of a third camera to adequately capture the gear hauling locations on a single side of the vessel. The ability of the NMFS contractor to successfully review videos improved

over time ("success rate"; Table 6.34; Appendix 6.9), and the trend in the number of weekly troubleshooting events declined (Figure 6.66).

Data Comparisons: EM versus VMS

Because bluefin interactions occurring in EM video selected for audit were a relatively rare event, the results of the data analysis are sensitive to the scale of the analysis and amount of data in the analysis. Comparing different sources of data on a set-by-set basis yields different results than looking at the overall frequency of bluefin interactions, or at the level of an audit period (3-month period). An audit period refers to an aspect of the design of the analytical aspect of the EM Program, the specified time period from which designated vessels and sets are selected for audit. For each 3-month audit period vessels and sets are selected for audit based on a specific sampling design and protocol. Comparisons of EM to VMS data are compared during each audit period. For example, there was strong agreement when comparing the ratios of the number of sets with bluefin interactions to the total number of sets (comparing EM data to VMS data to observer data). In 2017, 10 percent of the observed sets had bluefin interactions and 10 percent of the audited EM sets had bluefin interactions. In 2016, 7 percent of the VMS reported sets had bluefin interactions and 7 percent of the audited EM sets had bluefin interactions (Table 3.18).

In contrast, results of EM to VMS data comparisons regarding bluefin on a set-by-set basis are highly variable and depend on exactly how the bluefin data is compared to the VMS data (e.g., presence or absence of bluefin, total numbers, or numbers of bluefin by disposition). Additional data and discussion of the EM data is contained in Appendix 6.9.

Based on the comparison of the data, the dynamics of hauling longline gear, the expertise of the EM reviewers, and anecdotal information from other EM programs, it is very likely that the rate of detection of discarded bluefin by the EM system underestimates actual discards, whereas the detection of retained bluefin is more accurate. An analysis comparing observer data to EM data is pending. Data collected in the Hawaiian pelagic longline fishery indicated that mounting cameras on a boom[1] enabled a higher rate of detection of discarded fish than a camera mounted in the same plane as the vessel rail, or just inboard of the vessel rail. Therefore, consideration should be given to the feasibility of modifying the position of rail cameras in the Atlantic pelagic longline fleet. This information was not available at the time Amendment 7 was implemented.

Discussion and Performance Indicators for this Objective

Limits on the amount of IBQ allocation available to vessels, as well as on quota in the Longline category, and individual vessel accountability for bluefin catch (and tools to enforce accountability such as EM), serve as continuing incentives to avoid or reduce bluefin interactions. The fact that a few vessels at times landed substantial numbers of bluefin instead of discarding or avoiding them reflects two important aspects of the fishery under the IBQ Program:

1. Vessel operators react to the incentives to avoid bluefin by balancing the costs and benefits of avoiding, discarding, or retaining bluefin.
2. Bluefin inevitably co-mingle with the predominant species retained (i.e., swordfish, yellowfin and bigeye tunas, mahi), and are not always avoidable.

[1] In order to obtain a view of the vessel rail area from the perspective of 2 or 3 feet outboard of the rail.

The incentives of the IBQ Program work in the context of the rules of the IBQ Program and the other rules applicable to pelagic longline vessels. As a whole, the incentives and restrictions have worked to constrain bluefin catch, yet allowed flexibility in order to meet the other objectives of the IBQ Program and the 2006 Consolidated HMS FMP, as amended. An appropriate performance indicator for this objective is the amount of total catch of bluefin by pelagic longline vessels (specifically the Longline category bluefin quota).

Analyzing the amount of bluefin catch at the level of an individual vessel, as well as the distribution of catch among vessels may be considered as a way to evaluate IBQ Program incentives, but it is difficult to draw conclusions from such analyses. It is difficult to draw conclusions from the distribution of catch (among vessels) due to the variability of bluefin distribution, the diversity of the fleet, as well as the variability of IBQ shares. The diversity of the fleet means that vessel operators react differently (fishery aspect number 1 above), and the variability of bluefin distribution means that the presence or absence of bluefin with the target species will be variable (fishery aspect number 2 above). For example, it is difficult to infer precisely how the IBQ Program incentives are working based on whether five percent of the fleet catches the majority of bluefin (i.e., unequal distribution of bluefin catch across the fleet), or based on a more even distribution of catch across the fleet. The different catch distribution patterns may have resulted from different patterns of bluefin distribution, and may not reflect the effectiveness of the IBQ Program incentives. If a few vessels catch most of the bluefin, is the conclusion that the regulatory incentives are working, because most vessels catch little or no bluefin, or does that mean the incentives are not working because a few vessels catch a lot of bluefin? Evaluation of the total level of bluefin catch in relation to the quota is a better indicator.

A secondary performance indicator is reporting compliance and accuracy. Quantifying reporting compliance and accuracy should be done as a performance indicator, if practicable, and evaluated to take into account past levels of compliance and accuracy and in the context of other applicable reporting requirements.

Allocations and IBQ Indicators

The IBQ allocation data and indicators in this section are provided as reference information to understand the pelagic longline allocations in the larger context of the Longline category quota and the U.S. bluefin quota, as performance indicators regarding bluefin bycatch by pelagic longline vessels, and for the purpose of analyzing the IBQ share tiers and understanding the functioning of the IBQ Program.

For example, the amount of IBQ allocated annually or the amount of quota transferred from the Reserve category into the Longline category annually provide relevant context in order to evaluate the leasing market. As discussed further below, there are nuances with respect to evaluating the sufficiency of the amounts of quota distributed through the IBQ Program. The question of whether the total Longline category quota was sufficient to account for total bluefin catch is a different question than whether a particular vessel owner was allocated sufficient IBQ to account for bluefin caught by their vessels (or provide for anticipated future bluefin catch or provide enough to lease to other vessels). Other data are included in support of questions pertaining to whether there were meaningful differences in activity by share tiers (low, medium, or high). For example, were there differences among vessels' ability to account for bluefin catch or lease IBQ allocation based on IBQ share tier (low, medium, or high), or were the magnitude of the different IBQ allocations among tiers not very important (does "your" tier matter?)?

Table 3.8 below shows the total amount of allocation by year, with the relevant components. Table 6.5, Table 6.6, Table 6.7, and Table 6.8 in Appendix 6.2 provide information on the IBQ allocations to individual vessels by shareholder tier (high, medium, and low).

Table 3.8 Annual Quota Available to the Longline Category

Source of Quota	2015	2016	2017	2018
Annual distribution to shareholders (January 1)(mt)	137.3	148.3	148.3	148.3
Transfer from reserve category (mt)(date of transfer)	34.0 (July 28)	34.0 (January 4)	45.0 (March 2)	44.5 (April 13)
ICCAT baseline quota increase (mt)	11.0 (August 28)	N/A	N/A	15.3 (October 5)
Total quota (mt)	182.3	182.3	193.3	208.1
Total catch (mt)(excluding NED)	63.5	92.7	87.7	98.6

N/A=Not applicable.

The amount of quota allocated to vessels overall was sufficient to account for bluefin bycatch by the pelagic longline fleet each year. The total catches for 2015, 2016, 2017, and 2018 (63.5 mt, 92.7 mt, 87.7 mt, and 98.6 mt, respectively, excluding the NED) were less than the total IBQ allocations each year (182.3 mt, 182.3 mt, 193.3 mt, 208.1 mt, respectively). The fact that more quota was available to the Longline category than needed to account for actual bluefin catch, contributed to the effective functioning of the IBQ leasing market. Those with IBQ allocation available were hesitant to lease IBQ allocation to other permit holders because of the potential need to account for their own catch of bluefin. Therefore, relatively higher amounts of allocation to shareholders, or to active pelagic longline vessels in the case of the 2017 inseason transfer, and in total, facilitated the leasing market by reducing the risk to a shareholder of running out of IBQ allocation later in the year. This could be thought of as an incentive to lease IBQ allocation and facilitate a successful IBQ leasing market. One vessel owner who purchased an Atlantic Tunas Longline permit associated with a high tier quota share estimated the value of the IBQ eligibility at $15,000, based on the price he paid for the permit and his market research regarding the value of a permit.

This section contains data on IBQ Program metrics, including IBQ balances and analysis of landings, IBQ allocation use, and leasing by IBQ share tier. This discussion uses the term “balances” in a manner analogous to a bank account balance, to express the concept that IBQ system accounts track vessel usage of IBQ allocation, which may be depleted over time. The use of IBQ allocation over time was tracked by looking at the number of vessels with varying amount of IBQ allocation, expressed as numbers of bluefin tuna. Numbers of bluefin are used instead of pounds in order to standardize comparisons. There were required minimum balances of IBQ allocation in order to fish, which were different in the Atlantic and Gulf of Mexico. Figure 3.6 below shows 2017 and 2018 data on the number of vessels with IBQ allocation (at least one bluefin equivalent of IBQ; 551 lb. of Gulf of Mexico IBQ or 276 lb. of Atlantic IBQ) over the course of the year. For example, in January 2017, at the start of the year, 124 vessels had at least the equivalent of one fish in IBQ allocation (a one fish-equivalent was the amount needed to depart on a fishing trip), whereas by December 2017, only 106 vessels had the equivalent of one bluefin in allocation remaining. Note, Figure 3.6 shows the number of vessels that had *at least one* bluefin, and most had *more than one* bluefin in their accounts, but this graph does not provide any detail on how many bluefin equivalents each account had and instead portrays the depletion of accounts over time. Looked at another way, it displays how many vessels used “all” their IBQ allocation. Over the course of 2017, 15 percent of the vessels

depleted their IBQ allocations. During 2018, fewer vessels had a balance of at least one bluefin-equivalent of IBQ allocation in any given month (January-July) than during 2017. For example at the end of July, 114 and 91 vessels had the IBQ allocation equivalent of at least one bluefin in 2017 and 2018, respectively.

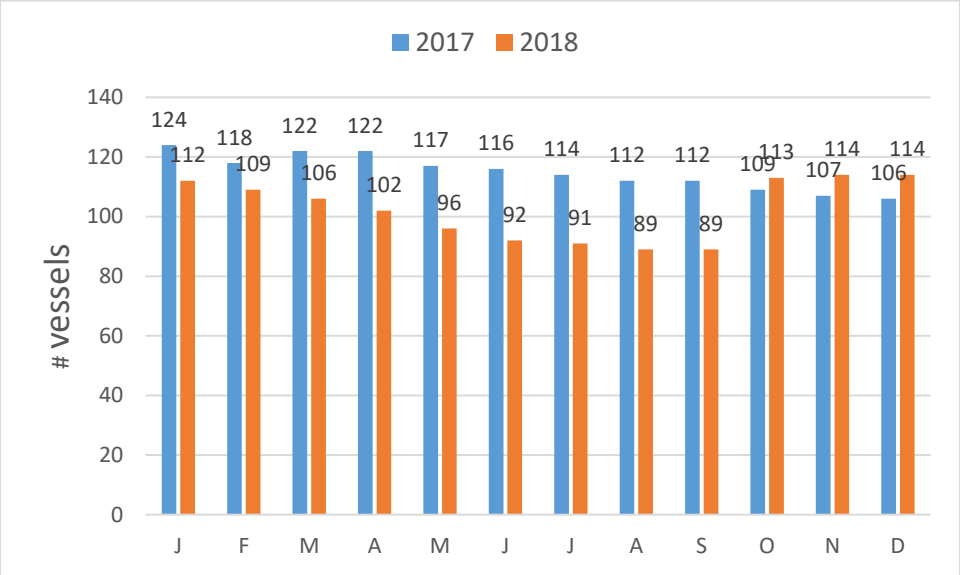

Figure 3.6 2017 and 2018 IBQ Balances

Expressed as number of vessels with at least one bluefin equivalent of IBQ allocation by month.
Source: IBQ System data.

Figure 3.7 below also explores the use of IBQ allocation over time, but in contrast to Figure 3.6, provides more information on precisely how much IBQ is in each account (i.e., many bluefin equivalents). The different colors represent the amount of IBQ allocation (expressed in the number of bluefin) that vessels had at various times during the year (e.g., the orange bar represents 4 bluefin). The height of the bar represents the number of vessels that had that particular number of bluefin. For example, at the start of the year ("annual" on the X-axis), 35 vessels had a balance of four bluefin, whereas on December 21, only 21 vessels had a balance of four bluefin. At the start of the year, all shareholders had enough IBQ allocation to account for one or more bluefin and most had enough IBQ allocation to account for four bluefin. By late December, most had enough to account for one or more bluefin.

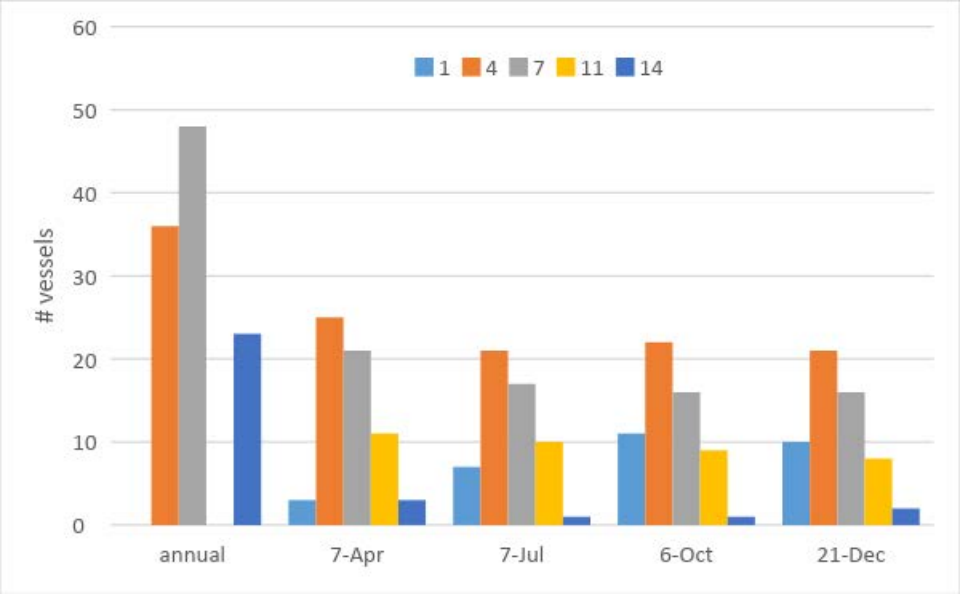

Figure 3.7 2017 Vessel IBQ Balances Over Time

Expressed as number of BFT (based on equivalent weights).
Source: IBQ System data.

Figure 3.8 shows the distribution of bluefin landings (by weight) among the IBQ share tiers by year. During 2015, 2016, and 2017, the medium and high tier vessels landed the majority of the bluefin, with the high tier increasing in the percentage it landed during 2017.

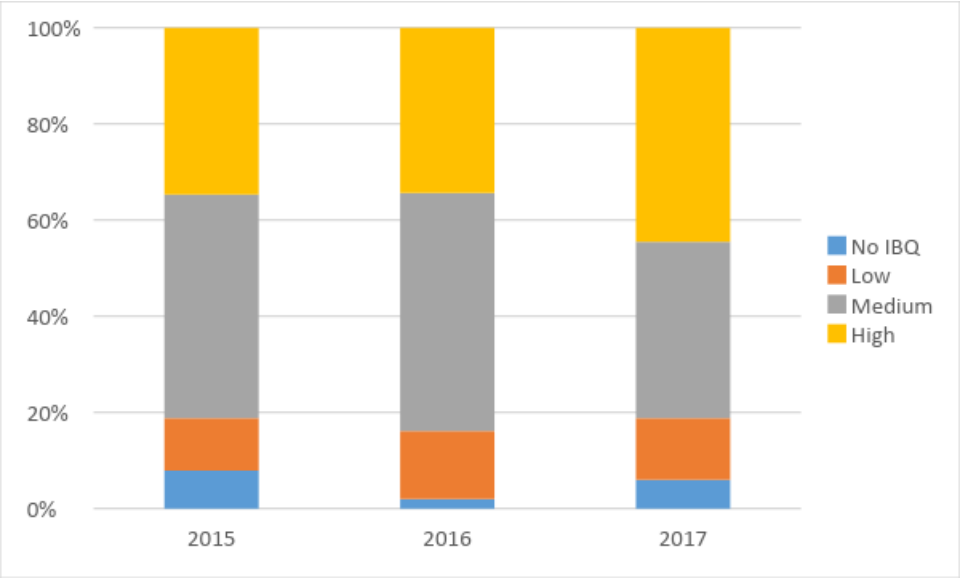

Figure 3.8 2015–2017 Percent of Total PLL BFT Landed by Quota Share Tier (High, Medium, Low, No IBQ)

Source: IBQ System data.

The percent of total year-end quota debt by tier below in Figure 3.9. Quota debt is a negative balance of IBQ allocation incurred when a vessel does not have enough IBQ allocation to account for the amount of bluefin they caught, whether retained or discarded dead. The graph in Figure 3.9 shows the cumulative total amounts of quota debt by tier. Quota debts were reconciled by the end of the year. In each of the years of the IBQ period, the medium tier had the greatest percentage of the total quota debt. The medium and high tiers had very similar numbers of active vessels, with 36 vessels in the high tier and 41 vessels in the medium tier during 2015, 32 high and 33 medium in 2016, and 34 high and 35 medium during 2017. The number of active vessels with low tier shares was 22, 18, and 18 during 2015, 2016, and 2017, respectively, and the number of active vessels that were not shareholders in total was 5, 3, and 4 during 2015, 2016, and 2017, respectively.

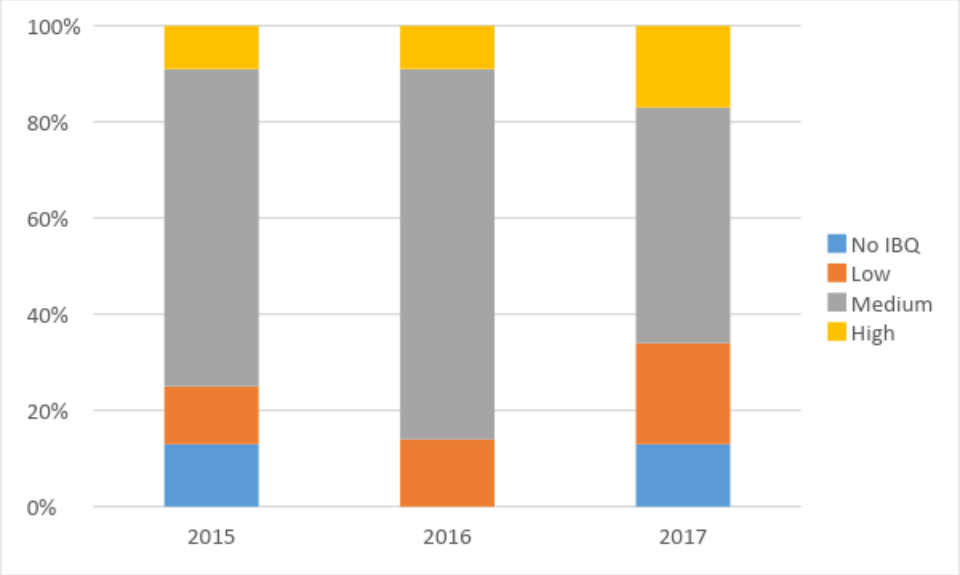

Figure 3.9 2015–2017 Percent of Total Quota Debt by Quota Share Tier (By Weight)

Source: IBQ System data.

Figure 3.10 categorizes bluefin landings by shareholder tier, as an intermediate way to look at landings (not from the perspective of all vessels or individual vessels, but by comparing groups of vessels depending upon which share tier is associated with the permit). Figure 3.10 illustrates each tier's landings as a percentage of the total amount of quota allocated to the tier. For example, in 2016, in the medium tier, shareholders cumulatively used approximately 47 percent of the total amount of IBQ allocated to the tier. The medium tier tended to land the highest percentage of total quota available.

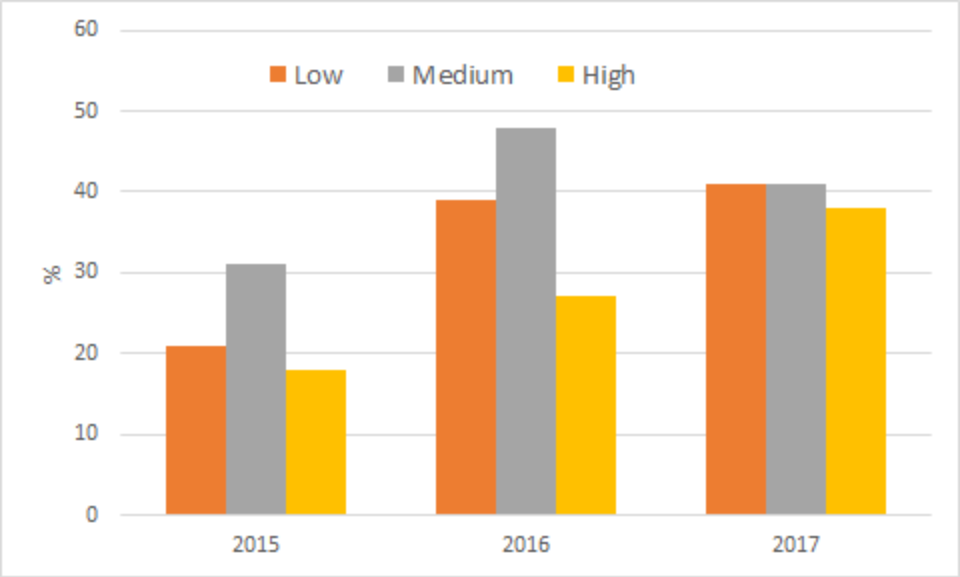

Figure 3.10 2015–2017 Percent of Quota Share Tier IBQ Landed

Source: IBQ System data.

Table 3.9 contains a summary of data regarding IBQ leasing, including the total pounds leased, number of leasing transactions, number of participants, and the percent of active vessels leasing IBQ. The number of lease transactions increased annually, with the number of lease participants and percentage of active vessels leasing increasing from 2015 to 2016 and then decreasing slightly in 2017, and then increasing in 2018.

Table 3.9 Summary Data on IBQ Leases by Year

Year	Total Allocation Leased (lb.)	Number of Transactions	Number of Participants (lessors and lessees)	Percent of Active Vessels Leasing (%)
2015	126,407	49	44	42
2016	141,183	81	63	74
2017	152,050	85	52	60
2018	170,160	83	55	75

Source: IBQ System data.

The percent of total leases (calculated by weight) per tier is shown in Figure 3.11. The majority of the vessels leasing quota for use (lessees) during 2015 and 2016 were in the medium tier, while the majority of leases during 2017 were by high tier vessels. The annual pattern in leasing reflects the annual pattern in the distribution of both bluefin landings and quota debt. In other words, as might be expected, high amounts of leased IBQ allocation were associated with high amounts of bluefin landings and quota debt.

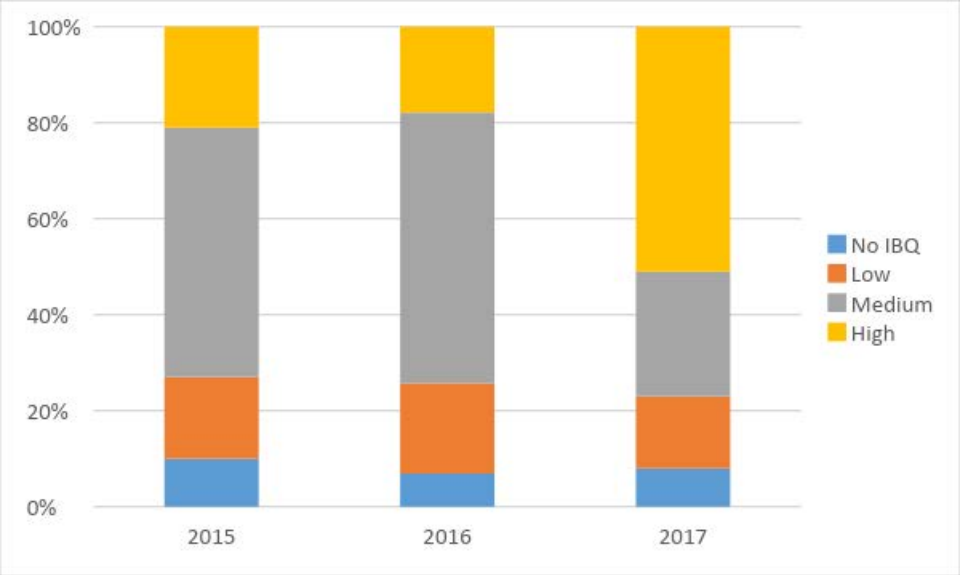

Figure 3.11 2015–2017 Percent of Total Leases by Lessees by Tier (Calculated by Weight)

Source: IBQ System data.

Table 3.10 shows the amounts of IBQ allocation leased by tier, according to the IBQ share tier of the Lessee (recipient of the leased IBQ allocation).

Table 3.10 2015–2017 Pounds IBQ Allocation Leased by Tier

	2015	2016	2017
High	14,749	25,338	74,162
Medium	36,875	79,789	38,216
Low	12,283	26,703	21,772
No IBQ	7,056	9,353	11,900

Source: IBQ System data.

Table 3.11 contains the average number of days from the accrual of quota debt to "payment" of quota debt during 2015 through 2017. The data show a trend downward in number of days to pay back debt, reflecting changes in regulations regarding timing of when vessels were required to pay back quota debt. In 2015, vessels were not required to resolve quota debt in order to fish. During 2016 to 2017, vessels needed a positive balance of IBQ allocation (one fish) in order to fish with pelagic longline gear.

Table 3.11 2015–2018 Duration of Quota Debt

Year	Accountability Rule	Average Number of Days from Accrual of Quota Debt to Paying of Quota Debt
2015	Annual	196 days
2016	Trip-level	25 days
2017	Trip-level	23 days*
2018	Quarterly	27 days

*Removing the two data outliers during 2017 (244 days and 101 days), the average duration is 9 days. 2018 data as of July 12, 2018.
Source: IBQ System data.

End of Year Quota Debt

With one exception, vessels were able to resolve quota debt by the end of each year, and avoid the situation where quota debt was carried from one year into the next (and, for shareholders, affecting the subsequent year's annual IBQ allocation). During 2015 (annual accountability), there was no end of year quota debt; during 2016 (trip-level accountability), there was no end of year quota debt; and during 2017 (trip-level accountability), there was one vessel that had quota debt at the end of the year (1,775 lb., which was paid off on January 1, 2018, when the shareholder was allocated 2018 quota).

2018: Quarterly Accountability

At the end of the first quarter under quarterly accountability (January through March 2018), four vessels had quota debt, which carried over into the beginning of the second quarter and delayed their ability to depart on their first trip of the second quarter until the quota debt was resolved. At the end of the second quarter under quarterly accountability (April through June 2018), one vessel carried quota debt into the beginning of the third quarter. No quota debt was carried over from the end of the third quarter into the fourth, and no quota debt was unresolved at the end of 2018.

Figure 3.12 shows the monthly pattern of IBQ allocation leasing for 2015 through 2017. Although the number of leases differed each year, the overall pattern of an increase in leases during the late spring and summer and then again in December, was consistent.

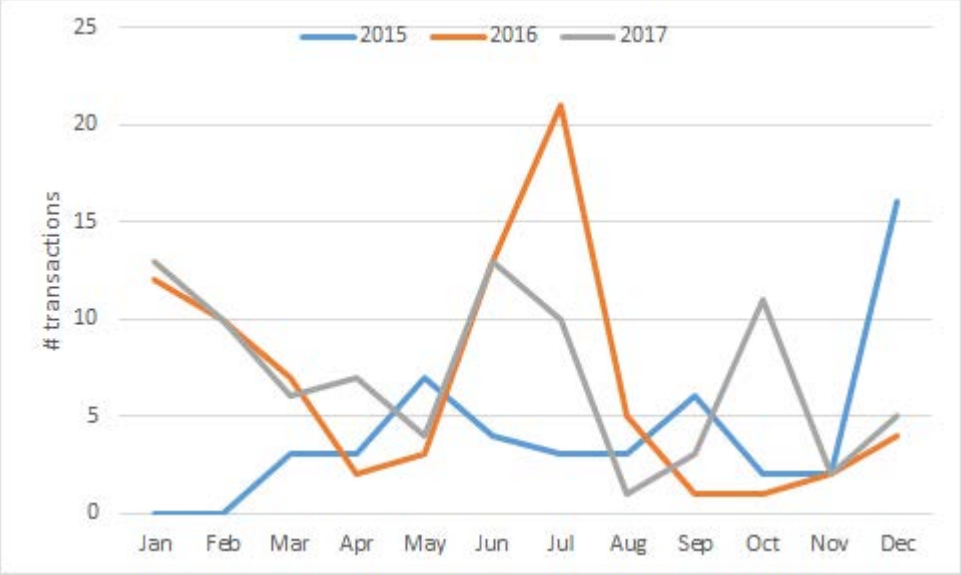

Figure 3.12 2015–2017 Number of IBQ Allocation Lease Transactions by Month

Source: IBQ System data.

Table 3.12 shows how much lessees paid to lease IBQ allocation. Specifically, it shows the weighted average price per pound of leased IBQ allocation and compares that to the average ex-vessel price of bluefin. The purpose of this data is to explore the costs and benefits of leasing IBQ allocation in order to account for bluefin. The weighted average lease price declined from 2015 to 2017 and was less than the average ex-vessel price of bluefin. It is important to note that these costs and prices are averages, and that for a portion of the fishery, due to the range of leasing costs and ex-vessel prices for bluefin, some vessels leased bluefin at a cost that exceeded the ex-vessel price. In other words, for some vessels the cost of leasing IBQ allocation exceeded the revenue derived from the

sale of bluefin (but did not exceed the trip revenue from all species). The amount of transactions used to calculate the lease price of IBQ allocation is less than the total number of lease transactions because some lease transactions were between IBQ system accounts owned by the same entity, or the lessor did not comply with the reporting requirements (i.e., did not put price information into the IBQ system when executing the lease transaction). During 2017, the IBQ system was modified so that the transaction could not be completed unless price information was put into the system by the Lessor.

Table 3.12 2015–2017 Price per Pound of Leased IBQ Allocation† and Average Ex-Vessel Price of BFT‡

Year	Weighted Average Lease Price	BFT Average Ex-Vessel Price*	Number of Transactions used to Calculated Lease Price	Total Number of Lease Transactions
2015	$3.46	$4.01	14	49
2016	$2.52	$4.08	45	81
2017	$1.67	$3.99	27	85

†Weighted average.
‡ From pelagic longline vessels.
*Round weight ex-vessel price, not including Purse Seine data; leasing price includes leases by Purse Seine category participants through the IBQ system. Lease price, not including those for which $0 or no price was entered; Less than one half of lease transactions provided data on lease price.
Source: IBQ System data.

Table 3.13 shows the estimated cost of leasing IBQ allocation fleetwide annually, based on extrapolation using the weighted average lease price and the total pounds leased, and compares that to the total pelagic longline fleet revenue annually. For example, during 2015, the estimated total cost of leasing IBQ allocation represented about two percent of the pelagic longline fleet revenue. Estimated lease cost decreased each year from 2015 to 2017, and as a percent of revenue dropped to one percent in 2017. The data in this table is useful for illustration of leasing costs fleetwide, but not for the costs to an individual vessel owner.

Table 3.13 2015–2017 Estimated total Cost of Leasing IBQ Allocation—Fleet-Wide†

Year	Total Weight Leased (lb.)	Weighted Average Lease Price	Estimated Total Cost of Leased IBQ (PLL fleet-wide)	Total PLL Revenue	Percent of PLL Revenue
2015	126,407	$3.46	$437,368	$27,203,733	2
2016	141,183	$2.52	$355,781	$25,562,061	1
2017	146,050	$1.67	$243,904	$27,053,154	1

†Based on extrapolated data. Based on average lease price, average pounds per lease, and average revenue per trip.
Source: IBQ System data; dealer data.

In contrast, Table 3.14 estimates the costs of leasing compared to revenue on a trip basis, and only includes data for vessels that leased IBQ allocation. Although this data is informative at the scale of an individual vessel, analyzing the data at the trip level may overestimate impacts, because it is likely that the IBQ allocation leases are used over many trips and therefore the cost is defrayed among many trips. The cost of a lease as a percent of trip revenue was 34 percent in 2015, 13 percent in 2016, and 10 percent in 2017. There has been a clear decreasing trend in lease costs as a percentage of trip revenue since 2015. As noted, the data in both tables 3.13 and 3.14 have

limitations regarding the relative costs of leasing. In 2017, the average revenue per vessel in 2017 was $307,422 (Figure 3.14). The calculated cost of a lease transaction was $2,988. Based on this estimate, a lease transaction equates to about one percent of a vessel's annual revenue.

To look at how the economics of vessels that leased IBQ allocation compare to the economics of vessels that did not lease, average revenue per trip was compared between the two groups of vessels. The fleetwide average revenue per trip for vessels that did not lease IBQ allocation was less than the average revenue per trip for vessels that leased IBQ allocation. For vessels that did not lease IBQ allocation, the average revenue per trip was $22,957, $24,707, and $25,322, for 2015, 2016, and 2017, respectively, compared to the vessels that leased IBQ allocation in the table below. The precise relationship, or cause and effect between leasing and revenue, is unknown.

Table 3.14 2015–2017 Cost of a Lease Transaction as a Percentage of Trip Revenue—Vessel Level

Year	Average Weight of IBQ per Lease Transaction (lb.)	Weighted Average Lease Price	Calculated Cost Per Transaction	Average Revenue per Trip per Vessel*	Cost of Lease as a Percent of Trip Revenue (%)
2015	2,580	$3.46	$8,927	$26,421	34
2016	1,743	$2.52	$4,392	$32,710	13
2017	1,789	$1.67	$2,988	$29,775	10

*For those vessels that leased IBQ.
Source: IBQ System data; dealer data.

Table 3.15 summarizes data for 2015 through 2018 to compare metrics and consider overall trends and the potential influence of quarterly accountability on the dynamics of the IBQ Program. The quota debt-to-landings ratio is intended to reflect both the need for IBQ allocation (landings) and the scarcity of IBQ quota debt. Years with a high amount of quota debt relative to the amount of bluefin landings may reflect different situations with respect to the willingness to incur quota debt.

Table 3.15 2015–2018 Catch Accountability; Comparing Metrics

	2015 Annual Accountability	2016 Trip-Level Accountability	2017 Trip-Level Accountability	2018 Quarterly Accountability
BFT landings (lb.)	102,295	150,796	173,724	185,232
Quota debt (lb.)	42,746	45,324	24,088	61,912
Leased (lb.)	126,407	141,183	152,050	170,160
Quota debt to landings ratio	0.42	0.30	0.14	0.33
Number of lease transactions	49	81	85	83
Number of distinct shareholder accounts leasing	44	63	52	55

Source: IBQ System data.

Comparing the totals among years shows that the number of shareholder accounts leasing and the number of lease transactions were remarkably similar among years, with the exception of the 2015, the first year of the Program. The other metrics were more variable among years. The amount of quota debt increased substantially in 2018, as did the quota debt-to-landings ratio. From 2017 to 2018 the amount of landings increased by 20 percent, the amount of leasing (by weight) increased by 12 percent, and the amount of quota debt increased by 157 percent. The low quota debt-to-landings ratio in 2017 (compared to 2015 and 2016) may be explained by the increase in both landings and leased IBQ.

Although it is difficult to draw definitive conclusions regarding the influence of the method of IBQ accountability on various IBQ Program metrics, it is likely that part of the large increase in the relative amount of quota debt in 2018 (quota debt-to-landings ratios of 0.33 in 2018 versus 0.14 in 2017) was due to the new accountability rules. The 2018 increase in total quota debt, and the amount of quota debt relative to total landings, can be attributed to vessels no longer having to account at the trip level (i.e., they no longer had to resolve any quota debt, and purchase more quota allocation, before each trip within the same quarter). Vessel operators may have utilized the new flexibility to delay leasing and incur quota debt. Delaying leasing may provide vessel operators the ability to accrue additional revenue with which to lease IBQ allocation as well as "shop around" for affordable IBQ allocation to lease. For owners or operators of multiple vessels, other factors may also be relevant to understanding the IBQ Program metrics. For example, such owners may move permits among vessels (or on and off vessels) to optimize IBQ allocation usage and/or avoid leasing IBQ allocation.

The EM Program and its associated requirements provide strong incentives for the vessel operator to report accurately, avoid bluefin interactions, and reduce dead discards. Video data of the longline being hauled (obtained from multiple cameras) provides a means to audit the accuracy of bluefin catch information reported by the vessel operator (and bluefin retained and discarded dead must be accounted for using IBQ allocation). The EM Program video associated with specific longline sets was selected for review (audit) based on a sampling protocol designed to select sets with a higher probability of catching bluefin (based on historical data). The sets selected for audit were grouped into three month periods (audit periods)The occurrence of bluefin from audited sets were documented, and compared to the corresponding VMS data to determine if the vessel operator reported bluefin for a particular set and analyze any differences between the VMS and EM data. Therefore, some information on the EM Program, is provided below (and some in the Appendix) to contribute to the evaluation the relevant IBQ Program objectives. If vessels are complying with the requirements of the EM Program, and the EM Program is successfully serving as an audit tool for bluefin reporting, then it can be concluded that the EM Program is contributing to the incentive to avoid bluefin interactions and reduce dead discards.

Table 3.16 shows data on the compliance with the hard drive submission requirements, specifically, the number of hard drives received late, the number of times there were multiple trips on a single hard drive, and the number of missing trips.

Table 3.16 2016–2017 Compliance with EM Hard Drive Submission Requirements

Year*	Number of Hard Drives Received	Hard Drives Received Late (<14 days) (%)	Multiple trips on one Hard Drive (%)	Missing Trips**
2016	975	29	8	50 (5%)
2017	1,020	27	4	58 (5%)

*2015 not included; first year of implementation; requirement effective June 1, 2015.
**Based on logbook data of number of trips using pelagic longline gear; 1,025 trips in 2016 and 1,078 trips in 2017.

Figure 3.13 shows the percent of audited sets which detected bluefin catch. The number of sets audited that detected bluefin catch ranged from four to 14 percent, indicating that bluefin interactions were a relatively rare event.

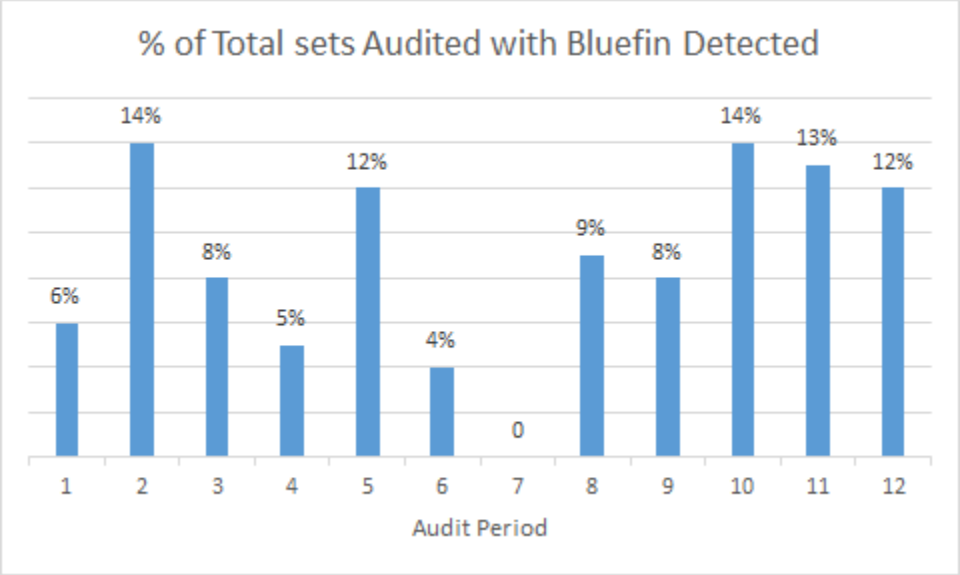

Figure 3.13 Percent of Total Sets Audited with BFT Catch Detected

Source: EM data; VMS data (total number of sets).

Table 3.17 shows the frequency of bluefin catch in pelagic longline sets based on observed trips (human observers) to serve as a point of reference for interpreting EM Program data. Specifically, the number of sets observed, the number of sets where bluefin catch was observed, and the percent of observed sets where bluefin catch was observed. The percentage of observed trips with bluefin catch was 4 percent, 9 percent, and 10 percent during 2015, 2016, and 2017, respectively.

Table 3.17 2015–2017 Frequency of BFT Catch in Observed Pelagic Longline Sets

	2015	2016	2017
Number of sets with bluefin Interactions observed	48	105	89
Total number of sets observed	1,142	1,229	903
Percent of observed sets with bluefin	4%	9%	10%

Source: Pelagic Observer Program data.

Similarly, Table 3.18 compares the overall frequency of bluefin catch between observer, EM, and VMS data. The frequency of bluefin catch is similar across various data sets thus providing a credible metric regarding the frequency of bluefin interactions. Secondly, the similarity between the EM and observer data may serve as an assessment of the accuracy of the EM data, with the observer data functioning as an independent standard against which the results of the EM audits can be measured. The discrepancy in bluefin documented between EM and observer/VMS data during 2015 is explained by the newness of the program in 2015, and the lower number of sets audited in 2015, because the program was implemented in June 2015.

A separate analysis (Table 6.38) of EM footage outside the course and scope of the scheduled vessel/hard drive audits, analyzed detection of bluefin by EM, and found that overall, dead discards were detected less frequently than retained bluefin, based on a comparison of EM data to VMS data (selected on the basis of reported bluefin). Additional data regarding the EM Program is contained in Appendix 6.9.

Table 3.18 2015–2017 Comparison of Frequency of BFT Catch: Observer, Electronic Monitoring, and VMS Data

Data Source	2015	2016	2017
Percent of observed sets with bluefin catch	4	9	10
Percent of audited sets (EM) with bluefin catch*	10	7	10
Percent of VMS set reports indicating bluefin catch	5	7	6

*Audited sets for 2015 and 2016 based on 6/15–11/15 (audit periods one and two); 3/16–11/16 (audit periods four through six).
Sources: Pelagic Observer Program data; EM and VMS data.

