



New England Fishery Management Council

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John F. Quinn, J.D., Ph.D., *Chairman* | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: October 21, 2019
TO: Skate Advisors and Committee
FROM: Fiona Hogan
SUBJECT: **Declared skate trips, percentage of revenues – kernel density plots**

At its May 22, 2019 meeting, the Skate Committee asked the staff to provide two analyses:

- Skate trip/pounds landed frequencies, by authorization code (declaration)
- Distribution of skate trips, by the percentage of skate to total revenues on those trips, also by authorization code

The following is an attempt to answer the first question.

WING FISHERY:

Plan Code Summary Data:

Table 1. Reference table with plan codes and corresponding descriptions.

Plan Code	Description
<i>NMS</i>	Northeast Multispecies
<i>MNK</i>	Monkfish
<i>SES</i>	Scallop
<i>HER</i>	Herring
<i>SCO</i>	Surfclam & Ocean Quahog
<i>SMB</i>	Squid, Mackerel, Butterfish
<i>DOF</i>	Declare out of fishery

Table 2. Total landed weight (lbs.), total live weight (lbs.), and total number of trips by skate wing fishery plan code in FY 2017. Percent landed is the sum landed by plan code divided by the landed total across all plan codes. Likewise with percent total live weight.

Plan Code	Total Landed Weight (lbs.)	Total Live Weight (lbs.)	# of Trips	% Total Landed Weight	% Total Live Weight
<i>HER</i>	1,217	2,763	5	0	0
<i>SES</i>	32,372	44,545	119	0	0
<i>SMB</i>	183,224	411,263	970	2	2
<i>DOF</i>	421,837	879,005	1,735	5	5
<i>Undeclared</i>	1,008,111	1,567,081	2,261	11	8
<i>MNK</i>	3,158,584	6,750,171	2,457	35	36
<i>NMS</i>	4,102,726	9,236,635	3,436	46	49
Total Landed Weight across Plan Codes	8,908,071	8,908,071			
Total Live Weight across Plan Codes	18,891,463	18,891,463			

The three plan codes with greatest percent landed in the fishery: NMS, 46% (Northeast multispecies), MNK, 35% (monkfish), and Undeclared or missing, 11%, plan codes.

Table 3a. Total landings between 0-500 lbs. (incidental limit), total landings between 501-2,600 lbs. (season 1 possession limit), total landings between 2,601-4,100 lbs. (season 2 possession limit), and total landings greater than 4,100 lbs. by plan codes that were in place during FY2017. Percentages of total landings in each of these landings groups by plan codes are also included.

