8.3 Finfish bycatch

8.3.1 Effects of area rotation on bycatch (Alternative 5.3.5.1)

Similar to the area access program effects described above, rotation area management is expected to focus fishing effort in areas with higher than average scallop biomass. More of the resource area will also be under controlled access rules, which will have a scallop possession limit and DAS tradeoff. It is projected (Section 8.2.1) that focusing fishing effort in controlled access areas will reduce bottom contact time per DAS and therefore will have a favorable effect in bycatch in general.

This effect would be similar to those observed in the 2000 fishing year, when the Scallop and Multispecies FMP allowed access to closed groundfish areas. Bycatch estimates and an anlysis of the effects on groundfish, barndoor skate, and other species is given in Section 1.0 of Appendix IX and the results are summarized in Section 7.2.4.1.1. Actual results for each future year, however, will vary, depending on the location and timing of re-opened controlled access areas relative to the distribution of finfish species that are susceptible to capture by scallop dredges and trawls.

The framework adjustment process however includes measures that can accommodate seasonal access, modifications of boundaries, or gear modifications when needed to minimize bycatch. Although difficult to predict for each finfish species, the overall impact of area rotation is expected to be positive due to its effect on fishing time per DAS and the framework adjustment process that will allow future management to avoid potential problems with unacceptable bycatch.

8.3.2 Effects on bycatch from increasing the minimum ring size to 4-inches (Alternative 5.3.5.2)

Catches of finfish and invertebrates were monitored during ring-size comparison research conducted by Dr. DuPaul at the VA Institute of Marine Science (Section 8.2.8). In general, it appears that dredges with 4-inch rings may allow greater escapement of smaller finfish and invertebrates. Like the catches of large scallops, however, a dredge with 4-inch rings may increase the catch of larger finfish, although the differences in catches of large fish are insignificant in most cases. More importantly, however, dredges with 4-inch rings are more efficient at catching large scallops and in most areas will decrease fishing time to catch the same number of scallops. Like area rotation and other similar effects that decrease fishing time per day-at-sea, this alternative is expected to reduce bycatch impacts and have a favorable effect on bycatch mortality, particularly for smaller finfish and invertebrates which are capable of passing through or between the rings unharmed by the experience.

8.3.3 Effects on bycatch from increasing the minimum twine top mesh to 10-inches (Alternative 5.3.5.3)

The only formal analysis of the effects of twine top mesh on bycatch and bycatch mortality were done in Framework Adjustment 11 (NEFMC 1998). No new data or analyses are available, partly because similar comparison research has not been conducted in open areas under recent fishing conditions. These earlier studies were often conducted in the groundfish closed areas because the large scallops found there at that time were retained by the dredge, rather than escaping through the large mesh twine top as smaller scallops do.

As the scallop biomass has rebuilt in open areas (see Figure 1 and Figure 2), the average size of sea scallops caught by scallop dredges has also increased. Therefore in many areas the scallop size distribution is more like those in the groundfish closed areas when the twine top comparisons were done. In addition, areas of small scallops are likely to be off-limits to scallop fishing under future rotation area management actions, keeping small scallop escapement through larger twine tops to a minimum.

Not all finfish escapement was improved by adding larger mesh twine tops, but many species saw improvements and bycatch rates for other species that did not see improvements were statistically insignificant. The quantitative effects of requiring a larger twine top mesh are difficult to predict due to a variety of variables and conditions. Overall, the effects of larger twine top mesh are expected to be positive, reducing bycatch and bycatch mortality for many species, especially when coupled with rotation area management.

There has been little published on the methods for reducing finfish bycatch in the sea scallop dredge fishery. In Canada, gear modifications to reduce bycatch have been tested by the scallop industry with modest success. The Canadian work found that the use of large square mesh in the twine top resulted in a 25% decrease in the catch of roundfish (cod, haddock) but not for flatfish. Windows or open squares in the back of the twine top and tickler chains attached to the frame of the dredge resulted in similar reductions for cod and haddock. Dredge modifications to reduce the harvest of flatfish while maintaining the harvest of scallops remained problematic.

