Northeast Fisheries Science Center Reference Document 04-09

Estimation of Striped Bass Discards in the Multispecies Groundfish Fishery during the 2002 Fishing Year (May 2002 - April 2003)

by

Gary R. Shepherd

June 2004

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OVERVIEW

Estimation of discards in commercial fisheries is generally dependent on a subset of information collected by at-sea observations, which is then expanded to the total fishery. The method of expansion depends on the type of fishery. General methods for expansion include use of the ratio of discard weight of species A to kept weight of species A ($D_{spp\ a} / K_{spp\ a}$); the ratio of discard weight of species A to the aggregate kept weight of other species (D_{spp} / K_{agg}); or the ratio of discard weight of species A per unit of fishing effort. For striped bass fisheries which are not legal in federal waters, estimation of discards based on discard to kept ratio is not appropriate. Estimation of discards based on using a fishing effort ratio is difficult because the duration of commercial fishing trips varies among fisheries and ports, and measurement of effective effort is difficult to quantify consistently. Therefore, the most appropriate estimator for striped bass discards in the multispecies groundfish fishery is the ratio of striped bass discards to aggregate kept weight of species targeted by the fishery.

A simple ratio of cumulative discard to aggregate kept weight on observed multispecies groundfish trips is not appropriate due to seasonal and geographic variations in multispecies landings between Maine and North Carolina. To account for this variability, the ratios were stratified by month and statistical area. Statistical area information (Figure 1) for landings was only available from vessel logbook data (VTR data). All trips reporting landing of multispecies in the 2002 VTR logbook database were initially included. Species landed weight was summed within trip, then across trips by month, 3-digit statistical area and gear type. The data were limited to otter trawl and sink gillnets since most of the multispecies groundfish observer trips were made on vessels using these gear types; these gear types are also the most likely to capture striped bass. The VTR results were compared to the reported dealer landed weight data for species comprising the multispecies group. With the exception of white hake (which are landed in a variety of configurations, e.g. headed, or gutted) and halibut (which comprise a very small % of the total), the VTR data averaged 5% less than weighout data (Table 1). Therefore, the VTR landings were adjusted upward by 5% to account for all landings.

Monthly landings that did not have area reported were re-distributed based on proportion of landings within each area. The 2002 VTR and observer data sets were subset to May through December to correspond to the fishing year beginning May 1st.

The observer data consist of haul specific information from trips targeting multispecies groundfish. The aggregate weight of multispecies groundfish kept per haul was summed across trip, gear, area and month. The data were also limited to sink gillnet and otter trawl gear. In addition, the weight of striped bass discarded was summarized by month, area and gear type. The data were insufficient to stratify at any finer geographic level than statistical area. A ratio of striped bass discards to aggregate landed weight of the multispecies complex was then calculated by month, area and gear. Observer data for the period January to April 2003 contained no record of striped bass caught or discarded; therefore the expanded estimate of striped bass discarded by the multispecies groundfish fishery in these months was zero (0). VTR reported landings from cells (month, area, gear) with observer coverage accounted for 89% of total landings in the otter trawl fishery and 73% from sink gillnets (Table 2 and 3). A monthly summary of landings and observed striped bass discards is provided in Table 4.

In cells (gear, month, area groups) with observer coverage (Table 5 and 6), the discard ratio was applied to expanded VTR aggregate landings data. In cells with no observer coverage for the multispecies fleet, a ratio for the general geographic area was applied. Areas were grouped as follows: Gulf of Maine (511-515); Rhode Island to the Great South Channel (521,526-539); western Georges Bank (522,525); eastern Georges Bank (542-543,551-562) ; Long Island south (611 and higher). An overall ratio for an area group was calculated as the sum of observed striped bass discards in the group/sum of observed multispecies landings within the same group. The resulting ratio was applied to VTR landings for each area in the group (Tables 5 and 6). The resulting striped bass discard estimates (Table 7 and 8) were summed across cells by gear type, with the assumption of 100% discard mortality in both gear types.

The result was a total of 289,808 lbs of striped bass discards in the multispecies groundfish fishery: 287,019 lbs. from otter trawls in May-December 2002 (Table 7); 2,789 lbs from sink gillnets in May-December 2002 (Table 8); and no discards during January to April for either gear. Beginning in June-July, there appears to be a north to

south progression of striped bass discards in the trawler fleet. The majority of discards occurred in statistical area 521, which corresponds to the Great South Channel. Discards of striped bas in September and October in Great South Channel accounted for 84% of the total annual estimated trawl discards of bass in the multispecies groundfish trawl fishery. The NEFSC research vessel bottom trawl survey data (Figure 2-3) indicate that the Channel has a seasonal concentration of striped bass (Figure 2), particularly in the autumn when migrating bass spatially overlap with spawning Atlantic herring.

