

Monkfish Fishery Management Area Daily Landings and Days-at-Sea Limit Allocation Analysis for FY2017-FY2019

Prepared by
Jay Hermsen, Ph.D.
Analysis and Program Support Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
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Introduction

The New England and Mid-Atlantic Fishery Management Councils (Councils) are developing a new framework to the Monkfish Fishery Management Plan (FMP) to adjust daily landing and/or trip limit allocations for the Northern Fishery Management Area (NMA) and Southern Fishery Management Area (SMA) for FY2017 – 2019. The objective of this analysis was to examine daily landing limits and days at sea (DAS) allocations under both status quo Total Allowable Landings (TALs) and TALs under a reduced management uncertainty buffer (to 3%) for both the NMA and SMA.

In the NMA, nine management alternatives were considered: 1) the status quo alternative: maintained status quo daily landing limits and DAS allocations by permit category; 2) adjusted the allocation of DAS in the NMA to a level at which projected landings approximated the FY2017 directed fishery allocation of the northern area TAL with a status quo management uncertainty buffer; 3) adjusted NMA daily landing limits of monkfish tail weight per DAS to a level at which projected landings approximated the FY2017 directed fishery allocation of the northern area TAL with a status quo management uncertainty buffer; 4) adjusted the allocation of DAS in the NMA to a level at which projected landings approximated the FY2017 directed fishery allocation of the northern area TAL with a 3% (down from 13.5%) management uncertainty buffer; 5) adjusted NMA daily landing limits of monkfish tail weight per DAS to a level at which projected landings approximated the FY2017 directed fishery allocation of the northern area TAL with a 3% management uncertainty buffer; 6) increased incidental daily landing limits to 900 lbs tail weight per DAS for monkfish permit category C vessels and to 750 lbs tail weight per DAS for monkfish permit category D vessels with a status quo management uncertainty buffer; 7) increased incidental daily landing limits to 900 lbs tail weight per DAS for monkfish permit category C vessels and to 750 lbs tail weight per DAS for monkfish permit category D vessels with a 3% management uncertainty buffer; 8) increased incidental daily landing limits to 1500 lbs tail weight per DAS for monkfish permit category C vessels and to 1250 lbs tail weight per DAS for monkfish permit category D vessels with a status quo management uncertainty buffer; 9) increased incidental daily landing limits to 1500 lbs tail weight per DAS for monkfish permit category C vessels and to 1250 lbs tail weight per DAS for monkfish permit category D vessels with a 3% management uncertainty buffer.

For the SMA, seven management alternatives were also considered: 1) the first alternative (the status quo alternative) maintained status quo daily landing limits and DAS allocations by permit category; 2) adjusted the allocation of DAS in the SMA to a level at which projected landings approximated the FY2017 directed fishery allocation of the southern area TAL with a status quo management uncertainty buffer; 3) adjusted SMA daily landing limits of monkfish tail weight per DAS to a level at which projected landings approximated the FY2017 directed fishery allocation of the southern area

TAL with a status quo management uncertainty buffer; 4) adjusted the allocation of DAS in the SMA to a level at which projected landings approximated the FY2017 directed fishery allocation of the southern area TAL with a 3% (down from 6.5%) management uncertainty buffer; 5) adjusted SMA daily landing limits of monkfish tail weight per DAS to a level at which projected landings approximated the FY2017 directed fishery allocation of the southern area TAL with a 3% management uncertainty buffer; 6) increased the DAS allocation and daily landing limits by 15% (from 32 DAS to 37 DAS and to 700 lbs tail weight per DAS for permit category AC vessels (from 610) and to 575 lbs tail weight per DAS for permit category BDH vessels (from 500) under the status quo uncertainty buffer; and 7) increased the DAS allocation and daily landing limits by 15% (from 32 DAS to 37 DAS and to 700 lbs tail weight per DAS for permit category AC vessels (from 610) and to 575 lbs tail weight per DAS for permit category BDH vessels (from 500) under a 3% management uncertainty buffer.

DAS monitoring and a refinement of the DAS declaration activity code allows the use of DAS declarations along with Vessel Trip Reports (VTR) and dealer-reported data to more accurately characterize monkfish landings. Prior to detailed VMS activity code DAS declarations, landings by limited access monkfish-permitted boats could not be easily separated into directed and incidental monkfish trips. Matching DAS declarations to dealer-reported data and VTRs has enabled a description of directed monkfish activity by limited access vessels by area, namely when a vessel has declared it is using a monkfish DAS. Monkfish landings by limited access vessels not on a monkfish DAS are considered to be incidental landings. These incidental landings by limited access vessels can then be subtracted from a management area monkfish allocation by permit category, allowing for a more accurate description of this fishery.

Because the allocated total allowable landings in the both the Northern and Southern Fishery Management areas were not fully harvested in FY2015 (the reference year for this analysis of DAS and daily landing limit allocations for FY2017-2019), the method that has been used to reduce DAS and/or daily landing limits for previous management actions was not applicable. Basically, this method has historically used fishing vessel trip reports, scaled to dealer-reported landings, to adjust trip-level and vessel-level aggregate data for each management area down incrementally in an effort to identify DAS levels and/or daily landing limits that summed to an allocated TAL for each of two sets of monkfish permit categories (AC and BDH) after subtracting estimated incidental landings. Instead, a method that modeled fleet-wide landings by area with an increase in DAS and/or directed daily landing limits, after subtracting for both limited access monkfish and other vessel incidental landings, was employed. The purpose of this report is to describe the assumptions and methods used to arrive at recommended DAS/daily landing limit combinations for each DAS/daily landing limit alternative by permit category in the NMA and SMA.

Methods

Data sources

Data from fishing year 2015 were used as our baseline set for this analysis. Several primary data sources were used for this analysis including: dealer weighout reports, the vessel permits database, DAS declarations (which can be transmitted into the database via the Vessel Monitoring System (VMS) or the Interactive Voice Response (IVR) system), and the fishing vessel trip report (FVTR) database. The source for days at sea declarations, dealer-reported landings data, and vessel-reported area fished data is a trip-matching derivative database: the data matching and imputation system (DMIS). Data from fishing year 2015 are the most recent available and can be matched to a very descriptive DAS declaration for monkfish trips. Starting in FY2007, DAS declarations in the directed monkfish fishery include the monkfish management area, which has advanced our ability to characterize and manage the monkfish fishery.

DMIS data were matched to monkfish vessel permit category (from the permits database) and days at sea charged information (from the Allocation Management System (AMS) database) to derive a comprehensive picture of fleet activity for this analysis.

Assumptions

- Landings from monkfish permit category E and state-only permitted vessels will be exactly the same, in terms of live pounds landed, in FY2017-FY2019 as they were in FY2015. This assumption enables a reasonable reduction of the FY2017-FY2019 monkfish TALs to account for the landings from monkfish permit category E and state-only permitted vessels.
- Landings and effort on trips in FY2017-FY2019 by limited access vessels on non-directed (incidental) monkfish trips will be the same as they were in FY2015.
- Fishing and landing patterns will be similar in FY2017-FY2019 to those observed in FY2015 as detailed in the text below.