Recent studies in the U.S. have demonstrated promising results. Smolowitz et al (1997) reported that increases in the mesh size of the twine top significantly reduced the number of flatfish captured by the dredge. Comparisons of a 6" diamond mesh twine top with that of an 8" square mesh resulted in a 37% reduction in the harvest of yellowtail flounder (1,674 versus 1,042; 78 tows). A similar experiment comparing a 6" diamond mesh twine top with that of a 10" diamond mesh resulted in a 45% reduction in the harvest of yellowtail founder (605 versus 300; 50 tows). There were no statistical differences in the size selection differential between the control and experimental twine tops but this may have been due to the size frequency distribution of the yellowtail flounder in the population at the time of the tests. The reductions in the number of yellowtail harvested by the dredge using the larger mesh twine tops were statistically different at the 95% confidence level. The use of a 10" twine top reduced the amount of scallops captured.

In 1998, DuPaul and Kerstetter (unpublished data) tested the use of larger mesh twine tops to reduce the bycatch of summer flounder in the mid-Atlantic. A comparison between a 6" diamond mesh twine top with that of an 8" diamond mesh produced inconsistent results that were not statistically different (292 versus 265; 28 tows). A comparison of a 6" diamond mesh twine top that of a 9.5" knot-center diamond mesh hung on the diagonal significantly reduced the catch of summer flounder by 42% (543 versus 310; 66 tows; Table I). Hanging the twine top on a diagonal resulted in an “open diamond” configuration similar to a square mesh. The harvest of scallops during this test was highly variable from tow-to-tow due to rough weather and a scarcity of scallops (1-3 baskets per dredge per tow). No conclusions relative to the harvest of scallops could be made.

In 1998, during the cooperative NMFS/Industry/Academia survey of the Georges Bank Closed Area II (CAII), comparative tows using larger mesh twine tops were made both inside and outside the boundaries of CAII (DuPaul et al 1999). A comparison between an 8" diamond mesh twine top with that of an 8" square mesh produced no significant reductions in the catch of yellowtail flounder ($p=0.233$) and blackback flounder ($p=0.670$) during the survey within the boundaries of CAII (224 tows). The catch of scallops were not statistically different.

In a second experiment outside the boundaries of CAII, an 8" diamond mesh twine top was compared with that of a 12" square mesh. Significant reductions in the capture of blackback flounder ($p=0.004$), windowpane flounder ($p=0.003$) and monkfish ($p=0.041$) were observed. The reduction in the catch of yellowtail flounder was not significant (219 versus 188; p=0.082). There was a highly significant reduction in the harvest of scallops (p=0.000). A total of 34 tows were made.

These recent studies indicate that increasing the mesh size of the twine top can be effective in reducing finfish bycatch in the sea scallop dredge fishery. However, it is also apparent that increases in mesh size must be balanced with undesirable losses in scallop production. In areas with an abundance of large scallops such as in the Georges Bank Closed Areas, minor losses in scallop production may be tolerated but not the extent where increases in towing time will offset gains in bycatch reduction.

8.3.4 Effects on bycatch from gear modifications based on recent research

Although the Council hoped for more favorable results and progress, developing gear modifications have not materialized to reliably reduce finfish bycatch. If future research shows a more desirable configuration or modification to reduce finfish bycatch, the Council may require changes by framework action, which will have a favorable effect.

Other modifications to the traditional New Bedford scallop dredge have been tested in an effort to reduce finfish bycatch. Smolowitz et al (1997) reported that a gooseneck roller attached to the bail of a standard dredge did not result in a reduction of bycatch. More recently Smolowitz et al (2001) tested a fish sweep in combination with an excluder ring-panel in Georges Bank Closed Area I. The dredge modifications resulted in 40% reduction in the catch of skates (3,197 versus 1,904; p=0.001) a 41% reduction in yellowtail flounder (518 versus 304; p=0.004) and a 48% reduction in blackback flounder (391 versus 201; p=0.0001). There were no significant differences in the catch of monkfish or scallop. These results are extremely promising but more sea trials for the gear area necessary before definite estimates of bycatch reduction can be made.

