

A Study of Monkfish Trip Limits
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Background

The Monkfish Monitoring Committee (MMC) of New England Fishery Management Council made a two-part request for trip limit analysis. The first part was to request an analysis of potential trip limits of monkfish landings by permit categories under proposed FY 2003 monkfish quotas for the Southern Fishery Management Area (SFMA) using the same data and methodology in a similar study for FY 2002. Two permit category groups were used in the analysis A&C and B&D permit based on existing permit categories. The four proposed quotas are: 11,022,989 lbs. (5,000 mt); 17,636,795 lbs. (8,000 mt); 24,250,601 lbs. (11,000 mt); and 27,557,594 lbs (12,500 mt). Since the highest proposed quota (27,557,594 lbs) would produce a trip limit higher than the highest trip limit analyzed in the previous study. Thus there is no comparable option and we did not consider trip limits for the highest proposed quota in this analysis. Analyses presented in Scenarios 1-3 below address the first part of the MMC's request (Part A).

The second part of the Committee's request was to determine expected landings from SFMA if the days-at-sea (DAS) allocation is reduced from 40 DAS to lower levels. This request is addressed in Part B of this report.

Part A – Trip Limit Analysis for Three Proposed Quotas - 2003.

Scenario 1: Estimate trip limits by each permit category group (A&C and B&D) for vessels fishing in the Southern Fishery Management Area (SFMA) which would achieve the proposed monkfish quota of 11,022,989 lbs. (5,000 mt);

Scenario 2: Estimate trip limits for each permit category group (A&C and B&D) for vessels fishing in the Southern Fishery Management Area (SFMA) which would achieve the proposed monkfish quota of 17,636,795 lbs. (8,000 mt);

Scenario 3: Estimate trip limits for each permit category group (A&C and B&D) for vessels fishing in the Southern Fishery Management Area (SFMA) which would achieve the proposed monkfish quota of 24,250,601 lbs. (11,000 mt);

Data Source and Analytical Procedure²

All analyses were based on fishing year 2000 landings (FY 2000: May 1, 2000 – April 30, 2001) supplemented by information from FY 1999 (May 1, 1999 – April 30, 2000) as detailed in the text below. Use of historical data implicitly assumes

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² The data are identical to those used in the last study in FY2001 and the procedures are comparable and almost identical to those in the last study.

that fishing patterns and monkfish availability will be similar in the future fishing years as in FY2000 in the trip limit setting.

In addition, it is assumed that monkfish landings by vessels with category E permits and unknown vessels remain the same amount as in FY2000 for all scenarios. This assumption bears directly on calculating the landing goals for A&C and B&D permit categories as described latter.

The FY2000 SFMA monkfish landings were estimated to be 17,371 thousand lbs. Monkfish landings from the SFMA for FY2000 was estimated using vessel trip reports (VTR) to prorate the total landings provided in the seafood dealers weighout reports. The equation below provides a summarized view of the calculation.

$$\text{Landing (SFMA)} = \text{total landing all areas (WO)} \bullet \frac{\text{Reported landings SFMA (VTR)}}{\text{Total reported landings (VTR)}}$$

WO = landings reported by seafood dealers;
VTR = Vessel Trip Reports (hail weight).

The SFMA landings were further partitioned into landings by permit category and gear sector using information provided in the VTRs (Table 1)³.

The landings by A&C and B&D permit category groups were used to calculate the landings goals for permit category group fore each scenario. For each scenario with a proposed quota, the FY 2000 landings of E permits and unknown vessels are first deducted from the proposed quota and the balance is then allocated to A&C and B&D permit category groups based on the landing percentage in each permit category in FY 2000. The landing goals are presented in Table 2.

Information provided in the VTRs was used as the basis for identifying an identical landings/DAS limit for non-trawl and trawl gears for each of permit category groups (A&C and B&D).

³ Hail weight recorded on the VTRs is approximately 54% of the landings weight reported by seafood dealers in the SFMA.