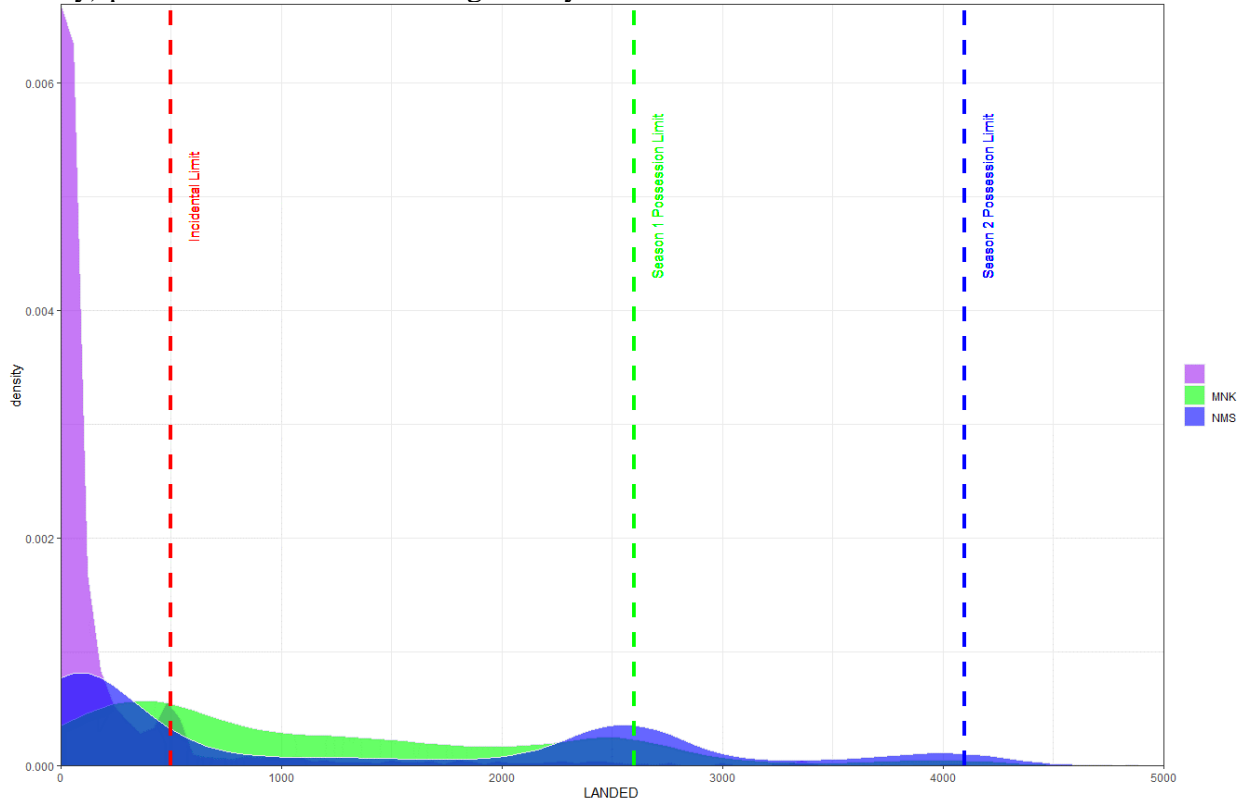
Plan_Code	<500 lb. LANDINGS	501-2,600 lb. LANDINGS	2,601-4,100lb. LANDINGS	4,101+ lb. LANDINGS	TOTAL LANDINGS	% Total Landings <500 lbs.	% Total Landings between 501-2,600 lbs.	% Total Landings between 2,601-4,100 lbs.	% Landings > 4,100 lbs.
<i>Undeclared</i>	158,027	220,372	96,248	533,464	1,008,111	16	22	10	53
<i>SMB</i>	176,374	6,850	0	0	183,224	96	4	0	0
<i>SES</i>	8,182	13,960	0	10,230	32,372	25	43	0	32
<i>NMS</i>	204,878	2,423,250	1,474,598	0	4,102,726	5	59	36	0
<i>MNK</i>	253,850	2,066,925	575,909	261,900	3,158,584	8	65	18	8
<i>HER</i>	1,217	0	0	0	1,217	100	0	0	0
<i>DOF</i>	344,830	59,212	10,920	6,875	421,837	82	14	3	2

Table 3b. Total number of trips landing <500 lbs. (incidental limit), number of trips with landings between 501-2,600 lbs. (season 1 possession limit), number of trips with landings between 2,601-4,100 lbs. (season 2 possession limit), and landings >4,100 lbs. by plan codes in FY 2017.

Plan Code	# of Trips Landing <500 lbs.	# of Trips Landing 501-2,600 lbs.	# of Trips Landing 2,601-4,100 lbs.	# of Trips Landing >4,100 lbs.
<i>Undeclared</i>	2,020	175	29	37
<i>SMB</i>	958	12	0	0
<i>SES</i>	104	13	0	2
<i>NMS</i>	1,892	1,146	398	0
<i>MNK</i>	931	1,323	167	36
<i>HER</i>	5	0	0	0
<i>DOF</i>	1,671	60	3	1
Total # of Trips	7,581	2,729	597	76

A kernel density plot was created to determine which plan codes and program codes (Figures 1 and 2) had the greatest concentration of trips within the incidental limit of 500 lbs., within season 1 possession limit (2600 lbs.), within season 2 possession limit (4100 lbs.), and greater than the season 2 possession limit (>4100 lbs.). The kernel density plot shows the distribution of landings data for FY 2017, with the area under each curve representing one program code. The x-axis shows the range of landings values in the dataset* while the y-axis shows the probability density or the probability per unit on the x-axis. In other words, this kernel density plot is a variation of a histogram that smooths out the noise of the data, with the peaks in the graph showing the greatest number of skate trips with that ‘LANDED’ value. The height of the peak below the incidental limit is large but the area under this peak is small (i.e. the area under the curve represents the probability of getting the respective x-value). This type of plot compares relative concentration of trips across plan and program codes.