Recent trials of a 4" ring dredge to estimate improvements in scallop selectivity have provided additional information of finfish bycatch reduction (DuPaul et al 2002). Reductions in bycatch using a 4" ring scallop dredge was only apparent for small fusiform fishes such as red hake, silver hake and sculpins. Reductions in the catch of small flatfish (yellow flounder <30 cm, 4-spot flounders) were also observed.

Table 195. Results of twine top experiments between the standard 6 inch diamond twine top and a 9.5 inch diamond mesh hung on the diagonal which resulted in opening of the mesh. Data was acquired from 66 comparative tows aboard the *F/V Carolina Breeze* during March of 1998 along the Mid-Atlantic Bight. Values represent numbers of summer flounder (*Paralichthys dentatus)* captured by each twine top configuration. Significance was determined by a two sample Student's t-test ($\propto$=0.05).

Total Length	6" Diamond	9.5" Open Diamond	Total	Significant Difference
<12"	160	72	232	yes
12"-14"	182	108	290	yes
14"-16"	161	107	268	yes
16"-"18"	28	12	40	yes
18"-20"	7	5	12	no

>20"	5	6	11	no

8.3.5 Effects on bycatch from area-specific possession limits for some finfish species (Alternative 5.3.5.5)

This alternative was considered in Amendment 10 to enable the FMP to apply finfish possession limits to scallop vessel fishing in specific areas, primarily the controlled access areas re-opened under area rotation. While this alternative was not formally approved in Amendment 10, it remains a viable alternative for future framework adjustments when and where needed.

Unlike a TAC which would close an area when finfish catches reach a limit set to avoid excessive catches, a finfish possession limit often causes regulatory discards (i.e. bycatch) to increase unless the possession limit forces a change in fishing behavior.

When applied to controlled access areas where vessels have time (due to the DAS tradeoff) to seek other fishing areas within the boundaries to avoid catching certain finfish, the effects can be drastically different. At the very least, the possession limit reduces the incentive to stay in an area with high finfish bycatch to partially target those species in addition to targeting sea scallops. When scallop biomass is high, like it would be in a controlled access area, and a DAS tradeoff applies, changing fishing locations to reduce finfish bycatch has few costs to the vessel and fishermen.

During 1999, Closed Area II access had a groundfish possession limit and a yellowtail flounder TAC apply. Generally, vessels successfully evaded yellowtail flounder catches by fishing the more northerly part of the scallop distribution in Closed Area II. Some of this effect broke down late in the season as prices and catches of large scallops from beds where yellowtail flounder began eroding.

Therefore when applied to controlled access areas with DAS tradeoffs, under certain conditions finfish possession limits can help to minimize finfish bycatch and bycatch mortality by changing fishing behavior. Under these circumstances, area-specific possession limits for some species could have a positive effect on minimizing bycatch and bycatch mortality.

8.3.6 Effects on bycatch from area-specific finfish TACs (Alternative 5.3.5.6)

Like the one above, this management alternative was considered primarily to enable establishing finfish TACs in controlled access areas where catches of certain species may be problematic, either causing overfishing on that species or inhibiting recovery of stock biomass. While this alternative was not formally approved in Amendment 10, it remains a viable alternative for future framework adjustments when and where needed.

Ideally, this measure would be applied in controlled access areas where the expected bycatch rates are higher within the area than outside the area. Otherwise, fishing effort that might occur in a controlled access area might be transferred to other places where bycatch rates are higher. On the other hand, with area-specific DAS allocations, this type of effort shift is more difficult which enhances the effectiveness of this alternative to minimize finfish bycatch.