3.3 Objective 3: Flexibility in the IBQ System to Enable Pelagic Longline Vessels' Full Accounting for Bluefin Catch and Minimize Constraints on Fishing for Target Species

The complete objective is, "Provide flexibility in the quota system to enable pelagic longline vessels to obtain bluefin quota from other vessels with available IBQ allocation in order to enable full accounting for bluefin landings and dead discards, and minimize constraints on fishing for target species." Appropriate metrics for success of meeting this objective are metrics regarding the IBQ leasing program, including leases, quota debt, and other metrics relating to the use of IBQ allocation

to account for bluefin. The objective to provide flexibility in the IBQ system and minimize constraints on fishing for target species was achieved through multiple means focusing on IBQ allocations: IBQ leasing; inseason quota transfers for distribution as IBQ allocation; fishing while in quota debt; and modifications to the regulations. Accounting for all bluefin landings and dead discards is still required in conjunction with these flexibility tools, and flexibility in the IBQ Program does not undermine the objective of limiting the amount of bluefin landings and dead discards.

A fairly large number of vessels leased IBQ allocation and participated in the leasing market (e.g., 60 percent of active vessels in 2017; Table 3.9), and in general, quota debt did not present a persistent challenge for vessels. There were increased numbers of lease transactions from 2015 to 2017, and an overall increase in the percentage of active vessels leasing IBQ allocation (42 percent, 74 percent, and 60 percent during 2015, 2016, and 2017, respectively; Table 3.9). The weighted average price of leased IBQ allocation declined from 2015 through 2017 ($3.46, $2.52, and $1.67, respectively (Table 3.12)). During 2015, 2016, and 2017, NMFS allocated additional IBQ allocation inseason in order to achieve several short-term objectives, supporting the general objective of providing flexibility and minimizing constraints on fishing for target species:

- Help vessel owners account for bluefin landings and dead discards.
- Foster conditions in which permit holders become more willing to lease IBQ allocation to one another.
- Contribute toward full accounting of bluefin catch by vessels that have quota debt (i.e., reduce quota debt).
- Enhance the likelihood that vessel owners will make the decision to lease IBQ allocation to other vessel owners.
- Reduce uncertainty in the fishery as a whole.

Although vessels incurred quota debt (Table 6.11), vessels were able to comply with the regulations, as the rules on resolving quota debt changed (Table 3.11), and vessels did not carry quota debt from one year to the next. New entrants were able to participate in the fishery, as well as permitted vessels with no quota share, which are indications that the IBQ Program was flexible enough to allow such participation (Table 4.6). Landings and VMS-reported dead discards were fully accounted for using IBQ allocation.

Notwithstanding the participation in the leasing market, some vessel owners were hesitant or unwilling to lease quota to other vessel owners because they did not know if they would have sufficient IBQ allocation to account for any bluefin they may catch. At times, leasing to other vessel owners was perceived as relatively uncertain from a business perspective (based on conversations with vessel owners). This was one of the reasons why NMFS made inseason quota transfers s, as noted above.

During 2016, NMFS proposed and then finalized a rule modifying the IBQ regulations regarding distribution of quota allocation inseason. The rule authorized NMFS to distribute bluefin quota inseason either to *all IBQ share recipients* or *only to vessels active* in the fishery. The rule enabled optimization of quota distributions, in support of the IBQ objectives, including flexibility, because an individual vessel would be receive more IBQ allocation if the inseason quota transfer is distributed among fewer, active vessels.

As previously discussed, in 2018, NMFS implemented quarterly accountability to provide additional flexibility for active pelagic longline vessels to account for bluefin catch. . Comparison of the data

from 2018 to previous years, suggests that the implementation of quarterly accountability did affect the dynamics of the IBQ Program. In comparison to 2017, there was an increase in the average number of days from accrual of quota debt to the day the quota debt was resolved (Table 3.11) in 2018. There was also an increase for total quota debt for the January through June period, and a much larger quota debt-to-landings ratio (comparing totals for fishery, January through June, previous years to 2018) (Table 3.15). During 2018, the changes in these metrics are indicators that vessel operators took advantage of the additional flexibility enabled by quarterly accountability.

3.4 Objective 4: Balancing Bluefin Landings and Dead Discards to Optimize Fishing Opportunities and Profitability

The complete objective is, "Balance the objective of limiting bluefin landings and dead discards with the objective of optimizing fishing opportunities and maintaining profitability."

Introduction

As discussed above, during 2015, 2016, and 2017, NMFS took actions to ensure flexibility in the IBQ Program in order to support this objective (e.g., inseason IBQ allocations and regulatory changes). Flexibility should help facilitate optimizing fishing opportunities and maintaining profitability by giving vessel owners more choice in operations decisions. Indicators of success for this objective include revenue, operating income (revenue minus trip costs), fishing effort, and target catch. The standardized performance indicators of catch share programs (Table 3.27) also provide relevant indicators of success for this objective. Trends observed in the standardized performance indicators (including those relating to catch and landings, effort, and revenue) are similar to those discussed elsewhere in this document. .

Revenue

There was a reduction in the pelagic longline vessel annual total revenue from HMS species during the IBQ Program compared to the Baseline period. Total revenue during each year of the IBQ period is less than the total revenue during any year of the Baseline period. The annual total revenue from HMS species during the IBQ Program was relatively stable after implementation of the IBQ Program ($27.0 M, $25. 3 M, and $26.8 M, during 2015, 2016, and 2017, respectively (Figure 3.15). The decline in revenue reflects declining landings (SAFE Report 2018), and declining fishing effort (Table 6.17, Figure 6.12, Appendix 6.3).

Fleetwide, the average revenue per vessel was less during the IBQ period than during the Baseline period, but the average revenue per vessel increased from 2015 through 2017 (Figure 3.14). The magnitude in the difference in average revenue per vessel between the Baseline and IBQ Period depended upon which years of the Baseline period and the IBQ Period were compared. Combining all vessels, the average revenue per vessel in 2017 ($307,422) was three percent less than during 2014 ($316,055), but 22 percent less than 2012 ($392,200). During each year of the IBQ Period the average revenue per vessel was lower than during each year of the Baseline Period, although average revenue per vessel increased during the IBQ Period.

This fleet-wide calculation of revenue masks underlying trends in revenue, because the average annual revenue per vessel during the IBQ period depended upon how the revenue was summarized. Slightly different trends in revenue emerged when metrics were calculated for groups of vessels with similar characteristics (i.e., by vessel size or amount of fishing effort, expressed as hooks or sets). The differences in revenue metrics also reflect the diversity of the pelagic longline

fleet, and highlights the challenges of drawing conclusions from the data. The pelagic longline fleet is very diverse both geographically, and with respect to vessel size and annual fishing effort.

Looking at the average annual revenue per vessel based on vessels of similar size, or level of fishing effort, indicated variable reductions in revenue during the IBQ period.

The average annual revenue per vessel for each of the vessel size classes declined in 2015 with the start of the IBQ Program, with subsequent increases of varying amounts, depending upon the size category (Table 3.19). The majority (73 percent) of the revenue values during the IBQ period were less than the revenues during the Baseline period for similar vessels (Table 3.19). For several size categories, there was a positive trend in revenue during the IBQ period, with 2017 representing a high value. For vessels greater than 75 feet, there was not a positive trend during the IBQ Period, with the 2017 revenue value ranking the lowest during the time series (including the Baseline Period).

With respect to individual vessel effort, average annual revenue per vessel varied by the number of hooks set per year. For vessels that set fewer hooks, the revenue during the IBQ period remained stable or increased from one year to the next. For example, the 2017 average revenue for vessels that fished between 25,000 and 50,000 hooks ($235,122) was higher than during any year from 2012 through 2016). For vessels that fished between 50,000 and 75,000 hooks, the 2017 average revenue ($338,401) was higher than any of the previous years with the exception of 2012. In contrast, for vessels fishing greater than 75,000 hooks, during the IBQ period the average revenues were less than during the Baseline period, with the exception of one instance (in 2015, the 75,000 to 100,000 hooks effort level was slightly higher than the value during 2014). Overall, the majority of the revenue values during the IBQ period (73 percent) were less than the revenues during the Baseline period (for similar vessels).

Analyzing the average annual revenue by numbers of sets per vessel revealed that only vessels that set from between 101 and 150 sets per year had an increase in revenue in 2015, the rest declined in 2015. However, in 2016 and 2017, all but one of the ranges of fishing effort (sets) had average revenues similar to revenues during 2013 or 2014. In contrast, vessels that fished more than 150 sets per year had lower levels of revenue during the IBQ period than during the Baseline period (Table 3.21). Overall, the majority of the revenue values during the IBQ period (67 percent) were less than the revenues during the Baseline period (for similar vessels).

Costs and Operating Income

Average costs per trip increase with increasing vessel size as one would expect. Average trip costs have been declining for most vessel size categories since 2012 (Table 3.22) due primarily to a decline in fuel costs and a slight decline in the cost of bait (Table 3.26). In contrast to NMFS data, a vessel owner and operator noted in 2018 that they were facing increased costs due to the price of Argentine *Illex* squid.

In order to take into consideration costs, operating income (revenue minus trip costs) was calculated. The average trip operating income (per vessel) increased each year during the IBQ period, with the 2017 overall average ($11,984 per trip) exceeding each of the prior years (Table 3.23). The fleetwide operating income per day increased each year during the IBQ period, and was at its highest level during 2017 ($1,165 per day).

Similarly, the percent of trips where revenue exceeded operating costs increased each year during the IBQ period, and was at its highest level during 2017, when revenue exceeded operating costs on 75 percent of the trips (Table 3.25). These changes in operating costs were likely due to declining average trip costs. For all vessel size classes, there were declining average trip costs, from 15 and 23 percent (18 percent overall).

Average annual vessel operating income also showed a positive trend during the IBQ period (Table 3.24), with the 2017 values comparing favorably to years during the Baseline period. The overall average annual vessel operating income during 2017 ($144,351) was greater than all the previous years with the exception of 2012, which was similar ($147,156). When looking at the annual vessel operating income by size category, 47 percent of the annual operating income values (in Table 3.24) during the IBQ period exceeded those of the Baseline period (for similar vessels). Three size categories (<45 ft, 55–65 ft, and 65–75 ft.) had a year during the IBQ period with the highest annual vessel operating income during the time series.

Effort

The relative number of vessels that fished low numbers of sets or hooks increased during the IBQ period, compared to the Baseline period. During the IBQ period the average number of vessels fishing between 1 and 50 sets increased by 21 percent, and the average number of vessels fishing less than 25 thousand hooks increased by 13 percent (Table 6.18; Appendix 6.3). Considering total effort (as previously discussed), the long-term trend in declining fishing effort continued during the IBQ period, with less numbers of annual trips, sets, and hooks during the IBQ period than during the Baseline period. The declining trend stopped in 2016, with the numbers of trips, sets, and hooks increasing in 2017, but declined again during 2018 (with the lowest numbers of trips, sets, and hooks during the time series in 2018).

Performance Indicators for Catch Share Programs

At the national level, NMFS' Office of Science and Technology developed national performance indicators intended to provide a consistent means of measuring and comparing the performance of catch share programs (https://www.fisheries.noaa.gov/national/laws-and-policies/fisheries-management-policy-directives). These performance indicators examine catch and landings, effort, and revenues (Table 3.27). Aggregate landings of bluefin have decreased dramatically from a high at the start of the Baseline period in 2012 (651,246 pounds) to a low in 2015 (the start of the IBQ period) of 102,294 pounds, and it increased again to 173,724 pounds in 2017. From 2012 to 2014, the aggregate landings of bluefin consistently exceeded the bluefin quota allocated to the Longline category (although the quota was lower then). With the implementation of the IBQ Program in 2015 and the increased category quota under Amendment 7 (and because of an increase in quota at ICCAT), the aggregate landing were well within the bluefin quota allocated to the Longline category.

Over the 2012 to 2017 period, effort has declined consistently each year from a high in 2012 to a low in 2016 with a slight rebound in 2017 when measured in terms of active vessels and trips. Effort as measured by days at sea showed a similar pattern through 2016, but continued to decline in 2017. The trends in aggregate revenue for the fish caught on longline trips, excluding revenue from bluefin tuna, followed the pattern in effort trends as measured by active vessels and trips. The aggregate revenue from these trips (excluding bluefin tuna) started at a high of $45.7 million in 2012 and declined to a low of $24.6 M in 2016 with a slight rebound up to $26.0 M in 2017. Revenue from landings outside of the Atlantic Tunas longline fishery by these same vessels has exhibited the same pattern of a high of $10.3 million in 2012 and a low of $5.0 million in 2016 with a rebound up to $6.0 million in 2017. Aggregate revenue from the bluefin was also at its highest for

the period in 2012 ($1,274,491), but declined to a low of $572,930 in 2015 and has rebounded up to $815,093 in 2017. Finally, the Gini coefficient, which measures income inequality and is one of the performance metrics used to evaluate catch share programs, (see section below titled "Performance Indicators of Catch Share Programs"), indicates that there was a slight increase in the unequal distribution of revenues throughout the fleet that occurred during the period.

Landings of Non-HMS Species

Given the decline in fishing effort by pelagic longline vessels (and intermittent effort by some vessels), landings of non-HMS species was also analyzed to explore what pelagic longline vessels may have been landing during years they were not fishing with pelagic longline gear. The underlying question is, when vessels are not fishing with pelagic longline gear, are they fishing for non-HMS species, or are they not fishing at all? Landings of both HMS species and non-HMS species by active vessels (vessels fishing with pelagic longline gear at some time during the Baseline or IBQ periods; defined below in this section) decreased during the period from 2015 to 2017 (compared to the Baseline period). However, the relative proportions of non-HMS to HMS landings remained similar to the Baseline period (around 30 percent) (Figure 3.20; Figure 3.21). During the IBQ Program, vessels that are not fishing with pelagic longline gear were landing relatively more non-HMS species (Figure 3.22). In other words, during the IBQ period, inactive pelagic longline vessels are landing more non-HMS species than such vessels landed during the Baseline period. During the IBQ period, the number of active vessels landing HMS declined, while the number of inactive vessels landing non-HMS species increased compared to the Baseline period (Figure 3.24). For some vessels, the economic impacts of the IBQ Program were partially offset by landings of non-HMS species in other fisheries.

Comparison of Amendment 7 Projections and Actual Outcomes

Amendment 7 contained projections for designated species (targeted) and the resultant revenue under different quota allocation scenarios (Final Amendment 7, Table 5.24). In this discussion, the quota amounts refer to IBQ allocation, and the revenue estimates are for designated species. For example, under the assumption that the total quota available to the pelagic longline category and distributed as IBQ allocation is 137 mt, and no leasing occurs, there was a prediction of a reduction in annual designated species landings revenue (revenue) of $7,574,590. The actual reduction in revenue from 2014 to 2015 was very similar to the estimated revenue decline (i.e., $7,562,306 or a 22 percent decline). However, it is difficult to draw conclusions about the IBQ Program by comparing predicted revenue to actual revenue for several reasons. The actual amount of IBQ allocation (182.3 mt) was between two of the amounts analyzed (137 mt and 216.7 mt), and the fishing effort declined from 2014 to 2015. The actual revenue declined by 22 percent, and the fishing effort also declined (by 17 percent based on the number of trips and by 18 percent based on the number of sets). It is difficult to separate out the relative influence of the IBQ Program and the reduction in fishing effort on the revenue. The average revenue per vessel also declined.

The Amendment 7 FEIS analysis predicted a decline in pelagic longline vessel revenue as a result of the IBQ Program's potential to constrain target species catch (under conditions of no leasing IBQ among shareholders). The decline in revenue in 2015 may have resulted from decreased effort due to overall uncertainty, limited availability of IBQ allocation for lease, cautionary fishing behavior, and other factors not directly related to the IBQ Program. Revenue per trip may provide an indication of whether the catch of designated species was constrained by the IBQ Program, or whether the effect of the IBQ Program manifested itself in the form of reduced fishing effort (number of trips). Overall average (fleetwide) average revenue per trip increased from 2015 to

2017 (Table 6.1; Appendix 6.1), so it does not appear that catch of designated species was consistently constrained by the IBQ Program.

A large portion of the reduction in total revenue during the IBQ Program compared to the Baseline period was likely due to a continuing trend in reduced fishing effort. The overall pattern of the decline in fishing effort predated the IBQ Program and continued until 2018. For example, from 2014 to 2015 (from the last year of the Baseline period to the first year of the IBQ Program, respectively), there was a 22 percent reduction in revenue ($34.8 to $27.2 million) and an 18 percent reduction in the number of hooks fished (7.1 to 5.9 million)(Figure 3.15; Figure 6.13, respectively). The reduction in fishing effort during 2015 compared to 2014 may have been due in part to uncertainty regarding the new IBQ Program, as well as factors driving the long-term reduction in fishing effort. Similarly, comparing the changes in revenue and effort from 2014 to 2017 shows that the 2017 total revenue ($27.0 million) was 22 percent less than the revenue in 2014 ($34.8 million), but the number of hooks fished was 38 percent less (4.4 million). The average revenue per vessel in 2017 ($307,422) was only three percent less than during 2014 ($316,055). In other words, the decline in fishing effort continued after the implementation of the IBQ Program, but the revenue per trip was more stable. The rate of decline in fishing effort was greater during the IBQ period compared to the Baseline period.

Summary

Although it is difficult to separate out the influence of the IBQ Program from other factors (including swordfish imports, other regulations such as closed areas, as well as target species availability), it is likely that the IBQ Program contributed to reduced revenue and fishing effort during the IBQ period. The reduction in fishing effort during 2015 compared to 2014 may have been due to uncertainty regarding the new IBQ Program, as well as the factors driving the long-term reduction in fishing effort. The increasing pattern in average annual operating income supports the contention that the economic situation has stabilized for many of the vessels that fished during the IBQ period, although there is high annual variability in the data. There are conflicting patterns in the data, such as increasing average annual operating income, but declining numbers of active vessels. Overall, balancing the objective of limiting bluefin landings and dead discards, with the objective of optimizing fishing opportunities and maintaining profitability was achieved in the context of the IBQ Program. Other factors such as imported swordfish or closed area regulations may be more important to the profitability of the fishery than the IBQ Program.

A positive social impact associated with the IBQ Program was the reduction in the frustration for fishery participants associated with regulatory dead discarding of bluefin. As described further below, based on the data and feedback from fishery participants, the IBQ Program had both positive and negative social impacts.

Below are figures and tables containing data focused on pelagic longline vessels (fleetwide and individual vessels), as well as dealer data used to determine potential impacts on dealers (including impacts on non-HMS revenue from pelagic longline vessels).

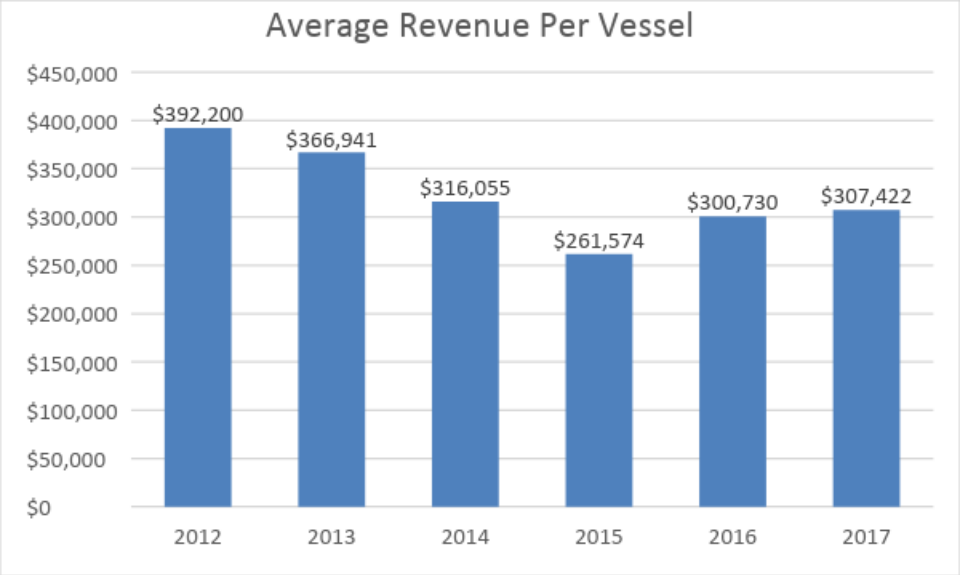

Figure 3.14 2012–2017 Average Revenue per Vessel by Year

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

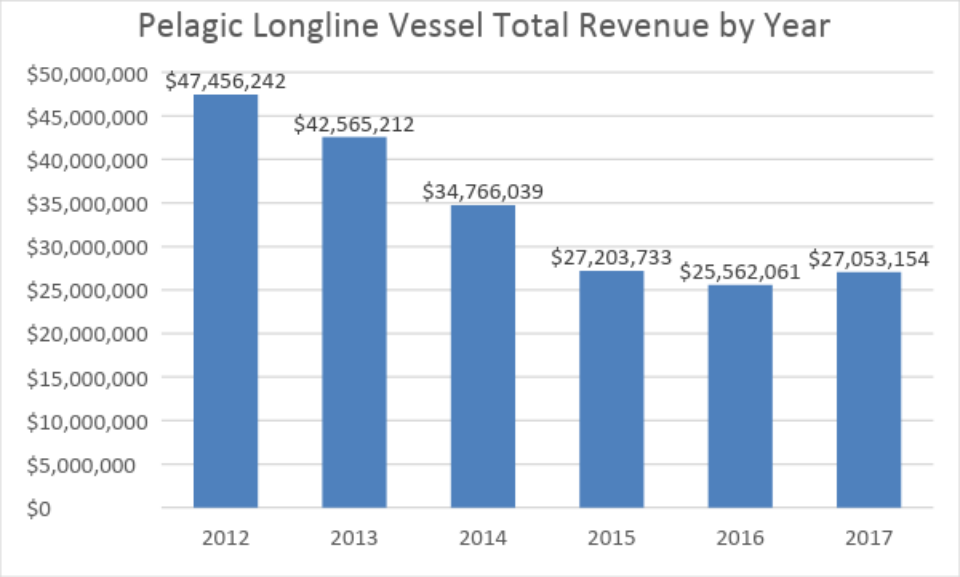

Figure 3.15 2012–2017 Total Revenue from HMS Species

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Revenue from the top three revenue-generating species--swordfish, yellowfin, and bigeye--decreased between the Baseline and IBQ periods (Figure 3.16). The biggest change occurred in swordfish revenue; however, this largely reflects a decline in revenue that occurred prior to implementation of the IBQ Program (from 2013 to 2014). Revenue from the next three highest revenue-generating species (dolphin, bluefin, and albacore) also decreased through time. (Figure

3.17). Note that swordfish, yellowfin, and bigeye are shown on a separate graph from dolphin, bluefin, and albacore due to the difference in y-axis scales.

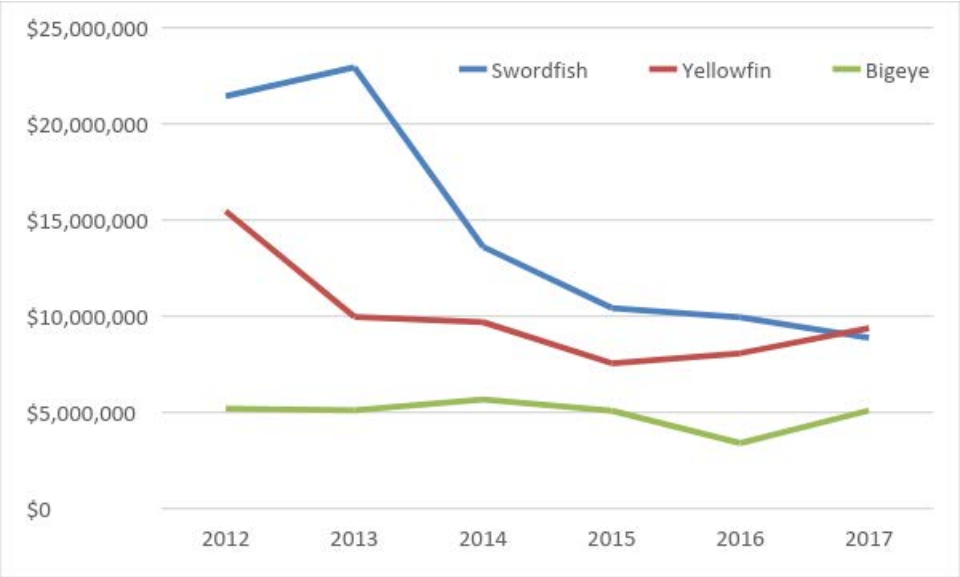

Figure 3.16 2012–2017 Revenue from Top Three Species (Swordfish, Yellowfin, Bigeye)

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

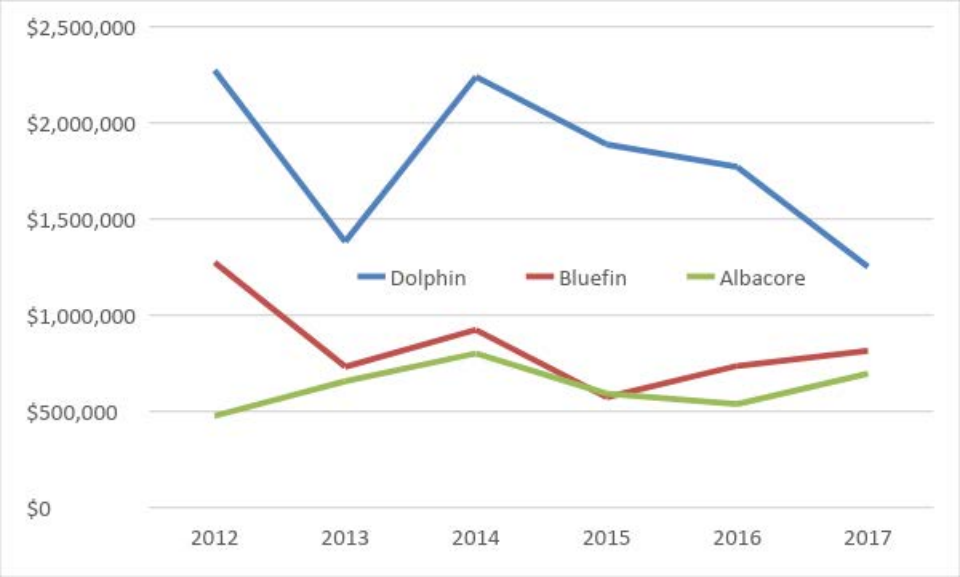

Figure 3.17 2012–2017 Revenue from Next Three Species (Dolphin, Bluefin, Albacore)

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

As noted above, analyzing data on a fleet-wide basis may mask underlying trends. The tables below show the results of analyses that are intended to show revenue and related trends, based upon vessel size and fishing effort.

Table 3.19 Average Annual Revenue per Vessel by Vessel Size Class

Size Class	2012	2013	2014	2015	2016	2017
<45 ft	$ 220,457	$ 245,332	$ 269,298	$ 174,125	$ 209,794	$ 237,409
45 ≤ 55	$ 295,883	$ 308,377	$ 308,869	$ 232,958	$ 219,085	$ 285,233
55 ≤ 65	$ 454,314	$ 470,133	$ 381,703	$ 345,720	$ 441,532	$ 391,334
65 ≤ 75	$ 475,872	$ 306,680	$ 249,032	$ 246,430	$ 250,999	$ 281,073
>75 ft	$ 577,905	$ 584,116	$ 384,589	$ 312,300	$ 407,320	$ 290,643
Overall average	$ 392,200	$ 366,941	$ 316,055	$ 261,574	$ 300,730	$ 307,422

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 3.20 Average Annual Revenue per Vessel by Number of Hooks Set Annually

# of Hooks Set per Year	2012	2013	2014	2015	2016	2017
<25,000	$ 88,723	$ 71,846	$ 53,567	$ 64,164	$ 61,594	$ 61,069
25,000≤50,000	$ 223,996	$ 218,818	$ 213,382	$ 147,194	$ 190,339	$ 235,122
50,000≤75,000	$ 364,173	$ 295,057	$ 296,056	$ 290,447	$ 280,822	$ 338,401
75,000≤100,000	$ 503,970	$ 496,509	$ 397,491	$ 428,831	$ 393,469	$ 360,241
>100,000	$ 729,355	$ 712,228	$ 642,071	$ 571,806	$ 604,523	$ 607,708
Overall average	$ 392,200	$ 366,941	$ 316,055	$ 261,574	$ 300,730	$ 307,422

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 3.21 Average Annual Revenue per Vessel by Number of Sets Made Annually

# of Sets per Year	2012	2013	2014	2015	2016	2017
1 – 50	$ 91,870	$ 70,028	$ 90,172	$ 75,862	$ 68,710	$ 96,849
51 to 100	$ 323,422	$ 299,059	$ 274,327	$ 222,754	$ 255,728	$ 281,471
101 – 150	$ 567,601	$ 488,223	$ 434,500	$ 452,000	$ 502,265	$ 488,386
>150	$ 745,888	$ 851,076	$ 673,776	$ 501,958	$ 576,498	$ 565,484
Overall average	$ 392,200	$ 366,941	$ 316,055	$ 261,574	$ 300,730	$ 307,422

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 3.22 2012–2017 Average Trip Costs by Vessel Size

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45	$9,330	$9,909	$9,387	$8,537	$6,929	$6,628
45≤55	$12,279	$11,473	$11,998	$10,809	$9,416	$9,366
55≤65	$22,859	$20,899	$20,212	$19,884	$18,322	$15,974
65≤75	$25,361	$24,532	$22,103	$20,068	$18,984	$18,174
>75	$31,445	$31,763	$31,536	$25,329	$23,250	$25,524
Overall average	$18,124	$17,109	$16,467	$14,982	$14,246	$13,298

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Average trip operating income (revenue minus trip costs) was estimated using the average revenue per trip and data from the HMS logbook cost-earnings survey and extrapolated using multivariate regression models for fuel consumption and other trip costs (Table 3.23). The average revenue per trip is based on logbooks, weighout slips, and dealer reports.

Table 3.23 2012–2014 and 2015–2017 Average Trip Operating Income by Vessel Size

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45	$3,708	$3,438	$6,270	$3,754	$7,469	$9,908
45≤55	$6,636	$7,712	$8,429	$6,009	$6,813	$10,764
55≤65	$14,707	$16,913	$12,884	$16,071	$17,923	$14,902
65≤75	$16,904	$7,491	$4,579	$6,667	$6,854	$9,641
>75	$19,924	$20,546	$9,141	$10,567	$16,489	$17,357
Overall Average	$10,884	$9,899	$8,437	$8,111	$10,619	$11,984

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 3.24 2012–2014 and 2015–2017 Average Annual Vessel Operating Income

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45 or (blank)	$62,696	$63,193	$107,847	$53,182	$108,828	$142,244
45≤55	$224,146	$229,430	$86,427	$91,937	$169,009	$117,645
55≤65	$103,799	$123,963	$127,453	$83,235	$91,975	$152,233
65≤75	$177,861	$210,291	$148,597	$154,525	$218,338	$184,188
>75	$190,326	$71,738	$42,733	$61,454	$66,581	$97,424
Overall average	$147,156	$134,492	$107,068	$91,876	$128,433	$144,351

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 3.25 2012–2017 Percent of PLL Trips Where Revenue Exceeded Operating Costs

	2012	2013	2014	2015	2016	2017
Positive Trips (%)	68	61	64	64	69	75
Negative Trips (%)	32	39	36	36	31	25

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

The percent of trips where revenue exceeded operating costs (positive trips) increased from 2013 to 2017 and reached its highest level in 2017, with 75 percent of trips reporting positive operating income. This is in contrast to the decrease in the number of vessels operating in the fleet over the same period (Table 6.19, Appendix 6.3).

Table 3.26 2012–2017 Revenue, Operating Costs, and Net Operating Income per Day at Sea

	2012	2013	2014	2015	2016	2017
Revenue per day	$2,753	$2,583	$2,290	$2,122	$2,294	$2,457
Operating costs per day	$1,720	$1,636	$1,514	$1,377	$1,314	$1,292
Operating income per day	$1,033	$947	$776	$745	$980	$1,165

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Operating income per day at sea dropped in 2015, the year Amendment 7 was implemented, but subsequently recovered. In fact, 2017 had the highest operating income per day over the six-year period.

Performance Indicators of Catch Share Programs

At the national level, NMFS' Office of Science and Technology has developed national performance indicators that are intended to provide a consistent means of measuring and comparing the performance of catch share programs. Table 3.27 contains the Tier I Performance Indicators for Catch Share Programs. (The word "tier" in this context refers to a specific set of performance indicators, defined in order to standardize the evaluation of catch share programs nationally.)

Table 3.27 2015–2017 Tier I Performance Indicators for Catch Share Programs

Performance Indicator	2012	2013	2014	2015	2016	2017
Catch & landings						
Bluefin quota allocated	227,958	101,413	273,814	401,902	401,902	426,153
Aggregate landings of bluefin*	179,076	129,1227	173,544	102,294	150,796	173,724
Effort						
Entities holding share	N/A	N/A	N/A	129	130	130
Active vessels	122	115	110	104	85	88
Season length	365	365	365	365	365	365
Trips	1,664	1,575	1,431	1,200	1,029	1,077
Days at sea	17,244	16,489	15,182	12,829	11,120	10,907
Revenues						
Aggregate revenue from bluefin	$1,274,491	$732,127	$925,327	$572,930	$736,755	$815,093
Aggregate revenue from non-catch share species (HMS)	$45,662,060	$41,793,507	$33,697,161	$26,468,384	$24,585,805	$26,026,097
Non-catch share species revenue (non-HMS)	$10,227,105	$8,659,310	$8,741,814	$6,651,865	$5,049,195	5,992,279
Gini coefficient	0.36	0.417	0.383	0.44	0.41	0.43

*Aggregate landings of bluefin not including NED.
Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

The Gini coefficient is one of the most commonly used indices of income inequality. Although income inequality was not an explicit objective of the IBQ Program, income inequality that may be the result of the IBQ Program could reflect limitations or flaws in the underlying design of the IBQ Program. Such design limitations may not be fully consistent with LAPP requirements. For example, income inequality resulting from the IBQ Program could inform a consideration of whether initial allocations are fair and equitable, or whether the allocations prevent inequitable concentration of limited access privileges (MSA § 303A(a)(5))

The Gini coefficient measures the evenness of a distribution. Here, it measures the evenness of revenue among IBQ Shareholders. A value of zero indicates that all shareholders ear the same amount of revenue, while a value of one indicates that one shareholder earns all of the revenue. NMFS calculated a Gini coefficient for the pelagic longline fleet, based on revenue from all pelagic longline species landed and sold, for the three-year Baseline period before the implementation of Amendment 7's IBQ Program. The average baseline Gini coefficient was 0.39 and is slightly lower than the Gini coefficients calculated for each of the three years after the implementation of the IBQ Program, which ranged from 0.41 to 0.44. This indicates there was a slight increase in the unequal distribution of revenues throughout the fleet that occurred in the period. In contrast, in the Red Snapper Individual Fishing Quota (IFQ) program, Gini coefficients for landings decreased slightly from ~0.8 pre-Red Snapper-IFQ to ~0.75 post-Red Snapper-IFQ, indicating a slightly greater distribution of red snapper landings among vessels post-Red Snapper-IFQ. However, the higher value of the Gini Coefficient in the Red Snapper IFQ program indicated a greater amount of inequality both pre- and post- catch share program implementation (Gulf of Mexico Fishery Management Council, 2013). Note, the red snapper fishery is a directed fishery, whereas bluefin is bycatch, and comparison of the Gini Coefficient between these two fisheries may have limited meaning.

Bluefin Dealer Activity

The annual number of dealers that purchased bluefin from pelagic longline and non-pelagic longline vessels is shown in Figure 3.18. The average number of dealers that purchased bluefin from pelagic longline vessels decreased between the Baseline period (2012–2014) and IBQ period (2015–2017), from 28 to 17, respectively. The average number of dealers who purchased bluefin from non-pelagic longline vessels increased from 26 to 30. The average number of dealers that purchased bluefin from any gear type decreased from 54 to 47. The number of bluefin purchased from pelagic longline vessels by the top 5 dealers (purchasing from pelagic longline vessels) increased during the IBQ period (Figure 3.19), indicating a concentration of bluefin purchasing from pelagic longline vessels among fewer dealers.

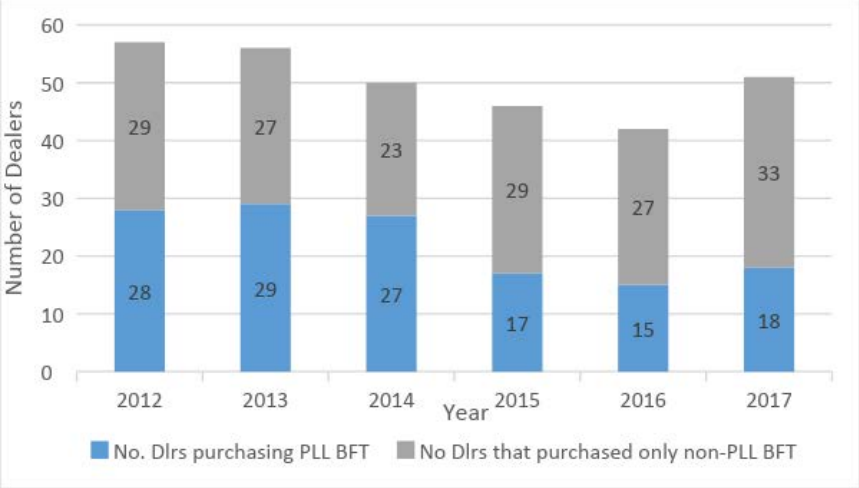

Figure 3.18 2012–2017 Annual Number of Dealers that Purchased BFT from PLL or Non-PLL Vessels

Source: Dealer data.

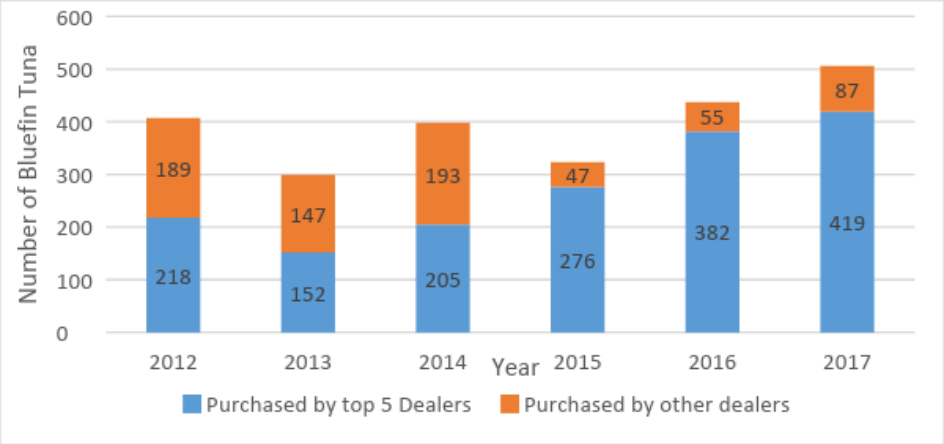

Figure 3.19 2012–2017 Number of BFT Purchased by Top Five Dealers vs Other Dealers

Source: Dealer data.

Based on this data, it appears that some dealers changed their behavior related to the IBQ Program, although other factors may also be relevant. The decrease in number of dealers handling pelagic longline bluefin from the Baseline to the IBQ period contrasts with the increase in the number of dealers handling bluefin landed by other gears. In other words, the trend in the number of dealers buying bluefin depends upon the gear landing the bluefin. The decrease in the number of dealers handling bluefin is unique to dealers handling *only* pelagic longline-caught bluefin compared to those landing bluefin caught by pelagic longline *and* other gear types. There was not a strong pattern with respect to the location of the dealers that ceased purchasing bluefin from pelagic longline vessels.

Designated Species Landing Data

Figure 3.20 presents pelagic longline-reported designated species catch (eDealer data). Designated species include swordfish, BAYS tunas, pelagic sharks, dolphin, and wahoo. Landings of these designated species have declined through the Baseline period and the IBQ period. A second analysis using different methods indicates a slightly different trend, with a slight 2017 increase in such landings (Figure 3.21).

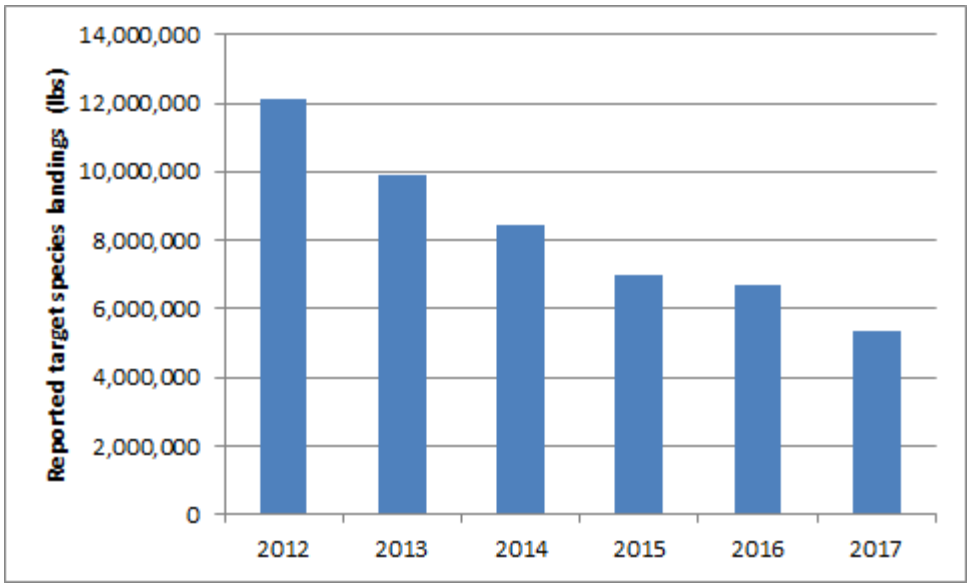

Figure 3.20 2012–2017 Reported Designated Species Landings

Source: eDealer data.