There is no empirical basis for modifying these assumptions going forward. This uncertainty should be understood in the selection of management alternatives.

Estimated discards

To derive the directed fishery TALs for the NMA and SMA, the Annual Catch Target (ACT) was first reduced by estimated discards, which are based on the discard percentage calculated for that management area in the most recent stock assessment. The discard percentage is 13.9% for the NMA and 24.6% for the SMA. The resulting figure is the overall TAL for each management area.

Procedures for identification of incidental monkfish landings

Incidental landings by open access permit category E and state-only permitted vessels

Incidental landings of monkfish must be subtracted from the TAL before the remainder can be allocated to the limited access monkfish fishery. Monkfish total reported live pounds from the dealer-reported landings database by FY2015 limited access monkfish permitted vessels were subtracted from total monkfish live pounds to determine landings by monkfish non-limited access vessels. These are landings by monkfish permit category E and state-only permitted vessels.

Incidental landings by monkfish limited access permitted vessels

Incidental landings for each permit category by monkfish limited access vessels was estimated by matching dealer-reported trips with a vessel's DAS declaration and to the Fishing Vessel Trip Report in DMIS. The DAS declaration indicated whether the vessel was on a directed or incidental monkfish trip. If the vessel was on an incidental trip (which has a DAS declaration code that lacks the monkfish management area), the FVTR for the trip indicated the management area fished on the trip.

Procedures for calculation of DAS allocation and/or trip limits for each management alternative

For the purposes of daily landing limit and DAS-setting to achieve the alternative TALs, landings and DAS/ daily landing limits in the NMA and SMA from FY2015 were used as a guide to trip limits and DAS. In FY2015 in the NMA, directed daily landing limits of 1,250 lbs and 600 lbs monkfish tail weight per DAS and 45 DAS allocated to AC and BD permit categories, respectively, 71% of the 5,854 mt TAL was landed (Table 1a). In FY2015 in the SMA, under trip limits of 610 lbs and 500 lbs monkfish tail weight per DAS and 32 DAS allocated to AC and BDH permit categories, respectively, 53% of the 8,925 mt TAL was landed (Table 1b).

Adjustment of allocated DAS for monkfish limited access permitted vessels

To adjust the allocated DAS under status quo trip limits in each management area, frequency distributions of the number of vessels by annual DAS charged were created for each management area. The area under the FY2015 frequency distribution was assumed to be proportional to the directed fishery landings by management area. To project landings under increased DAS allocations, the FY2015 DAS charged frequency distribution was moved iteratively along the horizontal axis until the Riemann sum (the area under the frequency distribution) of the distribution proportional to the directed allocation of the FY2017-2019 management area TAL. DAS allocations in the NMA did not appear to constrain DAS usage in the NMA on the bulk of the fleet. Therefore, an increase in DAS allocations in the NMA would be expected to have a minimal, if any, effect on total monkfish landings.

Adjustment of daily landing limits for monkfish limited access permitted vessels by permit category

To adjust the allocated daily landing limits under status quo DAS allocations in the both Management Areas, frequency distributions of the number of DAS charged by daily landings from a trip were created for each permit category and area. The area under these FY2015 frequency distributions is equivalent to the directed landings by permit category. To project landings under increased daily landing limits, the FY2015 daily limit frequency distribution was moved iteratively along the

horizontal axis until the Riemann sum under the distribution increased to the value of the directed allocation of the FY2017-2019 management area TAL by permit category, if plausible. Again, because daily landing limits in the NMA appeared to be limiting on a small fraction of trips in the NMA, an increase in daily landing limits would be expected to have a minimal effect on total monkfish landings.

Results and Discussion

Results for identification of incidental monkfish landings

Incidental landings by open access permit category E and state-only permitted vessels

The dealer and vessel permits databases allowed for the categorization of landings of monkfish in FY2015 by permit or permit category (Table 2). Matching these records to FVTRs enabled the allocation of dealer-reported landings to each of the two management areas (Table 3). For FY2015, landings by permit category E and state-permitted-only vessels totaled 1,337,949 live pounds.

Incidental landings by monkfish limited access permitted vessels

Incidental and directed monkfish landings for each limited access permit category and management area were estimated by matching dealer-reported landings data with vessel-reported DAS declarations and fishing vessel trip reports in the Data Matching and Imputation System (DMIS). In the NMA, incidental landings of monkfish by limited access monkfish vessels were approximately four times higher than landings on directed trips for both permit categories (Table 4). The pattern was reversed in the SMA, with a much higher proportion of landings on directed trips than on incidental trips by limited access monkfish vessels (Table 4).

After subtracting estimated discards and incidental landings by both limited and non-limited access vessels, the portion of the management area TAL to be allocated to the directed monkfish area by permit category could be calculated. The allocations of monkfish for the directed limited access fishery were further apportioned by the percentage of directed fishery landings by permit category (Tables 4 and 5)

Procedures for calculation of DAS allocation and/or trip limits for each management alternative

Adjustment of allocated Northern Management Area DAS for monkfish limited access permitted vessels

To project the allocation of days at sea necessary to land the directed fishery allocation of the FY2017-2019 NMA TAL under status quo and 3% management uncertainty, the frequency distribution of DAS charged by number of vessels was iteratively increased until the Riemann sum under the distribution increased proportionally to the FY2017-2019 directed NMA allocation divided by the FY2015 directed NMA landings (Figure 1, Table 6). Days at sea usage was increased by 29 days at sea (from 45 to 74) and 42 days at sea (from 45 to 87) in the NMA to increase the area under the NMA DAS frequency distribution proportional to the directed allocation of the FY2017-2019 NMA monkfish TAL under status quo and 3% management uncertainty buffers, respectively (Figure 1, Table 7).

Adjustment of allocated Southern Management Area DAS for monkfish limited access permitted vessels

The same method as described above for the NMA was applied to the DAS charged by number of vessels frequency distribution in the SMA. Days at sea usage was projected to increase by 24 days at sea (from 32 to 56) and 26 days at sea (from 32 to 58) in the SMA to land the directed allocation of the FY2017-2019 SMA monkfish TAL under status quo and 3% management uncertainty buffers, respectively (Figure 2, Table 7).

Adjustment of daily landing limits for monkfish limited access permitted vessels in the Northern Management Area by permit category

Frequency distributions of DAS charged by daily landings (tail weight lbs) by permit category were created for the NMA for FY2015. A projection to increase in the daily landing limits necessary to harvest the allocated portion of the TAL on directed monkfish trips was not analytically feasible because the daily landing frequency distribution observed for both permit categories were not limited to any significant extent by the daily landing limits in place in FY2015 (Figures 3 and 4). It is therefore proposed that daily landing limits be set at or around 1250 lbs tail weight per DAS for both permit categories in the NMA (Table 7).