Figure 1. Distribution of NMS, MNK, and Undeclared (the top 3 with greatest percent landed in the fishery) plan codes for the skate wing fishery in FY 2017.



***NOTE:** the data in the plot are truncated at 5,000 lbs to better visualize where the majority of the data are distributed (the full data range is from 0 - > 30,000 lbs from No Plan Code)

Key Findings:

- Most trips landing less than the 500 lb. incidental limit had a missing/undeclared plan code.
- For the NMS plan code, the greatest number of trips landed less than the 500 lb. incidental limit followed by another peak of trips at Season 1 possession limit (2,600 lbs.) followed by a smaller peak of trips landing at the Season 2 possession limit (4,100 lbs.)
- For the MNK plan code, the greatest number of trips had landings near the Season 1 possession limit (2,600 lbs.) and a smaller peak of trips around Season 2 possession limit (4,100 lbs.)
- There were trips that exceeded the Season 2 possession limit (4,100 lbs.). About 40 of these trips had no plan code and about 40 had an MNK plan code. There were trips in both groups with landings exceeding 30,000 lbs. There were no trips with NMS plan codes that exceeded the Season 2 limit, but about 100 trips were at 4,100 lbs. exactly.

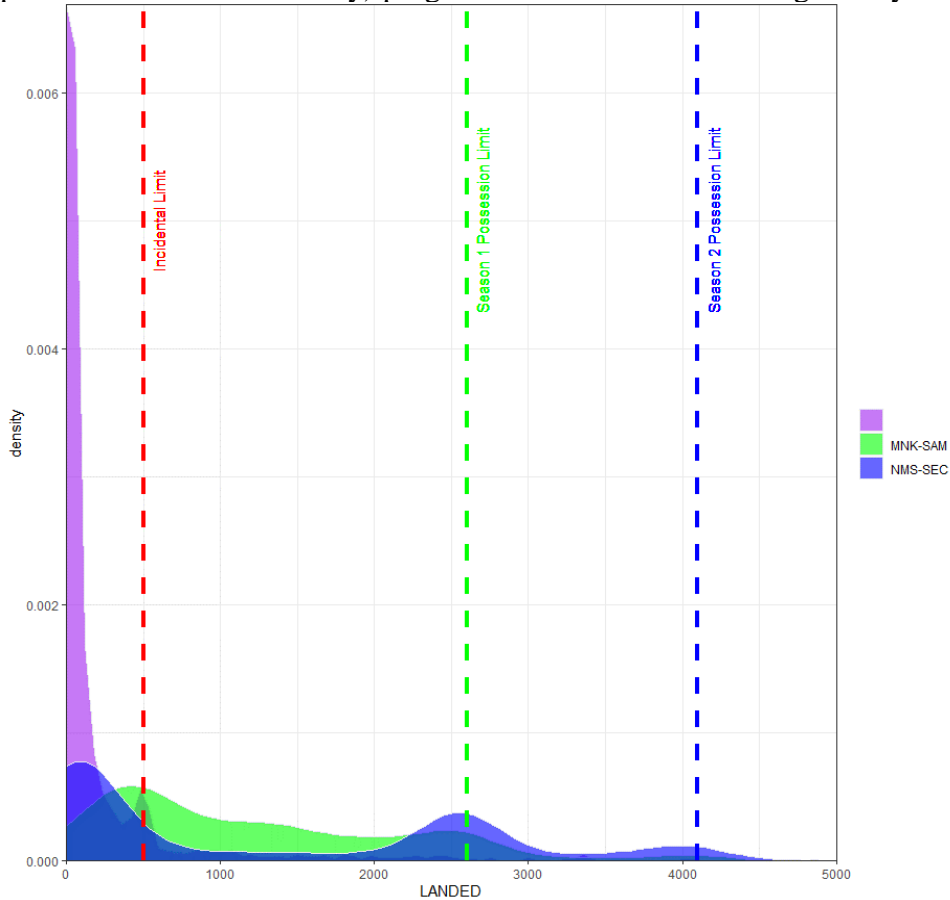
Program Code Summary Data:

Table 4. Total landed weight (lbs.), total live weight (lbs.), and total number of trips by skate wing fishery program code in FY 2017. Percent total landed weight is the total landed weight by individual program code divided by the total landed weight across all plan codes. Likewise with percent total live weight.