Additional Dealer Data: Non-HMS Landings by Pelagic Longline Vessels

A second analysis of dealer data was conducted to analyze changes in the purchase of HMS and non-HMS species from vessels that use pelagic longline gear in some years and non-longline gear in other years. Data on catch of non-HMS species is relevant because it answers the question "when pelagic longline vessels are not fishing with pelagic longline gear, are they fishing for non-HMS species or are they not fishing at all?" In the context of declining pelagic longline effort, and evaluation of the IBQ Program, this data provides additional context on the status of the fishery.

If a vessel reported the use of pelagic longline gear during any single year from 2012 through 2017, the vessel was included in the analysis. The data was organized according to vessel activity with pelagic longline gear. For purposes of this analysis only, if a vessel had reported using pelagic longline for a particular year, it was termed "active"; HMS and non-HMS data were included from dealer reports during these years. Conversely, if a vessel did not report using pelagic longline gear in a year it was termed "inactive" for purposes of this analysis, and only non-HMS data from dealers' reports were included. For example, if a vessel fished with pelagic longline gear during 2012, as indicated by the HMS Pelagic Longline Logbook Report, but did not fish with pelagic longline gear during 2013 through 2017, then HMS and non-HMS landings from dealer reports were included for 2012, but only non-HMS landings from dealer reports were included from 2013–2017. The HMS catch was derived from eDealer data and the non-HMS catch (which in this analysis included dolphin and wahoo) was derived from Southeast Fisheries Science Center landings data (Commercial Landings Monitoring). In the figures below, the weights of fish in pounds are summed as reported to NMFS by dealers (typically dressed weight). Figure 3.21 compares the landings of non-HMS species to HMS landings for active vessels.

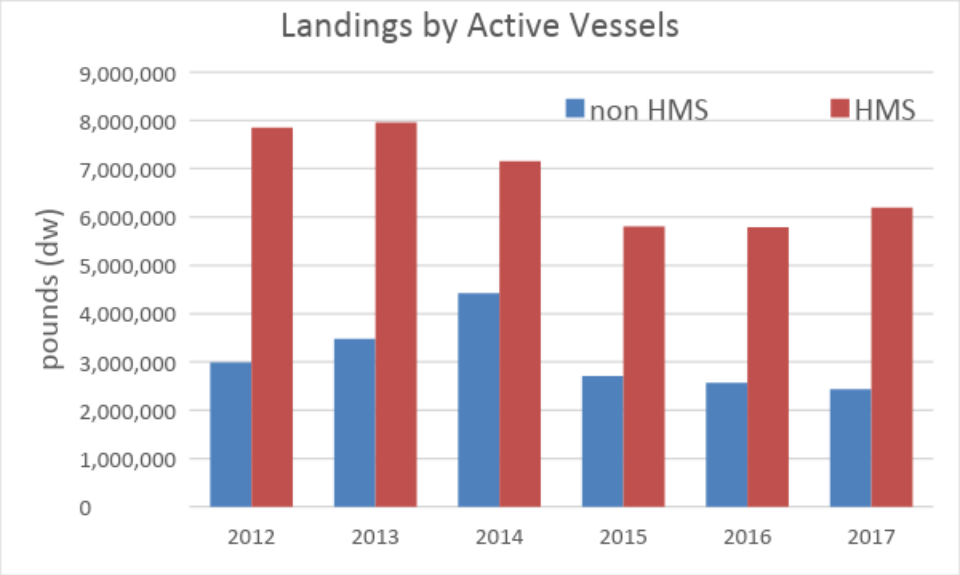

Figure 3.21 2012–2017 Landings by Vessels Using PLL Gear

Source: eDealer data; CLM data; logbook data.

The amounts of both HMS species and non-HMS species landed commercially by active vessels decreased in the IBQ period (compared to the Baseline period), but the relative proportions of non-HMS to HMS landings remained similar to the Baseline period (around 30 percent).

Figure 3.22 shows total landings (both HMS and non-HMS) and compares active to inactive vessels. The landings (non-HMS) amount by inactive vessels (not using pelagic longline gear) is likely underestimated because the data does not include HMS landings by other, non-pelagic longline gear. During the IBQ period, vessels that were not fishing with pelagic longline gear ("inactive vessels") were landing relatively more non-HMS species. The landings of non-HMS by inactive vessels (vessels not using pelagic longline gear) increased during the IBQ Period, while the landings of active vessels declined.

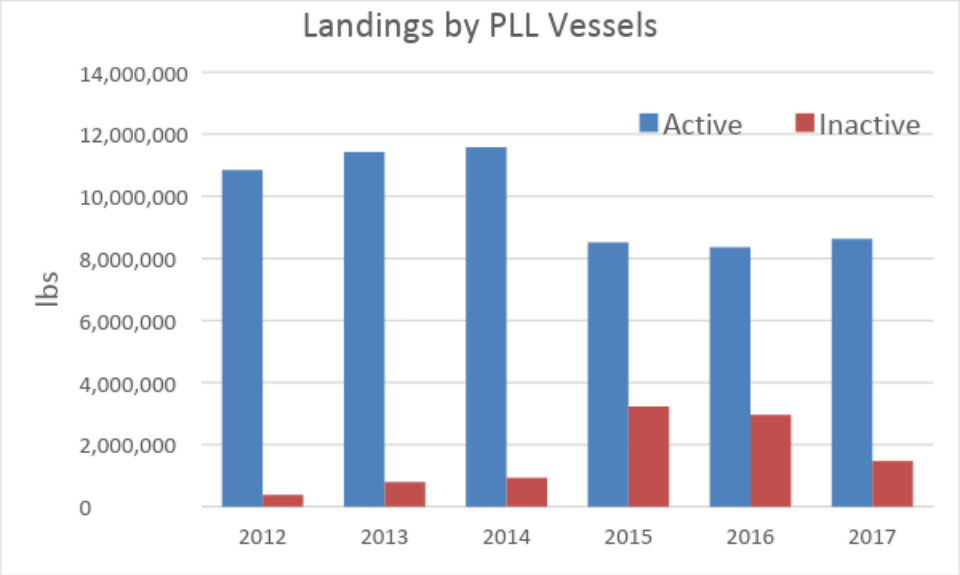

Figure 3.22 2012–2017 Landings by PLL Vessel, Active and Inactive*

*The landings (non-HMS) amount by inactive vessels (not using pelagic longline gear) is likely underestimated because the data does not include HMS landings by other, non-pelagic longline gear.
Source: eDealer data; CLM data; logbook data.

Figure 3.23 shows the total landings of non-HMS landings to HMS landings.

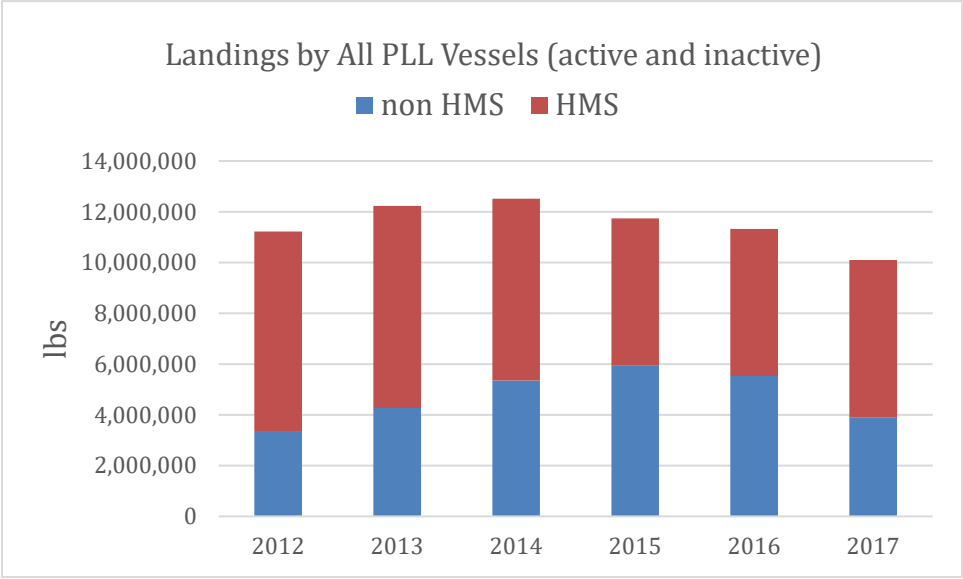

Figure 3.23 2012–2017 Landings of All Species* by All PLL Vessels, Active and Inactive

*The landings (non-HMS) amount by inactive vessels (not using pelagic longline gear) is likely underestimated because the data does not include HMS landings by other, non-pelagic longline gear.
Source: eDealer data; CLM data; logbook data.

Overall landings by pelagic longline vessels declined during the IBQ period (2015-2017), principally due to a decline in the HMS portion of the landings. Landings of non-HMS species during the IBQ period were similar to the landings during the Baseline period.

Figure 3.24 shows the number of active vessels landing HMS and the number of non-active vessels landing non-HMS species.

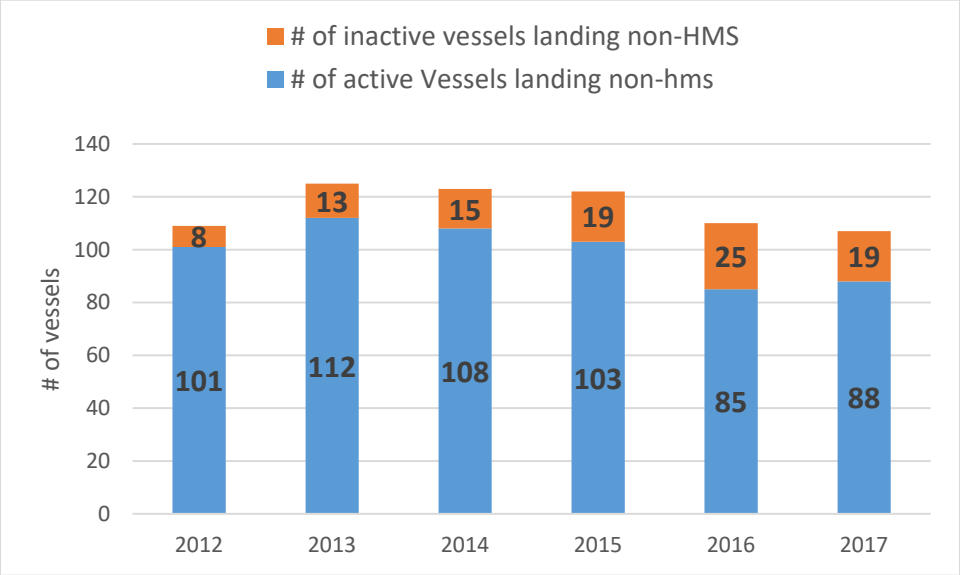

Figure 3.24 2012–2017 Inactive Vessels Landing Non-HMS and Active Vessels Landing HMS

Source: Dealer data.

During the IBQ period, the number of active vessels landing HMS declined, while the number of inactive vessels landing non-HMS species increased compared to the Baseline period.
Figure 3.25 shows the number of dealers purchasing from active vessels. The number of dealers purchasing from active vessels during the Baseline period is a little lower than during 2013 and 2014, but greater than during 2012.

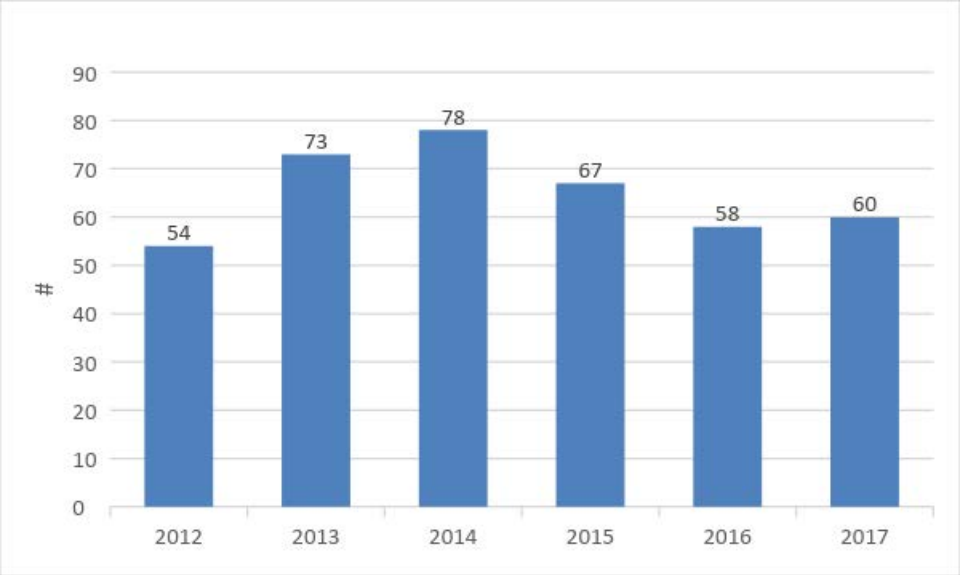

Figure 3.25 2012–2017 Number of Dealers Buying All Species from Active Vessels

Source: Dealer data.

To reiterate some of the trends above, the amounts of both HMS species and non-HMS species landed decreased during the IBQ period (2015-2017) (compared to the Baseline period). The number of non-active vessels landing non-HMS species increased and the amount of landings by such vessels increased during the IBQ period. This analysis does not include non-active vessels' HMS landings caught by other gear (non-longline gear such as rod and reel).

Other Social Impacts

In addition to revenue, other measures of social impacts may include a number of diverse metrics including safety at sea, health, quality of life, cultural impacts, and family or community impacts. Although difficult to quantify, fishery regulations may result in nuanced quality of life or cultural impacts such as increased uncertainty, disruption in business practices, reduced job satisfaction, distrust in government, sense of community, aspirations for future generations, etc. (Lord, 2011).

Based on the data and feedback from fishery participants, the IBQ Program had both positive and negative social impacts. Prior to implementation and during 2015 there was substantial uncertainty in the pelagic longline fishery. Overall, the uncertainty associated with the IBQ Program decreased over time, as vessel operators learned how to adhere to the many new regulations associated with the IBQ Program. Some areas of concern did not lessen with time, such as the constraint posed by the Cape Hatteras GRA for a small number of vessels, and the cost, uncertainty and stress associated with being directly accountable for bluefin catch.

There was uncertainty during the year regarding the inseason distribution of additional IBQ allocation. Since implementation, pelagic longline vessel owners consistently requested additional operational flexibility. The costs and availability of leasing IBQ allocation were perceived to affect the profitability of target species catch (primarily swordfish and yellowfin tuna). Vessel owners continued to report difficulties in leasing IBQ allocation at certain times as well as uncertainties regarding the availability of IBQ allocation to lease. This resulted in uncertainty surrounding their ability to depart on consecutive fishing trips. The ability of vessel owners to account for bluefin

using quota allocated to shareholders or IBQ allocation leased at an affordable price is key to the success of the IBQ Program.

As previously discussed in Section 1.4 ("IBQ Program Key Features and Events"), quarterly accounting provided flexibility for two important operational business decisions made by vessel owners: decisions regarding quota balance and any level of quota debt to maintain (subject to full accounting quarterly), and decisions regarding the timing and price at which they would lease additional quota.

A positive social impact associated with the IBQ Program was the reduction in fishery participants frustration due to regulatory dead discards of bluefin. Prior to the IBQ Program, vessels were subject to an inflexible formula based on the amount of target catch retained, which dictated the number of bluefin they could retain. Any additional bluefin caught, regardless of size or disposition, had to be discarded. The IBQ Program rules, while providing incentive to avoid bluefin interactions, incorporated more flexibility to retain bluefin than previously allowed and turned wasted dead discards of legal size into landed fish. Although the frustration associated with dealing with the bluefin regulations was not eliminated (i.e., a suite of regulations still must be adhered to), the IBQ Program enabled vessel operators to retain legal sized bluefin and have more flexibility in how bluefin were dealt with. Although inseason allocations and quarterly accountability minimized the uncertainty associated with IBQ accounting, it did not eliminate this uncertainty. As the average cost of leased IBQ allocation fell over time, the financial stress associated with that cost was reduced, but was not eliminated.

Safety

NMFS is not aware of any safety concerns in the fishery that resulted from implementation of the IBQ Program. To the extent that the IBQ Program facilitates flexibility in fishing operations, the Program may support safer operation of vessels.

3.5 Objective 5: Potential Impacts on the Directed Permit Categories and the 2006 Consolidated HMS FMP

The complete objective is, "Balance the above objectives with potential impacts on the directed permit categories that target bluefin tuna, and the broader objectives of the 2006 Consolidated HMS FMP and Magnuson-Stevens Act."

In balancing the above objectives with potential effects on the directed permit, NMFS was able to achieve of the objectives of the IBQ Program by balancing the effects on the directed permit categories that target bluefin and HMS dealers, as well as the broader objectives of the 2006 Consolidated HMS FMP and Magnuson-Stevens Act. The pelagic longline fishery neither impacted the non-longline bluefin fishery due to exceeding their quota, nor through disproportionate inseason transfers from the Reserve to the Longline category.

During 2015 through 2017, the Longline category had a negligible impact on the directed categories. That is in contrast to 2012 through 2014, when the Longline category exceeded its quota by very large amounts (due to dead discards), and therefore did affect the directed quota categories, because the unused quota, under-harvest, and carry-forward (from one year to the next) of the directed categories was used to account for the over-harvest of the Longline category. During the IBQ Period, because the Longline category bluefin catch did not exceed its quota, it did not impact the non-longline quota categories. The Longline category base quota increased during the

IBQ Period (as a result of Amendment 7), but even without that increase in quota, during the IBQ Period the pelagic longline category would not have had to rely upon the non-longline quota to account for its catch.

As a practical matter, the primary influence of the incidental catch of bluefin in the pelagic longline fishery on the directed permit categories is an indirect effect, given that quota allocated to the Longline category for bycatch of bluefin tuna represents an opportunity cost to the other categories that desire additional quota. During the IBQ period, NMFS transferred quota to the Longline category and to directed categories as warranted, and the Longline category was not allocated a disproportionate amount of bluefin quota compared with the directed categories.

With the implementation of the IBQ Program, due to the accountability for, and limitation of bluefin catch, the overall bluefin quota system of the 2006 Consolidated HMS FMP is more balanced (with the exception of the Purse Seine category, which remains underused and changes to the Purse Seine regulations should be considered).

3.6 Legal Requirements, Including the Magnuson-Stevens Act and ATCA

Based on the data and discussions presented in this document, NMFS has made a preliminary determination that the operation of IBQ Program has been consistent with the requirements of the Magnuson-Stevens Act (including the ten National Standards), ATCA, as well as with other legal requirements. It also is consistent with the objectives of Amendment 7, which included:

- Prevent overfishing and rebuild bluefin tuna, achieve on a continuing basis optimum yield, and minimize bluefin bycatch to the extent practicable by ensuring that domestic bluefin tuna fisheries continue to operate within the overall TAC set by ICCAT consistent with the existing rebuilding plan.
- Optimize the ability for all permit categories to harvest their full bluefin quota allocations; account for mortality associated with discarded bluefin in all categories; maintain flexibility of the regulations to account for the highly variable nature of the bluefin fisheries; and maintain fairness among permit/quota categories.
- Reduce dead discards of bluefin tuna and minimize reductions in target catch in both directed and incidental bluefin fisheries, to the extent practicable.
- Improve the scope and quality of catch data through enhanced reporting and monitoring to ensure that landings and dead discards do not exceed the quota and to improve accounting for all sources of fishing mortality.
- Adjust other aspects of the 2006 Consolidated HMS FMP as necessary and appropriate.

The IBQ Program has reduced bluefin bycatch, and maintained catch at levels in compliance with the broader requirements of the Magnuson-Stevens Act and ATCA, including requirements to appropriately conserve and manage the stocks, facilitate achievement of optimum yield, and to minimize bycatch to the extent practicable. The IBQ Program contributed to optimization of the ability of the pelagic longline fishery to harvest their target species, improved catch data and accounting for bluefin mortality.

4 Evaluation of IBQ Program Components

4.1 Allocations

The Amendment 7 share distribution formula created three share tiers (percent shares) and was intended to reflect historical catch and the diversity of the pelagic longline fleet. The IBQ share distribution formula that resulted in the high, medium, and low tier allocations, took into consideration both historical bluefin interactions and target catch (Table 6.45; Table 6.46). More specifically, the formula was intended to allocate bluefin in proportion to a vessel's historical fishing effort, and inversely proportional to the vessel's amount of bluefin interactions relative to its target catch. The sizes of the shares (percent) were intended to result in annual allocations (in pounds), which in conjunction with the ability to lease IBQ allocation from other vessels, would enable vessels to account for bluefin catch (and remain economically viable fishing businesses), and result in a total catch that did not exceed the overall Longline quota. Lastly, the quota was intended to be used by active vessels to account for bluefin catch (and not as a means of speculation or profit by entities not fishing with pelagic longline gear), and allow for turnover in fishery participants, including new entrants.

Based on the data presented, vessels were able to account for bluefin catch using a combination of annual and leased IBQ allocation (Table 3.8 and Table 3.9). The shareholder tier and resulting amount of IBQ allocation (high, medium, or low) available to a vessel, mattered, as evidenced by the different metrics associated with the three tiers (e.g., amount of bluefin landed by each tier, numbers of vessels leasing, percent of total leased IBQ allocation, percent of total quota debt (Table 3.10, Table 6.11, and Table 6.12)). For example, the ratio of the percent of the total leases to the percent of total quota debt was notably greater for vessels in the high tier (Table 6.14).

Another example of differences between IBQ share tiers is the contrast in percent of total quota debt comprised by each tier (Table 6.13). During 2017, the low, medium, and high tiers comprised 21 percent, 49 percent, and 17 percent of the total quota debt. During 2017, the low, medium, and high tiers landed similar proportions of their tier's total allocations (41, 41, and 38 percent respectively) *("total allocation" in this context meaning the sum of all individual allocations in a tier*). The high tier vessels landed 38 percent of the total allocation, but accounted for only 17 percent of the total quota debt. In contrast, the medium tier landed 41 percent of the total allocation to medium tier vessels, but accounted for 49 percent of the total quota debt. Based on this comparison, the different amounts of quota debt by tier do not seem to be related to the amount of total bluefin landings (relative to the total quota allocations by tier). Nor do the different amounts of quota debt by tier seem to be related to the number of vessels landing bluefin: During 2017, the numbers of vessels landing bluefin were similar in the high and low tiers, with 21 high tier vessels landing bluefin and 20 medium tier vessels landing bluefin (and 12 low tier vessels). In conclusion, the different metrics by tier likely reflect the different annual allocations to each tier, which result from the different quota shares associated with each tier.

Another consideration is that the different trends associated with the three tiers may not have been solely related to the amount of allocation, but may have also reflected underlying trends in the vessel characteristics (catch, vessels size, fishing effort, etc.).

A number of shareholders were not allocated IBQ due to an expired permit or a permit not associated with a vessel ("NOVESID") (Table 4.1). Still other shareholders met the criteria for receiving IBQ allocation (a valid Atlantic Longline permit associated with a vessel) but did not fish (27, 41, and 36 vessels in 2015, 2016, and 2017, respectively; or 21, 33, and 30 percent respectively) (Table 4.2; Table 4.3).

The allocation design principle stated in Amendment 7 (that the quota be used by active vessels to account for bluefin), was only partially achieved, given the number of shareholders that were inactive (Table 4.3). Some shareholders thought the 3-tiered allocation system was unfair, and disagreed that vessels with higher rates of historical catch of bluefin should be allocated less bluefin. Others advocated for an allocation system based only on vessel activity, to optimize allocation of quota among only active vessels.

Table 4.1 below shows the number of shareholders and vessels that were distributed IBQ allocation by year, and data on the number of shareholders that were not distributed IBQ allocation because a permit was in NOVESID status or a permit was expired.

Table 4.1 2015–2018 Number of Shareholders and Vessels Distributed IBQ

		Beginning of Year			Change in Status by End of Year	
Year	Number of Shareholders	Number of Vessels Distributed IBQ Allocation	Shareholders with Permit in NOVESID (no vessel)	Share-holder with Expired Permit	Shareholders with Permit in NOVESID (no vessel)	Shareholder with Expired Permit
2015	135	131	3	2	2	0
2016	136	126	7	3	6	0
2017	136	122	9	5	7	0
2018	136	112	13	11	NA	NA

Source: IBQ System Data; SERO PIMS (permit) data.

The amount of quota available to the Longline category but not distributed to shareholders is shown below (Table 4.2). The percentage of quota that was not allocated to shareholders was 1 percent, 4 percent, and 3 percent of the total Longline category quota allocated during 2015, 2016, and 2017, respectively. This percentage of quota not allocated reflects shareholders without vessels and/or expired permits. During the IBQ Period there were increasing numbers of shareholders over time that were not allocated quota because the relevant permits were not associated with vessels (i.e., NOVESID status).

From 2015 through the beginning of 2017, there was a decrease in the number of vessels that received IBQ allocation in shareholder accounts. This was as a result of an increased number of shareholders with NOVESID status and the number of expired permits (Table 4.3).

Table 4.2 2015–2017 Amount of Quota Associated with Shareholders but Not Distributed to Vessel Accounts

Year	Quota Not Distributed "Shareholders" (lb.)	Quota Distributed to Shareholders (lb.)	Percent Not Allocated (%)
2015	5,754	401,903	1.4
2016	16,249	401,903	4.0
2017	13,294	426,154	3.1

Source: IBQ System data.

The table below further explores the difference between the number of shareholders, the number of vessels distributed IBQ allocation and the number of vessels that were active (number that fished, based on logbook data).

Table 4.3 2015–2017 Number of Shareholders, Vessels Distributed IBQ and Active Vessels

Year	Number of Shareholders	Number of Vessels Distributed IBQ*	Number of Active Vessels	Percent of vessels distributed IBQ that were active	Percent of shareholders that were active
2015	135	131	104	79%	77%
2016	136	126	85	67%	63%
2017	136	122	86	70%	63%

*Annual allocation.
Source: IBQ System data; logbook data (number of active vessels).

The split of allocation to shareholders between the Gulf of Mexico and Atlantic was 35 percent Gulf and 65 percent Atlantic, which had a slightly greater amount actually distributed to vessels (Table 6.9)

A key metric for evaluating the success of the Amendment 7 share percentages (tiers) and resultant IBQ allocations is the ratio of bluefin interactions to designated species catch (Table 6.45; Table 6.46; Figure 6.68; Appendix 6.2). Overall, this ratio was consistent between the Baseline period and during the IBQ period, although there were changes noted between the Baseline and IBQ periods (Figure 6.37, Figure 6.38, Figure 6.39, and Appendix 6.6). The complex formula used in the Amendment 7 allocation of shares reflects the precedent of previous catch share program design procedures, as well as the Amendment 7 goal of providing incentives to reduce bluefin interactions. Although the Amendment 7 allocation formula "rewarded" historical avoidance of bluefin, the three-tiered shares and associated high, medium, and low annual allocations may not necessarily be functioning as an incentive under the IBQ Program. Under the IBQ Program, the three tiers landed similar percentages of their respective quotas (e.g., in 2017: 38 percent, 41 percent, and 41 percent by the high, medium, and low tiers, respectively; Table 6.10; Appendix 6.2). In contrast (as explained above), however, the three tiers incurred very different amounts of quota debt, with the largest proportion of the quota debt being incurred by the medium tier.

A tiered system of allocation of catch shares based on historical catch, which is typical of many catch share programs, may have disadvantages or limited relevance when implemented in the

context of a bycatch quota catch share program. The distribution of allocation may not be aligned with the need for quota, given the fact that bluefin catch and the need for quota may be concentrated, and bluefin comprises only a fraction of the total catch of the fishery. Distribution of shares based on the ratio of bluefin to designated species may be overly restrictive in the way it translates into the share percentage. The success of the IBQ Program in reducing dead discards likely relates more to the other elements of the IBQ Program than the precise method of allocation and incentives associated with the distinct amounts of annual allocation.

A different method of IBQ share allocation, and/or distribution of IBQ allocation among permit holders may warrant consideration in the future for several reasons. As noted above, the current distribution of allocation may not align with vessels' need for it. Bluefin catch and the need for quota may be concentrated among relatively few participants, and bluefin is a bycatch species, which comprises only a fraction of the total catch of the fishery.

The share distribution method adopted in 2015 through Amendment 7 was based in part on historical participation (2006-2012) and catch (both the amount of target catch landings and the ratio of bluefin bycatch to target catch landings) and may not reflect current fishery participation or current restrictions on species that can be landed (e.g., restrictions placed on shortfin mako and porbeagle landings since Amendment 7). Additionally, there were costs incurred by many fishery participants due to the need to lease IBQ allocation to account for their bluefin catch. Given the number of shareholders that were inactive (only 77 percent, 63 percent, and 63 percent of shareholders were active during 2015, 2016, and 2017, respectively), a simpler allocation system based on more recent vessel activity could be considered for the future, as was suggested by HMS Advisory Panel members during input on Draft Amendment 7. For example, annual allocations based on the previous year's pelagic longline activity could result in more IBQ allocation per active vessel due to reduced numbers of vessels allocated IBQ, as well as reduce any perceptions that the allocations are not fair. One could argue that in a context of a fully used quota, costs associated with quota leasing are unavoidable, however, in the context of the IBQ Program, and an underused quota, the need to lease quota may be attributed in part to the method of allocation.

This concept was not analyzed in the Amendment 7 FEIS, but was discussed in the Amendment 7 final rule preamble (response to comment 77). NMFS' response noted potential negative aspects of such a system of allocation, including increased complexity and difficulty administering, increased uncertainty, incentives to fish on an annual basis, and potentially weaker accountability from one year to the next.

This "annual allocation" concept and/or other allocation ideas may be fully explored in the future.

4.2 Approaches to Accountability

After implementation of the IBQ Program, the rules for accounting for bluefin catch changed twice. During 2015, there was end of year accountability (and no minimum IBQ allocation requirement to fish), during 2016 through 2017, there was trip-level accountability and a minimum IBQ requirement to fish, and then during 2018, there was quarterly accountability, with a minimum IBQ requirement on the first trip in each quarter. Bluefin landings and dead discards were successfully accounted for under each of these three approaches to accountability. The different approaches provided varying degrees of flexibility for vessel operators and shareholders, which were reflected in the amount and timing of quota debt, and in the patterns of IBQ allocation leasing. Under quarterly accountability, the average time between accrual of quota debt and resolution of quota debt went up slightly, and there was a higher ratio of quota debt to landings.

Quarterly accountability may represent the best balance between the amount of flexibility provided to vessel owners and important considerations regarding an accountability system that works. Such considerations include an accountability system that maintains strong incentives to avoid interactions with bluefin, takes into account the dynamics of the IBQ allocation leasing market, and reflects the diversity of the pelagic longline fishery (especially the fact that some vessels fish only during certain times of the year). Although annual accountability provides the most flexibility with respect to the amount of time a shareholder has to resolve quota debt, annual accountability may negatively affect the leasing market and reduce incentives to avoid bluefin interactions.

4.3 Eligibility

The Amendment 7 eligibility requirements resulted in a pool of 136 shareholders, only a subset of which were active (fished) during the IBQ period. The percentage of shareholders that were active was 77 percent, 63 percent, and 63 percent during 2015, 2016, and 2017, respectively). Although some shareholders did not fish with pelagic longline gear but leased out their IBQ allocation, this discussion focuses on vessels that fished, as a relevant metric. Fishing is the relevant metric, because the intent of the IBQ Program design was to allocate quota to vessels that fish so that they may account for bluefin catch (and incentivize vessel operators), and not necessarily provide quota as a means of revenue (via leasing) for vessels that do not fish.

The intent of the Amendment 7 eligibility requirements was to implement eligibility criteria that would result in a pool of qualified shareholders comprised of recent participants in the fishery (and exclude inactive vessels). In Amendment 7, vessels were required to meet two requirements to be eligible to receive IBQ shares: 1) vessels must have had a valid Atlantic Tunas Longline category permit; and 2) vessels must have been deemed to be "active." Vessels that made at least one set using pelagic longline gear between 2006 and 2012 (based on pelagic longline logbook data) were defined as "active." For the purpose of IBQ share eligibility, a "valid Atlantic Tunas Longline category permit" was determined to be one held as of the date of publication of the Proposed Rule for Amendment 7, August 21, 2013.

The eligibility criteria resulted in a larger pool of eligible vessels (shareholders) than the number of active vessels during the IBQ Program. The eligibility criteria successfully reflected active vessels, as indicated by the small number of active vessels without shares (six vessels), and the fact that the number of eligible vessels exceeded the number of active vessels. The eligibility criteria were not excessively restrictive. The eligibility criteria did however result in IBQ shares being awarded to vessels that were inactive during the IBQ period.

4.4 Catch and Sustainability

The IBQ Program resulted in bluefin catch that did not exceed the Longline category quota, and a reduction in dead discards compared to the Baseline period (Table 3.1). The sustainability of the IBQ Program is related to the sustainability of the pelagic longline fishery as a whole, which faces challenges to its viability due to a number factors in addition to the IBQ Program. The IBQ Program imposes additional constraints and costs on the fishery, but of a magnitude that, absent other factors would not affect the viability of an individual longline vessel's business.

4.5 Accumulation Caps

Table 4.4 provides data on IBQ share distribution, showing the percent of total annual pelagic longline allocation distributed to a single entity, the number of entities with that percentage of total annual allocation, as well as how those percentages change when leased IBQ allocation is included in the calculation (both leased from pelagic longline vessels and leases from purse seine participants). For example, 46 shareholders each control between 0.5 and 0.9 percent of the total pelagic longline IBQ shares. The largest percentage of the total allocation associated with a single shareholder, via owning multiple permits/vessels was in the range of 8.5 to 8.9 percent of the total pelagic longline allocation, when not including leased IBQ allocation. When leased IBQ allocation was included, the highest percentage of the total allocation associated with a single shareholder was 11.5 to 11.9 percent. The majority of shareholders (94 out of 106; or 89 percent of shareholders) each were associated with less than 1.4 percent of the total pelagic longline allocation, even when including leased IBQ in the calculation.

Table 4.4 Total IBQ Share Percent Among Shareholder Entities† and Total Percent Including Leased IBQ Allocation

Percent of Total Annual PLL Allocation (%)	Number of Entities with that Percentage of Total Annual Allocation	Number of Entities with that Percentage of Total Annual Allocation Including PLL IBQ Leased	Number of Entities with that Percentage of Total Annual Allocation Including PLL and PS IBQ Leased
0–0.4	20	18	18
0.5–0.9	46	47	46
1.0–1.4	32	32	30
1.5–1.9	2	0	2
2.0–2.4	4	1	1
2.5–2.9	0	1	0
3.0–3.4	0	3	2
3.5–3.9	0	1	2
4.0–4.4	0	0	0
4.5–4.9	0	1	0
5.0–5.4	1	1	3
7.0–7.4	0	0	1
8.5–8.9	1	0	0
11.5–11.9	0	1	1
Total entities	106	106	106

†All shareholders; holders of single shares or multiple shares.
Source: 2017 IBQ Leasing data.

Table 4.5 shows the distribution of Atlantic Tunas Longline permits among shareholders. Most shareholders (95) own only one permit, and one shareholder owns 13 permits (10 percent of the total number of permitted shareholders). The ownership of most of the Atlantic Tunas Longline permits is not concentrated. Only 11 shareholders (10 percent of the 106 shareholders analyzed) own multiple permits.

Table 4.5 Distribution of Permits Among Shareholder Entities

Number of Entities (with that number of permits)	Number of Permits per Entity
95	1
6	2
3	3
1	7
1	13
Total Entities: 106	Total Permits: 136

Source: SERO PIMS (permits) data.

Although the maximum amount of IBQ allocation an entity may theoretically lease is high (the sum of the total pelagic longline IBQ allocated to vessels and allocated to purse seine fishery participants), and the amount of shares an entity could control through accumulation of Atlantic tunas longline permits is large, the percentage of the total IBQ allocation that a single entity in the IBQ Program controlled, was less than 12 percent of the total allocation of IBQ (Table 4.4)., A shareholder may not permanently purchase IBQ shares/allocation from another shareholder, but may only lease IBQ allocation from another shareholder, for the duration of a year (i.e., all leases expire at the end of a calendar year). Similarly, under current regulations, Purse Seine category participants may theoretically lease the sum of the total pelagic longline IBQ allocated to vessels and quota allocated to purse seine fishery participants. The total annual allocation for the Purse Seine quota category can range from between 4.5 up to 18.1 percent of the U.S. bluefin quota (depending upon the level of purse seine activity and catch during the previous year). A cap on the amount of IBQ allocation that may be used or shares that may be distributed to one entity should be considered to reduce the risk of entities controlling a large percentage of IBQ shares/allocation.

During the development of Amendment 7 and the IBQ Program, NMFS determined that implementation of an accumulation cap at the start of the IBQ Program was not feasible, given the absence of relevant data upon which to base such a cap. In contrast, at this time after over three years from the time of implementation of the IBQ Program, there is relevant data that can be used to consider accumulation caps. A cap on the amount of IBQ allocation that may be used or shares that may be distributed to one entity may warrant consideration from NMFS for the IBQ Program in the future. During 2013 through 2015, landings by purse seine vessels were well below the Purse Seine quota, and during 2016 and 2017 there were no landings by purse seine vessels (Figure 6.30). During 2015 to 2017, purse seine category participants leased quota to pelagic longline vessels through the IBQ system. Purse seine to pelagic longline leases represented 16 percent, 28 percent and 20 percent of the total leases by weight during 2015, 2016, and 2017, respectively (Table 6.16).

4.6 Data Collection, Reporting, Monitoring, and Enforcement

The principal reporting and monitoring elements of the IBQ Program are VMS reporting of bluefin and set data EM of catch, and accounting for bluefin catch by the dealer and vessel operator in the IBQ system. These reporting and monitoring requirements implemented through Amendment 7 are in addition to the previously existing regulations that are still in effect (e.g., logbook, observer, dealer, and other VMS requirements).

To evaluate the IBQ Program's efficacy regarding the reporting and monitoring requirements, "new" data elements associated with the IBQ Program were compared against data elements from previously existing reporting and monitoring requirements. IBQ system records on landed bluefin were crossed checked against dealer records to ensure that all bluefin landed were accounted for in the IBQ system. The discrepancy between the two data sets was relatively minor, with the dealer data usually being more complete, but not always. With respect to dead discards, the majority of vessels and dealers did not input bluefin dead discard information to the IBQ system as required. During 2015, 2016, 2017, and half of 2018, NMFS staff used the VMS reported information on dead discards and manually entered the dead discard data into the IBQ system in order to account for the dead discards using IBQ allocation. During 2018, NMFS automated the process by connecting the VMS database to the IBQ database so that the VMS reported data on dead discards "automatically" results in accounting for the dead discards in the IBQ system. The original design concept for reporting of bluefin dead discards was to utilize the VMS, however reporting of dead discards into the online system at the time of landings was an interim means to obtain the data while the technical capability to connect the VMS database with the IBQ database was being developed. From 2015 through 2017, NMFS information technology staff in the Southeast Regional Office in Saint Petersburg, FL, worked with HMS staff and made continual improvements to the IBQ system in order to make the functions more user-friendly and efficient. Vessel owners and operators were able to use the system to check IBQ allocation balances, leased IBQ allocation, and resolve quota debt successfully. The HMS IBQ Program customer support team successfully provided support to the fleet during business hours.

The compliance with the VMS reporting requirement increased over time, based on comparisons to dealer data (landings), and logbook data (number of sets). During 2016 and 2017, the number of vessels submitting VMS set reports was very close (+/- 2) to the number of vessels reported as fishing with pelagic longline gear based on logbook data. Although the VMS data on numbers of sets and numbers of bluefin retained tended to be under-reported, the real time data available via VMS enabled real-time management of the NED set-aside quota (25 mt of bluefin). NMFS was able to project when the 25 mt set-aside would be caught, and communicate with the relevant vessels while they were still at sea, to alert them that the 25 mt threshold was being approached (and that subsequent to the catch of the 25 mt NED set-aside quota, IBQ would be required to account for bluefin caught in the NED). It is more difficult to evaluate the accuracy of the VMS reporting of dead discard or live releases, given the higher variability, lower numbers of such data. In 2015, 2016, and 2017, the VMS data reported greater numbers of bluefin released alive than the logbook data, but for each of these years reported less numbers of dead discards than the logbook info. There may have been a bias during the trip to report a bluefin that was not retained as alive rather than dead. Comparison of observed trips to the logbook data would be useful to explore that topic further.

The EM program was able to achieve the objective of verification of the counts and identification of bluefin reported by the vessel operator. The overall frequency of bluefin catch as estimated by the EM Program (percentage of sets with bluefin interactions) was very similar to the frequency of bluefin catch determined by observer and VMS data. Detection of discarded bluefin by EM was less

successful than detection of bluefin retained (Table 6.38, Appendix 0). The logistical and technical elements of the program were successfully implemented and operational as a result of the good cooperation between the pelagic longline vessel operators and the NMFS contractors. Vessel operators communicated consistently with the contractors and most complied well with the requirement to send the hard drives via mail in a timely manner. There were no instances where a vessel was prohibited from taking a fishing trip due to a non-functioning EM system and only a couple of cases where a trip was slightly delayed. The ability to review videos improved over time ("success rate"), and the trend in the number of weekly troubleshooting events declined. The video reviewers conducted a number of tests to evaluate their methods and identification of bluefin including "blind" identification of a known sample, comparison of camera positions, comparison of "manual" review versus review using activity recognition software, and rates of detection of dead discards versus retained fish. Additional information on monitoring and reporting is in Appendix 6.7.

4.7 Duration

The IBQ Program did not set a specific period for the duration of the IBQ shares. The IBQ Program is subject to the restrictions and limitations described in the Magnuson-Stevens Act. Under §303A(f), a limited access privilege established after the Magnuson-Stevens Reauthorization Act of 2006, is a permit issued for a period of not more than 10 years.