Adjustment of daily landing limits for monkfish limited access permitted vessels in the Southern Management Area by permit category

To adjust daily landing limits in the Southern Management Area, frequency distributions of DAS charged by daily landings (tail weight lbs) by permit category were created. To project the increase in the daily landing limits necessary to harvest the allocated portion of the TAL on directed monkfish trips, the distribution observed in FY2015 was moved along the horizontal axis until the Riemann sum of the distribution equaled the directed allocation of the FY2017-2019 TAL for each permit category (Figures 5 and 6). For permit category AC, the daily landing limit increased to 1160 lbs and 1200 lbs tail weight per DAS to harvest the directed portion of the FY2017-2019 TAL in the SMA (Figure 5, Table 7) under the status quo and 3% management uncertainty buffers, respectively. For permit category BDH, the daily landing limit increased to 1000 lbs and 1030 lbs tail weight per DAS to harvest the directed portion of the FY2017-2019 TAL in the SMA under the status quo and 3% management uncertainty buffers, respectively (Figure 6, Table 7).

Projected Landings under SMA Alternatives 6 and 7

Landings under SMA Alternatives 6 and 7, increased directed landing limits to 700 lbs tail weight per DAS for permit category A and C vessels and to 575 lbs tail weight per DAS for permit category B, D, and H vessels under 37 DAS under the status quo and 3% management uncertainty buffers, were projected according to the methods described in the analysis. The method first calculated the expected increase in monkfish landings under increased daily landing limits (Figures 5 and 6). Projected increased landings under increased daily landing limits are multiplied by the proportional increase in the area under the DAS usage frequency distribution with 37 allocated DAS in the SMA (Figure 2). With an allocation of 37 DAS, an increase of 5 DAS over the status quo 32 DAS allocation from 2014-2016, directed fishery landings were projected to increase by approximately 34%, to yield a total projected landings in the SMA by limited access monkfish vessels of 12,345,092 lb (Table 7).

Examination of the landings of tail weight per DAS on incidental trips by monkfish limited access permitted vessel in the NMA in FY2015

In 2014, Framework 8 to the Monkfish Fishery Management Plan (FMP) increased incidental landings limits for limited access permitted monkfish vessels in the NMA (from 300 lbs to 600 lbs tail weight per DAS for AC vessels and from 300 lbs to 500 lbs tail weight per DAS for BD vessels). The FY2012 incidental landing distributions were used to model what distribution of incidental trips would look like under increased daily landing limits (Figures 7 and 8). The distributions from FY2015 appear to validate the FY2012 models and the adoption of the increased daily landing limits (Figure 9). The FY2015 distribution also appears to indicate that trips were not generally limited by the FY2015 incidental landing limits that were adopted in Framework 8.

NMA Management alternatives 6-9 propose to increase incidental daily landing limits from 600 lbs tail weight per DAS to 900 (Alternatives 6 and 7) or 1500 (Alternatives 8 and 9) lbs tail weight per DAS for monkfish permit category C vessels on a multispecies DAS and from 500 lbs tail weight per DAS to 750 (Alternatives 6 and 7) or 1250 (Alternatives 8 and 9) lbs tail weight per DAS for monkfish permit category D vessels on a multispecies DAS under the two proposed management uncertainty buffers. It does not appear that daily landing limits were limiting for the overwhelming majority of incidental trips by C or D monkfish permit category vessels in the NMA in FY2015 (Figure 9). The proposed increased incidental landing limit alternatives will likely have a minimal effect on monkfish landings in the NMA. Rather, the proposed increases in the incidental landing limits in alternatives 6-9 will likely have a greater impact on whether vessels will have to use any directed monkfish DAS in the NMA. For monkfish permit category C vessels, a 900 lbs tail weight per DAS incidental landing limit would convert most of the directed fishing activity by this permit category into incidental activity (Figure 3). The higher incidental limit of 1500 lbs tail weight per DAS would likely convert all of the directed fishing activity by this permit category into incidental activity (Figure 3). Both monkfish incidental landing limit alternatives (750 and 1250) under consideration for permit category D vessels on a multispecies DAS would convert most, if not all, directed monkfish activity to incidental activity (Figure 4). Converting directed fishing activity to incidental activity in the NMA will likely not result in a significant increase in landings as very few, if any, monkfish limited access permit category vessels were limited by DAS allocations in the NMA in 2015 (Figure 1). There does not appear to be a ready analytical solution to the question of DAS allocation or daily landing limits in the NMA under alternatives 6-9. Because most directed fishing activity in the NMA would be converted to incidental activity (and directed activity is already a relatively smaller fraction of limited access monkfish vessel monkfish landings in the NMA than in the SMA (Table 4)), most, if not all, allocated DAS in the NMA would likely go unused, as has been the long-running case in this fishery. An increase in incidental landing limits would obviate the need for monkfish DAS with daily landing limits, it would not be practical to attempt to solve for monkfish DAS allocations and landings limits under these alternatives.

Table 1a. Monkfish target TALs, daily landing limits, DAS allocations, and landings (FY 2000 - FY 2016) for the NMA

Fishing Year	Target TAL (lbs)	Target TAL (mt)	Limit per DAS*		DAS Allocation**	Landings (lbs)	Landings (mt)	Percent of TAL
			Cat. A & C	Cat. B & D				
2000	12,507,000	5,673	n/a	n/a	40	26,145,000	11,859	209%
2001	12,507,000	5,673	n/a	n/a	40	32,745,000	14,853	262%
2002	25,737,000	11,674	n/a	n/a	40	31,947,000	14,491	124%
2003	39,039,000	17,708	n/a	n/a	40	31,207,000	14,155	80%
2004	37,408,000	16,968	n/a	n/a	40	25,905,000	11,750	69%
2005	29,012,834	13,160	n/a	n/a	40	21,016,667	9,533	72%
2006	17,057,165	7,737	n/a	n/a	40	14,720,265	6,677	86%
2007	11,023,100	5,000	1,250	470	31	11,133,344	5,050	101%
2008	11,023,100	5,000	1,250	470	31	7,777,909	3,528	71%
2009	11,023,100	5,000	1,250	470	31	7,372,258	3,344	67%
2010	11,023,100	5,000	1,250	470	31	6,247,901	2,834	57%
2011	12,905,845	5,854	1,250	600	40	8,153,433	3,699	63%
2012	12,905,845	5,854	1,250	600	40	8,349,609	3,788	65%
2013	12,905,845	5,854	1,250	600	40	8,032,200	3,644	62%
2014	12,905,845	5,854	1,250	600	45	7,591,355	3,444	59%
2015	12,905,845	5,854	1,250	600	45	9,121,088	4,138	71%
2016	12,905,845	5,854	1,250	600	45			