This analysis was intended to examine striped bass discards in the multispecies groundfish fishery. Striped bass encounters within this fishery are a relatively rare event (Figure 4). However, on occasion seasonal/geographic aggregations of striped bass result in high levels of discards. Since statistical area was the lowest resolution for geographic stratification, discards may actually be over-estimated for some areas. Expansion by all landings within broad areas may encompass groundfishing locations which are not in the migratory pathway of striped bass and therefore unlikely to result in striped bass discards. In contrast, discards may also be under-estimated in areas with limited or no observer coverage, such as inshore locations where the majority of the striped bass population occur. Since the analysis did not include all fisheries potentially discarding striped bass, the estimate should not be considered a total estimate of commercial striped bass discards. Nonetheless, striped bass discards in the multispecies groundfish fishery appear to be a localized, seasonal event.

Table 1. Comparison of annual multispecies landings data between dealer and VTR records, 2002

SPP	VTR data (lbs)	Dealer data (lbs)	Difference	
White Hake	3,417,116	5,375,107	1,957,991	36.4%
Halibut	13,497	19,177	5,680	29.6%
Cod	23,272,122	24,526,821	1,254,699	5.1%
Haddock	14,178,191	14,585,618	407,427	2.8%
Winter Flounder	12,249,435	12,957,688	708,253	5.5%
Am. Dab	7,188,204	7,530,648	342,444	4.5%
Witch Flounder	6,618,393	7,028,857	410,464	5.8%
Yellowtail Flounder	11,208,085	11,740,027	531,942	4.5%
Redfish	744,165	811,191	67,026	8.3%
Ocean Pout	26,168	26,741	573	2.1%
Pollock	6,327,977	6,940,455	612,478	8.8%
Total	81,812,740	86,148,046	4,335,306	5.0%

Table 2. Multispecies otter trawl 2002 landings per month/area. Cells with observer trips bolded, unobserved cells shaded. Level of coverage indicated by area and month.

Statistical Area	May	June	July	August	September	October	November	December	Total landed	Observed Cells	% coverage
459	52,346								52,346		0%
462					12,469				12,469		0%
464					31,712			19,430	51,142		0%
465							1,275	55,020	56,295		0%
511	31,376	7,031	28,959	19,994	37,247			14,762	139,368		0%
512	88,030	44,227	**71,724**	**32,232**	119,566	62,574	104,023	102,947	625,324	103,956	17%
513	165,946	506,857	**739,739**	**331,569**	**220,871**	**309,380**	**395,400**	**491,005**	3,160,768	2,487,965	79%
514	**451,303**	**1,188,863**	**1,091,242**	**762,962**	**834,044**	**391,870**	**556,486**	**1,916,624**	7,193,394	7,193,394	100%
515	**162,849**	247,964	**239,116**	**261,685**	**252,429**	**250,550**	**212,731**	**399,048**	2,026,372	1,778,408	88%
522	**1,056,557**	**1,358,446**	**733,153**	**814,448**	**998,212**	**544,816**	**636,632**	**531,254**	6,673,517	6,673,517	100%
525	**866,791**	126,953	**39,307**	76,497	51,420	**10,430**	**154,407**	**279,029**	1,604,834	1,349,964	84%
521	**463,535**	**1,317,813**	**1,798,722**	**1,955,419**	**2,585,421**	**2,367,103**	**1,092,952**	**1,179,307**	12,760,271	12,760,271	100%
526	**307,014**	44,917	**99,268**	26,673	48,922		**55,477**	**20,060**	602,331	481,819	80%
534							972		972		0%
537	**25,709**	144,220	78,561	15,744	**18,670**	**73,110**	22,171	269,410	647,596	117,489	18%
538	12,933	942		285	20,058	31,717	2,701		68,636		0%
539	101,568	60,498	24,369	11,919	4,731	**28,230**	**68,775**	125,672	425,762	97,005	23%
542	1,020		1,990	74		447	8,698	22,880	35,109		0%
543	23,095	66,892	56,433			32,096			178,516		0%
561	**1,564,518**	268,354	**211,382**	267,880	**68,241**	**143,722**	**264,489**	**128,984**	2,917,571	2,381,337	82%
562	**1,297,647**	**1,599,972**	**533,204**	61,126	91,187	**3,399**	**85,462**	**376,795**	4,048,792	3,896,479	96%
611	166,063	67,358	4,834	797	893	2,922	**9,433**	11,841	264,140	9,433	4%
612	78,344	**7,595**	15,325	5,979	21,192	2,634	15,084	16,514	162,667	7,595	5%
613	82,019	16,934	30,505	4,130	32,356	21,892	**19,202**	122,409	329,445	19,202	6%
614							384	527	911		0%
615	2,221		1,995						4,216		0%
616	582		483		420	1,712	8,681	27,132	39,010		0%
621					3	16			19		0%
624							1,030		1,030		0%
635							210	211	421		0%
Landed	7,001,465	7,075,834	5,800,310	4,649,411	5,450,064	4,278,622	3,716,675	6,110,861	44,083,242		
Observed Cells	6,195,922	5,472,688	5,556,858	2,202,896	2,392,468	4,122,611	3,551,445	5,322,106		39,357,833	
% coverage	88%	77%	96%	47%	44%	96%	96%	87%			89%