Program_Code	Total Landed Weight (lbs)	Total Live Weight (lbs)	# of Trips	% Total Landed Weight	% Total Live Weight
<i>DOF-DOF</i>	105	238	1	0	0
<i>DOF-REC</i>	2,600	5,902	1	0	0
<i>DOF-SCI</i>	1,554	3,532	29	0	0
<i>DOF-TSP</i>	282	640	2	0	0
<i>DOF-TST</i>	251	570	4	0	0
<i>HER-HMS</i>	1,217	2,763	5	0	0
<i>MNK-NAM</i>	3,397	7,711	19	0	0
<i>MNK-SAC</i>	22,641	50,097	23	0	0
<i>SES-SAA</i>	6,270	6,270	2	0	0
<i>SES-SCA</i>	7,674	8,505	7	0	0
<i>SES-SCG</i>	18,428	29,770	110	0	0
<i>SMB-LHM</i>	6,023	13,674	21	0	0
<i>SMB-MAC</i>	640	1,453	1	0	0
<i>SMB-MAS</i>	34	77	1	0	0
<i>SMB-SHM</i>	396	898	3	0	0
<i>SMB-SLH</i>	500	1,135	2	0	0
<i>SMB-SQM</i>	10,198	23,147	66	0	0
<i>MNK-NAS</i>	104,501	237,189	180	1	1
<i>NMS-COM</i>	61,130	136,609	199	1	1
<i>SMB-SLM</i>	74,151	166,661	358	1	1
<i>SMB-SQL</i>	91,282	204,218	518	1	1
<i>DOF-CML</i>	417,045	868,123	1,698	5	5
<i>MNK-SAS</i>	621,852	1,253,486	388	7	7
<i>Undeclared</i>	1,008,111	1,567,081	2,261	11	8
<i>MNK-SAM</i>	2,406,193	5,201,688	1,847	27	28
<i>NMS-SEC</i>	4,041,596	9,100,026	3,237	45	48
Total Landed Weight across Plan Codes	8,908,071	8,908,071			
Total Live Weight across Plan Codes	18,891,463	18,891,463			

The three program codes with greatest percent landed in the fishery include NMS-SEC (multispecies sector vessel trip), 45%, MNK-SAM (monkfish Southern Management Area monkfish-only vessel trip), 27%, and Undeclared or missing, 11%, plan codes.

Figure 2. Distribution of NMS sector trip, MNK SFMA, and undeclared (the top 3 with the greatest percent landed in the fishery) program codes for the skate wing fishery for FY 2017.



NOTE: the data in the plot are truncated at 5,000 lbs to better visualize where the majority of the data are distributed (the full data range is from 0 - > **30,000 lbs** from No Plan Code)

Key Findings:

- Similar trend as Figure 1; the program code MNK_SAM and NMS_SEC are driving the plan trends observed in MNK and NMS, respectively (which is they the two figures appear quite similar).
- The missing or undeclared program code is the same data shown as the missing plan code in the previous figure (i.e. missing program code data = missing plan code data so these shaded regions are identical)

BAIT FISHERY:

Plan Code Summary Data:

Table 5. Total landed weight (lbs.), total live weight (lbs.), and total number of trips by skate bait fishery plan code in FY 2017. Percent landed is the sum landed by plan code divided by the landed total across all plan codes. Likewise with percent total live weight.