4.8 New Entrants

Table 4.6 contains data on new entrants to the pelagic longline fishery and active vessels without IBQ shares to explore the nature of any barriers to participation in the fishery. This table is based on permit data regarding vessel ownership. For this discussion, new entities (permit holders/vessel owners not previously associated with an Atlantic longline permit and thus new to the pelagic longline fishery) are considered new entrants to the fishery. Five new entities took ownership of permits associated with IBQ shares, which indicates that there were new entrants to the fishery. There were six vessels that were able to be active in the fishery even without IBQ shares, through leasing IBQ allocation.

Table 4.6 Analyses of New Entrants to the PLL Fishery and Active Vessels Without Shares

Time Period	Metric	Number
1/1/15–1/23/18	New owners of permits (new entities) with shares	5
2015–2017	Active vessels without shares	6

Source: SERO PIMS (permit) data, IBQ System data, and logbook data.

Given the relatively low rate of interaction of pelagic longline gear with bluefin (zero to 14 percent of sets) under the IBQ Program, as well as the average price of IBQ leases, the IBQ Program neither precludes new entrants, nor presents unreasonable barriers to new entrants. The cost of an Atlantic Tunas Longline permit (for non-permit holders) is a greater barrier to entry than any particular aspect of the IBQ Program. To date, NMFS has fully paid the cost of installation for all new electronic monitoring systems for new entrants, so the costs associated with EM systems were not a barrier to new entrants. Despite new entrants to the fishery, there was a decline in the number of vessels allocated IBQ from 2015 through 2018.

4.9 Auctions and Royalties

Neither auctions nor royalties were considered during the development of the IBQ Program, and are not relevant to the three-year review.

4.10 Cost Recovery

Cost recovery, a required element of catch share programs under the Magnuson-Stevens Act, was not implemented at the start of the IBQ Program in 2015 in order to first gather information about the operation of the fishery under the IBQ Program and reduce initial costs and uncertainty given the bycatch dynamic of the program. The Magnuson-Stevens Act provides NMFS the authority for recovering mandatory fees from the fishery of up to three percent of the ex-vessel value of a LAPP to cover the incremental costs (incurred by NMFS) directly related to the management, data collection and analysis, and enforcement programs that are directly related to and in support of LAP programs (e.g.,, the IBQ Program). This analysis discusses the relevant considerations and makes suggestions regarding the utility of cost recovery within the IBQ Program.

Estimation of Costs that May Be Recovered

The estimation of the costs to be recovered from catch share program participants is calculated first by calculating the incremental operating costs associated with the LAPP. The relevant costs to recover are the incremental costs, i.e., those costs that *would not have been incurred but for the LAP program*, since cost recovery is not authorized for non-LAP fisheries. Conceptually, measuring these costs involves a "with and without" comparison of the cost of running the management program for the specified fishery under the status quo non-LAP regime, relative to the cost of running the management program under the LAP program. The difference is the incremental costs attributable to implementing the LAP program. The incremental costs to NMFS of implementing the IBQ Program are principally costs associated with labor, both NMFS staff and contracted entities. The types of tasks include IBQ Program oversight, customer service, database maintenance, computer programming (maintenance and development), the EM Program, monitoring of various data metrics for the Program, policy discussions, preparation of Federal Register documents, preparation of fleet communication, providing status reports to the HMS Advisory Panel, and enforcement related activities. In addition, there are likely to be future costs associated with the development of new regulations that may modify the program.

Estimation of Ex-Vessel Value of Catch Share Species

In the case of the IBQ Program, the relevant ex-vessel value is the value of bluefin landed, not the ex-vessel value of the target species that are not managed under an IFQ Program, such as the swordfish, yellowfin tuna, etc., which comprise the majority of the value of the fishery. This is in contrast to other cost recovery programs where the value of the IFQ Program is the ex-vessel value of the target species. Table 4.7 shows an estimate of the maximum recoverable amount for 2015 through 2017, based on a uniform price of $4.00 per pound dressed weight, for the purpose of comparison. Although the actual price is variable, $ 4.00 per pounds is within the range of average prices paid to pelagic longline vessels during the IBQ Program. The average ex-vessel price per pound (round weight) of bluefin from pelagic longline vessels was $ 4.01, $ 4.08, and $ 3.99, for 2015, 2016, and 2017, respectively). The price paid to longline vessels for bluefin is usually less than that paid for rod and reel caught fish (in the directed General category or Charter/Headboat fisheries), due to the usual condition of bluefin when boated, and the length of the pelagic longline trips. Three percent of the ex-vessel value of bluefin is straightforward to estimate based upon dealer data regarding the pounds of bluefin landed and the price paid by the dealer to the vessel.

Table 4.7 contains data relevant to evaluation of a cost recovery program, including the maximum recoverable amount from the fishery, based on the IBQ period.

Table 4.7 2015–2017 Analysis of Cost Recovery

Year	Weight Landed (lb)	Dressed Weight (lb)	*Price per Pound	PLL Bluefin Ex-Vessel Value	Maximum Recoverable (3%)
2015	157,418	125,934	$4.00	$629,672	$18,890
2016	190,127	152,102	$4.00	$760,508	$22,815
2017	228,895	183,116	$4.00	$915,580	$27,467

*Round weight price per pound.
Source: Dealer data.

Comparison of Incremental Costs to Ex-Vessel Value

Then the incremental cost to NMFS is compared to the estimated ex-vessel value. If the incremental cost to NMFS is less than three percent of the total ex-vessel value of the quota species then, that estimate of incremental cost is the total amount of fee that is recovered from the fishery. If the total incremental cost to NMFS of implementing the program exceeds three percent of the ex-vessel value of the quota species, then the total amount of fee recovered is limited to three percent of the ex-vessel value of the quota species. For cost recovery programs of IFQ catch share programs with a high ex-vessel value of target catch (the species subject to the catch share quota), the amount of the fee may be less than the three percent ex-vessel value. For IFQ catch share programs where the ex-vessel value of the fishery may be relatively low, then the total amount of fee recovered is limited to three percent of the ex-vessel value of the fishery.

An initial estimate of the incremental costs to NMFS described above is equivalent to the work of between two and four full time employees. Contracts to support the EM Program are relatively expensive (hundreds of thousands of dollars per year). Based on the costs of full time employees to NMFS (in excess of $ 40,000 per year), and contracts, it is clear that the incremental costs to NMFS exceed three percent of the ex-vessel value of the bluefin, based on the small amount of recoverable bluefin revenue, as well as the scope of NMFS' incremental costs described above. Therefore, the amount of recoverable costs would be limited to three percent of the ex-vessel value of bluefin landed by the pelagic longline fishery.

Costs of Collecting Cost Recovery Fees

In addition to the elements discussed above (the ex-vessel value of bluefin from the pelagic longline fleet, and the incremental costs to NMFS associated with the IBQ Program), the last consideration is the cost of the recovery program itself: the administrative/operational cost to NMFS associated with implementing the cost recovery program (as distinct from the incremental cost of the IBQ Program). The operational costs that would be associated with routine administration of the cost recovery program include multiple components in addition to the annual development of the estimate of annual incremental costs of the IBQ Program to NMFS. Specifically, NMFS would need to annually calculate the ex-vessel value of bluefin, calculate individual fees, develop a Federal Register document providing formal public notification, communicate with individuals in the

fishery to educate them about the process and assess the fees, and conduct oversight of collection of fees including follow-up and enforcement, oversight of cost recovery program, and database/computer costs.

While there are some economies of scale when running cost recovery programs, for the most part the costs will be similar regardless of the level of costs being recovered. What this means is that if the total funds to be recovered is small, it may cost close to or more to recover these funds than would be recovered. As the cost of implementing a cost recovery program is considered incremental, this could result in industry being required to pay more for the calculation and collection of cost recovery fees than the value of all other recoverable costs. The Pacific Coast Groundfish Fishery, Sablefish Permit Stacking Program, recommended that a cost recovery program not be implemented (NMFS 2015), and one of the relevant considerations was the cost of collecting cost recovery fees.

Social Impacts

Although the application of a cost recovery fee would have a relatively small economic impact due to the small amount, it would result in a social impact in the form of fishery attitudes and support for the IBQ Program.

In considering the methods and feasibility of cost recovery in the IBQ Program, additional guidelines may be relevant. In the 2007 NOAA Technical Memo titled "The Design and Use of Limited Access Privilege Programs," two justifications are provided for catch share programs to recover the incremental costs after changing to a catch share approach for fishery management (Anderson and Holiday, 2007):

1. Since the issue is to find the funds to cover the costs of adding LAP programs, then the real problem is to cover incremental costs.
2. To minimize the disincentives for Councils and their constituents as they consider replacing non-LAP programs with LAPs, it makes sense to have participants in LAP programs only pay for the costs that are added because of the LAP program itself.

Point number 2 above addresses which costs it makes sense to have participants in LAP programs pay for and also touches on the rationale, "To minimize the disincentives for Councils and their constituents as they consider replacing non-LAP programs with LAPs."

Because incentivizing the Atlantic pelagic longline fishery is one of the objectives of the IBQ Program, and incentives are relevant to cost recovery, incentives should be a consideration in designing a cost recovery system for the IBQ Program. The IBQ Program and the associated requirements represent a cost. In contrast to the LAPs for which cost recovery programs have been implemented to-date (approximately 13; Draft Cost Recovery Practices in U.S. Catch Share Fisheries Under Federal Management, September 2015), the pelagic longline fishery LAP is a bycatch fishery. In the pelagic longline fishery, accounting for bluefin catch under the IBQ Program represents a cost to the pelagic longline fishery participants, and compliance with the regulations landing bluefin results in little or no net economic benefit, given its status as a bycatch species and market value. Application of an additional cost to the fishery in the form a cost recovery fees may act as a disincentive for support for the IBQ Program, which has succeeded in several of its objectives, as described earlier in this document.

Cost Recovery Recommendation

The fact that the IBQ program is structured as a bycatch quota is central to the consideration of cost recovery in the pelagic longline fishery, the narrow scope of the ex-value of the IBQ Program, and the recommendation regarding the applicability of cost recovery to the IBQ Program. Because of the limited amount of incidental bluefin quota for the pelagic longline fishery under the IBQ Program, the even lower level of actual landings that occur from this fishery, as well as the lower ex-vessel price per pound paid for longline caught bluefin, the total ex-vessel value of bluefin landed by the pelagic longline fishery is low. Therefore, the maximum recoverable amount from the fishery under a cost recovery program would also be low. Given the low amount of recoverable costs (at a maximum of three percent of the ex-vessel value of bluefin landed), the costs associated with annual implementation of a cost recovery program would approach, equal, or may even exceed the recoverable costs. Implementation of a cost recovery for the IBQ Program, based on the recent fishery (and incremental costs) may provide little or no net value, and may undermine fishery support for the IBQ Program. Given this situation, a cost recovery program that includes flexibility for NMFS to make an annual determination whether cost recovery from the fishery for a particular year may be warranted, based on the recoverable costs and the cost of collecting the fees. Relevant considerations could be the ex-vessel value of bluefin landed, the costs of collecting the fees, as well as the economic impacts (both monetary and behavioral impacts) of the cost recovery fees. This document provides some relevant information regarding cost recovery but does not intend to fully explore and resolve the topic of cost recovery. Consideration of a cost recovery program will be in Amendment 13.

5 References

Anderson, Lee G. and Mark C. Holliday. The Design and Use of Limited Access Privilege Programs. NOAA Technical Memorandum NMFS-F/SPO-86. November 2007.

Cornwall, W. Deepwater Horizon After the Oil. Science 348 pp 22-29 (2015).

Environmental Assessment, Regulatory Impact Review, and Final Regulatory Flexibility Analysis for the Atlantic Bluefin Tuna and Northern Albacore Quota Rule. NMFS, HMS Management Division. September 2018.

Lord F. Understanding social impacts by using new variables and a causal model diagram in New England Fisheries, Impact Assessment and Project Appraisal, 29:1, 59-68, (2011) DOI: 10.3152/146155111X12913679730476.

Final Amendment 7 to the 2006 Consolidated Atlantic HMS FMP. Final Environmental Impact Statement (FEIS). August 2014. https://www.fisheries.noaa.gov/action/amendment-7-2006-consolidated-hms-fishery-management-plan-bluefin-tuna-management].

Gulf of Mexico Fishery Management Council. Red Snapper Individual Fishing Quota Program 5-year Review. April 2013. 94 pp.

Incardona J. P., et. al. Deepwater Horizon crude oil impacts the developing hearts of large predatory pelagic fish. Proceedings of the National Academy of Sciences (PNAS). March 24, 2014.

Murawski, S. A., and E.B. Peebles, A Gracia, J.W. Tunnel, Jr., and M. Armenteros. 2018. Comparative Abundance, Species Composition, and Demographics of Continental Shelf Fish Assemblages throughout the Gulf of Mexico. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 10:325-346.

NMFS Procedural Instruction 01-121-01; Catch Share Policy; Guidance for Conducting Review of Catch Share Programs. https://www.fisheries.noaa.gov/webdam/download/64669111.

NMFS 2015. Recovery of Incremental Costs Associated with the Pacific Coast Groundfish Fishery Sablefish Permit Stacking Program. June 2015 Report.

NMFS 2017. Swordfish Pelagic Longline Fishery Characterization and Trends. Presentation to the HMS Advisory Panel. September 7, 2017. https://www.fisheries.noaa.gov/event/september-2017-hms-advisory-panel-meeting

NMFS 2017. Stock Assessment and Fishery Evaluation (SAFE) Report for Atlantic Highly Migratory Species, 2017. NMFS Office of Sustainable Fisheries, Silver Spring, MD.

SCRS 2017. Report of the Standing Committee on Research and Statistics. ICCAT October 2-6, 2017; Madrid, Spain.

6 Appendix

This Appendix contains relevant data regarding the IBQ Program, most of which are referenced in the body of the document above. Due to the large amount of data, only a portion of the relevant data is contained in the body of the document; the rest is contained here in the Appendix. Brief statements under each section of the Appendix provide the reader some context for the data shown in that section.

6.1 Revenue Tables

The following tables show the average trip revenue and trip costs for vessels, grouped according to fishing effort and vessel size, because fleet-wide metrics showed different results from the economic metrics based on groups of similar vessels. Also shown is pelagic longline fleet revenue by species.

Table 6.1 2012–2017 Average Trip Revenue by Vessel Size Range

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45	$13,038	$13,347	$15,657	$12,291	$14,398	$16,536
45≤55	$18,915	$19,185	$20,428	$16,818	$16,228	$20,100
55≤65	$37,566	$37,812	$33,096	$35,955	$36,245	$31,357
65≤75	$42,265	$32,023	$26,682	$26,735	$25,838	$27,815
>75	$51,369	$52,309	$40,678	$35,897	$39,739	$42,882
Overall Average	$29,007	$27,008	$24,904	$23,093	$24,866	$25,426

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Although larger vessels tend to earn more revenue per trip, the pattern is not seen among all vessel size classes and years. Similarly, there is not a clear pattern in average trip revenue comparing the Baseline Period to the IBQ Period.

Table 6.2 2012–2017 Average Trip Costs by Vessel Size Range

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45	$9,330	$9,909	$9,387	$8,537	$6,929	$6,628
45≤55	$12,279	$11,473	$11,998	$10,809	$9,416	$9,366
55≤65	$22,859	$20,899	$20,212	$19,884	$18,322	$15,974
65≤75	$25,361	$24,532	$22,103	$20,068	$18,984	$18,174
>75	$31,445	$31,763	$31,536	$25,329	$23,250	$25,524
Overall average	$18,124	$17,109	$16,467	$14,982	$14,246	$13,298

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

Table 6.3 2012–2017 PLL Fleet Revenue by Species

Species	2012	2013	2014	2015	2016	2017
Bluefin	$1,274,491	$732,127	$923,919	$572,930	$736,755	$815,093
Swordfish	$21,445,020	$22,942,562	$13,608,220	$10,428,640	$9,941,420	$8,876,863
Yellowfin	$15,465,290	$9,972,392	$9,689,643	$7,549,567	$8,076,606	$9,380,940
Bigeye	$5,184,011	$5,117,280	$5,678,207	$5,087,863	$3,406,133	$5,102,180
Skipjack	$1,444	$1,385	$2,513	$1,248	$1,466	$1,298
Albacore	$476,984	$656,919	$801,479	$592,013	$538,148	$696,809
Dolphin	$2,273,275	$1,382,425	$2,240,169	$1,887,893	$1,770,553	$1,251,371
Wahoo	$321,010	$333,915	$374,630	$224,049	$263,191	$205,905
Shortfin mako	$281,957	$363,568	$415,169	$274,464	$310,940	$325,920
Thresher	$7,124	$7,861	$28,129	$8,183	$7,080	$2,945

Source: HMS logbooks, weighout slips, Accumulative Landing System (ALS), eDealer, and the BFT Bi-Weekly Dealer reports.

6.2 IBQ Allocations and Metrics

The annual distribution of IBQ allocation and inseason allocations of quota are shown for each tier during 2015, 2016, and 2017. The total amounts of IBQ allocation distributed to the shareholder accounts on January 1 each year, were based on the eligible permit's share tier as determined by the Amendment 7 criteria (either high (1.2 percent), medium (0.6 percent), or low (0.37 percent) tier permits). For shareholders that were not associated with a vessel, IBQ allocation was not distributed to the permit holder unless/until the permit was associated with a vessel. The specifics regarding inseason quota distributions are explained in section 1.4 above (IBQ Program Key Features and Events; Inseason Distribution of Allocation). Also included are the split of allocations between the Gulf of Mexico and the Atlantic, and bluefin metrics and IBQ metrics by tier, including the Purse Seine participants in the IBQ Program.

Table 6.4 2015 IBQ Allocations to the PLL Category by Share Tier

Quota Distribution	IBQ (mt)	Date (2015)	IBQ (lb.) to Each Eligible Shareholder*		
			High Tier (~1.2%)	Medium Tier (~0.6%)	Low Tier (~0.37%)
Annual allocation	137.3	January 1	3,616	1,808	1,124
Transfer from Reserve Category	34.0	July 28	551	551	551
ICCAT baseline quota increase	11.0	August 28	292	146	90
Total	182.3		4,459	2,505	1,765

*Only allocated to eligible shareholders, for which the valid permit was associated with a vessel.
Source: IBQ System data.

On January 1, 2016, NMFS distributed 148.3 mt of Longline category bluefin quota to IBQ shareholders associated with a vessel (Table 6.5). For shareholders whose permit was not associated with a vessel, IBQ allocation was not distributed to the permit holder unless/until the permit was associated with a vessel. The total amounts of quota distributed to the shareholder accounts on January 1, 2016, were based on the individual permit's share percentage as determined by the Amendment 7 criteria (either high (1.2 percent), medium (0.6 percent), or low (0.37 percent) tier permits). On January 4, 2016, NMFS distributed an additional 34 mt, which had been

transferred from the Reserve category. The January 4, 2016 quota distribution was equal amounts to each IBQ shareholder associated with a vessel (551 lb.).

Table 6.5 2016 IBQ Allocations to the PLL Category by Share Tier

Quota Distribution	IBQ (mt)	Date (2016)	IBQ (lb.) to Each Eligible Shareholder*		
			High Tier (~1.2%)	Medium Tier (~0.6%)	Low Tier (~0.37%)
Annual allocation	148.3	January 1	3,913	1,956	1,206
Transfer from Reserve Category	34.0	January 4	551	551	551
Total	182.3		4,464	2,507	1,757

*Only allocated to eligible shareholders, for which the valid permit was associated with a vessel.
Source: IBQ System data.

Table 6.6 2017 IBQ Allocations to the PLL Category by Share Tier

Quota Distribution	IBQ (mt)	Date (2017)	IBQ (lb.) to Each Vessel*		
			High Tier (~1.2%)	Medium Tier (~0.6%)	Low Tier (~0.37%)
Annual allocation	148.3	January 1	3,913	1,956	1,206
Transfer from Reserve Category	45.0	March 2	1,102	1,102	1,102
Total	193.3		5,015	3,058	2,308

*Annual allocation: Only allocated to eligible shareholders, for which the valid permit was associated with a vessel.
Transfer from Reserve Category: Only to active vessels (vessels with recent fishing activity (1/1/16 through 2/22/17)).
Source: IBQ System data.

Table 6.7 2018 IBQ Allocations to the PLL Category by Share Tier

Quota Distribution	IBQ (mt)	Date (2018)	IBQ (lb.) to Each Vessel*		
			High Tier (~1.2%)	Medium Tier (~0.6%)	Low Tier (~0.37%)
Annual allocation	148.3	January 1	3,913	1,956	1,206
Transfer from Reserve Category	44.5	April 13	1,102	1,102	1,102
ICCAT baseline quota increase	15.3	October 10	404	202	124
Total	208.1		5,419	3,260	2,432

* Annual allocation: Only allocated to eligible shareholders, for which the valid permit was associated with a vessel.
Transfer from Reserve Category: To 89 active vessels (vessels with recent fishing activity (1/1/17 through 3/31/18).
Source: IBQ System data.

Table 6.8 below shows the split between the Gulf of Mexico and Atlantic, of the allocations to shareholders and the IBQ allocation distributed to vessels. Most of the vessel shares for which IBQ allocation was not distributed were in the Atlantic.

Table 6.8 2015–2017 Split of Allocations Between GOM and ATL (Percent of Total Allocation)

	Allocated to Shareholders (%)		Distributed to Vessels (%)	
Year	GOM	ATL	GOM	ATL
2015	35	65	35	64
2016	35	65	35	61
2017	35	65	34	62

Source: NMFS allocation data.

Table 6.9 shows the pounds of bluefin landed, number of bluefin landed, number of distinct vessels landing bluefin, and the percentage of the tier quota landed, by tier for 2015, 2016, and 2017. All tiers generally increased in the pounds and number of bluefin landed from 2015 through 2017, with the exception of the medium tier, than declined from 2016 to 2017. The number of vessels landing bluefin remained consistent over time for all tiers. The percentage of each tier quota that was landed increased over time, and was fairly consistent during 2017 (i.e., 38 percent of the high tier quota overall was landed, and 41 percent of the medium and low tier quotas were landed).

Table 6.9 2015–2017 BFT Landings by IBQ Tier and Year Not including NED

Metric	Tier	2015	2016	2017
BFT landed (lb.)	High	35,444	51,786	77,527
	Medium	47,567	74,408	63,854
	Low	11,558	21,510	22,809
	NA	7,674	3,186	9,628
	Totals	102,243	150,890	173,817
	Percent of Total quota landed (%)	25	38	41
Number of bluefin landed	High	79	122	164
	Medium	102	193	144
	Low	27	51	61
	NA	18	7	22
	Totals	226	373	391
Number of distinct vessels landing	High	22	20	21
	Medium	21	23	20
	Low	11	10	12
	NA	5	2	4
	Totals	59	54	57
Percent of tier quota landed (%)	High	18	27	38
	Medium	31	48	41
	Low	21	39	41
	NA	-	-	125

Tier share percentages: 1.2 %, 0.6%, 0.37%, high, medium, low, respectively.
Source: SAFIS data; NMFS IBQ tier data.

The amount of quota debt (lb.) by tier and year is show in Table 6.10.

Table 6.10 2015–2017 Pounds of Quota Debt by Tier

Tier (share %)	2015	2016	2017
High (1.2%)	3,702	4,112	3,990
Medium (0.6%)	28,416	35,016	11,897
Low (0.37%)	5,179	6,196	5,116
No IBQ	5,449	0	3,085
Total	42,746	45,324	24,088

Source: IBQ System data.

Table 6.11 2015–2017 Quota Debt and Lessee* Data by Tier

	High Tier	Medium Tier	Low Tier	No IBQ
2015				
Quota debt (QD) (lb.)	3,702	28,416	5,179	5,449
Number of vessel in QD	3	7	3	3
Percent of total QD (%)	9	66	12	13
Leased* IBQ (lb.)	14,749	36,875	12,283	7,056
Number of vessels	4	7	6	3
Percent of total* leases by weight (%)	21	52	17	10
2016				
Quota debt (QD) (lb.)	4,112	35,016	6,196	0
Number of vessels in QD	5	7	5	0
Percent of total QD (%)	9	77	14	0
Leased IBQ (lb.)	25,338	79,789	26,703	9,353
Number of vessels	8	12	7	5
Percent of total leases by weight (%)	18	57	19	7
2017				
Quota debt (QD) (lb.)	3,990	11,897	5,116	3,085
Number of vessels in QD	3	6	5	1
Percent of Total QD (%)	17	49	21	13
Leased IBQ (lb.)	74,162	38,216	21,772	11,900
Number of vessels	11	7	7	3
Percent of total leases by weight (%)	51	26	15	8

*Subset of lease transactions; “terminal” leases.

Table 6.12 2015–2017 Comparison of Tier Landings, Quota Debt and Leasing Activity

Metric	Year	High Tier	Medium Tier	Low Tier	No IBQ
Percent of BFT landed* (%)	2015	35	47	11	8
	2016	34	49	14	2
	2017	45	37	13	6
Percent of tier quota landed* (%)	2015	18	31	21	-
	2016	27	48	39	-
	2017	38	41	41	125
Percent of total quota debt (%)	2015	9	66	12	13
	2016	9	77	14	0
	2017	17	49	21	13
Percent of leased (%)	2015	21	52	17	10
	2016	18	57	19	7
	2017	51	26	15	8

*Not including NED.
Source: Dealer data; IBQ System data.

Table 6.13 shows a metric (ratio of percent of total leases to percent of total quota debt) that is intended to reflect both the relative amount of leasing and the relative amount of quota debt, by tier, in order to further explore possible differences among IBQ share tiers. For example, in 2015, the medium tier represented 52 percent of the leased IBQ allocation and 66 percent of the quota debt (ratio of 0.79), whereas the high tier represented 21 percent of the leased IBQ allocation and 9 percent of the quota debt (ratio of 2.33). The high tier consistently had a higher ratio than the medium or low tier, and indicated a different situation for the high tier. Although the medium tier leased more IBQ allocation than the high tier in two of the three years, the medium tier had a much larger percentage of the overall quota debt, and therefore a lower ratio.

Table 6.13 2015–2017 Lease-to-Quota Debt Ratio by Tier

	High Tier	Medium tier	Low Tier	No IBQ
2015	2.33	0.79	1.42	0.77
2016	2.0	0.74	1.36	0
2017	3.0	0.53	0.71	0.62

Note: The ratio of percent of total leases to percent of total quota debt.
Source: IBQ System data.

Table 6.14 shows the number of active vessels by tier. It is interesting to note that the number of active vessels in the high and medium tiers are similar, despite the notable differences for quota debt and leased IBQ allocation. The differences in the metrics do not appear to be the result of different numbers of active vessels in the different tiers. This is the data used to distribute IBQ allocation to active vessels inseason, and is slightly higher than the numbers of vessels reporting use of pelagic longline gear via logbook. In this context, a vessel that reported bluefin sets via VMS was considered active, even if it did not report via logbooks.

Table 6.14 2015–2017 Number of Active Vessels by IBQ Tier

Tier	2015	2016	2017
High	36	32	34
Medium	41	33	35
Low	22	18	16
No shares	5	3	4
Totals	104	86	89

Sources: Logbook and VMS data.

Figure 6.1 shows the number of distinct shareholders participating in the leasing market by month. Of note is the large number of shareholders leasing during December 2015, and the fact that during 2015 vessels were accountable for bluefin catch on an annual basis (and not trip level). During 2015, shareholders were leasing in order to account for bluefin catch at the end of the year.

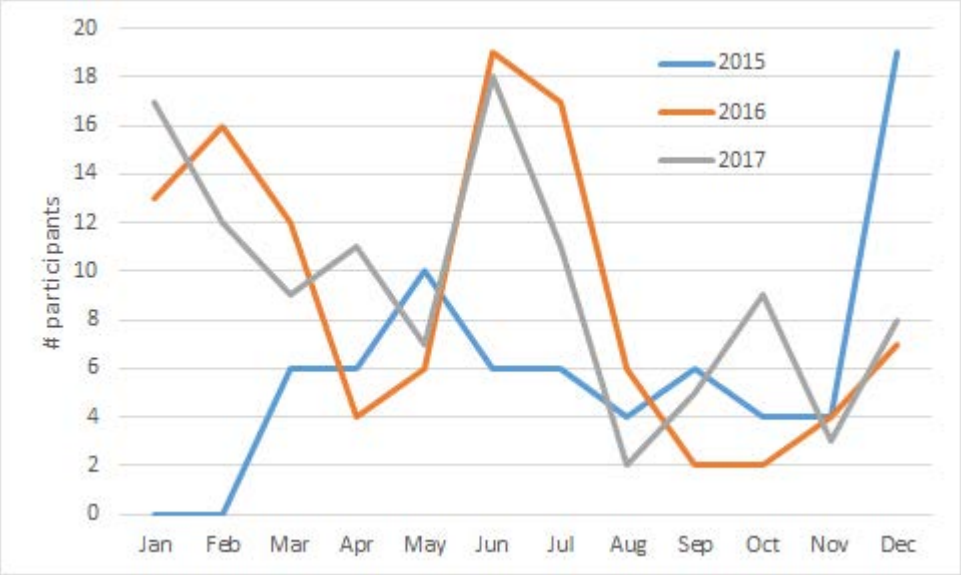

Figure 6.1 2015–2017 Number of Distinct Shareholders Leasing by Month

Source: IBQ System data.

Figure 6.2 and Table 6.15 show data on the relative amount of lease transactions between purse seine participants, between purse seine and longline, and between longliners. During 2015, 28 percent of the leases were among purse seine participants, but during the subsequent years, the pattern changed, and there were virtually no leases among purse seine vessels, and an average of 24 percent of the leases (by weight) were from purse seine to longline participants. The remaining leases were longline to longline, averaging 76 percent by weight of the leases during 2016 and 2017.

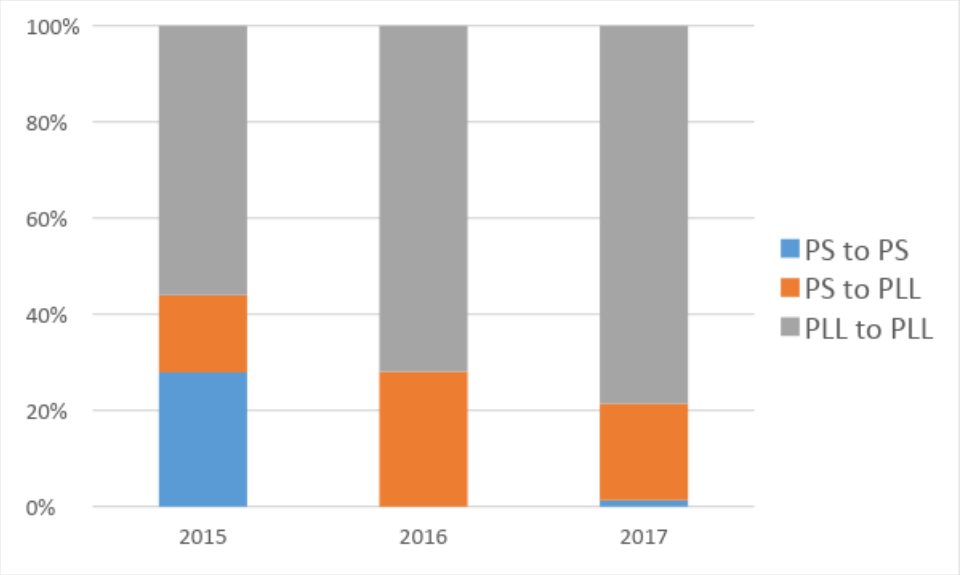

Figure 6.2 Percent of Total Leases by Weight, PS Participants, and PLL Shareholders

Source: IBQ System data.

Table 6.15 Percent of Total Leases by Weight, PS Participants, and PLL Shareholders

	2015	2016	2017
Purse seine to purse seine (%)	28	0	1
Purse seine to pelagic longline (%)	16	28	20
Pelagic longline to pelagic longline (%)	56	72	79

Source: IBQ System data.

6.3 Fishing Effort

This section includes data on various metrics that represent fishing effort, including the number of active pelagic longline vessels (i.e., fishing with pelagic longline gear), and data on the number of pelagic longline sets and hooks fished, and the distribution of fishing effort by geographic area, and time (month) (Table 6.16 through Table 6.19; Figure 6.3 through Figure 6.15).

Table 6.16 2012–2017 Active Vessels by Size Class

Vessel Length (ft)	2012	2013	2014	2015	2016	2017
<45	22	21	20	18	14	14
45≤55	12	12	11	10	8	9
55≤65	28	27	25	27	20	21
65≤75	32	30	30	26	22	25
>75	27	26	24	23	21	19
Grand Total	121	116	110	104	85	88

Source: Logbook data.

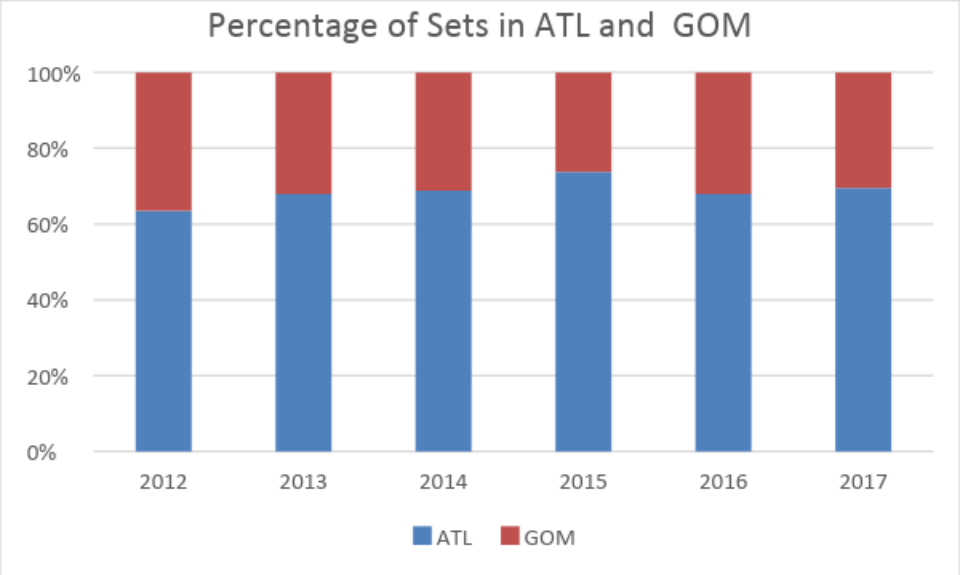

Figure 6.3 2012–2017 Percent of Total Sets in the ATL and GOM

Source: Logbook data.

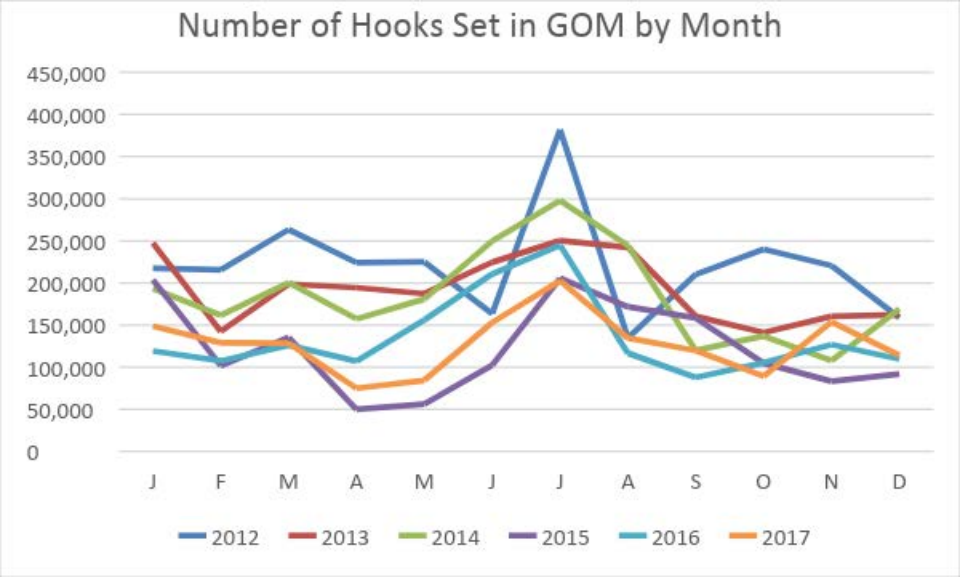

Figure 6.4 2012–2017 Number of Hooks Set in the GOM by Month

Source: Logbook data.

Figure 6.5 contains data on the overall distribution of hooks, based on VMS data, indicating a low percentage of reported hooks in the NED. For example, in 2017, 69 percent of the hooks set were in the Atlantic, 28 percent in the Gulf of Mexico, and 3 percent in the NED. As an indicator of fishing effort during 2015 through 2017, the percentage of hooks set in the NED corresponds well to the percentage of sets in the NED (i.e., 3 percent of hooks set in the NED; 4 to 5 percent of the sets in the NED). Note these data are only from 2015 through 2017 because the VMS reporting requirement did not exist prior to 2015. During years prior to the Baseline period, there was annual variability in the number of bluefin interactions in the NED.

Other measures of effort in the NED, such as number of sets annually, numbers of hooks, and numbers of hooks per set) support the conclusion that effort in the NED during the IBQ period was similar to or less than during the Baseline period.

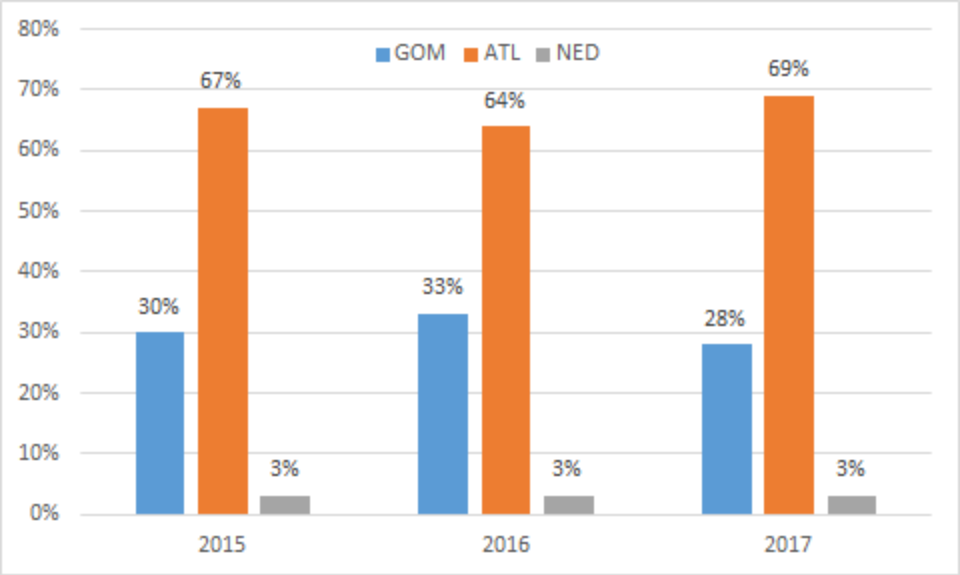

Figure 6.5 2015–2017 Percent of Total Hooks in the GOM, ATL, and NED

Source: VMS data.

Figure 6.6 shows the percentage of sets in the Atlantic from the NED and the percentage of bluefin landings from the Atlantic that were from the NED.

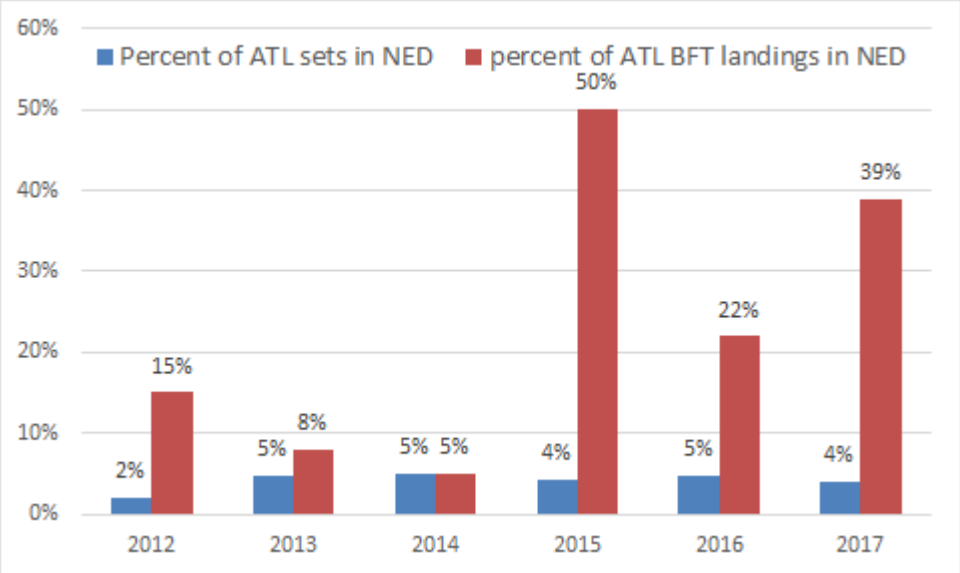

Figure 6.6 2012–2017 Percent of ATL PLL Sets and BFT Landings in the NED

Source: Logbook data.

Figure 6.7 shows a different analysis of the VMS data on numbers of hooks fished illustrating seasonal pattern in effort in the NED. The average percent of total hooks fished in the NED by month (for 2015 through 2017) shows the notable fishing effort during the months of August,

September, and October. For example, during September, on average, 15 percent of the total hooks reported by VMS were in the NED.