Table 3. Multispecies sink gillnet 2002 landings per month/area. Cells with observer trips bolded, unobserved cells shaded. Level of coverage indicated by area and month.

Statistical Area	May	June	July	August	September	October	November	December	Total landed	Observed Cells	% coverage
463			22481						22,481		0%
464	19349	17989							37,337		0%
465					17382				17,382		0%
512	1817	2579	3991	6327	6921	2105			23,740		0%
513	18921	123263	**300142**	**322440**	**223293**	**148927**	215511	**214572**	1,567,068	1,209,373	77%
514	630	**248778**	**221606**	**182903**	**146778**	**135831**	**161876**	**330243**	1,428,646	1,428,016	100%
515	84016	88944	128944	161234	192113	144404	91440	269187	1,160,281		0%
522	3410	37376	23610	6848	92	2078			73,413		0%
525		2333				1940			4,273		0%
521	**31010**	**548177**	**631290**	**451978**	**220982**	**177194**	**111435**	**173843**	2,345,910	2,345,910	100%
526		3301	11146	**2257**	10451			64	27,218	2,257	8%
534								320	320		0%
537	1052	1235	570	1		784	165	7031	10,838		0%
538	8089		3545	**4241**				1564	17,439	4,241	24%
539	1293	141			245	89	33	11	1,811		0%
542		368	3703					1697	5,768		0%
561	58998	34663						7333	100,994		0%
611			830						830		0%
612	1616					26			1,642		0%
613	1449		37		332			1373	3,190		0%
614				2582	43	13			2,638		0%
615	18			18	152				188		0%
621					5				5		0%
625	330	563	126				9		1,027		0%
631							3	20	23		0%
635		348		8		5		11	372		0%
639				2667					2,667		0%
Landed	231,996	1,110,059	1,352,019	1,143,504	818,788	613,397	580,472	1,007,268	6,857,503		
Observed Cells	31,010	796,956	980,224	963,819	591,053	461,953	273,312	718,658		4,989,797	73%
% coverage	13%	72%	73%	84%	72%	75%	47%	71%			

Table 4. Multispecies landings, landings in areas with observer coverage, landings on observed trips and observed striped bass discards for May to December 2002.

Otter Trawl

	Total VTR landings (lbs)	Landings (lbs) from areas covered by observed trips	Observed landings (lbs)	Observed Striped bass discard (lbs.)
May	7,001,465	6,195,922	151,764	
Jun	7,075,834	5,472,688	195,104	8
Jul	5,800,310	5,556,858	450,280	78
Aug	4,649,411	2,202,896	345,917	1,416
Sept	5,450,064	2,392,468	362,952	2,079
Oct	4,278,622	4,122,611	522,172	38,741
Nov	3,716,675	3,551,445	252,718	851
Dec	6,110,861	5,322,106	303,813	
sum	44,083,242	34,816,994	2,584,720	43,173

Sink Gillnet

	Total VTR landings (lbs)	Landings (lbs) from areas covered by observed trips	Observed landings (lbs)	Observed Striped bass discard (lbs)
May	231,996	31,010	5,515	
Jun	1,110,059	796,956	61,715	931
Jul	1,352,019	980,224	23,914	443
Aug	1,143,504	963,819	41,918	
Sept	818,788	591,053	32,525	
Oct	613,397	461,953	24,955	131
Nov	580,472	273,312	20,661	
Dec	1,007,268	718,658	18,173	
sum	6,857,503	4,816,984	229,376	1,505

Table 5. Ratios of striped bass discards to multispecies landings applied to the otter trawl multispecies groundfish landings, 2002. Bold numbers indicate cells with observer coverage; other discard ratios extrapolated from neighboring estimates. Lines show areas where ratios averaged; * indicates no observer coverage.