* Trip limits in pounds tail weight per DAS

** Excluding up to 10 DAS carryover, became 4 DAS carryover in FY2007

Table 1b. Monkfish target TALs, daily landing limits, DAS allocations, and landings (FY 2000 - FY 2016) for the SMA

Fishing Year	Target TAL (lbs)	Target TAL (mt)	Limit per DAS*		DAS Allocation**	Landings (lbs)	Landings (mt)	Percent of TAL
			Cat. A & C	Cat. B & D				
2000	13,281,000	6,024	1,500	1,000	40	17,549,000	7,960	132%
2001	13,281,000	6,024	1,500	1,000	40	24,404,000	11,069	184%
2002	17,463,000	7,921	550	450	40	16,487,000	7,478	94%
2003	22,511,000	10,211	1,250	1,000	40	26,891,000	12,198	119%
2004	14,929,704	6,772	550	450	28	13,719,000	6,193	92%
2005	21,325,315	9,673	700	600	39.3	21,287,811	9,656	100%
2006	8,084,351	3,667	550	450	12	13,027,100	5,909	161%
2007	11,243,562	5,100	550	450	23	15,829,172	7,180	141%
2008	11,243,562	5,100	550	450	23	14,883,407	6,751	132%
2009	11,243,562	5,100	550	450	23	10,582,189	4,800	94%
2010	11,243,562	5,100	550	450	23	9,885,528	4,484	88%
2011	19,676,234	8,925	550	450	28	12,789,016	5,801	65%
2012	19,676,234	8,925	550	450	28	11,746,229	5,328	60%
2013	19,676,234	8,925	550	450	28	11,250,189	5,103	57%
2014**	19,676,234	8,925	610	500	32	12,076,923	5,478	61%
2015	19,676,234	8,925	610	500	32	10,447,707	4,739	53%
2016	19,676,234	8,925	610	500	32			

* Trip limits in pounds tail weight per DAS

** Excluding up to 10 DAS carryover, became 4 DAS carryover in FY2007

Table 2: Summary statistics for monkfish in FY2015

	Live pounds
FY2015 monkfish landings by permit category E and state-only-permitted vessels	1,337,949
FY2015 monkfish landings by limited access permit category vessels	18,050,633
Total FY2015 monkfish landings	19,388,582

Source: NMFS GARFO permits, dealer, and DMIS (Data Matching and Imputation System) databases, accessed 9/13/2016.

Table 3: FY2015 monkfish landings by permit category E and state-permitted-only vessels by management area.

Management area	Live pounds
NMA	459,219
SMA	878,730
Total	1,337,949

Source: NMFS GARFO permits, dealer, and DMIS (Data Matching and Imputation System) databases, accessed 9/13/2016.

Table 4. FY2015 monkfish directed and incidental landings by permit category and management area.

Management Area	Permit Category	Incidental or Directed Landings	Prorated Total Live lbs	Percentage of directed fishery by permit category
NMA	AC	D	1,093,479	62%
		I	4,009,656	
	BD	D	657,654	38%
		I	2,793,127	
SMA	AC	D	3,040,534	39%
		I	897,236	
		BDH	D	4,825,055
		I	430,837	

Source: NMFS GARFO permits, dealer, and DMIS (Data Matching and Imputation System) databases, accessed 9/13/2016.

Table 5. ACT options for FY2017-FY2019 by Monkfish Fishery Management Areas with corresponding estimated discards, incidental landings and directed fishery allocations by monkfish permit category.

Management Area	ACT (mt) (1)	Discard rate (2)	Discards (mt) (3)	TAL (mt) (1)-(3) = (4)	TAL (live lbs) ((4)* 2204.623 lb/t) (5)	TAL (live lbs) incidental landings subtracted (6)	AC incidental landings (7)	BD(H) incidental landings (8)	AC proportion of directed landings (9)	BD(H) proportion of directed landings (10)	AC allocation of TAL ((6)-(7+8))*(9)= (11)	BD(H) allocation of TAL ((6)-(7+8))*(10)= (12)
NMA (status quo)	6,567	13.9%	915	5,652	12,460,527	12,001,308	4,009,656	2,793,127	62%	38%	3,246,172	1,952,352
NMA (3% uncertainty buffer)	7,364	13.9%	1,026	6,338	13,972,898	13,513,679	4,009,656	2,793,127	62%	38%	4,190,559	2,520,337
SMA (status quo)	11,515	24.6%	2,829	8,686	19,149,352	18,270,623	897,236	430,837	39%	61%	6,549,338	10,393,211
SMA (3% uncertainty buffer)	11,947	24.6%	2,936	9,011	19,865,854	18,987,125	897,236	430,837	39%	61%	6,826,311	10,832,741

Table 6. Directed allocations of the monkfish area TAL by permit category for FY2017-FY2019 under 2 uncertainty buffer options and FY2015 landings by Monkfish Fishery Management Area with corresponding proportional increase in landings necessary to harvest the directed allocation of the FY2017-FY2019 monkfish TAL.

	AC directed allocation of FY2017-2019 TAL (1)	BDH directed allocation of FY2017-2019 TAL (2)	Area directed fishery allocation FY2017-2019 (lbs) (1)+(2)=(3)	Total directed FY2015 landings (4)	Proportional increase in FY2015 landings to land FY2017-2019 directed allocation of TAL (3)/(4)=(5)
NMA (status quo)	3,246,172	1,952,352	5,198,524	1,751,133	2.97
NMA (3% uncertainty buffer)	4,190,559	2,520,337	6,710,895	1,751,133	3.83
SMA (status quo)	6,549,338	10,393,211	16,942,550	7,865,589	2.15
SMA (3% uncertainty buffer)	6,826,311	10,832,741	17,659,052	7,865,589	2.25

Table 7. DAS, directed fishery daily landing limits, and incidental landing limits (lbs tail weight per DAS) alternatives for both Monkfish Fishery Management Areas for FY2017-2019. Shaded grey cells indicate the variables that were solved for in this analysis.