Table 1: Summary Statistics for the Southern Fishery Management Area for Monkfish in FY2000

PERMIT CATEGORY	# VESSELS	# TRIPS				LANDINGS (1,000 Lbs. live weight)				
		Trawl	Non-Trawl	Dredge	Total	Trawl	Non-Trawl	Dredge	Total	Total (excluding landings by dredge gear)
A	8	40	281	0	321	113	332	0	445	445
B	22	0	1,017	0	1,017	0	1,050	0	1,050	1,050
C	257	1,568	1,288	821	3,677	1,956	1,508	961	4,424	3,463
D	156	2,509	1,440	62	4,011	1,108	1,837	52	2,997	2,946
E	259	3,133	281	264	3,678	177	67	92	336	244
unknown	57	197	164	36	397	34	88	35	158	122
Total	759	7,447	4,471	1,183	13,101	3,389	4,881	1,140	9,410	8,270

source: NMFS Permit and Vessel Trip Report Databases

Table 2. Landing goal (quota) by permit category.

Permit Category	Scenario 1	Scenario 2	Scenario 3
	5,000 MT = 11,022,928 LB	8,000 MT = 17,636,684 LB	11,000 MT = 24,250,441 LB
AC	2,308,207	5,677,700	9,047,193
BD	2,222,421	5,466,685	8,710,948
E + Dredge	6,492,299	6,492,299	6,492,299
TOTAL	11,022,928	17,636,684	24,250,441

In FY 2000, separate landings/DAS limits were established for the non-trawl (300 lbs/DAS) and trawl (1,500 lbs/DAS) gear sectors. Thus to evaluate landings/DAS limit greater than 300 lbs/DAS for the non-trawl sector, FY 1999 VTRs were used to estimate potential landings under an unconstrained condition (i.e., no limits on landings per DAS). A ratio estimator was used to account for changes in fishing and economic conditions, product availability, etc. between FY 1999 and FY 2000. The ratio was used to adjust FY 1999 landings under an unconstrained landings limit taking into account differences in fishery conditions between FY 1999 and FY 2000. Landings for the trawl gear sector were based on the FY 2000.

Procedures for simulating an unconstrained condition for the non-trawl gear sector for FY 2000 are outlined below.

1. Determine the total landings of monkfish by the non-trawl gear sector, exclusive of landings by dredge gear in FY 2000 by permit category. This is the non-trawl landings under the 300 lbs/DAS landing limit.
2. Simulate a 300 lbs/DAS landings limit for FY 1999 for the non-trawl gear sector by reducing the landings for trips which reported landings greater than the 300 lbs/DAS landings limit to 300 lbs. Trips which did not exceed the 300 lbs/DAS landings limit were not adjusted. Total landings for the non-trawl sector for FY 1999 under a 300 lbs/DAS landings limit constraint is the sum of the reduced trips and the unadjusted trips.
3. Calculate the ratio [R] of landings in FY2000 to FY1999 under the 300 lbs/DAS constraint to account for changes in economic, fishing and other extrinsic conditions between the two years.

$$R = \frac{\text{total landings for non - trawl gear in FY2000}}{\text{total landings for non - trawl gear in FY1999 under a 300 lbs / DAS landings limit}}$$

$$= \frac{\text{Total from Step 1}}{\text{Total from Step 2}}$$

4. Simulate an FY 2000 fishery for the non-trawl gear sector under an unconstrained landings-per-DAS limit by multiplying landings for each fishing trip from FY 1999 by R.

The procedures outlined above are followed for each permit category group separately.

A process was used to estimate landings-per-DAS limits for each permit category group (A&C and B&D) which would achieve the landing goals under the proposed quota. The process starts by recalculating landings as expected landings for a predetermined landing-

per-DAS limit. A range of predetermined limits were used to provide a setting for estimating a trip limit for each proposed quota. The limits used were: 100 lbs/DAS, 200 lbs/DAS, 300 lbs/DAS, 400 lbs/DAS, 500 lbs/DAS 1,000 lbs/DAS and 1,500 lbs/DAS.