Area	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
459	0.000							
462					0.000			
464					0.000			0.000
465							0.000	0.000
511	0.000	0.000	0.001	0.001	0.000			0.000
512	0.000	0.000	**0.000**	**0.000**	0.000	0.001	0.000	0.000
513	0.000	0.000	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
514	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**	**0.002**	**0.000**	**0.000**
515	**0.000**	0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
522	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
525	**0.000**	0.000	**0.000**	0.000	0.000	**0.000**	**0.000**	**0.000**
521	**0.000**	**0.000**	**0.000**	**0.006**	**0.011**	**0.090**	**0.006**	**0.000**
526	**0.000**	0.000	**0.000**	0.001	0.011		**0.000**	**0.000**
534							0.006	
537	**0.000**	0.000	0.000	0.006	**0.000**	**0.000**	0.006	0.000
538	0.000	0.000		0.006	0.011	0.090	0.006	
539	0.000	0.000	0.000	0.006	0.011	**0.000**	**0.006**	0.000
542	0.000		0.000	*		0.000	0.000	0.000
543	0.000	0.000	0.000			0.000		
561	**0.000**	0.000	**0.000**	*	**0.000**	**0.000**	**0.000**	**0.000**
562	**0.000**	**0.000**	**0.000**	*	0.000	**0.000**	**0.000**	**0.000**
611	*	0.000	*	*	*	*	**0.531**	*
612	*	**0.000**	*	*	*	*	0.321	*
613	*	0.000	*	*	*	*	**0.184**	*
614							0.321	*
615	*		*					
616	*		*		*	*	0.321	*
621					*	*		
624							0.321	
635							0.321	*

Table 6. Ratios of striped bass discards to multispecies landings applied to the sink gillnet multispecies groundfish landings, 2002. Bold numbers indicate cells with observer coverage; other discard ratios extrapolated from neighboring estimates. Lines show areas where ratios averaged; * indicates no observer coverage.

Area	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
463			0.002					
464	*	0.004						
465					0.000			
512	*	0.004	0.002	0.000	0.000	0.001		
513	*	0.004	**0.002**	**0.000**	**0.000**	**0.000**	0.000	**0.000**
514	*	**0.004**	**0.002**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**
515	*	0.004	0.002	0.000	0.000	0.001	0.000	0.000
522	*	*	*	**0.000**	*	*		
525		*				*		
521	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
526		0.000	0.000	**0.000**	0.000			
534		0.000						0.000
537	0.000		0.000	0.000		0.000	0.000	0.000
538	0.000		0.000	**0.000**				0.000
539	0.000	0.000			0.000	0.000	0.000	0.000
542		*	*					*
561	*	*						*
611			*					
612	*					*		
613	*		*		*			*
614				*	*	*		
615	*			*	*			
621					*			
625	*		*				*	
631							*	*
635				*		*		*
639				*				

Table 7. Estimates (lbs.) of striped bass discards from otter trawl multispecies groundfish fishery, 2002, by month and statistical area. * indicates no observer coverage.

Area	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
459	0								0
462					0				
464					0			0	
465							0	0	
511	0	0	22	16	0			0	38
512	0	0	0	0	0	41	0	0	41
513	0	0	2,629	0	0	0	0	0	2,629
514	0	0	0	1,425	0	596	0	0	2,021
515	0	0	0	0	0	0	0	0	0
522	0	0	0	0	0	0	0	0	0
525		0	0	0	0	0	0	0	0
521	0	398	0	11,901	28,797	212,819	7,021	0	260,936
526		14	0	163	545		0	0	721
534							6		6
537		44	0	96	0	0	138	0	278
538				2	223	2,855	17		3,097
539		18	0	73	53	0	429	0	573
542			0	*			0	0	0
543			0						0
561	0		0	*	0	0	0	0	0
562	0	0	0	*	0	0	0	0	0
611	*		*	*	*	*	5,006	*	5,006
612	*	0	*	*	*	*	4,842	*	4,842
613	*		*	*	*	*	3,523	*	3,523
614							123	*	123
615	*		*						0
616	*		*		*	*	2,787	*	2,787
621					*	*			0
624							331		331
635							67	*	67
Total	-	473	2,651	13,676	29,618	216,311	24,291	-	287,019

Table 8. Estimates (lbs.) of striped bass discards from sink gillnet multispecies groundfish fishery, 2002, by month, statistical area. * indicates no observer coverage.