Management Area	Alternative	Incidental Landing Limit (lb/DAS) (when fishing under a groundfish DAS in the NMA)	A,C daily landing limit (lb/DAS)	B,D (H – SFMA only) daily landing limit (lb/DAS)	DAS	Projected Limited Access Monkfish Fishery Landings for FY2017-2019
NFMA	1) NMA (status quo)	600 for C permits, 500 for D permits	1250	600	45	8,553,916
	2) NMA (status quo uncertainty buffer)	600 for C permits, 500 for D permits	1250	600	74	
	3) NMA (status quo uncertainty buffer)	600 for C permits, 500 for D permits	>1250	>1250	45	
	4) NMA (3% uncertainty buffer)	600 for C permits, 500 for D permits	1250	600	87	
	5) NMA (3% uncertainty buffer)	600 for C permits, 500 for D permits	>1250	>1250	45	
	6) NMA (status quo uncertainty buffer)	900 for C permits, 750 for D permits	>1250	>1250		
	7) NMA (3% uncertainty buffer)	900 for C permits, 750 for D permits	1250	600		
	8) NMA (status quo uncertainty buffer)	1,500 for C permits, 1,250 for D permits	>1250	>1250		
	9) NMA (3% uncertainty buffer)	1,500 for C permits, 1,250 for D permits	1250	600		
SFMA	1) SMA (status quo)	300	610	500	32	9,193,662
	2) SMA (status quo uncertainty buffer)	300	610	500	56	17,989,589
	3) SMA (status quo uncertainty buffer)	300	1160	1000	32	18,238,128
	4) SMA (3% uncertainty buffer)	300	610	500	58	18,722,583
	5) SMA (3% uncertainty buffer)	300	1200	1030	32	18,931,908

6) SMA (status quo uncertainty buffer)	300	700	575	37	12,345,092
7) SMA (3% uncertainty buffer)	300	700	575	37	12,345,092

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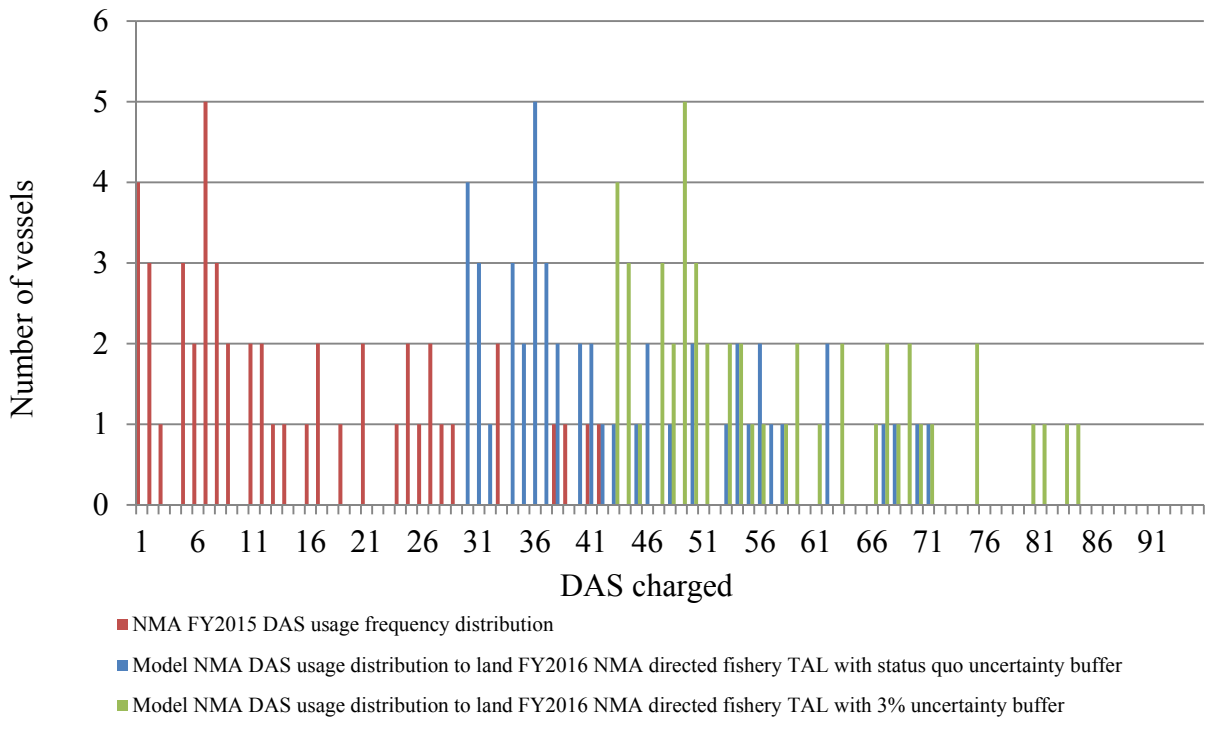


Figure 1. Monkfish Northern Management Area, FY2015 observed and modeled DAS usage by vessel frequency distribution

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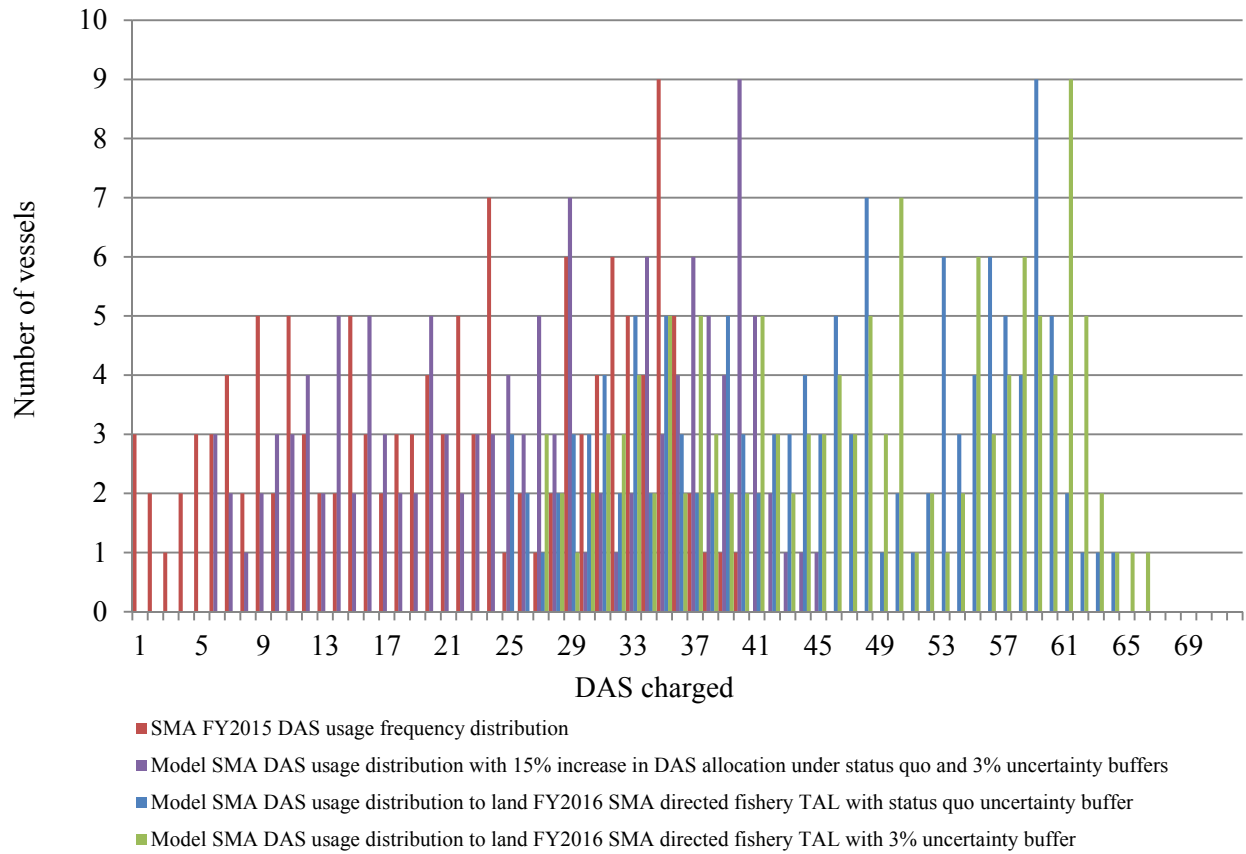


Figure 2. Monkfish Southern Management Area, FY2015 observed and modeled DAS usage frequency distribution with a 15% increase in DAS allocated and under status quo and 3% management uncertainty buffers.