Under the status quo overfishing definition, however, greater amounts of closures (i.e. less scallop catch from controlled access areas) would cause in increase in open-area DAS allocations to achieve the target fishing mortality rate. It would therefore be advantageous to direct area-specific finfish possession limits to areas and for species where the bycatch rates are higher inside an area rather than outside the area. This management alternative is expected to help reduce bycatch and bycatch mortality, but actual results will depend on how it is applied in future framework actions.

8.3.7 Seasonal and geographical variation in non-target finfish catches (Alternatives 5.3.5.7 and 5.3.5.8)

Finfish bycatch on observed scallop dredge trips[82] were analyzed for area and season specific trends to identify where and when finfish catches were abnormally high. The most common occurrences or those species that had high total hail weights were filtered before analyzing the trends by area and season. Cod and barndoor skate were included because of their high importance to management, but haddock were not because catches on scallop dredges are uncommon. The most common finfish or finfish species with high total hail weights were monkfish (angler), little skate, yellowtail flounder, unclassified skates (skates), fourspot flounder, summer flounder, winter flounder, sand-dab flounder, winter (big) skate, cod, clearnose skate, smooth skate, thorny skate (Table 73).

These data summaries represent over 28,000 observed tows from 1991 to 2000. The catches were adjusted for normalized trends in biomass (Table 199) derived in published reports for various assessments and SAFE Reports. The days absent and days fished were adjusted for the proportion of scallop landings from observed vs. unobserved tows during the trip. Kept and discarded components of the catch are shown separately in the summary tables (Table 197 and Table 198) With this statistical treatment to normalize the data with respect to temporal trend and the low sampling frequency in any one year, these sea sampling data are not very useful to examine temporal trends in bycatch. Geographical and seasonal trends in bycatch, as a ratio to fishing effort and scallop landings, however, provides a useful indicator of when and where bycatch for various finfish are higher than normal.

The observed tows were initially binned by ten minute square over a trip for calculating mean weights per tow and time fished, and then further binned into associated rotation management areas. Squares outside of the example rotation management areas are binned into one-degree squares, designated by degrees of latitude and longitude.

Categories (i.e. area and quarter pairs) were highlighted if their mean catch per pound of scallop landings and per day absent were above the 90th percentile for that species' bycatch over all years in the fishery. Analysis of discards and landings of non-target species were performed by quarter and rotation management area (or square degree where the observation did not fall within a scallop rotation management area) for commonly observed 15 species listed in the table below. Discards and landings of non-target species by vessels using scallop dredged on observed trips were summed over species when the amount ranked in the top 10th percentile for that species. The sum of discard and non-target species landings that ranked in the top 10th percentile are totaled by region and scallop management area in Table 197 and Table 198, respectively.

82 No observed trips on vessels using scallop trawls.

Table 196. Species included in geographic and seasonal distribution analysis of discards and non-target species landings on observed trips aboard vessels using scallop dredges during 1991-2000.

Sea scallop (discard only)	Monkfish	Cod[83]
Fourspot flounder	Sand dab flounder	Summer flounder
Winter flounder	Yellowtail flounder	Unclassified skate
Barndoor skate[84]	Clearnose skate	Little skate
Smooth skate	Thorny skate	Winter skate

This statistical summary therefore identifies those occurrences where bycatch was exceptionally high, possible candidates for either a seasonal (Section 5.3.5.7) or long-term (year around, Section 5.3.5.8) closure.

Scallop fishing areas in the Georges Bank region tend to have highest finfish catches (Table 197) in the third and fourth quarters (July to December), compared to the amount of fishing effort and scallops landed. Ranked by 90th percentile of finfish bycatch levels of the most frequently or abundant finfish species in the observed catch by scallop dredges, the areas that had the most frequent high finfish catch levels are GB7 to GB9 (the northern edge of Georges Bank) in July to December, GB10 in October to December (Closed Area I south), and the non-rotation areas around Cape Cod (4070, 4170, 4171). No area had consistently high catches throughout the year.