Area	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
463			40						40
464		67							67
465					0				0
511									0
512		10	7	0	0	2			19
513		461	0	0	0	0	0	0	461
514		931	443	0	0	131	0	0	1505
515		333	229	0	0	135	0	0	697
522	*	*	*	0	*	*			
525		*				*			
521	0	0	0	0	0	0	0	0	0
526		0	0	0	0				0
534		0						0	0
537	0		0	0		0	0	0	0
538	0		0	0				0	0
539	0	0			0	0	0	0	0
542			*						
561	*								
611			*						
612	*					*			
613	*		*		*				
614					*	*			
615	*				*				
621					*				
625	*		*				*		
631							*		
635						*			
639									
Total	0	1802	719	0	0	268	0	0	2,789

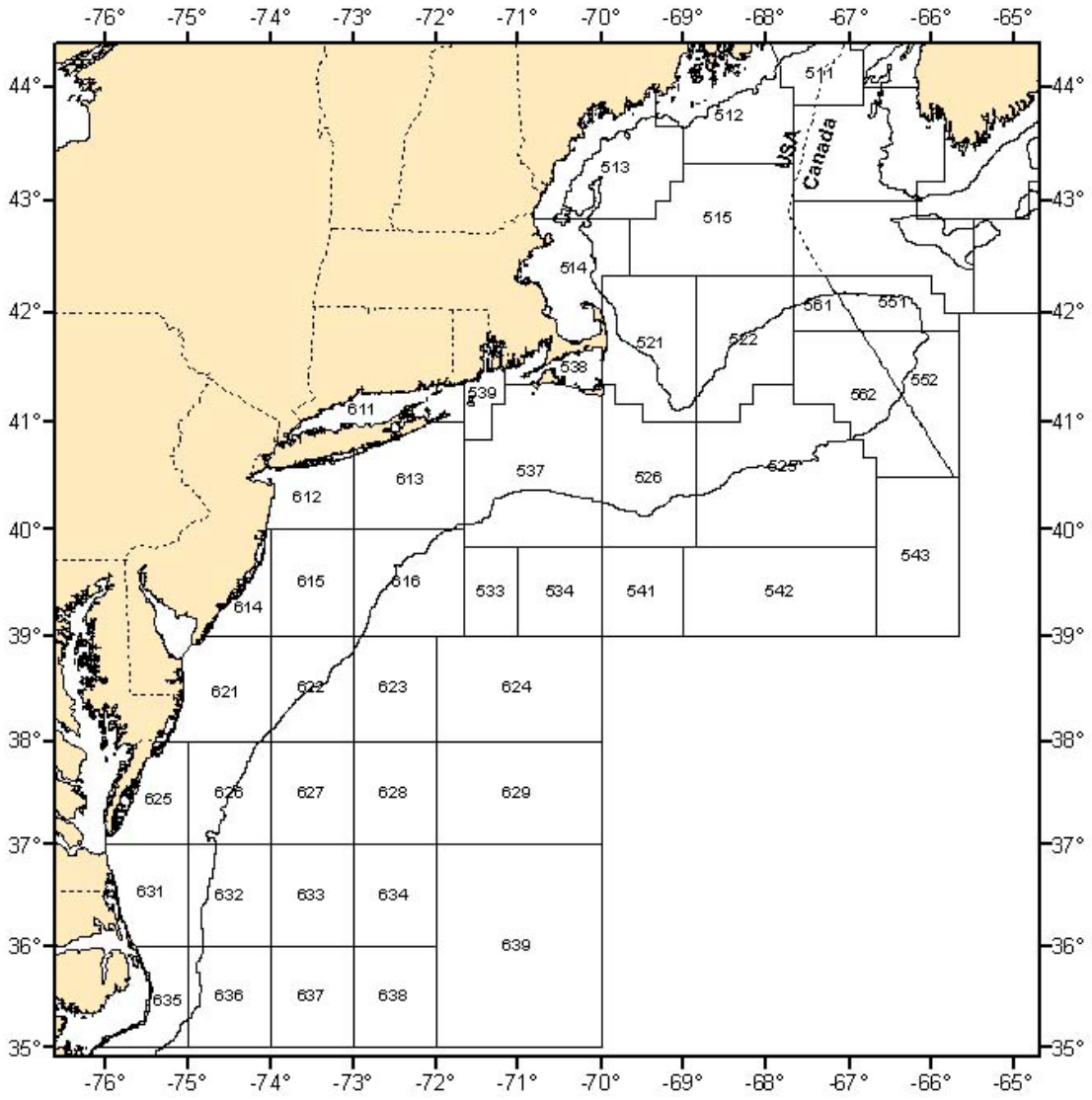


Figure 1. NEFSC statistical areas.