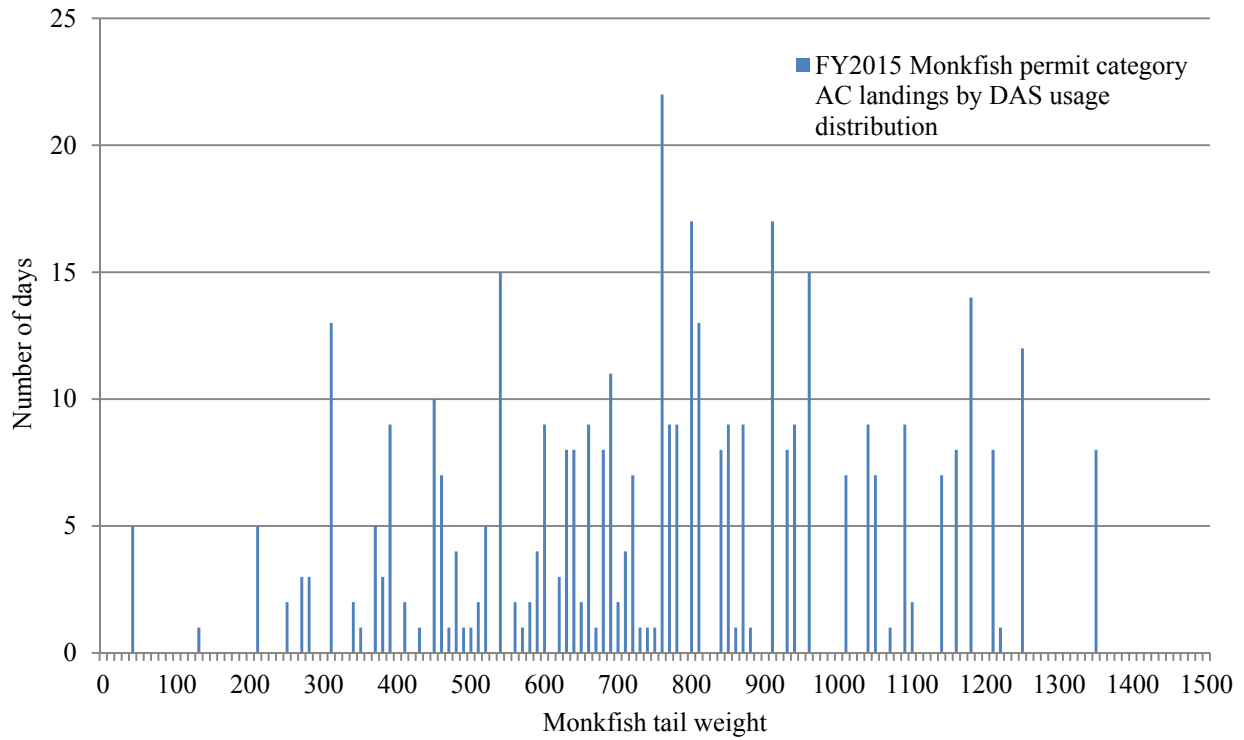


Figure 3. FY2015 Northern Management Area, Monkfish permit category AC observed daily landings by day frequency distribution

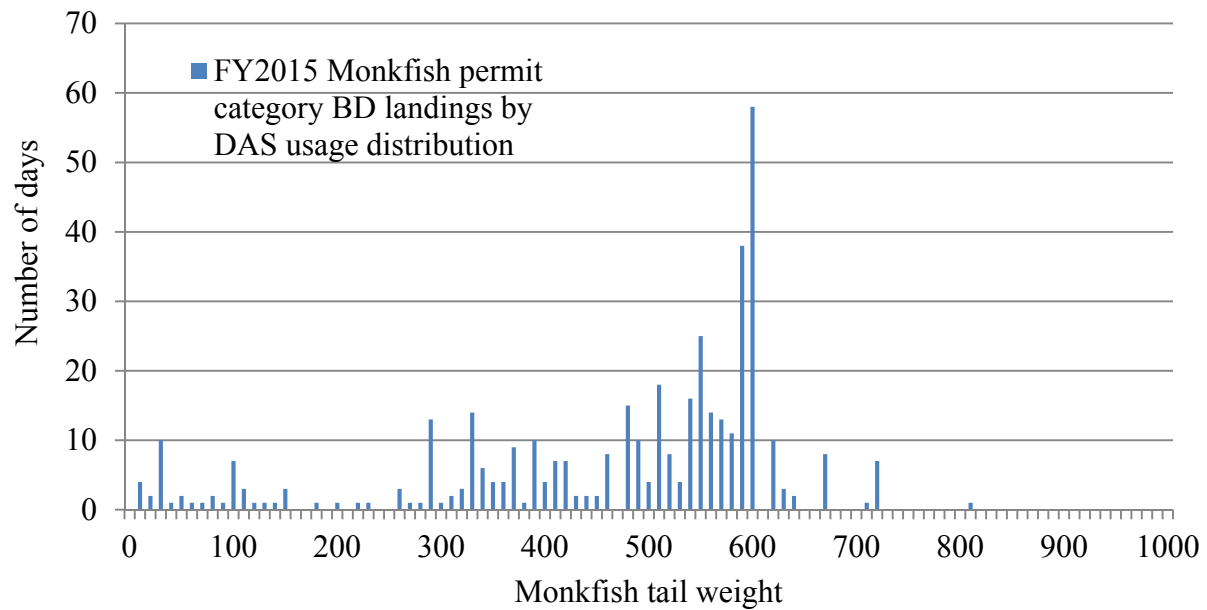


Figure 4. FY2015 Northern Management Area, Monkfish permit category BD observed daily landings by day frequency distribution