The expected landings as recalculated for each predetermined limit were produced according to the procedures outlined below. These procedures were applied separately to the A&C and B&D permit category groups. The universe of fishing trips used in these analyses was limited to trips by trawl vessels which landed monkfish in FY 2000 and trips by non-trawl vessels which landed monkfish in FY 1999. (The landings used in the simulation for the non-trawl sector were adjusted as described above.)

1. Trips that landed monkfish from the SFMA greater than the reduced landings/DAS limit were adjusted to the reduced landings/DAS limit.
2. Trips that landed monkfish from the SNFMA less than the reduced landings/DAS limit were not adjusted.
3. Recalculated landings are the sum of the reset landings of all trips which exceed the plus the original landings of all trips which did not exceed the reduced landings/DAS limit.

The procedures above produce simulated vessel landings data for the predetermined landings limits scenarios and their related expected landings for each permit category group (Table 3).

Table 3. Expected landing under pre-determ

Pre-determined Limit	Permit Category	
	AC	BD
(tail wt.)	Expected landing (Lbs. live wt.)	
100	829,336	1,038,906
200	2,853,513	3,106,188
300	4,037,580	4,315,470
400	4,877,690	5,173,470
500	5,529,329	5,838,986
600	6,061,758	6,382,752
700	6,511,919	6,842,500
800	6,901,867	7,240,751
900	7,245,825	7,592,034
1000	7,553,506	7,906,268
1500	8,737,574	9,115,550

These data for each of the predetermined limits and the expected landings were used to generate a general functional relationship for each proposed quota and landing limits for each of the permit category groups:

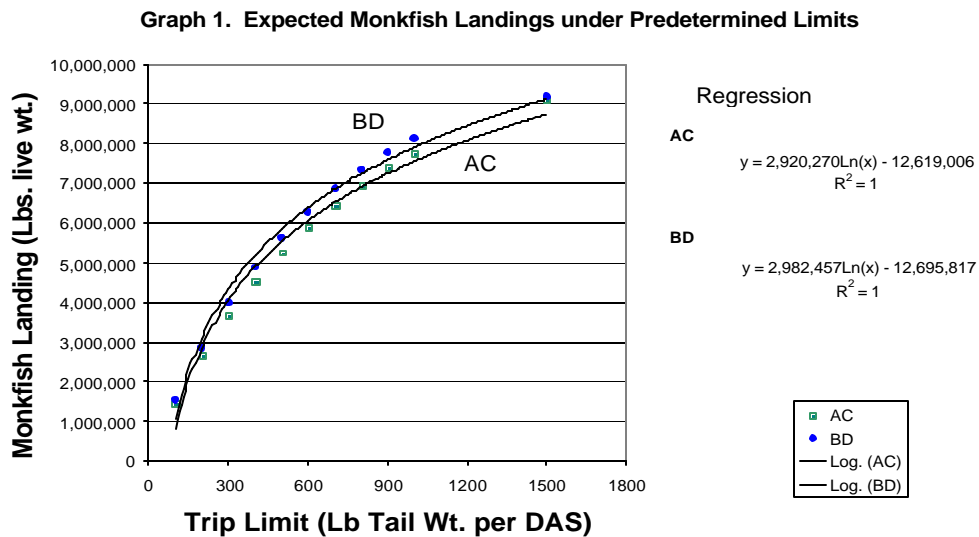
$$Y = A * \ln(X) + B;$$

Where: Y = expected landing,
 X = predetermined landing limit/DAS (100 lbs, 200 lbs., 300 lbs.,
 400 lbs., 500 lbs., 1,000 lbs., and 1,500lbs.)
 A & B are parameters to be estimated.

An empirical function was estimated for each permit category group and is presented below and also in Graph 1.

Permit category group A&C: $Y = 2,920,270 \ln(X) - 12,619,005$; $R^2 = 0.98$

Permit category group B&D: $Y = 2,982,457 \ln(X) - 12,695,816$; $R^2 = 0.99$



Scenario Analysis

With the empirical functions, landing limit per DAS can be generated by using the landing goal as expected landing (Y) and solving for X as landing per DAS for each permit category group and each scenario.

Findings

The findings of this analysis are presented in Table 4 and summarized with the scenario description below.