In the Gulf of Maine, finfish catch on scallop dredges was high most frequently in the third quarter (July to September), particularly in the "4267" degree block. Most of the scallop fishing in this one-degree block is on the northern edge of Georges Bank, and properly belongs in that region.

The high finfish catches on scallop dredges tend to be most frequent in the Mid-Atlantic region during the first and fourth quarters (Jan – Mar, Oct – Dec). Occurrences of high catches were frequent in Oct. to Dec. in MA8, MA9, and "4071". Frequent high catches were observed in MA9 during Jan. to Jun., also. Those areas are near the eastern end of Long Island and south of RI. Also, the high finfish catches were most frequent in the third quarter in degree blocks "3874" and "3974", inshore of the candidate rotation management areas off of NJ.

In terms of management status (Table 198), the closed areas that are within the groundfish closures had the most frequent occurrences of high finfish catches (averaging 17.5 per area), followed by the Framework Adjustment 13 areas (14.0), the candidate rotation management areas (11.4), and finally the areas not within the candidate rotation management areas (9.8). Seasonally the high finfish catches were frequent throughout the year in the groundfish closed areas, , but in the Framework Adjustment 13 areas, the finfish catches were most frequent in the third and fourth quarters (Jul – Dec) and lowest from Jan. to June. High finfish catches were most frequent in GB9 (the Framework 13 area within Closed Area I) during the third and fourth quarters.

[83] Included due to the controversiality of cod bycatch, not because it was frequently observed as bycatch on sea sampled trips.
[84] Included due to the controversiality of cod bycatch, not because it was frequently observed as bycatch on sea sampled trips.

Table 197. Occurrence of catches finfish per day-at-sea, per day fished, and per pound of landed scallop in the top 10th percentile for a species on observed trips by region, rotational management area and quarter, averaged over 1991 – 2000. Numbered areas are waters outside of the candidate rotation management areas, summed into a one-degree block (latitude/longitude).

		Disposition Data							
		Discarded				Landed			
Region	Area	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec
Georges Bank	GB1			2	3			1	
	GB2	2		3	5	3			4
	GB3	2		3				2	
	GB4	3	1				7		3
	GB5	7		3	4	6			1
	GB6	3		6		2			
	GB7		9	8	6			2	6
	GB8			7	6			3	
	GB9			12	5			5	4
	GB10	9	3	2	7		2		6
	GB11	2		2	2				4
	GB12								
	GB13	4	2	7		5	4		4
	GB14	6		5		4			1
	GB15		1				1	3	
	4065			8					
	4066				1				
	4067	5	3	4			3		1
	4068		3	4	5		3	3	3
	4069		2		2		9		3
	4070				27				9
	4166	1	1			2	1		
	4167					1			3
	4170	3	15		13				6
	4171			8	13				3
	4172				3				
	4173								
Georges Bank Total		**47**	**40**	**84**	**102**	**23**	**30**	**19**	**61**

		Disposition Data							
		Discarded				Landed			
Region	Area	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec
Gulf of Maine	4267			2	3			9	2
	4268			3					
	4269				1				
	4270	1		2					1
Gulf of Maine Total		**1**		**7**	**4**			**9**	**3**
Mid-Atlantic	MA1	2			4	3			
	MA2	2					2		
	MA3	3				3			
	MA4								1
	MA5	2	3						
	MA6	3			0				
	MA7				4	3	1		
	MA8		3	1	6				
	MA9	8	6	3	6				2
	3674								
	3675				3				
	3773								
	3775	3	3			4			
	3870								
	3872								
	3874	2	1	9					
	3974	3		6					
	4071	3			8	5			4
	4072	3	2		1	5			
	4073			3			3		
Mid-Atlantic Total		**34**	**18**	**22**	**32**	**23**	**6**		**7**
Grand Total		**82**	**58**	**113**	**138**	**46**	**36**	**28**	**71**

Table 198. Occurrence of catches finfish per day-at-sea, per day fished, and per pound of landed scallop in the top 10th percentile for a species on observed trips by rotational management area, management status, and quarter, averaged over 1991 – 2000. Numbered areas are waters outside of the candidate rotation management areas, summed into a one-degree block (latitude/longitude).