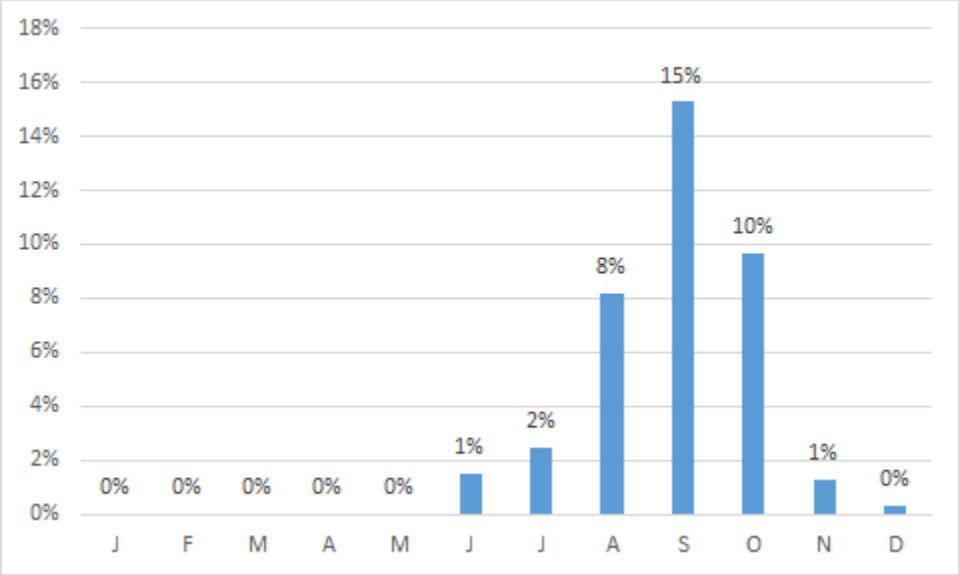

Figure 6.7 2015–2017 Average Percent of Total Hooks Fished in the NED by Month

Source: VMS data.

Logbook data regarding fishing effort in the NED are shown in Figure 6.8, Figure 6.9, and Figure 6.10. Numbers of sets and numbers of hooks do not appear to have increased during 2015 through 2017 compared to the baseline period. The number of hooks per set did increase during 2017 (over 2015 and 2016 levels), but is similar to levels during 2013 and 2014.

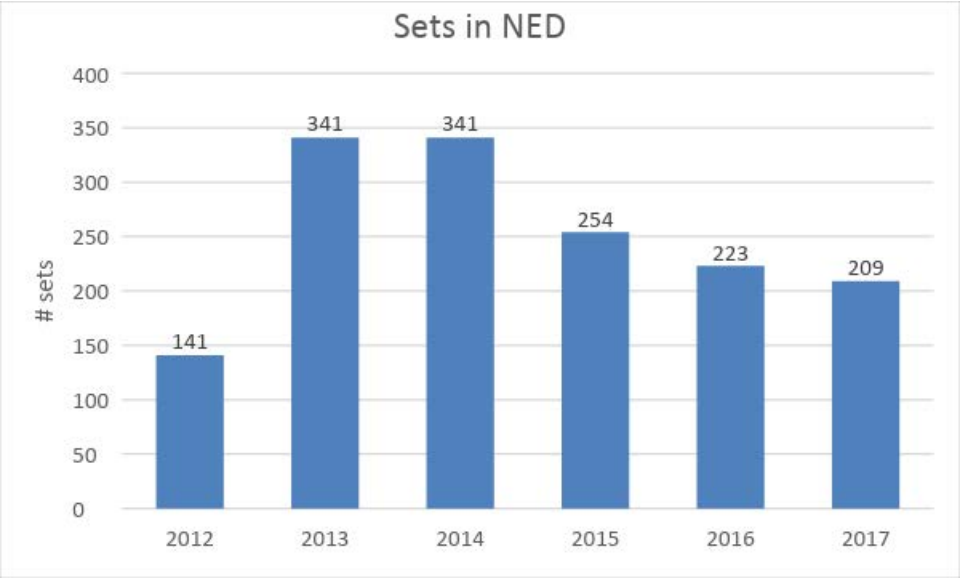

Figure 6.8 2012–2017 PLL Sets in the NED

Source: Logbook data.

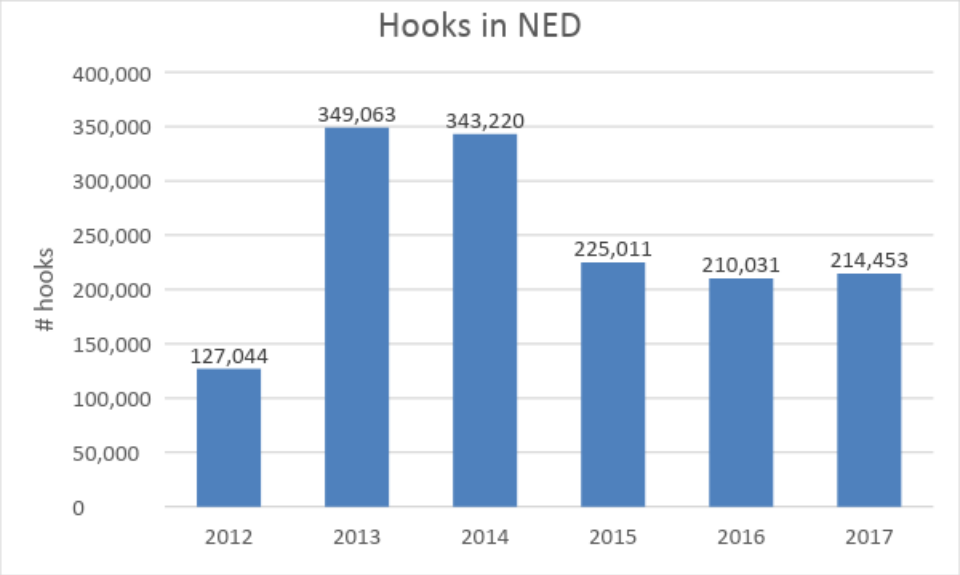

Figure 6.9 2012–2017 Hooks Set in the NED

Source: Logbook data.

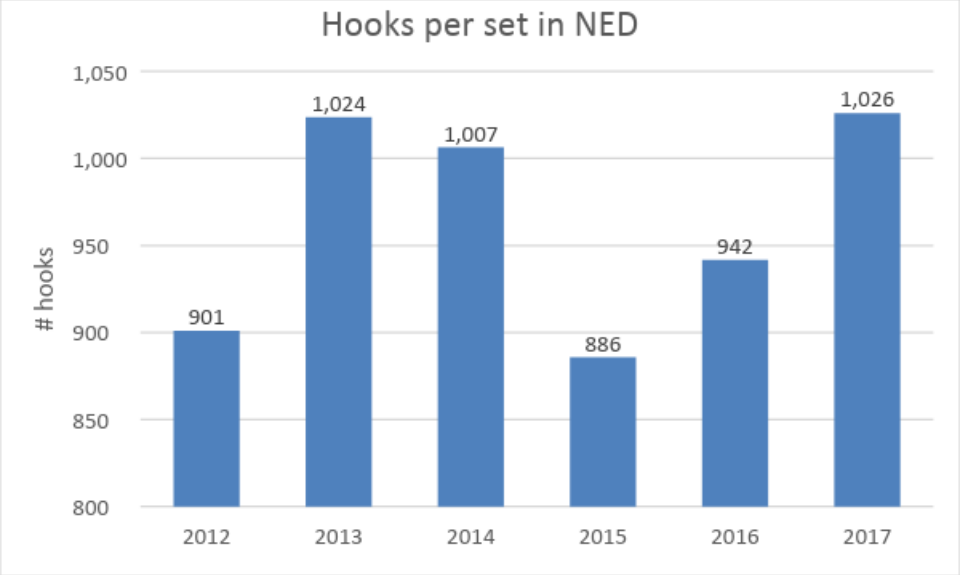

Figure 6.10 2012–2017 Hooks per Set in the NED

Source: Logbook data.

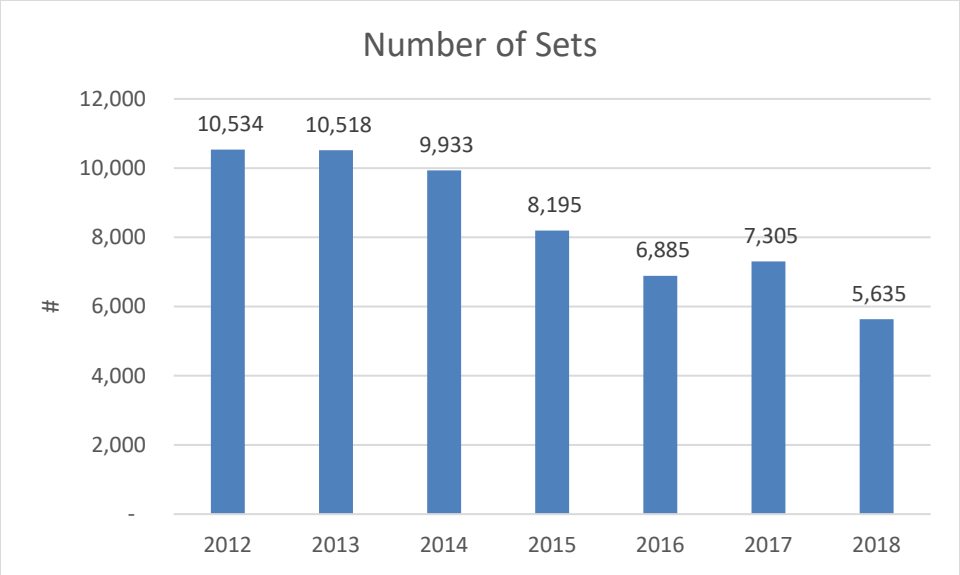

Figure 6.11 2012–2018 PLL Sets

Source: Logbook data.

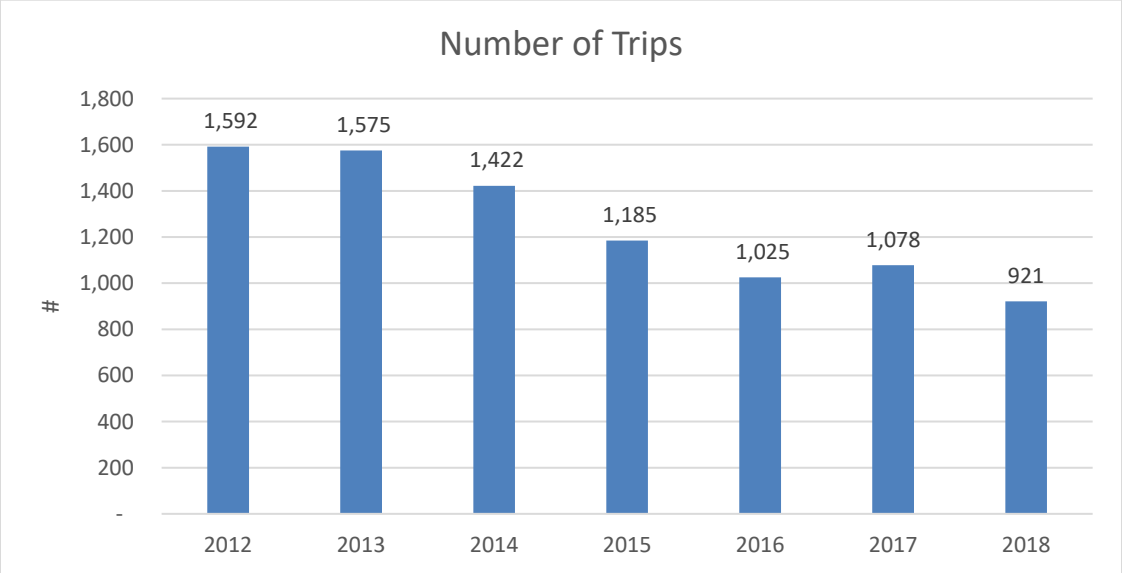

Figure 6.12 2012–2018 PLL Trips

Source: Logbook data.

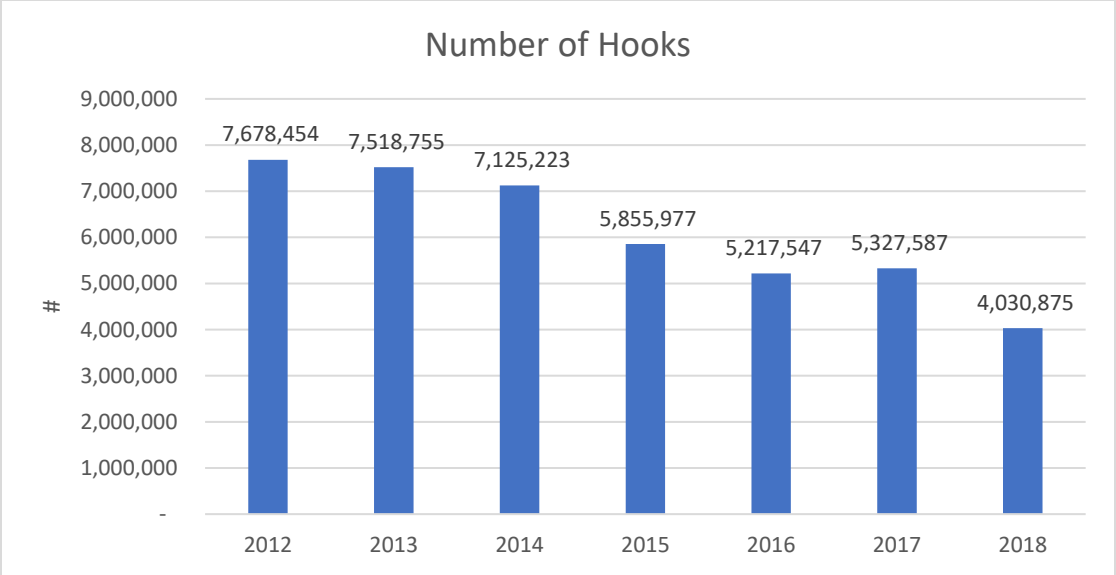

Figure 6.13 2012–2018 Total Number of Hooks Set

Source: Logbook data.

Table 6.17 2012–2017 Number of PLL Hooks Sets and Count of Vessels

Hooks Set Per Year	2012	2013	2014	2015	2016	2017
<25,000	21	19	15	24	19	19
25,000≤50,000	21	22	31	28	16	19
50,000≤75,000	31	31	27	22	17	25
75,000≤100,000	24	19	18	14	16	9
>100,000	24	25	19	16	17	16
Grand total (vessels)	121	116	110	104	85	88

Source: Logbook data.

Table 6.18 2012–2017 PLL Sets and Vessel Count

Number of Sets	2012	2013	2014	2015	2016	2017
1≤50	24	22	22	34	22	26
51≤100	46	43	46	33	32	30
101≤150	43	42	34	26	27	26
>151	8	9	8	11	4	6
Grand total (vessels)	121	116	110	104	85	88

Source: Logbook data.

Table 6.19 2012–2017 Average Number of Hooks per Set

Year	Average Hooks per Set
2012	729
2013	715
2014	717
2015	715
2016	758
2017	729

Source: Logbook data.

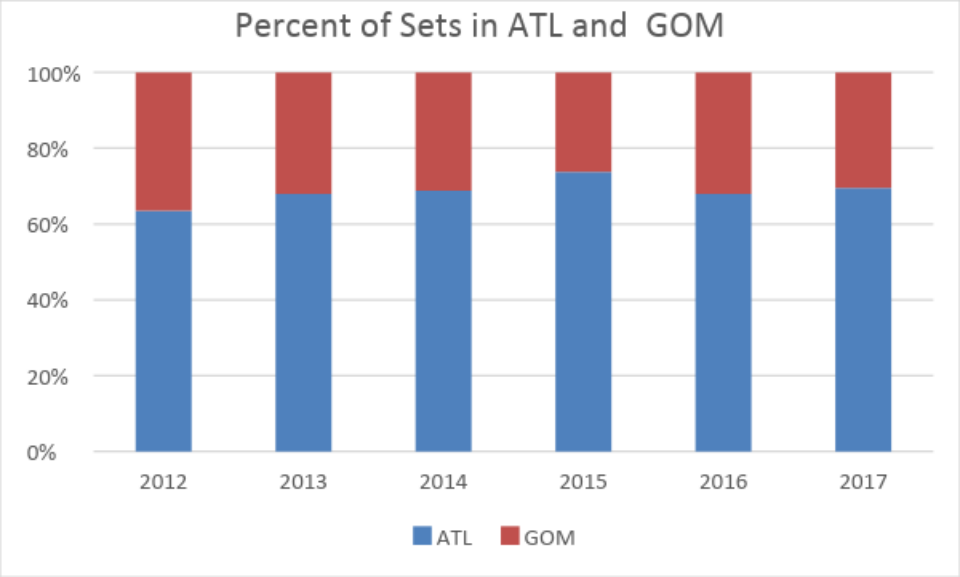

Figure 6.14 2012–2017 Percent of PLL Sets in ATL and GOM

Source: Logbook data.

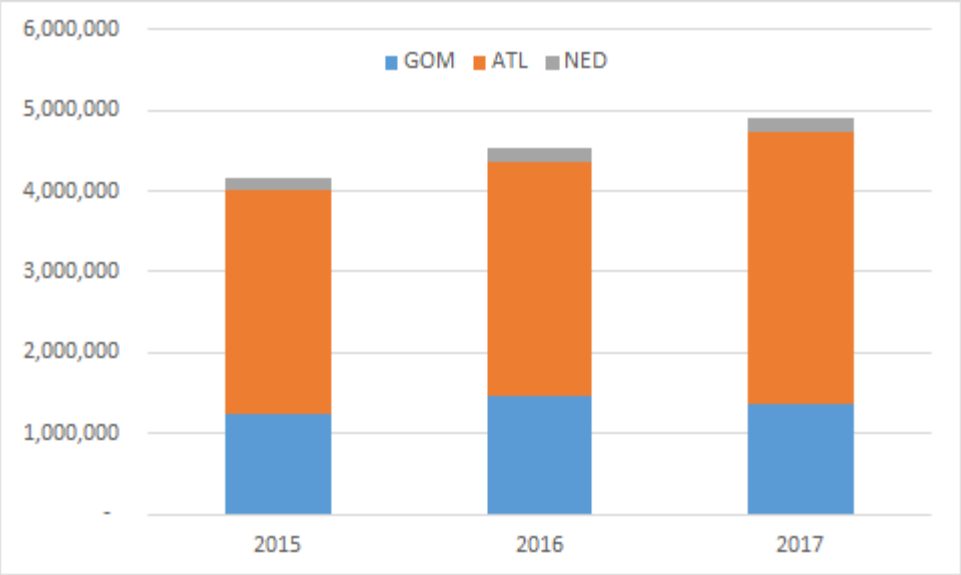

Figure 6.15 2015–2017 Total Number of Hooks by Area

Source: VMS data.

6.4 Additional Information on Bluefin Landing and Dead Discards

This section includes data on bluefin landings by state, geographic area, and month; dead discards by area; dead discard catch per unit effort by ICCAT area; and Purse Seine catch of bluefin.

Data on 2015 through 2018 landings from January through June are shown in Table 6.20 to enable a more complete evaluation of the IBQ Program, including consideration of potential impacts of quarterly accountability, which was implemented in 2018. The there was an increasing trend in the number of bluefin landed during the January through June period.

Table 6.20 2015–2018 BFT Landed from January through June

Year	Number of BFT
2015	114
2016	289
2017	271
2018	349

Sources: SAFIS data (2015-2017); IBQ data (2018).

Table 6.21 shows total bluefin landings by state by year, comparing totals from the Baseline period to the IBQ period. Canada, Maryland, New York, and Virginia had increased bluefin landings, whereas Florida, Louisiana, Massachusetts, Maine, North Carolina, South Carolina, Rhode Island, Puerto Rico, and the Turks and Caicos had decreased bluefin landings.

Table 6.21 2012–2014 and 2015–2017 Total BFT Landings by State (or Country)

Location	2012 to 2014 (total lb)	2015 to 2017 (total lb)	Percent Change
Canada	21,949	76,114	230 %
Florida	163,201	115,045	-30 %
Louisiana	105,918	23,831	-80 %
Massachusetts	174,828	133,554	-20 %
Maryland	11,132	18,238	60 %
Maine	1,760	1,269	-30 %
North Carolina	97,541	54,533	-40 %
New Jersey	28,085	27,225	0
New York	4,561	17,704	290 %
Puerto Rico	8,043	373	-100 %
Rhode Island	1,087	433	-60%
South Carolina	41,303	22,428	-50 %
Turks & Caicos	798	0	-100 %
Virginia	8,142	12,290	50 %

Sources: Dealer data.

Table 6.22 shows the bluefin landings by state and by year (not totaled).

Table 6.22 2012–2017 BFT Landings (lb) by State (or Country)

Location	2012	2013	2014	2015	2016	2017
Canada	11,065	5,502	5,382	18,215	18,061	39,838
Florida	47,579	50,453	65,170	33,335	34,307	47,403
Louisiana	64,731	18,876	22,311	6,176	7,693	9,962
Massachusetts	9,609	67,365	97,854	73.979	71,636	61,844
Maryland	3,365	2,721	5,046	315	6,694	11,229
Maine	921	839				1,269
North Carolina	30,378	27,628	39,535	8,404	19,453	26,676
New Jersey	15,186	3,785	9,114	6,752	11,355	9,118
New York	710	325	3,526	4,668	4,836	8,200
Puerto Rico	2,080	4,927	1,036		373	
Rhode Island			1,087	433		
South Carolina	12,098	17,089	12,116	4,806	11,281	6,341
Turks & Caicos			798			
Virginia	3,533	2,692	1,917	335	4,439	7,516

Sources: Dealer data.

Table 6.23 shows the detailed data on bluefin landings by year during 2015 through 2017 (pounds, number, and number of vessels landing), including a breakdown of landings south of the NED and from the NED, as well as how many of the landings from the NED were accounted for by IBQ allocation (i.e., in excess of the 25 mt NED quota). Due to the separate 25 mt NED quota being fulfilled in 2015 and 2017, vessels were subsequently required to account for bluefin caught in the NED using IBQ allocation (20,089 lb. (34 fish) in 2015 and 28,434 lb. (45 fish) in 2017). Between five and six vessels fished in the NED during these times.

Table 6.23 2015–2017 BFT Landings and Quota by Geographic Area (Including NED)

Metric			2015	2016	2017
Weight of bluefin landed (lb.)	GOM		8,134	7,693	12,559
	ATL south of NED		74,020	143,198	132,325
	ATL NED	Non IBQ (up to 25 mt)	55,175	39,236	55,578
		IBQ (> 25 mt)	20,089	0	28,434
		Total	75,264	39,236	84,012
	Total		157,418	190,127	228,895
Number of bluefin landed	GOM		15	13	21
	ATL south of NED		177	360	324
	ATL NED	Non IBQ (up to 25 mt)	97	64	111
		IBQ (> 25 mt)	34	0	45
		Total	131	64	156
	Total		323	437	501
Number of distinct vessels landing	GOM		12	10	13
	ATL south of NED		46	45	43
	ATL NED	Non IBQ (up to 25mt)	6	6	5
		IBQ (> 25 mt)	1	N/A	3
		Total	6	6	5
	Total		59	56	58

Source: SAFIS data.

Table 6.24 2012–2017 Estimated BFT Dead Discards by Geographic Area

	2012	2013	2014	2015	2016	2017	2018
NED (mt)	0.63	10.17	9.16	0	0.72	1.2	0.0
ATL (mt)	135.9	123.37	100.23	11.5	17.07	3.7	11.0
GOM (mt)	69.3	22.85	29.77	5.6	7.23	6.5	3.6
Total (mt)	205.8	156.39	139.16	17.1	25.02	11.4	14.6

Source: Logbook and observer data.

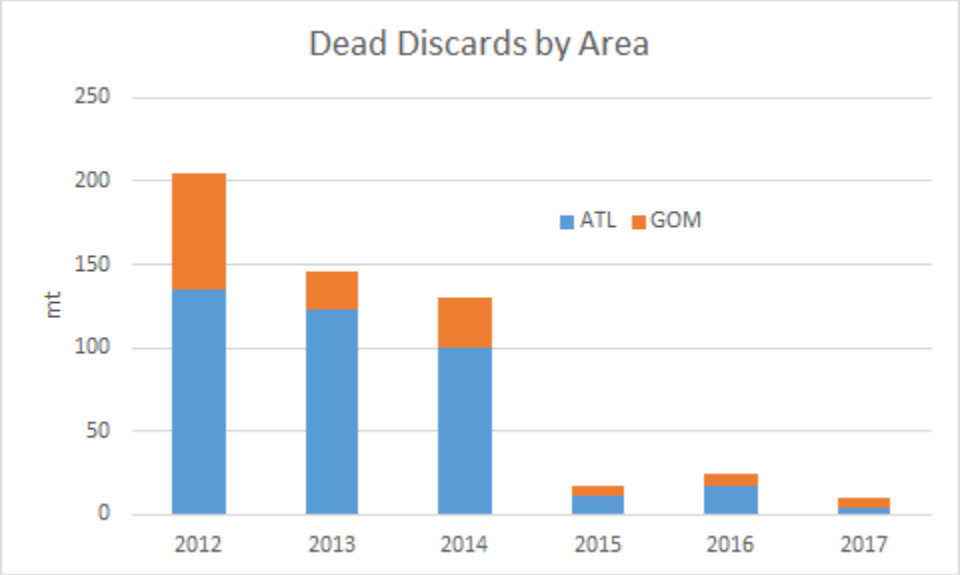

Figure 6.16 2012–2017 BFT Dead Discards in ATL and GOM

Source: Logbook and observer data.

Table 6.25 2012–2017 BFT Landings in the ATL by Area (Showing NED Contribution)

Year	NED (in)	South of NED (lb)	Total (lb)	Percent in NED (%)
2012	18,479	105,855	124,334	15
2013	9,399	102,080	111,479	8
2014	8,366	147,874	156,240	5
2015	75,264	74,020	149,284	50
2016	39,236	143,198	182,434	22
2017	84,012	132,325	216,337	39
2018	8,736	177,975	186,711	5

Source: Dealer data.

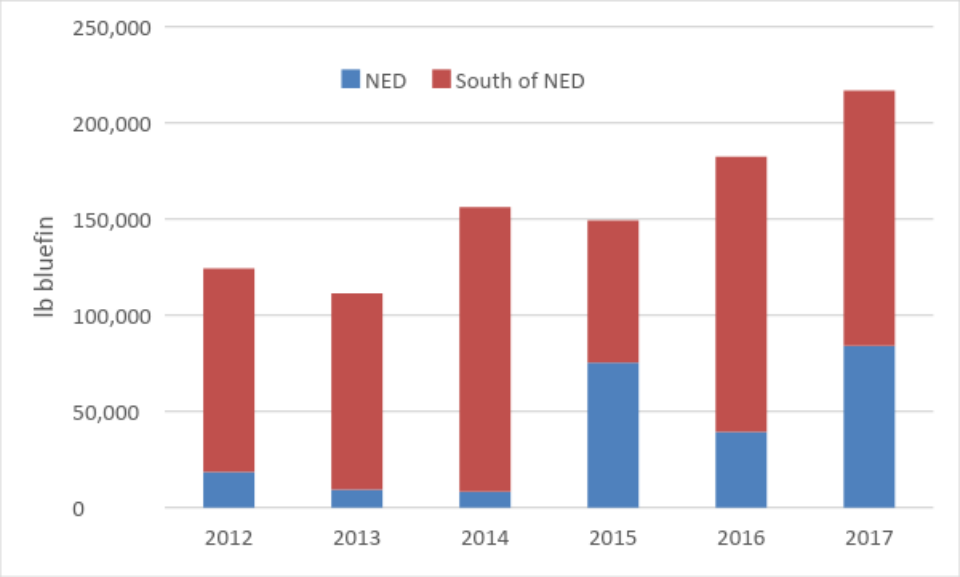

Figure 6.17 2012–2017 BFT Landing of ATL South of NED and NED

Source: Dealer data

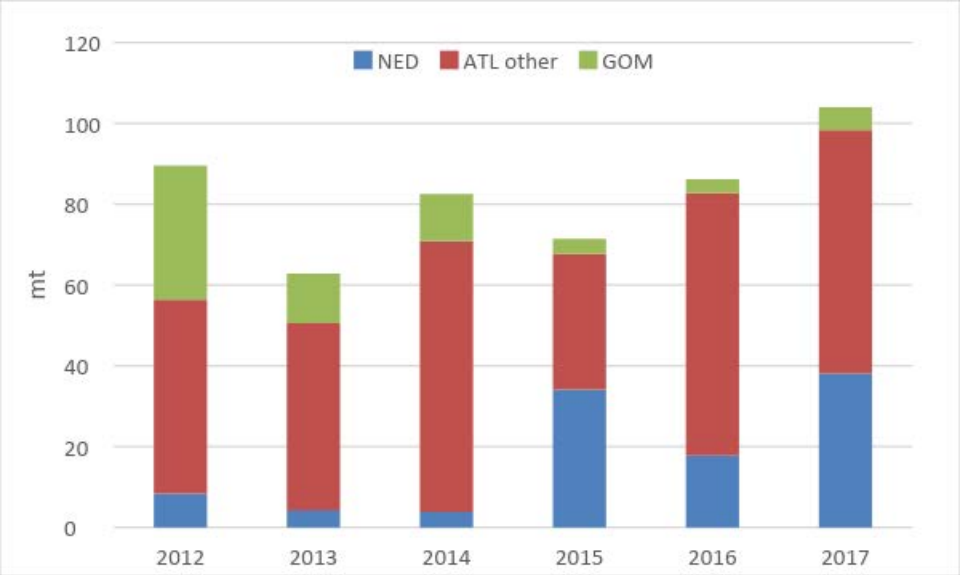

Figure 6.18 2012–2017 BFT Landings of NED, GOM, and Other ATL

Source: Dealer data.

In this graph (Figure 6.18), NED refers to geographic area, and includes the separate NED quota of 25 mt ww, and additional NED landings if total NED landings were greater than 25 mt. "ATL other" refers to the Atlantic not including the NED. GOM is the Gulf of Mexico.

The proportion of bluefin landings from the NED in relation to landings overall for the category increased notably in 2015 compared to the Baseline period. In 2015 and 2017, bluefin landings and dead discards from the NED exceed the 25 mt NED quota, and therefore vessels were required to utilize IBQ allocation to account for all bluefin catch (landings and dead discards) in excess of 25 mt. The proportion of total landings in the NED increased from 9 percent in 2012 to 37 percent in 2017. There was not however a concurrent increase in fishing effort in the NED, thus highlighting that the bluefin interaction rates in this area can vary widely from one year to the next. Estimates of bluefin dead discards based on observer and logbook data were low during the baseline period and during the IBQ Program.

There were no dead discards reported in the VMS data from the NED during 2015 and 2016, and only two dead discards reported from the NED during 2017.

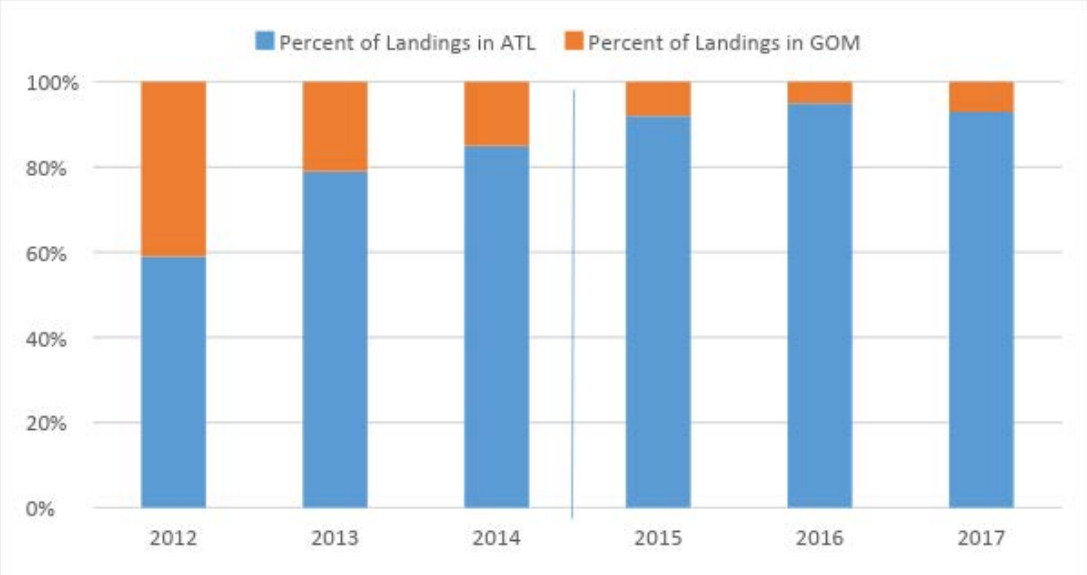

Figure 6.19 2012–2017 Percent of Landings in ATL and GOM, Not Including NED

Note: 2017 first year of "repose" in Gulf of Mexico.
Source: SAFIS data.

Figure 6.20 shows the number of bluefin landed by month from 2012 through 2014.

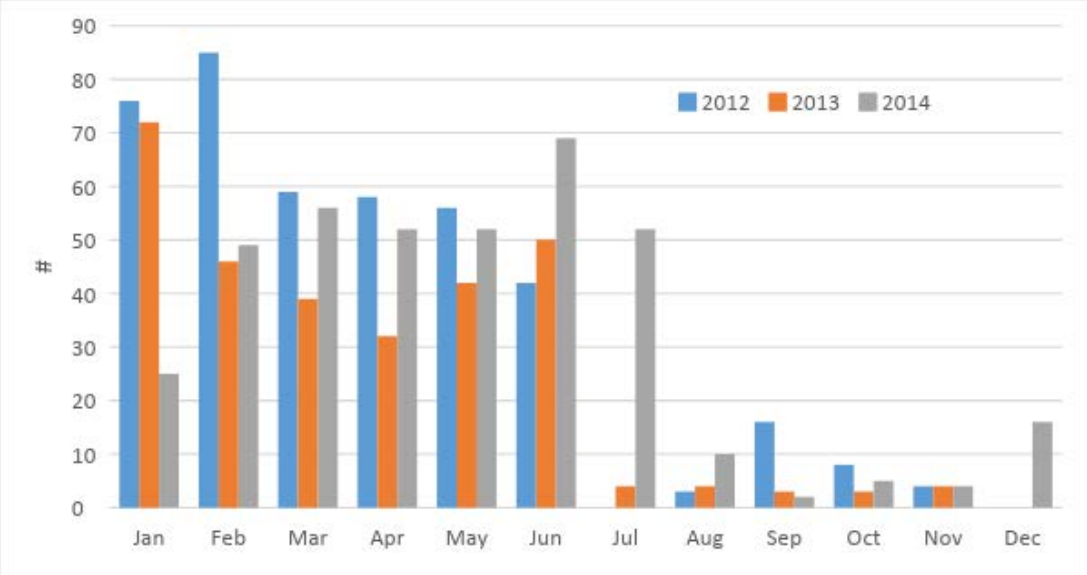

Figure 6.20 2012–2014 BFT Landed by Month

Source: SAFIS data.

Figure 6.21 shows the number of bluefin landed by month from 2015 through 2017. Bluefin landings were higher in 2016 and 2017 than in 2015. More fish were landed in June than in any other month.

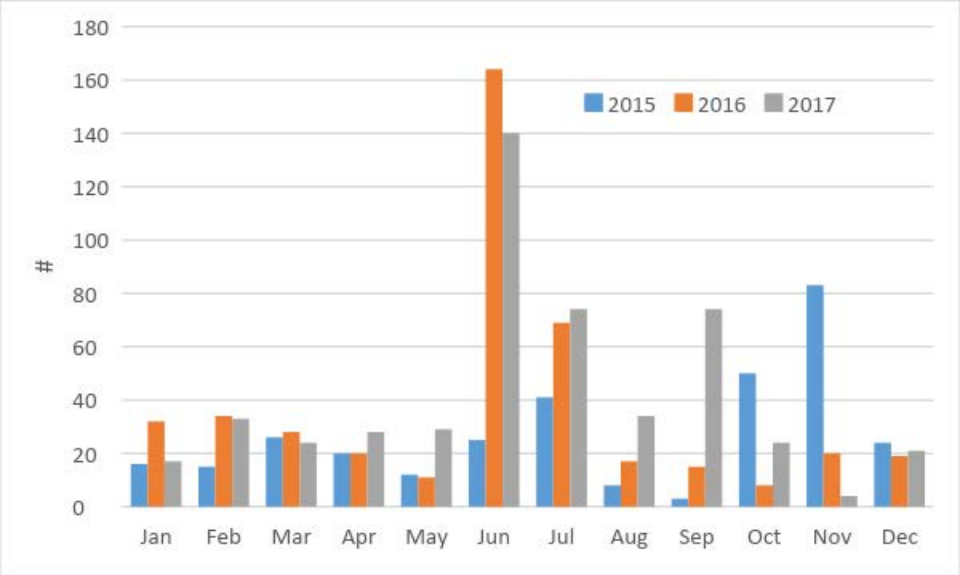

Figure 6.21 2015–2017 BFT Landed by Month

Source: SAFIS data.

Figure 6.22 shows the average number of bluefin landed by month from 2012 through 2017. The landings during the baseline period (2012-2014) occur predominantly January through June, whereas during 2015 to 2017 landings are uniform throughout the year, with an increase in June and July.

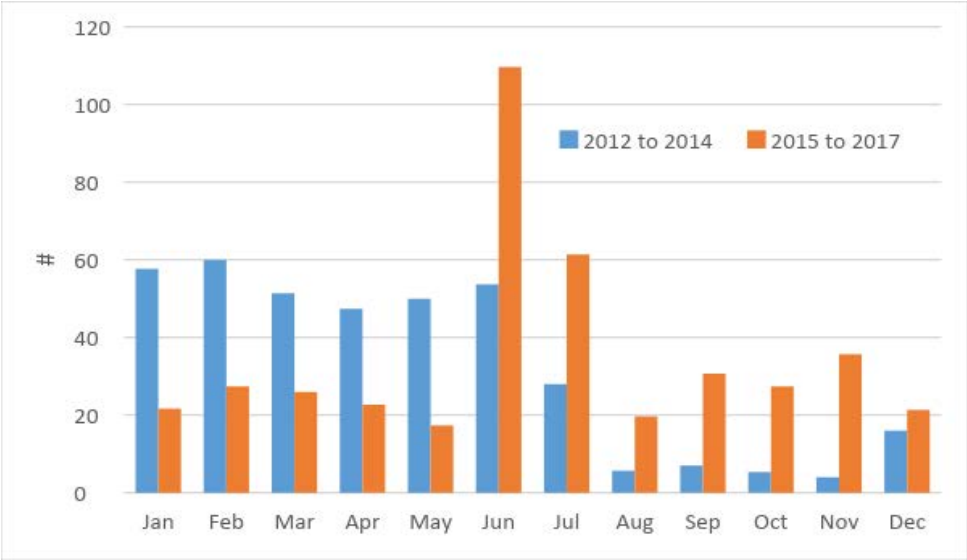

Figure 6.22 2012–2014 and 2015–2017 BFT Landings by Month Averages

Source: SAFIS data.

Figure 6.23 provides a reference to the ICCAT areas defined for bluefin in the western Atlantic.

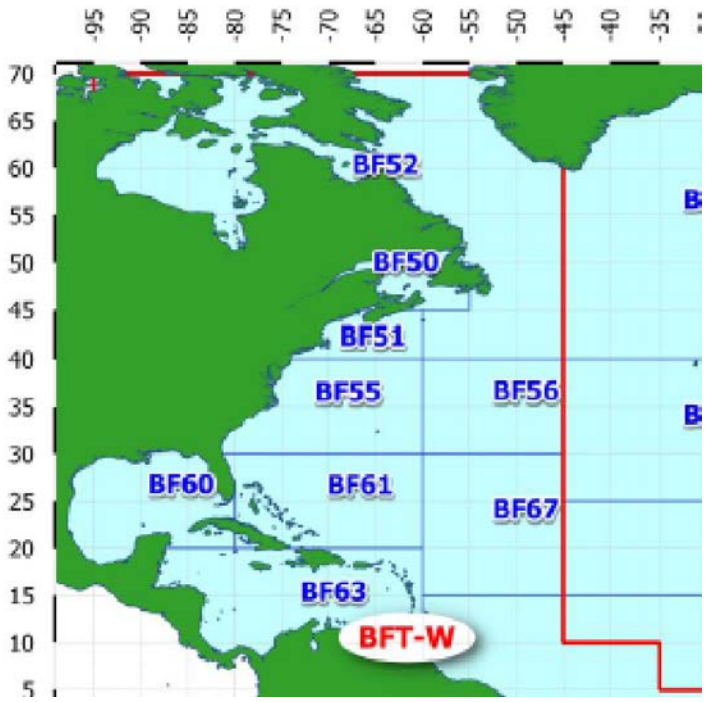

Figure 6.23 ICCAT BFT Area Designations in the Western Atlantic

Source: ICCAT.

Figure 6.24 shows the CPUE of dead discards, but by ICCAT statistical reporting area for western Atlantic bluefin. Specifically shown are the ICCAT statistical reporting areas with the highest dead discard CPUE.

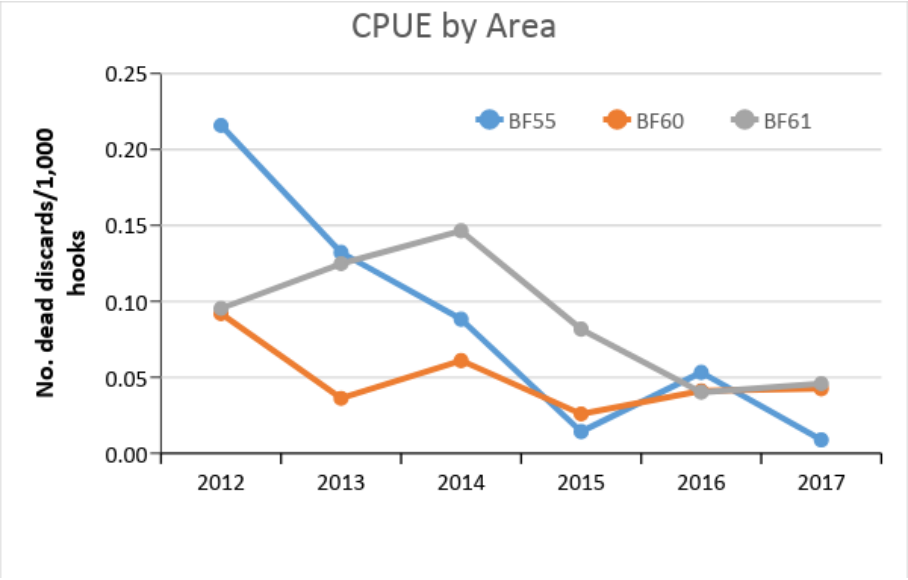

Figure 6.24 2012–2017 BFT Dead Discards per Unit Effort for the ICCAT Areas with the Most BFT Dead Discards

Source: SEFSC, based on observer and logbook data.