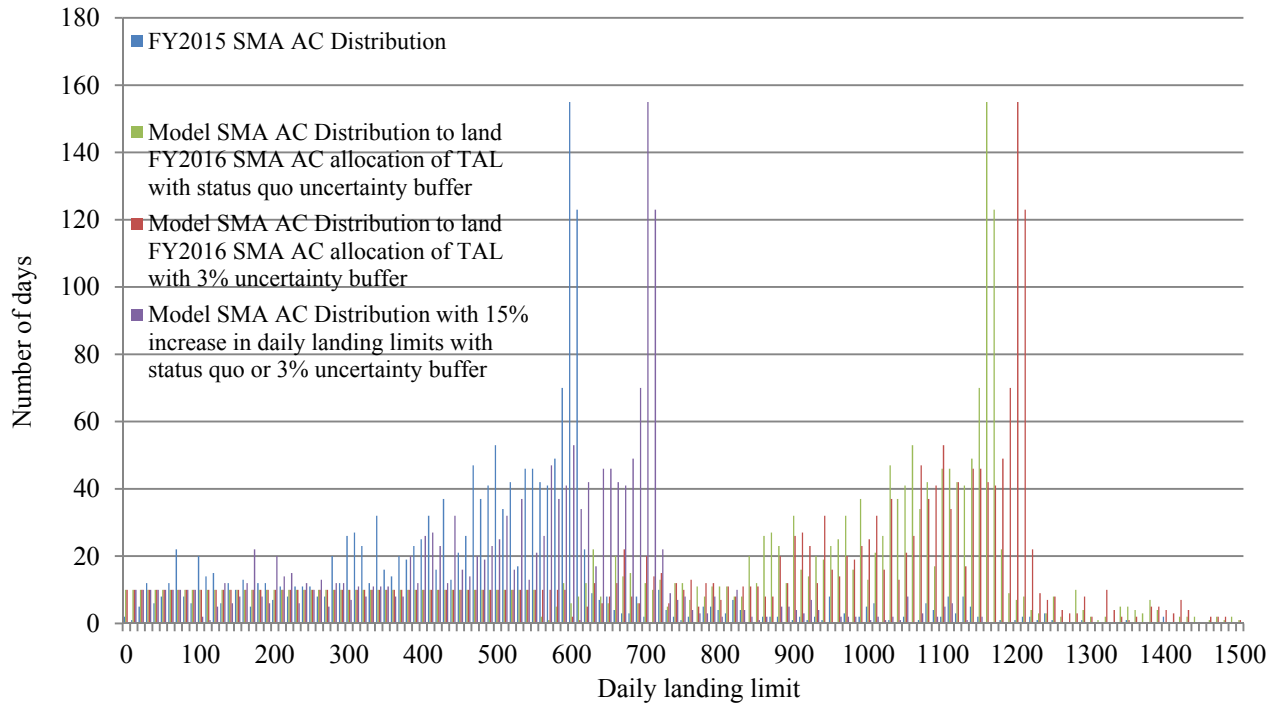


Figure 5. Southern Management Area, Monkfish permit category AC FY2015 observed and modeled daily landings by day frequency distribution

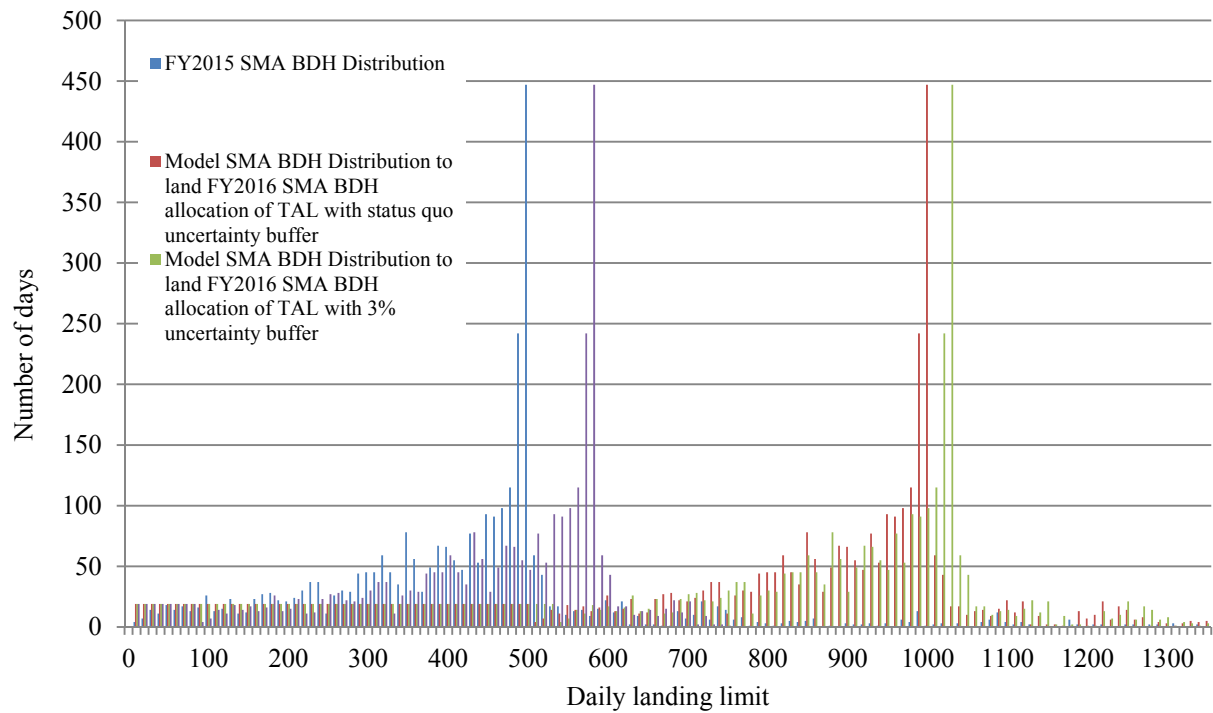


Figure 6. Southern Management Area, Monkfish permit category BDH FY2015 observed and modeled daily landings by day frequency distribution