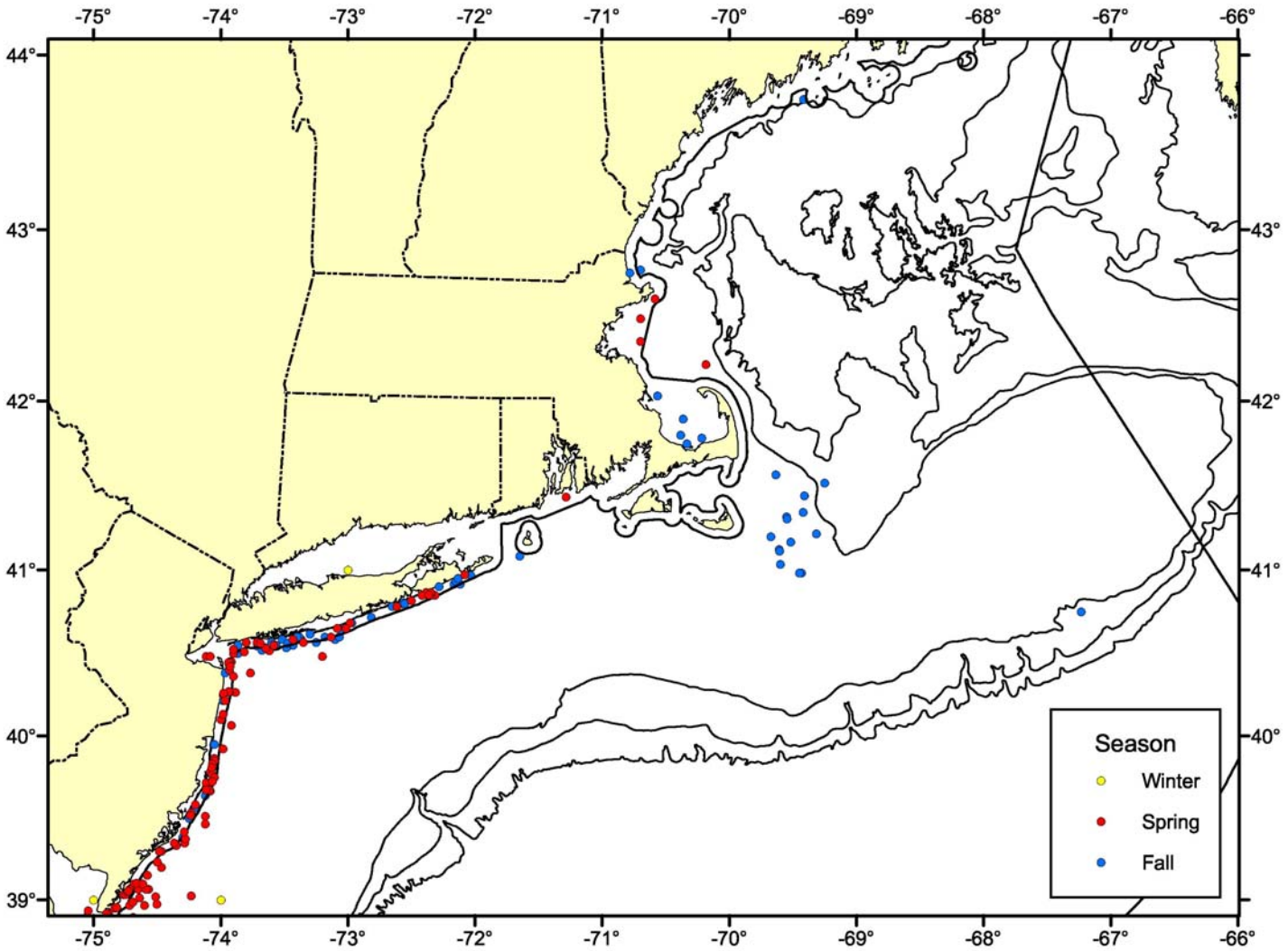


Figure 2. Distribution of striped bass during NEFSC 1973-2003 Winter, Spring and Autumn Bottom Trawl Surveys, northern areas.