Figure 6.25, Figure 6.26, Figure 6.27, and Figure 6.28 below show the observer and logbook data with the numbers of bluefin discarded dead indicated on the left axis (blue bars) and the number of hooks on the right axis (red line), by ICCAT area. The notable trends are the declines in both number of hooks and number of bluefin discarded dead during the IBQ period compared to the Baseline period.

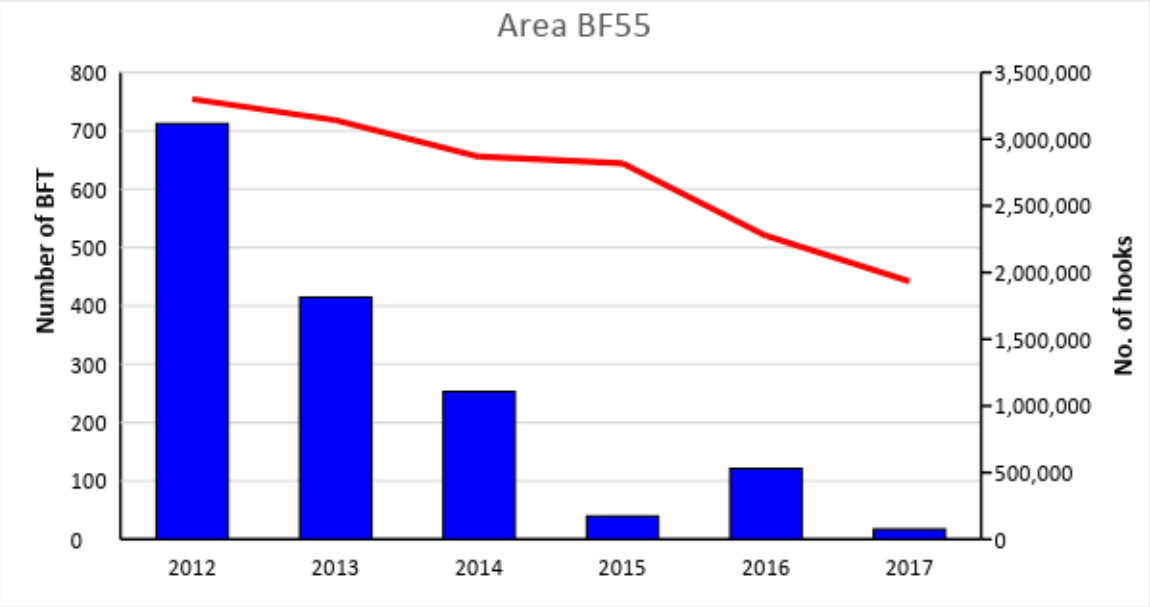

Figure 6.25 ICCAT Area BF55—BFT Discarded Dead and Number of Hooks

Source: SEFSC; observer data (number of bluefin represented by blue bars) and logbook data (number of hooks represented by red line).

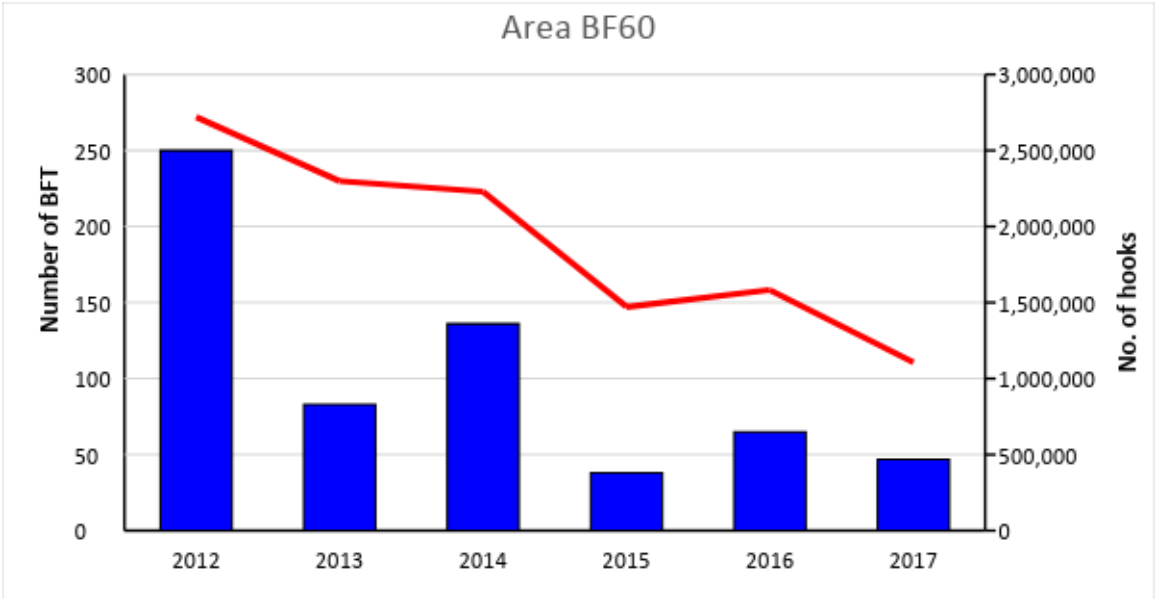

Figure 6.26 ICCAT Area BF60—BFT Discarded Dead and Number of Hooks

Source: SEFSC; observer data (number of bluefin represented by blue bars) and logbook data (number of hooks represented by red line).

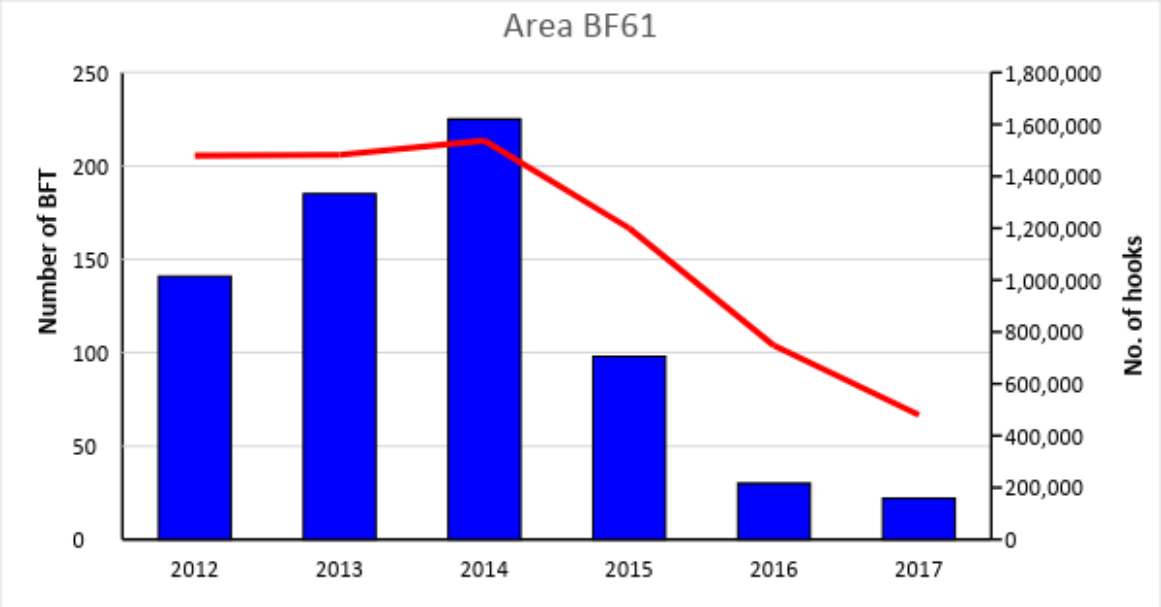

Figure 6.27 ICCAT Area BF61—BFT Discarded Dead and Number of Hooks

Source: SEFSC; observer data (number of bluefin represented by blue bars) and logbook data (number of hooks represented by red line).

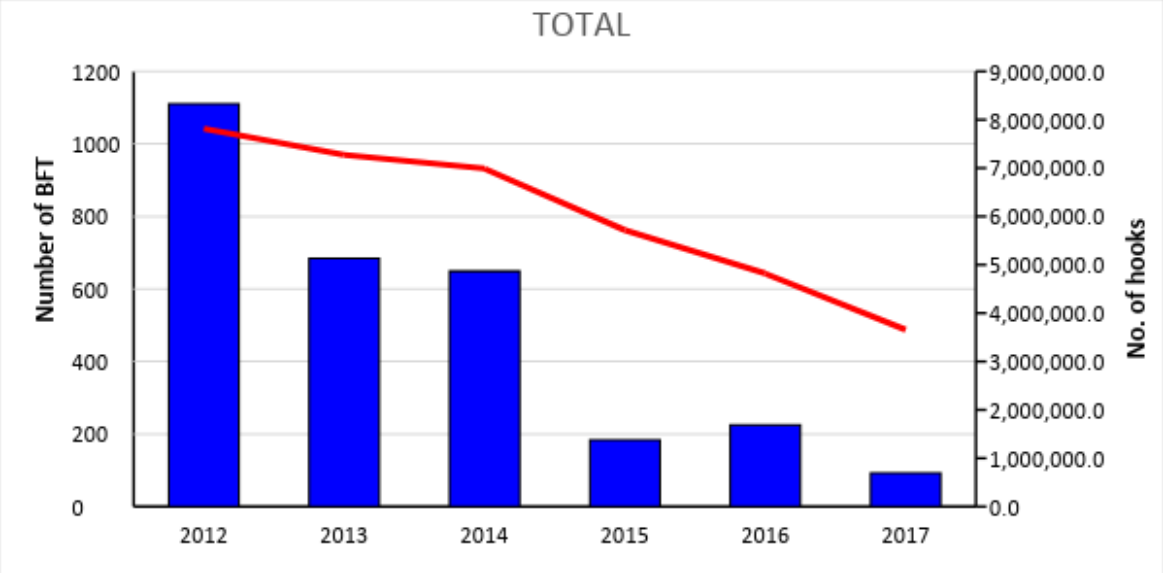

Figure 6.28 Total Number of BFT Discarded Dead and Number of Hooks

Source: SEFSC; observer data (number of bluefin represented by blue bars) and logbook data (number of hooks represented by red line).

Figure 6.29 below shows the bluefin CPUE from 2006 to 2012, based on logbook data.

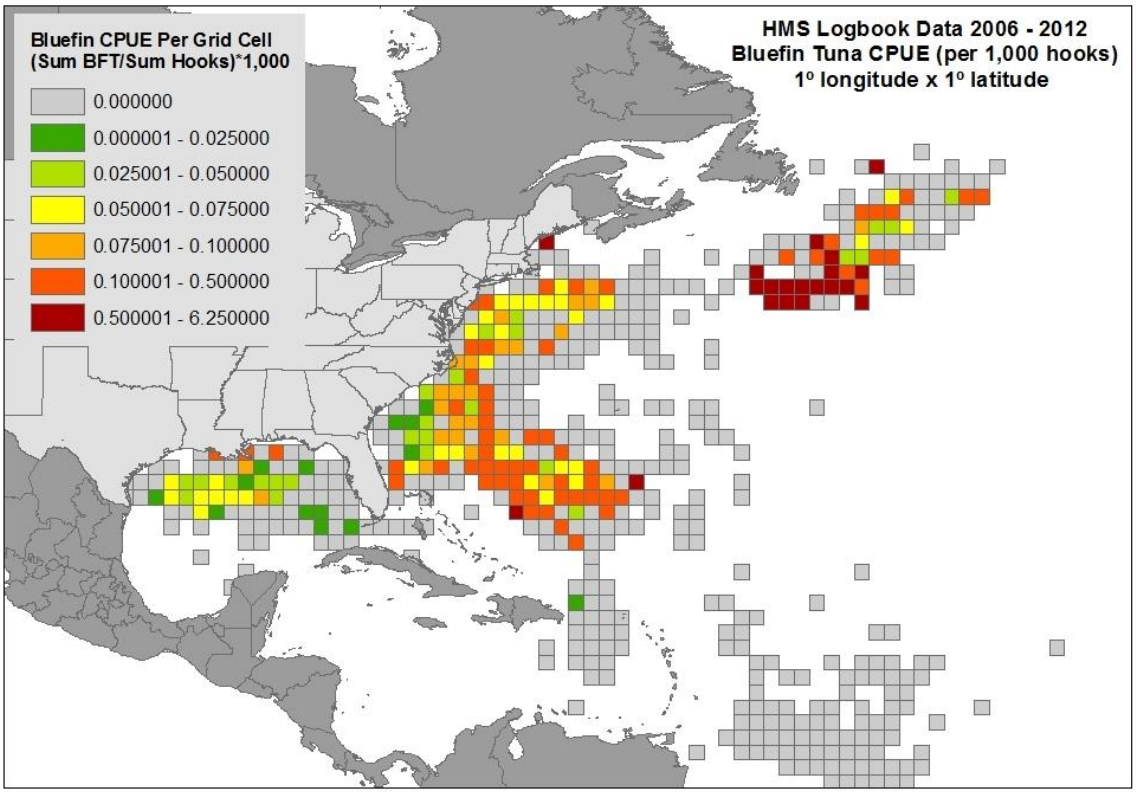

Figure 6.29 2006–2012 Average CPUE of Bluefin† Tuna

†Number of bluefin kept per thousand hooks set.
CPUE per cell = (sum of all bluefin tuna kept in a cell/sum of all hooks deployed in a cell) × 1000. (from Amendment 7 FEIS).

Figure 6.30 illustrates the 2013 to 2017 trends in the purse seine fishery. The purse seine category is related to the IBQ Program because the IBQ allocations and Purse Seine category quotas may be leased to and from the respective participants. During 2013 through 2015, landings by purse seine vessels were well below the quota, and during 2016 and 2017 there were no landings by purse seine vessels.

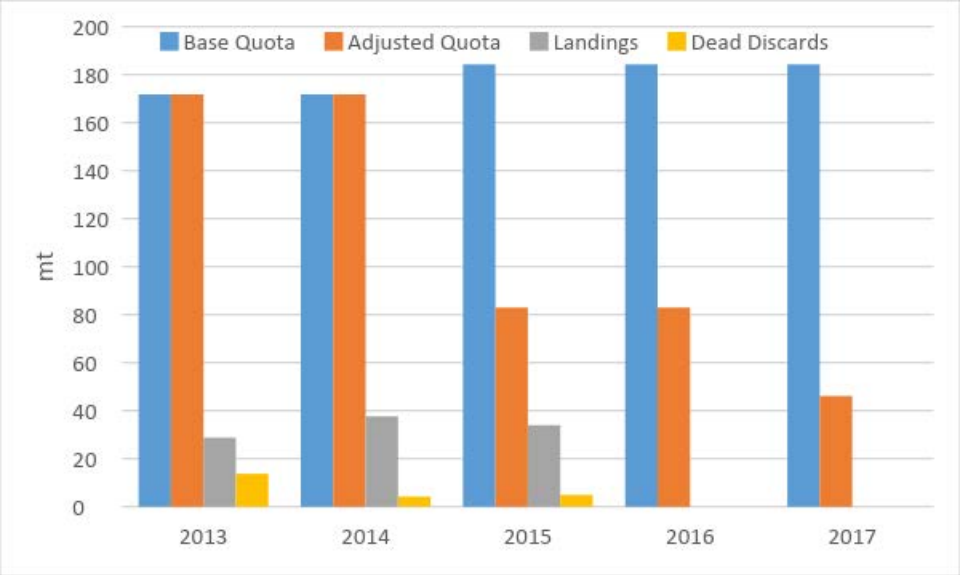

Figure 6.30 2013–2017 PS Fishery Quota and Catch Trends

Source: Dealer data.

6.5 Distribution of Bluefin Landings Among Vessels

This section includes data on the distribution of bluefin landings among vessels, by year, illustrating the change in the distribution of landings among vessels during the IBQ period compared to the Baseline period. There was a slight increase in the number of vessels landing one bluefin, and an increase in the numbers of vessels landings high numbers of bluefin, reflecting in general, the "conversion of dead discards into landings."

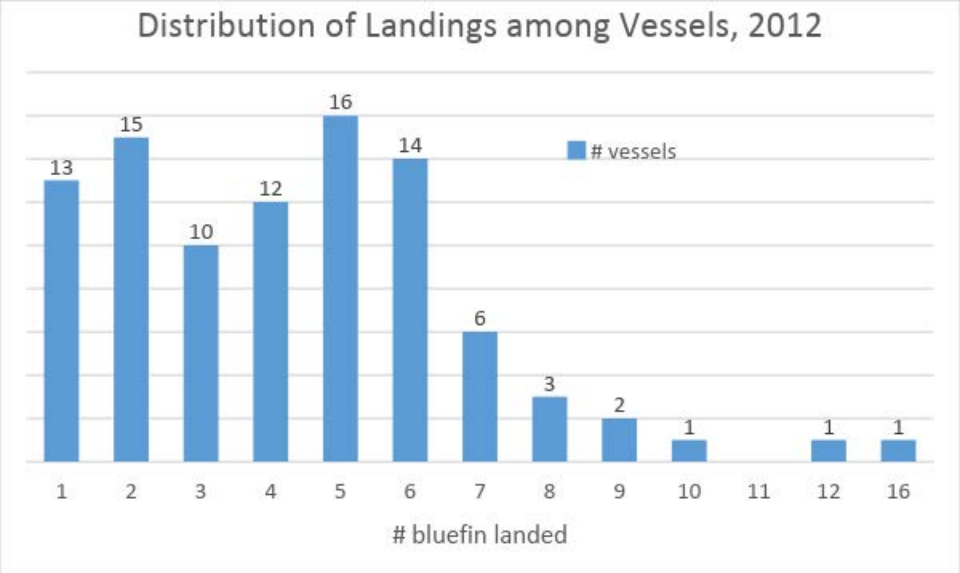

Figure 6.31 2012 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

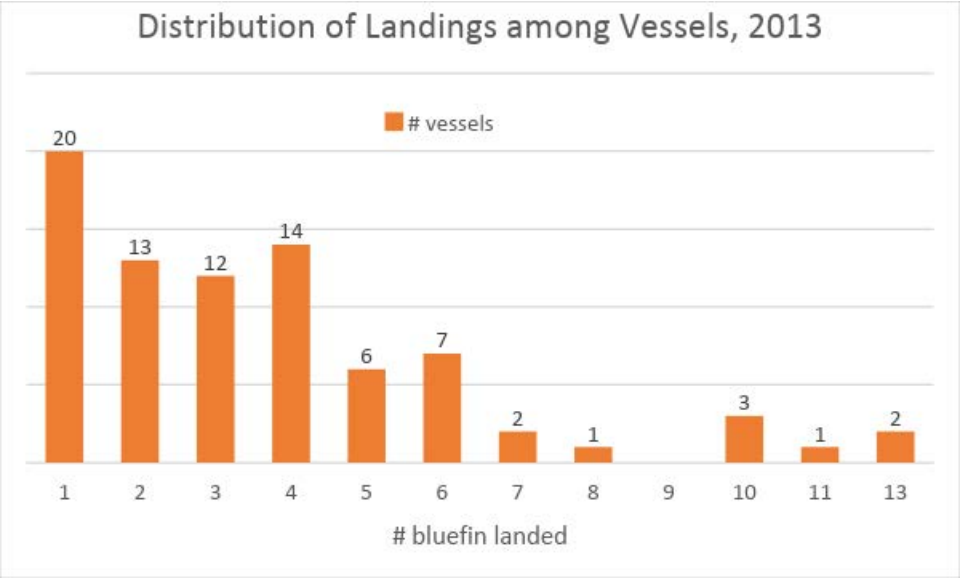

Figure 6.32 2013 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

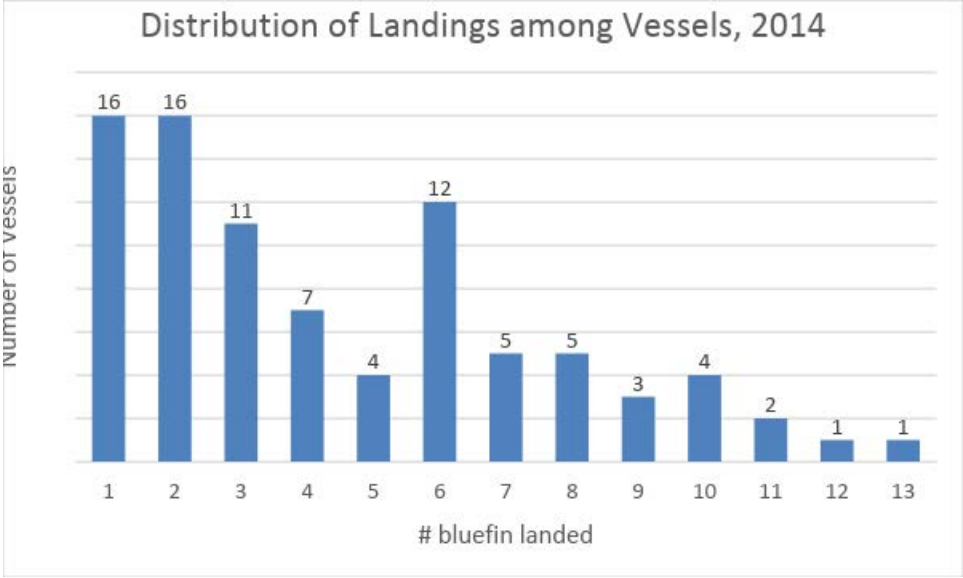

Figure 6.33 2014 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

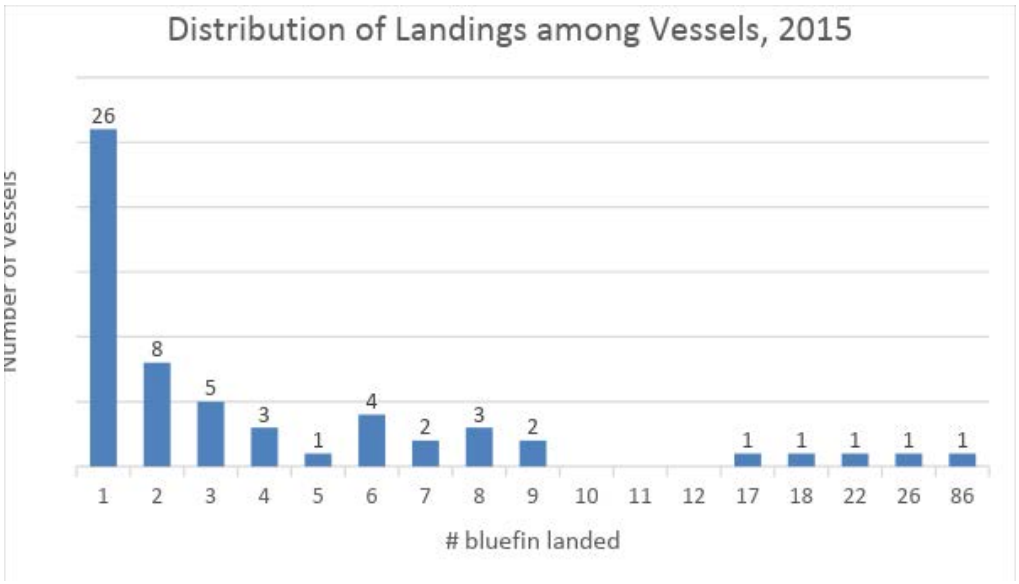

Figure 6.34 2015 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

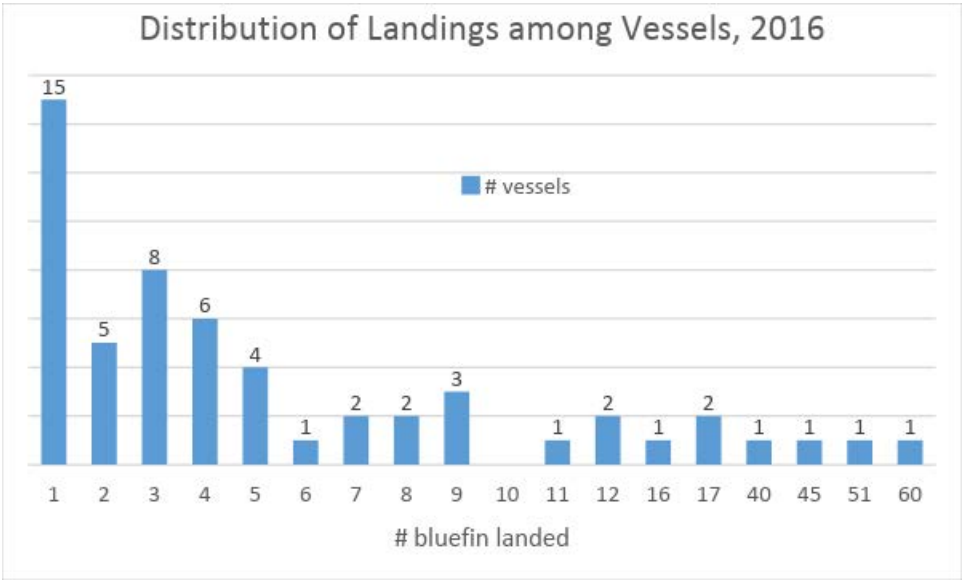

Figure 6.35 2016 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

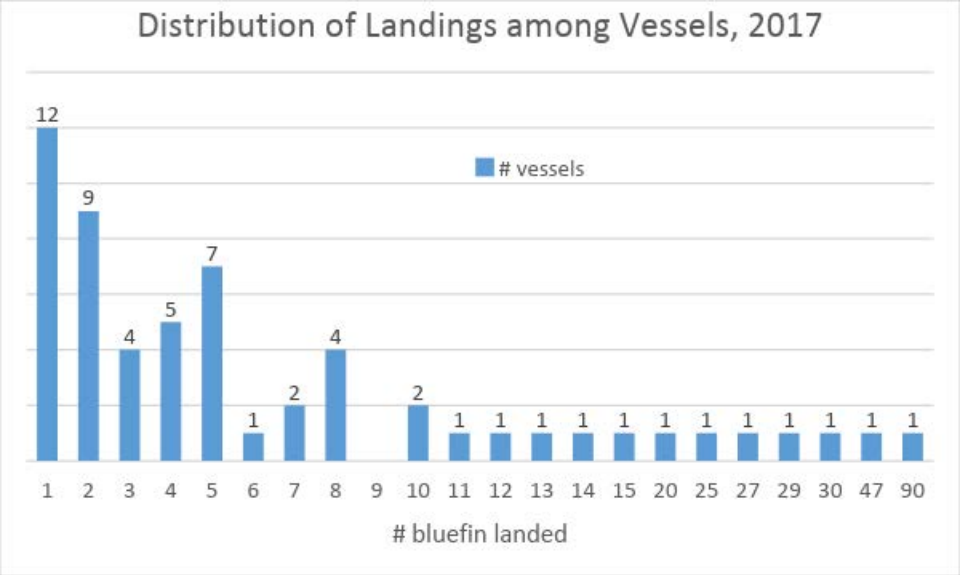

Figure 6.36 2017 Distribution of BFT Landings Among Vessels

Source: SAFIS data.

6.6 Bluefin Interactions to Designated Species Ratios Before and After Implementation of Amendment 7

This section shows the bluefin interactions to designated species ratios, which formed an important element of the Amendment 7 IBQ share allocation formula, and were an element in the Cape Hatteras GRA conditional access determinations.

The bluefin interaction to designated species ratio was back calculated and compared before and after implementation of Amendment 7 to determine whether the composition of allocation scores based on reported data changed as the management transitioned to the IBQ Program and individual accountability. Figure 6.37 shows the bluefin interaction to target species ratio from 2006 through 2017. The years 2006 to 2011 are shown to provide additional historical perspective against which to compare recent values.

Bluefin interaction to designated species landings ratios were much higher prior to the finalization of the 2010 ICCAT recommendation, which removed dead discard allowances and required full report and accounting of all sources of bluefin mortality (2006-2010, as shown in. The average ratios were similar between the baseline period (2012-2014) and during the IBQ Program (2015-2017). Evaluating bluefin catch rates based only on the fleet-wide average ratio should not be done, given the changes in the distribution of ratios at the vessels level, as explained below.

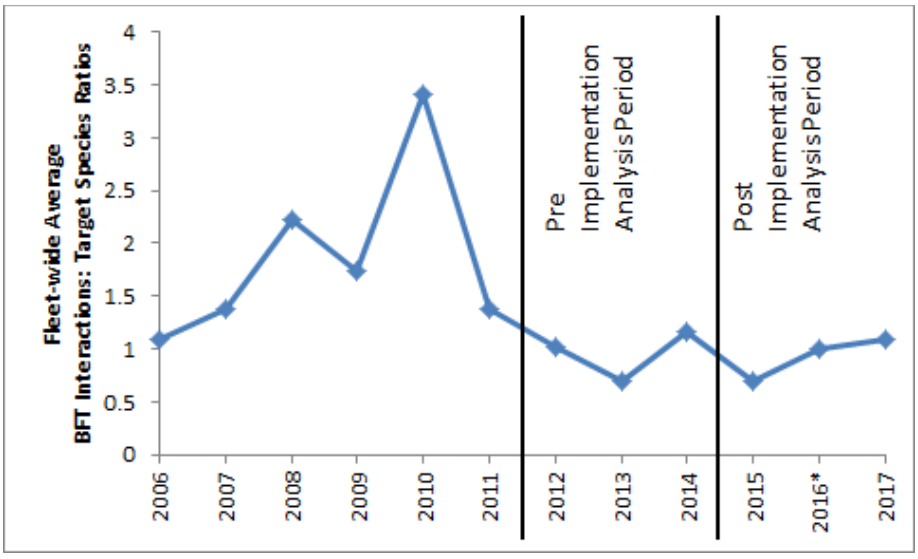

Figure 6.37 2006–2017 Fleetwide Average BFT Interaction to Designated Species Landings Ratio

Note: 2016 included an anomalous outlier that was removed that otherwise would have resulted in an average BFT: target species ratio of 13.7 fish per ten thousand pounds of target catch.
Source: Logbook data.

A slightly different pattern in the data is seen when you analyze the ratios on a vessel-level and look at the distribution of the ratios. Figure 6.38 below shows the distribution of bluefin interactions to target species ratios of individual vessels. The proportion of vessels with no bluefin interactions ("0") increased during the IBQ Program compared to the baseline period. The vessels with relatively few bluefin interactions ("0.001-1.0") declined. The proportion of the fleet with higher rates of bluefin interactions relative to target species landings (i.e., a ratio greater than 3.0) increased after implementation of Amendment 7. The distribution pattern of an increase in the number of vessels at either end of the range (no ratio or high ratios) is similar to the pattern of bluefin landings under the IBQ Program.

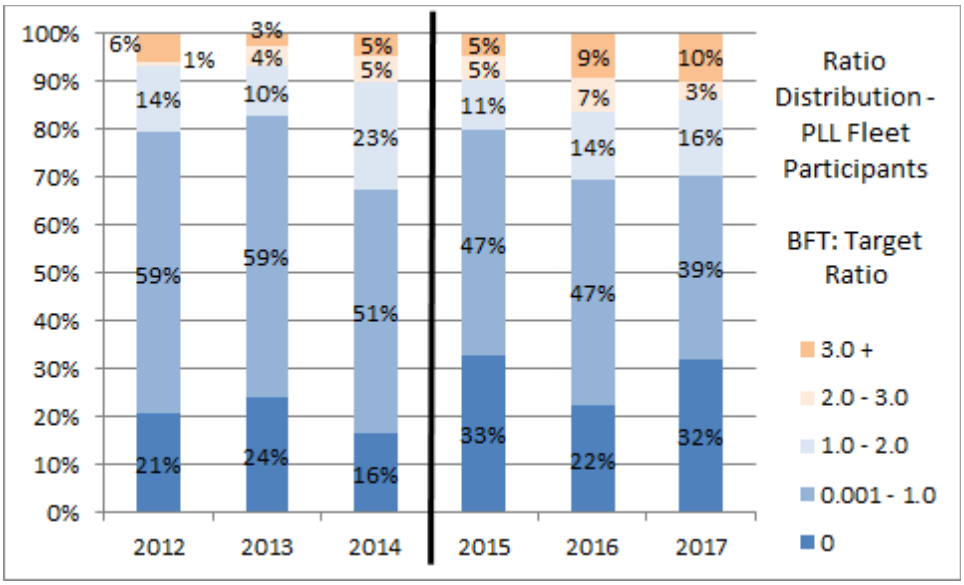

Figure 6.38 2012–2017 Fleet-Wide Breakdown of BFT Interactions to Designated Species Landings Ratios

Source: Logbook data.

It is difficult to infer a pattern of changes in fishing behavior in individual vessels because the changes in the composition of the fishery over time. There was an increase in the percentage of vessels with zero bluefin interactions between 2015 and 2017. This may be attributed, in part, to a complete avoidance of bluefin by eleven vessels in 2015-2017 that previously had low to moderate interaction rates (0.001 to 2.0 bluefin per 10,000 lb. target catch, dark blue in above) in 2012-2014. However, ten of the vessels no longer associated with a valid permit in 2015-2017 had very low bluefin interaction rates in 2012-2014 (0.001-1.0 bluefin per 10,000 lb. target catch, medium blue.

To further examine changes over time, the bluefin-to-designated species landings ratio calculated for each year were averaged across the 2012-2014 and 2015-2017 periods (i.e., three years averaged for each period), and the averages were compared (Figure 6.39). Some vessels decreased bluefin-to-designated species landings ratio, while other vessels increased bluefin to designated species landings ratio. The average bluefin-to-designated species landings ratio decreased in 2015-2017 by at least 50 percent for 23 vessels (bright red), and between 25 and 50 percent for 25 vessels (pink). Increases in the average ratio were also noted for vessels in the fleet, with 21 vessels experiencing anywhere from zero to 100 percent increases in the rate of bluefin interactions in 2015-2017. It is important to note that a high percent change is not necessarily reflective of an extremely high number of bluefin interactions. For example, a vessel catching 42,000 pounds in both time periods with an average bluefin to designated species landings ratio of 0.71 in 2012-2014 and an average ratio of 1.19 in 2015-2017 has a percent change in the average bluefin-to-designated species landings ratio of +67 percent. However, that could correspond to the vessel catching two more bluefin in 2015-2017 than in 2012-2014. Bluefin interactions are increasing for some vessels, however these bluefin are fully accounted for within the IBQ program, and could just reflect participant adaptation to the program.

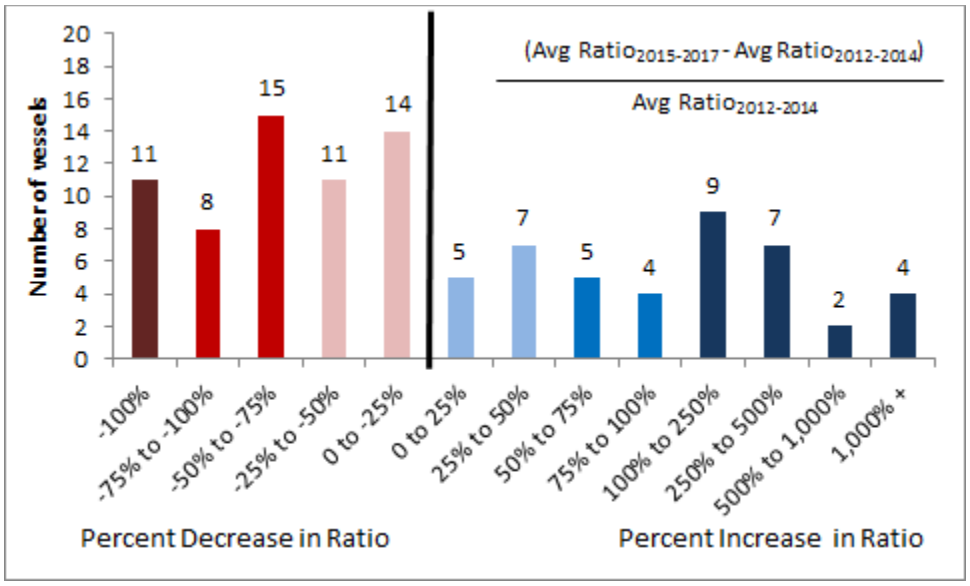

Figure 6.39 Change in BFT to Designated Species Landings Ratio Across a Pre-Implementation (2012–2014) and a Post-Implementation (2015–2017)

Source: Logbook data.

Ratios are averaged across all years of data within these time periods, and the percent change was calculated (formula in upper right corner of graphic).

6.7 Analysis of VMS and Logbook Data

This section includes VMS, logbook, and dealer data, as well as calculated estimates of dead discards. The data are intended to examine various data sources, in order to compare trends, and explore patterns in the fishery or data that may reflect larger patterns in reporting or fishing behavior. Many of the figures are exploration of logbook data, but include some comparisons of trends across the different data sources. For example, Figure 6.40 compares dealer data to logbook data. Figure 6.52 compares dead discards based on logbook data, estimates based on logbook and observer data, and VMS data. The VMS data on bluefin dead discards starts in 2015, because it did not exist prior to the implementation of Amendment 7. The trend in the number of extrapolated dead discards is downward, and the trend in the numbers of bluefin reported as dead discards via the logbooks is also decreasing, with the exception of 2016. The Cape Hatteras GRA and the electronic monitoring requirements may have increased the rate and/or accuracy of logbook reporting. There is relatively good correspondence between the logbook data and VMS data for the number of bluefin released alive and the number discarded dead (Table 6.26 and Table 6.27).

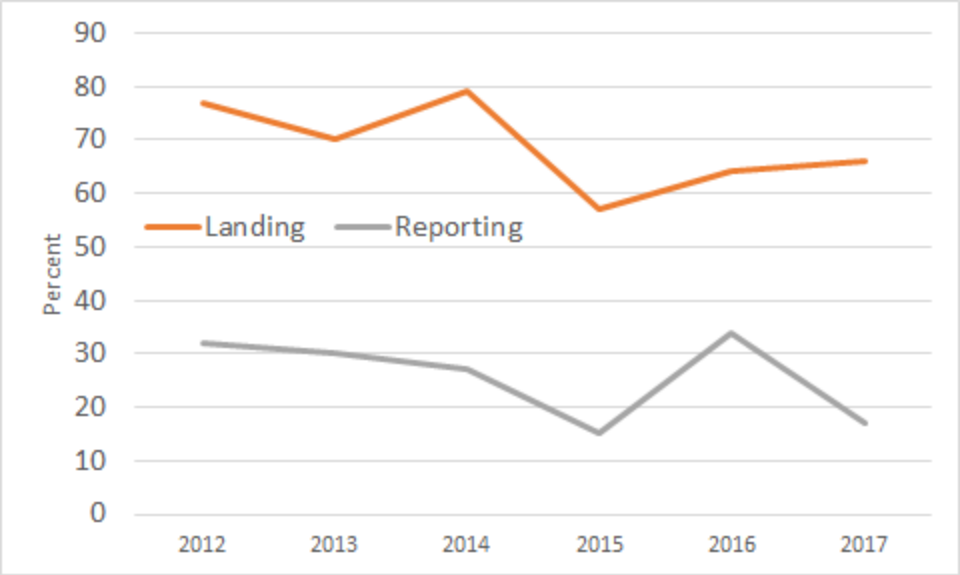

Figure 6.40 2012–2017 Percent of Vessels Landing BFT and Vessels Reporting Dead Discards

Sources: Landings data: dealer; number of active vessels and dead discard reporting data: logbooks.

Table 6.26 compares the number of dead discards reported through logbooks with the number of dead discards reported through VMS. The VMS data is overall fairly consistent with the logbook data.

Table 6.26 2012–2018 Number of Dead Discards Reported by Logbook and VMS

Year	Logbook Number Dead Discards	VMS Number Dead Discards
2012	193	N/A
2013	84	N/A
2014	115	N/A
2015	48	37
2016	162	175
2017	28	35
2018	pending	44

Source: Logbook and VMS data.

Table 6.27 compares the number of bluefin released alive reported through logbooks with the number released alive reported through VMS.

Table 6.27 2012–2018 Amount of BFT Released Alive

Year	Logbook Number Released Alive	VMS Number Released Alive
2012	353	N/A
2013	168	N/A
2014	232	N/A
2015	158	173
2016	418	483
2017	201	262
2018	pending	314

Source: Logbook data.

The figures below show trends in CPUE (for bluefin discarded dead, released alive, and kept) by different geographic areas, based on logbook data (Figure 6.41 through Figure 6.50).

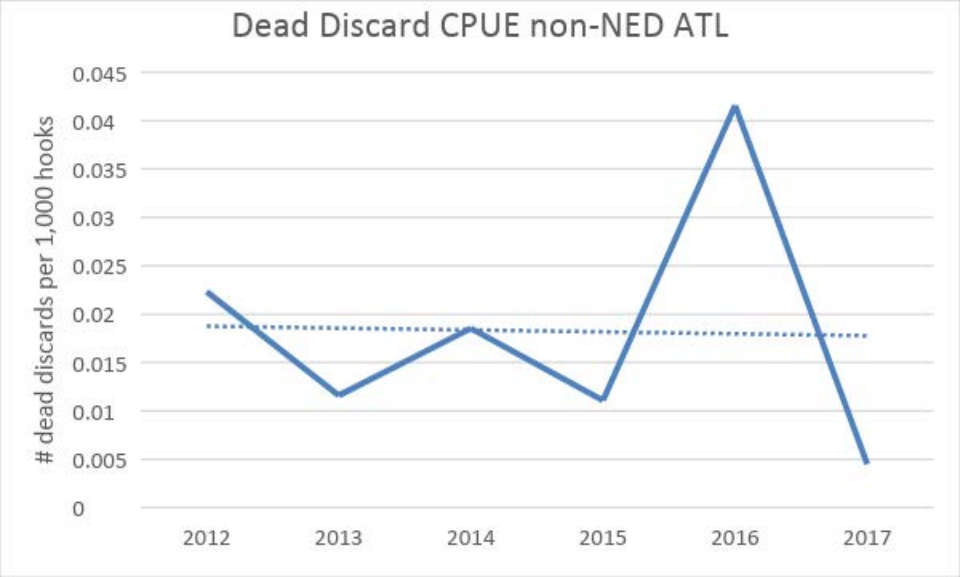

Figure 6.41 2012–2017 Dead Discards CPUE in the ATL, Not Including the NED

Source: Logbook data.