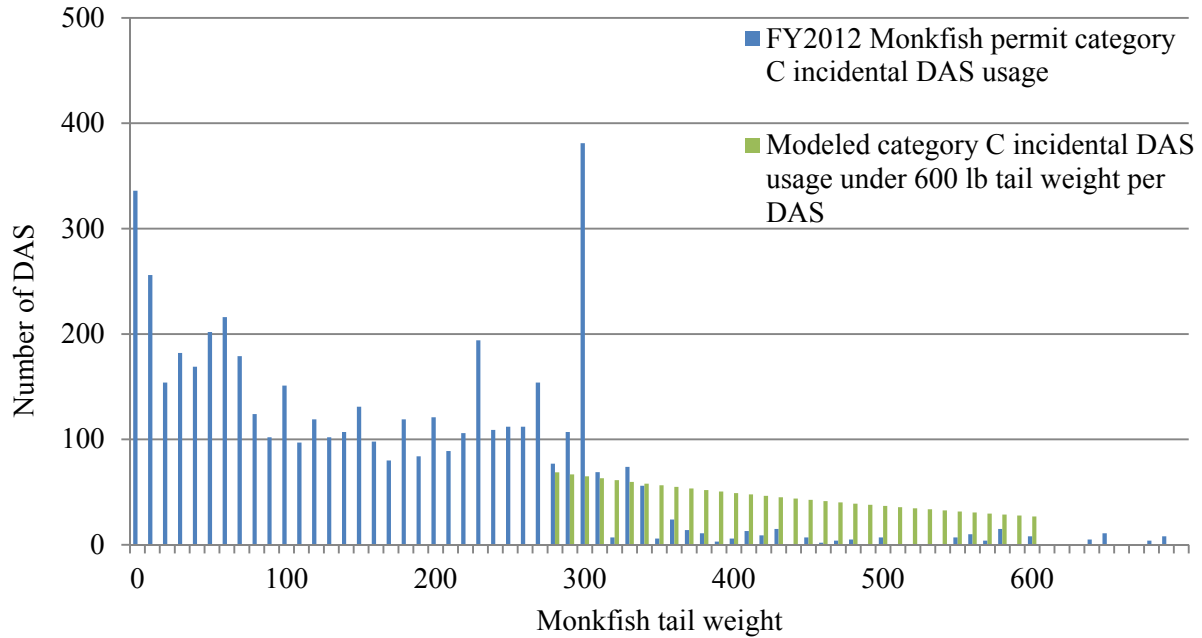


Figure 7. Monkfish Northern Management Area, FY2012 actual and modeled incidental monkfish permit category C DAS usage frequency distribution under increased incidental landing limits.

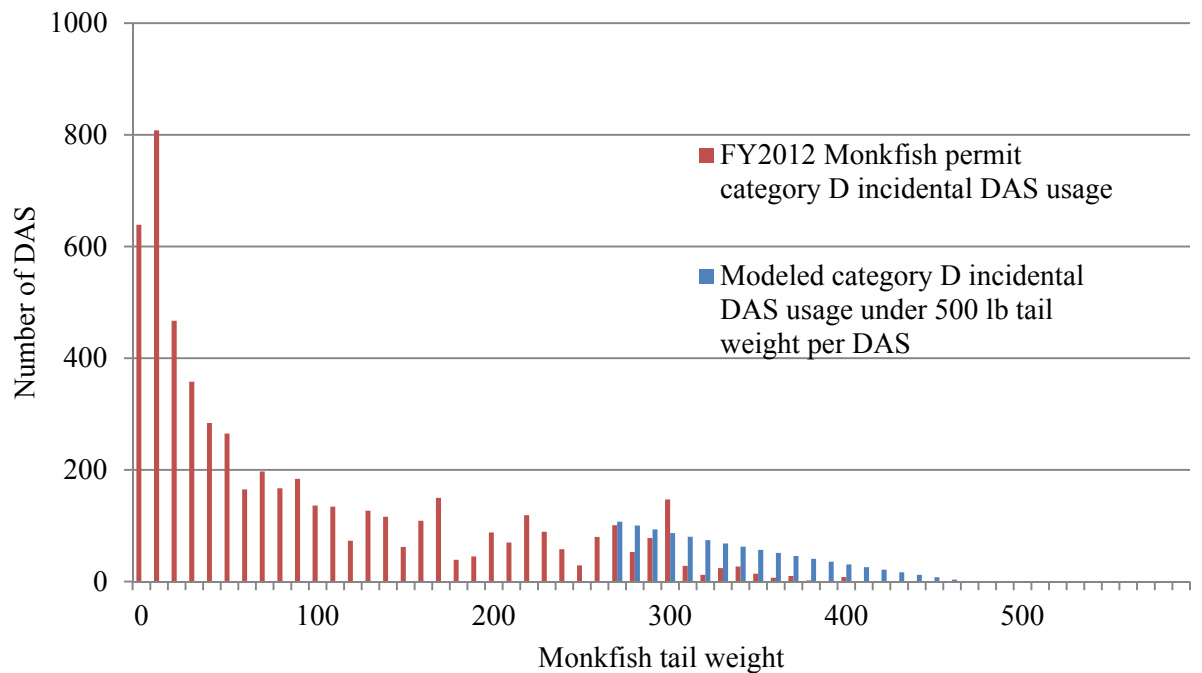


Figure 8. Monkfish Northern Management Area, FY2012 actual and modeled incidental monkfish permit category D DAS usage frequency distribution under increased incidental landing limits.

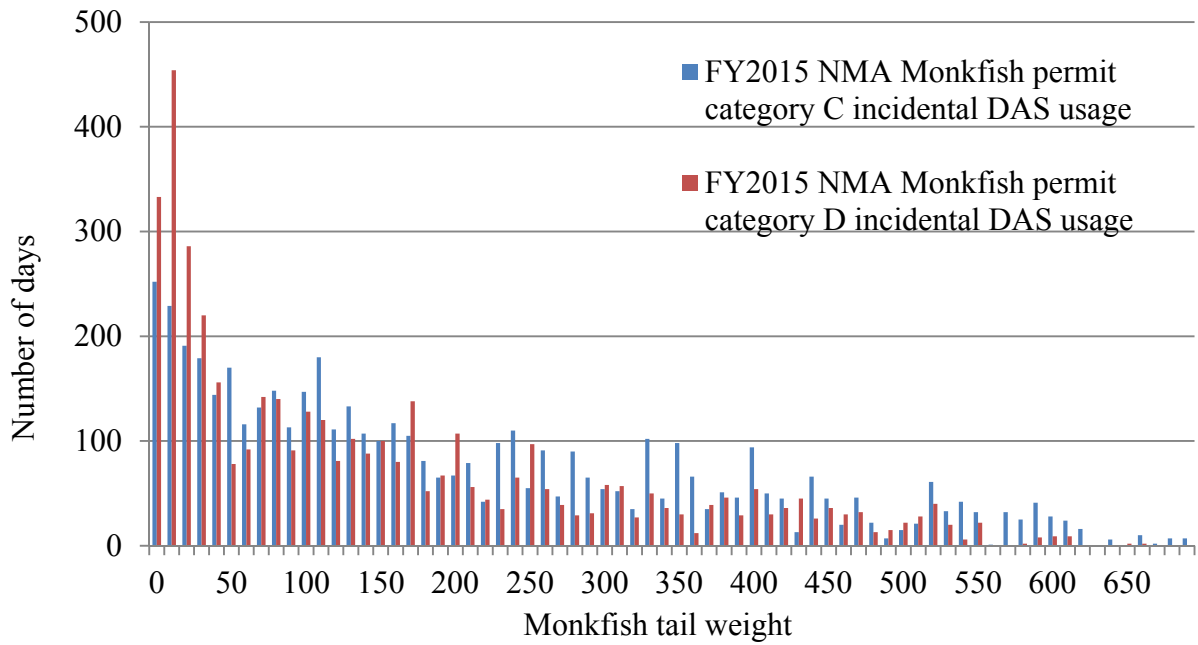


Figure 9. FY 20105 Monkfish Northern Management Areamonkfish permit category C and D DAS usage frequency by monkfish tail weight landed distribution

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