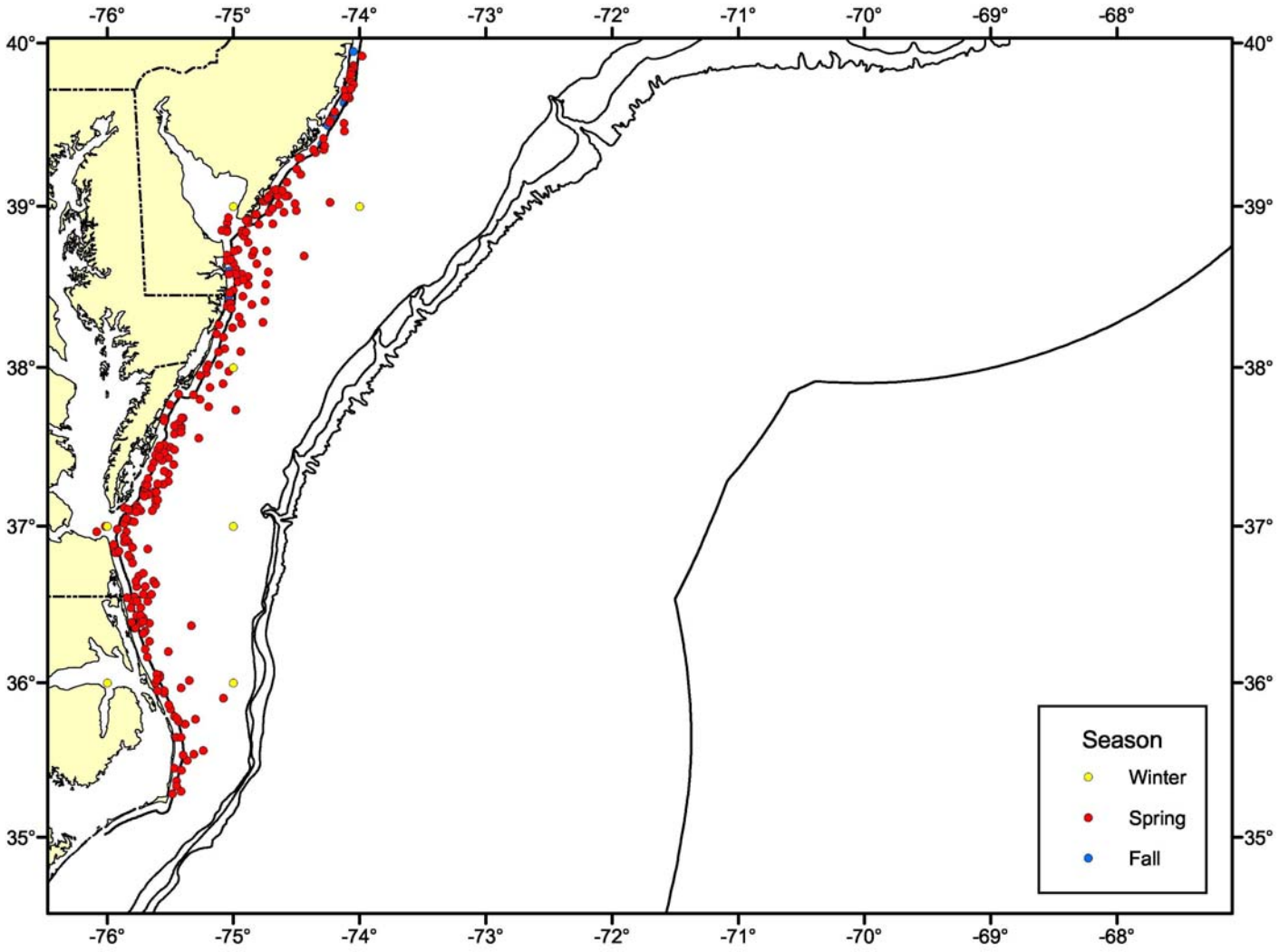
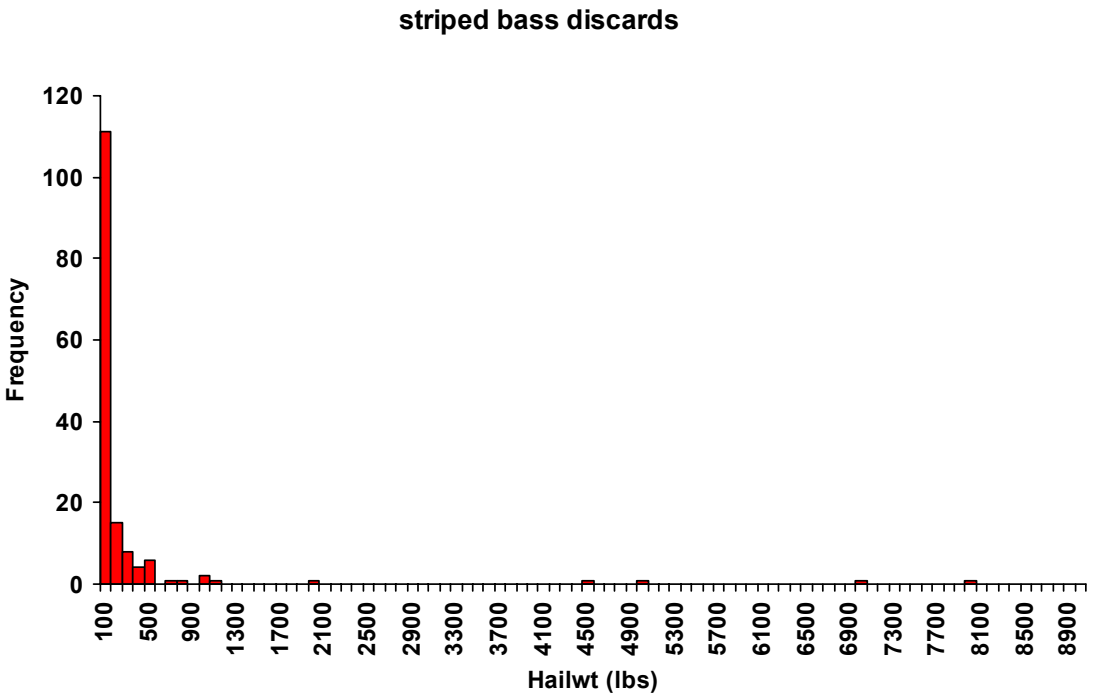