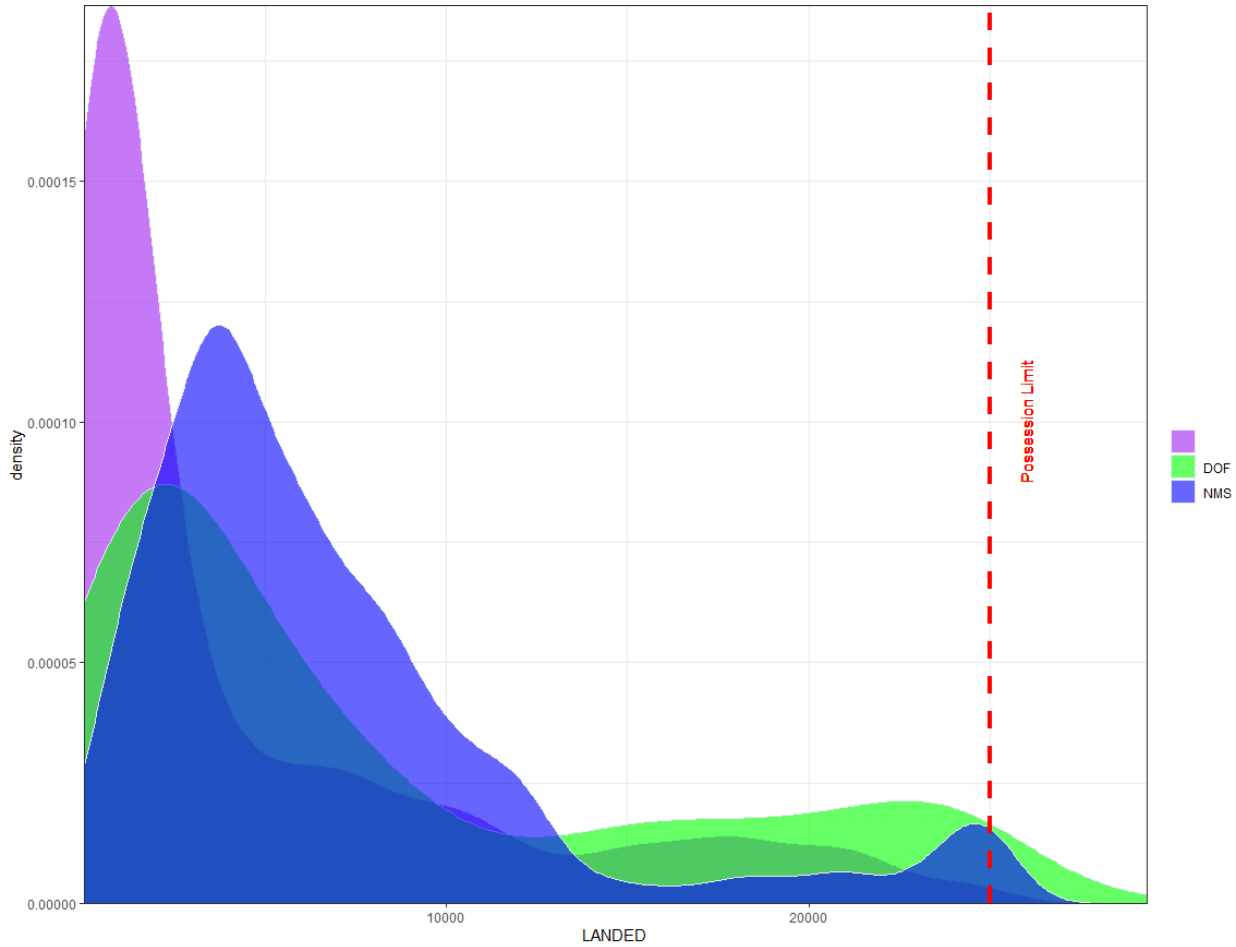
Plan_Code	Total Landed Weight (lbs)	Total Live Weight (lbs)	# of Trips	% Total Landed Weight	% Total Live Weight
<i>SES</i>	1,169	1,269	2	0	0
<i>SMB</i>	1,800	1,800	2	0	0
<i>MNK</i>	511,950	511,950	78	4	4
<i>DOF</i>	2,449,757	2,447,471	310	22	21
<i>Undeclared</i>	3,117,528	3,120,790	672	27	27
<i>NMS</i>	5,309,376	5,340,885	778	47	47
Total Landed Weight across Plan Codes	11,391,580	11,391,580			
Total Live Weight across Plan Codes	11,424,165	11,424,165			

Table 6. Total landings by less than and greater than 25,000 lb. with percent landings that are less than 25,000 lbs. and percent of landings that are greater than 25,000 lbs. by plan code. Total number of trips are also included by plan code.