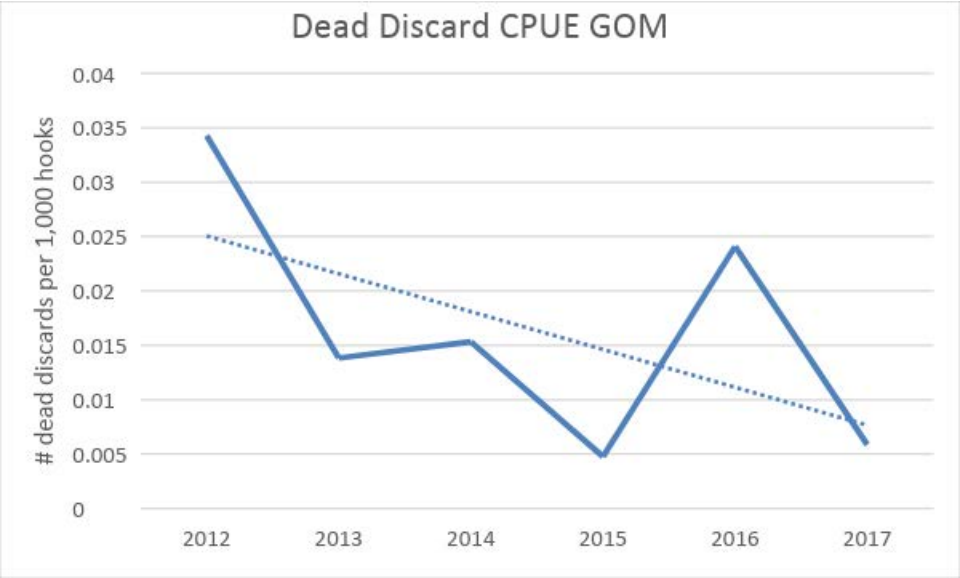

Figure 6.42 2012–2017 Dead Discards CPUE in the GOM

Source: Logbook data.

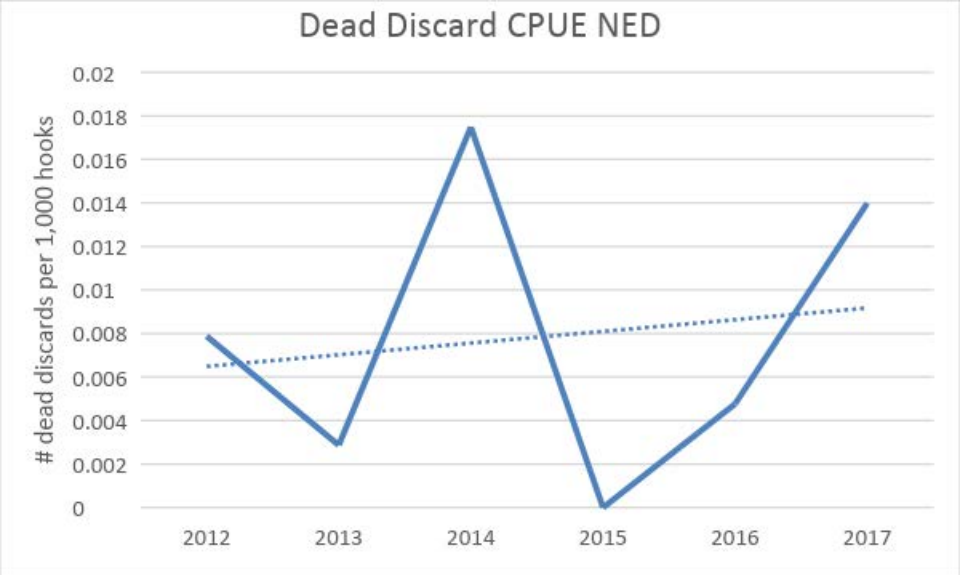

Figure 6.43 2012–2017 Dead Discards CPUE in the NED

Source: Logbook data.

Figure 6.44, Figure 6.45, Figure 6.46, and Figure 6.47 compare CPUE among areas, for kept, dead discards, released alive, and total interactions (respectively), based on logbook data. CPUE is expressed as numbers of dead discards per 1,000 hooks. These graphs illustrate both the difference in magnitude in the CPUEs among areas as well as different trends. Dead discard CPU declined in 2015, increased in 2016, and declined in 2017, with the exception of the NED. The increase in dead discards in 2016 is consistent with the overall spike in the number of bluefin interactions that occurred in 2016.

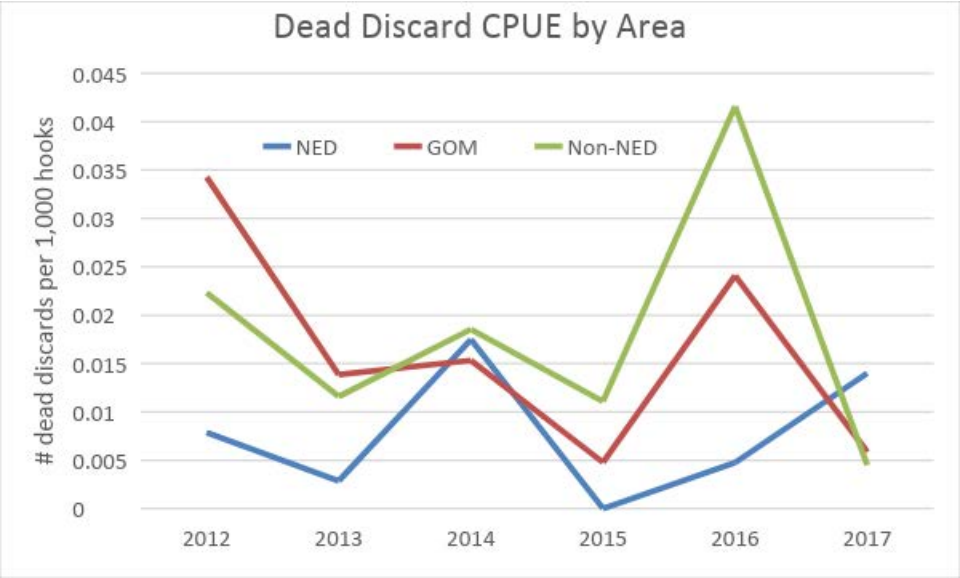

Figure 6.44 2012–2017 CPUE Dead Discards by Area

Source: Logbook data.

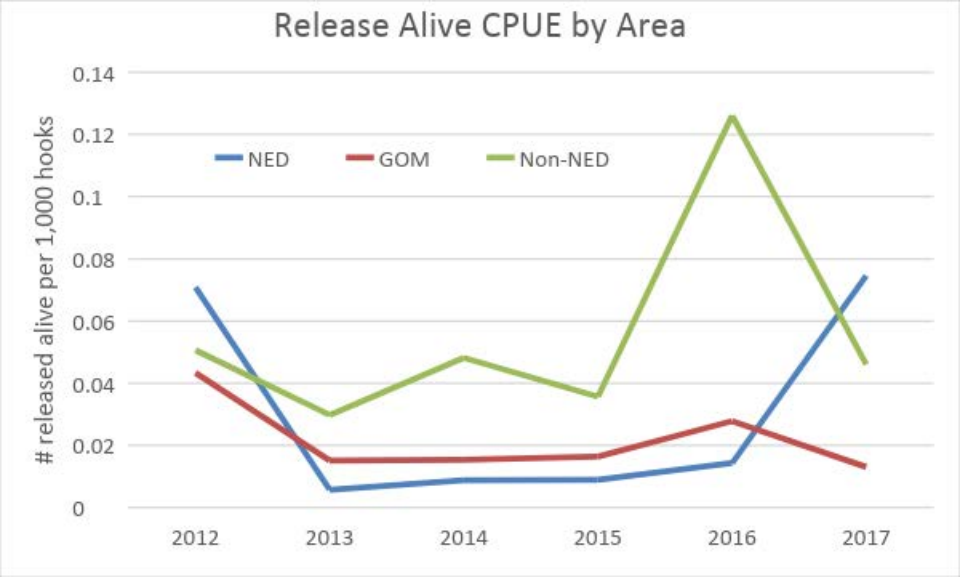

Figure 6.45 2012–2017 CPUE Released Alive by Area

Source: Logbook data.

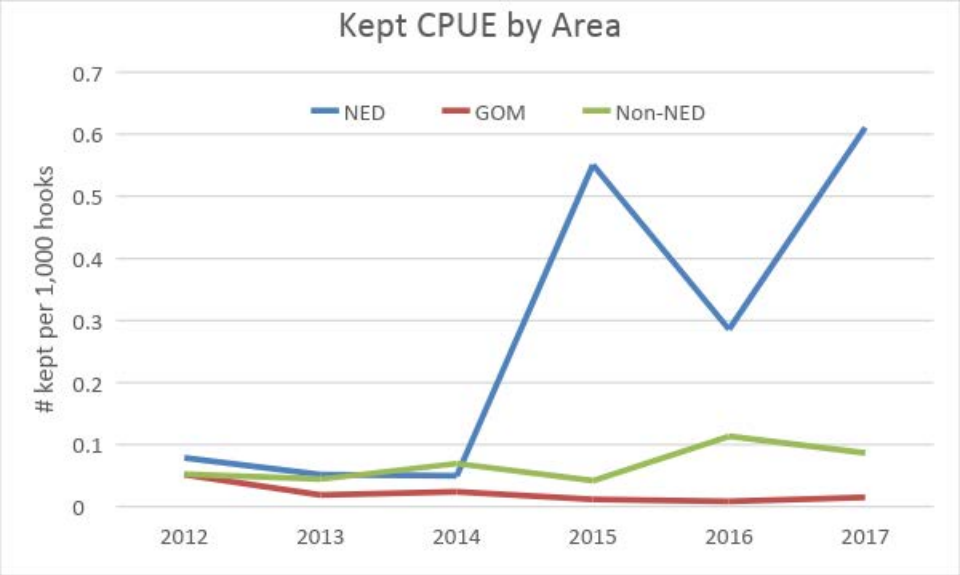

Figure 6.46 2012–2017 CPUE Kept by Area

Source: Logbook data.

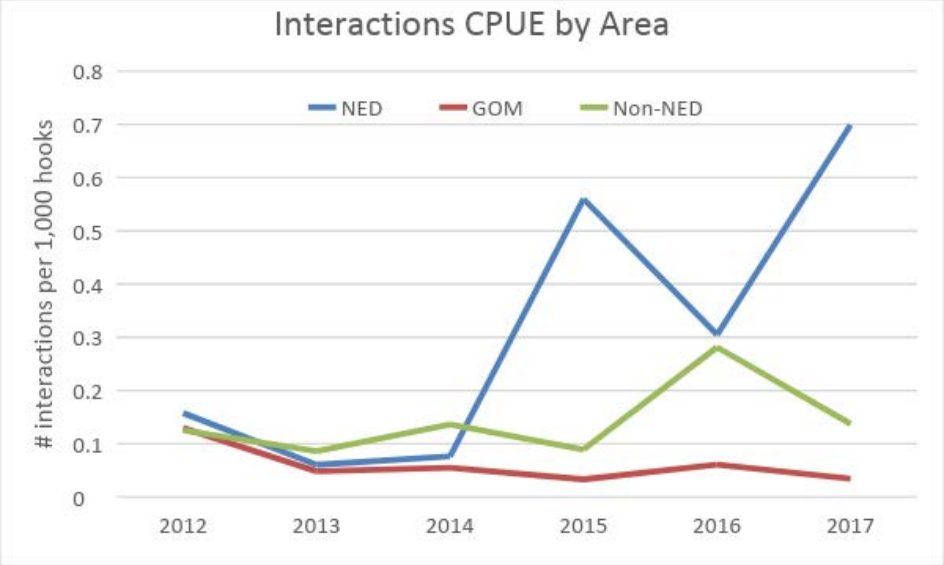

Figure 6.47 2012–2017 CPUE Interactions by Area

Source: Logbook data.

The graphs below compare the CPUE for kept, discarded dead, and released alive by area (NED, GOM, non-NED Atlantic), based on logbook data. CPUE is expressed as numbers of dead discards per 1,000 hooks.

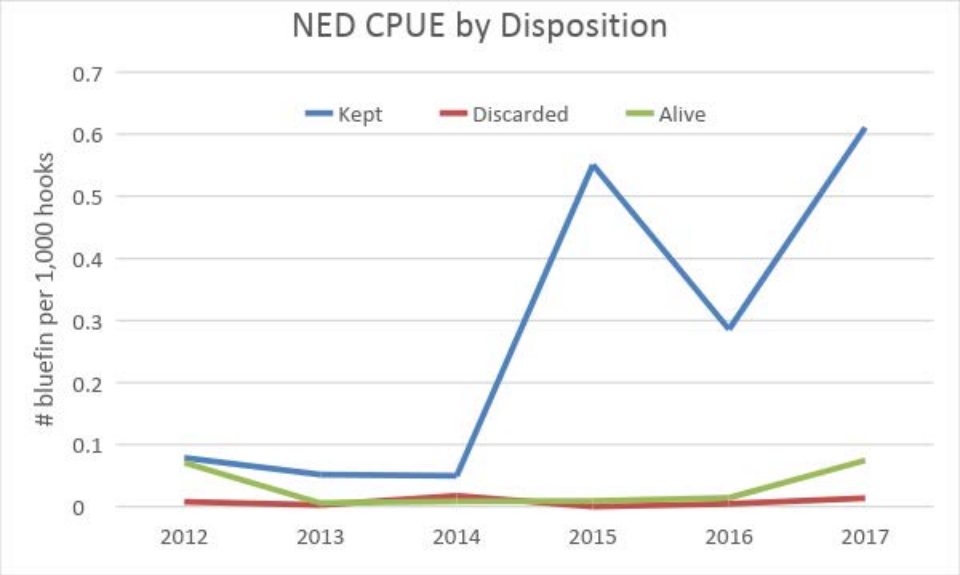

Figure 6.48 2012–2017 CPUE Kept, Discarded Dead, and Released Alive in the NED

Source: Logbook data.

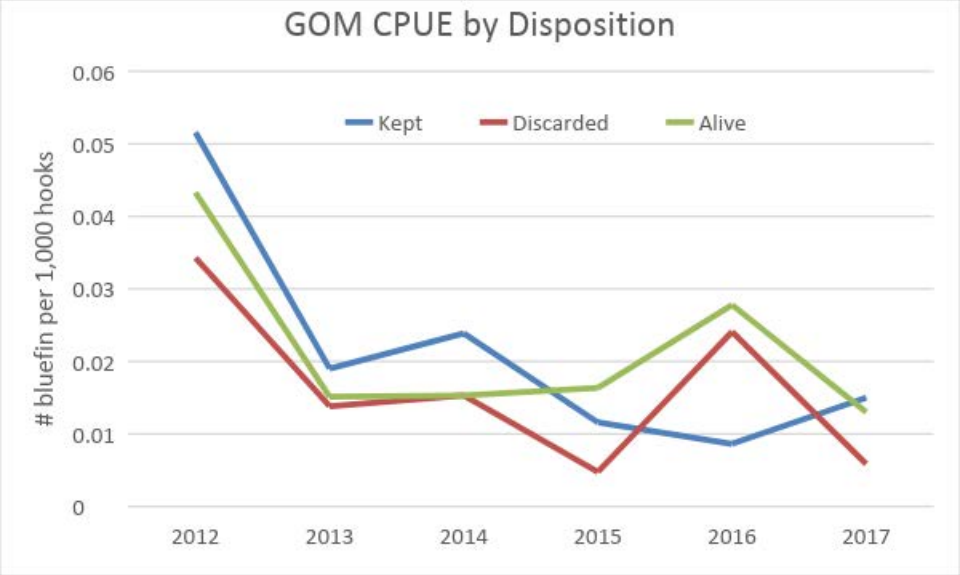

Figure 6.49 2012–2017 CPUE Kept, Discarded Dead, and Released Alive in the in the GOM

Source: Logbook data.

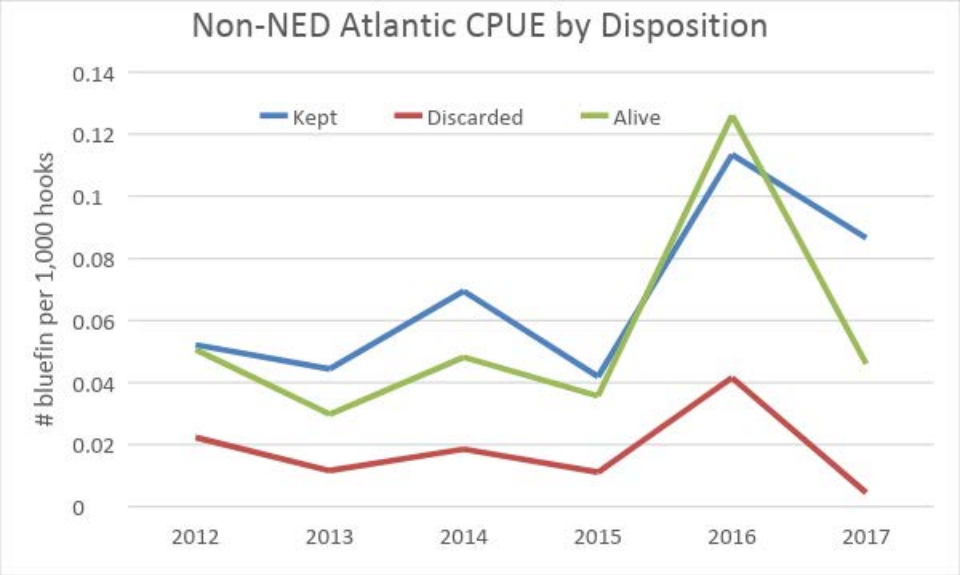

Figure 6.50 2012–2017 CPUE Kept, Discarded Dead, and Released Alive in the ATL

Source: Logbook data.

Figure 6.51 shows the trends in the number of bluefin dead discards and number of landings by year.

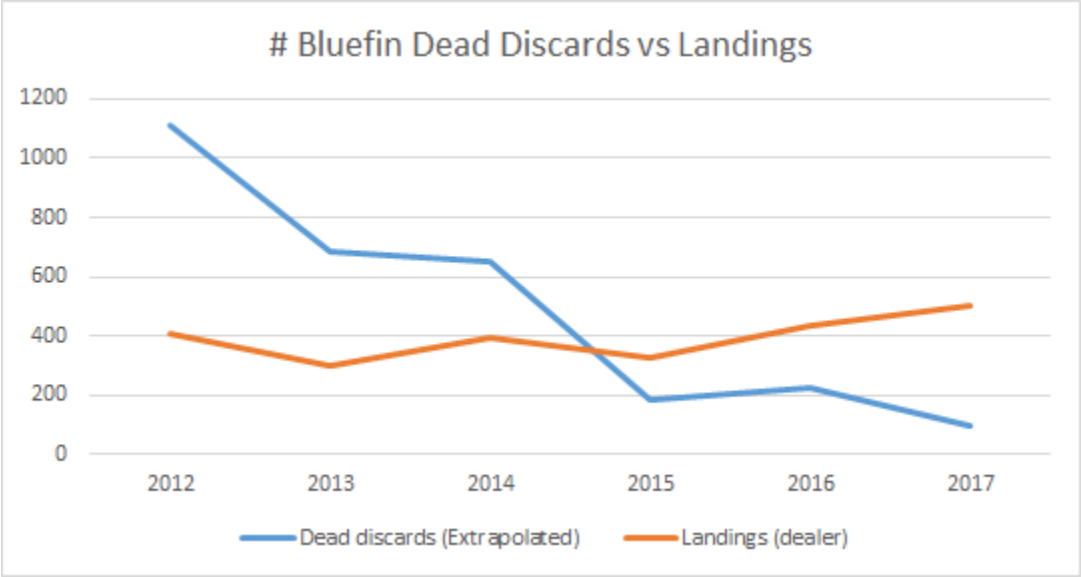

Figure 6.51 2012–2017 BFT Dead Discards and Landings

Source: Logbook data, observer data.

Dead discards are extrapolated values, based on dead discards from observer data and fishing effort from logbook data. Landings are dealer data.

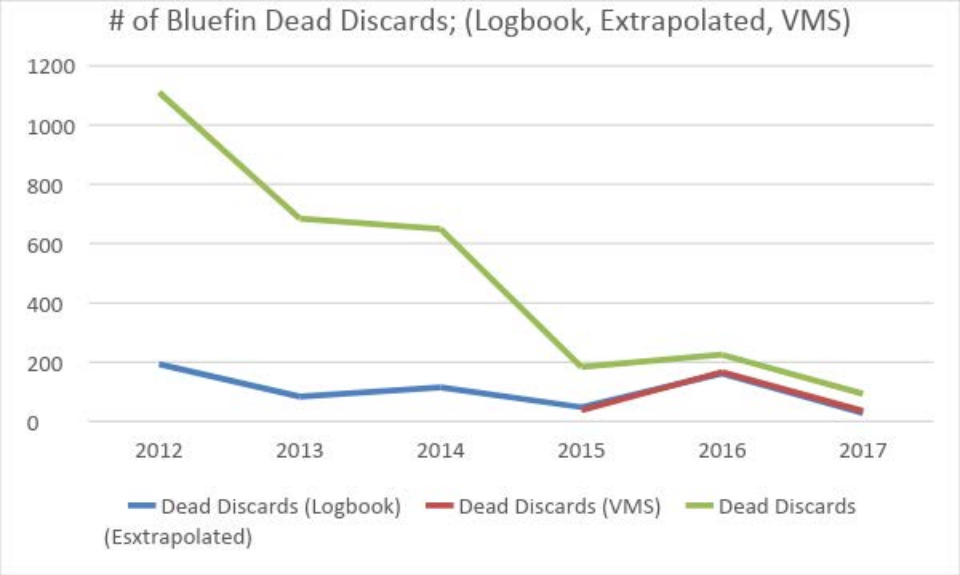

Figure 6.52 2012–2017 Comparison of Dead Discards

Source: Logbook data, VMS, and extrapolated data extrapolated based on observer data on bluefin and logbook data on effort.

Table 6.28 Number of Active Vessels, Comparing Logbook and VMS Data

Year	Number Vessels Fishing with PLL Gear	Number Vessels Submitting VMS BFT Set Reports
2012	122	N/A
2013	115	N/A
2014	110	N/A
2015	104	94
2016	85	83
2017	88	87
2018	76	73

Sources: Logbook data (for "Number Vessels Fishing with PLL Gear"); bluefin tuna set reports (for "Number Vessels Submitting VMS").

Figure 6.53, Figure 6.54, and Figure 6.55 compare the number of VMS bluefin set reports by month to the number of sets based on logbook data, for 2015 through 2017. For virtually all months, the logbook reported numbers were higher than the number of VMS set reports. However, the difference between the two data sets decreased from 2015 through 2017, indicating increased compliance with the VMS reporting requirement over time. The data associated with the three figures in contained in Table 6.29.

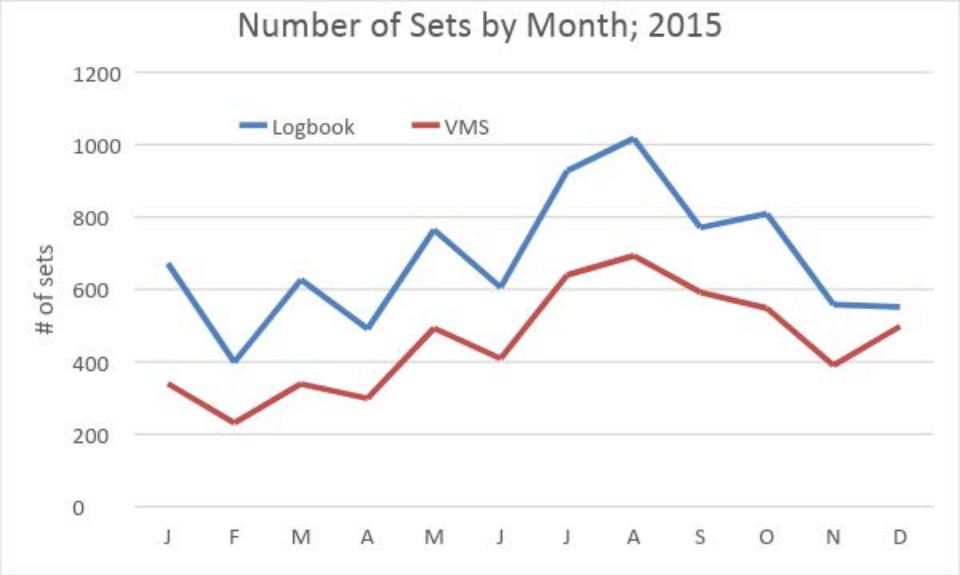

Figure 6.53 2015 Number of VMS BFT Reports Submitted by Month vs Number of Sets†

†Based on logbook data.
Note: The number of VMS bluefin reports submitted by month is a proxy for number of pelagic longline sets.

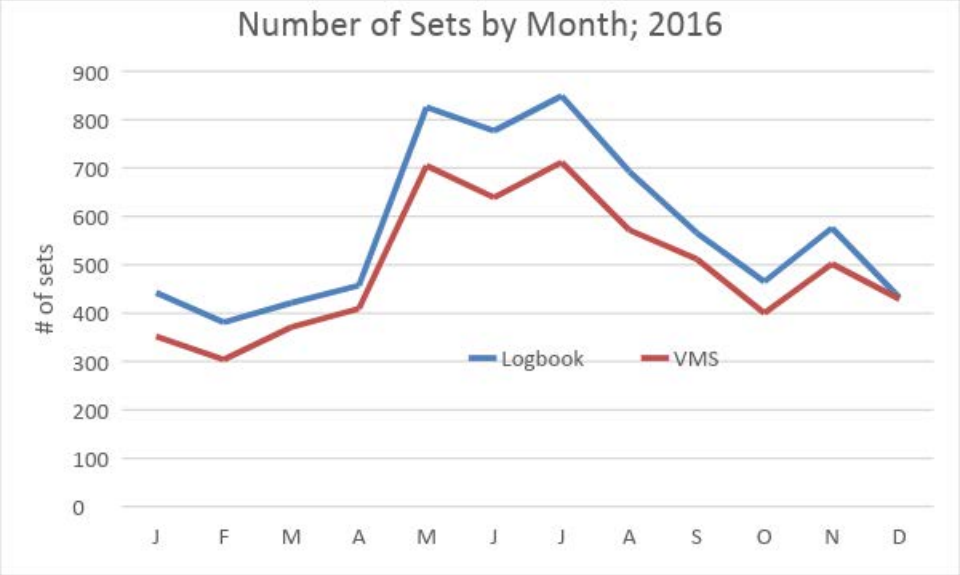

Figure 6.54 2016 Number of VMS BFT Reports Submitted by Month vs Number of Sets†

†Based on logbook data.
Note: The number of VMS Bluefin Reports submitted by month is a proxy for number of pelagic longline sets.

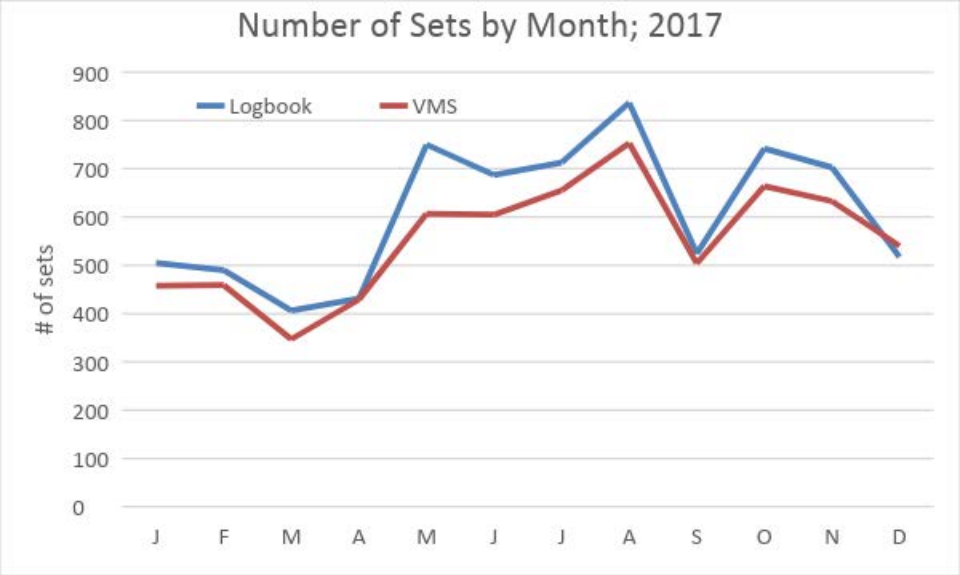

Figure 6.55 2017 Number of VMS BFT Reports Submitted by Month vs Number of Sets†

†Based on logbook data.
Note: The number of VMS Bluefin Reports submitted by month is a proxy for number of pelagic longline sets.

Table 6.29 2015–2017 Number of VMS BFT Reports Submitted† vs Number of Sets‡

	2015		2016		2017	
Month	Logbook	VMS	Logbook	VMS	Logbook*	VMS
Jan	672	340	442	352	505	458
Feb	399	231	381	304	490	459
Mar	627	339	421	371	406	347
Apr	491	299	457	409	431	429
May	765	493	826	705	750	607
Jun	606	409	777	639	687	605
Jul	928	640	849	712	713	655
Aug	1,017	693	693	572	837	753
Sep	771	592	566	512	524	504
Oct	809	548	465	400	742	664
Nov	558	390	576	502	703	633
Dec	552	498	432	429	517	540

†Proxy for number of PLL sets.
‡Based on Logbook data.
Sources: Logbook and VMS data.

Figure 6.56, Figure 6.57, and Figure 6.58 compare VMS data on the number of bluefin reported as retained to dealer data on the number of bluefin landed, by year. Although the dealer data tends to be higher, there is good agreement between the two data sources, especially during 2016 and 2017.

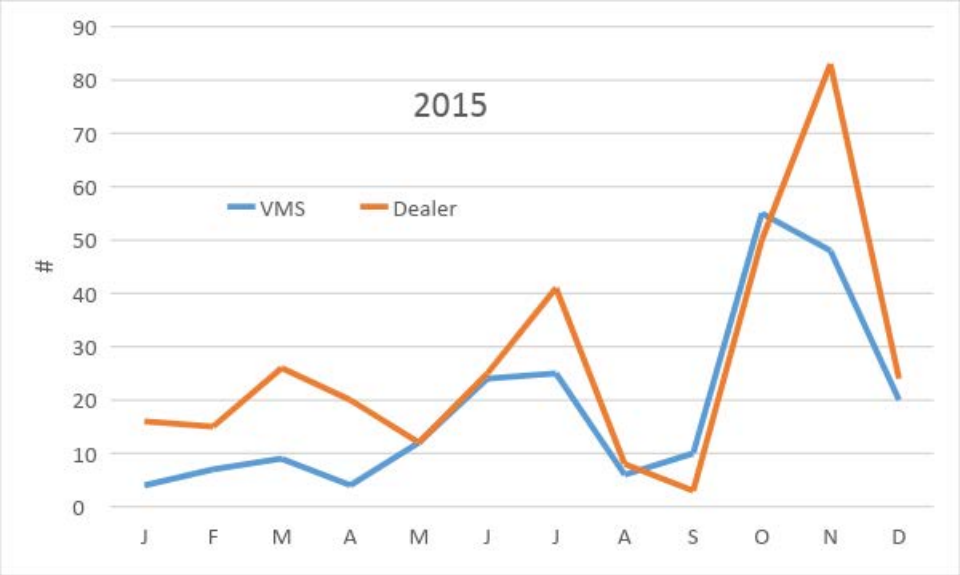

Figure 6.56 2015 Number of BFT Reported Retained vs Number Landed

Source: VMS data (for number retained) and dealer data (for number landed).

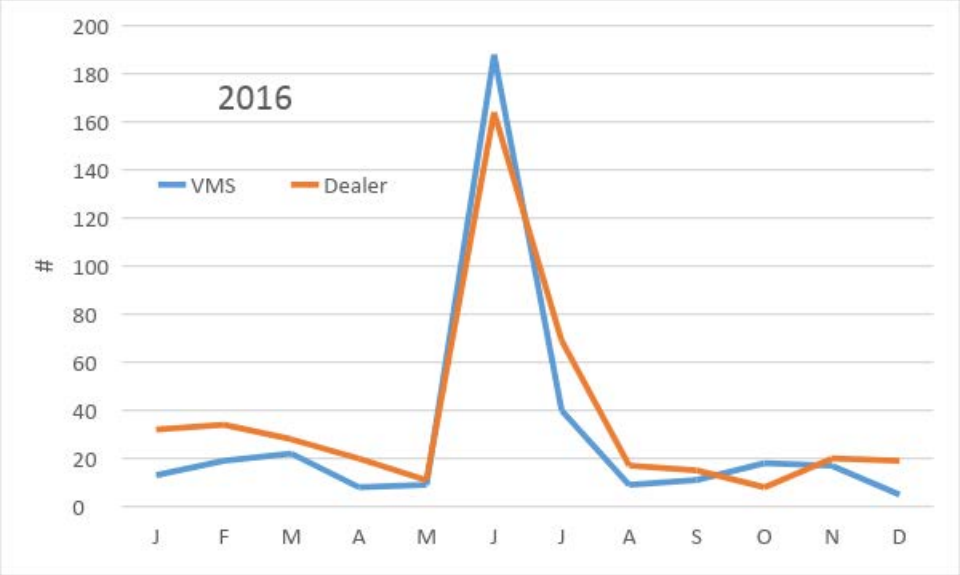

Figure 6.57 2016 Number of BFT Reported Retained vs Number Landed

Source: VMS data (for number retained) and dealer data (for number landed).

Figure 6.58 2017 Number of BFT Reported Retained vs Number Landed

Source: VMS data (for number retained) and dealer data (for number landed).

Table 6.30 compares data on bluefin retained or landed on an annual basis, among dealer, logbook, and VMS data. Dealer data is higher than logbook data in all years, and logbook data is greater than VMS data. Table 6.31 shows VMS data on bluefin dead discards by size class. The larger size classes represent most of the dead discards.

Table 6.30 2012–2018 Number of BFT Retained/Landed

Year	Dealer	Logbook	VMS
2012	407	392	N/A
2013	299	274	N/A
2014	392	379	N/A
2015	323	320	224
2016	437	411	353
2017	501	464	415
2018	467	pending	439

Sources: Dealer, logbook, and VMS data.

Table 6.31 VMS Reported Bluefin Dead Discards by Size Class (Percentage of Total Reported)

Year	0 to < 27" (%)	27 to < 47" (%)	47 to < 59" (%)	59 to < 73" (%)
2015	11%	35%	27%	27%
2016	4%	20%	35%	41%
2017	11%	3%	43%	43%
2018	2%	18%	30%	50%

Source: VMS data.

6.8 Cape Hatteras and Gulf of Mexico GRAs

Cape Hatteras GRA

Data on the number of vessels that did not qualify for access to the Cape Hatteras GRA by year, including information on the reason for denials is shown below in Figure 6.59. The Y-axis indicates the number of vessels not qualified to fish in the GRA, with the sequential years of the GRA shown on the X-axis. For each year of the GRA, there are two bars, one showing the number of vessels not qualified to fish due to compliance-related metrics, and one showing the number of vessels not qualified to fish due to the bluefin-to-designated-species ratio metric. The number of vessels that were not qualified to fish in the GRA (based on the performance metrics) declined notably after the first year of the GRA. The reduced numbers overall, and the reduced number of unqualified vessels due to the compliance related performance metrics are indicators that the GRA performance metrics were effective in providing incentives to comply with the logbook reporting and pelagic observer program requirements. The reduced numbers of vessels not qualified due to the bluefin metric indicated that the GRA performance program may also have influenced fishing behavior and bluefin avoidance, however, there are many factors that contribute to bluefin catch rates, and cause and effect are difficult to determine.

Relatively few vessels (58 total) were excluded from the GRA area from 2015 through 2018, and only 23 of those were the result of bluefin interactions. On an annual basis, the number of vessels excluded from the Cape Hatteras GRA, because of bluefin interactions, was 12, 4, 1, and 6, respectively. The biological impact of the GRA on bluefin was likely relatively small due to the low number of vessels excluded as a result of their rate of historical bluefin interactions.
Bluefin interactions to designated species landings ratios shown in Figure 6.60 are one of three metrics used to incentivize access to the GRAs. Average bluefin ratios for vessels that have been denied access to the GRA were high prior to the finalization of Amendment 7 (i.e., before 2012) but have been similar between the baseline period and the IBQ period.

The vessels recently denied access to the GRA exhibit a variety of fishing patterns, but historically did not fish within the Cape Hatteras GRA during the effective period. For instance, logbook data from 2014-2016 was analyzed for the 2017-2018 GRA effective period for six vessels denied access due to high rates of bluefin interactions relative to designated species catch, and four vessels denied access due to compliance issues (data not shown due to confidentiality requirements). Vessels with high rates of bluefin interactions both fished in specific locations (e.g., the NED) and/or were distant water vessels that fished between Georges Bank and Puerto Rico. Much of the fishing activity that did occur adjacent to the GRA occurred later in the season. Because it does not appear

that the historical interactions of the vessels that were excluded from the GRA were in the area of the GRA, the resultant change in fishing behavior had minimal effect. The local biological impacts of the Cape Hatteras GRA on bluefin aggregating off Cape Hatteras from these vessels are likely minimal. In contrast, Amendment 7 estimated that there would be moderate beneficial impacts for bluefin, as a result of reduced bluefin catch by excluded vessels (p.267 Amendment 7).
Another aspect of the GRA program to note is that, some vessel operators were confused about the applicability of the relevant performance metrics, and mistakenly thought that their annual IBQ allocations were determined by their performance metrics (instead of being determined on the basis of their IBQ share (tier) and the size of the annual Longline category quota). Only access to the Cape Hatteras GRA (and not the annual IBQ allocations) were determined by a vessel's performance metrics and reassessed on an annual basis.

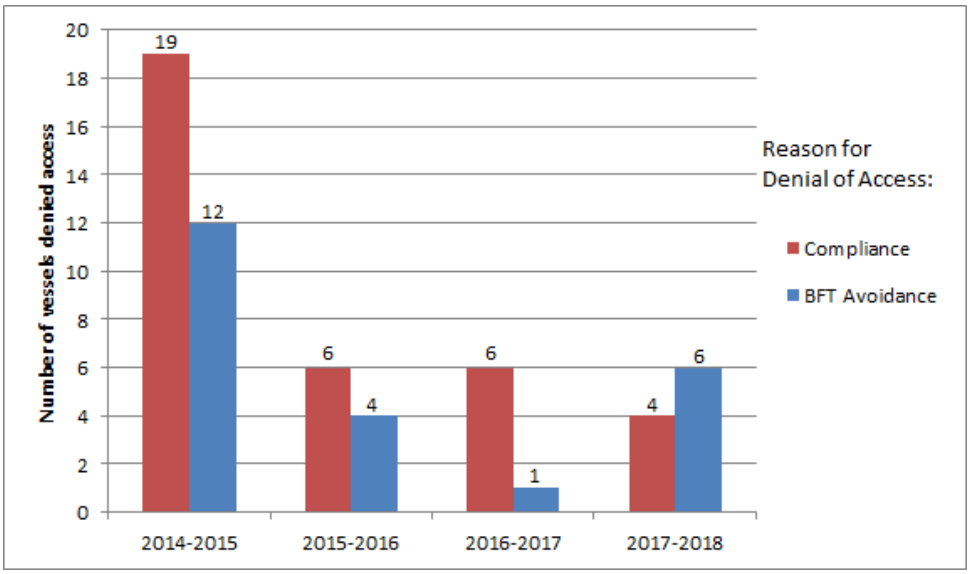

Figure 6.59 Number of Vessels Denied Access to Cape Hatteras GRA by Effective Period and Reason

Source: NMFS analysis of logbook and observer data.

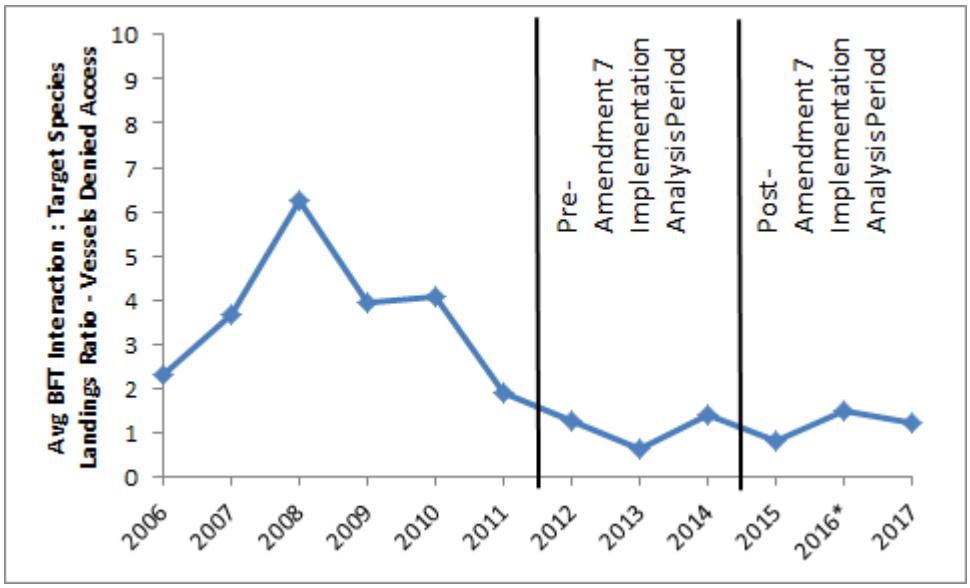

Figure 6.60 2006–2017 Average Bluefin Interaction to Designated Species Landings Ratio for 42 Vessels Denied Access to the Cape Hatteras GRA Since Inception

*One data point removed from 2016 data as a statistical outlier.
Source: Logbook data and NMFS GRA analysis.