Figure 3. Distribution of striped bass during the NEFSC 1973-2003 Winter, Spring and Autumn Bottom Trawl Surveys, south.



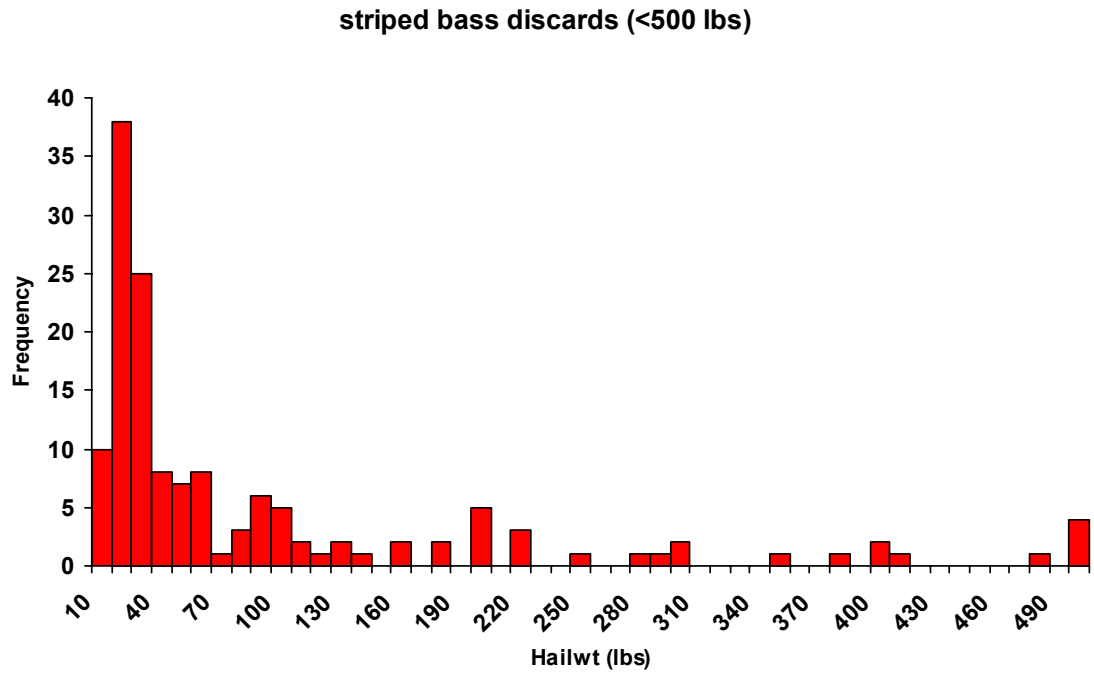


Figure 4. Frequency of striped bass weight per haul in observed hauls of the multispecies groundfish fishery, May-December 2002.

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