Plan_Code	0-25,000 lbs. LANDING S	>25,000 lbs. LANDING S	TOTAL LANDING S lbs.	% Landings between 0-25,000 lbs.	% Landings >25,000 lbs.	# of Trips with Landings between 0-25,000 lbs.	# of Trips with Landings >25,000 lbs.
<i>Undeclared</i>	3,117,528	0	3,117,528	100	0	672	0
<i>SMB</i>	1,800	0	1,800	100	0	2	0
<i>SES</i>	1,169	0	1,169	100	0	2	0
<i>NMS</i>	5,309,376	0	5,309,376	100	0	778	0
<i>MNK</i>	511,950	0	511,950	100	0	78	0
<i>DOF</i>	2,420,424	29,333	2,449,757	99	1	310	1

A kernel density plot was created to determine which plan codes (Figure 3) had the greatest concentration of trips within the 25,000 lb. possession limit.

Figure 3. Distribution of NMS, Undeclared, and DOF (the top 3 with greatest percent landed in the fishery) plan codes for the skate bait fishery in FY 2017.



Key Findings:

- For the NMS plan code, all trips landed less than the 25,000 lb. possession limit that was in effect in FY2017, with the greatest number of trips at ~5,000 lbs. More than 10 trips landed exactly 25,000 lbs. The figure shows trips exceeding the 25,000 lb. possession limit, however, this is a consequence of the kernel density plot where the figure tails are less reliable due to smoothing of data.
- For the Undeclared or missing plan code, all trips landed less than the 25,000 lb. possession limit that was in effect in FY2017, with a peak < 2,500 lbs.
- For the DOF plan code, the greatest number of trips landed less than 25,000 lbs. with a peak of trips at 2,5000 lbs. followed by a smaller peak of trips landing ~22,000 lbs. One trip landed more than the 25,000 lb. possession limit that was in effect in FY2017. The figure shows multiple trips exceeding the 25,000 lb. possession limit, however, this is a consequence of the kernel density plot where the figure tails are less reliable due to smoothing of data.

Program Code Summary Data:

Table 7. Total landed weight (lbs.), total live weight (lbs.), and total number of trips by skate bait fishery program code in FY 2017. Percent total landed weight is the total landed weight by individual program code divided by the total landed weight across all plan codes. Likewise with percent total live weight.

Program Code	Total Landed Weight (lbs)	Total Live Weight (lbs)	# of Trips	% Total Landed Weight	% Total Live Weight
<i>DOF-SCI</i>	1,700	1,700	1	0	0
<i>DOF-TST</i>	10,800	10,800	2	0	0
<i>MNK-NAM</i>	24,000	24,000	1	0	0
<i>MNK-SAC</i>	32,300	32,300	3	0	0
<i>SES-SCG</i>	1,169	1,269	2	0	0
<i>SMB-SLM</i>	1,200	1,200	1	0	0
<i>SMB-SQL</i>	600	600	1	0	0
<i>MNK-SAS</i>	65,975	65,975	15	1	1
<i>MNK-SAM</i>	389,675	389,675	59	3	3
<i>NMS-COM</i>	1,626,891	1,658,387	145	14	15
<i>DOF-CML</i>	2,437,257	2,434,971	307	21	21
<i>Undeclared</i>	3,117,528	3,120,790	672	27	27
<i>NMS-SEC</i>	3,682,485	3,682,498	633	32	32
Total Landed Weight across Plan Codes	11,391,580	11,391,580			
Total Live Weight across Plan Codes	11,424,165	11,424,165			

The three program codes with greatest percent landed in the fishery include NMS-SEC (multispecies sector vessel trip), 32%, undeclared or missing program codes, 27%, and DOF-CML (Declared out of Fishery Commercial), 21%.