			Disposition Data							
			Discarded				Landed			
Rotational management area	Status	Area	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec
Rotation	Closed	GB10	9	3	2	7		2		6
		GB11	2		2	2				4
		GB13	4	2	7		5	4		4
		GB15		1				1	3	
	Closed Total		**15**	**6**	**11**	**9**	**5**	**7**	**3**	**14**
	Framework 13	GB9			12	5			5	4
		GB12								
		GB14	6		5		4			1
	Framework 13 Total		**6**		**17**	**5**	**4**		**5**	**5**
	Open	MA1	2			4	3			
		MA2	2					2		
		MA3	3				3			
		MA4								1
		MA5	2	3						
		MA6	3			0				
		MA7				4	3	1		
		MA8		3	1	6				
		MA9	8	6	3	6				2
		GB1			2	3			1	
		GB2	2		3	5	3			4
		GB3	2		3				2	
		GB4	3	1				7		3
		GB5	7		3	4	6			1
		GB6	3		6		2			
		GB7		9	8	6			2	6
		GB8			7	6			3	
	Open Total		**37**	**22**	**36**	**44**	**20**	**10**	**8**	**17**

Rotational management area	Status	Area	Disposition Data: Discarded Jan - Mar	Discarded Apr - Jun	Discarded Jul - Sep	Discarded Oct - Dec	Landed Jan - Mar	Landed Apr - Jun	Landed Jul - Sep	Landed Oct - Dec
Rotation Total			**58**	**28**	**64**	**58**	**29**	**17**	**16**	**36**
Non-rotation	**Open**	3674								
		3675				3				
		3773								
		3775	3	3			4			
		3870								
		3872								
		3874	2	1	9					
		3974	3		6					
		4065			8					
		4066				1				
		4067	5	3	4			3		1
		4068		3	4	5		3	3	3
		4069		2		2		9		3
		4070				27				9
		4071	3			8	5			4
		4072	3	2		1	5			
		4073			3			3		
		4166	1	1			2	1		
		4167					1			3
		4170	3	15		13				6
		4171			8	13				3
		4172				3				
		4173								
		4267			2	3			9	2
		4268			3					
		4269				1				
		4270	1		2					1
	Open Total		**24**	**30**	**49**	**80**	**17**	**19**	**12**	**35**
Non-rotation			**24**	**30**	**49**	**80**	**17**	**19**	**12**	**35**

Rotational management area	Status	Area	Disposition Data: Discarded Jan - Mar	Discarded Apr - Jun	Discarded Jul - Sep	Discarded Oct - Dec	Landed Jan - Mar	Landed Apr - Jun	Landed Jul - Sep	Landed Oct - Dec
Total										
Grand Total			82	58	113	138	46	36	28	71