Scenario 1: Estimate trip limits for the A&C and B&D permit category groups for vessels fishing in the SFMA which would achieve the proposed monkfish quota of 11,022,989 lbs. (5,000 mt);

Results of the analysis indicate that a landing/DAS limits of 166 lbs for A&C permits and 149 lbs for B&D permits (tail weight) be established in order to achieve the proposed Quota of 11,022,989 lbs (5,000 mt) with a single landings/DAS limit for each permit grouping (Table 4).

Scenario 2: Estimate trip limits for the A&C and B&D permit category groups for vessels fishing in the SFMA which would achieve the proposed monkfish quota of 17,636,795 lbs. (8,000 mt).

Results of the analysis indicate that landing/DAS limits of 526 for the A&B permit group and 441 lbs for the B&D permit group (tail weight) be established in order to achieve the proposed quota of 17,636,795 lbs (8,000 mt) with a single landings/DAS limit for each permit group (Table 4).

Scenario 3: Estimate trip limits for A&C and B&D permit category groups for vessels fishing in the Southern Fishery Management Area (SFMA) which would achieve the proposed monkfish quota of 24,250,601 lbs (11,000 mt);

Results of the analysis indicate that landing/DAS limit of 1,618 lbs for the A&C permit group and 1,310 lbs for the B&D permit group (tail weight) be established in order to achieve the proposed quota of 24,250,601 lbs (11,000 mt) with a single landings/DAS limit for each permit category (Table 4).

Caveats:

This study is primarily based on the FY 2000 VTR data with some consideration of the fishing landing pattern in FY 1999. It may not fully account for potential changes in fishing behavior, resulting in changes in landing/DAS limits. For example, in response to changes in landing/DAS limit, the fishing pattern of the FY 2003 fishery in number of trips, trip length and trip landings may change in a manner different from the changes

assumed in this study, particularly as the identified trip limits represent a drastic change from the actual limits in FY 2000.

Table 4. Landing limits per DAS under four quota scenar

Scenario 1. A 5,000 Metric Ton Quota

Permit Category	Quota (Lbs. live wt.)	Landing per DAS (Lbs. Tail wt.)
AC	2,308,207	166
BD	2,222,421	149
E+ Dredge	6,492,299	
Total	11,022,928	

Scenario 2. An 8,000 Metric Ton Quota

Permit Category	Quota (Lbs. live wt.)	Landing per DAS (Lbs. Tail wt.)
AC	5,677,700	526
BD	5,466,685	441
E+ Dredge	6,492,299	
Total	17,636,684	

Scenario 3. An 11,000 Metric Ton Quota

Permit Category	Quota (Lbs. live wt.)	Landing per DAS (Lbs. Tail wt.)
AC	9,047,193	1,668
BD	8,710,948	1,310
E+ Dredge	6,492,299	
Total	24,250,441	

Part B - A Study of Monkfish Days-at-Sea Limits

The Monkfish Oversight Committee requested an analysis of the effect of reducing monkfish days-at-sea (DAS) from 40 DAS. The analyses presented here, may be used in conjunction with an analysis of trip limits presented in Part A of this report to establish regulations for the monkfish fishery.

Methods

Permit number, permit category, DAS usage, and total monkfish landings in fishing year (FY) 2000 are found in the NMFS Enforcement DAS database and the dealer weighout database. The procedure involved (1) setting a maximum 40 DAS usage for all permit holders, (2) proportionately adjusting the landing to a given DAS value, and (3) adjusting the landings to the same basis as that used for an earlier trip limit study. These procedures are further discussed below.

(1) Permit holders are allowed to carryover up to 10 DAS from one fishing year to the next. Adjustments to DAS usage are made by first reducing the landings from all permit holders who used more than 40 DAS by the proportion of DAS over 40, and resetting the upper limit of DAS usage at 40 DAS.

(2) Expected landings at reduced DAS are calculated by adding the landings of all permit holders who used less than a proposed DAS limit to the landings of those who use more than a proposed DAS limit where their landings are reduced by the proportion that the proposed DAS is to the actual DAS used. For example, all vessels which used 40 DAS would have their catch reduced by 25% to predict landings at 30 DAS.