Gulf of Mexico Gear Restricted Areas

The Gulf of Mexico Gear Restricted Areas (GRAs) were implemented in 2015, via Amendment 7, and consist of two areas in the central and eastern Gulf of Mexico. Both Gulf of Mexico GRAs are closed to pelagic longline gear from April 1 through May 31 annually. Each of these areas were identified in Amendment 7 as locations of high bluefin concentrations and interactions with pelagic longline gear. The areas were also closed to all vessels with pelagic longline gear onboard.

The Gulf of Mexico GRAs influenced the fishing operation of vessels in the Gulf of Mexico during the months of April and May, likely causing vessels to modify their location to avoid the GRAs, or to cease fishing with pelagic longline gear during those months. Figure 6.4 (previous section of document) shows logbook data on the number of hooks fished in the Gulf of Mexico by month and year. In general, there were fewer hooks set during April and May in 2015 and 2016 compared to those months during the Baseline period.

It is difficult to distinguish the effects of the Gulf of Mexico GRAs from the effects of the IBQ Program because the GRAs were implemented at the same time as the IBQ Program. Table 6.32 shows pelagic longline landings of bluefin from the Gulf of Mexico by month and year (2012 through 2017). The monthly bluefin landings, from the Gulf of Mexico during 2015 to 2017, were less than during the baseline period, for each month, despite the fact that the GRA is in effect only April and May. It is likely that the reductions in bluefin landings and dead discards are related to the combined effects of the IBQ Program, the GRA, and reduced fishing effort in the Gulf of Mexico.

Current Management Initiatives

NMFS published a proposed rule (84 FR 33205, July 12, 2019) to adjust regulatory measures put in place to manage bluefin tuna bycatch in the pelagic longline fishery for Atlantic highly migratory species (HMS), specifically addressing the Northeastern United States Closed Area, the Cape Hatteras Gear Restricted Area, and the Spring Gulf of Mexico Gear Restricted Area as well as the weak hook requirement in the Gulf of Mexico. The proposed measures would modify the existing year-round requirement for weak hooks in the Gulf of Mexico to a seasonal requirement; provide pelagic longline vessels access to the Northeastern United States Closed Area and the Spring Gulf of Mexico Gear Restricted Area for data collection during a three-year evaluation period to determine whether these measures are now duplicative, given the Individual Bluefin Quota (IBQ) Program requirements; and eliminate the Cape Hatteras Gear Restricted Area.

Table 6.32 2012–2017 PLL Bluefin Landings in the Gulf of Mexico by Month

Month	2012	2013	2014	Total (2012–2014)	2015	2106	2017	Total (2015–2016)
January	25	7	1	33	2	0	3	5
February	22	3	1	26	6	2	2	10
March	31	3	9	43	1	5	8	14
April	31	14	5	50	1	4	2	7
May	15	13	19	47	2	1	4	7
June	0	3	8	11	2	1	2	5
July	0	0	3	3	1	0	0	1
August	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0	0

Source: Logbook data.

6.9 Electronic Monitoring

This section contains a wide variety of reference data on the EM Program, including information on the audit periods; number of sets and vessels audited; the success rate in completing of audits ("audit exceptions"); comparison of EM and VMS data; analysis of EM methods; and data regarding maintenance and troubleshooting of the EM systems.

Table 6.33 Number of Sets and Vessels Audited

Audit Period	Months, Year	Number of Sets Selected for Audit	Number of Sets Audited	Percent Success (%)	Number of Vessels Audited
1	Jun–Aug 2015	177	126	72	43
2	Sep–Nov 2015	94	66	70	25
3	Dec 2015–Feb 2016	167	143	86	48
4	Mar–May 2016	195	156	80	44
5	Jun–Aug 2016	99	82	83	28
6	Sep–Nov 2016	88	75	85	24
7	*Dec 2016	52	35	67	35
8	Jan–Mar 2017	194	179	92	48
9	Apr–Jun 2017	212	181	85	55
10	Jul–Sep 2017	61	50	82	17
11	Oct–Dec 2017	184	158	86	49
12	Jan–Mar 2018	135	102	76	29

*One month period in order to transition to calendar quarters.
Source: NMFS Electronic Monitoring Program.

Table 6.34 Audit Exceptions (Selected for Audit But Not Successfully Audited)

Principal Reasons	Percent
No hard drive received	38
Potential hard drive loss	21
No set data	25
Quality control issue	16

Source: NMFS Electronic Monitoring Program.

Comparison of EM to VMS Data

The number of pelagic longline sets for which comparisons were conducted between VMS data and EM audited data (at the level of a set) was low, because bluefin catch was a relatively rare event. Comparisons were made only for audited sets where bluefin were detected by the audit, and were analyzed by three-month audit period. The agreement between the EM and VMS data was low during the first two audit periods and subsequently improved. For example, comparing VMS data to audited sets with bluefin, a high percentage of the sets matched with respect to the presence or absence of bluefin (Table 6.35). In contrast, when considering the number and disposition of the bluefin between the two data sets, the percentage of complete matching was much lower. Of those audited sets with bluefin catch, a complete match of data with the VMS data was highly variable and ranged from zero matches to 79 percent of the sets with complete matches (Table 6.35). Comparing the VMS to the EM data at the level of the set introduced a source of uncertainty that was a factor in how closely the two data sets corresponded to each other. Specifically, analyzing at the set level there was uncertainty regarding whether the data being compared were associated with same longline set. For example, the VMS data may refer to a set on a specific haul date and with a sequential set number (denoting the numeric sequence of that set in the context of the whole trip), and the EM data may have a matching haul date, but a different sequential set number. The lack of matching of the data identifying a particular set raises the question of whether or not one is comparing data from the same longline set.

Table 6.35 BFT Detected in EM Audit and Comparison to VMS Set Report Data

Audit Period	Number of Sets Audited with Bluefin Detected	Percent of Total Sets Audited with Bluefin Detected (%)	Percent of Sets* for which EM Data Matched VMS Data Regarding Presence or Absence of Bluefin (*number and disposition of bluefin did not necessarily to match*) (%)	Percent of Sets* for which VMS Reported Bluefin is Equal to or Greater Than the EM Number of Bluefin, Regardless of Disposition (%)	Percent Sets* for which the Number and Disposition Matched the VMS Data (%)
1	7	6	14	0	0
2	9	14	33	22	22
3	11	8	91	100	55
4	8	5	75	63	38
5	10	12	100	90	40
6	3	4	66	67	33
7	0	N/A	N/A	N/A	N/A
8	16	9	0	81	56
9	14	8	100	93	79
10	7	14	71	42	29
11	20	13	85	75	50
12	12	12	92	75	79

*Audited sets with bluefin detected.
Sources: NMFS Electronic Monitoring Program and VMS data.

Figure 6.61 shows graphically a portion of the data presented in above, the percentage of sets where EM data match VMS data regarding bluefin catch. In other words, whether, for audited sets that detected bluefin catch, the vessel operator reported bluefin catch via VMS (regardless of whether the numbers of bluefin or disposition matched).

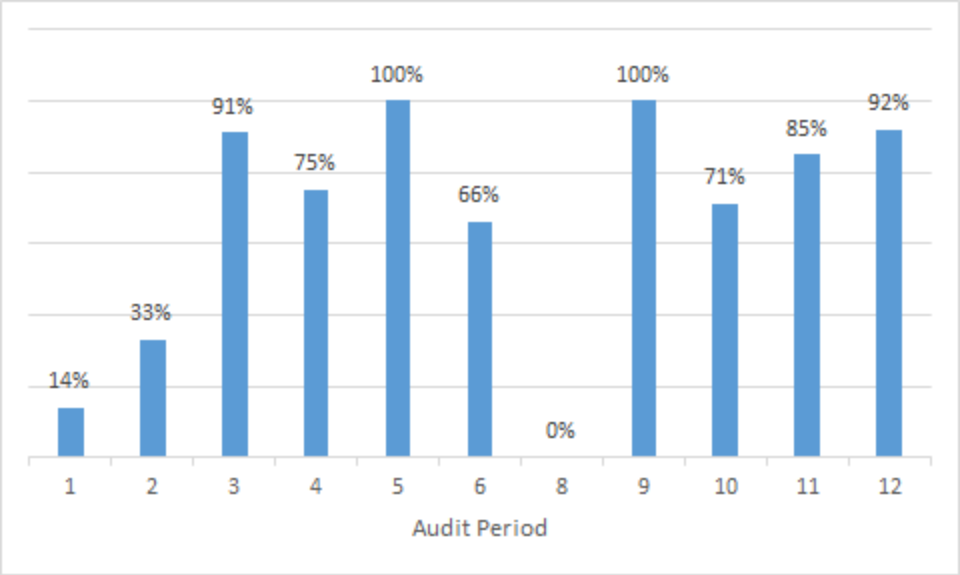

Figure 6.61 Percent of Sets by Audit Period where EM Data Matched VMS Data Regarding the Presence of BFT

Sources: NMFS Electronic Monitoring Program and VMS data.

Comparisons of the VMS to EM data by audit period, with numbers of bluefin caught summed for the entire audit period, shows patterns that are not apparent on the scale of individual set comparisons (Figure 6.62; Figure 6.63; and Figure 6.64). For each audited period, the EM audited sets where bluefin were identified are compared to the corresponding VMS sets (for either total bluefin, retained bluefin, or bluefin discarded dead). The audit periods are three months, with the exception of audit period 7, which was one month.

With respect to the total number of bluefin caught, the comparison of VMS data to the EM audit data did not show a consistent pattern. The trend in the difference between the VMS and EM data depends upon whether the comparison is total bluefin, retained bluefin, or discarded dead bluefin. When comparing bluefin retained, VMS data generally reported less retained bluefin than the EM audited documented. When comparing bluefin discarded dead, the VMS data generally reported more bluefin than the EM audit documented. For example, in Figure 6.62, with respect to total bluefin: During audit period 10, the corresponding VMS sets had less total bluefin than the EM audited sets detected (the bar under the X axis).

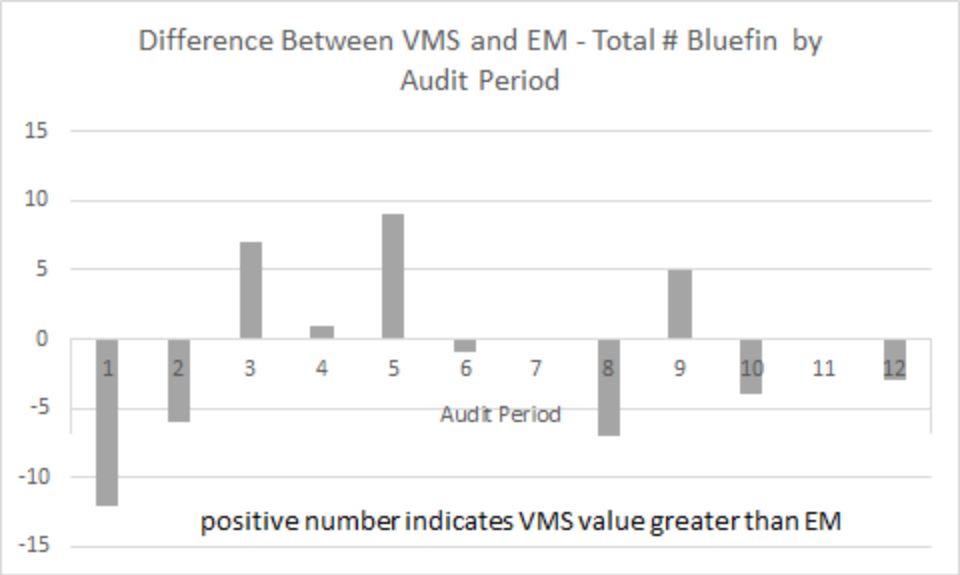

Figure 6.62 Difference Between VMS and EM by Audit Period—Total Number of BFT Caught

Sources: NMFS Electronic Monitoring Program and VMS data.

Figure 6.63 compares the number of bluefin retained. The bars are almost all negative, which indicates that the VMS data contains fewer bluefin than the EM data. For example, during audit period 11 (indicated on the X-axis), the VMS data indicated six less bluefin retained than did the EM audit (indicated on the Y-axis).

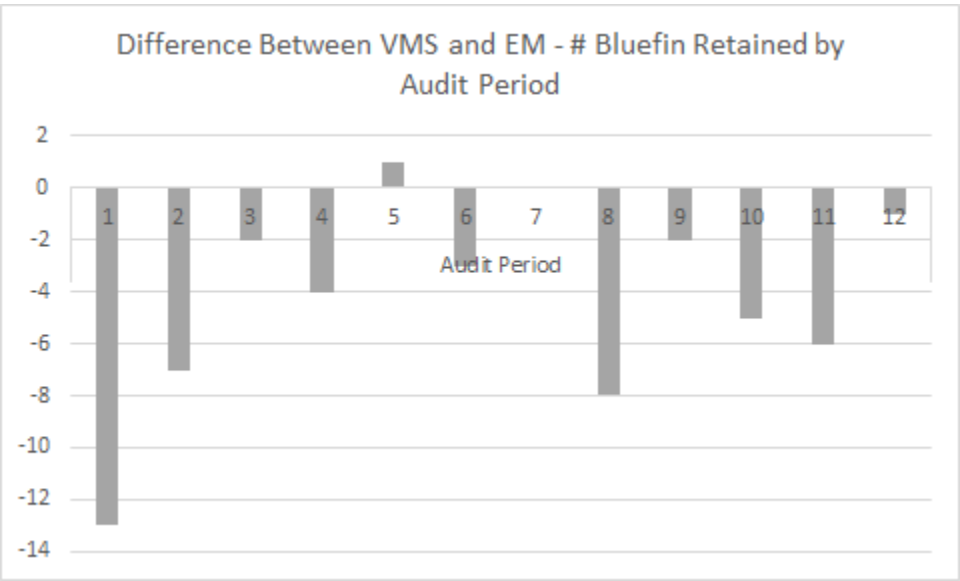

Figure 6.63 Difference Between VMS and EM by Audit Period—Number BFT Retained

Sources: NMFS Electronic Monitoring Program and VMS data.

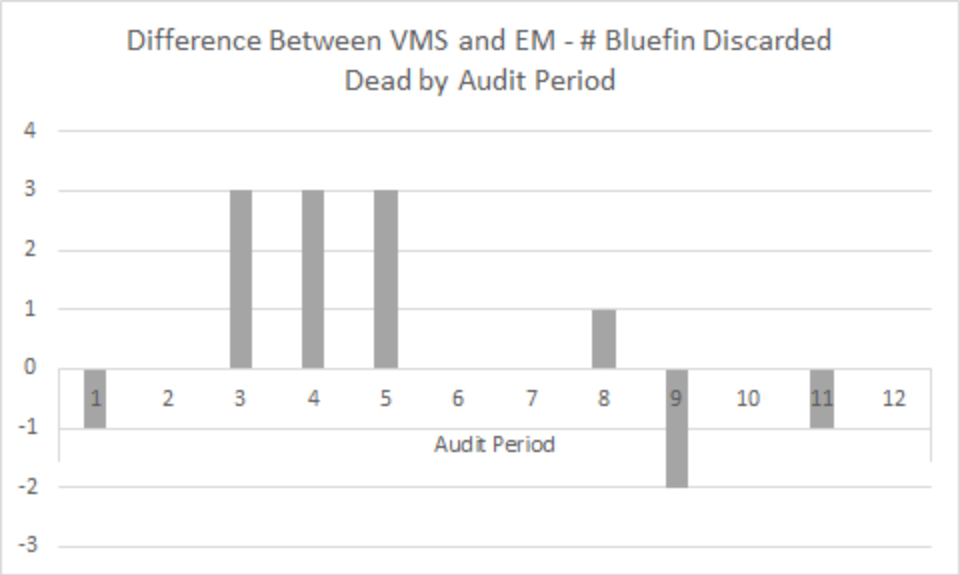

Figure 6.64 Difference Between VMS and EM by Audit Period—Number of BFT Discarded Dead

Sources: NMFS Electronic Monitoring Program and VMS data.

Table 6.36 shows VMS data indicating the percentage of sets with bluefin interactions reported, which corresponds well to the EM data in Table 6.35, specifically the percentage of total sets audited with bluefin detected.

Table 6.36 2015–2018 Percentage of Sets with Interactions of Bluefin Reported

Month	2015 (%)	2016 (%)	2017 (%)	2018 (%)
Jan	3	6	6	12
Feb	6	13	9	24
Mar	6	11	9	6
Apr	3	8	7	4
May	5	4	4	8
Jun	11	22	19	19
Jul	8	7	5	7
Aug	1	2	4	1
Sep	2	2	5	1
Oct	5	4	2	1
Nov	6	2	2	5
Dec	4	1	5	4
Average	5	7	6	7

Source: VMS data.

EM Analyses to Test Methods

The video reviewers conducted a number of tests to evaluate their methods and identification of bluefin including "blind" identification of a known sample, comparison of camera positions,

comparison of "manual" review versus review using activity recognition (AR) software, and rates of detection of dead discards versus retained fish.

An analysis was conducted to determine if detection rates of fish varied between rail and deck cameras. Table 6.37 shows data of the numbers of fish by species detected by the two camera locations. Camera position (rail camera or deck camera) was determined to have an effect on the number of fish recorded as retained or discarded. Rail cameras performed more effectively at recording discarded fish as compared to retained fish. The converse effect was observed for the deck camera, where 25 percent more fish were detected as retained by the deck camera.

Table 6.37 Detection of Discarded and Retained Fish Between Rail and Deck Facing Cameras

	ALB	YLF	BEY	SWO	SPJ	DOL	ESC	UNK TUNA	UNK	SHK	BFT 1–2	BFT 2–3	BFT 3–4	BFT 4–5	BFT 5–6	BFT 6–7	BFT >7	Kept	Discard
Deck summary	109	107	66	191	5	664	26	15	20	55	0	0	0	1	0	3	0	1219	45
Rail sum	90	50	22	153	1	536	7	46	62	66	0	0	0	1	0	2	0	966	71
Difference	-19	-57	-44	-38	-4	-128	-19	31	42	11	0	0	0	0	0	-1	0	-253	26

ALB: Albacore. YLF: Yellowfin. BEY: Bigeye. SWO: Swordfish. SPJ: Skipjack. DOL: Dolphin. ESC: Escolar. UNK: Unknown. SHK: Shark. BFT: Bluefin (the number ranges indicate size ranges in feet).
Source: NMFS Electronic Monitoring Program data.

Another analysis was conducted in which eight longline sets were selected based on the high numbers of bluefin interactions reported via VMS, and provided to the video reviewers for analysis. The reviewers were not provided the VMS data. Table 6.38 shows the results of the video review, which tabulated only bluefin. The EM analysis of retained bluefin closely matched the number of bluefin reported as retained in the VMS reports. In contrast, the number of discards documented through EM review, both for alive and dead bluefin, was substantially lower than self-reported through the VMS system.

Table 6.38 Exploration of VMS vs. EM data; Numbers of BFT in Eight Sets*

	Released Alive	Discarded Dead	Retained (All Sizes)
Vessel IBQ report	75	42	20
EM reviewer 1	3	11	21
EM reviewer 2	3	12	20

*Sets selected on the basis of exceptionally high numbers of bluefin reported via VMS; EM review was "blind" to VMS data.
Sources: VMS and NMFS Electronic Monitoring Program data.

Based on the comparison of the data, the dynamics of hauling longline gear, the expertise of the EM reviewers, and anecdotal information from other EM programs, it is very likely that the rate of detection of discarded bluefin by the EM system underestimates actual discards, whereas the detection of retained bluefin is more accurate. An analysis comparing observer data to EM data is pending.

Activity recognition (AR) software developed to increase review speed is being explored for implementation into the review process. AR software assists the human reviewer in locating fish, through automated detection of activity associated with fish capture (using detection of fish shapes,

increased motion by crew, etc.). Since inception the EM program has required full human review of all selected sets, this however, is time consuming since in some cases 90 percent of the video may have no activity. The adoption of AR software may lead to greater review efficiency; however, it must be determined to have no significant difference in the accuracy of review.

Multiple tests were conducted over time, to determine the difference in the number of Tunas and other species detected between the artificial recognition and full review. The AR initially performed well at detecting retained fish compared to the full review with a detection rate of 92 percent in the first and second test, and an 86 percent in the 3 tests. The discard detection rate was low initially however increased to 67 percent in the third test. Figure 6.65 illustrates the change in AR software accuracy among three analyses over time; the percentages reflect accuracy compared to the full (Non-AR) review. Analysis 1 contained 53 sets, analysis 2 reflects 59 sets, while analysis 3 reflected 24 sets. HMS will continue to develop AR software capability, and hopes to implement its use in the future to reduce program costs and increase review efficiency.

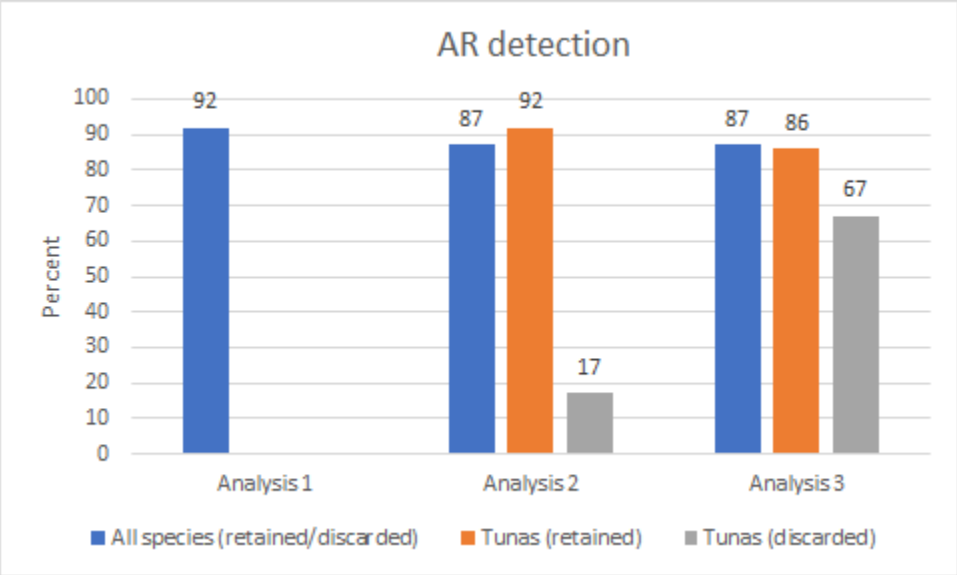

Figure 6.65 Analysis of AR Software Compared to the Full Review

Sources: NMFS Electronic Monitoring Program.

To confirm the accuracy of the reviewers' ability to identify fish caught on pelagic longline vessels, reviewer accuracy was tested via a blind review of 31 sets in which each reviewer analyzed the same sets independently (Table 6.39). Comparing the number of fish identified between reviewers, the reviewers had 96 percent agreement in terms of total detected. Using a t-test, it was found that no significant difference existed between the results.

Table 6.39 Reviewer Comparison—Aggregated Review Results of 31 sets

	Non-BFT	BFT
Reviewer A	558	0
Reviewer B	581	0
Difference	23	0

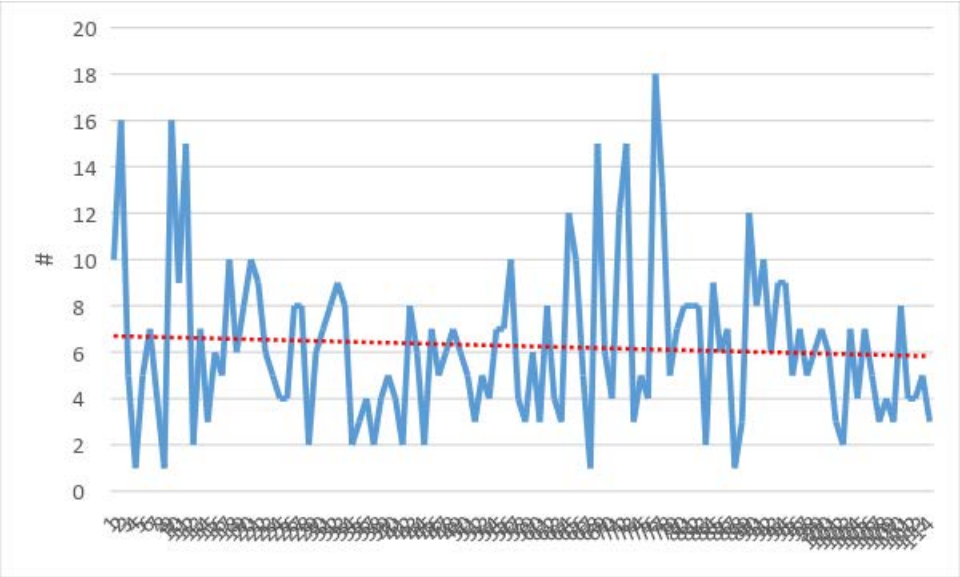

Figure 6.66 EM System Troubleshooting and Repair Data Number of Issues per Week (1/1/16 to 3/17/18)

Sources: NMFS Electronic Monitoring Program.

Table 6.40 2016–2018 Average Number of Weekly Troubleshooting Events (Remote and Field)

Type	2016	2017	2018
Remote	2.8	3.3	3.6
Field	3.7	3.6	0.9

Sources: NMFS Electronic Monitoring Program.

The number of field visits is a metric that should be interpreted carefully. Although a field service visit to a vessel may indicate a problem with the EM system that needs repair or troubleshooting, some field visits result from technicians visiting a particular port, and taking the opportunity to visit multiple vessels and conduct preventative maintenance. There is a seasonal pulse in EM maintenance in the spring after some vessels start fishing after not fishing for a period during the winter months.

Hard Drive Life Span Expectancy

Hard drive life expectancy was an average of 18.2 months (Table 6.41). Since 2015, 55 hard drives were received in an inoperable state. The average lifespan of hard drive has remained annually near the average lifespan of the hard drives overall.

Table 6.41 2015–2017 Number of Hard Drives that Failed and Average Lifespan of Hard Drives†

Year Entered	Number Failed HDD	Average Life (months)
2015	39	20.26
2016	14	11.86
2017	2	16

†That entered the program
Sources: NMFS Electronic Monitoring Program.

6.10 Oceanic Fish Restoration Project

The Oceanic Fish Restoration Project was implemented in cooperation with the NOAA Restoration Center and the National Fish and Wildlife Foundation. Participating vessels are compensated for not using pelagic longline gear in the Gulf of Mexico, and are encouraged to use alternative gear such as buoy gear. The project was designed to help restore fish species affected by 2010 Deepwater Horizon oil spill. The project is funded through early restoration funds from BP (British Petroleum) in 2011. For more information, visit http://www.nfwf.org/pll/Pages/home.aspx.

Information regarding participation in the Oceanic Fish Restoration Project is shown in Table 6.42. As participants in the "repose," seven vessels did not utilize pelagic longline during 2016 and ten vessels did not utilize pelagic longline gear during 2017. Participation in the Oceanic Fish Restoration Project is a variable that affects the IBQ Program. It is difficult to estimate the impacts of a small number of vessels, due to the variability of bluefin distribution and bluefin catch. Reports on the project have not been finalized. That said, under Amendment 7, historical information on bluefin interactions was compiled at the scale of individual vessel, to support the IBQ allocation. For example, for the seven vessels that participated in the Oceanic Fish Restoration Project during 2016, the total number of interactions with bluefin by those vessels from 2006 through 2012 were 388, based on logbook data, which is roughly 55 interactions (retained, released alive, and dead discards) per year.

Table 6.42 Vessel Participation in Deepwater Horizon Oceanic Fish Restoration Project PLL Gear Repose in the GOM

Year	Months of Repose (not fishing in GOM with PLL gear)	Number of Vessels Participating
2016	March through June	7
2017	January through June	10

Sources: NMFS.

6.11 Further Analysis of Bluefin Dealer Data

This section further explores the impacts on the IBQ Program on bluefin dealers. The analysis (Figure 6.67) further divides the number of dealers purchasing bluefin from pelagic longline vessels into those dealers that only purchase from pelagic longline vessels, and those that purchase pelagic longline bluefin and bluefin caught by other gears as well. The reduction in number of dealers during the IBQ period is mainly from a decrease in dealers solely purchasing bluefin from pelagic longline vessels.

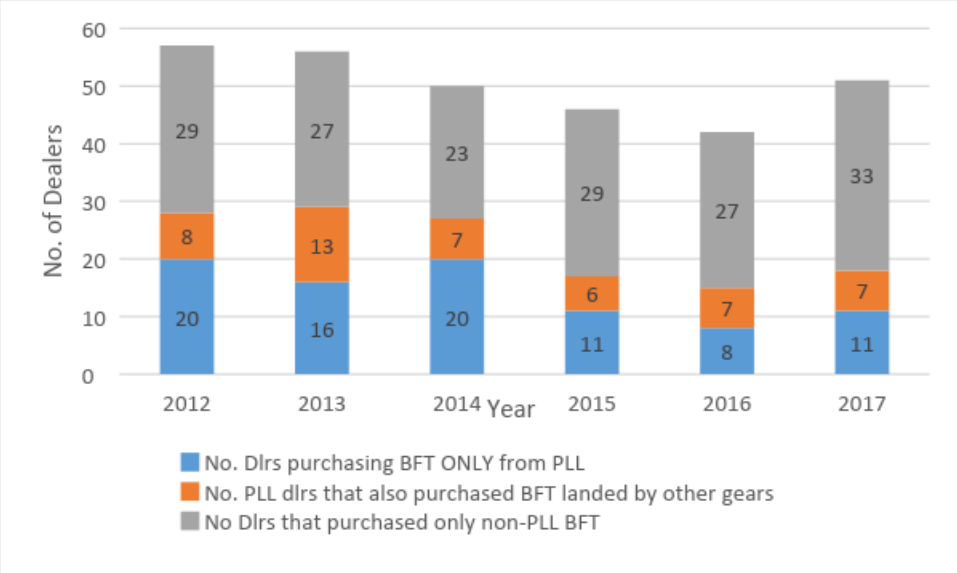

Figure 6.67 Annual Number of Dealers that Purchased BFT from PLL Vessels, Non-PLL Vessels, or Both

Sources: SAFIS data.

Thirty-seven dealers purchased at least one pelagic longline-caught bluefin during 2012 to 2017. Table 6.43 shows the number of dealers that were active during each of the six years in the study period. Each row represents a different pattern of years where dealers purchased bluefin from pelagic longline vessels, with the shaded boxes correspond to the years. Eleven dealers were active during 2012 to 2017 (top row; shaded). Seven additional dealers purchased pelagic longline bluefin in both periods (i.e., next six rows; active 4 or 5 years; shaded). Each of the dealers that were active three or less years only had landings in one of the two periods. Fourteen dealers landed bluefin solely during the baseline period (see first column; 9 + 3 + 2)), but not during the IBQ period. Five dealers landed pelagic longline bluefin during the IBQ period (1 + 1 +3 at bottom)) and not during the baseline period; however, each of these dealers only landed fish during one year. The purchases

for three of these dealers were in 2017, and their participation in the industry may continue in 2018.

Table 6.43 Dealers Who Purchased PLL—Caught BFT during the Indicated Year(s)

	Baseline			IBQ		
Number of Dealers	2012	2013	2014	2015	2016	2017
11						
2						
1						
1						
1						
1						
1						
9						
3						
2						
1						
1						
3						
Total	28	29	27	17	15	18

Sources: SAFIS data.

6.12 Amendment 7 Reference Information: Initial Allocations

This section provides reference information regarding the use of bluefin-to-designated target species ratio in IBQ Program Initial Allocations. Under Amendment 7, the IBQ shares were based on a complex formula that evaluated both the target species landings, and a metric that evaluated bluefin interactions relative to the amount of target species landings. For the target species metric, IBQ allocation was in proportion to the amount of target species to reflect the fact that vessels with more fishing effort (and target species catch) are likely to encounter more bluefin. For the second metric, bluefin interactions to target species ratio, IBQ allocation distributed inversely proportional to the ratio, in order to "reward" vessels that historically interacted with fewer bluefin (relative to their target catch). For initial IBQ share calculation, NMFS compiled all logbook and dealer data for vessels that reported at least one set in the HMS logbook between 2006 and 2012. The ratio formula, which estimates the number of bluefin interactions per 10,000 lb. of target species landings, is as follows:

Ratio = (Number of Bluefin Interactions /Target Species Landings) *10,000

Thresholds based on percentiles (High: 66–100 percent, Medium: 33<66 percent, Low: <33 percent) were used to group the 135 eligible vessels by landings of target species ("Designated Species Landings") and the bluefin interactions ("Designated Species Landings Ratio") (Table 6.44). Vessels were assigned scores (1, 2, or 3) based on the bins into which they were categorized for each metric (A or B). Scores for each metric (A and B) were summed to derive the Tier level (High = 5 or 6; Medium = 4; Low = 2 or 3). Each tier corresponded to a different amount of IBQ share that was further divided to reflect the distribution of fishing behavior. Table 6.44 also provides the relevant metric scores that were associated with scores used to assign the three IBQ share tiers.

Table 6.44 IBQ Allocation Bin Designated Species and Bluefin-to-Target Species Ratio Metrics

Bins (based on percentiles)	Designated Species Landings (average lb./year) (A)	Bluefin: Target Species Ratio (B)
High bin (66–100%)	≥ 61,269 (score 3)	< 0.2884 (score 3)
Medium bin (33–< 66%)	61,268–21,180 (score 2)	0.2884–0.9427 (score 2)
Low bin (0–< 33%)	< 21,180 (score 1)	> 0.9427 (score 1)

Source: NMFS Amendment 7 data.

The bluefin ratio is also used to calculate one of three annual performance metrics that are evaluated to determine whether a vessel is granted access to the Cape Hatteras GRA. In either case, comparing bluefin interactions to the amount of target species landings provides a standardized way to explore the relative amount of bluefin interactions before and after implementation of the IBQ Program. Therefore, the 3-year review includes a summary of the bluefin-to-target species landing ratios data used in tier calculations as well as an analysis of this ratio through time.

Amendment 7 IBQ Allocation Metric Results

Under Amendment 7 the calculations for the IBQ share tiers resulted in 112 vessels (82 percent) receiving the highest score for target (designated) species landings (Table 6.45). The distribution of vessels between scoring bins for bluefin intderaction: target species ratios was more evenly split between high (31 percent), medium (36 percent), and low (33 percent) bins. Most vessel ratios were on the low end of the range for each bin. Many vessels (n = 24; 17 percent of the fleet) had no reported interactions with bluefin.

Table 6.45 Vessels Scoring a 3, 2, or 1 for Both Metrics Used to Calculate IBQ Tiers Under Amendment 7[†]

Score Value	Designated Species Landings Scores (number of vessels)	Bluefin: Target Species Ratio Scores (number of vessels)
Score = 3	112	42
Score = 2	11	49
Score = 1	13	45

[†]For both metrics used to calculate IBQ tiers.
Source: NMFS Amendment 7 data.

Figure 6.68 shows the Amendment 7 distribution of the number of vessels with high, medium, and low shares, in the IBQ Program, and includes the bluefin interactions to target species ratio.

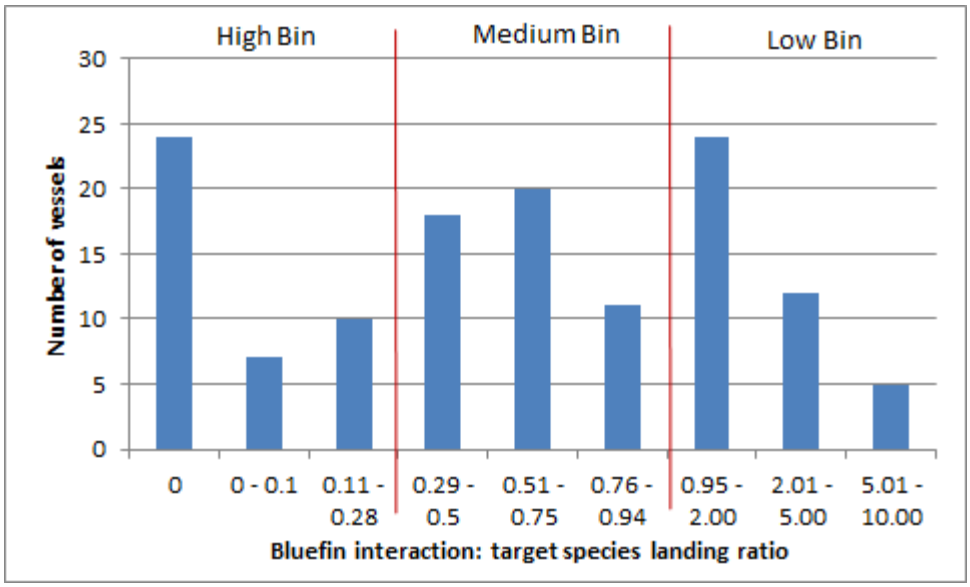

Figure 6.68 Historical Bluefin Interaction (2006–2012) to Designated Species Ratio

Sources: HMS logbook; eDealer data.

6.13 Notes on HMS Advisory Panel Feedback on IBQ Program

This section contains the high-level summaries of Advisory Panel meeting discussion topics and suggestions regarding management of the pelagic longline fishery (May 2017, September 2017, and March 2018). The Draft three-Year Review and this final document incorporate suggestions made by the Advisory Panel. For example, both the Draft document and this final document contain economic analyses that reflect the diversity of the pelagic longline fleet, as suggested by the Advisory Panel (September 2018). This final document was reorganized to address suggestions to make the document easier for the reader to review the large amount of data included. The Advisory Panel comments on the Draft Three-Year Review focused on the future management of the fishery and not the substance of the document. These summary points were compiled during the meetings and presented to the Advisory Panel at the ends of the meetings (respectively) as a way to recap the meeting discussions, but are not a substitute for the full discussions. Transcripts of each meeting are available online. (https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-highly-migratory-species-advisory-panel)

May 2017 Summary from AP meeting (Re: Pelagic Longline Fishery)

Good to see reductions in dead discards at same time as fuller U.S. quota use;
Some concern that extrapolated dead discards pre-A7 were over-estimated;
Show discards by size and area for better understanding where/why they occur;
Incorporate data from the 100% observer coverage period (Dec-Apr); show overlap with logbook data;
Given efforts to collect VMS set data, start to share VMS and EM data with AP; allow for side-by-side review with extrapolated dead discard data;
Questions about Electronic Monitoring data collection intent (BFT) and audit sampling design/protocol (covering right % of effort);
Don't need audit for trips where observer has indicated no BFT caught;

Electronic Monitoring troubleshooting: concerns about potential for system problems and impact (ability to leave dock); appreciation for support, which is changing the type of support needed; EM voltage issue may be why multiple trips on hard drive;
Re: ex-vessel revenues: Consider that vessels with marginal revenues have dropped out so results may be less positive than they appear (i.e., big picture of fishery);
Break out for vessels under/over 45' (get better sense of who still in fishery);
Show cost info (e.g., price of bait has increased)

Sept 2017 AP Meeting Summary (Re: Pelagic Longline Fishery)

Upcoming Rulemaking: IBQ Accountability;
If no conservation concerns, NMFS should make accountability more flexible;
Should/should not allow carryover of IBQ. ICCAT implications?
Implications flexibility in accounting could have on need for inseason transfers to the Longline category early in the year;
Trip-level accountability may prevent vessels from quick turn around when target species fishing is good. It can be difficult to find additional IBQ to lease, and leasing is a cost to vessels;
Vessels can be hesitant to lease early in year;
Accounting period should not be too long so that vessels don't go too far into quota debt ;
Interest in examining effort over a longer timeframe;
Other gears besides pelagic longline have experienced a drop in landings (reduced SWO availability)
In addition to SWO, the United States is importing more bigeye from Ecuador;
Need to analyze age of vessel crew, not just owners;
Poor public perception of SWO; marketing could help;
Countries that export SWO to the United States don't abide by same conservation requirements;
Not one issue that is preventing pelagic longline vessels from catching SWO; many facets reduce performance;
Flexibility in fishing would be helpful;
Pelagic longline Fishery: IBQ Program Update and 3-Year Review should analyze the whole fishery, not just BFT;
Concerns about liberalizing pelagic longline regulations, including IBQ accountability and closed areas;
General category interest in IBQ Program due to quota implications;
Industry offer to help provide relevant information;
Amendment likely following 3-year review

March 2018 AP Meeting Summary (Re: Pelagic Longline Fishery)

Purse Seine fishery: time to close the chapter on fishery as a whole;
Should not allow to lease IBQ to longline vessels and profit while purse seine vessels are not active;
Purse seine leasing to longline vessels is helpful to longline vessels;
Pelagic longline fleet status:
Need to re-evaluate the objectives of the IBQ program with respect to bluefin catch;
Enable fishery to more fully utilize its quota in order to help remain economically viable. Costs are increasing;
IBQ quota: get IBQ in the hands of active vessels;
Cape Hatteras GRA: need to evaluate the access criteria;
EM hard drives: allow multiple trips on one drive;
Big picture: Success - program has been successful in many respects (e.g., no longer overharvesting the quota, dead discards reduced);

Do we need the IBQ program anymore?
Fleet is in a different place than before implementation of the IBQ program. Attrition of vessels.

September 2018 AP Meeting Summary (Re: Three-Year Review and management)

Suggestion to analyze the economic data in the Three-Year Review by vessel size, and calculate operational costs;
Don't' undo the success of Amendment 7;
Provide more flexibility by allowing the use of Atlantic IBQ in the Gulf of Mexico;
Don't allocation IBQ to non-active vessels, allocate by hooks or sets;
Overhaul the IBQ system; fishery conditions have changed;
Don't' allow concentration of IBQ;
Sunset the purse seine fishery, but consider the impacts of the pelagic longline fleet;
Need to make bluefin IBQ available for use by the pelagic longline vessels.

May 2019 AP Meeting Summary (Re: Three-Year Review and management)

In response to a presentation on the Draft Three-Year Review, the focus of the Advisory Panel comments were on the future management of the pelagic longline fishery. The method of defining active vessels is important (e.g., look at by region);
Concern about the Amendment 7 focus of strong incentives to avoid bluefin interactions (i.e., may no longer be relevant);
Concurrence with the trends presented in the Draft Three-Year Review regarding fishing effort and revenue (i.e., the fishery has "bottomed out");
Question about the process of providing waivers for electronic monitoring requirements.