Table 199. Biomass trend adjustments to hail weight observations for sea sampled scallop dredge trips, by year and species. Data from various SARC documents and SAFE Reports showing trends in mid-year biomass, spawning stock biomass, or survey catch per tow.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ANGLER	1.294	1.074	0.981	0.860	0.911	0.976	0.964	1.044	0.991	0.904
COD	1.804	1.326	0.935	0.737	0.698	0.794	0.902	0.860	0.934	1.010
FLOUNDER, FOURSPOT	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FLOUNDER, SAND-DAB	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FLOUNDER, SUMMER	0.510	0.541	0.647	0.887	1.185	1.273	1.149	1.296	1.257	1.257
FLOUNDER, WINTER	0.926	0.750	0.572	0.565	0.880	1.155	1.120	0.976	1.651	1.405
FLOUNDER, WITCH	0.915	0.886	0.729	0.768	0.696	0.746	0.935	1.442	1.442	1.442
FLOUNDER, YELLOWTAIL	0.315	0.378	0.329	0.235	0.284	0.486	0.905	1.738	2.570	2.759
SCALLOP, SEA	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
SKATE, BARNDOOR	0.000	0.071	0.177	0.385	0.481	0.730	0.783	1.221	2.426	3.726
SKATE, LITTLE	1.073	1.057	1.007	0.954	0.999	1.011	1.012	0.980	0.973	0.934
SKATE, ROSETTE	2.000	1.253	0.710	0.630	0.833	0.902	0.861	0.799	0.899	1.113
SKATE, SMOOTH	1.165	1.244	1.082	1.232	1.110	1.429	1.043	0.790	0.402	0.503
SKATE, WINTER(BIG)	1.437	1.099	0.954	0.813	1.067	1.019	1.006	0.935	0.930	0.741
SKATES	1.135	0.945	0.786	0.803	0.898	1.018	0.941	0.945	1.126	1.403

8.3.8 Effects on bycatch and bycatch mortality from a proactive protected species program (Alternative 5.3.5.9)

The distributions of sea turtles interacting with scallop fishing gear and finfish species that are vulnerable to capture and discarding as bycatch are somewhat exclusive. It is difficult to anticipate what type of measures would be applied to reduce interactions with sea turtles below PBRs if action becomes necessary, but if they involve seasonal closures the impacts on bycatch and bycatch mortality for finfish species could be negative. If they involve gear modifications, it is impossible at this point to say whether they would have a positive or negative effect on finfish bycatch.

Seasonal area closures, if needed to minimize interactions with protected species could cause a shift in fishing effort to other open fishing areas. This would shift effort north, because the sea turtle distribution in the late summer and early fall overlaps the southern third or half of the resource. Fishing effort might shift to other seasons, or it might shift to other areas. If shifted north, the added effort would increase fishing time and finfish catches in the northern part of the scallop resource which has a greater overlap with monkfish, yellowtail flounder, barndoor skate, and other groundfish species of concern.

8.3.9 Effects on bycatch and bycatch mortality from the status quo overfishing definition (Section 5.1.1)

Compared to the proposed overfishing definition, the status quo overfishing definition would allow more fishing effort in regular, open fishing areas to achieve a stock-wide fishing mortality target, rather than one that applies only to scallops that are available to the fishery. As a result, overall scallop fishing effort is higher, smaller scallops would be available to the fishery, and fishing time would increase overall and on a DAS basis.

Projections show that total area swept by the fleet is likely to be higher with the status quo overfishing definition. Since finfish catches, many that cannot be landed due to possession and/or size limits that apply to scallop fishing, are proportional to the amount of fishing time and area swept, the effect of the status quo overfishing definition is expected to be negative.

8.4 Impacts on Protected Species

8.4.1 Protected Species Impact Summary – Large Whales

Six species of large whales that are listed as endangered under the Endangered Species Act (ESA) are found in the waters fished by scallop vessels. The major known sources of anthropogenic mortality and injury of right, humpback, and fin whales clearly are ship strikes and entanglement in commercial fishing gear. Although these species are known to become entangled in fixed gear, no right, humpback, or fin whale has ever been observed or reported taken in the mobile dredge and bottom trawl gear used to catch scallops. The apparent preference of their prey resources to mid-water or surface zones further makes it unlikely that the scallop fishery will affect either species.

Blue, sei and sperm whales are generally found along the continental shelf margins. Because of this general offshore distribution these species are found at the fringe of the area fished by scallop vessels. In addition, the near-surface feeding habits of blue and sei whales, and the deep diving habits of the sperm whale to depths below those fished by scallop vessels make it further unlikely that they may be affected by mobile gear used in the scallop fishery. See Section 7.2.7 for more detailed information.