(3) Landings are prorated according to the model in Part A of this report.

Results

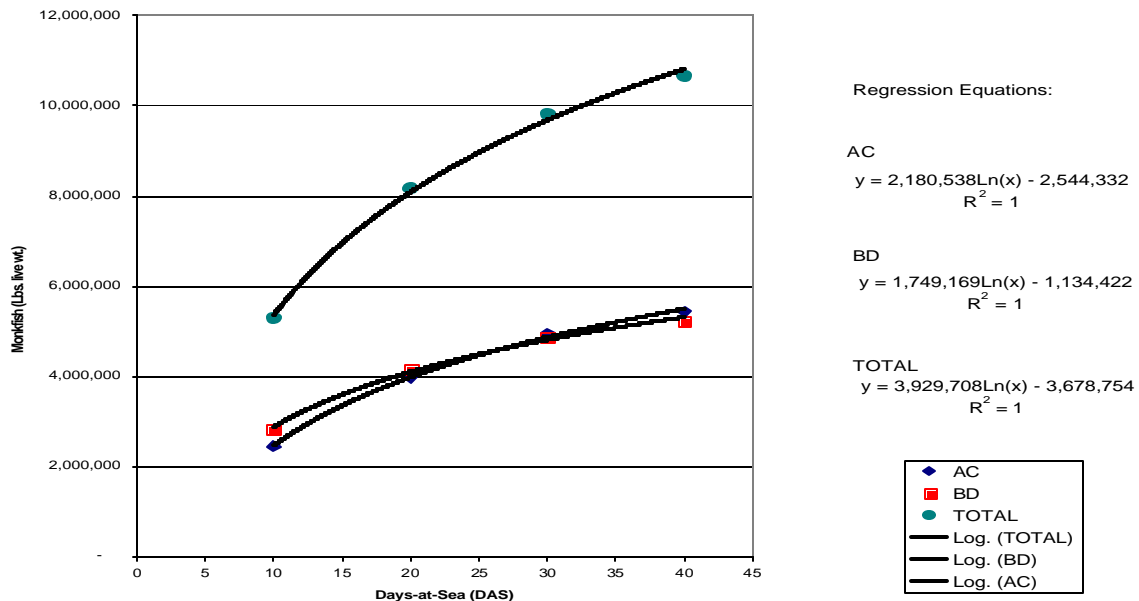
A total of 240 vessels used monkfish DAS during FY 2000. Of those, 98 vessels had either category A or C permits, and 142 had category B or D permits. Estimated monkfish landings by vessels in the A & C permit categories were 5,532,154 lbs and for the B & D permit categories 5,326,548 lbs for fishing year 2000. Landings constrained by a maximum of 40 DAS for all vessels (i.e., after adjusting for DAS carryover used by 13 A&C category vessels and 16 B/D category vessels) are presented in Table 5.

Table 5: Calculated monkfish landings under various DAS limits

DAS	Permit Category		Total
	AC (Lbs. Live Monkfish)	BD	
10	2,457,394	2,846,824	5,304,217
20	3,994,610	4,174,382	8,168,991
30	4,948,401	4,872,602	9,821,003
40	5,435,634	5,237,904	10,673,538

In interpolate landings at intermediate DAS values, the results presented in Table 5 are plotted and logarithmic regression was used to estimate landings values between the DAS levels presented (Graph 2).

Graph 2. Expected Monkfish Landings at Various DAS Allocations



Conclusions

Estimated landings for A/C and B/D permit categories show a similar responses to changes in DAS limits. This is consistent with analyses presented in Part A of this report (Figure 1). Reductions in DAS limits do not result in a directly proportional reduction in landings. For example, a 50% reduction in DAS to 20 DAS results in a 23% reduction in

landings. Each permit category group, however, shares equally in the reduction of landings.

Caveats

The results are based on calculations from a model of monkfish landings. They do not include changes in fishing behavior or fishing patterns due to DAS reductions.